Centre for International Health

Perceptions of Global Coronary Heart Disease Risk, and Adherence to Antihypertensive Treatment among Low Income Urban Women in Delhi, India

Lipi Dhar

This thesis is presented for the Degree of
Doctor of Phylosophy
of
Curtin University

July 2016

DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number HR42/2015.

Lipi Dhar

Signature: ……..

Date: ……

ABSTRACT

Background: Coronary Heart Disease (CHD), a complication of uncontrolled hypertension, is a leading cause of death in women. The gap between women's perceived global CHD risk (GCR) and their actual or calculated CHD risk may contribute to these alarming statistics. Understanding the factors influencing the inaccurate perception of GCR has significant implications for the implementation of effective CHD preventive interventions. Global CHD risk assessment is the most important approach to hypertension treatment. However, despite the availability of over 100 different effective drugs for hypertension treatment, the reported rates of blood pressure control are disappointing. The issue of medication non-adherence (MNA) has received little attention in India. Therefore, this study examined hypertensive womens' actual and perceived CHD risks, and adherence patterns to antihypertensive treatment recommendations. The study also explores the factors that influence CHD risk perceptions and medication adherence to hypertension treatment among women in a low-income community in Delhi, India.

Methods: A mixed-methods design comprised a quantitative survey and semi-structured interviews. The Health Belief Model (HBM) was used to design and construct the questionnaire. Between August and October 2015, 500 women from a low-income urban community in Delhi were recruited to take part in the study. An 81 item questionnaire was administered to each participant to collect socio-demographic information, comorbidities, knowledge of CHD risk factors, family history of heart disease, history of hypertension and its treatment, the perceived GCR, and hypertension perception. In the qualitative phase of the study, 30 hypertensive women and nine health care providers were interviewed to determine the reasons that may influence adherence to prescribed hypertensive medications. Participants' actual GCR was calculated by the NHANES non-laboratory-based risk scoring chart, and perceived GCR was determined by participants' answer to a survey question about personal CHD risk. Prevalence of MNA was based on patient self-reports of consuming <80% of the prescribed medications over a recall period of one week. Multiple logistic regression with backward stepwise likelihood ratio method was conducted to determine the association between study variables and inaccuracy of perceived GCR as well as MNA.

Results: The study found the prevalence of hypertension among women to be 35.2%. Although a majority (75.2%) of women had low risk (<10%) of developing CHD, about a quarter of the women (24.8%; n = 104) had high risk (≥10%) of developing fatal or non-fatal CHD in the next five years. There was a low agreement between calculated and perceived GCR of women (Kappa ± SE) (0.137 ± 0.072); p = .05. More than half of women (52%) who were aware of their hypertension status were not able to estimate their CHD risk correctly. Diastolic hypertension (AOR = 3.09; 95% CI: 1.18–8.09; p = .02); age ≥48 years (AOR = 4.57, 95% CI: 1.75–11.93; p = .002); and poor knowledge level of CHD risk factors (AOR = 6.76; 95% CI: 2.60–17.63; p = <.001) were significantly and independently associated with the inaccurate perception of CHD risk.

In this study, MNA was found in 51% of hypertensive women. The study showed women who were not satisfied with their antihypertensive treatment (AOR = 11.09; 95% CI: 2.33–52.87; p = .003); who had a duration of antihypertensive therapy for three years or less (AOR = 14.31; 95% CI: 2.40–85.18; p = .003); who were not given an explanation about the treatment regimen and side effects of medications by their doctors (AOR = 28.39; 95% CI: 4.50–178.40; p = <.001); who perceived their CHD risk as low (AOR = 153.65; 95% CI: 9.30–2539.43; p = <.001) and who were inaccurate of self-perception of the CHD risk (AOR = 188.087; 95% CI: 9.80–3606.47; p = .001) were significantly and independently associated with MNA. The result of the in-depth interviews also pointed towards the following barriers to antihypertensive treatment: women participants' low awareness of the disease condition, an undesirable outlook toward antihypertensive medications, and dis-satisfaction with the attitude of health care providers and health care services provided.

Conclusion: More than half of the hypertensive women in the study were unable to accurately perceive their GCR level and did not adhere to their antihypertensive treatment. The findings suggest the need of better communication between patients and health care professionals to address women's lay beliefs about hypertension, its treatment and the risk of experiencing CHD events. The results can be used by policy makers in the design of culturally appropriate efficient programs to improve accuracy of perceived CHD risks and medication adherence to antihypertensive therapy in women living in low-income urban communities in order to prevent an increasing burden of CHD.

ACKNOWLEDGEMENTS

With a heart full of gratitude, I wish to confer cordial thanks to my supervisors: Professor Jaya Dantas and Dr Mohammed Ali for their valued guidance, advice, encouragement and continuous support throughout my study period. I would like to thank Dr Supreet kaur, my associate local supervisor, for her valued contribution to the successful completion of my mission.

I acknowledge the Australian Postgraduate Award and the Curtin Research Scholarship; without it I would have been unable to conduct this study. I take this opportunity to express my appreciation to the concerned authorities.

I sincerely recognise the co-operation extended by the community members of the study area who participated in the study. They generously sacrificed their leisure time and participated in the study to share their knowledge and wisdom. They gave me the opportunity to share their thoughts and experiences and complete my work. My special thanks to Professor Neelam Roy, Community Medicine Department, Safdarjung Hospital, Delhi, for her valuable assistance in proof reading the Hindi version of the documents relating to data collection in India. I acknowledge the untiring help in data transcription by Vinay Sharma, a renowned lecturer of English in Delhi. I express my gratefulness to the members of the staff of the HOPE project in Delhi and my friend, Dr Manisha, for their generous help during data collection. I also wish to thank my friend, Vishnu Khanal, for making quantitative data analysis a bit easier.

I would also like to convey my deepest thanks to my close relative and well-wisher, Shri Bhailal Dutta, for his constant and unprecedented support and encouragement at all stages of my journey. I would also like to give my cordial thanks to all my relations, friends, colleagues and all others who directly or indirectly provided necessary back-up and unremitting support during my study period.

Finally, my family: I have been graced beyond measure by my family. I am indebted to my father, Shri Kalipada Dhar, for his constant support, encouragement and caring attitude in all what I do. I am grateful to my father-in-law, Shri Nandlal Sharma, and mother-in-law, Mrs Rati Sharma, for their strong support and encouragement to go ahead with my study. I would like to give sincere thanks to my husband Binu, my

brothers Dr Kanu, Subho, Sanjoy and my sister-in-law Mrs Mistee for their love, affection, encouragement and providing all logistic support and amenities within my arm's reach, allowing me to study undisturbed. My little nephew, Master Ramen, also deserves love and thanks for his unique role in breaking my monotony by playing pranks during my stay in Delhi.

Before I close, I mention my respectful salutations to my divine mother Dr Pushparani Dhar; my beloved Maa, my friend, teacher, guide and philosopher. Being inspired by her, I took up this gigantic task. But to my utter misfortune, before I could present her my success; she has ascended to heaven. But I can feel that she is always with me to show me the right path in the journey of my life. I remember my Maa so that I will follow the principles of giving relief to the distressed and needy people as she taught me. May her blessings be showered on me from heaven.

DEDICATION

To the memory of my heavenly mother

who was, who is and who will remain

as a source of all inspiration

in every step of my life

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AHAS	American Heart Association Survey
AIDS	Acquired Immune Deficiency Syndrome
AOR	Adjusted Odd Ratio
BP	Blood Pressure
BMI	Body Mass Index
BRFSS	Behaviour Risk Factor Surveillance System
CDC	Centre for Disease Control and Prevention
CHD	Coronary Heart Disease
CI	Confidence Interval
CVD	Cardiovascular Disease
DALYs	Disability-Adjusted Life Years
DASH	Dietary Approach to Stop Hypertension
DHS	Director of Health Service
GATS	Global Adult Tobacco Survey
GBD	Global Burden of Disease
GCR	Global CHD Risk
HBM	Health Belief Model
HDL-C	High Density Lipoprotein-Cholesterol
HIV	Human Immunodeficiency Virus
ICMR	Indian Council of Medical Research
INR	Indian Rupees
IPQ	Illness perception Questionnaire
IPAQ	International Physical Activity Questionnaire
ISH	International Society of Hypertension
JNC	Joint National Committee
LDL-C	Low Density Lipoprotein Cholesterol
MEMS	Medication Events Monitoring System Metabolic
MET	Equivalent of Task
MI	Myocardial Infarction
MNA	Medication Non Adherence
MVC	The Municipal Valuation Committee

NCD	Non-Communicable Diseases
NCDRF	Non Communicable Disease Risk Factor
NFHS	National Family Health Survey
NHANES	National Health and Nutrition Examination Survey
NICE	National Istitute for Health and Care Excellence
NPCDCS	National Program on Prevention and Control of Diabetes, CVD and Stroke
OR	Odds Ratio
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
SES	Socioeconomic Status
SPSS	Statistical Package for Social Sciences
STEPS	Stepwise Approach to Surveillance
UK	United Kingdom
UNFPA	United Nations Population Fund
USA	United States of America
USD	United States Dollar
WC	Waist Circumference
WHO	World Health Organisation
WHR	Waist Hip Ratio

OPERATIONAL DEFINITIONS

Drinker:

Current-drinker: Participant who had consumed an alcoholic drink such as beer, spirits, wine, or other alcohol based drinks within the last 30 days.

Former-drinker**:** Has consumed alcohol but who did not consume one or more drinks during the month preceding the survey.

Non-drinker: Participants who had never drank alcohol in their life.

Diabetes:

In this study, patients were considered as diabetic if someone was taking insulin or oral hypoglycemic drugs during the time of the survey.[1]

Family Type:

Joint Family**:** A family in which parents and their male children with their families live together and are considered as a single unit.[2]

Nuclear family: A family group consisting of a mother and father and their children.[3]

Global CHD risk score:

The absolute or global CHD risk score is defined as the probability of experiencing a coronary heart disease or cardiovascular-disease-related event within five years after the risk assessment.[4] To estimate the global risk score of individual participants the NHANES non-laboratory–based risk prediction chart was used in this study.[5] The variables used in the NHANES risk prediction charts were self-reported data (sex, age, current smoking status, diabetes status), anthropometric data (height, weight and systolic blood pressure), and calculated data (BMI).[5] Because the prevalence of smokeless tobacco users in the study population was high, and based on the INTERHEART data, it was decided a *priori* to replace smoking with tobacco consumption in the NHANES.[4] Based on the above-mentioned factors, the study women were stratified into low (<10%), moderate (10–20%) and high (>20%) risk of developing an adverse CHD event in the next five years.[4]

Hypertension:

Elevation of blood pressure equal or above the treatment goal; that is, 140/90 mmHg[6] and/ or on antihypertensive treatment during the time of the survey.

Level of CHD risk factor knowledge:

A 10 item standardised questionnaire was used to assess knowledge of modifiable risk factors of CHD.[7] Out of the 10 risk factors listed in the question, five were evidently known to cause CHD. These modifiable risk factors were smoking, hypertension, high cholesterol levels, diabetes and obesity. The response options were yes, no or 'not sure'. Participants were instructed to say 'yes' only for risk factors that they felt definitely contributed to CHD, 'no' for factors that they were certain did not contribute, and otherwise to mark 'not sure'. Correct identification of three or fewer risk factors was regarded as a poor level of knowledge while correct identification of four or more was considered as a good degree of knowledge.[8]

Medication Adherence:

In this study, medication doses consumed or missed, based on patient self-reports, was used to measure medication adherence.[9] Patients were asked how often they missed their doses in the last seven days. The total number of doses that were supposed to be consumed in the past seven days was computed from the available current prescription, and when the prescription was not available, the medicine strips were used.[10] A shorter recall period was used to obtain accurate responses to minimise recall bias. Adherence as a percentage was computed as follows:

$$\frac{\text{Number of pills the patient consumed in the last seven days} \times 100}{\text{Number of pills that were prescribed for that week)}}$$ [9]

For analysis of adherence, a cut-off value of 80% was used for labeling patients as adherent or non-adherent. [9, 11]

Adherence to antihypertensive medications:

Consuming ≥80% of the prescribed doses of medicine out of the total number of doses supposed to be consumed in the past one week.[9]

Non-adherence to antihypertensive medications:

Consuming <80% of the prescribed doses of medicine out of the total number of doses supposed to be consumed in the past one week or stopped taking the medications after starting treatment at any point in the time following diagnosis in the past. [9, 11]

Metabolic syndrome:

The cluster of the most dangerous heart attack risk factors: high blood pressure, diabetes and pre-diabetes, abdominal obesity and high cholesterol.[12]

Obesity:

Defined as Body Mass Index (BMI) ≥25 kg/m^2.[13]

Central or abdominal obesity*:* Abdominal obesity was defined as waist circumference (WC) ≥80 cm. A waist-to-hip ratio (WHR) of ≥0.85 for females was also considered to indicate abdominal obesity.[13]

Overweight:

Defined as BMI 23–24.9kg/m^2.[13]

Physical activity:

High physical activity: Defined as minimum total physical activity of at least 3000 MET-minutes/week.[14]

Moderate physical activity: Defined as minimum total physical activity of at least 600 MET-minutes/weeks.[14]

Low physical activity: Defined as total physical activity score <600 MET-minutes /week.[14]

Perceived global CHD risk:

Perceived risk was calculated in this study by asking research participants: 'In the next five years, how many paisa in a rupee do you think is your risk of having heart disease compared to a woman of your age (if you make no changes in your current lifestyle such as tobacco use, diet, activity level, non-adherence to medication)?'. Participants

indicated their response by placing an X on a scale ranging from 0 paisa (no risk) to 100 paisa (high risk) that was segmented at 10 paisa intervals. The 0–100 paisa response scale was selected to correspond with the risk estimates provided by the NHANES risk calculator. According to participants' responses, participants were categorised into 'low perceived risk' (<10 paisa in a rupee), moderate perceived risk (10–20 paisa in a rupee) and high perceived risk (>20 paisa in a rupee). For study purposes, the variables for 'moderate' and 'high perceived risk' were collapsed into a single variable: 'high perceived risk'.

Perception of high blood pressure:

Perceptions of high blood pressure were assessed with the valid and reliable Brief Illness Perceptions Questionnaire (BIPQ).[15] The BIPQ asks patients to provide information about eight dimensions of illness (hypertension). Five dimensions are related to cognitive illness representations (the perceived consequence, timeline, personal-control, treatment-control and identity), two dimensions are related to emotional representations (respondents' emotions and concerns about the illness) and one dimension is related to illness comprehensibility (coherence).[15] Separate scores for the eight dimensions of illness perception and an overall score were calculated. The scores represent the degree to which the illness is perceived as threatening (high scores) or benign (lower scores). As suggested by authors of the BIPQ, the word illness was replaced by the wording 'high blood pressure'.

Response to BP medications:

In this study, participants were asked whether their BP medications made them feel better and the response options were 'yes', 'no' and 'can't say'. For study purposes, those patients were further divided into two groups: feeling better (those who responded 'yes') and not feeling better (those who responded 'no' and 'can't say').

Risk accuracy:

Risk accuracy was defined as the ability of the participant to assign her likelihood of heart disease to the same category as her calculated risk.[16] If the difference between an individual's estimated risk and a personal perceived risk was a positive number, it indicated a pessimistic view in that participants see their own risk as greater than it is. Negative numbers would indicate an optimistic view in which participants understand

their risk as smaller than the calculated risk.[17] According to participants' responses, participants were dichotomised into participants with accurate perception and participants with inaccurate perception. Under-estimators were those women who perceived themselves to be at 'low' risk, but were actually at high risk[16] (i.e. calculated by the NHANES non-laboratory-based risk score chart).

Satisfaction with the BP treatment:

In this study, participants were asked if they were satisfied with the benefit of the present medications. The response options were 'satisfied', 'not satisfied' and 'can't say'. For study purposes, patients were further divided into two groups: satisfied and not satisfied (those who responded 'not satisfied' and 'can't say' with the BP treatment)

Tobacco Users:

Smoked tobacco user: Participant who consumed smoked tobacco products such as cigarettes, *bidis* or hookah in the last month before the assessment.

Current daily smoked tobacco user: Participant currently using smoked tobacco products such as cigarettes, bidis or hookah daily.

Smokeless tobacco user: Participant who consumed chewable tobacco products such as *gutkha, naswar, khaini* or *zarda paan* in the last month before the assessment

Current daily smokeless tobacco user: Participant currently using chewable tobacco products such as *gutkha, naswar, khaini* or *zarda paan* daily.[1]

CHAPTER 1

INTRODUCTION AND OVERVIEW

1.0 Introduction to the chapter

This chapter describes the background to the study, specifies the research aim and objectives and outlines the thesis chapters.

1.1 Overview of the background

Non-communicable diseases (NCDs), also known as chronic illness, are the world's number one killer, causing 60% of total deaths globally.[18] NCDs are of long duration and slow progression. Worldwide, approximately 36 million people die every year from these silent killers.[19] The four leading NCDs, in terms of burden of disease and mortality, are cardiovascular diseases (CVDs), cancers, chronic respiratory illness and diabetes.[19] Together, NCDs are the foremost cause of death for women worldwide. They cause 65% of all female deaths, amounting to 18 million deaths each year.[20] CVDs account for most NCD deaths.[18] CVDs are an assemblage of disorders of the heart and blood vessels and include: coronary heart disease (CHD), rheumatic and congenital heart disease, cerebro-vascular disease, hypertension, heart failure and peripheral vascular disease.[20]

CHD, the largest contributor of the cardiovascular diseases, has emerged as the leading cause of death worldwide.[21] The significant burden of CHD is already evident among populations living in low-income urban areas across India. Some studies in India have noted a high prevalence of CHD risk factors among urban, low-income people. Among these population groups, women are particularly vulnerable to developing CHD because of a higher prevalence of hypertension in middle-aged and older women compared to men.[22-24] CHD is one of the most significant causes of disability and mortality in women during childbearing years.[25] Regardless of race or ethnicity, the disease accounts for the death of one in three women worldwide, an estimated 3.4 million women every year.[26, 27] An analysis of global data reveals that of the women who will die from CHD, approximately 80% of the deaths will occur in low- and middle-income countries,[28] and is particularly common among people of low socioeconomic status.[29]

High blood pressure or hypertension is the one of the most important risk factors for cardiovascular disease and a leading cause of premature adult deaths worldwide.[18] Uncontrolled hypertension causes 50% of the CHD deaths globally.[18] Since most deaths attributable to hypertension are the result of CHD, the primary objective in the management of hypertension is the prevention of CHD. As most hypertensive patients living in low-income urban areas are undetected, untreated or sub-optimally treated, there is a significant treatment and prevention gap in CHD within this group.

As clustering of CHD risk factors frequently occurs in hypertensive individuals, the global CHD risk (GCR) approach (on the basis of combined effect of multiple risk factors) is the most important target for hypertension treatment.[30] GCR assessment more accurately identifies patients who will benefit from risk-reducing therapy, and such information may encourage patients and physicians to address CHD risk.[30] To use available resources more efficiently, and to make treatment cost-effective at the patient level, the GCR approach is the preferred standard in CHD preventive management.[31]

Studies show GCR varies among different sub-populations independent of the major risk factors.[32, 33] In the setting of underserved communities, due to the rising incidence of hypertension, research policies should focus on CHD prevention strategies. Identification of patients at risk for CHD could facilitate the prevention of CHD events. There is a notable lack of published data on the stratification of CHD risk, particularly among vulnerable women residing in low-income urban settlements in India; as such, it becomes difficult to initiate CHD preventive and promotional activities. Primary prevention in terms of risk stratification is essential for accurate and early decision-making and action in the natural history of CHD.[34]

Likewise, knowing the CHD risk perceptions of a population group is a prerequisite for planning and implementing focused and efficient CHD prevention strategies.[35] As hypertension has no symptomatic external cues, it is important to ensure that individuals who live with hypertension have accurate perceptions of their CHD or heart attack risk in order to encourage preventive actions (i.e. medication adherence) against future heart attack risk. Women's perceived heart disease risk can significantly influence their decision-making process about healthcare choice.[36] Evidence shows that only a small number of women recognise CHD as their greatest health threat.[36] As a

result of the mistaken belief that CHD affects mainly males, there is a considerable gap between perceived and actual risk of CHD in women. These inaccurate perceptions may lead women to underestimate their likelihood of CHD so that they fail to look for early interventions to prevent avoidable morbidity and mortality.[36]

Understanding the relationship between perceived risk of CHD in women and motivation to engage in health-promoting behaviour such as medication adherence is necessary to improve the health of women and prevent CHD.[36] Although CHD risk perception has been studied in different parts of the world, the majority of the participants in these studies were Caucasian women.[36] There was a limited representation of Asian and Pacific women in sample populations of these studies. Therefore, further studies need to be conducted with women of these regions on their perceptions of the risk for CHD.[36]

One of the most important and least expensive ways of preventing CHD is to control hypertension by pharmacological treatment. Due to poor adherence to antihypertensive treatment, approximately 75% of diagnosed hypertensive patients do not attain optimum blood pressure control.[9] Studies reveal that among women in developing countries such as India, the mean prevalence control of hypertension is only 16.2%.[37] Moreover, evidence suggests that despite the availability of free or low-cost antihypertensive medications at government primary care facilities, approximately 90% of people with hypertension residing in low-income settlements fail to achieve blood pressure control.[38]

Although, poor adherence to antihypertensive treatment is a significant problem, studies intended at finding out the reasons for such non-adherence are very few in India.[39] Moreover, the majority of these studies were conducted in hospital and clinical settings.[40] Studies carried out in low-income urban areas are extremely limited.[10] Overall, the non-adherence issue in hypertension control has received little public health attention in India.

Therefore, to develop an effective CHD prevention program among hypertensive women in low-income urban settings, a comprehensive description of global CHD risk, perceived CHD risk and issues related to non-adherence to antihypertensive treatment

would be extremely valuable. This present study is expected to help fill the knowledge gap and inform the development of strategies for improving women's perceived CHD risk, adherence to treatment and prevention of CHD.

1.2 Aim and Objectives of the study

The aim of the study was to examine hypertensive women's global coronary heart disease risks, their perception of the global CHD risks and adherence pattern to treatment recommendations in a low-income urban area of Delhi, India. The study objectives were to:

1. **Objective 1**: Assess and stratify global CHD risk among women living in a low-income urban area of Delhi, India.
2. **Objective 2**: Examine hypertensive women's perceptions of their global CHD risks and evaluate its relationship with socio-demographic variables and their knowledge of CHD risk factors.
3. **Objective 3:** Investigate prevalence and predictors of non-adherence to anti-hypertensive medications among hypertensive women in a low-income community.
4. **Objective 4:** Explore the reasons underlying antihypertensive treatment adherence.
5. **Objective 5:** Examine health care providers' attitudes regarding women's perceived global CHD risks and their adherence to antihypertensive treatment.

1.3 Over-view of the thesis

The present chapter has provided the background of the study, together with its aims and objectives.

Chapter 2 explains the context of the increasing risk of coronary heart disease among low socioeconomic groups of people in India, the vulnerability of women and the management gap in CHD prevention. Poor adherence to antihypertensive treatment is a significant problem in CHD prevention. Understanding the relationship between the perceived risks of CHD in women and their motivation to engage in health-promoting behaviour such as medication adherence, is necessary to improve the health of women and prevent CHD.

Chapter 3 provides a literature review on the factors that affect treatment non-adherence among hypertensive populations in developing countries with a special emphasis on urban women.

Chapter 4 describes the research methodology and the conceptual framework underlying it. It details both the qualitative and quantitative arms of the study. Ethical considerations are also described.

Chapter 5 contains the results from analysis of the quantitative data from the 500 women participating in the present study. The data is of socio-demographic characteristics, behavioural and physiological profiles, knowledge of heart disease risk factors, dietary habits, family history of heart disease, and history of hypertension and its treatment. Detailed findings concerning CHD risk perception and medication adherence of the already-diagnosed hypertensive women are presented.

Chapter 6 presents qualitative findings from hypertensive women and health care providers regarding their perceptions of the reasons that may hinder or assist antihypertensive medication adherence. It also describes women's expectations regarding their hypertension management and physicians' recommendations to improve medication non-adherence among hypertensive women from low-income communities.

Chapter 7 discusses key study findings related to the study objectives in the light of the published literature and their implications for practice, policy and research. The chapter also makes recommendations, discusses the significance of the study and its limitations, and offers a concluding statement to the thesis.

Appendices 1-15 contain ethical approvals from the HREC, Curtin University and Sigma International Review Board, India. They also include a supporting letter from the concerned NGO, the health behaviour model, lifestyle modifications and their effect on hypertension, the mechanism of action and adverse effects of common antihypertensive medications, participant information sheet, participant consent form, questionnaires, the semi-structured interview guide, the Hindi version of all participant related documents, a statement of accuracy of the Hindi translation, permission to use copyrighted questionnaires and overview of the included studies in literature review.

CHAPTER 2

BACKGROUND

2.0 Introduction to the chapter

This chapter starts with an overview of the non-communicable diseases, especially cardiovascular disease, globally and in India. It then describes the prevalence of Coronary Heart Disease (CHD) in India, its risk factors and the management gap in CHD prevention. This is followed by the perception of global CHD risk and preventive behaviour. It then describes the rising burden of hypertension in India, its treatment management, medication adherence and health care services in India.

2.1 Non-communicable diseases globally and in India

Non-communicable diseases (NCDs), also known as chronic illness, are the leading causes of adult mortality and morbidity, causing 60% of all deaths globally.[18] NCDs are of long duration and slow progression.[18] The four main NCDs, in terms of burden of disease and mortality, are cardiovascular diseases (CVDs), cancers, chronic respiratory illness and diabetes.[19] The most recent global estimates for NCD mortality are for the year 2008; they accounted for 36 million of the world's 57 million deaths (please see Figure 1).[27]

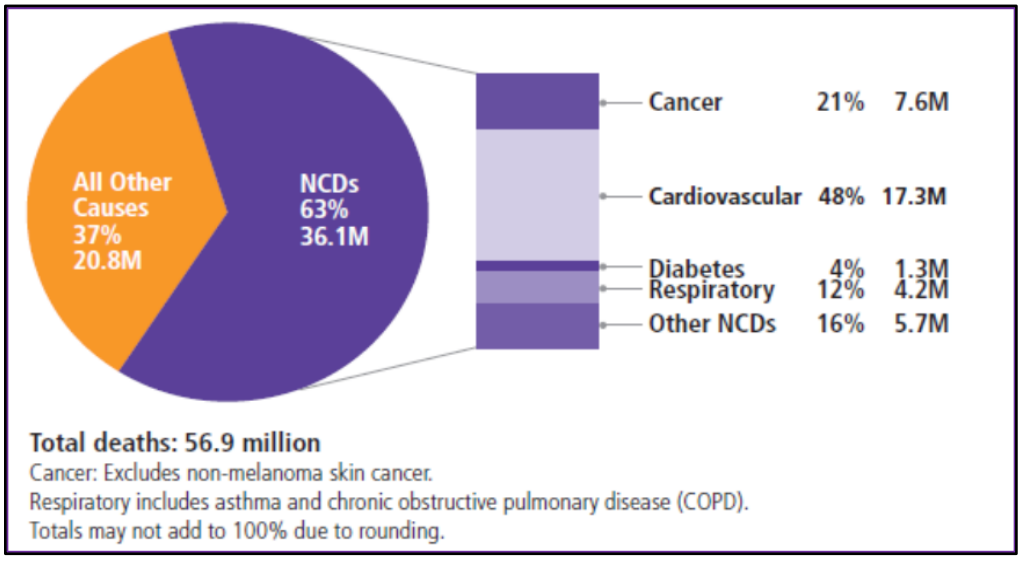


Figure 1: Global causes of death in 2008 [19]

Together, NCDs are also a significant cause of female deaths worldwide. They cause 65% of all female deaths: 18 million deaths each year.[41] The 2011 United Nations Assembly of Heads of States noted with concern that 'the rapidly growing magnitude of NCDs affects people of all ages, gender, race and income levels, and … that poor populations and those living in vulnerable situations, in particular in developing countries bear a disproportionate burden'.[42]

In India, NCDs accounted for an estimated 53% of all deaths in 2008[27, 43] (please see Figure 2). NCDs were also responsible for 44% of disability-adjusted life years (DALYs) lost in 2005.[44] One quarter of all NCD-related deaths usually occur among people below the age of 60.[19] Studies show that the leading NCDs will cost the world economy USD 47 trillion over the next two decades and drive millions of people below the poverty line.[4] In India, NCDs are creating more strain on health resources than that caused by communicable diseases and maternal health problems.[45] In 2004, NCDs accounted for 40% of all hospital stays and 35% of all outpatient visits.[46] The World Bank estimates that health promotion and prevention initiatives could be used to avoid more than one half of the NCD burden.[47]

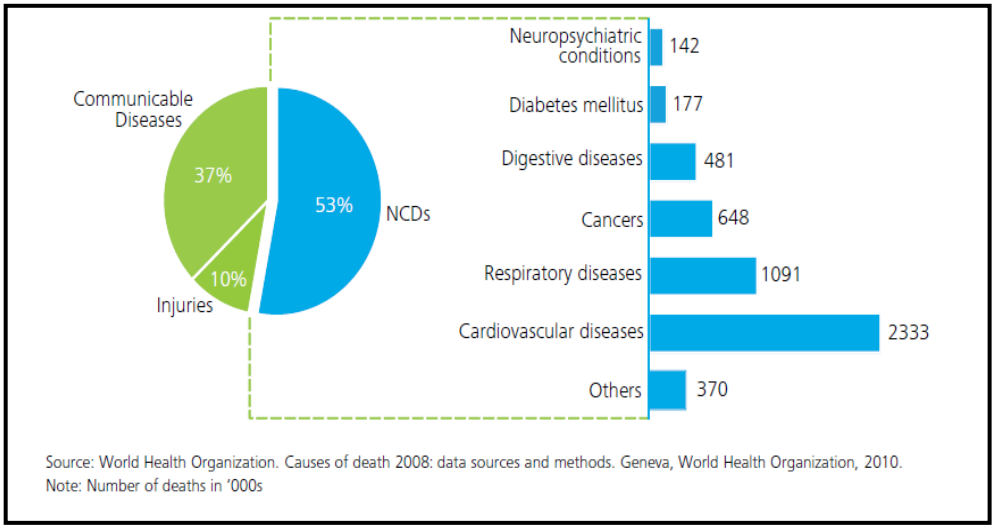


Figure 2: Proportion of major causes of mortality in India in 2008[43]

2.1.1 Cardiovascular disease

Cardiovascular disease (CVD) is the single largest cause of morbidity and mortality worldwide. CVDs are a collection of disorders of the heart and blood vessels. CVDs include coronary heart disease (CHD), rheumatic and congenital heart disease, cerebrovascular disease, hypertension, heart failure and peripheral vascular disease.[19] CVD represents nearly 50% of NCD deaths.[48] In 2012, an estimated 17.5 million people died from CVDs, representing 31% of all global deaths.[21] CVD is also the number one killer of women worldwide [20] causing 9.1 million deaths annually (please see Table 1).[28]

Table 1: The leading global causes of death among women, 2008[28]

Rank	Cause	Number of deaths	%
1	Cardiovascular diseases	9,127,416	33.2
2	Infectious and parasitic diseases	3,811,044	13.9
3	Cancer	3,566,128	13
4	Respiratory disease	2,018,967	7.3
5	Respiratory infections	1.812,342	6.6
6	Unintentional injuries	1,408,698	5.1
7	Per natal conditions	1,379,337	5.0
8	Digestive diseases	865,847	3.1
9	Diabetes mellitus	723,273	2.6
10	Neuropsychiatric conditions	640,406	2.3
	Total	**27,501,236**	

The majority of CVD deaths occur in low- and middle-income countries.[49] Based on statistics from the Global Burden of Disease study, over 25% of CVD deaths in low- and middle-income countries come from the South Asia Region (SAR).[50] The SAR consists of approximately 20% of the global population, with 1,470 million residents.[50] In this region, India accounts for 75% of its inhabitants. CVD is responsible for over 25% of all deaths in the SAR.[50] By 2030, the number of CVD deaths is expected to increase to 23.6 million, from a total of 44 million NCD deaths.[51] CHD is the most prevalent form of CVD, accounting for 90–95% of all CVD cases and fatalities.[52]

CHD is one of the leading causes of disease burden in developing countries.[50] In 2012, there were 7.4 million deaths due to CHD worldwide.[21] The majority of global deaths and more than 80% of the total DALYs due to CHD take place in low- and middle-income countries.[50] It is expected that by 2020, the global burden of heart disease will rise, both in relative and absolute terms and that 34–37% of all deaths will be attributed to CHD.[53, 54]

2.2 Coronary Heart Disease in India

As measured in 2010, CHD was the number one cause of mortality in India, replacing infectious diseases.[45] There were more than 1.67 million deaths from CHD in 2008[27] and CHD is expected to account for at least one-third (33.5%) of total deaths by the year 2015.[55]

CHD has a greater incidence among Indians than any other ethnic group.[56-58] The CHD risk of Indians is four times higher than that of Americans, six times greater than the Chinese and 20 times more than that among Japanese.[57] The prevalence of CHD in urban India has risen four-fold over the last 40 years and has doubled in rural areas over the past 30 years.[59] The prevalence of CHD is 7%–13% in urban populations and 2%–7% in rural populations in India.[60, 61] Approximately 31.8 million people are living with CHD in India.[62] It is also estimated that only one-quarter of these individuals are aware of their condition and seek medical care.[50] Despite this, nearly 25% of all medical admissions are due to CHD according to a survey carried out on hospital information in Delhi.[62] Patients who do not solicit proper treatment die at a rate of 7%–8% per year.[62]

More than 50% of CHD-related deaths in India occur in the age group of 35–64 years compared to around 22% of such deaths in the same age group in Western countries.[63] About 5%–10% of heart attacks or myocardial infarctions (MI) occur in Indian adults aged 40 years or below.[64] The INTERHEART study suggested that the earlier age of heart attack in Asian Indians is likely due to the earlier onset of major CHD risk factors and a relative lack of access to the preventive and treatment interventions.[65, 66] Earlier onset of risk factors is due to poor self-awareness and the failure to adopt healthy practices.[66, 67] CHD affects Indians in their more productive years of age—at least 10–15 years earlier than their western counterparts—effectively translating into a greater impact on the country's economy.[68, 69] In 2005, India experienced the 'highest loss in potentially productive years of life' worldwide.[70] India lost USD9 billion in national income from premature deaths owing to heart disease, stroke and diabetes.[70] These losses *are* expected to reach a cumulative total of USD237 billion over the next decade.[58, 71]

2.2.1 CHD and women

Evidence shows that CHD is one of the most significant causes of disability and mortality in women during childbearing years.[25] Regardless of race or ethnicity, the disease accounts for the deaths of one in three women.[26] An estimated 3.4 million women die from CHD in each year worldwide.[27] Women diagnosed with CHD experience greater morbidity and mortality than men. A higher proportion of younger women (52%) than men (42%) who experience a heart attack, die of sudden cardiac arrest before reaching a hospital.[72] Likewise, 38% of women suffering a heart attack die within one year in contrast to 25% of men who die within one year.[73] After a heart attack, heart failure occurs within six years in 46% of women compared to 22% for men.[73]

It is estimated that, of the women who will die from CHD, 80% of the deaths will occur in low- and middle-income countries.[28] Women in low- and middle-income countries living in poverty are particularly vulnerable to CHD. The report of the Registrar General of India on causes of death also stated CHD as the most significant cause of death among women in India.[74] Evidence suggests that there is a greater proportion of women in India with CVD than men.[75] A study found the prevalence of CHD among men was over 6% and women over 10% in India.[76] More than half of the 800,000 annual CHD deaths in women occur prematurely.[74] Adult female mortality has considerable impact on household welfare. The impact encompasses food insecurity and increased mortality amongst small children, increased work burden on children as well as their forced detachment from school and ultimately overall loss of assets.[77]

2.2.2 Aetiology and pathophysiology of CHD

Atherosclerosis (formation of atheromatous or fatty plaques in the walls of blood vessels), which is the primary pathological process, leads to CHD, progresses gradually and is usually asymptomatic for a significant period. The rate of progression of atherosclerosis is subject to several modifiable CHD risk factors: hypertension, abnormal blood lipids, diabetes mellitus, tobacco use, an unhealthy diet and physical inactivity. Sustained exposure to these risk factors leads to further progression of atherosclerosis (calcification or hardening of the walls of blood vessels), narrowing of blood vessels and obstruction of blood flow to the heart muscle[48] (please see Figure 3). The common clinical manifestations of CHD include angina pectoris, acute myocardial

infarction (MI) or heart attack, congestive heart failure, cardiomyopathies, inflammatory heart disease and sudden death.[52, 78]

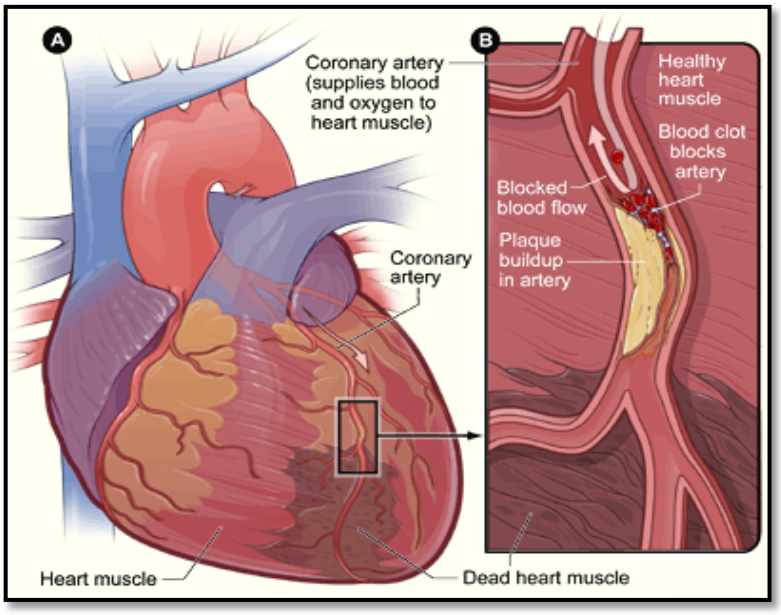


Figure 3: Heart with muscle damage and a blocked artery [79]

(Figure 3A shows a heart with damaged muscle caused by a heart attack or MI. Figure 3B shows a cross-section of a coronary artery with a blood clot and plaque accumulated).

2.2.3 CHD risk factors and population in India

Presence of a particular risk factor in an individual may increase the probability of developing a certain type of disease, but it does not suggest that the person will inevitably develop that disease.[80, 81] CHD risk factors are divided into two broad categories: modifiable and non-modifiable. A modifiable risk factor is one which can be changed. In contrast, a non-modifiable risk factor cannot be amended. Major modifiable risk factors include hypertension or high blood pressure, smoking, abnormal lipid or dyslipidemia, diabetes, obesity, inadequate intake of vegetables and fruits, and physical inactivity.

Non-modifiable risk factors include age, gender, ethnicity/race, family history and genetic disposition.[80] The INTERHEART study evaluated the risk factors associated with a heart attack in 52 countries.[72] Together, nine common risk factors (hypertension, abnormal lipids, smoking, diabetes mellitus, abdominal obesity, psychosocial variables, lack of consumption of fruits and vegetables, regular alcohol consumption and sedentary lifestyle) accounted for 90% of the population-attributable risk in men and

94% of women.[72] Hypertension and elevated levels of cholesterol continue to be the primary causes of CHD where as tobacco use, lack of physical activity and obesity remain significant contributors.[50]

The etiology and progression of CHD are related to a complex interplay of genetics and biological, behavioural, economic and social determinants.[82, 83] The literature shows that the nine common risk factors mentioned earlier, explain more than 90% of the CHD in South Asian subjects.[84] Findings from various studies have shown that, though genetic factors can perform a critical role, 80%-90% of people dying from CHD in India have one or more major modifiable lifestyle risk factors.[49] Several epidemiological studies conducted in India have reported an increase in these CHD risk factors among adult Indians.[60, 85-87] With demographic shifts, the epidemiological transition is principally responsible for the increase in CHD risk factors. Epidemiological change has been the result of rapid urbanisation, globalisation and intra-national migrations.[88, 89] Rapid urbanisation leads to change in lifestyles such as increased unhealthy dietary practices, sedentary behaviours, tobacco use, alcohol intake and increased levels of stress along with reduced physical activity.[88, 90] Changes in lifestyle increase the mean levels of blood pressure, serum cholesterol and blood glucose as well as a decrease in insulin sensitivity.[88, 91] As a result, there are an increasing number of cases of hypertension, dyslipidemia, diabetes and obesity. Together, these factors have accelerated the growth and mortality levels of CHD diseases in India. Due to a lack of concerted policy directions aimed at CHD control in India, the prevalence of CHD is poised to accelerate even further.[92]

2.2.4 CHD risk factors in Indian women

A nationwide epidemiological study among women reported a greater prevalence of multiple CHD risk factors in urban women.[93] Moreover, an analysis of nationally representative survey data[94] and findings from recent studies indicate a higher prevalence of hypertension in middle-aged and older women as compared to men.[23] The second and third National Family Health Surveys (NFHS) point out that smokeless tobacco use is particularly high in women.[95] Comparison of NFHS-2 and NFHS-3 shows that smoked tobacco use is also increasing among women, particularly among those with poor literacy or low socio-economic status.[95] There is also an increasing trend of overweight and obesity in Indian women, which is of a greater magnitude than that

observed among men.[96] Similarly, results from several studies demonstrate a higher prevalence of metabolic syndrome (it is a cluster of the heart attack risk factors: high blood pressure, diabetes and pre-diabetes, abdominal obesity and high cholesterol) and diabetes in women as compared to men.[93]

2.2.5 CHD risk in people with low socioeconomic status

In some developing countries, including India, the epidemiological transition has undergone a reverse social gradient with people of lower socioeconomic status suffering the highest rates of CHD and associated risk factors.[97] Several studies from Sweden, USA, France and the UK, have investigated the relation between socioeconomic status (SES) and cardiovascular disease. Despite substantial regional differences between these studies, all found that lower SES is associated with higher CHD risk.[98-100] Similarly, 30-day followup data of patients from the CREATE registry of acute coronary syndrome demonstrated significantly higher mortality rates in low SES groups compared to higher SES groups.[68] Recent case-control studies of acute MI in India has also suggested a reversal of the social gradient with a significantly higher burden of CHD morbidity in low SES groups compared to higher SES groups.[68, 101]

2.2.6 CHD risk in people living in low-income urban areas in India

India is the world's second most populous country. According to the 2011 Census of India, the total population is 1.21 billion.[102] India has witnessed rapid and unplanned urbanisation in recent decades due to robust economic growth. However, the escalation in national wealth has not been equally distributed. As a result, there has been a dramatic growth of the low-income population in urban India. Indian cities are faced with an acute shortage of adequate housing, which has led to the growth of informal sub-standard settlements in the form of slums or squatter settlements. About 30% of the Indian population now live in urban areas, while the population living in low-income urban settlements varies from 26%–55% of the total urban population.[103] Informal settlements are typically set up illegally either on government land or private land in a haphazard manner. They are unplanned and violate most norms of civic planning.[104] These settlements suffer from various infrastructural inadequacies in water supply, sewerage, drainage, garbage disposal, schools, hospitals and roads.[105, 106] The settlements are overcrowded with high levels of tenancy. Home-based manufacturing units are common in these areas, which accommodate tenants both for residential and

business enterprises.[105] As these settlements are illegal, most lack not only essential facilities but also lawful rights of occupancy, even though some of them may have been in existence for a long time.[106] An analysis of the 2005–2006 national survey data[107] found that the proportion of people living in poverty was smaller than the proportion of people residing in slums, signifying that not all people living in slums were poor, however, the majority of poor households were located in those slums.

Due to lack of infrastructure and basic health facilities, slums and other vulnerable settlements are amongst the world's most vulnerable environments.[108] In fact, the urban poor face a 'double burden' with high incidences of acute communicable diseases (due to overcrowding and unhygienic living conditions) and growing rates of chronic NCDs associated with rapid urbanisation.[109]

Many studies in India have noted a high prevalence of CHD risk factors among people living in low-income urban areas.[23, 110-114] They are generally more likely to have CHD than Indians living in affluent areas because of the high prevalence of CHD risk factors such as uncontrolled hypertension, tobacco use, low intake of fruits and vegetables, and obesity.[23, 110-114] Recent case-control studies in India have reported that being illiterate or poor is an independent risk factor for acute MI.[115] Lack of access to primary care is higher among the poor who are resident in vast urban slums or other substandard settlements leading to their conditions being undetected, untreated or undertreated. Consequently, they suffer avoidable complications that develop from NCD and CHD risk factors.[116] Also, due to poor compliance and adherence to pharmaceutical treatment, they are more vulnerable to future CHD events.[117, 118]

Among this population group, women are particularly vulnerable with higher prevalence of hypertension and other modifiable CHD risk factors compared to men.[23, 119] Women living with cardiovascular diseases experience particular challenges in accessing cost-effective prevention, early detection, diagnosis, treatment and care of cardiovascular diseases. The lack of knowledge and information regarding health, poor access to health care, family responsibilities, and poor economic, legal and political status worsen their situation.[119] Furthermore, in some places, cultural restrictions make it difficult for women to avail health care from male health care professionals, but there is, at the same time, a scarcity of female health care providers.[120] These issues are further

compounded by health systems that are often unable to respond to the particular requirements of women with CVDs.[116]

2.3 CHD risk factors

2.3.1 Major modifiable risk factors

Hypertension

Hypertension or high blood pressure (≥140/≥90mmof Hg) is the single leading risk factor for CHD and one of the most important causes of premature death worldwide.[18] It has been estimated that hypertension causes 50% of CHD death globally.[18] Among individuals aged 40–90 years, each 20/10mmHg rise in blood pressure (BP) doubles the risk of fatal coronary events.[121] An analysis of global data reveals that more than 80% of deaths from hypertension and associated CVDs now occur in low- and middle-income countries, with people of low SES particularly affected.[29] A review of hypertension epidemiology demonstrated a high prevalence of hypertension in both urban and rural areas in India. High blood pressure is prevalent in 30%–40% of adults in larger Indian cities and 10%–20% in rural populations.[109] These results are comparable with other regions of Asia and elsewhere where it has been reported that up to about 50% of all adult individuals have high BP at any given time.[109]

Tobacco use

Tobacco use causes a substantial number of preventable deaths from cardiovascular diseases.[122] Tobacco contains many components that contribute to the initiation or progression of atherosclerosis or trigger clinical events such as MI and angina.[123] Tobacco smoking is the single most potent risk factor for atherosclerosis.[124] It causes about 30% of CHD deaths globally.[125] Research shows chewing tobacco has a similar cardiovascular risk as smoking.[126] According to the Global Adult Tobacco Survey (GATS) 2009–2010, there were almost 275 million tobacco users in India.[127] Over one third of the adult population (48% of males and 20% of females) use tobacco products in one form or another. In India, a higher proportion of smoking tobacco users die from CHD than from any other diseases.[128]

Dyslipidaemia

Dyslipidaemia is characterised by elevated blood total cholesterol, triglyceride, low-density lipoprotein cholesterol (LDL-C) concentrations and low levels of high-density

lipoprotein cholesterol (HDL-C) concentrations.[129] According to the INTERHEART study, abnormal blood lipid is one of the most important risk factors for MI globally.[72] There is evidence of high prevalence of dyslipidemia among the urban slum population due to rapid acquisition of adverse lifestyles.[130-132] A study conducted amongst urban slum-dwelling residents in northern India found that approximately 27% of the men and 28% of the women had high levels of total cholesterol. Low HDL-C was seen in 16% of men and 17% of women, and high triglyceride in 17% of men and 12% of women.[132]

Diabetes

Diabetes or high blood glucose is an important risk factor for CHD. People with diabetes have a more than two-fold greater risk of fatal and nonfatal CHD compared to non-diabetics.[133] In 2001, approximately 1.49 million deaths from CHD globally (21% of all CHD deaths) were attributable to diabetes.[134] India has been severely affected by the diabetes epidemic, particularly in urban areas.[135] Although countrywide data are not available, smaller studies have been conducted in different states of India to investigate the prevalence of diabetes.[136] The highest prevalence of diabetes is reported from Ernakulam in Kerala (19.5%) and the lowest from the Kashmir Valley (6.1%). Based on these studies, the national average for diabetes prevalence is just above 10%.[136] Misra et al[112] reported a 10.3% prevalence of diabetes in a slum area in Delhi.

Overweight and obesity

Obesity is the most visible manifestation of the global trend of sedentary lifestyles and excessive calorie intake.[137] Epidemiological studies have shown that being overweight and obese confers a significantly elevated risk of CHD incidence and mortality. Also, obesity is an independent risk factor for CHD outcomes, such as congestive heart failure and sudden cardiac death.[137-139]

Even in low- and middle-income countries where under-nutrition is still highly prevalent, overweight and obesity, especially among women, is a burgeoning issue.[140] Body Mass Index (BMI) is used as an indicator of underweight, overweight, and obesity. BMI is calculated from height and weight measurements (weight in Kg/ height in metres). About 21% of global CHD risk is attributable to a BMI greater than 21 kg/m^2.[141] The health risks that are associated with overweight and obesity occur at lower levels of BMI in Asian populations in comparison to people in North America or Europe.[142]

Consequently, lower cutoff points for BMI are used to categorise overweight (BMI ≥23)and obesity (BMI ≥25) conditions for the Asian populations.[13] According to the National Family Health Survey-3 (NFHS-3) in India, the prevalence of overweight and obesity are three times higher in urban areas than in rural areas and are more frequent among women.[107, 143] Similarly, in the New Delhi Birth Cohort study, obesity was found in 54% of men and 66 % of women using BMI >25 as the cut-off point. In this study, more than 80% were considered overweight.[144] The prevalence of obesity is also on the rise among the population living in low-income settlements in India. A community-based cross-sectional study was conducted recently in a slum settlement in Chennai city. In this study, in women aged 20 years and above, the prevalence of overweight (BMI ≥23) and obesity (BMI ≥25) was found to be 27% and 20%, respectively.[9]

However, BMI does not differentiate between body mass due to body fat, or muscular build.[145] Abdominal obesity, (measured by waist circumference) appears to be a stronger predictor of CHD than BMI. It is suggested that abdominal obesity should be used as an indicator of obesity.[146] For Indian population, waist circumference should be <90 centimetres for men and <80 centimetres for women.[13] Another measure of central obesity is Waist to Hip Ratio (WHR), normally <0.85 for women and <0.95 for men.[13]

Recent studies have also proposed that Percent Body Fat (PBF) indicates more accurately body composition than BMI and waist circumference. PBF is defined as the proportion of individual fat mass over body weight.[147] Accurate determination of body fat could provide clinically useful guidance for physicians to assess CVD risks in patients with obesity and optimise preventive or therapeutic remedies for those patients.[148] However, due to cumbersome procedures of measurement and calculation for the PBF, BMI and waist circumference were used as diagnostic tools in the present study to identify weight problems of the participants.

Lack of daily consumption of vegetables and fruits

Vegetables and fruits are the primary resource of nutrients and phytochemicals, including fibre, B vitamins, vitamin C, antioxidants, potassium and flavonoids that support cardiovascular health.[149] Phytochemicals are bioactive non-nutrient plant compounds that are linked to reducing the risk of CHD.[149] People who eat more vegetables and fruits have a lower prevalence of major risk factors for CHD, such as

hypertension, diabetes, obesity and low levels of homocysteine.[150] In the INTERHEART study,[72] daily consumption of fruits and vegetables was estimated to be 30% for relative MI risk reduction. The daily fruit and vegetable intake of Indians is lower compared to the rest of the world (27% vs. 45%).[72] A community-based cross-sectional study in central Delhi found that, in a typical week, the daily intake of fruits was only 1% among participants, despite its easy availability and affordability.[151]

Lack of physical activity

Physical activity is defined as any body movement produced by skeletal muscle that requires energy expenditure. It impacts upon metabolic and other pathways that positively affect CHD risk factors.[152] It decreases body weight, lessens platelet aggregation, decreases BP, intensifies fibrinolytic activity, improves plasma lipid profile, decreases the resting heart rate, and enhances cardiac function and cardio-respiratory fitness.[152] Physical inactivity has been consistently linked with an increased risk of CHD, with 22% of CHD deaths being attributable to a sedentary lifestyle worldwide.[153] A Finnish study showed that regardless of other risk factors that may be present, moderate levels of physical activity was associated with a reduced risk of premature cardiovascular disease and mortality.[152]

The World Health Organisation (WHO) recommends at least 30 minutes or more of moderate-intensity physical activity such as brisk walking on most or preferably all days of the week for adult Indians, which is consistent with the CDC recommendations.[154] Currently, the changing trend of work from physically demanding work to mainly sedentary office-based work has resulted in a lower level of physical activity.[155] People from both developed and developing countries (60%-85% of the world's population) do not carry out sufficient physical activity to gain health benefits.[156]

2.3.2 Non-modifiable risk factors (age, genetic factors and ethnicity)

The global risk of CHD increases with age as the result of a progressive accumulation of coronary atherosclerosis and is associated with ageing.[82] Moreover, family history of CHD increases a person's risk of developing CHD.[157] The family history is considered positive if clinical CHD is documented in a first-degree male relative before the age of 55 years, or first-degree female relative before the age of 65 years.[158]

The prevalence of CHD and levels of risk factors also differs across diverse ethnic and racial groups.[159] For example, in comparison to the general population in the USA, the prevalence of CHD in Asian Indians is approximately four times higher.[160] It is worth pointing out that Asians in the USA comprise several ethnic groups. Among them, the Chinese have the lowest rates of CHD, and Asian Indians have the highest rates.[161]

A better understanding of the role of CHD risk factors has contributed a significant progress in the development of CHD prevention policies and programs. Moreover, the value of early detection and treatment of risk factors have been well acknowledged in the prevention of CHD and reduction of the disease consequences.[157]

2.4 Prevention of CHD

Evidence shows that control of risk factors has led to a 50%–80% decline in the incidence of cardiovascular diseases in high-income countries.[58, 162] However, due to lack of appropriate preventive approaches, the prevalence of CHD risk factors are increasing in low- and middle-income countries.[163] WHO has classified CHD prevention as population-based primordial, individual-based primary, and patient-based secondary prevention.[58]

Primordial prevention: population based

The population-based primordial approach is used to deal with behavioural risk factors at the community level. The success of this approach depends on population-wide education, partnerships with community organisations, the assertion of health services, policies regarding environmental changes, and legislative initiatives.[164] In this approach, while the cumulative societal benefits are significant, individual benefits are relatively small. This approach does not provide an adequate response to the need to strengthen health care for people at high risk of CHD. Consequently, the CHD burden can be reduced considerably if the population-based approach is used in conjunction with health care interventions for individuals who either already have CHD or are at high risk of developing CHD.[165-167]

Primary prevention: individual based

In primary prevention, ‘the high-risk approach’ aims at identifying persons at the highest risk of diseases (that is, those with markedly elevated risk factors), focusing on

preventing the first occurrence of a clinical event.[58] Interventions to reduce the risk factor levels might include, for example, use of blood pressure lowering medications or behaviour modification intervention in patients with hypertension, to prevent the earliest incidence of a heart attack. Hence, screenings for elevated blood pressure in at-risk groups are critical facets of CHD prevention guidelines.[168] The high-risk approach for individuals is often pharmacological-based and relatively more expensive than the population-based approach, but its focus on projected individual risk and anticipated personal benefit can elicit greater motivation in patients.[169]

Secondary and tertiary prevention: patient based

Secondary prevention averts the recurrence of clinical events and also reduces mortality in patients with established CHD,[157] whereas tertiary prevention incorporates appropriate treatment and rehabilitation approaches to slow the disease progression and reduce detrimental consequences.[170]

At present, the primary focus of health care for cardiovascular and other chronic diseases in many low and middle-income countries including India is hospital-centred curative care. In the case of CHD, a large proportion of people with high risk remain undiagnosed,[167] and even those diagnosed with the disease have inadequate access to treatment at the primary healthcare level.[171] Chronic diseases are often diagnosed at a late stage when people are admitted to hospitals with acute symptoms, long-term complications of illness or disabilities.[172, 173] In the advanced phase of the disease, treatment usually requires expensive high-technology equipment, health workers with specific skills, costly medications and tertiary hospital infrastructure.[158] High-cost interventions increase out-of-pocket spending and incur gross expenditures that can drive families into poverty.[46] Thus, to achieve a substantial impact on CHD, an approach is required to serve both the individual with overt disease and those with risk factors that predispose them to disease in later life.[158]

2.4.1 Recent guidelines for CHD risk management

Globally, treatments of CHD risk factors have resulted in a 50% decrease in deaths from CHD over the past 30 years.[174] However, the concept of primary and secondary prevention is, in many ways, outdated.[175] In a personal risk factor approach, a patient with modest levels of some risk factors may have a moderate or high total risk of a

CHD-related event, yet not be offered risk-reducing therapies.[176] This approach takes into account the individual risk factor but not the degree of other strong risk factors including age. Accordingly, the high-risk approach often misclassifies millions of adults who could benefit from risk-reducing therapy.[176] Ultimately, risk factor identification alone may not provide the physician adequate knowledge to make an appropriate decision about the use of pharmacologic agents for primary prevention. Therefore, preventive pharmacotherapy should take the patient's global or absolute risk into consideration, and not just risk factors.[30]

Global CHD risk (GCR) approach

Recent guidelines for CHD risk management have emphasised the use of the global CHD risk approach. This method requires concomitant assessment and management of multiple risk factors for individuals.[158, 177-180] Research has confirmed that CHD risk factors frequently occur in a cluster in an individual[181] and that the danger of developing CHD is determined by the cumulative effect of multiple associated CHD risk factors.[182] When multiple risk factors are present (even mildly or moderately elevated levels) in an individual, as compared to someone with just one high-risk factor, the overall likelihood of CHD of that individual may substantially increase.[183] The knowledge of the multi-factorial nature of CVD has prompted the development of global CHD risk management systems based on 'absolute risk' of developing CHD.

The typical clinical approach to primary prevention of CHD depends on identification and treatment of individual risk factors, such as hypertension and dyslipidaemia; in contrast, GCR is based on an empiric equation that combines all significant risk factors.[182] GCR is a calculation of the total risk of having a CHD event over a given period, expressed in terms of the number of years (usually 5 or 10 years).[30] The event can be 'hard' (e.g. myocardial infarction, sudden cardiac death) or 'soft' (e.g. chest pain). Epidemiological data suggests that incorporating risk factors into global scores is effective in computing an individual's total cardiovascular risk with reasonable accuracy and accordingly, making possible a balanced approach to detrmine who should obtain treatment.[158] The absolute, or global score, facilitates the intensity of interventions to be matched to the degree of total cardiovascular risk.[158]

Research has confirmed that CHD risk factor 'clustering' frequently occurs in hypertensive individuals, with about 40% of CHD events in men and 68% in women being attributable to the presence of additional two or more risk factors such as diabetes, obesity, left ventricular hypertrophy and dyslipidaemia.[184] As hypertension is associated with other CHD risk factors, the GCR reduction is the most important target for hypertension treatment.[30] Assessment of GCR helps to identify those at high CHD risk and formulate appropriate interventions that include changes in behaviour or prescribing medications to prevent the manifestation of CHD.[158] As part of the effort to improve primary prevention of CHD, several national guidelines (such as the American Heart Association Guidelines; National Vascular Disease Prevention Alliance's (NVDPA) Guidelines, Australia and National Clinical Guidelines, UK) have recommended estimating the patient's GCR as a starting point.[30]

Using the GCR to bring a hypertensive patient's risk factors to a particular threshold has proven to be cost-effective, because it is a means of preventing hospitalisation and avoiding tertiary treatment costs.[185] The WHO estimates that out-of-pocket health care expenditure of more than 15%–20% of total national health expenditure can lead to impoverishment; India's proportion in 2013 was 58%.[186] GCR assessments can help allocate preventive care to patients in need and restrict unnecessary drug treatment in low-risk patients.[187]

An additional underlying goal of assessing GCR is the motivation of physicians to address a patient's CHD risk. GCR assessment assists health professionals in communicating CHD risk with their patients in an effective manner.[188, 189] Once doctors know a patient's GCR, they are more likely to prescribe risk-reducing therapies such as antihypertensives, statins, and aspirin.[30] Besides, patients who are aware of their risk level are more likely to initiate risk-reducing therapies.[30] The literature indicates that assessment of GCR is particularly useful in young and middle-aged adults.[32] Even though risk scores may not be high in younger patients, the long-term risk of developing CHD can be high with increasing age. Primary care physicians have the unique advantage of detecting and managing these patients. Management typically involves not only counselling and motivating patients to take on preventive behaviour but also empowering them to understand their CHD risk scores and respective treatment targets.[190] Furthermore, measurement of population-level global CHD risk guides health

planners to make informed decisions regarding treatment, needs assessment, monitoring trends and evaluating the impact of preventive interventions to reduce the burden of disease in a high-risk population.[191, 192]

Studies show GCR varies among different sub-populations, independent of the major risk factors.[33] Risk scores provide a cost effective pragmatic solution to include people from diverse ethnic backgrounds in the primary prevention of CHD and, thereby, has the potential to reduce the enormous economic burden of health care in developing countries such as India.[158] Research that explores the global CHD risk has now become crucial in order to focus prevention strategies on the settings of underserved communities.[31]

2.4.2 CHD risk assessment tool or risk scoring chart

There is some disagreement about the best approach for assessing global CHD risk. Depending on the requirement of the nature of risk factors, various versions of CHD risk measurement tools have been developed.[158, 167] Most risk assessment charts have included patient's age, sex, systolic blood pressure, smoking status, diabetes mellitus, and total cholesterol level.[193-195] However, many variables that can confer risks are not included in these risk algorithms. Therefore, existing risk estimation tools simply allow a rough estimate of absolute risk and cannot accurately estimate total risk.[196] For instance, family history is not included in most risk assessment tools. Patients with a family history of early-onset cardiovascular disease are likely to be at greater risk than the tools indicate.[158] On the other hand, there is little evidence that adding additional variables (e.g. lipoprotein levels, a presence of left ventricular hypertrophy, C-reactive protein and homocysteine) in traditional CHD risk calculation tools, can improve overall predictive ability or inrease cost-effectiveness.[197] Despite these shortcomings, existing CHD risk assessment tools are recommended for the evaluation of global CHD risk, as they are constructive, convenient and easy enough to be used in clinical settings. [202]

The non-laboratory-based method for the assessment of CHD risk

Since developing countries have limited resources for prevention strategies that require laboratory testing, they can use a risk prediction method that does not need any laboratory tests.[5] In addition to the overall predictive discrimination, a non-laboratory screening process can classify patients correctly at the thresholds that most prevention

guidelines choose for initiating treatment. Research shows that the non-laboratory-based model correctly classifies most men and women at the 10% and 20% five-year risk thresholds and is not inferior to the laboratory-based model.[5]

The non-laboratory-based method of risk prediction is less costly and more convenient than the laboratory-based method. Indeed, laboratory-based CHD risk prediction is inconvenient even in developed countries and is certainly too expensive and impractical in low-income countries with limited testing facilities. In developed countries, the added cost of cholesterol testing is about USD10 and an additional USD20–80 if an additional visit is needed. The rates for developing countries are USD1–4 for the test and USD3–7 for an extra visit.[198] For example, in India, a cholesterol test that costs USD2–4 would account for 5%–10% of the 2005 estimate of per capita health spending of USD40.[199] Recommended cholesterol screening to risk-stratify patients would require more than 10% of the total Indian health care budget; besides, there is a modest or no additional benefit over non-laboratory means of risk stratification.[5] Therefore, the additional costs of cholesterol testing would make screening with laboratory-based guidelines unaffordable. Further, in many low- and middle-income countries the personal cost of being seen at a health center can be rather high since to see the nurse or doctor, a patient frequently requires to take a day off work Finally, most developing countries do not have the required amenities or health care staff to implement such laboratory-based screening at the primary health care level.[5]

The US National Health and Nutrition Examination Survey (NHANES) followup cohort demonstrated that a non-laboratory-based risk tool can predict CVD outcomes that were no different from the Framingham-based risk tool.[5] To estimate global CHD risk, the NHANES non-laboratory-based risk chart includes age, systolic blood pressure, BMI, diabetes status and smoking status. The results of goodness-of-fit tests suggest that the non-laboratory-based model is well calibrated across a broad range of absolute risk levels and without changes in the classification of risk. It can be applied in one clinic visit with minimal equipment, and a prediction risk value apportioned with a treatment decision able to be made in the same 5–10-minute visit without the cost or the time needed to wait for laboratory results.[5] The NHANES non-laboratory-based risk table differs from the World Health Organisation/International Society of Hypertension (WHO/ISH) chart, in that it includes the BMI, and it is based on a model that has been

validated against a laboratory-based model using a cohort that was followed prospectively.[5] The WHO/ISH charts have not yet been validated, nor have they been compared to established laboratory-based scores.[158]

However, risk profiling protocols lack universal applicability[200, 201] and may be of limited applicability to developing countries, whose populations were not sampled for the Framingham and other studies.[202, 203] Uncritical application of such protocols in hitherto untested populations may result in negative clinical and economic consequences.[204] It has been suggested that until the region or country-specific scores are accessible, health providers could consider using the WHO/ISH non-laboratory-based risk table or the NHANES non-laboratory-based risk chart[5] but health providers in those countries should recognise that the WHO/ISH chart and NHANES chart might miscalculate absolute risk. The probable inaccuracy in assessment would require to be considered against the health fatalities linked with no screening whatsoever.[5]

2.5 Management Gap in CHD prevention

Despite overwhelming evidence supporting the benefits of CHD preventive strategies, there has been a limited analysis of how extensively they are being implemented in health care. Several recently published studies in developed countries have shown substantial gaps in CHD risk management.[205-208] Research has demonstrated that the following major obstacles often stand in the way of quality cardiovascular care:

1. Physicians' lack of understanding of GCR, sub-optimal and incorrect use of risk assessment tools and substantial underestimation of a patient's risk.[188] Studies in developed countries have shown a low use of risk prediction charts to estimate an individual's 5–10 years GCR scores in primary practice (varying from 17%–47%).[188, 209-211] Moreover, studies assessing the correspondence between physicians' assessment of CHD risk at a primary practice and patients' actual CHD risk, suggest the tendency of physicians to underestimate the patient's risk.[188, 212] As a result, those who qualify for drug therapy are not necessarily receiving it. Consequently, the quality gap in the treatment of CHD risk factors is striking among hypertensive patients with multiple risk factors. Evidence shows that there are sub-optimal uses of medicines, such as beta-blockers (antihypertensive), statins (lipid-lowering drugs) and aspirin, for CHD

prevention in high CHD risk hypertensive people in India.[213, 214] Furthermore, use of these drugs is significantly lower in women than in men.[215]

2. Physicians may not have the required knowledge, attitude, and motivation to include preventive services into their practice.[216]
3. Patients' lack of eagerness and keenness to adhere to therapy and followup with their physicians.[216] Perception of disease risk will influence individuals' motivation and desire to change their risk behaviours, comply with treatment, and followup with their physicians.

2.6 Perception of CHD risk and preventive behaviour

2.6.1 Perception of risk

The literature indicates that by influencing individuals' perceptions and beliefs about a given risk, health providers can enhance the likelihood of people adopting healthier lifestyles.[217-219] Individuals have a distinctive perception of their possibility of experiencing an undesirable health event and these attitudes differ commonly. It is, therefore, crucial to emphasise the importance of assessing individual risk perceptions. At the lower end of the scale, some individuals may disagree with the likelihood of meeting a particular health threat; those in the mid-range may acknowledge the statistical chance of disease vulnerability; at the other end of the scale, some may exaggerate their risk of the health threat and, thus, increase the danger of the disease impacting their lives.[220]

2.6.2 Perception of global CHD risk and preventive behaviour

Perceived global CHD risk (GCR) is defined as the perception of the likelihood of experiencing a premature CHD event.[221] Evidence shows that CHD is preventable if people have an accurate perception of their risk of developing CHD. Inaccurate perception of GCR has important implications for CHD prevention, because people who do not perceive themselves as susceptible to CHD are less likely to adopt recommended behaviours to prevent it.[222] Only a small number of women recognise CHD as their greatest health threat.[36] As a result of the mistaken belief that CHD affects mainly male, there is a considerable gap between perceived and actual risk of CHD in women. These inaccurate perceptions may lead women to underestimate their likelihood of CHD so that they fail to look for early interventions to prevent avoidable morbidity and mortality.[36]

An accurate perception of a patient's GCR by both the patient and the doctor is necessary, as this is one of the important components that determines health-related behaviour.[223] Individual risk perception is a central construct in some health behaviour models including the Health Belief Model (HBM).[224] The HBM proposes that patients weigh up a health-related behaviour (e.g. adherence to medications) by considering their perceived susceptibility to illness and the seriousness of the disease, as well as the benefits of the action. Perceived susceptibility is one of the strongest predictors of preventive health behaviours.[225]

The HBM has been successfully applied and tested in many studies aimed at understanding patients' adherence to treatment recommendations concerning CHD prevention. Ali[226, 227] tailored the HBM's major concepts to explain women's participation in CHD prevention behaviours. This study included 178 women aged 50 years or older from three Midwestern churches in the USA, who did not have a history of heart disease. In Ali's model, a woman's perception consists of how susceptible she perceives herself to be at risk of CHD and how serious she perceives CHD to be. Using this model, Ali[226] found that perceived susceptibility to CHD explained the majority of variances (50.7%) of CHD behaviour followed by knowledge of risk factors (explaining 19.5%). These were also statically significant predictors of CHD preventive actions in women. Interestingly, Ali also found that perceived seriousness of CHD did not predict preventive behaviours for these women, although the majority of these women had at least one significant risk factor such as hypertension, diabetes, hyperlipidemia or family history. It appears that women do not personalise their risk of developing CHD despite their awareness of their risk factors. In another study, the HBM was used by Mirotzink et al. to explain attendance at a supervised community-based exercise program for CHD prevention.[226] They found that two dimensions of the model were associated with attending the program: perceived benefit and perceived severity of CHD.

Perceived GCR appears to be positively correlated with actual behavioural change and with a desire to make risk-reducing behavioural changes.[228, 229] Successful primary prevention requires early identification of CHD risk factors and communication of GCR to patients. Assessment and communication of GCR are essential since it can help patients in developing more pragmatic perceived risks of CHD.[230] A Cochrane review found that, in comparison to general risk communication, personalised communication

(i.e. presenting individualised risk scores) is associated with improved cognitive outcomes (i.e. increase knowledge, improved accuracy of risk perception and utilization of primary and secondary CHD prevention programs).[231] A communication gap about absolute CHD risk and treatment targets during the consultation between health care providers and their patients can lead to hypertensive patients have an inaccurate perception of GCR and, consequently, of the value of achieving treatment goals. The literature reveals that CHD risk factors alone do not necessarily assist a patient's estimation of his or her risk.[226] Other factors, including knowledge of CHD risk factors,[221, 232, 233] perceptions of general health,[189] and demographic variables such as age, education, personal income[189] and family history, may be related to accurate perceptions of personal CHD risk and thereby indirectly influence treatment-related behaviour.[189]

However, the association between behaviour change and risk perceptions is not linear. Furthermore, the optimal level of risk perceptions directing behaviour change is not clear.[234] For instance, Wilcox and Stefani's study failed to demonstrate a relationship between perception and knowledge of risk and following recommended CHD health-promoting behaviours.[232] Sometimes, even overestimated risk perceptions may lead to fatalistic or avoidance behaviours.[234] Nevertheless, the literature suggests that, even though risk perception does not inevitably influence changes in behaviour, acknowledging one's personal perception of risk may be the primary step toward CHD health promotion.[235 236]

2.6.3 Measurement of perceived global CHD risk (GCR)

Perceived GCR can be measured in several ways. The most fundamental risk measurement is to ask an individual's perception of the likelihood that a CHD event will occur at some point in the future (i.e. personal risk).[237] There are several approaches available for measuring risk perceptions including a percentage or numeric scale, verbally labelled scales and visual or graphic scales. There is no indication that any scale is consistently superior to another for measuring risk perceptions. Both numeric and verbally labelled scales are valid and reliable.[238] If the goal of an investigation is to compare risk perception with actual statistics, a numeric scale can be used.[239] Where comparisons with statistics are not planned, then a five- or seven-point verbally labelled scale can be used[239] because ordinal scales permit the measurement of the degree of

variance but not the specific amount of difference.[240] Frequently, ordinal scales are used as interval scales, but it is unclear if the distance between the response categories in ordinal scale is equivalent. Therefore, the mean cannot be calculated by these scales.[240]

It has been suggested that a numeric scale is appropriate for use in cultures such as in India.[241] In India, attitude measurement with a Likert-type scale has been problematic because the agreement categories, when translated into the local language, are open to subjective interpretations.[241] The Likert scale typically consists of a five-point scale ranging from 'strongly agree' to 'strongly disagree' and is well accepted and tested in Western countries. In cross-cultural contexts, the applicability of the Likert scale is debatable[242] because there is major problem with construct validity.[243] Within the Indian culture and the Indian languages, there is no clear-cut difference between 'strongly agree' and 'agree' or 'strongly disagree' and 'disagree'. Therefore, numeric response scales that provide more objective response categories may be more appropriate to overcome the subjective Likert response categories in countries such as India.[242]

Information about actual total CHD risk is needed to investigate the accuracy of the study participants' perception of their personal risk. A few earlier studies depended simply on epidemiological data to evaluate the accuracy of participants' perception of CHD risk and did not refer to the participants' total risk. However, the outcomes would be more precise if the participants' calculaed total CHD risk was taken into account.[230]

2.6.4 Discrepancy between individual's perceived and absolute CHD risk

Optimally, a patient's perceived risk of developing CHD should match the patient's actual calculated risk.[230] However, several studies[17, 223, 230] have found differences between perceived and calculated global risk. It appears that people can often be inaccurate in their risk estimates, and the bias tends to be towards either optimism or pessimism in risk accuracy.[223] Inaccurate risk estimation has been confirmed in many different populations by both qualitative and quantitative research.[17, 222, 230, 244, 245] That patients do not have an accurate understanding of their risk may be due to insufficient knowledge about CHD risk factors.[230, 246] Patients often tend to have a dichotomous understanding of risk (e.g. 'I have/do not have this risk factor') rather than understanding risk as a continuum.[223]

Persons who accurately perceive their risk of cardiovascular diseases may be more likely to adopt behaviours that reduce their risk, compared to those who do not perceive themselves to be at risk.[247] [248-250] Evidence shows that older age,[223, 245] smoking,[245] male gender,[17] the presence of typical CV risk factors including obesity[245] and high blood pressure,[245] and higher education levels are associated with the accuracy of estimated CHD risk.[245, 251] It is believed that communication of the personal global CHD risk score (GCR) score can assist patients in developing a more realistically perceived GCR that, in turn, may motivate them to initiate and maintain appropriate treatment-seeking behaviour.[32] On the other hand, perceived stress and lower personal income were found to be the strongest correlates of underestimation of risk.[252] A mismatch between patients' actual risk assessed by physicians and patients' perception of their global CHD risk might lead to conflicts between the physician's intended management and the patient's expectations.[246]

Understanding the relationship between women's perceived CHD risk and health-promoting behaviour is important to improve the health of women and prevent their risk of developing CHD.[36] CHD risk perceptions were studied in women in different parts of the world. However, there is a lack of information about the perceived CHD risk of hypertensive women in India. Knowing the patients' perceived risk and bringing them into line with the actual risk is a prerequisite for effective CHD prevention management. Hence, there is a fundamental need to develop interventions for enhancing an accurate perception of CHD risks.[35]

2.7 Hypertension

Hypertension is a chronic systemic disease and the leading risk factor for death and disability worldwide.[253] Blood pressure (BP) is the force exerted by blood against the walls of arteries due to the pumping action of the heart. The peak and lowest pressures in the cardiovascular system correspond to the systolic blood pressure (SBP) and diastolic blood pressure (DBP) respectively.[254] The optimal BP value for the general population is equal to or less than 120/80 mmHg. According to the Global Burden of Disease 2010 study (GBD 2010), hypertension is foremost among the top ten risk factors for the disease worldwide.[255] In 2010, hypertension was accountable for 9.4 million deaths and 7% of Disability-adjusted Life Years (DALYs) globally.[255] Between the years 2000 and 2013, the number of deaths due to hypertension rose from 7.6 to

9.4 million.[255] In the South East Asia region, one in three adults are estimated to have hypertension.[256]

Hypertension is a most important risk factor for CHD and is also accountable for more deaths globally than any other CHD risk factor.[257] It is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India.[258] Longitudinal population studies demonstrate that the relationship between high BP and increased risk of CHD events is constant, steady and independent of other risk factors.[259]

Control of cardiovascular diseases requires modification of risk factors that have a high attributable risk or high prevalence or both, and where most or all of the risks can be reversed cost-effectively.[258] Evidence shows that large proportions of most populations having non-optimal BP values, as well as most or all BP-related risks, appear to be reversible within a few years with inexpensive interventions. [260]

However, despite significant progress being made in diagnosis and treatment, hypertension remains largely uncontrolled worldwide. In the USA, hypertension still accounts for 30% of attributable risk for all-cause mortality and 40% of cardiovascular disease-related deaths.[261] Uncontrolled hypertension can cause severe long-term damage to the heart, kidneys, eyes and other organs.[262] The presence of each additional risk factor compounds the risk from high BP. The higher the BP, the greater the chance of heart attack, stroke, and kidney diseases.[263]

2.7.1 Rising burden of hypertension in India

Hypertension is an important public health problem in India.[264, 265] It is among the top four risk factors of global mortality and morbidity and accounts for the highest disease burden in India. Hypertension is directly responsible for 24% of all CHD deaths in India.[86]

In India, the prevalence of hypertension in the adult population increased from 5% in the 1960s to nearly 12% in the 1990s, and more than 30% in 2008.[256] A systematic review of studies published between 1969 and 2011 reported a rise in hypertension prevalence from 13.9%–46.3% in urban India and 4.5%–58.8% in rural areas.[266] An urban study on hypertension and socioeconomic status in the year 2000 showed

hypertension rates of 54% in low-income groups and 40% in high-income groups of people.[50] The number of hypertensive people in India is projected to increase from 118 million in 2000 to 214 million in 2025.[260]

Studies in India reveal the prevalence of hypertension rises with age in both genders.[267, 268]. Besides, an analysis of nationally representative survey data[94] and findings from recent studies in India indicate a higher prevalence of hypertension in middle-aged and older women compared to men.[23] In population-based studies, Gupta et al.[64] reported hypertension in Jaipur, northern India, in 30% of men and 33% of women aged ≥20 years, Joseph et al.[269] reported it in 31% of men and 41% of women in Thiruvananthapuram, southern India, while Gupta et al.[22] reported hypertension in 44% of men and 45% of women in Mumbai, western India. The findings may be related to increasing family stress and obesity which is common in middle-aged women.[270] The rates for hypertension are also projected to increase further in Indian females (23.6%) than Indian males (22.9%) by 2025.[264]

2.7.2 Hypertension among people living in low-income urban settlements

Socio-economically disadvantaged communities in large cities are more vulnerable to hypertension. The current prevalence of hypertension is between 15%–54% of people living in urban low-income settlements in India.[110, 113, 271] Earlier studies have concluded that, despite the presence of free or low-cost government primary care facilities, the majority of hypertensive subjects remain undetected and the control of hypertension is also inadequate.[39] A cross-sectional, population-based study was conducted recently in Delhi to assess awareness, treatment and control of hypertension in the population aged 20 years and above living in slum settlements.[38] The study found a lack of awareness and inadequate treatment-seeking behaviour (regarding medication) as the backdrop to a high prevalence of hypertension in these communities. The study results reveal that only 41% of hypertensive people were aware of their hypertensive condition. Of those aware, only 59% were on medication, and of those treated, only 5% had controlled their hypertension.[38] Moreover, a recent study among low-income settings in Delhi also revealed that awareness and knowledge about hypertension and its consequences were inadequate in these communities.[272]

2.7.3 Types of hypertension

a. Primary hypertension

In most patients, (over 90% of individuals) hypertension results from unknown patho-physiology.[273] Although the reasons for this type of hypertension (also termed as primary or idiopathic hypertension) are unknown, many lifestyle-related risk factors are thought to increase blood pressure such as obesity, smoked tobacco use, high alcohol intake, high salt intake, sedentary lifestyle and stress.[274, 275]

b. Secondary hypertension

In 5%–10% of individuals, hypertension is caused by underlying renal or adrenal disease and is termed secondary hypertension.[6] Secondary hypertension is common in patients with resistant high BP.[6] Resistant hypertension is defined as failure to achieve a BP goal in patients who adhere to an appropriate three drug regimen that includes a diuretic.[6] Essentially, hypertension cannot be cured, although secondary hypertension can be cured if the cause can be identified.[276]

2.7.4 Hypertension and CHD: the pathophysiological link

It is critical for blood pressure to remain normal or healthy, as low BP leads to decreased tissue perfusion, hypoxia and cellular necrosis. High BP on the other hand, leads to increasing cardiac afterload, and may damage functional and structural vascular components of organs such as heart, kidneys, brain and eyes.[277] To maintain equilibrium, several interconnected mechanisms such as vascular volume and peripheral resistance, autonomic nervous system, and renin-angiotensin systems play roles in regulating BP within normal limits.[278]

Epidemiological data has shown that the risk of CHD rises with increasing BP levels in an active, independent, graded and continuous manner. Hypertension hastens the development and progression of atherosclerosis, and sustained elevation of blood pressure can destabilise vascular lesions and precipitate acute coronary events such as stroke or MI.

Atherosclerosis

Hypertension can cause endothelial damage. The damaged endothelium is responsible for impaired production and discharge of the effective vasodilator nitric oxide.[273] The

endothelial injury also encourages the accumulation of reactive oxygen group and other inflammatory factors that promote the growth of atherosclerosis, thrombosis and vascular occlusion.[273] This inflammatory progression is an important aspect in the pathogenesis of both hypertension and atherosclerosis.[273] Besides, Angiotensin II (an octapeptide hormone in the blood that performs a fundamental role in cardiovascular homeostasis) assists development of atherosclerosis via vaso-constricting and vascular remodeling effects.[254]

Increased afterload and left ventricular hypertrophy

Increased afterload owing to high BP can result in left ventricular hypertrophy (LVH) significantly, which may weaken ventricular relaxation and compromise coronary blood flow during diastole.[279] Research confirms that LVH reduces coronary flow reserve and alone can predict future CHD, heart failure and sudden cardiac death.[280]

2.7.5 Benefit of hypertension control concerning CHD

One of the most effective and least expensive ways of preventing MI is to control hypertension. Controlling hypertension is associated with the reduction of 20–25% of MIs and more than 50% of cases of heart failure.[73, 281-284] If resources are limited, it is a preferred strategy to work on hypertension and not on other CHD risk factors such as lipid and diabetes, because of the lower CHD risk attributed to them.[31] It has been estimated that just a 2 mmHg decrease in blood pressure can prevent 153,000 CHD deaths across India.[285]

2.7.6 Management of hypertension

The prevention and control of hypertension are significant public health challenges worldwide.[286] Though challenging, hypertension is readily detectable and modifiable, and is manageable in the primary care setting. In high-income countries, early detection and treatment with inexpensive medications have considerably reduced mean blood pressure, contributing to a decline in deaths from heart disease.[18] Effective treatment of hypertension can be achieved by non-pharmacological (diet and lifestyle modifications) as well as pharmacological means.[287]

a. Diagnosis of hypertension

Individuals with severe hypertension may experience dizziness, blurred vision or headaches. Moderate hypertension, however, is asymptomatic and often detected only during a routine consultation.[262] Since undiagnosed hypertension can cause grave and enduring harm to the heart, kidneys, eyes and other vital organs, it is vital that blood pressure is frequently assessed, mainly in persons above the age of 60 years.[262]

b. Classification of hypertension

According to the seventh Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) in the USA,[6] hypertension in adults over 18 years is classified as indicated in Table 2 below.

Table 2: Classification of hypertension or high blood pressure [6]

BP classification	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	<120	and <80
Pre-hypertension	120–139	or 80–89
Stage I hypertension	140–159	or 90–99
Stage II hypertension	≥160	or ≥100

BP=blood pressure

c. Treatment of hypertension

Goals of Therapy

One of the crucial public health goals of antihypertensive therapy is to reduce cardiovascular morbidity and mortality. The Joint National Committee (JNC 8) guidelines support treating hypertensive persons from 30–59 years of age to a blood pressure goal of less than 140/90 mmHg.[253] The same thresholds and goals are recommended for hypertensive adults younger than 60 years who are diagnosed with diabetes or chronic kidney disease.[253]

Non-pharmacological treatment: lifestyle modifications

Lifestyle modifications should be the primary approach to hypertension management in all cases. Lifestyle treatments have the potential to improve BP control and even reduce medication needs.[253] The literature suggests that lifestyle modifications such as weight reduction, a decrease in the dietary salt intake and alcohol consumption, adoption of a DASH (dietary approach to stop hypertension) eating plan and regular physical exercise

all lower blood pressure. The DASH diet recommends consuming a diet rich in fruits, vegetables and low-fat dairy products with a reduced content of saturated and total fat.[6] Please see Appendix 5 for details of lifestyle modifications and their effects on hypertension.

However, a diet rich in vegetables and fruits can be expensive. Additionally, avoiding fatty foods, salt and sugar, refraining from alcohol and tobacco smoking, and maintaining a healthy body weight, all require continued hard work and a high level of self-motivation by the person. Effort and motivation tends to weaken over time in the absence of a collective approach and government support.[288, 289] Although there is strong evidence of the benefit of lifestyle changes in persons at high risk, the proof of such interventions when implemented at a population level (including those at low risk) is less credible.[187]

Although all patients with hypertension should be encouraged to adopt a healthy lifestyle, lifestyle change alone may be inadequate to control a patient's blood pressure.[290]

Pharmacological treatments

Research shows one of the easiest ways to deal with hypertension of at-risk CHD people is to continue antihypertensive therapy and achieve BP control. There is strong evidence showing a reduction in cardiovascular mortalities and morbidities on the application of antihypertensive therapy for controlling high blood pressure.[291] Low-cost generic medications for lowering blood pressure are prescribed for controlling hypertension and preventing the development of complications throughout the world.[292] The JNC 8 recommends initiating pharmacologic treatment to lower BP at systolic blood pressure (SBP) ≥140mmHg and diastolic blood pressure (DBP) ≥90mmHg in the general population aged <60 years, and treat to a goal of SBP <140mmHg and DBP <90mmHg.[253] JNC 8 also recommends initiating pharmacologic treatment to lower BP at SBP ≥150 mmHg or DBP ≥90 mmHg in the general population aged ≥60 years and treat to a goal of SBP <150 mmHg and DBP <90 mmHg.[253]

Antihypertensive drugs

Many safe and effective drugs, well evidenced by large randomised clinical trials, are available for initial treatment of hypertension. Please see Appendix 6 for commonly used classes of antihypertensive medications, their mechanisms of actions and common adverse effects.

About 50%–75% of patients with hypertension will not reach their BP target with a single drug, in which case combination (two or more drugs) therapy is advised.[293] When blood pressure is more than 20 mmHg above systolic goal or 10 mmHg above diastolic goal, consideration should be given to initiate therapy with two drugs, either as separate or in fixed-dose combinations.[294] In the ALLHAT study, 60% of those, whose BP was controlled to 140/90 mmHg received two or more agents, and only 30% were controlled on one drug alone.[295]

Followup and monitoring

Once antihypertensive drug therapy is started, patients should revisit for followup and modification of drugs if necessary, at monthly intervals or less, until the blood pressure goal is reached.[296] Pharmacological treatment of hypertension requires that patients should adhere to their prescribed medications and revisit for a refill when medications are exhausted. They should maintain their schedules for followup visits with their health care professionals and implement health activities that are prescribed to reduce their high BP.[297-299] The interval between followup visits can be extended if BP is within normal limits and stable. For instance, a review every three months for the next year and six-monthly after that is recommended.[296] However, more frequent visits may be required for patients with stage two hypertension or with serious co-morbid conditions.[296]

2.8 Uncontrolled hypertension in India

Uncontrolled hypertension is the most significant problem of CHD prevention. Despite the identification and control of BP being prioritised by many national and global organisations and the availability of inexpensive and efficient medications BP is inadequately controlled in most hypertensive patients.[300] In India, the situation is worse with very low levels of hypertension treatment and control.[86] There is no national data on hypertension treatment and control available. However, many cross-sectional

studies carried out in different regions of India such as in the north (Delhi 10.5%), the south (Chennai 7.5%, Thiruvananthapuram 8.6%), in the east (Assam 18.1%) and the west (Mumbai 13.6%) concluded there was suboptimal BP control.[266]

2.9 Adherence or compliance with therapy

Compliance with treatment has a strong positive influence on health outcomes. Adherence and persistence are the two conventional measures of compliance.[301] The WHO defines adherence to long-term therapy as 'the extent to which a person's behaviour—taking medication, following a diet, and/or executing lifestyle changes– corresponds with agreed recommendations from a health care provider.[9] The term 'compliance to drugs' may be defined as 'the extent to which a patient acts in accordance with the prescribed interval and dose of the dosing regimen', reported as a percentage of prescribed doses taken at the given time interval.[302] Although variations exist, all these terminologies have been used interchangeably in most studies.[303] However, the term 'adherence' is preferred over 'compliance' because, in the latter, the patient is passive in the decision-making, which means that the patient has no choice as to follow treatment recommendations or not.[304] Adherence refers to the extent of the patient's agreement to, and implementation of, the recommendations of the health care provider about the regular treatment on the timing, dosage and frequency processes.[305]

Adherence to pharmacological treatment of hypertension has a range of advantages for the individual, the society and the health care system as a whole. Antihypertensive medication adherence improves an individual's quality of life by preventing complications as well as untimely death from CHD.[9] To the close family member, medication adherence reduces psychosomatic impact related with sudden death or living with a family member suffering from a chronic, unbearable and unremitting complication because of uncontrolled hypertension.[306] It also preserves family resources that would have been otherwise used to get health care for complications.[306] To the society at large, adherence to drug treatment is a cost saving measure as it reduces the occurrence of complications such as CHD and the requirement for added medications.[47] To the health care system, adherence has been associated with reduced hospitalisation rates and lower medical care costs,[307] which is primarily essential in a publicly-financed but under-resourced health care system such as in India.

2.9.1 Medication non-adherence

Medication non-adherence occurs when an individual's health-seeking behaviour is not in accord with the agreed recommendations prescribed by a healthcare provider.[308] Non-adherence to medications may be defined when less than 80% of the doses of prescribed drugs is consumed out of the total number of doses supposed to be consumed, or the patient has stopped taking the medications after starting treatment at any point in the time following diagnosis in the past.[9, 11, 73] More than one-half of patients under treatment discontinue their medications entirely within a year of diagnosis and, of those who remain on medication, only about half take 80% of their prescribed medication.[9] In the USA, approximately 125,000 deaths per year were linked to medication non-adherence.[309] Moreover, 33%– 69% of medication-related hospital admissions in the USA were due to poor adherence, with total cost estimates ranging from USD100–300 billion each year, including costs for additional physician visits, visits in hospital emergency, hospital admissions and extra medicines.[310]

Approximately 75% of cases of antihypertensive treatment failure are attributable to poor adherence to medication.[9] Achieving optimum hypertension control by improving adherence to antihypertensive treatment has now become a substantial challenge.[311] Medication adherence for hypertension control is influenced by multiple factors related to the patients, the health professionals, government and the health care system.[312, 313] Few studies on medication adherence have been carried out in Asian and other developing countries.[308] More studies on antihypertensive medication adherence in these regions would be helpful to bridge the knowledge and practice gap and contribute to formulating strategies for countering non-adherence.[308]

2.9.2 Methods of measuring medication adherence

A range of direct and indirect methods can be used to evaluate or measure medication adherence, ranging from patient self-reporting to the use of sophisticated electronic medication monitors.[314] There is no best-practice or 'gold standard' for precise measurement of adherence.[314, 315] The methods available for measuring adherence can be classified into direct and indirect methods of measurement.

a. Indirect methods

Indirect methods include patient self-reports, patient questionnaires, pill counts, rates of prescription refills, electronic medication monitors, measurement of physiologic markers, assessment of a patient's clinical response as well as patient diaries.[198, 316] Indirect methods are convenient and inexpensive to obtain.[317]

Patient self-report

The most easy and low-cost method of measuring adherence is patient's self-report.[318] Self-report defines the measurement of adherence using questionnaires or by interviewing patients directly about their medication-taking and lifestyle habits.[319] A key benefit of self-report is the quick and simple application, with most non-adherent patients usually admitting to not taking medications on certain days.[320] These tools can identify non-adherence and factors that contribute to it.[320] In community surveys, patient self-reporting seems to be more feasible than other indirect methods. One limitation of these tools is that some patients may give desirable, rather than truthful information.[317] Patients may prefer to 'save face' than admit non-adherence to taking medication to a health professional, who they may perceive to be judgmental or critical.[319]

Monitoring clinic attendance

The most important appeal of this method is that it is effortless and economical. However, the main disadvantage of this approach is that clinic attendance does not essentially show a relationship with taking medication or maintaining the suggested lifestyle.

Pill counts

Pill counting may involve visiting patients to count the number of leftover pills in the container. This method is attractive to many investigators due to its simplicity and directly observable nature. However, the method is not free from problems. For example, patients may discard pills and switch over to liquid medication in bottles before visits, in the pretense of having followed the regimen. For such reasons, pill counting is not a perfect measure of adherence.[321, 322] Besides, this method does not give information on dose timing and medication holidays, where the medication has been discontinued on three or more consecutive days, both of which assist to decide clinical outcomes.[124]

Pharmacy refills records

The number of refilling prescriptions received by a patient may be used to measure overall adherence in general in a closed pharmacy system (that is health maintenance organisations, military hospitals or countries with universal drug coverage), given that refills are measured at a number of points in that time. This method is comparatively low-priced and does not invade a patient's confidentiality.[323] The main disadvantage of this practice, however, is that it does not essentially correlate with actual medication intake as other factors such as carelessness or forgetfulness may contribute considerably to non-adherence.[323]

Medication events monitoring system (MEMS)

The medication events monitoring system (MEMS) is an electronic pill bottle that encloses a microprocessor fixed in the bottle cap. The processor records the time and date the bottle is opened and by this means provides an objective method of evaluating adherence.[324] In this method, it is understood that patients take the medication when the pack is opened. However, a study of adherence with the MEMS showed that in 0.4% of patients the tool went wrong, and in 62% of patients there was a difference between the number of bottle openings and actual medication intake.[325] Besides, electronic monitoring devices are very expensive and impractical for use in daily life.[319]

b. Direct methods

Direct methods of measuring medication adherence involve the assessment of serum and urinary concentrations of drugs or using biological markers incorporated into the tablets.[315] Inspite of their higher sensitivity and specificity, pharmacological methods are not regularly used in clinical practice.[315] This strategy is costly and not convenient for patients. Moreover, only a limited number of drugs can be examined in this way. Direct measurements are challenging in hypertension treatment since many patients are on a number of drug combinations. Dissimilar bioavailability, completeness of absorption, metabolism and excretion rate of various drugs are factors that make it complicated to correlate drug concentrations in blood or urine with adherence.[326]

2.10 Health care in India

2.10.1 Government health care services

Health care services in India are largely the responsibility of state governments. The health policy and planning framework are formulated by the central government.[327] Government health care facilities include teaching hospitals, secondary level hospitals, first level referral hospitals, dispensaries, primary health centres and sub centres, and health posts. In addition, there are public facilities (typically hospitals of different capacities, and dispensaries or clinics) for particular prefessional groups like the Employees State Insurance Scheme (ESIS), defence, and the Central Government Health Scheme (CHGS) etc.[327]

The government health care system has three levels of care: primary, secondary and tertiary.[328] Primary health care is the initial level of attention and contact point in the national health care system. It forms the foundation of the country's health care delivery.[328] Primary health care is concentrated on the wide-ranging provision of basic preventive, curative and rehabilitative services in the community aligned with the national primary health care strategy. Most of the government or public primary health services are free or low cost.[328]

2.10.2 Nongovernment health care services

Public health services in India are inadequate.[327] It has been observed that with the increase in income, high purchasing power, and the growth of the middle class, urban India has witnessed a tremendous expansion in the private health care system.[329] Private health care is much more expensive and is mainly supported by direct out-of-pocket payments. The private sector dominates ambulatory curative services. Over 80% of ambulatory health care is supported through out-of- pocket expenses.[327]

Private health care services usually are of two kinds: for-profit and not-for-profit. The former could be individual ownership, cooperative or corporate. The latter is generally a society or a trust, some of these also being identified as nongovernment organisations (NGOs). Private facilities also could be hospitals, clinics, dispensaries and diagnostic facilities of various sizes providing a variety of care.[327]

Studies also show that there is much heterogeneity among health care providers regarding qualifications, systems of medicine and practices in India. A large proportion of private health care providers are not qualified to provide modern health care since they are trained in another system of medicine or do not have any training. They include herbalists, indigenous and folk practitioners, compounders and others.[330, 331] These practitioners-–being readily available and accessible locally-–are utilised extensively particularly by the poor. [327]

Though earlier studies have revealed the growing prevalence of NCD/CVD risk factors, health promotion and prevention of CVDs are yet to be adequately addressed in the country's health system.[332] Indeed, the literature indicates that health systems in India might not be prepared to deal with hypertension and other cardiovascular diseases even though cost-effective interventions are available.[333] The so-called risk of a "double burden of disease" due to infections and NCDs poses a grave threat to the weak health system.[333] A multiplicity of providers and extensive heterogeneity in the quality of clinical care result in individuals belonging to higher socioeconomic strata having access to the best possible, evidence-based care while, the poor lack access to even basic primary care.[333]

However, the newly launched National Program on Prevention and Control of Diabetes, CVD and Stroke (NPCDCS) program has been initiated in 100 districts across 21 states during 2010–12 and it is anticipated to be implemented in 640 districts across the country under the twelfth 5-year plan (2013—2017) through selected institutions.[334] Primary activities under the program are yet to reach the urban poor communities.

2.10.3 Health care services in Delhi

At present, there are 509 dispensaries managed by the Delhi Government for providing primary care services. There are also 38 hospitals run by the Delhi Government for providing secondary and tertiary health care services.[335] In addition, mobile health dispensaries are available to deliver curative and preventive health care services to disadvantaged people of Delhi living in slums and resettlement colonies. At present, there are 90 mobile health dispensaries in Delhi run by the Directorate of Health Services (DHS). The Mobile Health Service is a very crucial and important health support to the people who are not able to access the costly health facilities at private

clinics.[335] Directorate of Health Services (DHS) is the technical wing of the Delhi Government. DHS is involved in coordination and implementation of various national and state health programs.[336] Among other governmental agencies (local bodies) working for delivery of medical services to the citizens of Delhi, the most significant are the Municipal Corporation of Delhi (MCD), with its network of 403 dispensaries and 61 hospitals, and the New Delhi Municipal Council (NDMC) with its network of 44 clinics and four hospitals. MCD organises the whole spectrum of public health services in Delhi.[337]

Within the private sector, Delhi also has several non-profit organisations and charitable institutions that provide free health services or services at subsidised rates to the poor.[338] Along with these NGOs, there are some private sector super-specialty hospitals, which receive patients referred from different parts of the country and from overseas.[338] There are 883 medical hospitals or centres in Delhi with a capacity of 42,698 beds. The hospital-bed-population ratio of 2.55 beds per 1000 Delhi residents in 2011[335] is far below the minimum 5 beds per 1000 population recommended by the WHO, but higher than the national average 0.7 beds per 1000 population.[339]

Literature suggests that for primary level care, a substantial section of the population in both rural and urban areas access the services of individual private practitioners.[340, 341] Micro-level studies from Delhi, show that people prefer to use private practitioners as a first resort for acute conditions.[330, 331] Poorer people unable to afford the doctor's charges either choose government hospitals or go without care.[342-344]

2.10.4 Utilisation of health care services by urban low-income communities

The use of primary health care services is sub-optimal in urban low-income communities despite the supposed proximity of the latter to the medical services.[336] This is on account of their being 'crowded out' because of the meagerness of the urban health delivery system. Regardless of improved health care infrastructure, government primary health care services have not developed in proportion to the excessive growth of the urban population. Inefficient outreach and weak referral systems also restrict the access of the urban poor to public health care services. The Indian primary and secondary health care system is under-prepared to handle chronic NCDs, this leads to increased patient flow and patient load in tertiary care hospitals. Moreover, social

elimination and lack of information and assistance at the secondary and tertiary hospitals make low-income people uncomfortable and unfamiliar with the modern hospital environment, thus further restricting their access and utilisation.[336] Also, the lack of economic resources confines their access to the obtainable private services.[336] The vast majority of the low-income population remains outside the purview or coverage of any type of insurance; [345, 346] the small minority that is covered; mostly belongs to the organized urban employment sector.

The Indian government has recognised the inadequate availability and utilisation of existing health services in urban low-income settlements. This recognition was reflected in significant policy statements such as the National Population Policy 2000 and the Tenth Five Year Plan (2002–2007).[336] To address the growing health care needs of the urban population, particularly urban poor, the National Urban Health Mission (NUHM) has been introduced by the Government of India in 2013, but it is yet to be implemented.[332]

A continued neglect of the health care among overcrowded populations in urban low-income areas will indeed lead to greater expenditure and diversion of medical resources in the long term. These additional expenses will be attributable to the management of end-stage complications of undetected or under-treated CHD risk factors among these populations.[347] Health care systems should include this vulnerable group in their priority area. Therefore, there is an imperative to execute and assess low-cost interventions for primary prevention of CHD in low-income urban areas to decrease the magnitude of CHD diseases in this stratum. More women-specific public health research is also required to deal with this issue, since most studies so far have been carried out on men.[348]

2.11 Summary of the chapter

CHD and its risk factors are greatly prevalent in urban and rural Indian populations and are increasing rapidly among the low socioeconomic stratum. This significant burden of CHD is driven by the growing prevalence of major cardiovascular risk factors among these groups. Women are more vulnerable among them due to the higher prevalence of CHD risk factors including hypertension. As most hypertensive patients living in low-income urban areas are undiagnosed, untreated or sub-optimally treated, there is a

considerable management and prevention gap in CHD within this group. Women are more at risk due to lack of disease and treatment information, and low adherence to long-term treatment recommendations.

As hypertension is associated with a grouping of other CHD risk factors, the GCR reduction is the most important target for hypertension treatment. Using available resources more efficiently and making treatment cost-effective, GCR becomes best–practice in CHD preventive management. Research strategies aimed at considering the GCR is now essential in order to focus prevention strategies within the setting of underserved communities. Likewise, knowing the CHD risk perception of a population group is crucial for planning and implementing focused and efficient CHD prevention strategies. Poor adherence to antihypertensive treatment is a primary problem in CHD prevention. Achieving optimum hypertension control by improving adherence to antihypertensive treatment has now become a substantial challenge. Data on adherence to antihypertensive medications in India are extremely limited, particularly from urban low-income areas. Information on factors that influence CHD risk perception and non-adherence to antihypertensive treatment will help health care providers and clinicians to design effective interventions to reduce CHD risk burden among women in India.

CHAPTER 3

LITERATURE REVIEW OF FACTORS INFLUENCING ADHERENCE TO ANTIHYPERTENSIVE MEDICATIONS

This chapter has been submitted to PLoS ONE

and

has been reviewed and I have responded to reviewer comments

3.0 Introduction to the chapter

This chapter provides a literature review on the factors that affect treatment non-adherence among hypertensive populations in developing countries with a special emphasis on urban women. The chapter ends with drawn conclusions and a summary.

3.1 Rationale for reviewing medication non-adherence among hypertensive populations in developing countries

High blood pressure or hypertension is the one of the most important risk factors for cardiovascular disease and a leading cause of premature adult deaths worldwide.[18] Uncontrolled hypertension causes 50% of the total coronary heart disease (CHD) deaths globally.[18] An analysis of global data reveals that of the deaths from CHD, approximately 80% will occur in low and middle-income countries,[28] and this is particularly common among people of low socioeconomic status.[29] Findings from recent studies also indicate a higher prevalence of hypertension in middle-aged and older women compared to men in developing countries.[22-24] CHD causes significant morbidity and mortality in women during childbearing years.[25] Regardless of race or ethnicity, the disease accounts for the death of one in three women globally[26] with an estimated 3.4 million women dying from CHD every year worldwide.[27]

Among all the WHO regions, the prevalence of hypertension is highest in the African Region (46%) and lowest in the region of the Americas (35%).[256] One in three adults in the South East Asia region has hypertension.[256] In developed countries, strong public health policies, multi-sectored preventive action and widely available diagnosis and treatment have led to an appreciable reduction in the prevalence of high blood pressure (BP).[256] A systematic review of the studies published between 2001 to 2007 revealed that BP was poorly controlled among hypertensive population in developing countries, the mean proportion of control of hypertension among all hypertensive patients being only 13%.[37] Poor medication adherence is one of the leading causes of failure to achieve BP control.[349] Most of the studies on adherence have been undertaken in developed countries. However, health care access, cultural beliefs, education about chronic illnesses and the functions of medication, the nature of patient-physician interactions and social support, among many other factors, are very different in developing countries compared to developed countries and may profoundly affect rates of medication adherence.[350, 351] The World Bank classifies all low- and middle-income countries as developing countries (however, this term is not intended to imply that all

economies in the group are experiencing similar development or that other economies have reached a preferred or final stage of development).[352] In developing countries, the degree of non-adherence is assumed to be higher particularly due to the shortage of health resources and difficulties in access to healthcare.[9]

Over the past decade, though some studies have been conducted in developing countries to explore the factors influencing medication adherence among hypertensive patients, little has been documented about medication non-adherence (MNA) and its determinants of hypertensive patients. This literature review was conducted to address this gap and examine the prevalence of MNA among hypertensive patients as well as investigate factors affecting MNA in this hypertensive population.

3.2 Methods

The literature search was conducted using the electronic databases: Proquest, PubMed, JSTOR and Science Direct for articles published during 2000-15. The online search engine, Google Scholar was also used to search for and identify likely papers. The search strategy included the following terms: adherence, compliance, treatment behaviour, hypertension, antihypertensive medications, non-adherence, persistence, belief, perception, high BP, women, and developing countries.

3.2.1 Study selection

From the initial search, 1425 titles and abstracts were identified. Duplicates were removed. Abstracts and titles were screened for relevance, and an initial list of 124 relevant articles was made (please see Figure 4). The full-texts of these articles were then examined to determine eligibility for inclusion in this literature review using the following selection criteria:

1) measured adherence to antihypertensive medications in developing countries
2) identify factors related to medication adherence with the antihypertensive treatment
3) enrolled hypertensive adults (18 years and older)
4) published in English as a peer-reviewed full-text article

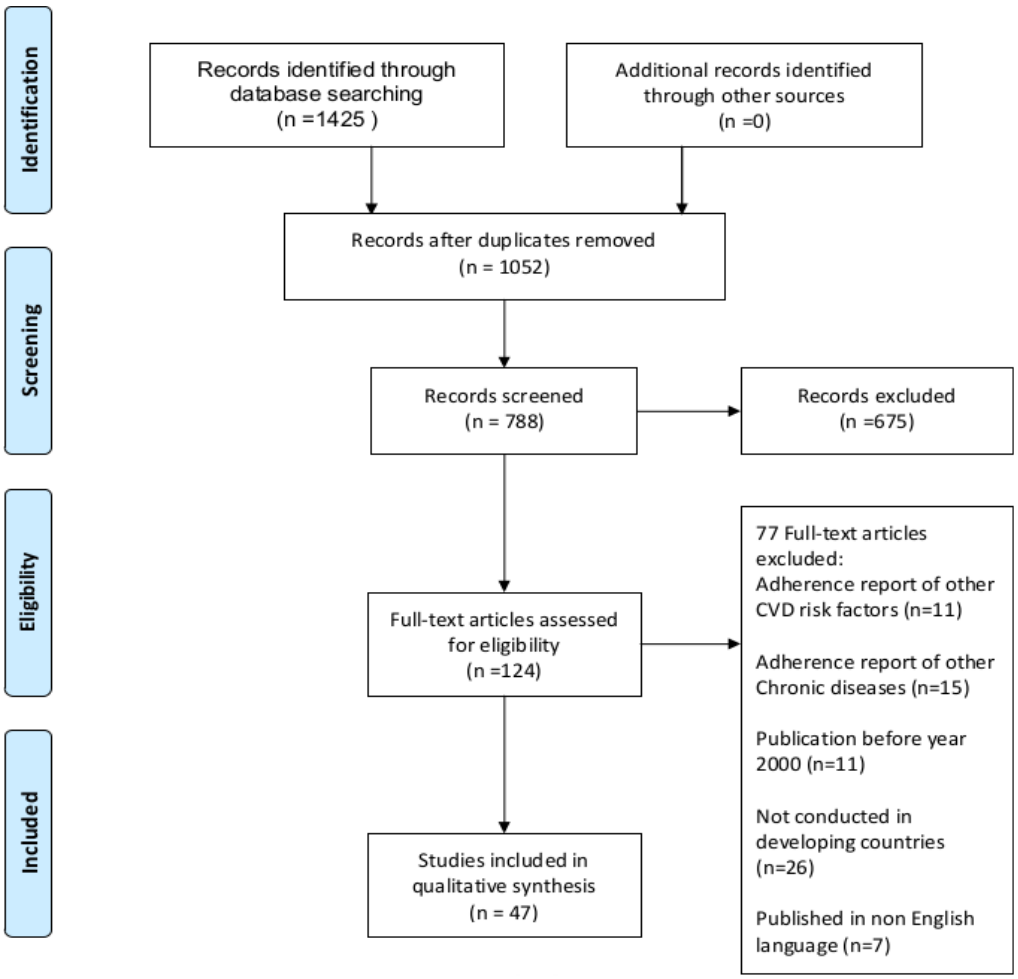


Figure 4: Result of screening process

Studies were excluded that measured adherence of other chronic diseases or were conducted in developed countries and published in a non-English language.

3.2.2 Data extraction and analysis

The total number of relevant articles meeting the above criteria was 47, consisting of 45 peer-reviewed journal articles and two thesis papers: 40 were on quantitative studies, five on qualitative studies and two were mixed methods studies. To check the quality of quantitative studies the National Collaborating Centre for Methods and Tools' quality assessment tool for quantitative studies was used.[353] Qualitative studies were checked based on NICE guidelines.[354]

A standardised data extraction form was used to record the citation details, methodology and objectives, and main findings of each paper. The following information was extracted and tabulated by the researcher: author name, date of publication, the country in which research was conducted, sample size, sampling method , study design, sex (% female), the adherence measure used, key findings and any statistical information (odd ratios, 95% CI p-value, correlation coefficients). A summary of the studies reviewed was provided in Appendix 15. A meta-analysis of the findings was not possible due to the heterogeneity in important aspects of methodology of the selected studies including sampling procedure (random/ purposive) population ages, study settings (hospital/ clinic/ community), study design (Cross sectional/ longitudinal/qualitative) and measurement of medication adherence. Descriptive analysis of studies examining similar variables and any association observed were considered to offer a simple indication of the level of evidence. Summary ranges of quantitative proportions and measures relating to prevalence and factors associated with MNA were compiled and presented. The evidence from the studies was synthesised and presented in a narrative review. The review followed the PRISMA reporting guidelines.[355]

3.3 Results

3.3.1 Description of the studies

The selected studies were conducted in developing countries in Asia (22) Africa (17), the Middle East (4), South America (2), and Europe (1). Among the 42 quantitative studies, the majority (33 studies [78.57%]) were conducted in urban hospital or clinic settings, with only nine studies were carried out in community settings (five in India and one each from Bangladesh, Nepal and Nigeria). Most of the studies (34 studies) were cross-sectional quantitative in type. A study from Nigeria was mixed methods in type, comprising both quantitative and qualitative methods for data collection.[356] A summary of the characteristics and the aim of each study are shown in Appendix 15.

The five qualitative studies were from India (1), Pakistan (1), Congo (1), Malaysia (1) and Nigeria (1)**.** Three studies used one-to-one qualitative interviews, one study used focus group discussion, and one used a combination of these methods. Further details of the study designs are presented in Appendix 15.

In all of the studies, the study population included both males and females. Overall women comprised 55.98% of study participants.

3.3.2 Reported adherence to antihypertensive treatment

To measure medication adherence, 21 (50%) of the quantitative studies used the Morisky Medication Adherence Scale'. Other scales used in the four different studies were: Medicines Team Questionnaire-Qualiaids (QAM-Q) (1); Beliefs about Medicine Questionnaire (BMQ) (1); Hill-Bone Adherence to Blood Pressure Therapy Scale (1); Drug Attitude Inventory (DAI-10) (1); One study used Medication Event Monitoring System (MEMS) and one used pill count to measure adherence. The remaining studies used questionnaires. Among them, eleven studies used structured questionnaires with established reliability and or validity, while eight studies (33%) did not cite information on their reliability or validity. The rate of MNA among hypertensive population ranged from 23.8%-86.76% with the mean being 47.34%.

3.3.3 Factors impacting on adherence

The identified factors related to MNA in the reviewed studies can be categorised into seven domains: demographic; psychosocial; perceptions regarding hypertension and its severity; perceptions regarding antihypertensive treatment; perceived barriers to treatment adherence; treatment and disease related factors; and health care services.

Demographic factors

Sixteen studies reported significant associations between demographic variables (such as age, sex, level of education, types of family, household income, occupation, type of family, comorbidities, and use of herbal preparations) and MNA to hypertensive therapy (please see Table 3).

Age

The effect of age on medication adherence showed conflicting results. Younger age was found to be significantly associated with MNA to hypertensive medications in India (≤57 years) (OR = 3.348; 95% CI: 1.665–6.732),[357] Palestine (<45 years) (OR = 0.40; 95% CI: 0.157–0.99)[358] and Pakistan (≤51years) (OR= 1.0; 95% CI: 1.00–1.04). The mean age of hypertensive patients who were not adherent to medications was 54.5 ± 13.2 years while those who were adherent had a mean age of 60.9 ± 12.1 years (p

<0.001) in Ghana and Nigeria.[359] On the other hand, a significantly lower level of adherence was identified in a study with elderly patients in Serbia. In that study younger than less than 65 years of age were found to be more likely to adhere to their prescribed treatment, compared to older patients (AOR = 6.0; 95% CI: 2.76–13.04).[360]

Table 3: Summary of variables under the domain of demographic factors

Domain	Variables being investigated	Study	Measurement of medication adherence	Setting and sample size (N)
Demographic factors	Age	Boima et al[359]	MMAS 8	Ghana and Nigeria; N=357
		Nagarkar et al[357]	MMAS 8	India; N=174
		Bilal et al[361]	Questionnaire	Pakistan; N=113
		Lalic et al[360]	MMAS 8	Serbia; N=170
	Sex	Khanam et al[362]	Questionnaire	Bangladesh; N=29,960
		Praveen et al[363]	Questionnaire	India; N=804
		Ismael et al[364]	Questionnaire	Iraq; N=200
		Bilal et al[361]	Questionnaire	Pakistan; N=113
		Joho et al[365]	Questionnaire	Tanzania; N=135
	Level of education	Khanam et al[362]	Questionnaire	Bangladesh; N=29,960
		Bhandari et al[366]	MMAS 4	Nepal; N=154
		Boima et al[359]	MMAS 8	Ghana and Nigeria; N=357
	Household income and employment	Hussain et al[367]	Questionnaire	Bangladesh; N=120
		Gelaw et al[368]	Questionnaire	Ethiopia; N=91
		Bilal et al[361]	Questionnaire	Pakistan; N=113
	Type of family	Nagarkar et al[357]	MMAS 8	India; N=174
	Comorbidities	Hareri et al[369].	Questionnaire	Ethiopia; N=365
		Khanam et al[362]	Questionnaire	Bangladesh; N=29,960
		Ambaw et al[370]	MMAS 4	Ethiopia; N=384
		Al-Ramahi et al.[358]	MMAS 8	Palestine; N=450
	Use of herbal preparation	Boima et al[359]	MMAS 8	Ghana and Nigeria; N=357
		Saleem et al[371]	Qualitative	Pakistan
		Odusola et al[372]	Qualitative	Nigeria

Key: MMAS=Morisky Medication Adherence Score

Sex

Being female was independently and significantly associated with poor adherence in a study in India (AOR = 2.95; 95% CI: 1.39–6.24) with hypertensive women 2.95 times more likely to be non-adherent to their medications than men.[363] A study in Iraq also revealed that female hypertensive patients (61.7%) were more non-adherent than male (30.3%) patients.[364] On the other hand, MNA was significantly associated with male gender in Pakistan (p = .008),[361] Tanzania (p = .044),[365] and Bangladesh (AOR = 1.67; 95% CI: 1.42–1.97).[362] However, several studies[359, 366, 367, 373, 374] found no significant association between gender and MNA among hypertensive patients. Thus, the effect of gender on MNA showed conflicting results across countries.

Level of education

Hypertensive patients in Nepal who were illiterate almost five times less likely to be adherent to medications than those who were literate (AOR = 5.34; 95% CI: 1.23–23).[366] Similarly, a lower level of education was significantly associated with MNA among hypertensive patients in Bangladesh (OR = 6.34; 95% CI: 1.65–24.41).[367] On the other hand, formal education was associated with MNA (p = .001) in Ghana and Nigeria.[359] A study in India found that educational level was not a significant contributing factor to non-adherence.[39] These results suggest that educational level may not always be a good predictor of MNA.

Household income, employment and type of family

Hypertensive patients with low monthly income (AOR = 11.60; 95% CI: 3.77–35.65) in Bangladesh[367] and Ethiopia (p = .04)[368] were more non-adherent to their medications. In Pakistan,[361] the likelihood of MNA was also found to be higher among unemployed persons (p = .002) and people with low socioeconomic status (p = .046). Hypertensive patients who had private businesses were 72% less likely to adhere to medication compared to government employees (AOR = 0.28, 95% CI: 0.130–0.60) in Ethiopia.[375] Hypertensive patients living in a nuclear family setup in India were more likely to have lower adherence to medication as compared to staying in the extended family (OR = 2.67; 95% CI: 1.38–5.18).[357]

Comorbidities

Hypertensive patients with comorbidities were 50% less likely to be adherent to their medications compared to patients with no comorbidity (AOR = 0.50; 95% CI: 0.29–0.89) in Ethiopia.[369] In Bangladesh, hypertensive patients with cardiovascular comorbidity were significantly associated with MNA (AOR = 0.79; 95% CI: 0.64–0.97).[362] A study in north-west Ethiopia[370] also found that patients with no comorbidity and one co morbidity were more likely to adhere to their treatment than those with two (AOR = 2.50; 95% CI: 1.01–6.21) or more than two co-morbidities (AOR = 2.68; 95% CI: 1.07–6.71). However, having no other chronic disease (p = .009) was a significant factor influencing MNA among hypertensive patients in Palestine.[358]

Using traditional or herbal preparation

In Ghana and Nigeria, patients who used herbal preparations for the treatment of hypertension were more likely to show MNA (p = .014).[359] In a qualitative study in Pakistan,[371] almost all the hypertensive patients surveyed firmly supported the utilisation of traditional or herbal remedies for the control of their high BP and confirmed that only in the case of failure of these therapies would they seek help from modern or biomedical health care providers. A qualitative study in Nigeria found some patients with low medication adherence substituted or complemented prescribed pills with herbal remedies on their own without informing their doctor.[372]

Psychosocial factors

Seven studies reported significant associations between psychosocial variables (such as family support, depression and use of social drugs) and MNA to hypertensive treatment (please see Table 4).

Family support

An absence of household support had a strong negative effect on adherence among hypertensive patients in Ethiopia (AOR = 0.170; 95% CI: 0.03–0.90)[376] and Nigeria (p<0.05).[377] Likewise, studies[373, 378] in Congo reported that patients who received no reminder from family members about taking their medications were likely to be more non-compliant than the others. A qualitative study in Congo[378] found that there was a perception among some family members that the hypertensive patient had brought the condition upon himself or herself by being a bad person:

'They say I developed hypertension because I killed her sister (through witchcraft).'

Table 4: Summary of variables under the domain of psychosocial factors

Domain	Variables being investigated	Study	Study design	Study setting and sample size
Psychological factors	Family support	Hussain et al[367]	Questionnaire	Bangladesh; N=120
		Nsitou et al[373]	Questionnaire	Congo; N=212
		Lubaki et al[378]	Qualitative	Congo
		Ali et al[376]	MMAS 8	Ethiopia; N=121
		Olowookere et al[377]	Questionnaire	Nigeria; N=420
	Depression	Boima et al[359]	MMAS 8	Ghana and Nigeria; N=357
	Use of social drugs	Khanam et al[362]	Questionnaire	Bangladesh; N=29,960
		Ahmed et al[379]	MMAS 8	India; N=334
		Kamran et al[380]	MMAS 4	Iran; N=671
		Bhandari et al[366]	MMAS 4	Nepal; N=154

Key: MMAS=Morisky Medication Adherence Score

Though family cohesion is very high in Bangladesh, lack of an accompanying person to go to the physician or hospital was a significant factor in determining non-adherence to antihypertensive treatment (OR = 3.54; 95% CI: 1.04–11.99).[367] This lack of support may be due the family members lacking knowledge about the disease process.

Depression

When patients are depressed, they are less likely to follow health care providers' treatment plan for hypertension. In Ghana and Nigeria[359] MNA occurred in patients who had varying degrees of depression (r = −0.208, p <.001) (r = Pearson's correlation coefficient).

Use of social drugs

A World Health Organisation report observed that alcohol abuse and tobacco smoking were important modifiers of compliance behaviour. Patients' habit of alcohol consumption,[362, 379] tobacco chewing,[379] and smoking[362, 379, 380] were strongly associated with poor adherence to antihypertensive treatment in studies in India, Iran and Ethiopia.

In contrast, a study in Nepal did not find any significant association between tobacco use and alcoholism with MNA among hypertensive study participants.[366]

Perceptions regarding hypertension and its severity

Four studies reported significant associations between variables related to perceptions of hypertension and MNA to hypertensive medications. These factors included: awareness, knowledge and belief of hypertension and knowledge of the severity of hypertension.

Researchers found that poor understanding and belief in high blood pressure were significant factors associated with MNA in Bangladesh (AOR = 12.90; 95% CI: 1.65–100.63)[367] and in Ethiopia (p <.01).[368] A qualitative study in Pakistan[371] revealed that patients, when achieving control of their high BP, tended to discontinue their medications. Those patients with an inadequate knowledge of hypertension-related complications were also more likely to be non-adherent with the treatment regimen, as found in a study in Bangladesh (OR = 23.71; 95% CI: 3.38–166.46)[367] and Congo (OR = 2.9; 95% CI:1.61–5.29).[373] Diagnosed hypertensive patients who lacked knowledge regarding the severity of hypertension were also more likely to be non-adherent to medications in Bangladesh (AOR = 23.71; 95% CI: 3.38–166.46)[367] and Congo (AOR = 0.34: 95% CI: 0.13–0.94).[373]

Perceptions regarding antihypertensive treatment

Eight studies found significant associations between variables related to antihypertensive treatment and MNA (please see Table 5).

Studies in Bangladesh (AOR = 24.50; 95% CI: 6.28–95.58),[367] Congo (AOR = 0.36; 95% CI: 0.15–0.83),[373] and Ethiopia[368] (p <.01) reported that patients' lack of knowledge about hypertension management was significantly associated with non-adherence to therapy. A significant correlation between beliefs about medication and MNA was found among hypertensive patients in Ghana and Nigeria;[359] patients who were worried about the adverse effects of antihypertensive drugs less likely to be adherent to their medications (r = −0.0347, p = .002). Qualitative studies in Pakistan[371] and Malaysia[381] also found patients hesitated to take medications continuously due to their lack of belief in medications. As one hypertensive patient in Pakistan commented:

'*Medications are hot* (*warm*) *in nature*. *They enter the stomach and increase temperature, which interferes with digestion*.'

Table 5: Variables summarised under the domain of perceptions regarding antihypertensive treatment

Domain	Variables investigated	Study	Measurement of medication adherence	Study setting and sample size
Perceptions regarding antihypertensive treatment	Knowledge about hypertension management	Hussain et al[367]	Questionnaire	Bangladesh; N=120
		Nsitou et al[373]	Questionnaire	Congo; N=212
		Gelaw et al[368]	Questionnaire	Ethiopia; N=91
	Belief about medication	Boima et al[359]	MMAS 8	Ghana and Nigeria; N=357
		Saleem et al[371]	Qualitative	Pakistan
		Shima et al[381]	Qualitative	Malaysia
		Al-Ramahi et al[358]	MMAS 8	Palestine; N=450
	Avoiding side effect of medications	Campbell et al[374]	MMAS 4	Nigeria; N=262
		Hareri et al[369]	Questionnaire	Ethiopia; N=365
		Praveen et al[363]	Questionnaire	India; N=804
	Do not understand drug regimen well	Gelaw et al[368]	Qualitative	Ethiopia
		Odusola et al[372]	Qualitative	Nigeria

Key: MMAS=Morisky Medication Adherence Score

A study in Palestine found that patients with hypertension were not adhering to their medication due to the fear of dependency on medicines (AOR = 8.00; 95% CI: 2.44–26.19).[358] Similarly, avoiding side effects of drugs (AOR = 3.0; 95% CI: 1.4–6.7) was an important reason for non-adherence to a treatment regimen among hypertensive patients in Nigeria.[374]

Hypertensive patients who did not understand their drug regimen well, were poorly adherent to their prescribed medications (AOR = 4.06; 95% CI: 1.01–16.32) in India[363] and Ethiopia (AOR = 0.12; 95% CI: 0.26–0.58).[369] Gelaw et al.[368] found that insufficient information about the consequence of non-adherence to hypertension treatment contributed to the non-adherence of hypertensive patients in Ethiopia. In Nigeria, a qualitative study also found ignorance about regular use of medication was an important contributor to medication non-adherence.[372]

Perceived barriers to adherence

Sixteen studies found significant associations between aspects related to perceived barriers and MNA. These perceived barriers were: the cost of medications, the number of pills that needed to be taken on a daily basis, forgetfulness, side effects of medications, duration of therapy, satisfaction with the treatment and health services provided, and distance from a health care centre (please see Table 6)

Table 6: Variables investigated under the domain of perceived barriers to adherence

Domain	Variables being investigated	Study	Measurement of adherence	Study setting and sample size
Perceived barriers to adherence	Cost of medications	Bhandari et al[366]	MMAS 4	Nepal; N=154
		Nsitou et al[373]	Questionnaire	Congo; N=212
		Eizubier et al[382]	Pill count	Sudan ; N=198
		Praveen et al[363]	Questionnaire	India; N=804
	Number of pills	Bhandari et al[366]	MMAS 4	Nepal; N=154
		Srikanth et al[383]	MMAS 8	India; N=304
		Olowookere et al[377]	Questionnaire	Nigeria; N=420
		Ramli et al[384]	The hill bone adherence to BP scale and MMAS 8	Malaysia; N=653
		Bilal et al[361]	Questionnaire	Pakistan; N=113
		Srivastava et al[385]	Self-report and MMAS 4	India; N=440
	Forgetfulness	Campbell et al[374]	Moisky Green	Nigeria; N=262
		Al-Ramahi et al[358]	MMAS 8	Palestine; N=450
	Side effect of medicine	Lalic et al[360]	MMAS 8	Serbia ; N=170
		Shima[381]	Qualitative	Malaysia
		Odusola[372]	Qualitative	Nigeria
	Duration of therapy	Bhandari et al[366]	MMAS 4	Nepal; N=154
		Hareri et al[375]	Questionnaire	Ethiopia; N=286
		Lalic et al[360]	MMAS 8	Serbia; N=170
		Bilal et al[361]	Questionnaire	Pakistan; N=113
		Hu et al[386]	Questionnaire	China; N=318
	Distance from health care facilities	Gelaw et al[368]	Questionnaire	Ethiopia; N=91
		Al Ramahi[358]	MMAS 8	Palestine; N=450
		Ambaw et al[370]	MMAS 4	Ethiopia; N=384

Key: MMAS=Morisky Medication Adherence Score; BP=Blood Pressure

Studies showed a link between patients' perception of the high cost of treatment with poor adherence. In non-adherent patients surveyed in Nepal, a significantly greater proportion of patients considered the price of medications to be too high (AOR = 5.14;

95% CI: 1.1–23.9)[366] and a reason for not taking medications (AOR = 0.143; 95% CI: 0.02–0.78). The cost of medicine was also a significant factor associated with MNA among patients in Congo (OR = 1.84; 95% CI: 0.93–3.64).[373] Similarly, the inability to buy medications (p <0.001) was positively and significantly related to MNA in Sudan.[382] Even being able to afford only some of the prescribed antihypertensive drugs (AOR = 3.70; 95% CI: 1.81–7.59) was also significantly related with MNA in India.[363]

Number of pills

In Nepal, non-adherence was significantly associated with therapy requiring more than one pill per day (AOR = 5.33; 95% CI: 1.19–23.70) compared to patients prescribed only one pill per day.[366] MNA was also greater among patients with higher pill intake in India,[383] Nigeria,[377] and Malaysia[384] (p <.05). On the other hand, a couple of studies[361, 385] found that when patients had to take multiple medications, they were less likely to fail to remember to take them, compared to having only one pill. A study in Pakistan[361] found non-adherence was higher among those patients who were on mono-therapy and di-therapy compared to patients using 3 or >3 drugs (p = .02).

Forgetfulness

Patients also often forget to take even once-daily medications. Studies in Nigeria (OR = 14.8; 95% CI: 3.9–54.8)[374] and Palestine (AOR = 5.12; 95% CI: 3.12–8.41)[358] found significant correlation between forgetfulness and non-adherence among hypertensive patients.

Side effects of medications

Hypertensive patients who experienced side effects of their medications were less adherent to their medication than those who did not experience side effects in Palestine (AOR = 4.58; 95% CI: 1.87–11.25) and Serbia (OR = 7.95; 95% CI: 1.48–42.60).[358, 360] Qualitative studies in Malaysia[381] and Nigeria[372] also found perceived side effects were inhibitors of antihypertensive medication adherence. In India, however, Praveen et al.[363] did not find any correlation between adverse drug events and non-adherence.

Duration of therapy

Patients who had had a diagnosis of hypertension of five or more years were less likely to adhere to treatment than those who had been diagnosed for less than five years in

Nepal[366] (OR = 2.98; 95% CI: 1.73–5.14) and Ethiopia (AOR = 0.11, 95% CI: 0.01–0.95).[375] Lower levels of adherence in elderly patients in Serbia was correlated with longer duration of antihypertensive therapy.[360] On the other hand, patients with shorter duration of hypertension were less likely to be adherent to treatment in Pakistan (<5 years) (AOR = 0.11; 95% CI: 0.01–0.96)[361] and China (<3 years) (AOR = 3.31; 95% CI: 1.91–5.72; p <.001).[386]

Distance from health care facilities

Distance from health care facilities was a significant barrier for adherence to treatment. Being further away from medical centres contributed to MNA of hypertensive patients in Ethiopia.[368] In the same way, those living in rural areas had poorer adherence to hypertensive medications in Palestine than those living in urban areas (AOR = 1.79; 95% CI: 1.10–2.92).[358] As the remoteness from the hospital decreased, adherence to hypertension treatment improved (AOR = 2.02; 95% CI: 1.19–3.43) in Ethiopia.[370]

Treatment or disease related factors

Eleven studies found a number of treatment or disease related factors associated with MNA. These included absence of disease symptoms, complication, irregular followup, family history of hypertension and poor BP control (please see Table 7).

Absence of disease symptoms

The absence of symptoms significantly contributed to poor compliance to hypertensive therapy in Nigeria (AOR = 3.3; 95% CI: 1.3–8.0)[374] and India (OR = 0.414; 95% CI: 0.19–0.89).[357] Qualitative studies in Congo[378] and India[387] also found hypertensive medications were more likely to be taken when the patient experienced symptoms of hypertension.

Presence of hypertension-related complications

The presence of hypertension-related complications such as heart diseases (AOR = 21.73; 95% CI: 1.57–418.42; p = .000) was found to be associated with decreased medication adherence among patients in Ethiopia.[376] In contrast, a study in Pakistan found that cases suffering from hypertension-related complications were more likely to be adherent to medications.[388]

In Nepal, those with no family history of hypertension were less adherent to their medications compared to those with a family history of high BP (OR = 4.46; 95% CI: 1.21–16.40; p = 0.024).[366]

Table 7: Variables summarised under the domain of treatment and/or disease related factors investigated by the studies

Domain	Variables investigated	Study	Measurement of medication adherence	Study setting and sample size
Treatment and disease related factors	Absence of symptoms	Campbell et al[374]	Morisky Green	Nigeria ; N=262
		Nagarkar et al[357]	MMAS 8	India; N=174
		Lubaki et al[378]	Qualitative	Congo
		Kusuma et al[38]	Qualitative	India
		Odusola et al[372]	Qualitative	Nigeria
	Presence of hypertension related complications	Ali et al[376]	MMAS 8 and patient medication chart	Ethiopia; N=121
		Hashmi et al[388]	History of pill taken & MMAS 4	Pakistan
	Family history of hypertension	Bhandari et al[366]	MMAS 4	Nepal; N=154
	Irregular follow up	Bhandari et al[366]	MMAS 4	Nepal; N=154
		Praveen et al [363].	Questionnaire	India; N=804
	Blood pressure control	Boima et al[359]	MMAS 8	Ghana and Nigeria; N=357
		Lalic et al[360]	MMAS 8	Serbia; N=170
		Ramli et al[384]	The hill bone adherence to BP and MMAS 8	Malaysia;N=653
		Ali et al[376]	MMAS 8	Ethiopia; N=121

Key: MMAS=Morisky Medication Adherence Score; BP=Blood Pressure

Irregular followup

Frequent meetings or appointments provide better monitoring of blood pressure levels, as well as the opportunity to have more access to information and can serve as the basis for adherence to antihypertensive medication management.[389] Irregular followup (AOR = 6.39; 95%CI: 1.22–33.30),[366] was significantly associated with MNA in Nepal. Similarly, an Indian study reported that a longer time since the previous visit to a doctor for advice (AOR = 7.26; 95% CI: 2.65–19.86) was significantly related with non-adherence to hypertensive medications.[363]

Blood pressure (BP) control

Poor BP control was significantly associated with MNA in Ghana and Nigeria (p = .006).[359] BP values over 140/90 mmHg were also reported in 59.1% of non-adherent patients and 21.4% of adherent patients, ($\chi 2$ = 19.84; p <.01; OR = 5.30; 95%, CI: 2.39–11.85) in Serbia.[360] Similarly the average systolic and diastolic blood pressure for non-adherents was significantly higher (p = .05) than that in adherents in Malaysia.[384] In contrast, a study in Northern Ethiopia[376] found that patients at the pre-hypertension level (BP values below 140/90 mmHg) (AOR = 0.026; 95% CI: 0.003–0.242) were less adherent to their medications.

Health care services

Four studies found 'dissatisfaction with the health services and treatment provided' significantly influenced MNA among hypertensive patients (please see Table 8).

Table 8: Variables summarised under the domain of health care services

Domain	Variables being investigated	Study	Measurement of medication adherence	Study setting and sample size
Health Care services	Dissatisfaction with the health care services received	Barreto et al[390]	Morisky- Green	Brazil; N=68
		Lubaki et al[378]	Qualitative	Congo
		Kusuma et al[387]	Qualitative	Delhi
		Odusola et al[372]	Qualitative	Nigeria
	Inadequate information from health care Centre	Hussain et al[367].	Questionnaire	Bangladesh; N=120
	Dissatisfaction with treatment	Al-Ramahi et al[358].	MMAS 8	Palestine; N=450
	Fewer Interaction with physicians	Hussain et al[367]	Questionnaire	Bangladesh; N=120

Key: MMAS=Morisky Medication Adherence Score

A study conducted in Brazil confirmed the high correlation between MNA and dissatisfaction with health services.[390] Hypertensive individuals who were dissatisfied with the care received in primary public health services (such as reception service, scheduling appointment and care received from the health team) were more likely to not adhere to the proposed medication treatment. Inconvenient clinic operating hours, long

waiting time and under-dispensing of medications were found to be inhibitors of adherence in a qualitative study in Nigeria. Studies in Congo[378] and India[387] found that antihypertensive medication was sometimes not readily available at health care centres. Patients waited for long periods to receive medications once they had been prescribed. Rude or unsympathetic behaviour and attitudes by staff members at the health clinics was the other reason found for the dissatisfaction of the patients in Congo.[378]

In Bangladesh, inadequate information from health care professionals about hypertension and its treatment (AOR = 5.16; 95% CI%:1.13–23.66) were significantly associated with MNA.[367] Also in Palestine, patients dissatisfied with treatment were less likely to adhere to prescribed hypertensive medications than those satisfied with their treatments (AOR = 2.93; 95% CI: 1.22–7.02).[358] Due to fewer interactions with the physicians, those receiving treatment at government hospitals had a 30 times greater chance of being non-adherent than those treated at private hospitals or clinics (AOR = 35.29; 95% CI 9.76–127.63) in Bangladesh.[367]

3.4 Discussion

Though non-adherence to antihypertensive treatment is a significant problem in CHD management few studies on medication adherence have been conducted in developing countries.[308] Moreover, the majority of these studies were conducted in hospital and clinical settings. Studies carried out in low-income urban areas extremely limited. Despite the higher prevalence of hypertension and its poor control among women in developing countries, this researcher did not find any studies that focused specifically on this vulnerable population.

This review found that although there was substantial heterogeneity in methods and populations across studies, approximately half (49.64%) of the participated hypertensive population both male and female 18 years and older did not adhere properly to the treatment for hypertension as prescribed by their doctors. Women in developing countries living with chronic non-communicable diseases such as hypertension experience particular challenges in accessing cost-effective prevention, early detection, diagnosis, treatment and care. The lack of knowledge and information regarding health, poor access to healthcare, family responsibilities, and poor economic, legal and political status further worsen their situation.[119]

From 25 studies, significant factors were identified associated with MNA. A limitation of the selected studies was the fact that factors associated with MNA were not examined for gender differences. However, a study in Brazil reported reasons for non-adherence to medication and non-medication regimen in patients' opinion according to gender.[391] Considering the magnitude of inadequately treated or controlled hypertension among women in developing countries, studies that explore factors affecting MNA in this vulnerable population are urgently needed.

While recognising these limitations, the findings do provide insight into factors influencing MNA of hypertensive patients. Factors related to demography, barriers for adherence and treatment and disease related factors were the most commonly examined among the studies reviewed while factors related to perceptions regarding hypertension and its severity were the least examined. Associations of MNA with demographic and psychosocial factors such as age, gender, ethnicity, level of education, co-morbidities, duration of therapy, the number of medicines, use of social drugs, were often varied and not consistent. Factors affecting MNA consistently were: low socioeconomic status and low monthly income, family support, the use of traditional herbal preparations, knowledge and belief regarding hypertension and its management, cost of medications, avoiding side effect of medications, forgetfulness, absence of symptoms, distance from health facilities, irregular followup, and dissatisfaction with the treatment and health services provided.

3.4.1 Implications for hypertension management and research

The present review reveals that gender may not be a good predictor of non-adherence because of inconsistent conclusions. However, it is conceivable that women with low socioeconomic status and lower level of education are more vulnerable. Their lack of adherence might be due to their inability to buy medicines, and lack of access to free health facilities as governments in developing countries spends comparatively less of their budgets on health than developed countries. The importance of cost-related factors should be considered against the background of the relatively high out-of-pocket payments for most treatments in developing countries especially in South Asia and Africa.

The review also found that fear of side effects make some hypertensive patients stop their medications or reduce their daily doses without consulting their health care providers. Therefore, information tailored to patient's literacy level about the side effects of prescribed medications and how to manage these should be provided to all patients. From the review, it appears that educational level may not be a good predictor of MNA. However, sceptical attitudes towards antihypertensive treatment even among educated participants necessitate the health education on hypertension and its treatment to all hypertensive patients irrespective of the patients' educational status. Understanding potential complications of hypertension could be a motivating factor for adherence to treatment. For this to happen, patients need to be aware of the seriousness of their condition and all risks involved without being worried unnecessarily.[392] To better deal with these problems, educational interventions are required that recognise patients' apprehension and perceptions. In particular, patients should be provided an explanation of the benefits and adverse effects of treatment. The safety of long-term use of drugs needs to be discussed, including the information that treatment does not cause physical dependence irrespective of the length of treatment.

The review indicated that adherence to antihypertensive medication treatment would be improved if patients experience positive encounters with their doctors or health care providers regarding adequate and accurate advice on achieving control of their high blood pressure.[393]

Among the selected studies, there was a general lack of assessment of individual risk perceptions of hypertension complications such as CHD. This is an unfortunate omission given the importance of such risk perceptions in medication adherence. Earlier studies in developed countries have shown that patients who accurately perceive their risk of cardiovascular disease are more likely to be adherent to medications and guidelines compared to those who do not perceive themselves to be at risk.[247-250] Women's perceptions of their risk for heart disease can significantly influence their decision-making process concerning health care choice.[394]

The studies in the review did not examine in depth psychological issues, in particular those relating to self-efficacy (i.e. the belief that one can perform a particular behavior under differing conditions) which can greatly impact on medication adherence. Cultural

restrictions make it difficult for women to seek medical care from male health care providers,[120] but there is, at the same time, a shortage of female health professionals.[120] These issues are compounded by health systems that often fail to respond to the particular needs of women with NCDs such as hypertension.[116] Weak health systems have been identified as major obstruction in effectively responding to the rising burden of chronic conditions such as hypertension in developing countries.[395] In spite of the need for research on health systems, little attention has also been given to the role of local health systems in the delivery of care for the control of hypertension.

Moreover, belief-laden factors including confidence in the physician's knowledge or ability, belief of control over one's health and illness perception were all found to be significantly related to medication adherence in developed countries.[396] Studies in developing countries especially at community settings on these factors influencing adherence would be helpful to address the knowledge gap and contribute to global strategies for addressing non-compliance among hypertensive patients.

3.4.2 Strengths and weaknesses of the review

We have included studies from 20 developing countries (27.40% of all developing countries). Having study population from less than one third of the developing countries incorporated in the analysis, the conclusions of this review might not be extrapolated to the whole population of the developing countries.

Most of the studies in this review that met inclusion criteria were quantitative in type. Only half of the quantitative studies (20) chose study participants using simple or systematic random sampling techniques. Eight studies used purposive sampling method, thus their results may not be necessarily generalisable to the wider population. The remaining studies selected all eligible hypertensive patients from clinics or hospitals or communities as their study participants.

The review followed the PRISMA reporting guidelines for identifying, reporting, and synthesising research. The results of the review are robust. Most of studies selected for the review were judged to be of moderate to strong quality in terms of research rigour, reliability and validity. A large number of MNA related factors were consistently identified across different countries. However, this review was subject to a few

limitations. This study included only English peer-reviewed journal articles. The majority of the studies relied solely on self-reported adherence, which may be subject to self-presentation and recall bias. Among the selected quantitative studies, only two prospective cross-sectional studies were found. Longitudinal assessment is desirable to differentiate between chronic and occasional non-adherence and related barriers that may contribute to non-adherence.

3.5 Conclusion

This literature review examined the prevalence of MNA among hypertensive population as well as investigated factors affecting MNA. Approximately half of hypertensive men and women were found to be non-adherent to their medications. Among the selected studies, very few studies were conducted in low-income community settings. MNA was influenced by a range of factors including socio-economic status, knowledge of hypertension and its management, medication side effects, costs of medication, and dissatisfaction with the treatment and health services provided. There was a general lack of consideration of cultural barriers, role of health system in health care delivery, self-efficacy and perceived individual risk of hypertension complications. Policymakers and health service providers should take these factors into account to design intervention strategies that are relevant and appropriate for the target population, in order to enhance adherence among hypertensive patients. There is also a lack of gender-specific research, which is necessary given the social and economic vulnerabilities faced by women in developing countries that may affect adherence to antihypertensive medications.

3.6 Summary of the chapter

This chapter has reviewed the key factors that impact on the medication adherence status of the hypertensive populations in developing countries. The next chapter describes the research methodology used in the study.

CHAPTER 4

RESEARCH DESIGN AND METHODS

4.0 Introduction to the chapter

This chapter describes the research methods used in the study. The chapter begins with the conceptual framework, and it then describes the quantitative arm of the study, focusing on sampling procedures, the survey questionnaire used, and the methods of quantitative data analysis. It is followed by a description of the qualitative arm, describing the methods of qualitative data collection and analysis. Finally, it documents ethical considerations involved in this study.

4.1 The conceptual framework, theoretical model and study variables

This study used as its conceptual framework the Health Belief Model (HBM)[397] (please see Appendix 4).[397] The HBM framework helped inform the selection of the research variables, and the development of the hypothetical model and the data collection instruments.

4.1.1 The Health Belief Model (HBM)

The HBM was initially developed by Rosenstock to clarify and predict individuals' health behaviours, and has been subsequently modified by Becker to integrate illness role behaviours as well.[398] According to the HBM, the following five key elements determine an individual's adherence to treatment:

1. Threat of the illness: perceived susceptibility to the illness.
2. Positive outcome expectancy: the patient's perceived benefits from treatment.
3. Barriers to using the treatment: the patient's expected disadvantages of the treatment.
4. Intent: the patient's intention to adhere to their treatment regimen.
5. Self-efficacy: the patient's belief in their ability to adhere to the course of therapy.

Perceived susceptibility

Perceived susceptibility refers to the patients' perception of the possibility of having an illness such as hypertension or the complications of uncontrolled hypertension.[220]

Perceived susceptibility to CHD is defined as the perception of the likelihood of experiencing a premature CHD event.[221] In several studies, perceived susceptibility was determined to be an indicator of an individual's inclination to take part in risk-reducing behaviours for the prevention of heart disease.[229, 399]

According to the HBM, a person who believes susceptible to hypertension and its sequel such as heart attack, kidney failure or stroke, would more likely adhere to treatment than those who do not hold this belief.[220] Such a perception is usually derived from good knowledge of the disease. Patients with proper understanding regarding the pathophysiology of hypertension and likely risks associated with non-adherence to treatment; would possibly perceive themselves vulnerable to the disease and its complications. Persons, who consider that they are not vulnerable to hypertension or oppose the existence of hypertension, may not realise the requirement for consumption their medications as advised or modify their lifestyle. For example, a study[400] in Finland reported that 66% of hypertensive respondents did not believe they had hypertension and did not follow through with their treatment.

Perceived severity

Perceived severity is one's belief about the gravity of a medical condition. According to the HBM, people who understand hypertension to be a severe disease would be more adherent with prescribed medicines and lifestyle changes than those who do not hold such a perception.[220]

Perceived threat

Carpenter[401] defines perceived threat as 'the anticipation of harm that is based on the cognitive appraisal of an event or cue that is capable of eliciting the individual's stress response'. The explanation emphasises three issues: first, the expectation of harm, which involves that individuals have needs, and ambitions they desire to attain in life; whatever jeopardises these requirements and aspirations constitutes a danger. Second, the anticipated threat, results in cognitive evaluation of the relevance or irrelevance of the risk. Third, action is taken, which demands appraisal of the resources available to deal with the risk and the method(s) of doing so.[401]

Different socio-demographic, socio-psychological and structural variables could together influence persons' judgment outcomes. Perceived susceptibility and perceived severity also influence their perception of hypertension as an intimidation.[402] For patients suffering from uncomplicated asymptomatic hypertension, a permutation of these factors would decide their response to the prescribed treatment and advice given on lifestyle modifications.[402]

Perceived benefits

The HBM assumes that patients who perceive benefits from implementing specific health behaviour are more likely to exhibit the requisite health behaviour than those who do not.[403] For instance, those patients who believe that consuming antihypertension medications and adopting lifestyle changes would benefit them would be more likely to be adherent than those who do not have such a perception. Such perceptions are influenced by knowledge of the disease and its consequences if untreated.

Perceived barriers

Perceived barriers refer to potential obstacles to taking a recommended health action.[403] Such barriers are related to physical and psychological costs of taking health action. Patients with a greater perception of barriers are less likely to adhere to their treatment than those who believe that the benefits outweigh the barriers.[403] Potential barriers for hypertensive people to take prescribed medication may include: inadequate knowledge about hypertension and its treatment, fear of getting side effects from medicines, fear of addiction from long term use of drugs, and financial expenses.[404] A qualitative study in the UK[393] identified many suspicions that patients had regarding antihypertension medications. Several participants stated the need to discontinue a medication in order not to become addicted whereas others preferred alternatives to medicines. A number of patients expressed an apprehension of the unseen threat associated with lifelong drug consumption whereas others questioned the justification behind taking antihypertensive medications even in the absence of any disease symptoms.

A cue to action

A cue is defined as a spontaneous influence that makes the person consider the necessity to act.[403] Cues to action may be internal or external. Internal factors may be the appearance of the symptoms of the illness.[220] Peoples' beliefs about illness and the symptom of illness perform as internal cues to adherence behaviour.[405] External factors could be, for instance, effective counselling on CHD risk management by health care providers.[220] These cues can perform a key function in adherence behaviour by reminding or encouraging patients to consume their medications regularly.

Self-efficacy

Self-efficacy is defined as the confidence or self-belief to adopt health action and perform a health action. The self-efficacy construct states that, for a successful change, confidence in medication efficacy and lifestyle alteration is essential. It has been documented that patients adhere well when they can manage the treatment regimen, and when they believe in medication efficacy.[406]

Modifying factors

Several modifying factors, together with socio-demographic, socio-psychological and structural factors, are known to have considerable influences on health behaviour. The HBM postulates that modifying factors influence health behaviour, as indicated in the literature review in chapter 3.

Likelihood of compliance behaviour

The HBM suggests that low perceived barriers, a high perceived threat, and a high-perceived benefit would result in the probability of demonstrating adherence behaviour. Nevertheless, the final outcome decision would be determined by the interaction of several demographic, psychosocial and structural factors surrounding the individual and the cues to action to which they are exposed.[407]

4.1.2 Theoretical model and study variable

All the constructs of HBM are important factors for examining medication adherence to hypertension medication.[408] Knowing what aspects of HBM are influencing medication adherence in a given population, can help health care providers and policy makers to design appropriate interventions to improve adherence among hypertensive patients.

For example, if a patient is unaware of his or her risk factors for developing CHD we can direct teaching to make the patient aware of his or her personal CHD risk factors. Consequently, based on the HBM constructs, a theoretical model (please see Figure 5) was developed by the researcher to examine factors influencing medication adherence to pharmacological treatment measures of hypertensive women and to suggest recommendations that might improve treatment adherence.

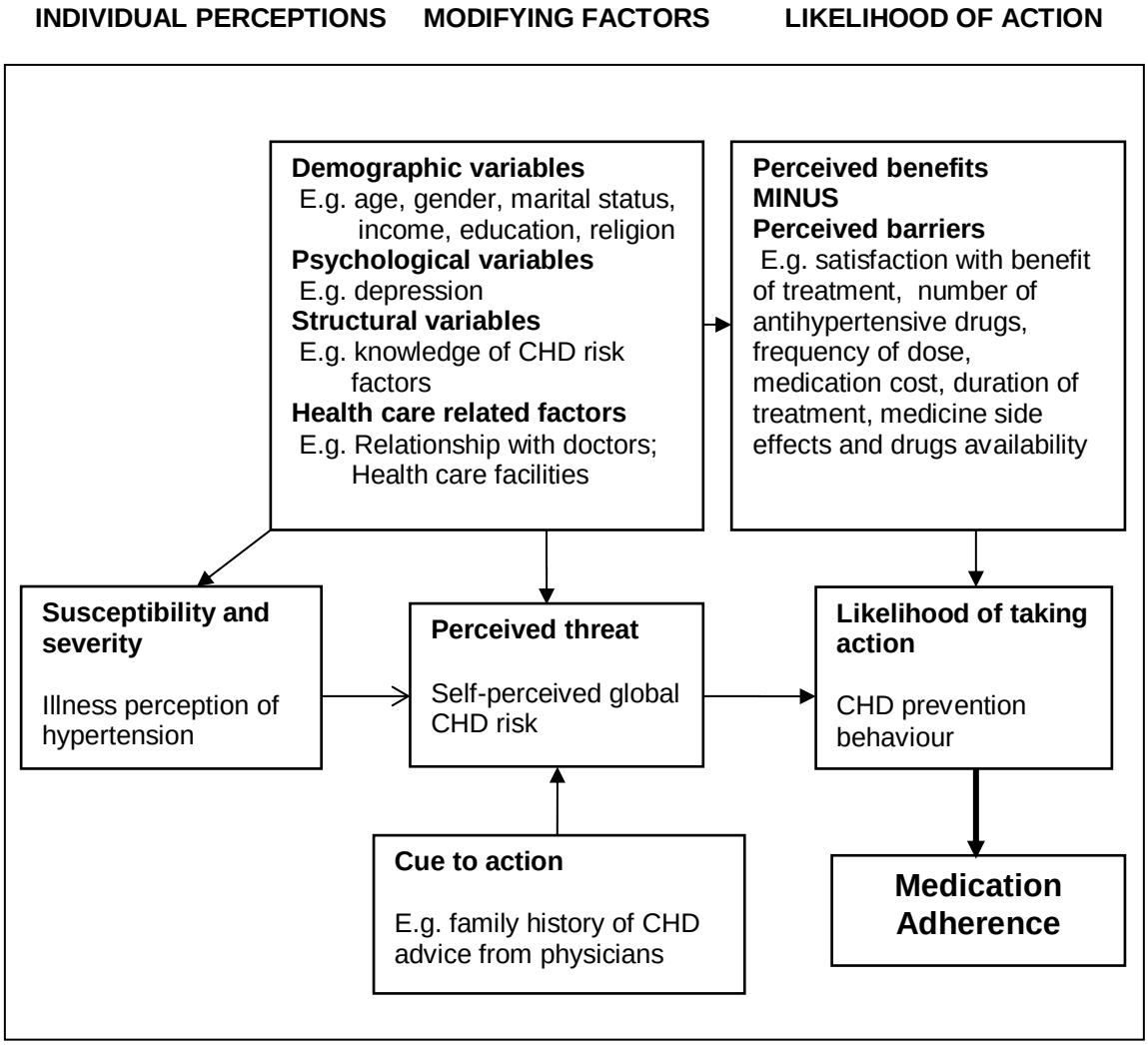


Figure 5: The theoretical model based on the Health Belief Model[398]

The hypothetical model consisted of variables based on the research objectives. These variables were primarily identified from the literature and classified as independent and dependent variables. Details of the study variables are summarised in Table 9.

Table 9: Overview of the study variables

Independent variables	
Socio-demographic	Age, religion, level of education, marital status, work status, per month household income in INR, co-existing chronic illnesses, knowledge of greatest health for women in India and knowledge level of CHD risk factors
Psychosocial	Perceived global CHD risk and hypertension perception
CHD risk factors	Tobacco use, alcohol consumption, dietary habits, physical activity, systolic and diastolic BP, self-reported diabetes, family history of heart disease, the BMI, physical activity and abdominal obesity
Hypertension and its related treatment	History of high BP, treatment duration, number of prescribed pills per day, side effects of drugs, cost of medicine, availability of prescribed drugs locally, feeling better with medication, and satisfaction with the treatment
Health care provider-Related	Doctor explains the treatment regimen and the likely side effects of medication, doctor explains the reason for carrying out the medical test, and doctor treats in a friendly and courteous manner
Dependent variables	Medication adherence

4.2 Study design

Based on the need for a better understanding of the medication adherence of urban low-income women in India, a mixed methods design was chosen for the present research. The purpose of using mixed methods in this study is to look for complementarities and convergence. Complementarities refer to the use of different data sources to obtain alternate or overlapping views of phenomena. Convergence refers to reaching shared conclusions from data collected by the various methods thereby increasing the validity of outcomes.[409]

Mixed-methods research involves collecting, analysing, and integrating (or mixing) quantitative and qualitative research (and data) in a single study.[136] The rationale for this form of research is that both qualitative and quantitative research, in combination, can provide a better understanding of a research problem or issue than either research approach alone.[410] In this research study, complementarities were accomplished using both quantitative and qualitative research methods. The findings from the dominant method type (whether quantitative or qualitative) can be enhanced or clarified by results from another method type (quantitative or qualitative).[411] The dominant component in

the present study was quantitative while the less dominant, or supplementary component, was qualitative. Quantitative and qualitative data was collected concurrently and sequentially, the mixed pattern of timing being appropriate for investigating convergence and complementarities. Using the Morse notation system, this multi-strand, mixed dominant-less dominant design can also be depicted as 'QUAN (qual)'.[136, 412]

Phase one of the study consisted of the QUAN strand, whereby a survey was carried out among 500 households in a low-income urban settlement in Delhi. It was designed to collect information on the characteristics of individuals and determine associations between the key independent variables and dependent variables. Phase two of the study consisted of the qual strand to assist in gaining a deeper understanding of the treatment adherence among hypertensive women in low-income areas and the contextual factors that either facilitate or hinder medication adherence. Both hypertensive women and health care providers were interviewed in the qualitative phase of the study. A purposeful sample of 30 hypertensive women participants were selected from phase one of the study and nine physicians were chosen from different government and non-government health care centres in Delhi.

In each strand, there were four stages:

- Conceptualisation stage: the research question was formulated
- Methodological stage: the data was collected
- Analytical stage: collected data was analysed
- Inferential stage: inferences were made.

The conceptualisation of the research questions, data collection and analysis of both the qualitative and quantitative phases occurred independently of each other. Inferences were made based on the data from each phase and then findings from the QUAN and qual phases were converged for a shared conclusion.[413]

4.3 Study site

4.3.1 Delhi

Delhi, the national capital of India, is the eighth largest metropolis in the world with an estimated population of approximately 16.75 million.[102] Delhi is spread over an area of around 1483 square kilometres.[102] It is the fastest growing and densely populated city in India. The UN-Habitat's study shows that the average annual growth rate in most of the large cities in developing countries was 1.8% in the 1990s[414] while Delhi's was 4.23% for the same period.[415] Delhi's population growth is accounted for by natural increase and net in-migration. With Delhi being a hub for trade and employment for the whole of northern India, migration has averaged 1.3 times the natural growth of Delhi.[416] The bulk of the migrant population is from the northern states such as Uttar Pradesh, Haryana and Bihar. [417] This disproportionate growth has had a severe impact on the city's physical and societal infrastructure, besides creating an acute shortage of housing.[418]

Figure 6: Map showing Delhi, India[419]

Delhi's citizens have a higher economic status overall to other parts of the country. Contrarily, due to unequal distribution of natural wealth, the proportion of Delhi's

population living below poverty line has increased from 1.55 million (1999–2000) to 2.29 million (2004–2005) which was 14.7% of the total population in Delhi. This means, the population living below the poverty line grew by 87% in just five years.[420] Therefore, Delhi has two faces: one accommodates the richer population and the other accommodates a large number of poor people, whose numbers continue to increase.[104] Explosive population growth and low-income contribute to the proliferation of uncontrolled informal urban settlements in Delhi. More than half of Delhi's population resides in these settlements.[104]

Delhi is divided into nine administrative districts. Each district is headed by a Deputy Magistrate and has three subdivisions. A Subdivision Magistrate directs each subdivision. The culture of Delhi is characterised by the assimilation of cultural traits of different states of India bordering the Union Territory of Delhi, especially Rajasthan, Punjab, Haryana and Uttar Pradesh. The language spoken in Delhi is primarily Hindi, the national language.[421] It is also the mother tongue of most of the people living in Delhi, Bihar, Haryana, Uttar Pradesh, north-eastern Madhya Pradesh and Rajasthan. English enjoys the status of subsidiary official language but is the most important language for national, business-related and political communication.[422] A majority of the city's population is of the Hindu religion (82%) followed by Muslims (11.7%), Sikhs (4%) and Christians (0.9%), while the remaining are Jains, Buddhist and others.[423] A disproportionately large number of Muslims in urban India experience miserable poverty.[424] The demographic profile of Delhi State in Table 10 is from the 2011 census.

Table 10: Demographic profile of Delhi State[102]

Indicator	Delhi
Total population	16,787,941
Male (M)	8,976,410
Female (F)	7,776,825
Sex ratio (per thousand)	866 F per 1000 M
Population growth	21.21%
Area (square kilometre)	1,483
Density per square kilometre	11,320
Average literacy	86.21%
Female literacy	68.85%
Male literacy rate	90.95%

4.3.2 Study area

The study was conducted at Sarai Kale Khan locality (Chand Bibi camp, near Nafisa masjid and T86 areas), a low-income urban settlement[425] located behind Nizammudin Railway station and under the jurisdiction of South Delhi Municipal Corporation.[425]

This research site had a population of approximately 25,000 people, covering an area of less than a square kilometre. The majority of the population were from Muslim and Hindu religious groups and Hindi was the most commonly and widely spoken language. This area was largely inhabited by migrants from the neighbouring states of Uttar Pradesh and Rajasthan. The problems of continued access to livelihoods, education, healthcare and other basic amenities were quite prevalent in low-income settlements in Delhi, and this particular area was not an exception. The majority of the people earned their living through manual labour, small businesses and menial jobs. Women were mainly responsible for managing households.

There was no government health facility within this locality. The nearest government primary health centre that provided free outpatient care was located about a kilometre away. In contrast, there were about 15 private health service facilities in the area with medical doctors trained in modern allopathic medicine or in Indian Ayurvedic, Homeopathic and Unani complemenatary medical systems, who offered mostly primary care services on a fee-for-service basis. Furthermore, there were many private pharmacies and several medical diagnostic laboratories in this locality.

This locality was selected because a Mobile Health Unit from the 'Hope Project' Charitable Trust, an NGO where the primary researcher had previously been employed, provided weekly health care support to this community. The NGO was one of the stakeholders in the study and assisted the research team by providing:

- research assistants for data collection purposes
- logistic support during data collection
- the mobile van, for the transportation of study participants to the nearby government hospital for further evaluation, treatment and followup
- office premises to train research staff and for carrying out research related work.

4.4 Quantitative arm of the study: Phase 1

4.4.1 Conceptualisation stage

The literature search was conducted by searching the following databases: PubMed, Proquest, Science Direct, Ovid, Cochrane Database, and JSTOR. Keywords included: CHD, India, absolute or global CHD risk, perceived CHD risk, low socio-economic areas, women, health behaviour, antihypertensive treatments and medication adherence. The retrieved literature was examined in depth and scrutinised in detail.

a. Data collection tool: Questionnaire

An interviewer-administered structured questionnaire was used after some modification. Interviewer administration was chosen mainly because of the low literacy rate among the target population. The 81-item structured questionnaire was divided into six sections (please see Appendix 9). It was developed from reliable and validated questions used in previous studies. Table 11 below provides an overview of the questionnaire and the various validated questionnaires used for the study. The variables in the questionnaire for individuals reflected the research objectives and represent health behaviours, beliefs, attitudes and health status of the respondents.

All interactions with study participants were conducted in Hindi (the primary language spoken in Delhi). The entire questionnaire, consent form and other study materials were translated from English into Hindi by the primary researcher (please see Appendix 12). The Hindi translation was cross-checked with all discrepancies resolved (please see Appendix 13 for the statement of the accuracy of Hindi translation).

Cultural adaptation of the intervention was accomplished by incorporating survey and interview terminology that are aligned with Indian culture. Moreover, the researcher had worked in the past with the NGO in the broad study area. She also had extensive clinical work experience as a physician and public health professional in teaching hospitals and nongovernmental health programmes in Delhi, India where the study was conducted. Furthermore, to check for understandability and clarity of the questions, the data collection was pre-tested in a pilot study of 10 community women who were not included in the final analysis.

Table 11: **Overview of the questionnaire**

Sections	Variables	No. of items	Source of validated questions or scale
1: Socio-demographic information	Age, gender, level of education, religion, marital status, monthly income and work status	9	WHO STEPS[426]
2: Behavioural measurements	Tobacco use (4Qs), Alcohol consumption (2Qs)	6	WHO STEPS[426]
	Diet and nutrition	20	Adapted from NFHS-3, India[107]
	History of last seven days physical activity	6	IPAQ[14]
3: Assessment of knowledge of CHD risk factors	Knowledge of CHD risk factors	10	Standardised questionnaire[7]
4: Assessment of knowledge of women's health problem and family history of heart attack	Greatest health problem for women in India	1	Adapted from AHAS[427]
	Family history of premature CHD	1	BRFSS[428],
5: History of high BP and its treatment	History of hypertension, other co- morbidities, medication adherence, treatment belief and satisfaction, medication information satisfaction	18	Developed by the present researcher from published literature [1, 9, 318]
6: Assessment of CHD risk perception	CHD risk perception	1	Developed by the present researcher from Pachod Paisa scale (numerical scale)[17, 237, 238, 241, 429].
7: Assessment of illness perception for high blood pressure	Illness perception for hypertension scale	9	BIPQ[15]

KEY: WHO STEPS=Stepwise approach to surveillance; NFHS=National Family Health survey; IPA=: International physical activity questionnaire; BRFSS=Behavioural Risk Factor Surveillance System (BRFSS); AHAS=American Heart Association Survey; IPQ: Illness perception questionnaire

b. Instrument reliability and validity

Reliability of a research instrument refers to the consistency with which it measures a particular attribute.[430] The validity of an instrument refers to the degree to which it measures what it is intended to measure in the context of the phenomenon of interest.[431] The following instruments, which are in the public domain (excluding the

Brief Illness Perception Questionnaire) and validated in previous studies, were included in the questionnaire:

The WHO STEPS[426] instrument for non-communicable disease risk factors: This is a standardised instrument and protocol for collecting, analysing, disseminating data in WHO member countries. Questions on demography, tobacco and alcohol consumption were adopted from the WHO STEPS.

NFHS-3: National family Health Survey (2005–06), India

Questions regarding diet and nutrition were adapted from NFHS-3[107]. Consumption of food was assessed by asking, 'How often do you eat the following food items: daily, weekly 3–4 times, weekly, occasionally or never?' related to cereals consumption, milk or milk products, pulses or beans, green leafy vegetables, fruits, eggs, fish, chicken or meat, and junk foods. Participants were also asked regarding the total amount of salt and oil consumption (in Kg) in their household in a month.

IPAQ: Questions on physical activity followed those in the International Physical Activity Questionnaire (IPAQ).[14] The IPAQ has standard measurement properties for utilisation in several settings and languages, and is appropriate for national population-based prevalence studies of participation in physical activity.[432] The short version consisted of three distinct activities: walking, moderate-intensity activities and vigorous-intensity activities. Besides, there was also a question of sitting activity as an indicator of the time that was used for sedentary activities, but it was not incorporated in the computation of the total physical activity score.

BRFSS from CDC: The Behavioural Risk Factor Surveillance System (BRFSS) questionnaire, was developed by the Centre for Disease Control and Prevention (CDC).[428] A review of results from numerous other studies suggests that measures included in the BRFSS are both reliable and valid. The question related to family history of heart disease was taken from BRFSS.

AHAS: American Heart Association Survey (AHAS): What is the greatest health problem of women in India? This question was modified from AHAS.[427]

The Pachod Paisa scale: It is a valid, newer numeric response scale that is supposed to be a culturally sensitive altrnative to the Likert-type scale.[241] The scale has cultural resemblance within the South Asian regions as the 'paisa' reference is a typically used analogy in every parts of the area. Lack of education also does not become an impediment when using the scale given that everybody, educated or non-educated, deals with money and can relate to an amount of agreement thereby enabling a higher level of precision in measurement.[241] The Pachod Paisa scale is based on the monetary currency in India, the 'rupee' (INR) which is comprised of '100' paisa (100 paisa = INR1). The scale elicits agreement in 'paisa' thereby providing the researcher with a continuous variable ranging from '0–100'. Several examples demonstrate that this scale can be used effectively to a numeric estimate of attitude, perception, cultural belief, and quality of life in clinical and community settings.[241] In this study the Pachod Paisa scale was used to develop a question to calculate the perceived CHD risk of the participants.

The Brief Illness Perception Questionnaire (BIPQ)

The Brief Illness Perception Questionnaire is a standardised nine-item tool developed to measure cognitive and emotional illness depictions.[15] BIPQ has been validated and available in different languages, including Hindi.[433, 434] BIPQ has been used for a variety of conditions such as hypertension, diabetes and HIV.

Permission from the researcher was obtained to use this copyrighted questionnaire in this study, in Hindi, via email (please see Appendix 14).

4.4.2 Conducting the study

a. Study population

The study population was defined as all households (approximately 4000) in the selected low-income urban settlement in Sarai Kale Khan, Delhi, India. Household, in the Indian context, is defined as a group of individuals living together and sharing a common kitchen.[435]

b. Study participants' selection criteria

Inclusion criteria:

- All women residing in the selected settlement
- Age: 35–59 years

- Women who had the ability to give informed consent

Exclusion criteria:

- Not willing to participate
- Acutely ill
- History of a past CHD event (based on documentary evidence such as physician certified angina pectoris, acute myocardial infarction, congestive heart failure, cardio-myopathies, and inflammatory heart diseases),
- Pregnant women
- Cannot converse in Hindi (local language in Delhi).

c. Sample size determination

By using the formula:

$$N=2zP(1-P)/(d2(1-\alpha/2)^{436}$$

and considering a hypertension prevalence of 40%,[437] precision 0.05 and CI 95%, the minimum sample size was calculated to be 369. By adding 15% to account for incomplete questionnaires, the total number was rounded up to **500**.

d. Sampling technique

Data was collected in a cross-sectional survey over three months, from August to October, 2015, in the selected community. The study participants were selected using a multi-stage random sampling technique. At the first stage of sampling, 10 lanes or *gallies* were selected randomly out of approximately 27 *gallies* of the settlement. In the second stage, 500 households were randomly chosen from the identified 10 lanes of the study area as the secondary sampling units. For selecting households, in the beginning, a sampling frame was developed by listing all the residential buildings in the selected *gallies*. Subsequently, the research team visited those residential buildings and updated the household list to include only eligible households. For the enrolment, a household needed to have (a) at least one female member aged between 35 and 59 years and (b) that female member residing in the area at the time of the survey.

Each of the selected households was then given a distinctive number. Using the updated households list and a unique random number table the research team selected 500 households for interviews. An invitation and an information sheet about the study

were delivered to each of the selected households. The invitation messages included the time and date of the proposed home visit.

e. Recruitment process

In the last stage of sampling, one eligible woman from each household was selected for the study. Research staff visited the selected households at a predetermined date and time. Only one eligible adult woman was recruited from each household. If a selected household had more than one eligible adult woman, the team member in attendance used a Kish table[438] to select one woman for participation in the study. The Kish selection table is a commonly-used method in research that enables interviewers to select individuals by following simple and rigorous rules for deciding one person to interview among household residents. The method involves creating a list of eligible individuals at a particular address, ordered by age, and then selecting according to the serial number of the address itself. The method is planned so that all individuals in a household have an equal chance of selection.[439] If a selected person was not eligible for the study, the research team proceeded to the next household.

The research team had two groups. One group conducted the interviews, and the other took the necessary anthropometric and clinical measurements including height, weight, waist, hip circumference and blood pressure. The interviewing group comprised two female interviewers with several years' experience as community health educators and counsellors in reproductive health, HIV/AIDS, communicable diseases and immunisations. The second group taking the physical measurements comprised two female health workers with several years' experience as paramedics in the health department of the NGO.

Prior to formal data collection, the interviewing team attended a training workshop conducted by the researcher to ensure consistent and accurate data collection. Similarly, the measurement group was trained by the researcher in performing basic anthropometric and clinical measurements including height, weight, waist, hip circumference and blood pressure according to standard guidelines. The researcher conducted two 7-hour training workshops using the existing resource materials, developed by national and international agencies. At the end of each session of the workshop, the researcher tested the participants' knowledge and understanding of the

subjects that had been taught during each session.

The researcher closely supervised data collection and the collected data were checked on the day of compilation for errors, missing information and inconsistent responses in order to ensure data quality. Where necessary, research staff revisited a study participant to clarify any erroneous information.

f. Data collection procedures

The research staff informed participants of their ethical rights and obtained written informed consent from participants before starting interviews.

First stage: The interviewers in the team collected information from the participants using a standardised structured questionnaire. Patients were also asked about details of their prescribed medication regimen. Prescriptions, available at the time of the interview, were used in getting reliable data. Wherever prescriptions were not available, the medicine or drug strips used by the respondents were inspected and noted. Each interview lasted between 20 and 30 minutes.

Second stage: Upon completion of the face-to-face interview, physical measurements were taken from the participants in the following order: BP then heart rate then height then weight then waist circumference and finally hip circumference, using a standard guideline.[440] All physical measurements were conducted in a separate room or screened-off area in the interviewee's house. The separate areas provided privacy for waist and hip circumference measurements as measures were taken with participants wearing minimal clothing and were without shoes (Table 12 documents the physical measurement procedures).

Physical mesurements were followed by basic health education related to CHD risk factors, including hypertension. All the hypertensive women, irrespective of their blood pressure level, were referred to nearby designated government health centres for further evaluation, treatment or followup. They were provided with contact details of the local government hospitals that provide free health care to the community. Contact details of private health care providers also were made available to participants.

Table 12: Overview of the physical measurement procedures

Measurements	Instruments	Procedures
Blood pressure (BP)	Omron digital automated blood pressure monitor (OMRON HEM 7111, Omron Healthcare Co. Ltd. Uk-Ku, Kyoto, Japan).	The left arm of all participants was used for the BP measurement. An appropriate-sized cuff (cuff bladder encircling at least 80% of the arm) was used for accurate reading. Three BP measurements were taken in a sitting position, three minutes apart. During data analysis, the average of the second and third readings was calculated.
Weight	Equinox BR-9201 analogue weighing machine (Microlife AG Swiss Corporation, Switzerland).	The device was placed on a smooth concrete surface. The participants were asked to remove their shoes and all external heavy clothes. A display panel showed 0.0 before the participants stood on the scale. This was followed by the participants being asked to stand straight with their feet aligned in the centre of the weighing machine with arms hanging relaxly by their sides, and head facing forward. The measurements were recorded to the nearest 100g.
Height	Non-stretchable measuring tapes (Jonson Tapes Ltd. Delhi, India)	The participants were asked to remove their shoes so as to obtain a precise measurement. While standing with their feet straight together against the flat wall, they were asked to keep their back as straight as possible with arms hanging relaxled by their sides, and facing forwards**.** The height was recorded in centimetres (cm).
Waist circumference (WC)	Non-stretchable measuring tapes (Jonson Tapes Ltd. Delhi, India)	WC was measured at the central point amid the lower margin of the last palpable rib and the top of the iliac crest (hip bone) in the mid-axillary plane, without any outfits; that is, directly over the skin or over light clothing.[440] Measurement was read to the nearest centimetre on the tape, while ensuring to keep the measuring tape at ease without causing any tightening of the skin.
Hip circumferences (HC)	Non-stretchable measuring tapes (Jonson Tapes Ltd. Delhi, India)	HC was measured at the widest part of the buttocks, with the tape parallel to the floor.[441] Measurement was read to the nearest centimetre on the tape.

4.4.3 Analytical stage

All data collected from the questionnaire were entered into the Statistical Package for Social Sciences (SPSS) (Version 19 for Windows).[442] Data cleaning was performed to check for accuracy and consistency. There were no missed values during entry. The cleaned data was then used for statistical analysis. Distributions of data were explored

using the histogram with normality curve. Recoding of variables was also done, mainly to convert continuous variables into ordinal and nominal data to ease data analysis. The median value was taken as the cutoff for conversion of the continuous variables into binary ones.

Study objective 1: the prevalence of CHD risk factors

Descriptive statistics was used in describing patients' characteristics, CHD risk factors, and prevalence of global CHD risk, health behaviours, knowledge of risk factors and the degree of medication adherence. Mean and standard deviation were computed for all continuous data. Frequencies (with percentages) were calculated for categorical and binary variables.

Study objective 2: the prevalence of inaccurate perception of global CHD risk and its predictors

Kappa analysis (weighted kappa) was carried out to study the agreement between perceived and calculated risk. Socio-demographic, behavioural and physiological and variables were compared using the non-parametric chi-squares test and t test between the accurate and inaccurate perception of CHD risk group. Chi-square tests were used to determine the association between categorical variables and the t test for continuous variables. Pearson's chi-square was used to find out any statistically significant associations during bivariate analysis, however, in the two-by-two tables, Yates' Correction for Continuity was used which compensates for the overestimation of the chi-square when used with a two-by-two table. Fischer's Exact Test was used if 20% or more cells had an expected value of less than 5.

Logistic regression analysis was performed to identify the factors that were associated with inaccurate perception of CHD risk. All variables identified in the bivariate analysis with a p-value <.05 was entered into multiple regression models. Multiple logistic regression analysis using the backward stepwise likelihood ratio method was conducted to determine whether the factors could significantly predict inaccuracy of CHD risk. Odds ratio (OR) and corresponding 95% confidence interval (CI) are reported. A p–value of less than .05 was considered to be statistically significant for all analyses.

Study objective 3: the prevalence of medication non-adherence and its predictors

For analysis of adherence, a cut-off value of 80% was used for labeling patients as adherent or non-adherent.[9] Socio-demographic, behavioural and physiological variables were compared using the non-parametric chi-squares test and t test between adherence and non-adherence group. Chi-square tests were used to determine the association between categorical variables and t test for continuous variables. Pearson's chi-square and Fisher's exact tests were used to find out any statistically significant associations during bivariate analysis.

Logistic regression analysis was performed to identify the factors that were associated with medication non-adherence to hypertensive treatment. All variables identified in the bivariate analysis with a p-value <0.05 were entered into multiple regression models.

Multiple logistic regression analysis using the backward stepwise likelihood ratio method was conducted to determine whether the factors could significantly predict non-adherence. OR and corresponding 95% CI are reported. A p value of less than .05 was considered to be statistically significant for all analyses.

4.5 Qualitative arm of the study: Phase 2

4.5.1 Conceptualisation stage

For the qualitative interviews, semi-structured guides were developed based on an extensive review of the relevant literature. A search of the literature was conducted by using PubMed, Proquest, Science Direct, Ovid, Cochrane Database, and JSTOR. Key words included: CHD, India, CHD risk, low socioeconomic areas, women, health behaviour, antihypertensive treatments and medication adherence. The retrieved literature was examined in depth and scrutinised in detail.

4.5.2 Methodological stage

a. Interviews with the hypertensive women

Recruitment of the participants

The selection of the women hypertensive participants for the in-depth qualitative interview depended on their willingness to communicate freely regarding their medical condition and its management, so as to provide sufficient information.[443] Another criterion was women who had at least one-year experience of living with hypertension.

For a sample size in qualitative interview studies, the number of participants is adequate if interviews with new members do not yield new themes.[444] Guest[445] suggests that 12 participants in homogenous groups are generally enough to achieve saturation. With these considerations and the inclusion criteria, a purposeful sample of 30 hypertensive women participants from the phase one of the study was invited. None declined the qualitative interview.

Interviews were conducted over four week period during October–November, 2015. Training sessions were held with the research team before conducting the interviews to introduce the interview guide, the information sheet, the digital voice recorder, and how to conduct the interview. Each question was discussed with the interviewers, and an explanation given regarding how to present the question, followup issues, how not to lead the participants and how to make the participants relaxed. The interviewers were also asked to take notes that would help the researcher later during the transcribing of the interviews.

Interviews

The patients' interviews were conducted in participants' homes with prearranged appointments adjusted to the participants' schedules. Interviews with the participants lasted between 15 and 30 minutes and were audio recorded. Before the interviews, the participants were informed of their ethical rights. After informed consent had been obtained, interviews were conducted with help of the semi-structured guide (please see Appendix 7). The guide was developed in English and translated into Hindi by the researcher, as interviews with participants were conducted in Hindi. The Hindi translation was cross-checked with all discrepancies resolved (please see Appendix 10 for the statement of the accuracy of Hindi translation).

Cultural adaptation of the intervention was accomplished by incorporating interview terminology that is aligned with Indian culture. The interview guide was also pretested with five hypertensive women, not included in the study, for its relevance, appropriateness and ease for delivery in community settings.

To ensure confidentiality, the in-depth interviews were all carried out face-to-face in a private room, which was out of hearing range of other family members and neighbours. The interviews mainly focused on participants':

- knowledge regarding hypertension treatment
- beliefs about antihypertensive medications
- reasons for medication non-adherence
- factors related with high medication adherence
- nature of interaction with health care personnel
- expectation regarding their hypertension treatment management.

Moreover, to draw out in-depth views, at the end of the interview the patients was given freedom to express any further views and comments.

b. Interviews with the health care providers

Recruitment

Individual semi-structured interviews were conducted in health care settings in Delhi. Physicians were selected using purposive sampling techniques from government and nongovernment health care centres that were directly involved in providing health care services to a large number of patients with hypertension from low-income urban areas in Delhi.

Before the interview, each participant was contacted by phone. The researcher briefly described the aim of the interview and sent an information sheet to the potential participant. The sampling procedure allowed for a variety in physicians' characteristics in order to obtain diversity on risk perception and medication adherence. In all, 12 physicians were approached on the basis of gender, experience, their association with private practices, practices at government health facilities and their association with nonprofit organisations. These characteristics are known to have an impact on the management of care and risk perception.[446] Three of the 12 physicians did not respond to the contact. The researcher made an appointment with the nine physicians who responded and interviews were conducted in the month of October, 2015.

Data collection

As in Phase 1, participants were informed of their ethical rights and their informed consent obtained before the start of the interview, which lasted between 15 and 35 minutes and was audio recorded. A separate semi-structured interview guide was developed for this purpose (Appendix 8). Themes for the guide were identified through a review of the literature and centred on CHD risk perceptions and medication adherence by hypertensive women. The interviews mainly focused on physicians':

- perception of hypertensive women's perceived CHD risk
- medication adherence characteristics of their women hypertensive patients
- factors related to high level of medication adherence
- factors related to lower levels of medication adherence
- strategies for addressing medication non-adherence.

The in-depth interviews were all conducted face-to-face in a private room in the health clinic after the physician had completed seeing their patients. The interviews were conducted by the researcher. In order to draw out in-depth views, at the end of the interview the physicians were given freedom to express additional views and comments they might have to make.

c. Data recording and transcribing of the interview data

The researcher audio recorded interviews to ensure there was an accurate and complete verbatim recording of both the interviewer's questions and participant's responses. The researcher listened to the recordings and transcribed the audio recordings into English with an assistant. Transcripts were verified by the researcher for their accuracy by repeated listening to the audio interview data.

4.5.3 Data analysis

Thematic analysis,[294] the most widely used method in qualitative studies, was used in this study to identify prominent perspectives on non-adherence. Data were analysed by the researcher in two stages.

First stage

Analysis of the data began with repeated readings of the whole transcripts and interview notes line-by-line to gain familiarity with the data from the answers to each of the research questions. Sections of text from the transcripts were coded, paying

attention to the relevant words, phrases or sentences related to the research questions. This coding process was done manually, by writing notes on the texts and by using highlighters or coloured pens to indicate possible patterns and was thus inductive.[294]

Second stage

After coding each transcript, themes were created by grouping the coded transcripts around related research questions. The transcripts were reviewed again to determine the sub-themes and then collated to form major themes. The list of themes was then grouped into several categories. Thus, a coding framework was drawn up to identify dominant themes and sub-themes relating to four categories: factors inhibiting medication adherence, factors facilitating medication adherence, women's expectations related to their hypertension management, and suggested strategies to improve women's medication adherence to antihypertensive treatment. The results are presented in detail in chapter 6.

4.5.4 Ensuring rigor in the research

Steps were taken throughout the data collection and analysis processes to establish the trustworthiness of the methods and credibility of the collated qualitative data and findings.[447] These steps included verification strategies such as systematic checking of data and on-going interpretation of data to enhance reliability and validity. Methods and data were documented (audio recording, followed by transcription of interviews) so that the analysis of the data could be confirmed.[448] Moreover, throughout the research process, the research methodology, findings, and documentation were consulted with the supervisors of the present researcher.

4.6 Ethical Issues

Ethical approval was sought from the Curtin University Human Ethics Committee, Perth, Western Australia and from the Sigma Institutional Ethical Review Board, Delhi, India. Sigma, a research and consulting organisation actively engaged in the social and development sector research in India since its inception in 2008. Sigma has sensitivity for research ethics in Indian society and culture, with vast experience research conducted throughout India. Necessary permission to carry out the research was also obtained from the community leaders where the data collection procedure was performed.

Informed consent

Before the interviews, trained research team members explained the study intervention to potential subjects verbally and provided all pertinent information (purpose, data collection procedures, risks, benefits, participants' rights, confidentiality and anonymity). They read out the translated information sheet and consent form to the participants. The research team members allowed the potential subjects ample opportunity to ask questions to clarify any ambiguities and obtain additional information. They were also provided an opportunity to discuss their participation with someone at home (for example, husband or in-laws) who could support them in making a decision to participate. Interviewers obtained informed consent from those who agreed to participate. If a prospective participant was unable to give written informed consent due to lack of literacy, the participant's verbal consent was taken down, and a thumb impression was obtained in the appropriate space of the consent form. In such cases, the entire procedure was completed in the presence of an independent witness who was selected by the participant and had no connection with the research team. The witness signed and dated the consent form. The interviewer reviewed and countersigned each consent form. All study participants were provided with a copy of an 'Information Sheet' and a 'Consent Form' with the contact details of the researcher for their personal records (please see Appendices 4 and 5).

Right to withdraw

Participants were informed about their ethical rights. As their participation was voluntary, they were free to not answer any particular question(s) or refuse any physical procedures such as measurement of blood pressure, body weight and waist circumference. They had the right to withdraw from the study at any phase without compromising the regular services they received from the NGO or other health care services.

Confidentiality

Participants were assured of full confidentiality with regards to their responses in the interviews. No information about participants was accessible to other study participants or the general public. The interviewers held all meetings in the privacy of the participants' homes. Individual identifiers were removed permanently from all the data. Data, without any personally identifiable information, were entered into a computer

database for analysis so that individual participants could not be identified in any publications associated with the study.

Minimisation of harm

The researcher was very much aware of the possibility of psychological harm because of hypertension labeling, since the study involved an examination of individuals' blood pressure status. To prevent adverse psychological consequences, research staff (the counsellor-interviewer) was trained to provide such information in an empathic and neutral manner to the study participants. The research team followed the advice of Dr. Thomas Pickering:

> '*When we diagnose and treat patients with hypertension, we should emphasise the positive aspects of care. Our message to the public should not be that hypertension is the 'silent killer' but that it is a risk factor that can be readily controlled by an ongoing partnership between patients and their health care providers*'.[410]

Addressing unequal relationship

The researcher was acutely aware that the study women, who were disadvantaged due to gender, poor socio-economic status and poor access to health care in the Indian social and cultural context, were in an unequal power relationship with the health care staff of the NGO, which provided weekly services to them. To minimise impacts of such unequal relationship, only those interviewers were selected from the NGO who were not associated with providing direct health services to the study participants.

Dissemination of the findings

The thesis will be open access and will be uploaded on the Australian Digital Thesis website, which is a mandatory requirement of the Australian government. An abridged report in English and Hindi will be made available to the NGO and will also be uploaded to the School of Nursing, Midwifery and Paramedicine, Curtin University website. The findings will also be submitted for publication in peer-reviewed journals so that the results can be shared with the global academic community. The report will also be launched at a community event in New Delhi with the NGO and participants.

4.7 Data storage

All paper records, audio recordings, questionnaires, printed transcripts, interview notes and code sheets are stored in a secured cabinet in the Research Hub of Curtin University. Before transfer of the data by the researcher to Australia, the survey information, including participants' consent forms, were placed in sealed envelopes and locked in cupboards in a secure location at the researcher's residence in Delhi. All electronic data is password protected. Data will be stored seven years after the thesis has been submitted, after which it will be destroyed as required by legislation.

4.8 Summary of the chapter

This chapter has described the methods of data collection and analysis used in the quantitative and qualitative arms of the present study as well as ethical considerations. of the study. The next chapter presents the quantitative findings of the study.

CHAPTER 5

QUANTITATIVE RESULTS

5.0 Introduction to the chapter

This chapter presents quantitative findings from the survey questionnaire. They include socio-demographic characteristics, behavioural and physiological profiles, knowledge of heart disease risk factors, dietary habits, knowledge of greatest health problem of women, family history of heart disease and history of hypertension, and treatment obtained. The findings concerning CHD risk perception and medication adherence of hypertensive participants are then presented in the form of univariate, bivariate and multivariate statistics.

5.1 Description of the survey participants

The 500 eligible community women were approached for structured quantitative interviews. None declined the interview. The researcher closely supervised data collection and the collected data were checked on the day of compilation for errors, missing information and inconsistent response in order to ensure data quality. Where necessary, research staff revisited a study participant to clarify any erroneous information. All data collected from the questionnaire were entered into the SPSS (Version 19). There were no missing values during data entry (please see page 107, chapter 4.4.3 for details of the data analysis procedure).

5.1.1 Socio-demographic characteristics of the participants

This section summarises the socio-demographic characteristics of the 500 community women of the low-income urban settlement in Delhi, who participated in this study. These are presented in summary form in Table 13 (age, average household members, education, religion, marital status, work status, type of family and average household income).

The mean age of the study women was 45.8 years (± SD 6.5) (range 35–59 years). The median age was 45 years. The majority of the women were Muslim (56.8%; n = 284) followed by the Hindu faith (39.6%; n = 198). Most of the women (89.4%; n = 447) were

married while 3.4% (n = 17) were never married and rest 6.6% (33) were divorced, separated, or widowed at the time of the survey.

Table 13: Socio-demographic characteristics of survey participants, N=500

Socio-demographic factors	Females N	Percent %	Mean ± SD
Age (years)			45.8 ± 6.57
Age grouping			
≤45years	260	52	
>45 years	240	48	
Number of household members			5.1 ± 1.8
Education			
No schooling (can't sign)	133	26.6	
Primary school = 0 to <5 years (can sign only)	119	23.8	
Primary school completed (5 years)	120	24	
Secondary school completed(10 years)	66	13.2	
Higher secondary school completed	46	9.2	
College/university completed	16	3.2	
Religion			
Hindu	198	39.6	
Muslim	293	58.6	
Christian	6	1.2	
Sikh	3	0.6	
Marital status			
Never married	20	4	
Currently married	447	89.4	
Separated	18	3.6	
Divorced	12	2.4	
Widowed	3	0.6	
Work status			
Government employee	14	4	
Nongovernment employee	70	14.8	
Self-employed	53	10	
Unskilled manual labour	58	12.2	
Homemaker	298	58	
Retired	5	1	
Unemployed	2	0.4	
Type of family			
Nuclear	422	84.4	
Joint	78	15.6	
Co-existing illnesses	127	25.4	
Monthly household income (INR)	9000[a](median)		9,404.17± 4,283.83

[a]INR 9000=AUD187

Over half of the women (52%; n = 251) were found to be illiterate, and this included 115 women (23%) who could sign their names but not read or write. Only a quarter of the participating women (24%; n = 120) had up to primary education, whereas 22.4% (n = 128) had received 10 years or more of formal education. The majority of the women (84.4%; n = 422) lived in nuclear families with an average family size of 5.1 (± SD 1.8)

members. Above half (59.6%; n = 298) of the families were having more than four members. Nearly a quarter of the women (25.4%; n = 127) had self-reported history of co-existing chronic illnesses.

Regarding employment status, over half of the study women (58%; n = 298) were homemakers and not engaged in any formal work, while 18.8% (n = 84) were employed in government or nongovernment organisations. About 12.2% (n = 58) were in manual labour jobs and a tenth (n = 53) were self-employed. The remaining (1.4%; n = 7) were unemployed or retired persons. The average monthly family income of them was INR 9,404.17 (± SD 4,283.83) with a median of INR 9,000 (USD 135).

5.1.2 Dietary habits

Table 14 shows the frequency of consumption of each of the food groups represented on the food frequency questionnaire. All of the participants consumed cereals (chapati, rice, daliya, suji, bajra, jowar, ragi etc.) daily. Vegetables were eaten daily by more than

Table 14: Dietary habits of survey participants, N=500

Food groups	Frequency of consumption n (%)				
	Daily	3-4 days in a week	Weekly	Occasionally	Never
Cereals	500 (100)	-	-	-	-
Milk or milk products	145 (29.9)	131(26.2)	66 (13,2)	100 (20)	58 (11.6)
Pulses or beans	156 (31.2)	145 (29)	174 (34.8)	25 (5)	-
Green leafy vegetables	81 (16.2)	180(36)	208 (41.6)	30 (6)	1 (0.2)
Roots and tubers	77 (15.4)	292 (58.4)	126 (25)	5 (1)	1 (0.2)
Other vegetables	126 (25.2)	264 (52.8)	107 (21.4)	3 (0.6)	-
Fruits	51 (10.2)	132 (26.4)	181 (36.2)	127 (25.4)	9 (1.8)
Eggs	5 (1)	29 (5.8)	155 (31)	229 (45.8)	82 (16.4)
Fish	9 (1.8)	13 (2.6)	60 (12)	237 (47.4)	181 (36.2)
Chicken or meat	6 (1.2)	147 (29.4)	149 (29.8)	81 (16.2)	117 (23.4)
Nuts and oilseed	5 (1)	2 (0.4)	8(1.6)	136 (27.2)	346 (69.2)
Fats and oils	497 (99.4)	3 (0.6)	-	-	-
Sugar and Jaggery	315(63)	103 (20.6)	32 (6.4)	44 (8.8)	6 (1.2)
Fried foods	4(0.8)	122 (24.4)	38.6 (193)	153 (30.6)	28 (5.6)
Junk foods	-	2 (0.4)	28 (5.6)	221 (44.2)	249 (49.8)
Sweets	1 (0.2)	11(2.2)	139 (27.8)	301 (60.2)	48 (9.6)
Aerated drinks (soft drinks)	6(1.2)	11 (2.2)	119 (23.8)	264 (52.8)	99 (19.8)
Monthly individual salt consumption (mean ± SD) 220.18 ± 50 mg					
Monthly individualcooking oil intake(mean ± SD) 1.30 ± 0 .32 kg					

half of the participants (56.8%) though green leafy vegetables were eaten daily by only 16.2% (n = 81) of the women. Approximately one-tenth of the study women (10.2%; n = 5) had eaten fruits daily in the preceding one month. Only 36.2% (n = 181) and 41.6% (n = 208) reported eating fruit or green leafy vegetables weekly respectively in the last month. Less than a third (29.9%; n = 145) of the women reported consumption of milk products daily.

Just under a third (29.4%; n = 147) of the women consumed chicken or meat three to four days per week. The consumption of eggs and fish was quite infrequent, with 5.8% (n = 29) of women eating eggs and 2.6% (n = 13) eating fish 3–4 days a week. Very few women reported eating chicken or meat (1.2%; n = 6), fish (1.8%; n = 9) and eggs (1%; n = 5) daily. Eggs were consumed less often daily than chicken or meat, or fish. Of the participants, more than one-third (36.2%; n = 181) never ate fish. The 126 women (25.2%) who reported eating fried foods (poori, pakora, vada, samosa, tikki, etc) did so either 3–4 days a week, or more. The mean consumption of salt and cooking oil per month, per household member, was 220.18 mg (± SD 50.04) and 1.30 kg (± SD 0.32) respectively.

5.1.3 Knowledge of modifiable CHD risk factors and greatest health problem of women

In section 3 of the questionnaire, participants were asked several questions to measure their knowledge of CHD risk factors. The findings are summarised below in Table 15.

Table 15: Knowledge of CHD risk factors among survey participants, N=500

Items	Response frequency		
	Yes n (%)	No n (%)	Don't know n (%)
Smoking/tobacco use	255 (51)	129 (25.8)	116 (23.2)
Weight loss	181 (36.2)	210 (42)	109 (21.8)
Obesity	347 (69.4)	100 (20)	53 (10.6)
Depression	250 (50)	148 (29.6)	100 (20.4)
Hypertension	417 (83.4)	28 (5.6)	55 (11)
High cholesterol	295 (59)	87 (17.4)	118 (23.6)
Daily exercise	112 (22.4)	218 (43.6)	170 (34)
Stress	355 (71)	64 (12.8)	81 (16.2)
Sleeping too much	104 (20.8)	241 (48.2)	155 (31)
Diabetes mellitus	187 (37.4)	96 (19.2)	217 (43.4)

Among the participants, hypertension, obesity, high cholesterol and smoking were identified as modifiable risk factors of CHD by 83.4 % (n = 417), 69.4% (n = 347), 59% (n = 295), and 51% (n = 255) respectively. Only 37.4% (n = 187) knew that diabetes mellitus was a modifiable risk factor of CHD. Overall, the majority (74.8%) of participants lacked 'good' level of knowledge about modifiable risk factors of CHD, where 'good level' was defined as correctly knowing four or more major modifiable CHD risk factors. Only a quarter (25.2%; n = 126) had a good level of knowledge about modifiable CHD risk factors.

The majority of the women (32.2%; n = 161) identified cancer as the greatest health problem followed by AIDS (14.2%; n = 71) and diabetes (13.6%; n = 68) for women in India. A tenth of the study women (10.4%; n = 52) considered heart diseases or heart attack as the greatest health problem for women while 3.8% could not give a response regarding the greatest problem.

5.1.3 Behavioural and physiological CHD risk factor among survey women

This section summarises behavioural and physiological risk factors of the study women. The statistics for tobacco use, alcohol consumption, physical activity, history of diabetes, family history of heart disease, and physiological parameters (blood pressure, height, weight, waist and hip circumference) are summarised in Table 16.

Of the 500 women studied, some of them indulged in unhealthy lifestyles such as tobacco use and alcohol consumption. The overall prevalence of current tobacco users was 28.2% (n = 141). Among the study participants, the prevalence of smokeless tobacco users (17.8%; n = 89) was higher than that of smoked tobacco users (10.4%; n = 52). Only three women (0.6%) consumed alcohol in the past 30 days.

A low level of physical activity was observed in 190 women (38.4%) while 279 women (55.8 %) were moderately active and 29 women (5.8%) were highly active. The overall prevalence of overweight and obesity (BMI ≥23 kg/m^2)[13] among the participants was 52.6% (n = 263). A higher proportion of women had abdominal obesity (66.4% assessed by waist circumference and 82.8% by waist-hip ratio).

Over one-third of the study women were identified as having hypertension (35.2%; n = 176). Among them, 102 (58%) women were aware of their hypertensive status, 82 women (46.6%) were currently on antihypertensive medication, and only 28 women (15.9%) had achieved blood pressure (BP) control.

Table 16: Prevalence of CHD risk factors among survey participants, N=500

CHD risk factors	Number	Percent	Mean ± SD
Use smoked tobacco daily	51	10.2	
Use smokeless tobacco daily	90	18	
Current drinker	3	0.6	
Physical activity score (MET-minutes/week)			830.24 ± 935.05
Physical activity level			
Low activity	192	38.4	
Moderate activity	279	55.8	
High activity	29	5.8	
Hypertensive	176	35.2	
On current medication	82	46.5	
Not on treatment	20	11.5	
Not aware of hypertensive state	74	42	
Self-reported diabetics	55	11	
Height (cm)			150.02 ± 5.19
Weight (kg)			55.31 ± 12.47
Body Mass Index (BMI)			24.53 ± 4.87
<18.5 kg/m^2	21	4.2	
18.5–22.9kg/m^2	216	43.2	
23–24.9kg/m^2	68	13.6	
≥25kg/m^2	195	39	
Waist circumference (WC)			86.94 ± 11.94
WC<80 cm	167	33.4	
WC ≥80 cm	333	66.6	
Hip circumference (cm)			97.98 ± 11.54
Waist and Hip Ratio (WHR)			1.06 ± 3.98
WHR ≥0.85	414	82.8	
WHR <0.85	86	17.8	
Family history of heart disease	45	9	

Of all study women, 11% (n = 55) had self-reported diabetes. Nine percent (n = 45) had a family history of heart disease as diagnosed by health care providers. Although the majority (75.2%: n = 376) were in the low risk category (<10% risk) of developing CHD, about a quarter (24.8%; n = 124) had ≥10% risk of developing fatal or non-fatal CHD in the next five years (please see Table 17).

Table 17: Global five-year risk of CHD among survey participants according to NHANES non-laboratory-based risk prediction chart, N=500

Global CHD risk	Number	Percent
High risk >20%	35	7
Moderate risk 10–20%	89	17.8
Low risk <10%	376	75.2

5.2 Description of the hypertensive respondents

This data was collected only from those respondents who were hypertensive (n = 176). The data analysis was conducted in two phases. At the first step, descriptive analysis of all variables related to socio-demography, psychosocial, CHD risk factors, CHD risk factor knowledge, global CHD risk, CHD risk perception, hypertension perception, and antihypertensive treatment of the hypertensive women was performed. In the second step, relationships of independent variables with CHD risk perception and medication adherence status were examined.

5.2.1 Socio-demographic characteristics of hypertensive women

The statistics on socio-demographic characteristics of the hypertensive women are summarised in Table 18 (age, household members, education, religion, marital status, work status, type of family, co-existing illness, and average household income).

The mean age of the participants was 46.3 years (SD ± 6.9) (range 35–59 years). The median age was 48 years. The majority of the participants were of the Muslim faith (59.7%; n = 105) followed by Hindus (39.8%; n = 70). Over half of the participants (51.1%; n = 90) were illiterate, among whom 21.6% (n = 38) could sign their names. A quarter of the participants (25%; n = 44) received only five years of formal education; just under a quarter (23.9%; n = 42) completed 10 years or more of formal education. Most of the study women (89.8%; n = 158) were married while 11 (6.2%) were divorced, separated, or widowed. Seven women (4%) never married. One-third of the women (34.1%; n = 60) had a self-reported history of co-existing chronic illnesses.

The majority of the women (58.5%; n = 103) were homemakers followed by government or non-government employees (15.4%; n = 27) and self-employed (13.1%; n = 23). A tenth of the women (10.8%; n = 19) were in manual labour jobs. Most of the women

(80.7%; n = 142) lived in nuclear families with an average family size of 5.3 (± SD 2.2) members. The average monthly family income of the study population was Rupees 10,065 (± SD 5,117) with a median of INR 9,000 (USD 135).

Table 18: Socio-demographic characteristics of the hypertensive women, N = 176

Socio-demographic factors	Females n	Per cent %	Mean ± SD
Age (years)			46.36 ± 6.93
Age grouping			
≤46 years	96	54.5	
>46 years	80	45.5	
Number of household members			5.34 ± 2.21
Education % (n)			
No schooling (can't sign)	52	29.5	
Primary school = 0 to <5 years) (can sign only)	38	21.6	
Primary school completed (5 years)	44	25	
Secondary school completed (10 years)	20	11.4	
Completed higher secondary school	16	9.1	
College/university completed	6	3.4	
Religion			
Hindu	70	39.8	
Muslim	105	59.7	
Christian	1	0.6	
Marital status			
Never married	7	4	
Currently married	158	89.8	
Separated	5	2.8	
Divorced	5	2.8	
Widowed	1	0.6	
Work status			
Government employee	4	2.3	
Nongovernment employee	23	13.1	
Self employed	23	13.1	
Unskilled manual labour	19	10.8	
Home maker	103	58.5	
Retired	4	2.2	
Type of family			
Nuclear	142	80.7	
Joint	34	19.3	
Co-existing illnesses	60	34.1	
Monthly household income (INR)	9000 (median)		10,065 ± 5,117

5.2.2 Food habits of the hypertensive women

Table 19 shows the frequency of consumption of each of the food groups represented on the Food Frequency Questionnaire. All of the study women consumed cereals (chapati, rice, daliya, suji, bajra, jowar, ragi etc.) daily. Fruit and green leafy vegetables (GLVs) were eaten more than three days in a week by 40.3.1% (n = 71) and 42.1% (n =

74) of women respectively. Over half of the women reported eating fruit (59.7%; n = 105) and green leafy vegetables (58%; n = 102) weekly or occasionally. Only 28.4% (n = 50) of the study women consumed milk products daily, whereas, 13.1% (n = 23) never had milk or any dairy products in the previous month.

The majority of women (42.6%; n = 75) had eaten chicken or meat on more than three days a week. Eggs were consumed less often than chicken or meat. Of the participants, approximately one third (33%; n = 58) never ate fish. Forty five women (25.6%) reported eating fried foods three to four times weekly. The mean consumption of salt and cooking oil per month, per household member, was 218.37 mg (± SD 50.13) and 1.32 kg (± SD .31) respectively.

Table 19: Dietary habits of hypertensive women, N = 176

Food groups	Frequency of consumption n (%)				
	Daily	3-4 times in a week	Weekly	Occasionally	Never
Cereals	176 (100)	-	-	-	-
Milk or milk products	50 (28.4)	45 (25.6)	24 (13.6)	34 (19.3)	23 (13.1)
Pulses or beans	17 (9.7)	92 (52.3)	62 (35.2)	5 (2.8)	-
Green leafy vegetables	4 (2.3)	70 (39.8)	89 (50.6)	13 (7.4)	-
Roots and tubers	18 (10.2)	103 (58.5)	54 (30.7)	1 (0.6)	-
Other vegetables	36 (20.5)	108 (61.4)	31 (17.6)	1 (0.6)	-
Fruits	9 (5.1)	62 (35.2)	57 (32.4)	44 (25)	4 (2.3)
Eggs	1 (0.6)	9 (5.1)	59 (33.5)	77 (43.8)	30 (17)
Fish	1 (0.6)	-	23 (13.1)	94 (53.4)	58 (33)
Chicken or meat	-	75 (42.6)	60 (34.1)	12 (6.8)	29 (16.5)
Nuts and oilseed	1 (0.6)	-	4 (2.3)	49 (27.8)	122 (69.3)
Fats and oils	175 (99.4)	1 (0.6)	-	-	-
Sugar and Jaggery	93 (52.3)	44 (25)	16 (9.1)	22 (12.5)	2 (1.1)
Fried foods	-	45 (25.6)	72 (40.9)	46 (26.1)	13 (7.4)
Junk foods	-	-	9 (5.1)	67 (38.1)	100 (56.8)
Sweets	2 (1.1)	-	47 (26.7)	105 (59.7)	22 (12.5)
Aerated drinks	1 (0.6)	3 (1.7)	37 (21)	87 (49.4)	48 (27.3)
Monthly individual salt consumption (mean ± SD) 218.37 ± 50.13 mg					
Monthly individual cooking oil intake (mean ± SD) 1.32 ± 0.31kg					

5.2.3 Knowledge of modifiable CHD risk factors and prioritisation of health problems by hypertensive women

In section 3 of the questionnaire, participants were asked several questions to measure their knowledge of CHD risk factors. The results are summarised in Table 20. Among the participants, hypertension, obesity, high cholesterol and smoking were identified as

modifiable risk factors of CHD by 86.9 %(n = 153), 69.9% (n = 123), 64.8% (n = 114), and 49.4% (n = 87), respectively. Only 47.2% (n = 83) knew that diabetes mellitus is a modifiable risk factor of CHD. Just over half (52.3%) of participants lacked 'good' level of knowledge about modifiable risk factors of CHD, where 'good level' was defined as correctly knowing four or more major modifiable CHD risk factors, while the remaining 47.7% (n = 84) had a good level of knowledge.

The majority of the women (42.6%; n = 75) considered cancer as the greatest health problem for women in India, followed by diabetes (13.6%; n = 24) and hypertension (13.1%; n = 23). Only 4.5% (n = 8) women recognised heart diseases or heart attack as the greatest health problem for women in India. Nine women (5.1%; n = 9) could not say what was the greatest health problem for Indian women.

Table 20: Knowledge of CHD risk factors among hypertensive women. N = 176

CHD risk factors	Response frequency		
	Yes n (%)	No n (%)	Don't know n (%)
Hypertension	153 (86.9)	8 (4.5)	15 (8.5)
Obesity	123 (69.9)	33 (18.8)	20 (11.4)
Stress	118 (67.0)	26 (14.8)	36 (20.5)
High cholesterol	114 (64.8)	26 (14.8)	36 (20.5)
Depression	91 (51.7)	44 (25.0)	41 (23.3)
Smoking/tobacco use	87 (49.4)	46 (26.1)	43 (24.4)
Diabetes mellitus	83 (47.2)	33 (18.8)	60 (34.1)
Weight loss	64 (36.4)	73 (41.5)	39 (22.2)
Daily exercise	46 (26.1)	61 (34.7)	69 (39.2)
Sleeping too much	33 (18.8)	93 (52.8)	50 (28.4)

5.2.4 Behavioural and physiological CHD risk factors of the hypertensive women

This section summarises the behavioural and physiological risk factors of the hypertensive women. The statistics on womens' tobacco use, alcohol consumption, physical activity, history of diabetes, family history of heart disease, and physiological parameters (blood pressure, height, weight, waist and hip circumference) are summarised in Table 21.

Among hypertensive women, the prevalence of current tobacco users was 26.1% (n = 46). The prevalence of smokeless tobacco users (17.6%; n = 31) was higher than that of smoked tobacco users (8.5%; n = 15). Among the hypertensive study women, the

prevalence of systolic hypertension was 68.2% (n = 120) while the prevalence of the diastolic hypertension was 54% (n = 95). The mean systolic blood press (SBP) was 143.95 ± 18.36 mmHg, and it ranged from 100 to 206 mmHg. The average diastolic blood pressure (DBP) was 88.09 ± 9.70 mmHg, and ranged from 62 to 108 mmHg. Almost one-fifth of the hypertensive women (18.2%; n = 34) had co-existing self-reported diabetes.

Of the hypertensive women studied, 44.3% (n = 78) reported low physical activity, while 54.5 % (n = 96) were moderately active and 1.1% (n = 2) were highly active. The overall prevalence of overweight and obesity (BMI ≥23 kg/m2) was 70.5% (n = 124). A higher proportion of women had abdominal obesity (82.4% assessed by waist circumference and 93.2% evaluated by waist-hip ratio) compared to obesity defined in terms of BMI. Twenty-four women (13.6%) had a family history of heart disease as diagnosed by health care providers. The majority of women (79%; n = 139) said that someone accompanied them during their clinic visits most of the time.

Table 21: Prevalence of CHD risk factors among hypertensive women. N = 176

CHD risk factors	Number	Percent	Mean ± SD
Use smoked tobacco daily	15	8.5	
Use smokeless tobacco daily	31	17.6	
Current drinker	0.6	1	
Physical activity score (MET minutes/week)			728.67± 550.461
Level of physical activity			
Low activity	82	46.6	
Moderate activity	72	40.9	
High activity	22	12.5	
Systolic hypertension	120	68.2	
Diastolic hypertension	95	54	
Self-reported diabetics	32	18.2	
Body Mass Index (BMI)			26.37 ± 5.12
<18.5 kg/m^2	2	1.1	
18.5–22.9kg/m^2	49	28.4	
23–24.9kg/m^2	30	17	
≥25kg/m^2	93	53.4	
Waist circumference (WC)			91.75 ± 11.77
WC ≤80 cm	32	18.2	
WC >80 cm	144	81.8	
Hip circumference (cm)			102.11 ± 12.00
Waist and Hip Ratio (WHR)			0.89 ± 0.03
WHR ≥0.85	164	93.2	
WHR<0.85	12	6.8	
Family history of heart disease	24	13.6	

5.2.5. Global five-year CHD risk of hypertensive women

Of all hypertensive women, 14.8% (n = 26) had high risk and 27.3% (n = 48) had moderate risk of developing fatal or non-fatal myocardial infarction or stroke in the next five years, as assessed with the NHANES non-laboratory-based prediction chart[5] (please see table 22).

Table 22: **Global five-year CHD risk of hypertensive women according to the NHANES non-laboratory-based risk prediction chart, N = 176**

Global CHD risk	Number	Percentage
High risk >20%	26	14.8
Moderate risk 10–20%	48	27.2
Low risk <10%	102	58.0

5.3 Hypertensive womens' perceptions of coronary heart disease risk

This data was collected only from those hypertensive women (n = 102) who were aware of their hypertensive condition before the survey. As the first step, descriptive analysis of all the variables related to perceived and global CHD risk was carried out. In the second step, associations and inferences of variables with inaccurately perceived CHD risk status were performed.

Perceived CHD risk was calculated in this study by asking research participants 'In the next five years, how many paisa in a rupee do you think is your risk of having heart disease compared to a woman of your age (if you make no changes in your current lifestyle such as tobacco use, diet, activity level, non-adherence to medication)?'. Participants indicated their response by placing an X on a scale ranging from 0 paisa (no risk) to 100 paisa (high risk), segmented at 10 paisa intervals. The 0–100 paisa response scale was selected to correspond with the risk estimates provided by the NHANES risk calculator. According to participants' responses, participants were categorised to 'low perceived risk' (<10 paisa in a rupee), moderate perceived risk (10–20 paisa in a rupee) and high perceived risk (>20 paisa in a rupee). For research purposes the variables 'moderate' and 'high perceived risk' were collapsed into a single variable, 'high perceived risk'. Risk accuracy was defined as the ability of the participant to assign her likelihood of heart disease to the same category as her calculated risk.[16] If the difference between an individual's estimated risk and a personal perceived risk was a positive number, it indicated a pessimistic view in that participants saw their own risk

as greater than it is. While negative numbers would indicate an optimistic view in which participants understand their risk as smaller than the calculated risk.[17] According to participants' responses, participants were dichotomised to participants with accurate perception and participants with inaccurate perception. Under-estimators were those women who perceived themselves to be at 'low' risk, but were actually at high risk,[16] as calculated by the NHANES non- laboratory-based risk score chart.

The mean score for CHD risk perception of these hypertensive women was 22.9 (± SD 28.4; median 10) indicating that the participants had low CHD risk perception overall. The distribution of the scores was positively skewed (skewness = 1.17 and SE .24) indicating that responses were clustered around the lower end**.** Figure 7 illustrates this. The majority of the women (58.8%; n = 60) perceived their CHD risk as low while 28.4% (n = 29) viewed it as moderate and only one-tenth (9.8%; n = 10) perceived their CHD risk as high.

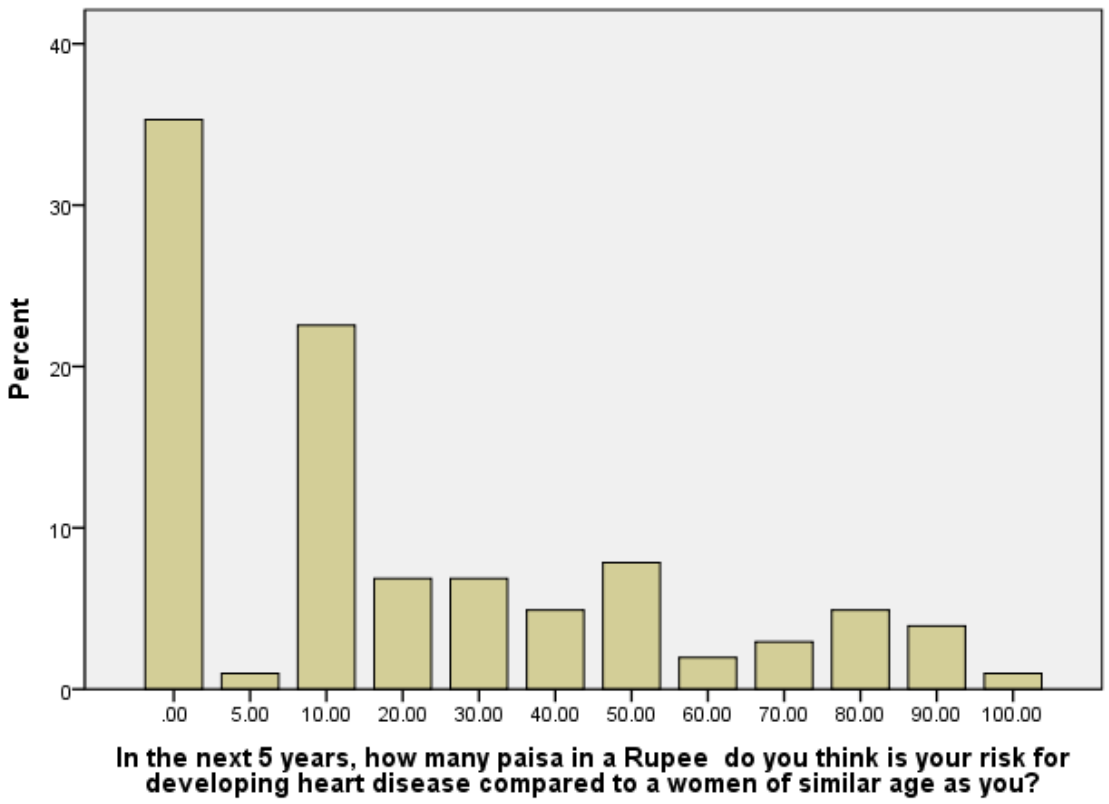


Figure 7: Distribution of perceived CHD risk score among hypertensive women

On the other hand, NHANES non-laboratory-based prediction chart indicates 20.6% (n = 21) of all hypertensive women had high risk, and 31.4% (n = 32) and 48 (49%) had moderate and low risk of fatal or non-fatal myocardial infarction or stroke in five years, respectively.

Thus, women tended to underestimate their moderate and high risks of CHD. The statistics on perceived and global CHD risk of these women are summarised in Table 23. Kappa analysis showed low agreement[449] (Kappa ± SE: 0.137 ± 0.072; p = 0.05 between Global CHD risk as assessed with the NHANES chart and perceived CHD risk of the women.

Table 23: Agreement between perceived and absolute CHD risk of hypertensive women, N=102

		Perceived CHD risk n (%)*			Total
		High	**Moderate**	**Low**	
Total five-year CHD risk	High risk	4 (3.9)	7 (6.9)	10 (9.8)	**21 (20.6)**
	Moderate risk	9 (8.8)	9 (8.8)	14 (13.7)	**32 (31.4)**
	Low risk	0	13 (12.7)	36 (35.3)	**49 (48.0)**
	Total	**13 (12.7)**	**29 (28.4)**	**60 (58.8)**	**102 (100)**

* Kappa=0.137

5.3.1 Prevalence of accuracy of self-perception of CHD risk

In statistical analysis, more than half (52%; n = 53) of women who were aware of their hypertension status were not able to estimate their CHD risk correctly while 48% (n = 49) could do so correctly. Under-estimation of their CHD risk was observed in 31 women (30.4% of the total aware hypertensive women and 58.49% of the inaccurate women participants), while over-estimation was observed in only 22 women (21.6% of the aware hypertensive women; 41.50% of the inaccurate women participants).

5.3.2 Comparing the socio-demographic, other chronic illnesses, CHD risk factor knowledge and CHD risk factors profile of the hypertensive women based on the accuracy of their CHD risk perception

Table 24 summarises the statistics comparing data on socio-demographic factors, other chronic illnesses, monthly household salt consumption, monthly use of household cooking oil, CHD risk factor knowledge, knowledge of greatest health problem of women in India, and CHD risk factors profiles of hypertensive women who were

accurate in their CHD risk perception with those who were not accurate. Socio-demographic factors include age, religion, marital status, educational status, work status, type of family, and monthly household income. The CHD risk factors profile includes data on daily tobacco use, mean systolic blood pressure (SBP), mean diastolic blood pressure (DBP), systolic hypertension, diastolic hypertension, BP control, BMI, physical activity, abdominal obesity, self-reported diabetes and family history of heart disease.

Among the participants, the following proportions reported the following as risk factors for heart attacks: 80.4% of participants for obesity, 76.55% for high cholesterol, 53.9% for diabetes and 52.9% for smoking. Women who perceived their CHD risk accurately were younger than women who perceived their CHD risk inaccurately (mean age ± SD 45.8 ± 7.1 versus 50.2 ± 7.2; p = 0.003). A significantly higher proportion of women with inaccurate risk perceptions were aged 48 years or more in comparison to women with accurate risk perceptions: 66% versus 34.7% respectively (p = 0.003).

Regarding the overall level of CHD risk factor knowledge, there was a significant difference between hypertensive women who estimated their risk correctly with those women who did not. A higher proportion of women who perceived their CHD risk accurately had a good level of CHD risk factor knowledge in comparison to women with inaccurate risk perceptions: 71.4% versus 30.2% respectively, (p = .0000). Of those women with inaccurate CHD risk perception, 28.3%, 32.1%, 56.6%, and 60.4% did not know that obesity, high cholesterol, smoking and diabetes increase the risk of having a heart attack respectively. Though the higher proportion of women with inaccurate risk perception unable to identify hypertension as a risk factor for heart attack, in comparison to those women who correctly perceived their CHD risk (17% versus 6.1% respectively), the difference was not significant (p = 0.12).

A non-significant higher proportion of women with inaccurate perception of CHD risk were illiterate and homemakers, than those who perceived their risk accurately: 52.8% versus 47.2% and 66% versus 34% respectively. In univariate analysis, there were no significant differences between women who perceived their CHD risk accurately and those who perceived their risk inaccurately for characteristics such as religion, marital status, type of family, monthly household income, fruits and vegetable consumptions,

and monthly household salt and oil consumption. There were also no significant differences between women who perceived their CHD risk accurately and those who perceived their risk inaccurately for household cooking oil use per month, other chronic illness and knowledge of greatest health problem of women in India.

Average BP was significantly higher among women with inaccurate CHD risk perceptions (SBP 152 mmHg [± SD 20.8] and DBP (89.1 mmHg [± SD 10.4]) than those with accurate risk perceptions (SBP 138 mmHg [± SD 14.6] and DBP 84.1 mmHg [± SD 9.1]), with p values less than 0.000 and 0.014, respectively. Similarly, a greater proportion of women who inaccurately perceived their CHD risk had BP above the treatment goal (i.e. ≥140/90 mmHg) in comparison to those women who correctly perceived their CHD risk: 84.9% versus 59.2% respectively (p = 0.004).

The univariate analysis showed no significant differences between women with accurate CHD risk perceptions and those with inaccurate perceptions with regards to CHD risk factors such as daily tobacco use, BMI, self-reported diabetes, physical activity and family history of heart disease. However, hypertensive women with accurate risk perceptions had a higher rate of abdominal obesity compared to those with inaccurate perceptions, although this did not quite reach statistical significance: 98% versus 86.8% respectively (p = 0.06).

Table 24: **Socio-demographic, CHD risk factor knowledge and risk factor profile of hypertensive women compared with their CHD risk perceptions**

Variables	Total (N = 102) n (%)	Accurate PCR (N = 49) n (%)	Inaccurate PCR (N = 53) n (%)	p value*
Socio-demographic				
Age(mean ± SD)	48.08 ± 7.44	45.83 ± 7.15	50.16 ± 7.16	**0.003**
Age group				0.**003**
<48 years	50 (49)	32 (65.3)	18 (34.0)	
≥48 years	52 (51)	17 (34.7)	35 (66.0)	
Religion				0.839
Hindu	38 (37.3)	19 (38.8)	19 (35.8)	
Muslim	64 (62.7)	30 (61.2)	34 (64.2)	
Marital status				0.51
Currently married	92 (90.2)	43 (87.8)	49 (92.5)	
Currently not married	10 (9.8)	6 (12.2)	4 (7.5)	
Educational status				1.00
Illiterate	54 (52.9)	26 (53.1)	28 (52.8)	
Literate	48 (47.1)	23 (46.9)	25 (47.2)	
Work status				0.417
Homemaker	63 (61.8)	28 (57.1)	35 (66)	
Not housewife	39 (38.2)	21 (42.9)	18 (34)	
Type of family				1.00
Nuclear	81 (79.4)	39 (79.6)	42 (79.2)	
Joint	21 (20.6)	10 (20.4)	11 (20.8)	
Monthly household income				0.32
≤INR8,000	52 (51)	22 (44.9)	30 (56.6)	
>INR8,000	50 (49)	27 (55.1)	23 (43.4)	
Family members				0.83
≤5	67 (65.7)	33 (67.3)	34 (64.2)	
>5	35 (34.3)	16 (32.7)	19 (35.8)	
Consumption of vegetables				0.55
≥3–4 days/week	53 (52)	27 (55.1)	26 (49.1)	
<3–4 days/week	49 (48)	22 (44.9)	27 (50.9)	
Consumption of fruits				0.67
≥3–4 days/week	31 (30.4)	16 (32.7)	15 (28.3)	
<3–4 days/week	71 (69.6)	33 (67.3)	38 (71.7)	

Household salt consumption (mg)/month	1.3 ± 1.09	1.2 ± 0.721	1.4 ± 1.34	0.291
Household Cooking oil use (kg)/month	6.6 ± 2.54	6.8 ± 2.52	6.3 ± 2.55	0.345
Other chronic illness				0.68
Yes	36 (35.3)	16 (32.7)	20 (37.7)	
No	66 (64.7)	33 (67.3)	33 (62.3)	
CHD risk factor knowledge				
Level of CHD risk factors knowledge				**<.001**
Good level of knowledge	51(50)	35 (71.4)	16 (30.2)	
Poor level of knowledge	51(50)	14 (28.6)	37 (69.8)	
Smoking increase the risk of heart attack				**0.05**
Yes	54 (52.9)	31 (63.3)	23 (43.4)	
No	48 (47.1)	18 (36.7)	30 (56.6)	
Obesity increase the risk of heart attack				**0.02**
Yes	82 (80.4)	44 (89.8)	38 (71.7)	
No	20 (19.6)	5 (10.2)	15 (28.3)	
Hypertension increase the risk of heart attack				0.12
Yes	90 (88.2)	46 (93.9)	44 (83)	
No	12 (11.8)	3 (6.1)	9 (17)	
Cholesterol increase the risk of heart attack				**0.03**
Yes	78 (76.5)	42 (85.7)	36 (67.9)	
No	24 (23.5)	7 (14.3)	17 (32.1)	
Diabetes increase the risk of heart attack				**0.003**
Yes	55 (53.9)	34 (69.4)	21 (39.6)	
No	47 (46.1)	15 (30.6)	32 (60.4)	
Heart attack is women's greatest health problem				0.71
Know	8 (7.8)	3 (6.1)	5 (9.4)	
Don't know	94 (92.2)	46 (93.9)	48 (90.6)	
Presence of CHD Risk factors				
Use smoked tobacco daily				0.36
Yes	5 (4.9)	1 (2)	4 (7.5)	
No	97 (95.1)	48 (98)	49 (92.5)	
Use smokeless tobacco daily				0.48
Yes	22 (21.6)	9 (18.4)	13 (24.5)	
No	80 (78.4)	40 (81.6)	40 (75.5)	
Systolic hypertension				**0.001**
Present	70 (68.6)	26 (53.1)	44 (83)	
Absent	32 (31.4)	23 (46.9)	9 (17)	

Diastolic hypertension				**0.029**
Present	45 (44.1)	16 (32.7)	29 (54.7)	
Absent	57 (55.9)	33 (67.3)	24 (45.3)	
BP control				**0.004**
Yes	28 (27.5)	20 (40.8)	8 (15.1)	
No	74 (72.5)	29 (59.2)	45 (84.9)	
Self-reported diabetes				0.109
Yes	24 (23.5)	8 (16.3)	16 (30.2)	
No	78 (76.5)	41(83.7)	37 (69.8)	
BMI				0.597
Obese	70 (68.6)	36 (73.5)	34 (64.2)	
Overweight	15 (14.7)	6 (12.2)	9 (17)	
Normal	17 (16.7)	7 (14.3)	10 (18.9)	
Physical activity				0.324
Active	30 (61.2)	30 (61.2)	27 (50.9)	
Low active	19 (38.8)	19 (38.8)	26 (49.1)	
Abdominal obesity				**0.06**
Yes	48 (98.0)	48 (98.0)	46 (86.8)	
No	1 (2.0)	1 (2.0)	7 (13.2)	
Family history of heart disease		.		1.00
Yes	24 (23.5)	12 (24.5)	12 (22.6%)	
No	78 (76.5)	37 (75.5)	41 (77.4%)	

PCR=Perceived CHD risk; * p values calculated using Yates Correction for Continuity chi-square or Fisher's Exact Test where appropriate; BP=blood pressure; SBP=systolic Blood pressure; DBP=diastolic blood pressure.

5.3.3 Factors associated with inaccurate perception Of CHD risk among hypertensive women

5.3.3.1 Bivariate analysis

Bivariate analysis was conducted to determine the factors associated with inaccurate perception of CHD risk among hypertensive women and the results are summarised in Table 25. The variables included in the model were sociodemographic factors (i.e. age, religion, marital status, educational status, work status, type of family, number of family members, monthly household income, and monthy household consumption of fruits, vegetables, salt, and cooking oil), level of CHD risk factor knowledge and presence of CHD risk factors (i.e tobacco use, systolic hypertension, diastolic hypertension, BP control, self-reported diabetes, BMI, physical activity, abdominal obesity, and family history of heart disease). The factors significantly associated with inaccurate perception of CHD risk on bivariate analysis at the $p<0.05$ levels were: age, level of CHD risk factors knowledge, systolic hypertension, diastolic hypertension and BP control level of the participants.

The participants who were aged ≥48 years, the median age of the study population, were almost four times more likely (OR = 3.7, 95% CI: 1.6–8.30; p = 0.02) to have an inaccurate perception of risk compared to participants aged <48 years. Women's lack of knowledge or awareness of various CHD risk factors was significantly associated with inaccurate perceptions of their CHD risk. As shown in Table 25 these factors included smoking, obesity, high cholesterol and diabetes. In general, hypertensive women in the study who had a poor level of CHD risk factors knowledge, were almost six times (OR = 5.8; 95% CI: 2.5–13.6; p = <0.001) more likely to have an inaccurate perception of their CHD risk compared to those with a good level of knowledge.

The participants who had systolic hypertension were four times more likely to be associated with inaccurate perception of CHD risk compared to those who had no systolic hypertension (OR = 4.3; 95% CI: 1.7–10.7; p = 0.002). The participants who had diastolic hypertension were 2.5 times more likely to be linked with inaccurate perception of CHD risk than those who had no diastolic hypertension (OR = 2.5; 95% CI: 1.1–5.6; p = 0.02). Similarly, the women with uncontrolled BP were approximately four times more likely to be associated with inaccurate CHD risk perception compared to participants with BP under control (OR = 3.9; 95% CI: 1.5–9.9; p = 0.005).

Table 25: **Bivariate analysis of factors associated with inaccurate perception of CHD risk among hypertensive women. N=102**

Characteristics	Total N	Inaccurate PCR n (%)	OR (95% CI)	P* value
Socio-demographic				
Age				
≥48years	52	35 (67.3)	3.66 (1.61–8.29)	0.**02**
<48 years	50	18 (36.0)	Reference	
Religion				
Hindu	38	19 (50.0)	0.88 (0.39–1.97)	0.76
Muslim	64	34 (53.1)	Reference	
Marital status				
Currently married	92	49 (53.3)	1.70 (0.45–6.46)	0.42
Currently not married	10	4 (40.0)	Reference	
Educational status				
Illiterate	54	28 (51.9)	0.99 (0.45–2.15)	0.98
Literate	48	25 (52.1)	Reference	
Work status				
Homemaker	63	35 (55.5)	0.17 (0.77–3.86)	0.18
Not housewife	39	18 (46.1)	Reference	
Type of family				
Nuclear	81	42 (51.8)	0.76 (0.29–2.02)	0.59
Joint	21	11 (52.4)	Reference	
Monthly household income				
≤INR 8,000	52	30 (57.7)	1.60 (0.73–3.50)	0.23
>INR 8,000	50	23 (46.0)	Reference	
Family members				
≤5	67	34 (50.8)	1.41 (0.64–3.10)	0.39
>5	35	19 (54.3)	Reference	
Consumption of vegetables				
≥3–4 days / week	53	26 (49.1)	0.80 (0.36–1.71)	0.55
<3–4 days / week	49	27 (55.1)	Reference	
Consumption of fruits				
≥3–4 days / week	31	15 (48.3)	0.81 (0.35 –1.89)	0.63
<3–4 days / week	71	38 (53.5)	Reference	
Monthly household salt consumption (mg)	1.3 ± 1.0	1.4 ± 1342.4	1.00 (1.00–1.00)	0.30
Monthly household cooking oil use/ (kg)	6.6 ± 2.5	6.3 ± 2.5	0.90 (0.79–1.08)	0.34

Heart attack is women's greatest health problem				
Know	8	5 (62.5)	1.59 (0.36–7.06)	0.53
Don't know	94	48 (51.1)	Reference	
CHD risk factors knowledge				
Level of CHD risk factors knowledge				
Poor level of knowledge	51	37 (72.5)	5.80 (2.5–13.6)	**<.001**
Good level of knowledge	51	16 (31.4)	Reference	
Smoking increase the risk of heart attack				
No	48	30 (62.5)	2.20 (1.01–4.97)	**0.04**
Yes	54	23 (42.6)	Reference	
Obesity increase the risk of heart attack				
No	20	15 (75.0)	3.50 (1.15–10.44)	**0.02**
Yes	82	38 (46.3)	Reference	
Hypertension increase the risk of heart attack				
Yes	90	44 (48.9)	0.30 (0.08–1.25)	0.102
No	12	9 (75.0)	Reference	
Cholesterol increase the risk of heart attack				
No	24	17 (70.8)	2.80 (1.05–7.59)	**0.039**
Yes	78	36 (46.1)	Reference	
Diabetes increase the risk of heart attack				
No	47	32 (68.1)	3.40 (1.52–7.84)	**0.003**
Yes	55	21 (38.2)	Reference	
Other chronic illness				
No	66	33 (50.0)	1.30 (0.59–2.83)	0.51
Yes	36	20 (55.5)	Reference	
Presence of CHD Risk factors				
Smoked tobacco users daily				
No	97	49 (50.5)	3.91 (0.42–36.33)	0.22
Yes	5	4 (80.0)	Reference	
Non smoked tobacco users daily				
No	80	40 (50.0)	1.84 (0.69–4.86)	0.219
Yes	22	13 (59.1)	Reference	
Systolic hypertension				
Present	70	44 (62.8)	4.32 (1.74–10.74)	**0.002****
Absent	32	9 (28.1)	Reference	
Diastolic hypertension				
Present	45	29 (64.4)	2.49 (1.11–5.58)	**0.02**
Absent	57	24 (42.1)	Reference	

BP control				
No	74	45 (60.9)	3.87 (1.51–9.96)	**0.005****
Yes	28	8 (28.6)	Reference	
Self-reported diabetes				
Yes	24	16 (66.7)	2.22 (0.85–5.70)	0.104
No	78	37 (47.4)	Reference	
BMI				
Overweight	15	9 (60.0)	0.80 (0.02–3.24)	0.75
Obese	70	34 (48.6)	0.70 (0.24–2.05)	0.51
Normal	17	10 (58.9)	Reference	
Physical activity				
Low active	45	26 (57.8)	0.77 (0.35–1.69)	0.51
Active	57	27 (47.4)	Reference	
Abdominal obesity				
No	8	7 (87.5)	7.30 (0.86–61.70)	0.**06****
Yes	94	46 (48.9)	Reference	
Family history of heart disease				
No	78	41 (52.6)	1.10 (0.44–2.76)	0.82
Yes	24	12 (50.0)	Reference	

PCR=perceived CHD risk; CHD=coronary heart disease; OR=odds ratio; CI=confidence interval; INR=Indian Rupees; BMI=Body Mass Index;* p values calculated using Yates Correction for Continuity chi-square or Fisher's Exact Test where appropriate; ** Due to small cell size (less than 10) not included in multivariate logistic model

There was also an association between inaccuracy of self-perception of CHD risk and abdominal obesity (≤80cm). That is, participants who had no abdominal obesity were 7.3 times more likely not to have an accurate perception of CHD risk, although this did not quite reach statistical significance (OR = 7.3; 95% CI: 0.9–61.7; p = 0.06).

5.3.3.2 Multivariate analysis

The factors that were significantly associated with inaccurate perception of global CHD risk on binary logistic regression were used in a multivariate logistic model, using the backward stepwise likelihood ratio method. Multiple logistic regression analysis was conducted to determine whether the variables could significantly predict inaccurate perception of CHD risk. The variables included in the model were age of the participants; women's awareness of smoking, obesity, high cholesterol and diabetes increase the risk of heart attack; level of CHD risk factors knowledge; and diastolic hypertension. Due to small cell size (less than 10) variables such as systolic hypertension, BP control, and abdominal obesity were not included in the multivariate logistic model. On regression, diastolic hypertension, age of the participants and level of CHD risk factor knowledge remained significantly associated with inaccurate perception of global CHD risk among hypertensive women (please see Table 26).

Diastolic hypertension

The study women with diastolic hypertension were three times more likely to be associated with inaccurate CHD risk perception compared to the women who had no diastolic hypertension (AOR = 3.0 ; 95% CI: 1.2–8.0; p = 0.02).

Age

The women participants who were aged ≥48 years were almost five times more likely to have an inaccurate perception of CHD risk than those women who were <48 years old (AOR = 4.6; 95% CI: 1.8–11.0; p = 0.002).

Level of CHD risk factor knowledge

Hypertensive women who had a poor level of CHD risk factor knowledge were approximately seven times more likely to have an inaccurate perception of CHD risk than those women with a good level of knowledge (AOR = 6.8, 95% CI: 2.6–17.6; p = <0.001).

Table 26: Multivariate logistic regression analysis of factors associated with inaccurate perception of CHD risk among hypertensive women

Variable	P value	AOR	95% CI for OR	
DBP	0.022	3.09	1.18	8.09
Age	0.002	4.57	1.75	11.92
Level of CHD risk factors knowledge	<0.001	6.76	2.59	17.63

AOR= Adjusted odd ratio; CI=confidence interval; CHD=coronary heart disease; DBP=diastolic blood pressure. Variables entered in initial model: age of the participants; women's awareness of smoking, obesity, high cholesterol and diabetes increase the risk of heart attack; level of CHD risk factors knowledge, and prevalence of DBP.

5.4 Hypertensive womens' perception of hypertension

This data was collected only from those hypertensive women (n = 102) who were aware of their hypertensive condition before the survey. Table 27 shows that hypertensive study women had a lower score on items such as emotional response (less affected emotionally), identity (fewer symptoms) and consequence (less affect on life), with emotional responses having the lowest score of 3.17 (± SD 1.76). There was a higher score for items such as treatment control (treatment was more helpful), timeline (longer time), personal control (more control) and understanding (more illness understanding), with treatment control having the highest score of 7.07 (± SD 2.24). After reversing the score for personal control, treatment control and illness understanding, the total illness perception score was 32.55 (± SD 4.72).

Table 27: **Descriptive statistics of hypertension perception among women who were aware their hypertensive status, N = 102**

Variables	Score		
	Mean	**SD**	**Median**
Consequences	3.99	2.63	4
Timeline	6.35	3.31	6
Personal control	6.03	1.77	6
Treatment control	7.07	2.24	7
Identity	3.51	2.28	3
Concern	4.49	1.47	4
Understanding	5.78	2.74	5.50
Emotional response	3.17	1.76	3

Perceived cause of hypertension

Table 28 shows that the majority of the hypertensive women (n = 65; 63.7%) ranked stress as the number one perceived cause of their hypertension followed by lifestyle (n = 31; 30.4%) and heredity (n = 6; 5.9%).

Table 28: Perceived causes of hypertension by the hypertensive women, N=102

Rank order	Frequency	%
Stress, lifestyle, heredity	56	54.9
Stress, heredity, lifestyle	9	8.8
Lifestyle, stress, heredity	29	28.4
Lifestyle, heredity, stress	2	2.0
Heredity, lifestyle, stress	2	2.0
Heredity, stress, lifestyle	4	3.9
Total	**102**	**100**

5.5 Adherence status to antihypertensive medications among women

This data was collected only from those hypertensive women (n = 102) who were aware of their hypertensive condition before the survey. For the first step, descriptive analysis of all the variables related to medication adherence was carried out. For the second step, associations and inferences of variables with medication non-adherence were performed.

5.5.1 Prevalence of adherence and non-adherence to antihypertensive medications

Among the hypertensive women the mean adherence score was 79.45 (± SD 21.82). At the 80% cutoff level, about half (51%; n = 52) of the women were found to be non-adherent and the other half (49%; n = 50) adherent to their treatment.

5.5.2 Comparing the socio-demographics, CHD risk factor knowledge and CHD risk profile of the hypertensive women based on their medication adherence status

Table 29 summarises the statistics comparing data on socio-demographic factors, other chronic illnesses, monthly household salt consumption, monthly household cooking oil use, CHD risk factor knowledge, knowledge of greatest health problem of women in India and CHD risk factors profile of the hypertensive women who were adherent and who were not adherent to their antihypertensive treatment. Socio-demographic factors

included age, religion, marital status, educational status, work status, type of family, monthly household income. CHD risk factors included data on daily tobacco use, mean SBP, mean DBP, systolic hypertension, diastolic hypertension, blood pressure control, BMI, physical activity, abdominal obesity and family history of heart disease.

It was interesting to identify literate women as being more likely to be non-adherent to medications than non-literate women: 59.6% versus 40.4% respectively ($p = 0.01$). Lower monthly household income (INR ≤8,000) was also significantly associated with a higher medication non-adherence (MNA) in comparison to higher monthly household income (>INR 8,000): 61.5% versus 38.5% respectively ($p = 0.04$).

A univariate analysis, found no significant differences in socio-demographic characteristics such as age, work status, family type and family members between women who were adherent to their hypertensive medications and those who were non-adherent.

Similarly, there was no difference in knowledge of CHD risk factors between these two groups. However, women living in nuclear families were more likely to be medication non-adherent than those living in joint family structures, although this did not quite reach statistical significance: 86.5% versus 13.5% respectively ($p = 0.08$).

Regarding presence of CHD risk factors, a univariate analysis, found no significant differences between women who were adherent to their hypertensive medications and those who were non-adherent. Women who were adherent to their medication had a non-significant higher rate of obesity (76% versus 61.5%), low physical activity (50% versus 38.5%), abdominal obesity (96% versus 88.5%), and family history of heart disease (28% versus 19.2%) compared with those who were non-adherent.

Table 29: Socio-demographics and CHD risk factor profile of hypertensive women compared with their medication adherence status

Variable	Total (N = 102) n (%)	Adherence (N = 50) n (%)	Non-adherence (N = 52) n (%)	P* value
Socio-demographic				
Age (mean ± SD)	48.08 ± 7.44	49.06 ± 7.12	47.15 ± 7.70	0.19
Age group				0.17
<48years	50 (49)	21 (42)	29 (55.8)	
≥48 years	52 (51)	29 (58)	23 (44.2)	
Religion				0.84
Hindu	38 (37.3)	18 (36)	20 (38.5)	
Muslim	64 (62.7)	32 (64)	32 (61.5)	
Marital status				1.0
Currently married	92 (90.2)	45 (90)	47 (90.4)	
Currently not married	10 (9.8)	5 (10)	5 (9.6%)	
Educational status				0.**01**
Illiterate	54 (52.9)	33 (66.0)	21 (40.4)	
Literate	48 (47.1)	17 (34)	31 (59.6)	
Work status				1.0
Housewife	63 (61.8)	31 (62)	32 (61.5)	
Not housewife	39 (38.2)	19 (38)	20 (38.2)	
Type of family				0.08
Nuclear	81 (79.4)	36 (72)	45 (86.5)	
Joint	21 (20.6)	14 (28)	7 (13.5)	
Monthly household income				**0.04**
≤INR8,000	52 (69.6)	20 (40)	32 (61.5)	
>INR8,000	50 (30.4)	30 (60)	20 (38.5)	
Family members				1.0
≤5	67 (65.7)	33 (66)	34 (65.4)	
>5	35 (34.3)	17 (34)	18 (34.6)	
Consumption of vegetables				0.69
≥3–4 days/week	53 (52)	27 (54)	26 (50)	
<3–4 days/week	49 (48)	23 (46)	26 (50)	
Consumption of fruits				0.393
≥3–4 days/week	31 (30.4)	13 (26)	18 (34.6)	
<3–4 days/week	71 (69.6)	37 (74)	34 (65.4)	
Monthlyhousehold salt consumption	1.33 ± 1.09	1.22 ± 483	1.44 ± 1.45	0.306
Monthly household cooking oil use	6.58 ± 2.54	7.01 ± 2.74	6.18 ± 2.28	0.101

Knowledge of CHD risk factors				0.553
Good level of knowledge	51 (50)	27 (54)	24(46.2)	
Poor level of knowledge	51 (50)	23 (46)	28 (53.8)	
Heart attack is women's greatest health problem				1.0
Know	8 (7.8)	4 (8)	4 (7.7)	
Don't know	94 (92.2)	46 (92)	48 (92.3)	
Other chronic illness				1.0
Yes	36 (35.3)	18 (36)	18 (34.6)	
No	66 (64.7)	32 (64)	34 (65.4)	
Presence of CHD Risk factors				
Smoked tobacco users daily				0.36
Yes	5 (4.9)	1 (2)	4 (7.7)	
No	97 (95.1)	49 (98)	48 (92.3)	
Non smoked tobacco users daily				0.47
Yes	22 (21.6)	9 (18)	13 (25)	
No	80 (78.4)	41 (82)	39 (75)	
BMI				0.26
Obese	70 (68.6)	38 (76)	32 (61.5)	
Overweight	15 (14.7)	5 (10)	10 (19.2)	
Normal	17 (16.7)	7 (14)	10 (19.2)	
Self reported diabetes				1.00
Yes	24 (23.5)	12 (24)	12 (23.1)	
No	78 (76.5)	38 (76)	40 (76.9)	
Physical activity				0.31
Active	57 (55.9)	25 (50)	32 (61.5)	
Low active	45 (44.1)	25 (50)	20 (38.5)	
Abdominal obesity				0.27
Yes	94 (92.2)	48 (96)	46 (88.5)	
No	8 (7.8)	2 (4)	6 (11.5)	
Family history of heart disease				0.35
Yes	24 (23.5)	14 (28)	10 (19.2)	
No	78 (76.5)	36 (72)	42 (80.8)	

INR=Indian Rupees; CHD=coronary heart disease; BMI= Body Mass Index* p values calculated using Yates Correction for Continuity chi-square or Fisher's Exact Test where appropriate.

5.5.3 Hypertension and antihypertensive treatment characteristics among women

The descriptive analysis of all the variables related to hypertension, antihypertensive treatment and health care provider behaviour are summarised in Table 30.

Among the hypertensive women (n = 102), the mean duration of hypertension since diagnosis was 57.9 months (±SD 48.7 months; median 48 months). Approximately 45% of the women were on antihypertensive treatment for more than three years with an average duration of 50.6 months (± SD 36 months) (range 5–180 months). Treatment duration was associated with medication adherence with those on treatment for more than three years (36 months) less likely to be to be non-adherent than those with treatment duration of three years or less: 34.6% versus 65.4% respectively (p = 0.04).

At the time of the study, women who were non-adherent were more likely to have systolic hypertension than those who were adherent: 92.3% versus 44% respectively (p = .000). Similarly, women who were non-adherent to medication were more likely to have diastolic hypertension than those who were adherent: 59.6% versus 28% respectively (p = 0.002). Therefore, it was not surprising that most of the women (94.2%) who were non-adherent to their antihypertensive treatment had uncontrolled BP. Only about 6% of the non-adherent women had controlled BP (p = <0.001).

In this study, non-adherent women were more likely to believe that their medications were not available at their local pharmacy than adherent women: 29% versus 4% respectively (p = 0.001). It was seen that the mean cost of antihypertensive medicines per month was less in non-adherence women compared to adherent women: INR113.6 (± SD 89) versus 117.1 (± SD 95) respectively. Among the hypertensive women, 74.5% (n = 76) had been prescribed a single pill by their health care provider and the majority (89.2%; n = 91) were on a single dose regimen. A greater proportion of non-adherent women were prescribed a single pill per day than adherent women: 82.7% versus 66% respectively (p = 0.063).

Of the twomen who were under current treatment, 75.5% (n = 77) reported feeling better with BP medications. A significantly higher proportion of adherent women in comparison to non-adherent women reported feeling better on their antihypertensive medications: 86% versus 65.4% respectively (p = 0.02). Likewise, a higher proportion of

adherent women in comparison to non-adherent women had no complaints of medications side effects: 98% versus 67.3% respectively (p = <0.001). Regarding treatment satisfaction, just 47.1% women were satisfied with their antihypertensive treatment. A significantly lower proportion of non-adherent women in comparison to the adherent women were satisfied with their antihypertensive treatment: 32.7% versus 62% respectively (p = 0.005).

Only half of the total women (52%; n = 53) stated that their treating doctor had treated them in a friendly and courteous manner. A considerably lower proportion of non-adherent women in comparison to the adherence women reported that doctors treated them in a friendly manner: 32.7% versus 64% respectively (p = 0.003).

A significantly higher proportion of non-adherent women were not provided explanations by the doctor regarding the treatment regimen and its likely side effects, compared to adherent women: 73.1% versus 40% respectively (p = 0.001). Likewise, a greater proportion of non-adherent women in comparison to adherent women did not receive an explanation for a medical test by their doctors: 82.7% versus 68% respectively (p = 0.05).

Regarding lifestyle advice, doctors' instructions on salt restriction, losing weight and doing more physical activity were reported by 81.4%, 54.9% and 70.6% of the hypertensive women respectively. Doctors' advice regarding lifestyle changes showed no statistical difference in women's medication adherence characteristics. Surprisingly, no one reported a doctor suggesting they stop tobacco use.

Table 30: Hypertension and its treatment characteristics of adherent and non-adherent hypertensive women: history of hypertension, antihypertensive medications and health care providers' behaviour

Variables	Total (N = 102) n (%)	Adherence (N = 50) n (%)	Non-adherence (N = 52) n (%)	*p value
History of hypertension				
Hypertension duration				0.112
≤4 years	54 (52.9)	22 (44)	32 (61.5)	
>4 years	48 (47.1)	28 (56)	20 (38.5)	
Duration of therapy				**0.04**
≤3 years	56 (54.9)	22 (44)	34 (65.4)	
>3 years	46 (45.1)	28 (56)	18 (34.6)	
SBP				**<0.001**
Present	70 (68.6)	22 (44)	48 (92.3)	
Absent	32 (31.4)	28 (56)	4 (7.7)	
DBP				**0.002**
Present	45 (44.1)	14 (28)	31 (59.6)	
Absent	57 (55.9)	36 (72)	21 (40.4)	
BP under control				**<0.001**
Yes	28 (27.5)	25 (50)	3 (5.8)	
No	74 (72.5)	25 (50)	49 (94.2)	
Antihypertensive medications				
Number of tablets/day				0.063
1	76 (74.5)	33 (66)	43 (82.7)	
>1	25 (24.5)	17 (34)	8 (15.4)	
Dose frequency/day				0.20
1	91 (89.2)	47 (94)	44 (84.6)	
>1	11 (10.8)	3 (6)	8 (15.4)	
Side effect				**<0.001**
Yes	18 (17.6)	1 (2)	17 (32.7)	
No	84 (82.4)	49 (98)	35 (67.3)	
Easy availability				**0.001**
Yes	85 (83.3)	48 (96)	37 (71.2)	
No	17 (16.7)	2 (4)	15 (28.8)	
Feeling better				**0.02**
Yes	77 (75.5)	43 (86)	34 (65.4)	
No	25 (24.5)	7 (14)	18 (34.6)	

Treatment satisfaction				**0.005**
Yes	48 (47.1)	31 (62)	17 (32.7)	
No	54 (52.9)	19 (38)	35 (67.3)	
Cost per month (INR)(mean ±SD)	115.34 ± 92	117.10 ± 95	113.65 ± 89	0.85
Health care providers				
Doctor explains treatment and medication side effects				**0.001**
Yes	44 (30)	30 (60)	14 (26.9)	
No	58 (20)	20 (40)	38 (73.1)	
Doctor treat in a friendly manner				0.**003**
Yes	49 (48)	32 (64)	17 (32.7)	
No	53 (52)	18 (36)	35 (67.3)	
Doctor explain medical test				**0.05**
Yes	25 (24.4)	16 (32)	9 (17.3)	
No	77 (75.7)	34 (68)	43 (82.7)	
Non-pharmacological advice by doctors				
Reducing salt				0.80
Yes	83 (81.4)	40 (80)	43 (82.7)	
No	19 (18.6)	10 (20)	9 (17.3)	
Losing weight				0.327
Yes	56 (54.9)	30 (60)	26 (50)	
No	46 (45.1)	20 (40)	26 (50)	
Do more exercise				0.30
Yes	72 (70.6)	37 (74)	35 (67.3)	
No	30 (29.4)	13 (26)	17 (32.7)	
Stop tobacco use	nil	Nil	nil	

SBP=systolic blood pressure**;** DBP= diastolic blood pressure; * p values calculated using Yates Correction for Continuity chi-square or Fisher's Exact Test where appropriate.

5.5.4 Characteristics of perceived CHD risk and hypertension perception of adherent and non-adherent hypertensive women

This data was collected only from those hypertensive women (n = 102) who were aware of their hypertensive condition before the survey. The descriptive analysis of all the variables related to perceived CHD risk and hypertension perception are summarised in Table 31.

There was a significantly higher proportion of non-adherent women with low perceived CHD risk in comparison to those women who were adherent to their hypertensive treatments: 78.8% versus 38% respectively (p = <0.001). There was also a significant difference between the adherent and non-adherent hypertensive women, with a higher proportion of non-adherent women having an inaccurate self-perception of CHD risk than adherent women: 65.4% versus 38% respectively (p = 0.01). Regarding the perception of hypertension, the mean Brief Illness Perception Questionnaire (BIPQ) score of non-adherent participants was not significantly lower than the mean score of the adherent participants: 32.0 ± 5.3 versus 33.1 ± 4.0. The lower score would translate into the lower level of medication adherence.

Table 31: CHD risk perception, accuracy of CHD risk perception, and hypertension perception of adherent and non-adherent hypertensive women

Variables	Total N=102 n (%)	Adherence N=50 n (%)	Non-adherence N=52 n (%)	*p value
CHD risk perception				**<0.001**
Low	60 (58.8)	19 (38)	41 (78.8)	
High	42 (41.2)	31 (62)	11 (21.2)	
Accuracy of CHD risk perception				**0.01**
Accurate	49 (48)	31 (62)	18 (34.6)	
Inaccurate	53 (52)	19 (38)	34 (65.4)	
Hypertension perception (mean BIPQ score)	32.55 ± 4.72	33.12 ± 4.01	32.01 ± 5.30	0.241

CHD=coronary heart disease; BIPQ=Brief Illness Perception Questionnaire; * p values calculated using Yates Correction for Continuity chi-square or Fisher's Exact Test where appropriate

5.5.5 Factors associated with non-adherence to antihypertensive medications among women

5.5.5.1 Bivariate analysis

Bivariate analysis was conducted to determine the factors associated with non-adherence to medications among hypertensive women (Table 32). The factors significantly associated with non-adherence to antihypertensive medications on bivariate analysis at the p<.05 level were participants' educational status, monthly household income, systolic hypertension, diastolic hypertension, blood pressure control, duration of therapy, number of pills, availability of medications, treatment satisfaction, feeling better with medication, explanation by the doctor regarding the treatment regimen and its side effects, treating doctor friendly, perceived CHD risk and accuracy of self-perception of CHD risk.

The participants who were literate were almost three times more likely to be non-adherent than those women who were without an education (OR = 2.9; 95% CI: 1.3–6.4; p = 0.01). Those women who were living in families with an average monthly income of ≤INR 8,000 were 2.4 times more likely to be non-adherent compared to those living in households with average monthly income of >INR 8,000 (OR = 2.4; 95% CI: 1.0–5.3; p = 0.03).

The participants who had a duration of three years or less of antihypertensive therapy were two times more likely to be non-adherent than those who had more than three years (OR = 2.4; 95% CI: 1.0–5.3; p = 0.031) of therapy. Those who were non-adherent were more likely to have higher average SBP (OR = 15.3; 95% CI: 4.8–48.8; p = <0.001) and DBP (OR = 3.8; 95% CI: 1.6–8.7; p = 0.002).

A prescription for only a single tablet or pill daily had a significant association with non-adherence, with an odds ratio of nearly three times compared to the prescription of more than one pill per day (OR= 2.5; 95% CI: 0.97–6.2; p = 0.06). Women participants who believed that medications were not easily available had an almost 10 times higher chance of being non-adherent to their treatment than those who believed that medications were readily available (OR = 9.8; 95% CI: 2.1–45.2; p = 0.004). Women who had no complaints of the side effects of antihypertensive drugs were about 24

times more likely to be non-adherent than those who had complaints (OR = 23.8; 95% CI: 3.0–187.2; p = 0.003).

The women who were not satisfied with their hypertension treatment were 3.4 times more likely to be non-adherent than those who were satisfied (OR = 3.4; 95% CI: 1.5–7.6; p = 0.004). Similarly, the women who reported not feeling better because of their antihypertensive medications were 3.3 times more likely to be non-adherent than those who reported feeling better (OR = 3.3; 95% CI: 1.2–8.7; p = 0.01).

Women who reported the treating doctor as not friendly had a significantly higher chance of being non-adherent to their treatment (OR = 3.7; 95% CI: 1.6–8.3; p = 0.002). The women who were not explained the treatment regimen and its side effects by their doctors were four times more likely to be non-adherent (OR = 4.0; 95% CI: 1.8–9.4; p = 0.001) than those whose doctor gave exlanations.

Those women who perceived their CHD risk as low had a significantly higher chance of being non adherent to their treatment (OR = 6.0; 95% CI: 2.5–14.6; p = <0.001) than those who perceived their CHD risk as high. Women who had an inaccurate self-perception of CHD risk were three times more likely to be non-adherent than those with accurate self- perception (OR = 3.0; 95% CI: 1.4–6.9; p = 0.006).

Table 32: **Bivariate analysis of factors associated with non-adherence to antihypertensive medications among women. N=102**

Variable	Total n	Non-adherence n (%)	OR (95% CI)	*p value
Socio-demographic				
Age (years)(mean ± SD)	48.08 ± 7.44	47.15 ± 7.70	0.57 (0.26 –1.25)	0.166
Age				
<48years	50	29 (58.0)	0.52 (0.24 –1.16)	0.164
≥48 years	52	23 (44.2)	Reference	
Religion				
Hindu	38	20 (52.6)	1.11(0.49–2.48)	0.79
Muslim	64	32 (50.0)	Reference	
Marital status				
Currently married	92	47 (51.0)	1.044(0.28 –3.85)	0.94
Currently not married	10	5 (50.0)	Reference	
Educational status				
Literate	48	31 (64.6)	2.86 (1.28–6.41)	**0.01**
Illiterate	54	21 (38.9)	Reference	
Work status				
Homemaker/housewife	63	32 (50.8)	0.98 (0.44 –2.18)	0.96
Not housewife	39	20 (51.3)	Reference	
Type of family				
Nuclear	81	45 (55.5)	2.50 (0.91–6.84)	0.07
Joint	21	7 (33.3)	Reference	
Monthly household income				
≤INR 8,000	50	32 (64.0)	2.40 (1.08–5.31)	0.**03**
>INR 8,000	52	20 (38.5)	Reference	
Family members				
≤5	67	33 (49.2)	0.97 (0.43 –2.20)	0.94
>5	35	17 (48.6)	Reference	
Consumption of vegetables				
≥3–4 days/ week	53	26 (49.1)	1.17 (0.53 –2.55)	0.69
<3–4 days / week	49	26 (53.1)	Reference	
Consumption of fruits				
≥3–4 days / week	31	18 (58.1)	1.51 (0.64–3.53)	0.346
<3–4 days / week	71	34 (47.9)	Reference	
Other chronic illness				
Yes	36	18 (50.0)	0.94 (0.42–2.12)	0.88
No	66	34 (51.5)	Reference	

Knowledge of CHD risk factors				
Good level of knowledge	51	27 (52.9)	0.99 (0.45–2.16)	0.99
Poor level of knowledge	51	25 (49.01)	Reference	
Heart attack is women's greatest health problem				
Know	8	4 (50.0)	0.95 (0.22–4.06)	0.95
Don't know	94	48 (51.1)	Reference	
Monthly household salt consumption	1.33 ± 1.09	1.44 ±1.450	1.00 (1.00–1.00)	0.319
Monthly household cooking oil use	6.58± 2.54	6.18± 2.28	.87 (0.74–1.02)	0.103
Presence of CHD risk factors				
Smoked tobacco users daily				
Yes	5	4 (80.0)	1.46 (0.23–9.17)	0.68
No	97	48 (49.5)	Reference	
Non smoked tobacco users daily				
Yes	22	13 (59.1)	1.51 (0.58–3.95)	0.39
No	80	39 (48.7)	Reference	
BMI				
Obese	70	32 (45.7)	0.59 (0.20–1.72)	0.335
Overweight	15	10 (66.7)	1.40 (0.33–5.93)	0.64
Normal	17	10 (58.9)	Reference	
Self reported diabetes				
Yes	24	12 (50.0)	0.95 (0.38–2.37)	0.91
No	78	40 (51.3)	Reference	
Physical activity				
Active	57	32 (56.1)	1.6 (0.73–3.51)	0.24
Low active	45	20 (44.4)	Reference	
Abdominal obesity				
Yes	94	46 (48.9)	0.32 (0.06–1.66)	0.17
No	8	6 (75.0)	Reference	
Family history of heart disease				
Yes	24	10 (41.7)	0.61 (0.24–1.54)	0.29
No	78	42 (53.8)	Reference	
Hypertension				
Hypertension duration				
≤4 years	54	32 (59.2)	2.04 (0.92–4.48)	0.078
>4 years	48	20 (41.7)	Reference	
Duration of therapy				
≤3 years	56	34 (60.7)	2.40 (1.08–5.34)	**0.031**
>3 years	46	18 (39.1)	Reference	

SBP				
Present	70	48 (68.6)	15.27 (4.77–48.85)	**<0.001****
Absent	32	4 (12.5)	Reference	
DBP				
Present	45	31 (68.9)	3.79 (1.65–8.70)	**0.002**
Absent	57	21 (36.9)	Reference	
BP under control				
No	74	49 (66.2)	16.33 (4.49–59.38)	**<0.001****
Yes	28	3 (10.7)	Reference	
Related to antihypertensive medications				
Number of tab daily				
1	76	43 (56.6)	2.46 (0.97–6.21)	0.**057****
>1	26	9 (34.6)	Reference	
Dose frequency				
1	91	44 (48.3)	0.35 (0.08–1.40)	0.14
>1	11	8 (72.7)	Reference	
Side effect				
No	84	35 (41.7)	23.8 (3.02–187.28)	**0.003**
Yes	18	17 (94.4)	Reference	
Easy availability				
No	17	15 (88.2)	9.73 (2.09–45.22)	**0.004**
Yes	85	37 (43.5)	Reference	
Feeling better				
No	25	18 (72.0)	3.26 (1.21–8.68)	**0.01**
Yes	77	34 (44.1)	Reference	
Treatment satisfaction				
No	54	35 (64.9)	3.36 (1.49–7.57)	**0.004**
Yes	48	17 (35.4)	Reference	
Cost per month (mean ±S D)	115.34 ± 92.07	113.65 ± 89.06	1.00 (0.99–1.00)	0.849
Health care related factors				
Treating doctor friendly				
No	53	35 (66.0)	3.66 (1.61–8.29)	**0.002**
Yes	49	17 (34.7)	Reference	
Doctor explain the treatment regimen and its side effects				
No	58	38 (65.5)	4.07 (1.77–9.37)	**0.001**
Yes	44	14 (31.9)	Reference	

Doctor explain medical test				
No	77	43 (55.9)	0.44 (1.75–1.13)	0.089
Yes	25	9 (36.0)	Reference	
Non-pharmacological advice by doctors				
Reducing salt				
Yes	83	43 (51.8)	1.19 (0.44–3.24)	0.727
No	19	9 (47.4)	Reference	
Losing weight				
Yes	55	26 (47.3)	0.67 (0.30–1.46)	0.331
No	46	26 (56.5)	Reference	
Do more exercise				
Yes	72	35 (48.6)	0.72 (0.30–1.70)	0.459
No	30	17 (56.7)	Reference	
Individuals perception				
Perceived CHD risk				.
Low	60	41 (68.3)	6.08 (2.53–14.61)	**<0.001**
High	42	11 (26.2)	Reference	
Accuracy of the CHD risk perception				
Inaccurate	53	19 (35.9)	3.08 (1.374–6.91)	**0.006**
Accurate	49	31 (63.7)	Reference	

OR=odd ratio; CI=confidence interval; INR=Indian Rupees; BMI=Body Mass Index; SBP=systolic blood pressure, DBP=diastolic blood pressure, BP=blood pressure; CHD=coronary heart disease; *p values calculated using Yates Correction for Continuity chi-square or Fisher's Exact Test where appropriate; ** Due to small cell size (less than 10) not included in multivariate logistic model.

5.5.5.2 Multivariate analysis

Multiple logistic regression analysis using the backward stepwise likelihood ratio method was conducted to determine whether the factors could significantly predict medication non-adherence. Factors significantly associated with medication non-adherence on bivariate analysis at $p < 0.05$ level were used in a multivariate logistic model. The variables included in the model were participants' literacy level, monthly household income, duration of the antihypertensive therapy, diastolic hypertension, feeling better with BP medication, treatment satisfaction, perceived CHD risk level, friendly doctor, explanation by the doctor regarding the treatment regimen and its side effects, and accuracy of self-perception of CHD risk.

A multivariate analysis revealed the factors that remained significantly associated with non-adherence to antihypertensive medications among women included the duration of the antihypertensive therapy, explanation by the doctor regarding the treatment regimen and its side effects, treatment satisfaction, perceived CHD risk level and accuracy of self-perception of CHD risk (Table 33). Literacy level, monthly household income, diastolic blood pressure, friendly doctor and feeling better with BP medication no longer remained significantly associated with non-adherence after the multivariate analysis was conducted.

Treatment satisfaction

The women who were not satisfied with their antihypertensive treatment were 11 times more likely to be non-adherent than those who were satisfied (AOR = 11; 95% CI: 2.3–52.9; p = 0.003).

Duration of the antihypertensive therapy

The participating women who had antihypertensive therapy for three years or less were 14.3 times more likely to be non-adherent than those women who had therapy for more than three years (AOR = 14.3; 95% CI: 2.4–85.2; p = 0.003).

Doctor explained treatment regimen and side effects

The women who were not given an explanation of the treatment regimen and its side effects by their doctors were 28.3 times more likely to be non-adherent than those

Table 33: Multivariate logistic regression analysis of factors associated with non-adherence to antihypertensive medications among women

Variables	P value	AOR	95% CI for OR	
Treatment satisfaction	0.003	11.08	2.33	52.87
Duration of therapy	0.003	14.31	2.40	85.18
Doctor explains treatment regime and side effects	<0.001	28.34	4.50	178.40
Perceived CHD risk level	<0.001	153.65	9.29	2539.43
Accuracy of the self-perception of the CHD risk	0.001	188.08	9.80	3606.47

AOR=Adjusted odd ratio; CI=confidence interval; CHD=coronary heart disease.
Variables entered in initial model: prevalence of diastolic blood pressure, participants' literacy level, monthly household income, feeling better with BP medication, treatment satisfaction, doctor friedly, doctor explain treatment regime and side effects, accuracy of the self perception of CHD risk, perceived CHD risk lvel and duration of therapy.

women who had received such explanation (AOR = 28.3; 95% CI: 4.5–178.4; p = <.001).

Perceived CHD risk level

Hypertensive women who perceived their CHD risk as low, were 153.6 times more likely to be non-adherent than those who perceived their CHD risk as high (AOR = 153.6; 95% CI: 9.3–2539.4; p = <0.001).

Accuracy of the self-perception of the CHD risk

Women with inaccurate self-perception of CHD risk were 188 times more likely to be non-adherent to their hypertensive medication than those women with accurate self-perceptions (AOR = 188; 95% CI: 9.8–3606.5; p = 0.001).

5.6 Conclusion

The majority of the previously diagnosed hypertensive study participants who were on treatment were found to be inaccurate in the estimation of their global CHD risk (GCR), as well as being non-adherent to their antihypertensive treatment. This study identified several factors influencing the inaccurate perception of global CHD risk and non-adherence to antihypertensive medications. Factors that were significantly and independently associated with medication non-adherence among hypertensive women are: shorter duration of the antihypertensive therapy, non-satisfaction with the treatment, not receiving an explanation of the treatment regimen and side effects by the physician, low perceived GCR and the inaccurate estimation of perceived GCR. Older age, poor level of CHD risk factors knowledge, and diastolic hypertension was associated with inaccurate CHD risk perception of hypertensive women.

5.7 Summary of the chapter

This chapter described the socio-demographic characteristics, behavioural and physiological profiles, knowledge of heart disease risk factors, and history of hypertension and its treatment obtained from the 500 participants in a low income community in Delhi. It also presented the results regarding CHD risk perception and medication adherence among hypertensive women. The next chapter reports the results of the qualitative data from interviews undertaken with 30 hypertensive women and nine health care providers.

CHAPTER 6

QUALITATIVE RESULTS

6.0 Introduction to the chapter

This chapter presents the analysis of the qualitative data from interviews with 30 hypertensive women and nine health care providers. Major themes were drawn from the analysis using thematic analysis. The presentation of the themes is enhanced with interview quotes that best highlight the issues presented. Participants have been identified by a number to maintain confidentiality.

6.1. Characteristics of the participants

6.1.1 Characteristics of the hypertensive women participants

The selection of the women hypertensive participants for the in-depth qualitative interview depended on their willingness to communicate freely regarding their medical condition and its management, so as to provide sufficient information.[443] Another criterion was women who had at least one-year's experience of living with hypertension. With these inclusion criteria, a purposeful sample of 30 hypertensive women participants from the phase one of the study was invited. None declined the qualitative interview.

Table 34 summarises the socio-demographic characteristics of the 30 hypertensive women. The mean age was 48 years with an age range of 35–59 years. Of the participants, 16 had completed five or more years of education. Eighteen of the 30 women were homemakers and did not work.

The duration of their hypertensive state varied from 1 to 14 years (mean of 6 years); only nine women had treated and controlled BP. The participants in this study experienced symptoms during their diagnoses such as dizziness, headaches and palpitation. Among all the women, two were first diagnosed during their routine antenatal check-up, one during a hospital visit due to an accident, another during a hospital visit due to a surgical procedure, while others were identified when they sought medical attention for their symptoms. Almost all the women participants knew the risk of heart attack connected with high BP.

Table 34: Characteristics of the hypertensive women interviewed

Participants	Age	Education completed	Occupation	Duration of HTN (years)	BP control
P1	49	Can sign only	UL	1	Yes
P2	53	Year 12	NGE	5	Yes
P3	54	Year 12	Homemaker	6	No
P4	57	Can sign only	UL	5	Yes
P5	59	Illiterate	UL	12	No
P6	46	Primary school	Homemaker	1	No
P7	35	Can sign only	Homemaker	1	Yes
P8	55	Can sign only	Homemaker	12	No
P9	40	Illiterate	Homemaker	5	No
P10	55	Illiterate	Homemaker	10	No
P11	55	Can sign only	Homemaker	11	No
P12	59	Can sign only	Homemaker	10	No
P13	46	Year 10	Homemaker	5	Yes
P14	58	Can sign only	Homemaker	12	No
P15	59	Illiterate	Homemaker	4	No
P16	49	Year 12	NGE	1	Yes
P17	35	Year 10	Homemaker	3	No
P18	58	Year 12	Pensioner	1	No
P19	44	Year 10	Homemaker	10	Yes
P20	40	Can sign only	UL	7	Yes
P21	42	Year 10	Homemaker	5	No
P22	44	Primary school	NGE	1	No
P23	38	Year 10	Homemaker	14	No
P24	51	College	NGE	8	No
P25	45	Year 10	NGE	3	No
P26	45	Can sign only	Homemaker	8	No
P27	35	Year 10	NGE	1	No
P28	40	Primary school	Homemaker	1.5	No
P29	59	Illiterate	Homemaker	4	No
P30	59	Year 12	NGE	12	Yes

NGE=Nongovernment Employee; HTN=hypertension; BP=Blood Pressure; UL=Unskilled Labourer.

6.1.2 Characteristics of the health care providers

For qualitative interviews, health care providers or physicians were selected using purposive sampling techniques from government and nongovernment health care centres that were directly involved in providing health care services to a large number of patients with hypertension from low-income urban areas in Delhi. Before the interview, each participant was contacted by phone. In all, 12 physicians were approached on the basis of gender, experience, their association with private practices, practices at government health facilities and their association with nonprofit organisations. Three of the 12 physicians did not respond to the contact. The researcher made an appointment with the nine physicians who responded and interviews were conducted in the month of October, 2015.

Among the nine physicians, six were female and three were male. Seven physicians were general medicine specialists and two were cardiologists. Three physicians worked for government health facilities, three for private health facilities and two were self-governing private practitioners. They had an average of 16 years of clinical experience after their training (range, 7–25 years) (please see Table 35)

Table 35: Characteristics of the health care providers interviewed

Participants	Sex	Health facility	Years of experience
Ph1	Female	Private	12
Ph2	Female	Private	10
Ph3	Female	Private	23
Ph4	Female	Government	15
Ph5	Female	Government	18
Ph6	Female	Private	20
Ph7	Male	Government	7
Ph8	Male	Private	14
Ph9	Male	Private	25

6.2 Summary of the hypertensive women and health care providers' responses

Present study aimed at finding out the hypertensive women and health care providers' perspective on women's medication adherence behaviour in hypertension management. From the analysis of hypertensive women and health care providers' responses, this study identified several themes which were organised under four categories:

1. factors inhibiting medication adherence
2. factors facilitating medication adherence
3. women's expectation related to their hypertension management
4. suggested strategies to improve women's medication adherence.

6.2.1 Factors inhibiting medication adherence

Even though almost all participating women were aware of the complications of uncontrolled hypertension, such as heart disease and stroke, 14 of the participants said that they did not always take their antihypertensive medications as prescribed. Factors that inhibited women from using their medications as prescribed could be classified into three major themes: patient related, issues with health care providers, and issues in health care service delivery. The reasons for non-adherence identified by physicians

were patient related and health system connected. An overview of themes and related sub-themes under the category 'factors inhibiting medication adherence' are summarised in Table 36.

Table 36: Reasons for non-adherence

Categories	Themes	Related sub-themes (patients' perspective)	Related sub-themes (health caeproviders' perspective)
Factors inhibiting medication adherence	**Patient related**		
	Perception of disease and health belief	▪ Knowledge of hypertension and its management ▪ Views on personal CHD risk ▪ Feeling good physically	▪ Belief regarding hypertension and its management ▪ Perceived CHD risk ▪ Lack of education
	Treatment perception	▪ Lack of knowledge about hypertension treatment (treatment duration, medication side effect, how it works) ▪ Medication satisfaction	▪ Treatment belief ▪ Treatment duration ▪ Multiple medicine prescription
	Family or social Support	▪ Lay belief of hypertension ▪ Family crisis ▪ Domestic works ▪ Lack of companion to visit health facilities	▪ Lack of family cooperation ▪ Lack of companion to visit health facilities ▪ Family commitments ▪ Less prioritiy ▪ Tendency for saving money for other reason
	Forgetfullness	▪ Busy schedule	▪ Being too lazy to have medications
	Issues with health care providers	▪ Physicians attitude ▪ No explanation of treatment regimen ▪ Lack of risk communication	-
	Issues with health care service delivery	<u>Government service</u> ▪ Non-availability of medicine ▪ Quality of medicine ▪ Long waiting time to procure medicine ▪ Distance and travel cost ▪ Ill-mannered staff <u>Private service</u> ▪ Cost of medicine	<u>Government service</u> ▪ Frequent visit to collect medications ▪ Non-availability of medications ▪ Inflexible hospital timing <u>Private service</u> ▪ Cost of medicine

6.2.1.1 Patient related factors

This section presents findings related to patients' knowledge of hypertension, perceptions of treatment and CHD risk, family support, and forgetfulness**.**

Knowledge of hypertension and its management, perceived CHD risk and health beliefs

In the interviews, women participants were asked about their perceptions of the most important factors to control high BP. Five of the women did not consider taking medication as a priority to control their BP. They believed that they could control their blood pressure more effectively through drinking lots of water. As one woman stated,

> *'The most important thing is to increase my intake of water. As many older people told me that more water intake helps in lowering the BP more effectively.'* (P24)

Another woman commented,

> *'In my opinion, drinking lots of water is the most important thing to control my high BP. Taking medicines is also important, but it would have been great if one does not require using the medicines.'* (P21)

Two women considered consuming less salt and taking morning walks as the most important;

> *'Consuming less salt is most important. In my view, medication is less important than salt. If my dietary restrictions fail to control my high BP, then I have to use medications as the last option'.* (P7)

One woman felt that refraining from eating oily and fried food was the most important factor to control her BP; another woman felt losing weight was the most important task to control high BP.

In the interviews, hypertensive women were asked about their risk of having a heart attack. Patients' perceived risk motivated them to make life style changes and engage in prevention after receiving advice from family and friends. Some non-adherent women believed that if they had a heart attack then it is God's will. As one illiterate older woman commented,

'I never think that I may encounter that chance associated with heart attack. I leave everything on GOD's mercy.' (P5)

Anther younger women who completed primary school said,

'If I have to die I will die! Nobody could stop that. Since it is Almighty's will!' (P6)

Three women associated their heart disease risk with the intensity of high BP symptoms. One woman who was a home maker said,

'When my physical problem increases such as palpitation due to high BP, I feel that I may have a heart attack.'(P9)

In the study, some physicians reported disappointment with their efforts to improve patients' CHD risk perception. According to the physicians, in spite of their counselling, women patients did not understand the seriousness of heart disease risk as a consequence of their uncontrolled BP. The physicians attributed this to women's low level of education, and misconceptions. As one physician working in a private primary care health facility commented,

'Many of them (women) don't take their heart disease risk seriously ... they feel that the consequences of uncontrolled hypertension will never happen with them. I don't know why they have this notion ... they believe that getting a heart attack is the God's wish. If someone is supposed to get a heart attack, nobody can prevent it. So these women don't bother to take precautions for getting a heart attack.' (Ph1)

Another physician working in a government health care facility said,

'I think … among women who do not adhere to their treatment, most of them do not know the risk involving a heart attack as a consequence of uncontrolled high BP.' (Ph7)

Seven women stated that they did not take their medications when they had felt well. The comments of two women serve as examples:

'When I feel better, I think my BP is under control; I stop taking the medication on my own. When I feel sick, I simply restart my medication. I

don't like to take the pills every day. Let's see what will happen if I skip my medication! (P5)

'If I remain to stabilise for couple of weeks, I usually consume half of my prescribed medicines on my own, without consulting my doctor; this is my personal decision. It has nothing to do with the doctor. Whenever I feel better, I simply discontinue my medication'. (P16)

Some of the participating physicians also recognised the asymptomatic nature of hypertension related to MNA. As one physician commented,

'When they are being diagnosed to be suffering from high blood pressure ... we start their treatment. After some time, once they become symptoms free and when they come to know that their BP has become normal; they feel that they need not to continue their medication for the extended period. They stop taking their medication abruptly on their own.' (Ph5)

Treatment perceptions:

Concerns and fear were expressed by some women regarding the use of their antihypertensive medications regularly. Among them, two women expressed the opinion that the long-term continuous use of medications would have an impact on important organs of the body and body system.

'Doctor prescribed me three drugs per day. But my husband told me not to take these BP medications daily as these drugs may increase my usual temperature. That's the reason I avoid taking the medications daily.' (P4)

Another woman even expressed fear of becoming addicted to using antihypertensive medicines.

'*I don't want the medications to affect my kidneys nor would I like to become addicted to these medications.'* (P20)

Similarly, one physician stated,

'*Some of the patients believe that if they start taking medicines, their body will become habituated to it and eventually they will need to take these*

medications regularly on a life-long basis. So they think if they use other ways to control BP that will be a better option for them.' (Ph5)

A long duration of treatment affects treatment adherence. Two participants expressed their concern regarding the long duration of antihypertensive treatment;

'I have been using medicines for my BP for fourteen years and at this point, I do not feel like to continue my medications.' (P23)

'I do not prefer to prolong treatment by the doctors. I believe by God's blessing my treatment may get shorter.' (P5)

Physicians also recognised prolonged treatment duration *as one of the reason for MNA.* As one physician commented,

'*Patients generally don't want to go for medicine for a longer period of time ... When they are symptom-free; they don't bother to take medications anymore.'* (Ph1)

Prescription of multiple medications due to comorbidities such as diabetes, thyroid, and high cholesterol was frequently reported by the participating physicians as treatment-related factors associated with MNA of hypertensive women. One physician commented,

'As per my experience, poor adherence is linked to multiple medicines on the daily basis. I don't see simple hypertension cases. Most of the hypertensive patients have other problems too. Like diabetes, thyroid, etc. So, we are also helpless, but we need to prescribe multiple medicines.' (Ph6)

Among the non-adherent participants, four women stated that, as they were not satisfied with their current treatment, they hesitated to take medications continuously. Uncontrolled BP was perceived by them as one of the reasons for not being satisfied with the medication. For example, two women commented:

'*I am not satisfied with my current medicine for high BP ... it is still high. I visited my doctor for this purpose and asked him to change the medicine ... But he did not bother to say anything further in these contexts. He only*

advised me to minimise the intake of my salt consumption in my diet, refrain myself from greasy and fatty foods and I have to lose my weight.' (P2)

'I am not satisfied with my BP medications; it does not work effectively on me. Infrequently, some physical problems happen with me due to my high BP'. (P17)

Family support and forgetfulness:

Five participants stated that they had non-supportive family members. Perceptions of hypertension were very much responsible for non-support of the family members. These conceptions were expressed in the following comments:

'Most of my family members feel since I underwent an operation in the past and I have had many domestic problems, and they think … these circumstances are responsible for my high BP.' (P3)

'My family members do not take my problem of high BP acutely. They don't care about the risk involved in high BP neither they care whether I live or die. Even if I die today, they are least concerned about me!' (P23)

Two participants also claimed that, as they were busy with their work and daily life commitments in the family they often forgot to adhere to their medications.

6.2.1.2 Issues with health care providers

The majority of the women with low-adherence were not satisfied with the way physicians dealt with them. They indicated that they were not able to discuss their health status freely with the doctor since the consultations were hurried.

'Whatever we say to doctors, they simply do not listen to our wordings. They only advise, since we have high BP, just keep on taking the medications. Most of the doctors are mannerless, and they use foul language. As a result, I avoid asking them anything ... If we could have found any good doctor who sympathises with us, we would have shared our medical problems with him or her as we could easily relate to them.' (P17)

Only two women said that their doctor informed them that they might experience some side effects at the time of the initial diagnosis. Five participants stated their doctor did not make them aware of the prolonged duration of the treatment or the need to keep taking medicines on a regular basis, without fail. One woman stated,

> *'No, the doctor did not say to continue my medicine lifelong. He wrote nothing in my prescription.'*(P3)

Another woman said,

> *'If my family doctor could have said that I have to take my BP medications daily, then I may continue to take my medicines on a regular basis ... its doctor's fault! The doctor should have told me that I have to take my medications regularly and lifelong. If I already do so many things, I don't mind taking extra medications for my high BP to save my life!'* (P8)

Regarding lack of information about the risk associated with uncontrolled BP, one participant commented,

> *'If I could have been aware of the risks such as heart attack, paralysis or brain haemorrhage involved with high BP, I must have been taking the medicines daily without fail ... Doctor never told me any such risk associated with high BP.'* (P3)

This study has found that none of the participating physicians used CHD risk assessment tools (a detail of CHD risk assessment tools has been explained in chapter 2) to communicate the individualised CHD risk to the women they were treating. They claimed they found the risk scoring tool difficult to use daily in a clinical context. The main reasons for not using risk scoring tools, as acknowledged by the physicians were workloads, not interested, lack of staff, work protocol and lack of staff to assist them. A physician at a government health facility stated,

> '*For treatment of the patients, we follow the standard guidelines. It is important to calculate the risk, but no one could have helped us to do that. We explain patients their risk according to the circumstances and advise them for a followup regularly. And I believe this is being followed in private practices also.*' (Ph5)

A physician at a private health care facility commented,

> *'No, that is not possible at the busy centre like ours. Workloads on doctors are so high that it is not feasible to calculate the actual risk by using charts. For that, we need to keep a separate group of staff who can sit, calculate and maintain those records. At present, what we do is the proper treatment that is more important than calculation'.* (Ph2)

Most of the patients reported having blood tests performed to assess their blood sugar, cholesterol levels or other blood tests. They did not understand the reason for the test. A few assumed that they had been tested for their heart disease risk even if their physicians had not mentioned it. No patients interviewed recalled having had information conveyed by their physicians concerning their personal CHD risk after tests or physicians explaining their results to them.

> *'My doctor advised me for some tests. But he has never mentioned these tests were meant for measuring heart attack risk or not.'* (P11)

6.2.1.3 Issues with health care facilities and service delivery

Consistent with the participants' experiences, health care facilities and delivery of the services had some influence on hypertensive treatment adherence. Fiive patients preferred government health facilities and the others preferred private health facilities. A common reason given for going to government health facilities was free medications for hypertension. In spite of the availability of free medications, the majority of the women did not prefer government services. Also, government health services were either not available in their locality or participants were not aware of the services.

The reasons given by the participants for not preferring government health services were: long distances, ill-mannered staff, poor quality of medicines, unavailability of drugs, long queues, lack of a companion to visit health facilities, overcrowding, uncaring doctors, and doctors not giving much time to the patients. Some patient comments regarding the health care system were:

> *'I had a bad experience at a government hospital. As the medical staff there, at large are very impolite and manner less. Once they threw my OPD registration card at my face. That's the reason I prefer going to private GP.'* (P14)

'I prefer to go to government hospitals as they provide free medicines. But the major problem is that there are always long queues to register you at general OPD. After that even for getting myself scheduled at doctors chamber there is all the time another long line. That's the reason I have to spend the whole day in simply standing in the lines. And at times, while standing in the lines my turn does not come up.' (P16)

The conversations also revealed that patients were unlikely to continue private treatment because they could not afford it, due to their economic status. As one patient commented,

'My whole day gets wasted in procuring my medications from government hospital. So I go to private medical doctor for my treatment even though it is expensive. That's why; I am forced to quit my treatment whenever I feel better.' (P11)

Health system factors that were related to MNA highlighted in the physicians' interviews were: need frequent visits to the government health facilities to collect medications, non-availability of subsidised medication, and the cost of private medications. Some physicians' comments regarding health systems associated factors were:

'The women need to come repeatedly for collecting the drugs which itself is a time-consuming task. Most of the health facilities provide 7–15 days medicine only.' (Ph3)

'*They (working women patients) simply cannot afford to lose their daily earnings for collecting medications*.' (Ph9)

'*Occasionally medicines are not available in the government health facilities. Some women from low-income areas cannot afford to buy these medicines from private chemist shops'.* (Ph4)

However, one physician did not think that medication cost was a significant factor in low adherence to medications,

'Yes sometimes I don't feel so … cost of medicine is an important cause of non-adherence. In our dispensary we at times give free medicine to the

patients who are unable to buy … still they would like to avoid taking medicine!' (Ph1)

6.2.2 Factors facilitating medication adherence

Sixteen of the participants stated that they were taking their antihypertensive medication as prescribed. Participating women and physicians suggested four themes of factors that motivated women to use their medications as prescribed: remain physically fit, trust in medicine and physician, family and social support, and integrating routine to aid medication adherence (please see Table 37).

Table 37: Motivating factors for adherence

Categories	Themes	Related sub-themes (patient's perspective)	Related sub-themes (health providers' perspective)
Factors facilitating medication adherence	**Remain physically fit**	▪ Avoiding physical manifestations ▪ Fear of getting heart attack and even death ▪ Past event in the family	▪ Awareness of risk ▪ Young kids to look after ▪ Family history
	Trust in physician	▪ Belief in the benefits of medication	▪ Young age ▪ Education
	Family and social support	▪ Supportive family ▪ Family responsibilities ▪ Considerate health care providers	▪ Supportive family ▪ Family history ▪ Domestic work
	Integrating routine to aid in medication adherence	▪ Fixed timing to have medications	-

6.2.2.1 Remain physically fit

Eight women commented that they took their medicine regularly to stay physically fit and to avoid symptoms of hypertension.

Fear of a heart attack

The fear or knowledge that they could suffer from a heart attack or stroke and even death if they do not control their high BP was a significant reason for medication adherence.

'If I do not take my high BP medications I feel a severe headache and pain in my neck. Even there is a risk of heart attack or paralysis. If I die of a heart attack, the life is over but If I have to live with this disease throughout my life, who will look after my family and me ... That's the question I am worried about. So I am taking my medications as advised by my doctor.' (P15)

'I fear that I may have a heart attack; even death at times. So I always take my medications regular basis.' (P18)

Past event in the family

Two participants had a family history of heart attack and stroke. So, they made sure to take their medications on a daily basis to prevent their future heart attack risk. One woman said,

'*In the past, my sister had some heart problems, and my father had brain haemorrhages due to uncontrolled high BP. Because of these instances, I feel afraid that it may happen to me anytime ... this invisible fear motivates me to continue my medications.* (P13)

Another woman commented,

'My father had thrice heart attack and ultimately he died of heart attack ...
If I do not take my high BP medications...there is a risk of heart attack or paralysis. Hence, I am taking my medications as advised my doctor'. (P15)

Participating physicians also acknowledged that family history of heart attacks could make patient serious about their heart disease risk. As one physician commented,

'If they (hypertensive women) have a previous family history of the heart attack then they think their heart attack risk seriously. Otherwise, they do not appreciate.' (Ph9)

Family commitments

The family commitment was also perceived by four participants as another factor for taking high blood pressure medication on a regular basis. Family obligation included responsibility for household work and looking after young unmarried children. As one woman commented,

'Since I have to do lot of household works, if I do not take my medication regularly, am afraid it will affect my health ... so I have to take my medicine daily.' (P10)

Another woman commented,

'I take my medication daily. I have family responsibilities ... as my unmarried children have to be married in time.' (P19)

6.2.2.2 Trust in physician and medicine

Belief in medicine and the physician affects medication adherence. One participant expressed her feeling about the relationship with her physician,

'*I have full faith in my doctor, and I believe him; I am dependent on him regarding my treatment. I have full confidence in him that he will never give me too many medicines unnecessarily.'* (P30)

Physicians reported that young age and education level of participants were related to good medication adherence. As one physician commented,

'I tell them to take medicine continuously as advised. Old and middle aged women are not worried. Young and educated women have faith on us, if they are hypertensive, they want to come out of it; they are willing to take medicine. Especially, aged women do not understand the importance of taking medicine.' (Ph1)

6.2.2.3 Family and social support

For taking antihypertensive medication properly, five participants did get support and motivation from their family members. One woman stated,

'*Family members are very caring and supportive about my high BP problem. They always enquire whether I have taken my medication on time or not.'* (P28)

Most physicians also identified supportive family and awareness of the consequence of high BP as an important factor associated with high medication adherence. As one physician stated,

'When we describe them the consequences of uncontrolled hypertension … and if their family is supportive then they become strict to their regime'. (Ph1)

6.2.2.4 Integrating routine in daily life to aid in medication adherence

Adherence to treatment was easier if the medication was taken in the morning. In this case, the majority of participants had associated their medication with their breakfast or had invented different tricks to remember it. For example, participants commented:

'I put down all my medicines in a box, and this box is being kept in kitchen'. (P25).

'I take my medications just after having my breakfast'. (P21)

6.2.3 Expectation regarding hypertension management

When women were asked about their expectation regarding hypertension management, most expressed their desire for caring and sympathetic physicians who should educate them on hypertension and its management without getting annoyed. Some of the women further stated that awareness programs by health educators should be implemented at the household level so that the majority of the women can get benefits. Apart from the education, participants expected their prescribed antihypertensive drugs should be useful and efficient to control their BP. Private practitioners should prescribe cheap and effective medicine.

Some women conveyed willingness to get a regular supply of free, good quality medicine from government health facilities. They stated that this would help them to control their condition. Patient comments regarding their wishes for disease management were:

'I wish I could have persons who may sympathise with me, ask me whether I have taken my regular medications and done medical tests then perhaps I would have felt happy and would have recovered from my medical problems sooner.' (P17)

'I wish there could be some real and effective drugs available which may stabilise my high BP and perhaps some medical test which can precisely predict why my BP simply cannot be under control?' (P1)

"I wish if I could have a good supply of quality medicines regularly in government facilities then I could have visited goernment hospital for my medications.' (P11)

6.2.4. Strategies to improve women's medication adherence

In this study, physicians suggested strategies related to counselling and education, and health service delivery. Physicians recommended that counselling should be continuous and regular every time a patient made a clinic visit, and include the patient's spouse and other family members. They echoed the importance of communicating with the patients and expressed that it was largely their job to educate them. However, they pointed out that additional staff is always necessary for them for regular health counselling and followup the patient. Some physicians' comments regarding the counselling were:

'First of all, we have to educate them, not only them but also their children or husband. We have to teach them that hypertension is a long term disease, and it needs to be managed on a long-term basis.' (Ph4)

'One sitting of counselling in our chamber is not sufficient for the patient. It should be continuous and regular process.' (Ph1)

To improve MNA, some physicians recommended outreach services to teach women at community level and for health care services delivery. One physician commented,

'If *the government takes an initiative and trains community health workers to visit women at their house to measure their BP, provide them subsidised medicines and arrange for a blood test when need in a fundamental way … I think this procedure can help to control BP of these group of women and prevent their future heart attack risk.'* (Ph8)

The physicians also recommended that, if possible in their busy schedule, doctors should explain the prescribed medication in patients' languages as well as write detailed instructions on prescriptions. Private practitioners should prescribe cheap and effective medicines. Apart from this, they also suggested the free supply of medication from government facilities be for a longer period of, at least, 15–30 days as a shorter duration of medication supply causes non-adherence. As one physician commented,

'Most of them (women patients) are working. They do not get leave from their workplaces to collect medications at regular interval. Their work schedules interfere with their medications adherence behaviour.' (Ph3)

6.3 Conclusion

In conclusion, the present study identified several issues relevant to the medication adherence of women patients with hypertension. The results indicated that barriers to medication adherence for antihypertensive treatment included: low awareness of the conditions of the disease, an undesirable outlook toward antihypertensive medications and dissatisfaction with the attitude of health care providers and health care services.

6.4 Summary of the chapter

This chapter described the characteristics of 30 hypertensive women and nine health care providers who were interviewed. It presented the analysis of participants' responses. The next chapter describes an overview of the study design, discussion of the findings for each objective, recommendations and a concluding statement.

CHAPTER 7

DISCUSSION, SIGNIFICANCE, RECOMMENDATIONS AND CONCLUSIONS

7.0 Introduction to the chapter

This chapter describes the study design and discusses the findings for each objective. The chapter also makes recommendations, discusses the significance of the study, notes limitations of the study and makes a concluding statement.

7.1 The overview of the study design

Based on the need for a better understanding of medication adherence of urban low-income women in India, a mixed-method design was chosen for the research study. The rationale for this form of research is that using both qualitative and quantitative research methods, can provide a better understanding of a research problem or issue than either of the research approaches alone.[410] In this study, complementarities were accomplished using both the approaches together. In such a combined approach, the dominant research mode can be enhanced by results from the other method type.[411]

In present study, the dominant component was quantitative with the supplementary component being qualitative. Quantitative and qualitative data were collected both concurrently and sequentially.[411] The quantitative survey provided information on how many women were hypertensive, how many were on antihypertensive treatment, how many perceived their global CHD risk inaccurately and how many women were not adherent to their antihypertensive treatment, and finally factors that were associated with these results. The qualitative semi-structured interviews explored the perceptions of hypertensive women and health care providers about the reasons that hamper or facilitate antihypertensive medication adherence.

The two methods used together allowed a more holistic understanding of medication non-adherence (MNA) in this population. The mixed-method approach helped offset the weakness in one approach with a more nuanced understanding given by the other, and in the process assisted with explanation and contextualisation of the findings. Table 38 summarises some of the examples of the complementarities (i.e explanation and

context) of the mixed methods approach in this study, followed by explanation on some aspects of offsetting the weaknesses.

Table: 38 Examples of complementarities of the mixed methods approach in this study

Quantitative findings	Qualitative findings	Pragmatic explanation of issues raised
Inaccuracy of the self-perception of the CHD risk was significantly associated with MNA of the hypertensive women	Some non-adherent women believed that heart attack risk was due to divine will while others associated their risk with the severity level of their hypertensive symptoms	Explanation: Most of the women did not understand the seriousness of the condition due to misconceptions and inadequate knowledge of CHD risk factors, treatment and consequences of MNA
Women who had not been explained the treatment regimen and side effects of medications by their doctors were significantly more likely to be non-adherent	Concerns and fear were expressed by the low adherent women about the long term use of regular medicines. Some even expressed fear of dependence on antihypertensive medicines	Explanation: Hypertensive women had lay beliefs regarding hypertension, its treatment and management. The qualitative findings explain the inadequate knowledge and belief of women in the study
Women with shorter duration of hypertension were significantly less likely to adhere to treatment	In response to the mild symptoms of high BP, some patients stopped or reduced their daily doses without consulting their health care providers	Context: Recent diagnosis may be associated with mild hypertension, fewer symptoms and fewer complications, which leads to complacency among patients
Women who were not satisfied with their treatment were more non-adherent than those who were satisfied	Uncontrolled BP was one of the important reasons that women were not satisfied with the medication	Context: Poor BP control might be attributable to inadequate medication therapy. When physicians assess patient's global risk of CHD, they are more likely to recommend risk-reducing therapies

Offsetting the weaknesses

Mixed methods are used in some studies because the weaknesses of one method can be compensated by the strengths of another.[450] One of the central constructs in the

quantitative arm of the study—medication adherence—was measured using a single item with a binary response. Participants were expected to answer 'yes' or 'no' to the question of whether they had missed any of their doses for high BP in the last seven days. Unlike the structured interview, the qualitative interviews were able to extensively explore the underlying issue of not taking the drugs and the impact it has on patients' medication adherence behaviour.

It should be noted that the Health Belief Model (HBM) was used to help inform the selection of the variables related to the research objective, the development of the hypothetical model, and the design and construction of the questionnaires (please see chapter 4). The model is useful in predicting the likelihood of a person taking recommended preventive health action and to understand an individual's motivation and decision-making about seeking health service. In this respect, the model has been found to correlate well with medication adherence.[408] A major feature of this model holds that the patients have choices and can make reasonable decisions regarding their health.[397]

7.2 Discussion of findings and response to study objectives

7.2.1 Objective one: *Assess and stratify global CHD risk among women living in a low-income urban area of Delhi, India*

This section discusses the findings of the prevalence of major CHD risk factors among women in a low-income urban area in Delhi. This is followed by a discussion of the findings regarding the stratification of global CHD risk among this population using the NHANES non-laboratory-based risk score.

Hypertension

The study found the prevalence of hypertension of 35.2% among women in a low-income community in Delhi. This is similar to hypertension prevalence among urban women found in other Indian studies where they ranged from 21%–48.2%.[64, 267, 269, 437, 451-453] In the current study among hypertensive women, 58% were aware of their hypertensive status, 46.5% were currently on treatment, and only 15.9% had BP under control. These results closely reflect those from a population-based cross-sectional study spread across Delhi of hypertensive women aged 20–59 years, where 60.8%

were aware of their diagnosis, 49.7% were taking treatment, and only 14% had controlled BP.[451]

Diabetes

Among participating women the prevalence of self-reported diabetes was 11%. This prevalence was found to be high, given the fact that an enormous number of patients with diabetes mellitus frequently remain unaware of their diabetic status.[85] Conversely, this rate of prevalence was lower considering the estimates using bio-medical diagnostic tools for diabetes (range: 12.1%–14%) from different parts of the country.[454, 455] This difference between measured and self-reported diabetes prevalence suggests a high burden of undiagnosed diabetes.

Coexistence of hypertension and diabetes

Hypertension may precede the onset of diabetes. People with co-existing diabetes and hypertension are at increased risk of developing atherosclerosis and coronary heart disease.[456] In the present study, nearly one-fifth of the hypertensive women (18.2%) had co-existing self-reported diabetes, which demonstrated that the substantial burden of diabetes and hypertension is on the rise in India. This result was consistent with India's Twin Epidemic (SITE) cross-sectional study conducted in 10 Indian states where diabetes and hypertension were co-existent in 20.6% patients.[457]

Physical activity level

Approximately 38% of the women studied had a low physical activity score (MET-minutes per week), comparable to recent studies conducted in 11 cities across India[458] and a slum in Brazil[106] where the physically inactive rate among women was 46% and 27.3% respectively. Household chores and transportation may represent a substantial proportion of women's total activity in the low-income area. However, studies that include all social classes had reported a higher level of physical inactivity. The prevalence of physical inactivity was reportedly higher (66.8%) among women in a study conducted in Chandigarh, capital of India's prosperous state Punjab.[458]

Overweight and obesity

The mean Body Mass Index (BMI) in the present study was 24.53 ± 4.87, which was comparable to the mean BMI 25.0 ± 4.9 among women reported in a study in north

India.[459] It was found that in the current study, more than half of the women (52.6%) were overweight and had obesity (BMI≥23 kg/m^2). CHD risk and metabolic syndrome begin to increase above BMI 23 kg/m^2. [460] This result was comparable to a five-city study in India by Singh et al. where 51.6% of women had overweight and obesity.[460]

Among the studied women, abdominal or central obesity was more prevalent than generalised obesity defined by BMI. In the present study, an analysis based on waist-circumference (WC ≥80 cm) and waist-hip ratio (WHR ≥0.85) showed that 66.6% and 82.8% of women respectively had abdominal obesity. These results were consistent with studies in North India[459] and Kerala[461] where abdominal obesity was found among women at a rate of 74.8% by WC and 85.6% by WHR respectively. It was also comparable to another study conducted among women in a Mumbai slum, where 57.1% and 72.2% of the women had abdominal obesity using WC and WHR respectively.[462]

In the current study, an estimated two-thirds of the women had abdominal obesity as assessed by multiple parameters, which was of considerable concern because abdominal obesity is one of the key determinants of insulin resistance, an important component of metabolic syndrome and the major CVD risk factor in all populations. Traditional explanations for the increase in obesity include reduced physical activity and consumption of high-fat diets.[463]

Tobacco use

Among the study participants, the prevalence of tobacco users was 28.2%; the prevalence of smokeless tobacco users (17.8%) was higher compared to the smoked tobacco users (10.4%). These results are consistent with previous studies. According to the Global Adult Tobacco Survey (GATS) report 2009–2010, 18.4% of females were current smokeless tobacco users in India.[127] Studies in urban slums in Delhi and Haryana found self-reported smoked tobacco use among women 10.3% and 9.1% respectively.[464]

In the present study, 9% of women had a family history of heart disease as diagnosed by a health care provider which was comparable to a study where 6% of urban women had a first-degree relative with a history of heart disease.[465] The high prevalence of CHD risk factors in the current study confirms a reverse social gradient of CHD risk

factors in that people from lower socioeconomic groups and women suffer the highest rates of CHD and levels of various risk factors.[97]

Stratification of global CHD risk

In the present study, using the NHANES non-laboratory-based risk score alone, it was found that 7% of the study population were at high risk (>20%) of developing a fatal or nonfatal CHD event over the next five years. The finding was consistent with an observational study carried out in Bangladesh, Guatemala, Mexico, and South Africa. Across all sites, of the 4049 community members who had completed NHANES screening, it was found that 6% had a five-year CHD risk of >20%.[466] The prevalence of high CHD risk in the current study was comparable to studies that reported the prevalence of high CHD risk (>20% chance of developing a CHD event over 10 years) in other countries such as Pakistan (10%)[467], Malaysia (6%)[468] and Seychelles (5.1%).[469] The present study, disturbingly, estimated one-fourth of the women (24.8%) had ≥ 10% risk of developing fatal or non-fatal CHD in the next five years. This is a stark indication of the high burden of CHD diseases that can be expected in the near future to arise in the low income urban Indian population.

7.2.2 Objective two: *Examine hypertensive women's perceptions of their global CHD risks and evaluate its relationship with socio-demographic variables and their knowledge of CHD risk factors*

This section discusses the findings related to women's level of accuracy in estimating their perceived global CHD risk (GCR). This is followed by a discussion of the results about predictors of inaccurate perception of CHD risk. In the current study, a five-year risk was chosen, rather than ten-year risk, to assess the perceived GCR because it was thought to reflect more realistic expectations about near future events, based on current state of health.[16]

Inaccurate estimation of global CHD risk

In the current study, there was a low agreement between calculated and perceived GCR of women, which was in line with other studies.[16, 470] More than half (52%) of the studied hypertensive women of the low-income community were inaccurate in assessing their GCR (heart attack) in the next five years. The result is comparable with

a study outcome in the Netherlands done by Frijling et al.[17] where the researchers compared calculated to perceived GCR in 1194 patients with diabetes mellitus and hypertension. The rate of inaccuracy was 42% for a heart attack. In another study in North Carolina, where Kreuter et al. compared perceived risk with calculated heart attack and stroke risks in a sample of 1317 participants, 65% of participants had an inaccurate perception of their risk.[247] In the current study, a majority of the inaccurate participants under-estimated their CHD risk (rather than overestimation), which was consistent with other studies.[246, 247, 471, 472]

Accurate understanding of the CHD risk

In this present study, approximately 45% of hypertensive women at medium and high risk of a heart attack had an accurate understanding of their risk. Also, nearly 73% of low-risk women accurately identified their low-risk status. However, the study by Christian et al.[230] revealed slightly different results. She found 71% of ethnic women with medium and high likelihood of heart attack had an accurate understanding of their risk, but only 52% of low-risk women accurately identified their low-risk status.

Predictors of inaccurate CHD risk perceptions

In this study, backward multiple regression analysis demonstrated that age, knowledge level of CHD risk factors and diastolic hypertension were the significant predictors of inaccurate perceptions of CHD risk of hypertensive women.

Older age

In this study, older age predicted inaccuracy of the perceived GCR. This result is consistent with three other studies[245, 251, 473] where older age had led to decreased accuracy in estimation of risk. On the other hand, studies by Hussein et al.[16] established that younger age, not older age, was independently related to the inaccurate perception of GCR. Similarly, two other studies[245, 247] also reported that younger participants were more likely to have an optimistic bias (underestimation of risk) to a heart attack. However, age was not seen to be associated with the ability to perceive risk in some studies.[252, 474]

Poor knowledge level of CHD risk factors

In the present study, inaccurate perception of GCR was significantly higher in women with a poor knowledge level of major modifiable CHD risk factors. The result is in line with the studies[474, 475] of other populations, such as adults with type 2 diabetes, where greater CHD risk factor knowledge was associated with higher perceived CHD risk. However, in a study of HIV-infected adults,[252] CHD risk factor knowledge was not related to perceived GCR. It is possible that HIV-infected adults did not personalise the general knowledge that they had about heart disease.[252]

In the current study, most of the women were not able to recognise heart attack as the greatest health problem for women in India. Like a previous study,[472] this study also showed that women perceived cancer as a higher risk than CHD. The lower level of women's risk perceptions for heart disease in the present study corresponded to a frequent misperception found in earlier studies, which revealed that the general public perceived heart disease primarily as a health problem for men.[36, 476] These misperceptions may lead women to underestimate their risk of CHD and fail to seek early interventions to prevent unnecessary morbidity and mortality.[36]

Diastolic hypertension

Studies have shown that high BP increases the accuracy of perceived risk.[245] However, in this study, inaccurate perception of the GCR was higher with the hypertensive women with increased diastolic BP. This high BP might be due to the result of women's underestimation of risks for their heart disease, which likely inhibited them from practicing preventive behaviour such as medication adherence to the hypertensive treatment. Persons who accurately perceive their risk of cardiovascular diseases may be more likely to be adherent in practices to reduce their risk, compared to those who do not perceive themselves to be at risk.[247-250]

7.2.3 Objective three: *Investigate the prevalence and predictors of non-adherence to antihypertensive medications among hypertensive women in a low-income community*

This section discusses findings regarding the prevalence of MNA among hypertensive women. This is followed by a discussion of findings related to the predictors of non-adherence in this population.

Prevalence of MNA

In this study, the prevalence of MNA among hypertensive women was 51%, similar to the studies in another part of India and in Pakistan where the rate of MNA was found to be 49.67%[39] and 51.7% respectively.[379] The rate was lower than studies in Ghana and Nigeria (66.7%),[359] Pakistan (68.4%),[361] and a multicentre study in Bangladesh and India (90%).[404] However, MNA was higher than what has been reported from Ethiopia (26.4%),[376] Congo (32.5%)[373] and other parts of India (45.8%).[477] This inconsistency of data could be due to measurement of adherence based on different criteria, along with variations in the subset of the population that served as the study sample, and sampling and monitoring periods. Besides, most of the previous studies were hospital-based whereas the current study was community-based.

Predictors of MNA

Shorter duration of hypertension

In the present study, women who had hypertension for less than three years were less likely to adhere to treatment. Recent diagnosis may be associated with milder hypertension, fewer symptoms and fewer complications and might lead to complacency among the participants. This result was consistent with a study in China,[386] Pakistan[361] and another part of India.[10] The result also emphasised the fact that a shorter duration of the disease hinders the patient in accepting the diseased state as well as adapting to the adherence behaviour. However, in contrast to this finding, lower levels of adherence with a longer duration of antihypertensive therapy were found in studies in Serbia[360] and Nepal.[366]

Lack of knowledge about hypertension treatment, medication information and consequence of medication non-adherence

The current study found a significant relation between knowledge of hypertension treatment, medication information and adherence to medications. Women whose doctors had not explained the treatment regimen and the possible side effects of medications were more likely to be non-adherent than those women who had been given such an explanation by their doctors. Similar observations were noted in other studies[363, 369] where hypertensive patients who did not properly understand their drug regimen were poorly adherent to their prescribed medications. Knowledge about

hypertension and its management creates a clear understanding and avoids confusion about the treatment and the disease condition.

Perceived low and inaccurate CHD risk

In this study, non-adherence was significantly higher when women perceived their CHD risk as low. Those who perceived their risk as high were more adherent to their hypertensive treatment. The study result was in line with Ali's study in the USA,[226, 227] which explained women's participation in CHD prevention behaviours such as medication adherence. Ali[226] found that perceived susceptibility to CHD explained the majority of variances (50.7%) and was a statistically significant predictor of CHD preventive actions in women. Similarly, in other studies, the perceived CHD risk appeared to be positively correlated with actual behaviour change, and with a desire to make risk-reducing behavioural changes.[228, 229] The current study also found that inaccuracy of the self-perception of the CHD risk was significantly associated with MNA of the studied women. A similar observation was noted in previous studies[222, 245] where persons who accurately perceive their cardiovascular disease risk may be more likely to engage in reducing their risk, compared to those who do not perceive themselves to be in danger.[247]

7.2.4 Objectives four and five: *Explore the reasons underlying antihypertensive treatment adherence; to examine health care providers' attitudes regarding women's perceived global CHD risks and their adherence to antihypertensive treatment*

This section discusses findings related to hypertensive women and health care providers' perception of the reasons that may influence adherence to prescribed antihypertensive medication.

The current study results suggest that patient-related factors such as their knowledge and beliefs about hypertension and its management, Support from family members and family accountability, health care provider related issues and issues related to health facilities and service delivery were perceived as important reasons for not being adherent to medications. The result also revealed that to remain physically healthy, trust in physician, and family and social support, were the motivating factors for medication adherence. Integrating routine concerning taking regular medicine helped

aid medication adherence. In general, these results are consistent with findings from other qualitative studies on antihypertensive medication adherence.[371, 478, 479]

Knowledge and beliefs in hypertension and its management

In this study, it appeared that knowledge and beliefs in hypertension were inadequate among hypertensive women. In response to mild symptoms of high BP, some patients stopped or reduced their daily doses without consulting their health care providers. The participants who had discontinued medication due to 'feeling well' physically, resumed taking it again on their own accord when they felt unwell. Patient's perception that hypertension is a temporary condition and antihypertensive medications may no longer be required once symptoms disappear, contributed significantly to the non-adherence to medications. Other studies reported similar findings of feelings and beliefs of wellness concerning adherence.[371, 378, 480] Evidence shows that inadequate knowledge of patients on their disease management is associated with their poor education level.[481 482, 483] In the current study, over half of the women (53%) were found to be illiterate; some (30%) could sign their names but could not read or write. The lack of education leads to the poor conceptual understanding of hypertension as a silent cause of death. In developing countries poverty is a significant contributory factor to low levels of education.[378]

In the present study, some patients believed that heart attack risk was God's will; as a result they perceived less need for medication. This misconception was also reported in earlier studies.[484] Perceived CHD risk appears to be positively correlated with actual behaviour change, and with a desire to make risk-reducing behavioural changes.[228, 229]

In previous studies, one of the reasons for non-adherence given by patients was medication side effects, however, none of the hypertensive women in the current study perceived this as a cause for MNA. In this study, some perceived that barriers to medication adherence were patients' beliefs and knowledge about hypertension treatment, fear of dependence, forgetfulness and being busy, which were consistent with the experiences of participants in previous research.[478, 485-487]

Support of family members and family accountability

Some participants in the study who were non-adherent to their antihypertensive medications experienced an adverse attitude from their family members and relatives, who regarded the hypertensive person as being responsible for their condition, as reported in other studies.[378] Family roles or accountability i.e household activities also deprived some women by limiting their mobility to access healthcare. This finding was also consistent with earlier study.[488]

Factors related to health care providers

In this study, there was a lack of communication between patients and health care providers concerning the nature of treatment, drug use, medications side effects and the consequence of MNA. Very few women reported that their doctors had alerted them to the possibility of side-effects at the time of the initial diagnosis. Moreover, a number of women stated that they were not made aware by their doctors about the prolonged duration of the treatment as well as taking medicines on a regular basis without fail. Such inadequate communication and negative attitudes by healthcare providers towards patients from low income communities were responsible for poor access to satisfactory health care to a number of participating women, as reported in other studies.[488]

Inadequate communication may be due to physicians' time constraints. Government health care facilities are often crowded; and as a result, physicians' consultation times with patients are typically very brief. According to a World Bank report in 2012, the total number of physicians per 1000 population in India was 0.7.[489] Also, there is no appropriate patient followup and referral system in most government health care facilities in India.[490] In the present study women perceived that trust in a doctor and a good patient-doctor relationship facilitated adherence to the treatment. This finding was consistent with earlier research.[356, 478, 485]

Uncontrolled BP was highlighted by non-adherent women in the present study as one of the reasons for dissatisfaction with the antihypertensive medications. The literature shows that poor hypertension control results in part from failing to intensify or step up medication therapy.[491] When physicians make out a patient's global risk of CHD, they are more likely to recommend risk-reducing therapies.[30] In this study, none of the

participating physicians used CHD risk assessment tools. A qualitative study in Australia also confirmed that general practitioners do not routinely perform global CVD risk assessments of their patients.[492] Other studies have shown the suboptimal use of such tools in primary practice, varying from 17 to 47%.[209-211] Surprisingly, in the present study, none of the participating physicians identified their actions in providing care as contributing to poor medication adherence and control of BP.

Standard guidelines require physicians to use CHD risk score of hypertensive patients which can assist health professionals in communicating CHD risk with their patients effectively.[188, 189] A Cochrane review reports that, compared to general risk communication, personalised communication such as presenting individualised risk scores has been related to improved cognitive outcomes related to good health care seeking behaviour (i.e. increased knowledge, improved the accuracy of risk perception and uptake of primary and secondary CHD prevention programs).[231] Although CHD risk assessment tools are simple enough to use in clinical settings,[5, 493] physicians in this study identified some barriers in utilising risk assessment tools including lack of time during the consultation, low patient levels of education and lack of helping hands. These findings were consistent with previous studies.[494, 495]

Factors related to health care facilities and service delivery

According to the perception of the hypertensive women, travel expenses incurred in visiting the government health care facilities, long waiting times to procure medicines, and the lack of medicines at the hospital dispensary were inhibiting factors for taking medications regularly. These findings were also credible in the light of other studies.[378, 387, 487, 488] Moreover, the drugs that were available at the government dispensaries were viewed by some women patients with suspicion regarding their effectiveness. Women believed that the drugs obtained at private clinics were of a higher quality than the ones they were receiving at the government's health facilities, as reported in other studies.[378] Financial constraints and treatment costs were perceived as barriers to seeking private health care in the current study. A study investigating the association between the free supply of medication for hypertension and adherence among patients in Ghana found that the financial support itself did not act as a reason for improving medication adherence and satisfactory BP control.[483] In this current study, physicians were aware of these obstacles for MNA among women in low-income communities. To improve

medication adherence among female patients, they suggested the free supply of quality medicines from government health facilities at regular intervals for a longer period.

7.3 Recommendations

The study results are expected to be helpful in devising strategies to improve perceived GCR and antihypertensive medication adherence among women in low-income communities to prevent CHD risk burden among them. The recommendations from the study can be categorised as: 1) educational and behavioural interventions, 2) recommendations for health care providers, 3) recommendations for the health system and policy makers.

7.3.1 Educational and behavioural intervention

At the patient level

Health care providers should address the hypertensive women's lack of basic knowledge about hypertension and its treatment. In addition to giving appropriate treatment to women, physicians need to perform as a competent patient mentor. Education should be targeted at the consideration that hypertension is usually symptomless with long-term sequela if left untreated. The body will adapt to high BP so that the complications will gradually manifest with no specific symptoms.[6] Understanding potential complications of hypertension could be in itself a motivating factor for adherence to treatment. For this to happen, patients need to be aware of the seriousness of their conditions and all risks involved with it, without being worried unnecessarily.[392]

Educational interventions should recognise women's apprehension and perceptions regarding antihypertensive medications. Clinicians should spend time with women patients to allay these fears and explain the benefits and adverse effects of treatment. The women need to be educated about the distinctive differences between curing hypertension and managing and treating it with medication.[371] The safety and side effects of long-term use of drugs needs to be discussed, including the information that treatment does not cause physical dependence irrespective of the length of treatment. They should be made aware of the risk of complications arising from poor adherence to treatment. This information is necessary for patient adherence and has been acknowledged in many studies.[478, 479, 487]

There is also a need for educational interventions to develop hypertensive women's knowledge about CHD risk factors to improve the accuracy of their perceived global risk of CHD. A lack of awareness of cardiac risk factors translates into an underestimation of personal cardiac risk. An inaccurate understanding of CHD risk contributes to low levels of perceived susceptibility, urgency and self-efficacy in initiating the behavioural changes for CHD prevention.[264, 496] Educational programs on CHD and risk factor control, specially designed for hypertensive patients, should be part of each patient's visit with health educators. Education and counselling should be continuous and regular. Aims to increase CHD risk factor knowledge and, more importantly, to link risk factor knowledge to risk perception and health-related consequences, are required for behaviour change.[252] According to the present study results, recently detected hypertensive women with inaccurate or low perceived GCR deserve particular attention as they are more non-adherent to their antihypertensive medications.

At the family level

For better family support, adequate information should also be provided to women's' husbands or children to regarding hypertension and its treatment. Female patients usually come to the health clinic with their children and husband. At the health clinic, health educators can utilise this opportunity to educate patients' family members.

At the community level

A well-planned educational program, especially at the low-income community level is also recommended to educate patients, their family members as well as neighbours to address misconceptions regarding hypertension and its management. Adherence is influenced by community members where patients live.[16, 497] Community level education has been effectively used in developed countries. The education must be delivered by community health educators who are trained and competent as well as those who are known, trusted, culturally competent and confident in the language of the target community.[372]

For this purpose, health educators can be selected from each community and need-based training can be provided to them. In India, under the Revised National Tuberculosis Control Programme (RNTCP) if a patient fails to collect their medicine form their local DOT (Direct Observation Therapy) centre, then community health

workers follow them up by visiting their houses to ensure they take their medications.[498] Likewise, to control blood pressure and future CHD risk among hypertensive women in low income communities, the government could take similar proactive measures to train community health workers to followup patients at their homes, if necessary, to ensure BP control and medication adherence. At the same time, they can also provide them with subsidised medicines and arrange for laboratory tests if indicated.

At the national level

Continued education and awareness at the national level is imperative for all women about modifiable CHD risk factors including hypertension, CHD being the leading cause of women's deaths. Dissemination of educational content, screening and early detection of CHD risk factors by public health agencies can help to shift women's attitudes and improve outcomes. In this regard, physicians and public health agencies can play an important advocacy role to raise awareness at the highest political levels, so that government action can result.

7.3.2 Recommendation for health care providers

Improving communication with patients

There is a need to enhance health care providers' communication with patients. Most of the women felt that the doctor should spend more time to explain the prescribed medication, including its side effects, how long to use medication and the risks associated with not continuing the medication. A physician who spends quality time with their patients in explaining about the disease and treatment contributes significantly to patients' medication adherence.[393, 479, 487] Physicians also need to check on patients' understanding of the information concerning their illness and treatment.[371] Effective and formal communication skills' training is required for medical professionals for this purpose. Unfortunately such organised training courses for medical professionals are not available in India.[499] Structured training courses regarding these issues should be mandated for medical students in their curriculums to ensure that they are adequately skilled, and that patients get the satisfactory care.

Some women indicated that they were not able to discuss their health status freely with the doctor since the consultation is typically done in a hurried manner. To overcome the time limits of physician consultations in addressing individual needs at primary care, a

practical solution could be the integration of group visits into the primary care routinely. A group visit brings together a group of patients with similar medical requirements or conditions for therapeutic care in an extended appointment with a physician or health care provider.[500] The meeting of several patients with the primary care physician at the same time allows a more efficient use of the physician's consultation time and better interaction with patients, as the group approach may facilitate communication, sharing concerns with the doctor and, therefore, adherence.[501] Shared medical appointments are shown to have a positive impact on tackling misconceptions and concerns about hypertension.[502, 503] Implementing such a measure however requires consideration of possible privacy concerns, although this should not be a significant obstacle as hypertension does not carry the same sensitivity concerns as conditions like HIV/AIDS or sexually transmitted infections which are associated with stigma and discrimination.

A good relationship between patients and health professionals underpins the treatment adherence and may persuade the patient to take care of her health.[504, 505] A number of hypertensive women expressed their preferences for caring and sympathetic physicians. Uncaring communications also contributes to patients' lower levels of recall of the information presented to them by health care providers and increase the risk of medication non-adherence (MNA). When patients are satisfied with their medical visits, they tend to experience better recall of information.[504] Adherence to antihypertensive medication treatment will be improved if patients experience positive encounters with their health care providers about receiving adequate information to control high BP. There is also a need to identify and work collaboratively with patients in addressing the reasons related to non-adherence to improve BP control among hypertensive women.

Accurate assessment and effective communication of CHD risk to the patient

It is vital that physicians, particularly at the primary level of care, should counsel their patients about their CHD risk in an individualised manner using a CHD risk assessment tool. Lack of communication between women and their health care providers adds to the misperceptions of uncontrolled hypertension risk in women. Individualised advice about CHD risk should come from a physician. Risk communication interventions have positive beneficial effects and are most productive when they include personalising risk estimates in the discussion between professional and patient.[506] If physicians are not using risk assessment tools to assess CHD risk, their estimations will not be accurate.

In line with international standard guidelines, indeed, the National Program on Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) program in India requires physicians to use a CHD risk score for accurate assessment of patients' CHD risk.[507]

It is essential that physicians not only take the opportunity to discuss CHD risk with their hypertensive women patients when they can but also give accurate advice and present it in a way that the patient understands the risks.[223] The simple way of repeatedly conveying CHD risk information to a patient has been shown to improve the accuracy of risk perception.[223]

Overcoming clinical inertia for effective blood pressure control

Inspite of adherence to antihypertensive treatment, one important reason for uncontrolled blood pressure is clinical inertia.[508] Physicians need to overcome clinical inertia to treat hypertensive patients. Despite knowing the patient is not achieving BP control, failure to titrate or combine medications represents clinical inertia.[509] Physicians often lack appropriate aggressiveness in the use of antihypertensive medications, which can lead to prescription of suboptimal antihypertensive therapy.[295] When physicians can evaluate a patient's global risk of CHD, they are more likely to recommend risk-reducing therapies.[30]

7.3.3 Health system and policy

At the higher health system and policy levels, the following considerations should be taken into account when formulating national strategies to tackle hypertension.

Strategies for early diagnosis and prompt treatment of hypertension

The higher prevalence of undiagnosed hypertension among the low-income women points out the need to devise a comprehensive strategy for early identification and prompt treatment of hypertension to prevent its end-stage complications such as CHD; thus reducing the burden on health systems and the need for management at tertiary care institutes.

Recognising MNA as a modifiable risk factor for complications of hypertension

The NPCDCS should address the issue of non-adherence to medication and recognise it as one of the modifiable risk factors for complications of hypertension.[477] By addressing this risk factor, the quality of life for individuals with hypertension can be improved and will reduce the overall CHD morbidity and mortality among women.

Availability of free or low-cost medications

The health system needs to be strengthened to ensure steady, regular supply of free, quality medicines for a longer period to patients at the government health facilities. Shorter duration of medication supply or irregular supply of drugs should not be a cause for medication non-adherence among hypertensive women. Apart from this, private practitioners should prescribe inexpensive but effective medicines to prevent non-adherence among hypertensive women of low-income communities.

7.4 Future research

This study generated valuable findings regarding women's perceived global risk and medication adherence characteristics. However, more research is needed to evaluate how such results can be used for the control of hypertension as well as prevention of CHD at the community level. The development of efficient methods for dealing with treatment non-adherence among hypertensive women patients of urban low-income communities should be a priority for future research in India.

This study was not able to examine all factors that impact on the CHD risk perceptions and adherence to long-term hypertensive therapy among women in low-income communities. There is a need for extensive targeted research to identify cultural factors and patients' self-efficacy that could have an effect on these outcomes. Research also needs to be conducted to explore the use of multiple adherence assessments, which could be equated and combined to obtain a single adherence estimate.

There is also a need to conduct systematic evaluation of psychosocial factors as part of a standard cardiovascular risk assessment as per the European Society of Cardiology risk assessment guideline recommendations.[510]

7.5 Significance of the study

This study was significant for several reasons. These are briefly discussed below.

One, there have not been many comprehensive studies done in India that demonstrate the probability of major cardiovascular events (heart attack or stroke) among population sub-groups using existing CHD risk factors. To this researcher's knowledge, this is the first study that has estimated the prevalence of CHD risk factors among women in a low-income urban community in India and classified the population using the NHANES non-laboratory-based risk prediction chart. This information is crucially important for public health authorities to plan for allocation of health resources to vulnerable population sub-groups such as the women in this study.

Two, despite the rising incidence of hypertension in women little is known about the level of CHD risk perception and its determinants in hypertensive women in India. It was important for this study to assess perceived GCR in hypertensive women and investigate its relationship with socio-demographic variables and women's knowledge of CHD risk factors. This information is critical because a CHD risk perception that is not appropriate to actual risk may prevent women from accepting and relating to CHD risk reduction behaviour.

Three, although non-adherence to antihypertensive treatment causes significant problems in CHD prevention, it is inadequately addressed as a public health problem in India**.** Studies aimed at finding out the reasons for non-adherence to hypertensive medications have been very few in India.[39] Moreover, studies on women, particularly in low-income urban areas, are scarce. Therefore, this study, which provides insights into the prevalence and determinants of non-adherence to antihypertensive treatment among women in a low-income urban area, is a crucial step towards filling the knowledge gap. The study findings in this regard can help inform the formulation of strategies to address barriers to medication adherence.

Fourth, the present study has focused on specifically vulnerable, neglected and disempowered population sub-group in India, namely poor urban women. According to India's constitution, women have equal rights with men. However, because of socio-cultural fators in a predominantly patriarchal and male dominant society, Indian women

suffer enormously. Higher prevalence of hypertension in middle-aged and older women compared to men as reported by recent studies in India are related to increasing family stress and domestic violence especially common among middle aged women.[511] According to a recent report by the United Nations Population Fund (UNFPA), approximate two third of married Indian women are victims of domestic violence and as many as 70% of married women in India between the age of 15 and 49 are victims of beating or forced sex.[511]

Economic, social, legal and political fators drastically affect women's health. In the current study, several women said that they interrupted their daily dose of antihypertensive medications due to financial constraints. In addition, our study finding on women's forgetfulness about medication usage was connected with their prioritisation of expected gender-based family roles of females. Stringent domestic responsibility negatively affected participating women's medication adherence by restricting their freedom of movement and authority. The role of gender is widely recognised to affect women's health and healthcare in general, including treatment of chronic conditions.[512]

There is a considerable gap between male and female literacy rates in India. According to Census 2011, the male literacy rate is 82.14% and the female literacy rate is 65.46%.[102] In the current study, the majority of the research participants were uneducated women. The lack of education leads to poor conceptual understanding of hypertension, its complication and treatment adherence. In our study, some women believed that heart attack risk was God's will; as a result, they perceived less need for medication. These findings suggest a need for interventions that contribute to promoting societal norms enhancing women's status and self-sufficiency within families and society. Additionally, Muslim women have distinctive beliefs, attitudes, and perceptions that may directly impact healthcare received within a modern health care system.[513] In this study, the majority of the women participants were Muslims and some of them acknowledged during their interviews that they sometimes interrupted their daily doses of medications and follow-up investigations due to religious practices (for example, during the month of Ramadan, Muslims are not permitted to eat or drink from dawn until dusk). Our study findings highlight the need to understand the religious beliefs of

Muslim women to effectively develop interventions and programmes that meet the health care requirement of this community.

The lack of knowledge and information about health and health care access can worsen women's health. Women experience particular challenges in accessing cost-effective primary care leading to their conditions being undetected, untreated or undertreated. Consequently, they suffer avoidable complications that develop from NCD and CHD risk factors. Our study reveals the gender factor influence adherence of CHD prevention medications. The study findings can be used by the health policy makers in the design of effective interventions to prevent the rising burden of CHD among low income urban women in India and other South Asian populations.

7.6 Limitations of the study

This study had several limitations. These are outlined below.

First, for the quantitative survey, the sample size calculation was based on the prevalence of hypertension (i.e. 40%) in Indian Women. In addressing the first objective of the study: 'Assess and stratify global CHD risk among women living in a low-income urban area of Delhi, India'- the sample size may have been underestimated. Preferably, the sample size should have been calculated based on the prevalence of CHD in Indian women (i.e. over 10%). Assuming even about 15% prevalence of CHD in Indian women would require double of the sample size of the present study undertaken. In the current study, this approach (prevalence of hypertension) was taken principally keeping in mind the study time, the logistics and available budget for the research.

Second, the data collected from interviews may have been affected by recall and courtesy bias. Interviewer bias was another possible limitation due to differences in the attitudes of interviewers. However, the researcher believes that this latter bias should be minimal as interviewers were not only provided intensive training in data collection procedures but also had field experience among the population.

Third, CHD risk estimation in the study was based on a simple application of a NHANES non-laboratory-based risk algorithm in line with other recent studies where assessment of the CHD risk category was based on self-reported history of diabetes

mellitus, whereas studies in India have shown that only 60–70% of diabetics are actually aware of their diabetic status.[455, 514] Also, the NHANES tool uses a BMI cut-off of 25, whereas the revised cut-offs in the Indian population classify BMI 23 as overweight. These factors, integral features of the NHANES tool, could have led to some degree of inaccurate classification of the CHD risk among the study population.[515] For a novel way of measuring 'risk' discordance in cross-sectional studies, powerful risk assessment tools such as atherosclerosis imaging techniques can be used to calculate the actual burden of disease.[516] Otherwise, risk can be measured directly in prospective studies. However, laboratory-based CHD risk prediction is inconvenient even in developed countries and is too expensive and impractical in low-income countries with limited testing facilities.[198]

A fourth limitation of this study was that self-reported adherence was assessed only once. Point prevalence of adherence may not reflect actual adherence to medication(s) for a chronic condition such as hypertension.[517] Longitudinal assessment may be required to differentiate between chronic and occasional non-adherence and related barriers that may contribute to the nature of non-adherence. In the present study, the decision for one time data collection was due to the limited study time, resources and budget.

Also, the study participants were recruited from a low-income urban community within Delhi; therefore, the scope of generalisability to the entire population is limited except for those patients with a similar background.

7.7 Concluding statement

There is a high prevalence of hypertension among women in urban low-income areas in Delhi, India. The majority of the diagnosed hypertensive study participants who were on treatment were found to be inaccurate in their estimation of their global CHD risk (GCR), as well as being non-adherent to their antihypertensive treatment. This study identified several factors influencing the inaccurate perception of global CHD risk and non-adherence to antihypertensive medications. Older age, poor level of CHD risk factors knowledge, and diastolic hypertension were associated with inaccurate CHD risk perception of hypertensive women. Factors independently associated with medication non-adherence among hypertensive women included a shorter duration of

the antihypertensive therapy, dissatisfaction with the treatment, not receiving an explanation of the treatment regimen and side effects by the physician, low perceived GCR and the inaccurate estimation of perceived GCR. The result of the in-depth interviews found that barriers to medication adherence to antihypertensive treatment included low awareness of the disease condition, an undesirable outlook toward antihypertensive medications, and dissatisfaction with the attitude of health care providers and health care services provided.

Overall, to improve MNA, the study has specified the need for better communication between patients and health care professionals to address women's lay beliefs about hypertension, its treatment and the risk of experiencing CHD events. Primary level health care providers are in an excellent position to assess the women's accuracy of risk perception and should consider this factor when providing education and counseling interventions. Physicians also need to identify and work collaboratively with women to address the barriers related to non-adherence to hypertensive medications to improve their BP control. This study result can be used by policy makers at national and international levels and health organisations at the local level, in the design of effective programs to improve medication adherence to antihypertensive therapy in women living in low-income urban communities and to prevent the rising CHD burden among them.

REFERENCE LIST

1. The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS). WHO STEPS Instrument Question-by-Question Guide (Core and Expanded), 2008. Geneva, Switzerland: World Health Organization.
2. Cambridge Dictionaries online. Joint Family. Cambridge University Press; 2016.
3. Encyclopedia Britannica online. Nuclear family. Encyclopedia Britannica; 2011.
4. Fathima FN, Joshi R, Agrawal T, Hegde S, Xavier D, Misquith D, et al. Rationale and design of the Primary prevention strategies at the community level to Promote Adherence of treatments to prevent cardiovascular diseases trial number (CTRI/2012/09/002981). The American Heart Journal. 2013; 166(1):4-12. DOI: 10.1016/j.ahj.2013.03.024.
5. Gaziano TA, Young CR, Fitzmaurice G, Atwood S, Gaziano JM. Laboratory-based versus non-laboratory-based method for assessment of cardiovascular disease risk: The NHANES I follow-up study cohort. The Lancet. 2008; 371:923-31.
6. Chobanian A, Bakris G, Black H, Cushman W, Green L, Izzo J, et al. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension 2003; 42:1206-52.
7. Saeed O, Gupta V, Dhawan N, Streja L, Shin JS, Ku M, et al. Knowledge of modifiable risk factors of Coronary Atherosclerotic Heart Disease (CASHD) among a sample in India. BioMed Central International Health and Human Rights. 2009; 9:2. DOI: 10.1186/1472-698X-9-2.
8. Dowse GK, Gareeboo H, Alberti KG, Zimmet P, Tuomilehto J, Purran A, et al. Changes in population cholesterol concentrations and other cardiovascular risk factor levels after five years of the non-communicable disease intervention programme in Mauritius. Mauritius Non-communicable Disease Study Group. The British Medical Journal. 1995; 311(7015):1255-9.
9. Sabate E. Adherence to Long-Term Therapies: Evidence for Action. Geneva, Switzerland: World Health Organization; 2003; p. 107-14.
10. Bhandari S, Sarma PS, Thankappan KRP. Adherence to Antihypertensive Treatment and Its Determinants Among Urban Slum Dwellers in Kolkata, India. Asia Pacific Journal of Public Health. 2011; DOI:10.1177/1010539511423568.
11. Monane M, Bohn RL, Gurwitz JH, Glynn RJ, Levin R, Avorn J. The effects of initial drug choice and comorbidity on antihypertensive therapy compliance: results from a population-based study in the elderly. The American Journal of Hypertension. 1997; 10(7 Pt 1):697-704.

12. The IDF consensus worldwide definition of the metabolic syndrome. Brussels, Belgium: International Diabetes Federation; 2005. Available from: www.idf.org
13. The Asia-Pacific Perspective: Redefining Obesity and Its Treatment. World Health Organization, International Diabetes Institute, International Association for the Study of Obesity, International Obesity Task Force; 2000. Available from: http://iris.wpro.who.int/handle/10665.1/5379.
14. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. Medicine and Science Sports and Exercise [Validation Studies]. 2003; 35(8):1381-95. DOI: 10.1249/01.MSS.0000078924.61453.FB.
15. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. Journal of Psychosomatic Research. 2006; 60(6):631-7. DOI:10.1016/j.jpsychores. 2005.10.020.
16. Hussein HM, Harris-Lane P, Abdelmoula MM, Vazquez G. Accuracy of self-perception of cardiovascular risk in the community. Journal of Vascular and Intervention Neurology. 2008; 1(4):106-12.
17. Frijling BD, Lobo CM, Keus IM, Jenks KM, Akkermans RP, Hulscher ME, et al. Perceptions of cardiovascular risk among patients with hypertension or diabetes. Patient Education and Counseling. 2004; 52:47-53.
18. World health statistics 2014 report. Geneva: World Health Organization; 2014. Available from: http://apps.who.int/iris/bitstream/10665/112738/1/9789240692671_eng. pdf.
19. Global Status Report on Noncommunicable Diseases 2012. Geneva: World Health Organization; 2012.
20. The NCD Alliance. Non communicable diseases: a priority for women's health and development. International Diabetes Federation, International Union Against Tuberculosis and Lung disease, Union for International cancer Control, World Heart Federation; 2011. Available from: http://www.who.int/pmnch/topics/maternal/2011_women_ncd_report.pdf.
21. WHO. Cardiovascular diseases fact sheet. Geneva: World Health Organization; 2015.
22. Gupta PC, Gupta R, Pendnekar MS. Hypertension prevalence and blood pressure trends in 88653 subjects in Mumbai. India. Journal of Human Hypertension. 2004; 18:853-56.
23. Gupta R, Guptha S, Sharma KK, Gupta A, Deedwania P. Regional variations in cardiovascular risk factors in India: India heart watch. World Journal of Cardiology. 2012; 4(4):112-20. DOI:10.4330/wjc.v4.i4.112.
24. Gupta R, Gupta VP, Sarna M, Prakash H, Rastogi S, Gupta KD. Serial epidemiological surveys in an urban Indian population demonstrate increasing coronary risk factors

among the lower socioeconomic strata. Journal of the Association of Physicians of India. 2003; 51:470-7.

25. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet. 2012; 380(9859):2095-128. DOI:10.1016/S0140-6736(12)61728-0.
26. Thom T, Haase N, Rosamond W, Howard VJ, Rumsfeld J, Manolio T, et al. Heart disease and stroke statistics--2006 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation. 2006; 113(6):e85-151. DOI:10.1161/CIRCULATIONAHA.105.171600.
27. Alwan A. Global Status Report on Non communicable Diseases 2010. Geneva: World Health Organization; 2011. Available from: http://www.who.int/chp/countries/en/.
28. World Health statistics 2011. Geneva: World Health Organization; 2011. Available from: http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf.
29. Boutayeb A, Boutayeb S. The burden of non communicable diseases in developing countries. International journal for Equity in Health. 2005; 4(1):2. DOI:10.1186/1475-9276-4-2.
30. Viera AJ, Sheridan SL. Global risk of coronary heart disease: assessment and application. The American Family Physician. 2010; 82(3):265-74. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20672791.
31. Modesti PA, Agostoni P, Agyemang C, Basu S, Benetos A, Cappuccio FP, et al. Cardiovascular risk assessment in low-resource settings: a consensus document of the European Society of Hypertension Working Group on Hypertension and Cardiovascular Risk in Low Resource Settings. Journal of Hypertension. 2014; 32(5):951-60. DOI:10.1097/HJH.0000000000000125.
32. Grundy SM, Pasternak R, Greenland P, Smith SJ, Fuster V. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor AssessmentEquations : A Statement for Healthcare Professionals From the American Heart Association and the American College of Cardiology. Circulation: Journal of The American Heart Association. 1999; 100:1481-92. DOI:10.1161/01.CIR.100.13.1481.
33. Lee J, Heng D, Chia KS, Chew SK, Tan BY, Hughes K. Risk factors and incident coronary heart disease in Chinese, Malay and Asian Indian males: the Singapore Cardiovascular Cohort Study. International Journal of Epidemiology. 2001; 30(5):983-8.
34. Kanjilal S, Rao VS, Mukherjee M, Natesha BK, Renuka KS, Sibi K, et al. Application of cardiovascular disease risk prediction models and the relevance of novel biomarkers to risk stratifi cation in Asian Indians. Vascular Health and Risk Management. 2008; 4(1):199-211.

35. Gholizadeh L, Davidson P, Salamonson Y, Worrall-Carter L. Theoretical considerations in reducing risk for cardiovascular disease: implications for nursing practice. Journal of Clinical Nursing [Review]. 2010; 19(15-16):2137-45. DOI:10.1111/j.1365-2702.2009.03189.x.
36. Hart PL. Women's perceptions of coronary heart disease: an integrative review. Journal of Cardiovascular Nursing [Review]. 2005; 20(3):170-6.
37. Pereira M, Lunet N, Azevedo A, Barros H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. Journal of Hypertension. 2009; 27(5):963-975. DOI:10.1097/HJH.0b013e3283282f65
38. Kusuma YS, Gupta SK, Pandav C. Treatment Seeking Behaviour in Hypertension: Factors Associated with Awareness and Medication among Socioeconomically Disadvantaged Migrants in Delhi, India. Collegium Antropologicum. 2013; 37(3):717-22.
39. Dennis T, Meera NK, Binny K, Sekhar MS, Kishore G, Sasidharan S. Medication adherence and associated barriers in hypertension management in India. CVD Prevention and Control. 2011; 6(1):9-13. DOI:10.1016/j.cvdpc.2010.11.001.
40. Sathvik BS, Karibasappa MV, Nagavi BG. Self-Reported Medication Adherence pattern of Rural Indian Patients with Hypertension. Asian Journal of Pharmaceutical and Clinical Research. 2013; 6(1):49-52.
41. Oli N, Vaidya A, Thapa G. Behavioural Risk Factors of Noncommunicable Diseases among Nepalese Urban Poor: A Descriptive Study from a Slum Area of Kathmandu. Epidemiology Research International. 2013; Available from: http://dx.doi.org/10.1155/2013/329156.
42. United Nations. Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Noncommunicable Diseases. UN General Assembly, 19 September 2011. Available from: http://www.who.int/nmh/events/un_ncd_summit2011/political_declaration_en.pdf.
43. WHO. World Health Statistics. World Health Organization ; 2010.
44. Indian Council for Medical Research and Medical Research Council (UK) workshop. Building Indo-Uk colloboration in chronic diseases. 2009 p. 16.
45. The Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010). Seattle, USA: Institute for Health Metrics and Evaluation; 2013. Available from: http://www.healthmetricsandevaluation.org/sites/default/files/country-profiles/GBD%20Country%20Report%20-%20India.pdf.
46. Mahal A, Karan A, Engelgau M. The Economic Implications of Non-Communicable Disease for India. Washington DC: The International Bank for Reconstruction and Development/The World Bank; 2009.
47. World Bank. Growing Danger of Noncommunicable Diseases. Washington, DC: World Bank; 2011.

48. WHO. Cardiovascular Diseases Fact Sheet. Geneva,Switzerland: World Health Organization; 2011. Available from: http://www.who.int/mediacentre/_factsheets/fs317/en/index.html.
49. WHO. The Atlas of Heart disease and Stroke. In: Cardiovuscular Disease. Geneva, Switzerland: World Health Organization; 2012. Available from: http://www.who.int/cardiovascular_diseases/resources/atlas/en/index.html.
50. Gaziano TA, Bitton A, Anand S, Abrahams-Gessel S, Murphy A. Growing epidemic of coronary heart disease in low- and middle-income countries. Current Problems in Cardiology. 2010; 35(2):72-115. DOI:10.1016/j.cpcardiol.2009.10.002.
51. Roger V, Go AS, Lloyd-Jones D, Adams R, Berry J, Brown, TM. , et al. Heart disease and stroke statistics--2011 update: A report from the American Heart Association. 2011.
52. Taylor DW. The Burden of Non-Communicable Diseases in India. Hamilton ON: The Cameron Institute, Canada; 2010; p. 2.
53. Levenson JW, Skerrett PJ, Gaziano JM. Reducing the global burden of cardiovascular disease: the role of risk factors. Prevention Cardiology [Review]. 2002; 5(4):188-99.
54. Murray CJL, Lopez AD. The Global Burden of Disease. Cambridge, MA: Harvard School of Public Health; 1996.
55. Manisha C, Deedwania PC. Coronary Heart Disease and Risk Factors in Asian Indians. Diabetes and Cardiovuscular diseases. 2001; 498(1):27-34. DOI:10.1007/978-1-4615-1321-6_5
56. Reddy KS. Cardiovascular diseases in India. World Health Statistics Quaterly Journal. 1993; 46(2):101-7.
57. Ghaffar A, Reddy KS, Singhi M. Burden of non-communicable diseases in South Asia. The British Medical Journal [Review]. 2004; 328(7443):807-10. DOI:10.1136/bmj.328.7443.807.
58. WHO. Preventing chronic diseases : A vital investment. WHO global report. Geneva, Switzerland: World health organization; 2005.
59. Enas EA, Senthilkumar A. The Internet Journal of Cardiology. Coronary Artery Disease In Asian Indians: An Update And Review, 2001March 6, 2012.
60. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart [Review]. 2008; 94(1):16-26. DOI:10.1136/hrt.2007.132951.
61. Gupta R. Recent trends in coronary heart disease epidemiology in India. Indian Heart Journal [Review]. 2008; 60(2 Suppl B):B4-18.
62. Gupta R. Burden of coronary heart disease in India. Indian Heart Journal [Review]. 2005; 57(6):632-8.
63. Forge BH, Briganti EM. Lipid lowering and coronary heart disease risk: how appropriate are the national guidelines? Medical Journal of Australia. 2001; 175(9):471-5.

64. Gupta R, Gupta S, Gupta VP, Prakash H. Prevalence and determinants of hypertension in the urban population of Jaipur in western India. Journal of Hypertension. 1995; 13(10):1193-200.
65. Slovic P, Finucane ML, Peters E, MacGregor DG. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality Risk Analysis. 2004; 24(2):311-22.
66. Ezzati M, Hoorn SV, Rodgers A, Lopez AD, Mathers CD, Murray CJ, et al. Estimates of global and regional potential health gains from reducing multiple major risk factors. The Lancet. 2003; 362(9380):271-80.
67. Gupta R, Misra A, Vikram NK, Kondal D, Gupta SS, Agrawal A, et al. Younger age of escalation of cardiovascular risk factors in Asian Indian subjects. BioMed Central Cardiovascular Disorder. 2009; 9(28):28. DOI:10.1186/1471-2261-9-28.
68. Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS, et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. The Lancet. 2008; 371(9622):1435-42. DOI:10.1016/S0140-6736(08) 60623-6.
69. Prabhakaran D, Yusuf S, Mehta S, Pogue J, Avezum A, Budaj A, et al. Two-year outcomes in patients admitted with non-ST elevation acute coronary syndrome: results of the OASIS registry 1 and 2. Indian Heart Journal. 2005; 57(3):217-25.
70. Reddy KS, Shah B, Varghese C, Ramadoss A. Responding to the threat of chronic diseases in India. The Lancet. 2005; 366:1746-51.
71. Leeder S, Raymond S, Greenberg H, Liu H, Esson K. A Race Against Time. The Challenge of Cardiovascular Disease in Developing Countries. New York: The earth Institute, Columbia University; 2004.
72. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. The Lancet. 2004; 364(9438):937-52. DOI: 10.1016/S0140-6736(04)17018-9.
73. The American Heart Association. Heart and Stroke Facts: Statistical Update. Dallas, Texus; 2002. Available from: www,americanheart,og/statistics/index.html.
74. Registrar General of India. Report on causes of deaths in India 2001-2003. New Delhi: Registrar General of India, Ministry of Home Affairs; 2009.
75. Ahmad N, Bhopal R. Is coronary heart disease rising in India? A systematic review based on ECG defined coronary heart disease. Heart [Review]. 2005; 91(6):719-25.
76. Ajay V, Gupta R, Panniyammakkal J, Chaturvedi V, Prabhakaran D, Reddy K. National Cardiovascular Disease Database. New Delhi: Ministry of Health and Family Welfare, Government of India, World Health Organization; 2002. Available from: http://www.whoindia.org/LinkFiles/NMH_Resources_National_CVD_database-Final_Report.pdf

77. Non communicable diseases: a priority for women's health and development. World Heart Federation, the International Diabetes Federation, the International Union Against Cancer and the Framework Convention Alliance; 2011. Available from: www.who.int/pmnch/topics/maternal/2011_women_ncd_report.pdf.
78. Disease burden in India: Estimations and causal analysis. National Commission on Macroeconomics and Health (NCMH) Background Papers; 2009; USA.
79. National Heart Lung and Blood institute. Exploree Heart Attack. National Heart Lung and Blood institute. U.S. Department of Health & Human Services; 2012. Available from: http://www.nhlbi.nih.gov/health/health-topics/topics/heartattack/.
80. Dawber TR. The Framingham Study: The Epidemiology of Atherosclerotic Disease. Cambridge, MA: Harvard University Press; 1980.
81. The American Heart Association. Heart Disease and Stroke Statistics-2006 Update. Dallas, TX.; 2006.
82. Australian Institute of Health and Welfare. Living dangerously: Australians with multiple risk factors for cardiovascular disease. Canberra ACT 2005. AIHW cat. no. AUS 57.
83. Halfon N, Hochstein M. Life course health development: an integrated framework for developing health, policy, and research. Milbank Quaterly. 2002; 80(3):433-79, iii.
84. Joshi P, Islam S, Pais P, Reddy S, Dorairaj P, Kazmi K, et al. Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. Journal of the American Medical Association. 2007; 297(3):286-94. DOI:10.1001/jama.297.3.286.
85. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian Journal of Medical Research [Historical Article]. 2007; 125(3):217-30.
86. Gupta R. Trends in hypertension epidemiology in India. Journal of Human Hypertension [Review]. 2004; 18(2):73-8. DOI:10.1038/sj.jhh.1001633.
87. Prabhakaran D, Chaturvedi V, Shah P, Manhapra A, Jeemon P, Shah B, et al. Differences in the prevalence of metabolic syndrome in urban and rural India: a problem of urbanization. Chronic Illness. 2007; 3(1):8-19.
88. Franks P, Tancredi DJ, Winters P, Fiscella K. Including socioeconomic status in coronary heart disease risk estimation. The Annals of Family Medicine. 2010; 8(5):447-53. DOI:10.1370/afm.1167.
89. Mohan R. Urbanization in India: patterns and emerging policy issues. In: Gughler J, editor. The Urban transformation of the developing world. New York: Oxford University Press; 1996.
90. Yadav K, Krishnan A. Changing patterns of diet, physical activity and obesity among urban, rural and slum populations in north India. Obesity Review. 2008; 9(5):400-8. DOI:10.1111/j.1467-789X.2008.00505.x.

91. Goyal A, Yusuf S. The burden of cardiovascular disease in the Indian subcontinent. Indian Journal of Medical Research [Review]. 2006; 124(3):235-44.
92. Gupta R, Guptha S, Joshi R, Xavier DT. Translating evidence into policy for cardiovascular disease control in India. Health Research Policy Plan. 2011; 9(8).
93. Chopra SM, Misra A, Gulati S, Gupta R. Overweight, obesity and related non-communicable diseases in Asian Indian girls and women. European Journal of Clinical Nutrition. 2013; 67(7):688-96. DOI:10.1038/ejcn.2013.70.
94. Moser KA, Agrawal S, Davey Smith G, Ebrahim S. Socio-demographic inequalities in the prevalence, diagnosis and management of hypertension in India: analysis of nationally-representative survey data. PLoS One. 2014; 9(1):e86043. DOI:10.1371/journal.pone. 0086043.
95. Bhan N, Srivastava S, Agrawal S, Subramanyam M, Millett C, Selvaraj S, et al. Are socioeconomic disparities in tobacco consumption increasing in India? A repeated cross-sectional multilevel analysis. The British Medical Journal Open. 2012; 2(5):e001348. DOI:10.1136/bmjopen-2012-001348.
96. Wang. Y, Chen HJ, Shaikh S, Mathur P. Is obesity becoming a public health problem in India? Examine the shift from under- to overnutrition problems over time. Obesity Review. 2009; 10:456-74. DOI:10.1111/j.1467-789X.2009.00568.
97. Reddy KS. Cardiovascular disease in non-Western countries. The New England Journal of Medicine. 2004; 350(24):2438-2440.
98. Hotchkiss JW, Davies CA, Gray L, Bromley C, Capewell S, Leyland A. Trends in cardiovascular disease biomarkers and their socioeconomic patterning among adults in the Scottish population 1995 to 2009: cross-sectional surveys. The British Medical Journal Open. 2012; 2(3):e000771. DOI:10.1136/bmjopen-2011-000771.
99. Saurel-Cubizolles M, Chastang J, Menvielle G, Leclerc A, Luce D, EDISC group. Social inequalities in mortality by cause among men and women in France. Journal of Epidemiology and Community Health. 2009; 63(3):197-202.
100. Dray-Spira R, Gary T, Brancati F. Socioeconomic position and cardiovascular disease in adults with and without diabetes: United States trends, 1997–2005. Journal of General Internal Medicine. 2008; 23(10):1634-41.
101. Rastogi T, Reddy KS, Vaz M, Spiegelman D, Prabhakaran D, Willett WC, et al. Diet and risk of ischemic heart disease in India. The American Journal of Clinical Nutrition. 2004; 79(4):582-92.
102. Census and Registrar General. Census of india 2011. New Delhi: Office of the Registrar General & Census Commissioner, Ministry of Home Affairs, Government of India; 2011. Available from: http://censusindia.gov.in/.
103. National Commision on Population. New Delhi: Ministry of Health and Family Welfare, Government of India; 2000.

104 Ahmad S, Choi MJ. The Context of Uncontrolled Urban Settlements in Delhi. ASIEN. 2011; 118:S 75-90. Available from: www.asienkunde.de/content/.../118_urban_settlements_in_delhi.pdf.

105. Ali S. Managing Slums in Delhi. Sabir Ali ed.: Managing Urban Poverty. New Delhi: Uppal Publishing House; 2006; p. 432- 517.

106. Alves JG, Figueiroa JN, Alves LV. Prevalence and predictors of physical inactivity in a slum in Brazil. Journal of Urban Health. 2011; 88(1):168-75. DOI:10.1007/s11524-010-9531-8.

107. National Family Health Survey-3, India, 2005-2006 Adult Nutrition. Available from: www.nfhsindia.org/NFHS.../NFHS-3%20Nutritional%20Status%20of%20Adults.ppt.

108. Press Information Bureau. Poverty Estimates for 2004-05. 2007. Available from:http://pib.nic.in/release/release.asp?relid=26316.

109. WHO. NCD Country Profiles-India. Geneva: World Health Organization; 2011.

110. Anand K, Shah B, Yadav K, Singh R, Mathur P, Paul E, et al. Are the urban poor vulnerable to non-communicable diseases? A survey of risk factors for non-communicable diseases in urban slums of Faridabad. National Medical Journal of India. 2007; 20(3):115-20.

111. Gurav RB, Kartikeyan S. Levels of blood pressure in an urban community. Bombay Hospital Journal. 2003; Available from: http://www.bhj.org/journal/2001_4301_jan/original_148.htm

112. Misra A, Pandey RM, Devi JR, Sharma R, Vikram NK, Khanna N. High prevalence of diabetes, obesity and dyslipidaemia in urban slum population in northern India. International Journal of Obesity and Related Metabolic Disorder . 2001; 25(11):1722-9. DOI:10.1038/sj.ijo.0801748.

113. Kusuma Y, Gupta S, Pandav C. Migration and hypertension: a cross-sectional study among neo-migrants and settled-migrants in Delhi, India. Asia Pacific Journal of Public Health. 2009; 21(4):497-507. DOI:10.1177/1010539509344114.

114. Yadav G, Chaturvedi S, Grover VL. Prevalence, awareness, treatment and control of hypertension among the elderly in a resettlement colony of Delhi. Indian Heart Journal. 2008; 6(4):313-7.

115. Gupta R, Gupta KD. Coronary heart disease in low socioeconomic status subjects in India: "an evolving epidemic". Indian Heart Journal. 2009; 61(4):358-67.

116. Oti SO. HIV and noncommunicable diseases: a case for health system building. Current opinion in HIV AIDS. 2013; 8(1):65-9. DOI:10.1097/COH.0b013e32835b8088.

117. Anand S, Pais P, Pogue J, Yusuf S. A comparison of practice patterns for acute myocardial infarction between hospitals in Canada and India. 1997; 49: 35-41. Indian Heart Journal. 1997; 49:35-41.

118. Pais P, Xavier D, Gupta R, Jaison TM, AK M, Naik S For CREATE Registry Investigators. Treatment and Outcome of Acute Coronary Syndromes: Does the Hospital Make a Difference? Annual conference- Cardiology society of India; 2002 Kochi, Kerala: Indian Heart Journal; 2002.
119. Chatterjee C, Sheoran G. Vulnerable Groups in India. Mumbai: The Centre for Enquiry into Health and Allied Themes (CEHAT); 2007. Available from: http:// www.cehat.org.
120. banglanews 490en - Xoom.it. Available from: http://xoomer.virgilio.it/dinajpur/b11c/banglanews490en.htm.
121. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R, Prospective Studies C. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. The Lancet. 2002; 360(9349):1903-13.
122. Ayanian JZ, Cleary PD. perceived risk of heart diseases and cancer among cigarette smokers. Journal of the American Medical Association. 1999; 281(11):1019-21.
123. Haskell WL. Cardiovascular disease prevention and lifestyle interventions: effectiveness and efficacy. Journal of Cardiovascular Nursing [Review]. 2003; 18(4):245-55.
124. Koerbel G, Korytkowski M. Coronary heart disease in women with diabetes. Diabetes Spectrum. 2003; 16(3):148-153.
125. American Heart Association. Facts about women and cardiovascular diseases. 2012. Available from: http://www.americanheart.org/presenter.jhtml?identifier=2876.
126. Pednekar MS, Gupta PC, Hebert JR, Hakama M. Joint effects of tobacco use and body mass on all-cause mortality in Mumbai, India: results from a population-based cohort study. The American Journal of Epidemiology. 2008; 167(3):330-40.
127. Global adult tobacco survey (GATS): Fact Sheet India 2009-2010. World Health Organization, U.S. Centre for Disease Control and Prevention, The Johns Hopkins Bloomberg School of public health and the RTI International, Ministry of Health and family Welfare, Government of India; 2010. Available from: http://www.who.int/tobacco/surveillance/gats_india/en/index.htm
128. Ezzati M, Henley SJ, Thun MJ, Lopez AD. Role of smoking in global and regional cardiovascular mortality. Circulation. 2005; 112(4):489-97. DOI:10.1161/CIRCULATIONAHA.104.521708.
129. Enas EA, Senthilkumar A, Chacko V, Puthumana N. Dyslipidemia among Indo-Asians: Strategies for identification and management. 2005;5:81-90. The British Journal of Diabetes and Vascular Disease. 2005; 5:81-90.
130. Kar SS, Thakur JS, Virdi NK, Jain S, Kumar R. Risk factors for cardiovascular diseases: is the social gradient reversing in northern India? Nationall Medical Journal of India. 2010; 23(4):206-09.

131. Shah B, Mathur P. Surveillance of cardiovascular disease risk factors in India: the need & scope. Indian Journal of Medical Research [Review]. 2010; 132(5):634-42.
132. Misra A, Vikram NK, Sharma R, Basit A. High prevalence of obesity and associated risk factors in urban children in India and Pakistan highlights immediate need to initiate primary prevention program for diabetes and coronary heart disease in schools. Diabetes Research and Clinical Practice. 2006; 71(1):101-2. DOI:10.1016/j.diabres. 2005.06.006.
133. Asia Pacific Cohort Studies Collaboration. The effects of diabetes on the risks of major cardiovascular diseases and death in the Asia Pacific region. Diabetes Care. 2003; 26(2):360-66.
134. Danaei G, Lawes CM, Vander Hoorn S, Murray CJ, Ezzati M. Global and regional mortality from ischaemic heart disease and stroke attributable to higherthan- optimum blood glucose concentration: Comparative risk assessment. The Lancet. 2006; 368(9548):1651-59.
135. Berry JN, Chakravarty RN, Gupta HD, Malik K. Prevalence of diabetes mellitus in a north Indian town. Indian Journal of Medical Research. 1966; 54(11):1025-47.
136. Tandon N, Raizada N. The burden of diabetes in India Diapedia [Internet]. 2014; 1105045828 rev.(8) Available from: http://dx.doi.org/10.14496/dia.1105045828.8.
137. Cameron AJ, Welborn TA, Zimmet PZ, Dunstan DW, Owen N, Salmon J, et al. Overweight and obesity in Australia: the 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab). Medical Journal of Australia. 2003; 178(9):427-32.
138. Eckel RH, Krauss RM. American Heart Association Call to Action: Obsesity as a major risk factor for Coronary Heart Disease. Circulation 1998; 97(21):2099-2100.
139. Joint WHO/FAO Expert Consultation on Diet Nutrition and the Prevention of Chronic Diseases and World Health Organization Department of Nutrition for Health and Development. Diet, nutrition and the prevention of chronic diseases: Report of a joint WHO/FAO expert consultation, Geneva, 28 January- 1 February 2002 , WHO technical report series. Geneva: World Health Organization; 2003.
140. Caballero B. A nutrition paradox—underweight and obesity in developing countries. The New England Journal of Medicine. 2005; 352(15):1514-16.
141. The American Heart Association. International cardiovascular disease statistics. 2012. Available from: http://www.americanheart.org/presenter.jhtml?identifier=3001008.
142. WHO. Obesity-Preventing and managing the global epidemic. WHO technical report series 894. Geneva: World Health Organization; 1999.
143. WHO. Strategic priorities of the WHO cardiovascular disease programme. World Health Organization; 2005. Available from: http://www.who.int/cardiovascular_diseases/ priorities/en/.

144. Huffman MD, Prabhakaran D, Osmond C, Fall CH, Tandon N, Lakshmy R, et al. Incidence of cardiovascular risk factors in an Indian urban cohort results from the New Delhi birth cohort. Journal of the American College of Cardiology. 2011; 57(17):1765-74. DOI:10.1016/j.jacc.2010.09.083.

145. Welborn TA, Dhaliwal SS, Bennett SA. Waist–hip ratio is the dominant risk factor predicting cardiovascular death in Australia. Medical Journal of Australia. 2003; 179:580-85.

146. Rosengren A, Hawken S, Ôunpuu S, Sliwa K, Zubaid M, Almahmeed WA, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11 119 cases and 13 648 controls from 52 countries (the INTERHEART study): case-control study. The Lancet. 2004; 364(9438):953-962. DOI:10.1016/s0140-6736(04)17019-0.

147. Bandyopadhyay A. Anthropometry and body composition in soccer and volleyball players in West Bengal, India. Journal of Physiological Anthropology. 2007; 26(4):501-5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17704629.

148. Steinberger J, Kelly A. Cardiovascular risk at the extremes of body composition. Journal of Pediatrics. 2006; 149:739-40.

149. Enas EA. Indian diet and cardiovascular disease: An update. In: Chatterjee SS, editor. Update in Cardiology Hyderabad: Cardiology Society of India; 2007.

150. Bazzano LA, Serdula MK, Liu S. Dietary intake of fruits and vegetables and risk of cardiovascular disease. Current Atherosclerosis Reports [Review]. 2003; 5(6):492-9.

151. Laskar A, Sharma N, Bhagat N. Lifestyle disease risk factors in a north Indian community in delhi. Indian Journal of Community Medicine. 2010; 35(3):426-8. DOI:10.4103/0970-0218.69279.

152. Barengo NC, Hu G, Lakka TA, Pekkarinen H, Nissinen A, Tuomilehto J. Low physical activity as a predictor for total and cardiovascular disease mortality in middle-aged men and women in Finland. European Heart Journal. 2004; 25(24):2204-11.

153. WHO global strategy on diet, physical activity and health. Copenhagen: World Health Organization; 2003.

154. Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. Journal of the American Medical Association. 1995; 273(5):402-7.

155. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. Circulation. 2001; 104(22):2746-53.

156. The American Heart Association. Facts about women and cardiovascular disease. 2005; Available from: http://www.americanheart.org/presenter.jhtml?identifier=2876.

157. Grundy SM, Balady GJ, Criqui MH, Fletcher G, Greenland P, Hiratzka LF, et al. Primary prevention of coronary heart disease: guidance from Framingham: a statement for healthcare professionals from the AHA Task Force on Risk Reduction. The American Heart Association. Circulation. 1998; 97(18):1876-87.

158. WHO. Prevention of cardiovascular disease. Guidelines for risk assessment and management of cardiovascular risk. Geneva: World Health Organization; 2007. Available from: http:/www.who.int/cardiovascular_diseases.html.

159. Allen J, Szanton S. Gender, ethnicity, and cardiovascular disease. Journal of Cardiovascular Nursing [Review]. 2005; 20(1):1-6; quiz 7-8..

160. Enas EA, Mehta J. Malignant coronary artery disease in young Asian Indians: thoughts on pathogenesis, prevention, and treatment. Clinical Cardiology. 1995; 18:131-35.

161. Klatsky AL, Tekawa I, Armstrong MA, Sidney S. The risk of hospitalization for ischemic heart disease among Asian Americans in northern California. The American Journal of Public Health. 1994; 84(10):1672-75.

162. Leupker RV. Decline in incident coronary heart disease. Why are rates falling? Circulation. 2008; 117:592-93.

163. Gersh B, Mayosi B, Sliwa K, Yusuf S. The epidemic of cardiovascular diseases in the developing world: global implications. European Heart Journal 2010; 31:642-648.

164. Daviglus ML, Lloyd-Jones DM, Pirzada A. Preventing cardiovascular disease in the 21st century: therapeutic and preventive implications of current evidence. The American Journal of Cardiovascular Drugs. 2006; 6(2):87-101.

165. WHO. World Health Report. Reducing risks, promoting healthy life. Geneva, Switzerland: World Health Organizatiion; 2002. Available from: http://www.who.int/whr/en.

166. WHO. Action plan for the global strategy for the prevention and control of non-communicable diseases. Geneva: World Health Organization; 2008.

167. WHO. Prevention of recurrent heart attacks and strokes in low and middle income populations: evidencebased recommendations for policy-makers and health professionals. Geneva: World Health Organization; 2003.

168. Kavey RE, Daniels SR, Lauer RM, Atkins DL, Hayman LL, Taubert K. American Heart Association guidelines for primary prevention of atherosclerotic cardiovascular disease beginning in childhood. Circulation. 2003; 107:1562–66.

169. Rose G. Sick individuals and sick populations. International Journal of Epidemiology. 1985; 14(1):32-8.

170. Yancy CW, Benjamin EJ, Fabunmi RP, Bonow RO. Discovering the full spectrum of cardiovascular disease: Minority Health Summit 2003: executive summary. Circulation. 2005; 111(10):1339-49. DOI:10.1161/01.CIR.0000157740.93598.51.

171. Mendis S, Fukino K, Cameron A, Laing R, Filipe A, Jr., Khatib O, et al. The availability and affordability of selected essential medicines for chronic diseases in six low- and middle-income countries. Bulletin of the World Health Organization. 2007; 85(4):279-88.
172. Deshpande AD, Harris-Hayes M, Schootman M. Epidemiology of diabetes and diabetes-related complications. Physical Therapy [Review]. 2008; 88(11):1254-64. DOI:10.2522/ptj.20080020.
173. Pramono LA, Setiati S, Soewondo P, Subekti I, Adisasmita A, Kodim N, et al. Prevalence and predictors of undiagnosed diabetes mellitus in Indonesia. Acta Media Indonesiana. 2010; 42(4):216-23.
174. Ford ES, Ajani UA, Croft JB, Critchley JA, Labarthe DR, Kottke TE, et al. Explaining the decrease in U.S. deaths from coronary disease, 1980-2000. The New England Journal of Medicine. 2007; 356(23):2388-98. DOI:10.1056/NEJMsa053935.
175. Plummer CJ. What's in the CARDS? Diabetic Medicine [Editorial Review]. 2006; 23(7):711-4. DOI:10.1111/j.1464-5491.2006.01903.x.
176. Persell SD, Lloyd-Jones DM, Baker DW. National Cholesterol Education Program risk assessment and potential for risk misclassification. Preventive Medicine. 2006; 43(5):368-71. DOI:10.1016/j.ypmed.2006.06.017.
177. Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, et al. European guidelines on cardiovascular disease prevention in clinical practice: executive summary: Fourth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (Constituted by representatives of nine societies and by invited experts). European Heart Journal. 2007; 28(19):2375-2414. DOI:10.1093/eurheartj/ehm316.
178. Mosca L, Benjamin EJ, Berra K, Bezanson JL, Dolor RJ, Lloyd-Jones DM, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women--2011 update: a guideline from the american heart association. Circulation [Practice Guideline]. 2011; 123(11):1243-62. DOI:10.1161/CIR.0b013e31820faaf8.
179. WHO. Prevention of cardiovascular disease: guidelines for assessment and management of total cardiovascular risk. Geneva: World Health Organisation.; 2007.
180. National Heart Foundation of Australia. National Vascular Disease Prevention Alliance. Guidelines for the assessment of absolute cardiovascular disease risk. Available from: http://www.heartfoundation.org.au/Professional_Information/General_Practice/Pages/AbsoluteRisk.aspx
181. Lunetta M, Barbagallo A, Attardo T, Crimi S, Sangiorgio L. Frequency of coronary heart disease and related risk factors in a diabetic and nondiabetic population: a comparative study. Panminerva Medica [Comparative Study]. 1996; 38(4):211-6.
182. Kannel WB. Bishop lecture. Contribution of the Framingham Study to preventive cardiology. Journal of the American College of Cardiology. 1990; 15(1):206-11.

183. Huang N, Daddo M, Clune E. Heart health - CHD management gaps in general practice. Australian Family Physician [Review]. 2009; 38(4):241-5.
184. Bhatt DL, Steg PG, Ohman EM, Hirsch AT, Ikeda Y, Mas JL, et al. International prevalence, recognition, and treatment of cardiovascular risk factors in outpatients with atherothrombosis. Journal of the American Medical Association. 2006; 295(2):180-9. DOI:10.1001/jama.295.2.180.
185. Gaziano TA, Steyn K, Cohen DJ, Weinstein MC, Opie LH. Cost-effectiveness analysis of hypertension guidelines in South Africa: absolute risk versus blood pressure level. Circulation. 2005; 112(23):3569-76. DOI:10.1161/CIRCULATIONAHA.105.535922.
186. World Health Organization. Health System Financing Coutry profile: India. 2013. Available from: http://apps.who.int/nha/database/Country_Profile/Index/en
187. Ebrahim S, Taylor F, Ward K, Beswick A, Burke M, Davey Smith G. Multiple risk factor interventions for primary prevention of coronary heart disease. Cochrane Database Systematic Review. 2011; (1):CD001561. DOI:10.1002/14651858.CD001561.pub3.
188. Heeley EL, Peiris DP, Patel AA, Cass A, Weekes A, Morgan C, et al. Cardiovascular risk perception and evidence--practice gaps in Australian general practice (the AusHEART study). Medical Journal of Australia. 2010; 192(5):254-9.
189. Meischke H, Sellers DE, Robbins ML, Goff DC, Daya MR, Meshack A, et al. Factors that influence personal perceptions of the risk of an acute myocardial infarction. Behavioural Medicine. 2000; 26(1):4-13. DOI:10.1080/08964280009595748.
190. Tan NC, Ho CWS, Cheah SL. Lifestyle modifications of patients with coronary heart disease on follow up in public primary care centres in Singapore. Assessment of perception and behaviour. 2011; 37(1):67-72.
191. Nair M, Prabhakaran D. Why do South Asians have high risk for CAD? Global Heart. 2012; 8:1-8.
192. Batsis JA, Lopez-Jimenez F. Cardiovascular risk assessment--from individual risk prediction to estimation of global risk and change in risk in the population. BioMed Central Medicine [Review]. 2010; 8(29):29. DOI:10.1186/1741-7015-8-29.
193. Assmann G, Cullen P, Schulte H. Simple scoring scheme for calculating the risk of acute coronary events based on the 10-year follow-up of the prospective cardiovascular Munster (PROCAM) study. Circulation. 2002; 105(3):310-5.
194. Ferrario M, Chiodini P, Chambless LE, Cesana G, Vanuzzo D, Panico S, et al. Prediction of coronary events in a low incidence population. Assessing accuracy of the CUORE Cohort Study prediction equation. International Journal of Epidemiology. 2005; 34(2):413-21. DOI:10.1093/ije/dyh405.
195. Conroy RM, Pyorala K, Fitzgerald AP, Sans S, Menotti A, De Backer G, et al. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. European Heart Journal. 2003; 24(11):987-1003.

196. Poulter N. Global risk of cardiovascular disease. Heart [Review]. 2003; 89 Suppl 2((Suppl 2)):ii2-5; discussion ii35-7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12695425.
197. Helfand M, Buckley DI, Freeman M, Fu R, Rogers K, Fleming C, et al. Emerging risk factors for coronary heart disease: a summary of systematic reviews conducted for the U.S. Preventive Services Task Force. The Annals of Internal Medicine. 2009; 151(7):496-507.
198. Rodgers A, Lawes C, Gaziano T, Vos T. The growing burden of risk from high blood pressure, cholesterol, and bodyweight. In: Jamison DT, editor. Disease control priorities in developing countries. New York: Oxford University Press and the World Bank; 2006.
199. World Bank. World Development Indicators. Washington DC: World Bank; 2007.
200. Lenz M, Muhlhauser I. [Cardiovascular risk assessment for informed decision making. Validity of prediction tools]. Medizinische Klinik (Munich). 2004; 99(11):651-61. DOI:10.1007/s00063-004-1097-3.
201. Menotti A, Puddu PE, Lanti M. The estimate of cardiovascular risk. Theory, tools and problems. Annali Italiani di Medicina Interna. 2002; 17(2):81-94.
202. Stork S, Feelders RA, van den Beld AW, Steyerberg EW, Savelkoul HF, Lamberts SW, et al. Prediction of mortality risk in the elderly. The American Journal of Medicine. 2006; 119(6):519-25. DOI:10.1016/j.amjmed.2005.10.062.
203. Brindle P, Beswick A, Fahey T, Ebrahim S. Accuracy and impact of risk assessment in the primary prevention of cardiovascular disease: a systematic review. Heart. 2006; 92(12):1752-9. DOI:10.1136/hrt.2006.087932.
204. Fornasini M, Brotons C, Sellarès J, Martinez M, Galán ML, Sáenz I, et al. Consequences of using different methods to assess cardiovascular risk in primary care. Family Practice. 2006; 23(1):28-33.
205. Webster RJ, Heeley EL, Peiris DP, Bayram C, Cass A, Patel AA. Gaps in cardiovascular disease risk management in Australian general practice. Medical Journal of Australia. 2009; 191(6):324-9.
206. Peiris DP, Patel AA, Cass A, Howard MP, Tchan ML, Brady JP, et al. Cardiovascular disease risk management for Aboriginal and Torres Strait Islander peoples in primary health care settings: findings from the Kanyini Audit. Medical Journal of Australia. 2009; 191(6):304-9.
207. Reid C, Nelson MR, Shiel L, Chew D, Connor G, DeLooze F. Australians at risk: management of cardiovascular risk factors in the REACH Registry. Heart Lung Circulation. 2008; 17(2):114-118. DOI:http://dx.doi.org/10.1016/j.hlc.2007.07.009.
208. Fonarow GC. A practical approach to reducing cardiovascular risk factors. Review of Cardiovascular Medicine [Review]. 2007; 8 Suppl 4:S25-36.

209. Graham IM, Stewart M, Hertog MG. Factors impending the implementation of cardiovascular prevention guidelines: findings from asurvey conducted by the European Society of Cardiology. European Journal of Cardiovascular Prevention and Rehabilitation. 2006; 13(5):839-45.

210. De Muylder R, Lorant V, Paulus D, Nackers F, Jeanjean M, Boland B. Obstacles to cardiovascular prevention in general practice. Acta Cardiology. 2004; 59(2):119-25.

211. Eaton CB, Galliher JM, McBride PE, Bonham AJ, Kappus JA, Hickner J. Family physician's knowledge, beliefs, and self-reported practice patterns regarding hyperlipidemia: a National Research Network (NRN) survey. Journal of the American Board of Family Medicine. 2006; 19(1):46-53.

212. Cacoub P, Tocque-Le Gousse E, Fabry C, Hermant S, Petzold L. Application in general practice of treatment guidelines for patients with dyslipidaemia: the RESPECT study. Archive of Cardiovascular Diseases. 2008; 101(11-12):715-21. DOI:10.1016/j. acvd. 2008.09.011.

213. Wood A, Pell J, Patel A, Neal B, Raju PK, Chow CK. Prevention of cardiovascular disease in a rural region of India and strategies to address the unmet need. Heart. 2011; 97(17):1373-8. DOI:10.1136/hrt.2011.225987.

214. Gaziano T, I. KG. Cost of treating non-optimal blood pressure in select low and middle income countries in comparison to the United States. Boston, MA: Background Paper Commissioned by the Committee on Preventing the Global Epidemic of Cardiovascular Disease. 2009.

215. Sharma KK, Gupta R, Basniwal PK, Guptha S, Gupta R. Age and Gender Disparities in Evidence-based Treatment for Coronary Artery Disease in the Community: A Cross-sectional Study. Indian Journal of Community Medicine. 2011; 36(2):159-60. DOI: 10.4103/0970-0218.84138.

216. Keevil JG, Stein JH, McBride PE. Cardiovascular disease prevention. Primary Care. 2002; 29(3):667-96.

217. Johansson S, Wilhelmsen L, Lappas G, Rosengren A. High lipid levels and coronary disease in women in Goteborg--outcome and secular trends: a prospective 19 year follow-up in the BEDA*study. European Heart Journal. 2003; 24(8):704-16.

218. Garrity TF, Garrity AR. The nature and efficacy of intervention studies in the National High Blood Pressure Education Research Program. Journal of Hypertension Suppl [Review]. 1985; 3(1):S91-5.

219. Pimm TJ, Byron MA, Curson D, Weinman J. Personal illness models and the self-management of arthritis. Arthritis and Rheumatology. 1994; 37(suppl. 9):358.

220. Glanz K, Rimer BK, Lewis FM. Health Behavior and Health Education. Theory, Research and Practice. 3 ed. San Fransisco: Wiley & Sons; 2002; p. 47-9.

221. Becker DM, Levine DM. Risk perception, knowledge, and lifestyles in siblings of people with premature coronary disease. The American Journal of Preventive Medicine. 1987; 3(1):45-50.
222. Avis NE, Smith KW, McKinlay JB. Accuracy of perceptions of heart arrack risk: what influences perceptions and can they be changed? The American Journal of Public Health. 1989; 17:1608-12.
221. Webster R, Heeley E. Perceptions of risk: understanding cardiovuscular disease. Risk Management and Healthcare Policy [Review]. 2010; 3:49-60. DOI: http://dx.doi.org/10. 2147/RMHP.S8288
224. Rosenstock IM. The health belief model and preventive health behavior Health Education Monograph; 1974; p. 7.
225. Galloway RD. Health promotion: causes, beliefs and measurements. Clinical Medicine and Research [Review]. 2003; 1(3):249-58.
226. Ali N. Prediction of coronary heart disease preventive behaviours in women : A test of the health belief model. Women Health. 2002; 35(1):83-96.
227. Rogers RW. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In: Cacioppo JT, Petty RE, editors. Social Psychophysiology. New York: Guilford Press; 1983.
228. Winkleby MA, Flora JA, Kraemer HC. A community-based heart disease intervention: predictors of change. The American Journal of Public Health. 1994; 84(5):767-72.
229. Silagy C, Muir J, Coulter A, Thorogood M, Roe L. Cardiovascular risk and attitudes to lifestyle: what do patients think? The British Medical Journal. 1993; 19:1657-60.
230. Christian AH, Mochari HY, Mosca LJ. Coronary heart disease in ethnically diverse women: risk perception and communication. Mayo Clinic Proceedings. 2005; 80(12):1593-9. DOI:10.4065/80.12.1593.
231. Edwards A, Unigwe S, Elwyn G, Hood K. Personalised risk communication for informed decision making about entering screening programs. Cochrane Database of Systematic Reviews. 2007; (1):CD001865.
232. Wilcox S, Stefanick ML. Knowledge and perceived risk of major diseases in middle-aged and older women. Health Psychology. 1999; 18(4):346-53.
233. Zerwic JJ, King KB, Wlasowiez GS. Perceptions with patients with cardiovascular disease about the causes of coronary artery disease. Heart Lung. 1997; 26:92-98.
234. Chyun DA, Amend AM, Newlin K, Langerman S, Melkus GD. Coronary heart disease prevention and lifestyle interventions: cultural influences. Journal of Cardiovascular Nursing [Review]. 2003; 18(4):302-18.
235. McMahan S, Cathorall M, Romero DR. Cardiovascular disease risk perception and knowledge: A comparison of Hispanic and white college students in a Hispanic serving institution. Journal of Hispanic Higher Education. 2007; 6(1):5-18.

236. Hughes S, Hayman LL. Improving cardiovascular health in women: an opportunity for nursing. Journal of Cardiovascular Nursing [Review]. 2004; 19(2):145-7.
237. Peterson ML, Larsenb MH, Volppcde KG, Kimmel ES. Heart attack risk perception biases among hypertension patients: The role of educational level and worry. Psychology and Health. 2012; 27(6):737-51.
238. Diefenbach MA, Weinstein ND, O'Reilly J. Scales for assessing perceptions of health hazard susceptibility. Health Education Researh. 1993; 8(2):181-92.
239. Weinstein ND, Diefenbach MA. Percentage and verbal category measures of risk likelihood. Health education Research: Theory & Practice [Short Communication]. 1997; 12 (1):139-141.
240. Clason DL, Dormody TJ. Analyzing data measured by individual Likert type Items. Journal of Agricultural Education. 2000; 35(4):31-35.
241. Kapadia-Kundu N, Dyalchand A. The Pachod Paisa scale: A numeric response scale for health and social sciences. Demography India. 2007; Available from: http://www.comminit.com/africa/content/pachod-paisa-scale-numeric-response-scale-health-and-social-sciences.
242. Heine SJ, Lehman DR, Peng K, Greenholtz J. What's wrong with cross-cultural comparisons of subjective Likert scales?: The reference-group effect. Journal of Personaliy and Social Psychology. 2002; 82(6):903-18.
243. Van de Vijver F, Tanzer NK. Bias and equivalence in cross-cultural assessment: an overview. Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology. 2004; 54(2):119-135. DOI:10.1016/j.erap.2003.12.004.
244. Marteau TM, Kinmonth AL, Pyke S, Thompson SG. Readiness for lifestyle advice: self-assessments of coronary risk prior to screening in the British family heart study. Family Heart Study Group. The British Journal of General Practice. 1995; 45(390):5-8.
245. Niknian M, McKinlay SM, Rakowski W, Carleton RA. A comparison of perceived and objective CVD risk in a general population. The American Journal of Public Health. 1989; 79(12):1653-4.
246. Van der Weijden T, van Steenkiste B, Stoffers HE, Timmermans DR, Grol R. Primary prevention of cardiovascular diseases in general practice: mismatch between cardiovascular risk and patients' risk perceptions. Medical Decision Making. 2007; 27(6):754-61. DOI:10.1177/0272989X07305323.
247. Kreuter MW, Strecher VJ. Changing inaccurate perceptions of health risk: results from a randomized trial. Health Psychology. 1995; 14(1):56-63.
248. Van der Pligt J. Perceived risk and vulnerability as predictors of precautionary behavior. The British Journal of Health Psychology. 1998; 3:1-14.
249. Rimal RN. Perceived risk and self-efficacy as motivators: Understanding individuals' long term use of health information. Journal of Communications. 2001; 51(4):633-54.

250. Weinstein ND. What does it mean to understanding a risk? Evaluating risk comprehension. Journal of National Cancer Institute Monographs. 1999; (25):15-20.
251. Strecher VJ, Kreuter MW, Kobrin SC. Do cigarette smokers have unrealistic perceptions of their heart attack, cancer, and stroke risks? Journal of Behavioural Medicine. 1995; 18(1):45-54.
252. Cioe PA, Crawford SL, Stein MD. Cardiovascular risk-factor knowledge and risk perception among HIV-infected adults. Journal of the Association of Nurses in AIDS Care. 2014; 25(1):60-9. DOI:10.1016/j.jana.2013.07.006.
253. Paul AJ, C. BL, Cheryl DH, Michael LL, Sidney CS, Laura PS, et al. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults. Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). Journal of the American Medical Association. 2013; DOI:10.1001/jama.2013.284427.
254. Ganong WF. Review of medical physiology. 21 ed. New York: McGraw-Hill; 2003; p. 378-645.
255. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet. 2012; 380(9859):2224-60. DOI:10.1016/S0140-6736(12)61766-8.
256. WHO. High Blood Pressure-Global and Regional Overview. World Health Organization, Regional office for South East Asia; 2013.
257. He FJ, MacGregor GA. Blood pressure is the most important cause of death and disability in the world. European Heart Journal 2007; Suppl 9(Supp B):B23-B28.
258. Dangroo S, Hamid S, Rafiq M, Ashfaq D. The Role of Gender and Their Marital Status in the Prevalance of Hypertension in Kashmiri Population. Scholars Journal of Applied Medical Sciences. 2013; 1(6):975-980.
259. Law MR, Morris JK, Wald NJ. Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomised trials in the context of expectations from prospective epidemiological studies. The British Medial Journal. 2009; 338:b1665.
260. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. The Lancet. 2005; 365(9455):217-23. DOI:10.1016/S0140-6736(05)17741-1.
261. Yang Q, Cogswell ME, Flanders WD, Hong Y, Zhang Z, Loustalot F, et al. Trends in cardiovascular health metrics and associations with all-cause and CVD mortality among US adults. Journal of the American Medical Association. 2012; 307(12):1273-83.

262. Moorman J, West D, Chambers S. Disease overview – Hypertension and cardiovascular disease. In: Kassianos G, editor. Hypertension and Cardiovascular Disease. Oxfordshire, UK: CSF Medical Communications Ltd; 2005. p. 5-15.
263. Anderson KM, Wilson PW, Odell PM, Kannel WB. An updated coronary risk profile. A statement for health professionals. Circulation [Guideline]. 1991; 83(1):356-62.
264. Gupta R, Guptha S. Strategies for initial management of hypertension. Indian Journal of Medical Research [Review]. 2010; 132(5):531-42.
265. Gupta R, al-Odat NA, Gupta VP. Hypertension epidemiology in India: meta-analysis of 50 year prevalence rates and blood pressure trends. Journal of Human Hypertension [Meta-Analysis]. 1996; 10(7):465-72.
266. Devi P, Rao M, Sigamani A, Faruqui A, Jose M, Gupta R, et al. Prevalence, risk factors and awareness of hypertension in India: a systematic review. Jounal of Human Hypertension. 2013; 27:281-7.
267. Mohan V, Deepa M, Farooq S, Datta M, Deepa R. Prevalence, Awareness and control of hypertension in Chennai-The Chennai Urban Rural Epidemiology Study (CURSE-52). Journal of the Association of Physicians of India [Original article]. 2007; 55:326-332.
268. Sagare SM, Rajderkar S, Girigosavi BS. Certain Modifiable Risk Factors in Essential Hypertension. National Journal of Community Medicine. 2011; 2(1):9-13.
269. Joseph A, Kutty VR, Soman CR. High risk for coronary heart disease in Thiruvananthapuram city: a study of serum lipids and other risk factors. Indian Heart Journal. 2000; 52(1):29-35.
270. Isles C. Prevalence, epidemiology and pathology of hypertension. In: Warrell DA, editor. Oxford Textbook of Medicine. 4 ed. Oxford: Oxford University Press; 2000. p. 1153-60.
271. Ramachandran A, Snehalatha C, Vijay V, King H. Impact of poverty on the prevalence of diabetes and its complications in urban southern India. Diabetic Medicine. 2002; 19(2):130-5.
272. Kusuma YS. Perceptions on hypertension among migrants in Delhi, India: a qualitative study. BioMed Central Public Health. 2009; 9:267. DOI:10.1186/1471-2458-9-267.
273. Oparil S, Zaman MA, Calhoun DA. Pathogenesis of hypertension. The Annals of Internal Medicine [Review]. 2003; 139(9):761-76.
274. INTERSALT Co-operative Research Group. Sodium, potassium, body mass, alcohol and blood pressure: the INTERSALT study. Journal of Hypertension. 1988; 6(Suppl 4):S584–6.
275. Sever PS, Poulter NR. A hypothesis for the pathogenesis of essential hypertension: the initiating factors. Journal of Hypertension. 1989; 7(Suppl 1):S9–12.
276. Kannel WB. Hypertensive risk assessment: cardiovascular risk factors and hypertension. Journal of Clinical Hypertension (Greenwich). 2004; 6(7):393-9.

277. Giles TD, Berk BC, Black HR, Cohn JN, Kostis JB, Izzo JL, Jr., et al. Expanding the definition and classification of hypertension. Journal of Clinical Hypertension (Greenwich). 2005; 7(9):505-12.
278. Beevers G, Lip GY, O'Brien E. ABC of hypertension: The pathophysiology of hypertension. The British Medical Journal [Review]. 2001; 322(7291):912-6.
279. Frohlich ED. Hypertension, left ventricular hypertrophy, and coronary flow reserve. Advances in Experimental Medicine and Biology [Review]. 1997; 432:253-62.
280. Kannel BW, Wilson PWF. Cardiovascular risk factors and hypertension. In: Izzo JL, Jr., Black HR, editors. Hypertension Primer. 3 ed. Dallas, Tex, USA: The American Heart Association; 2003. p. 235-38.
281. Law M, Wald N, Morris J. Lowering blood pressure to prevent myocardial infarction and stroke: a new preventive strategy. Health Technology Assessment. 2003; 7(31):1-94.
282. Mulrow C, Lau J, Brand M. Pharmacotherapy for hypertension in the elderly. Cochcrane Database of Systematic Reviews. CD00028. 2004; 3
283. Petrella RJ, Merikle EP, Jones J. Prevalence, treatment, and control of hypertension in primary care: gaps, trends, and opportunities. Journal of Clinical Hypertension (Greenwich). 2007; 9(1):28-35.
284. Ong KL, Cheung BM, Man YB, Lau CP, Lam KSL. Prevalence, awareness, treatment, and control of hypertension among United States adults 1999-2004. Hypertension. 2007; 49:69-75.
285. Rodgers A, Lawes C, MacMahon S. Reducing the global burden of blood pressure-related cardiovascular disease. Journal of Hypertension Suppl [Research Support, Non-U.S. Gov't]. 2000; 18(1):S3-6.
286. Joint National Committee. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003; 42:1206-52.
287. Kaplan NM. Treatment of hypertension: remaining issues after the Anglo-Scandinavian Cardiac Outcomes Trial. Hypertension [Editorial Review]. 2006; 47(1):10-3. DOI:10.1161/01.HYP.0000196271.03526.50.
288. Messerli FH, Williams B, Ritz E. Essential hypertension. The Lancet [Review]. 2007; 370(9587):591-603. DOI:10.1016/S0140-6736(07)61299-9.
289. Kaplan NM, Opie LH. Controversies in hypertension. The Lancet [Review]. 2006; 367(9505):168-76. DOI:10.1016/S0140-6736(06)67965-8.
290. Cohen J. A power primer. Psychological Bulletin. 1992; 112:155-59.
291. Fuster V. The AHA guidelines and scientific statements handbook. Sussex, UK: Wiley-Blackwell; 2009.

292. Pereira M, Lunet N, Azevedo A, Barros.H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. Journal of Hypertension. 2009; 27(5):963-75.
293. The Heart Foundation. Guide to management of hypertension The National Heart Foundation, Australia; 2008.
294. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006; 3:77-101.
295. Cushman WC, Ford CE, Cutler JA, Margolis KL, Davis BR, Grimm RH, et al. Success and predictors of blood pressure control in diverse North American settings: the antihypertensive and lipid-lowering treatment to prevent heart attack trial (ALLHAT). Journal of Clinical Hypertension (Greenwich). 2002; 4(6):393-404.
296. Scarabelli T. Clinical Cardiovascular Pharmacology: Hypertension. Available from: http://www.readbag.com/med-wayne-pharmacology-courses-medpharm-scarabelli-hypert...
297. Appel LJ, Brands MW, Daniels SR, Karanja N, Elmer PJ, Sacks FM, et al. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. Hypertension [Practice Guideline]. 2006; 47(2):296-308. DOI:10.1161/01.HYP.0000202568.01167.B6.
298. Greeff D. An approach to preventing and treating hypertension through lifestyle modification. Professional Nursing Today. 2006; 10(5):8-22.
299. Xin X, He J, Frontini MG, Ogden LG, Motsamai OI, Whelton PK. Effects of alcohol reduction on blood pressure: a meta-analysis of randomized controlled trials. Hypertension. 2001; 38(5):1112-7.
300. MacMahon S, Alderman M, Lindholm LH, Liu L, Sanchez R, Seedat Y. Blood—pressure-related disease is a global health priority. The Lancet. 2008; 371(9623):1480-82.
301. Cramer JA, Benedict A, Muszbek N, Keskinaslan A, Khan ZM. The significance of compliance and persistence in the treatment of diabetes, hypertension and dyslipidaemia: a review. International Journal of Clinical Practice. 2008; 62(1):76-87. DOI:10.1111/j.1742-1241.2007.01630.x.
302. Cramer JA, Roy A, Burrell A, Fairchild CJ, Fuldeore MJ, Ollendorf DA, et al. Medication compliance and persistence: terminology and definitions. Value Health. 2008; 11(1):44-7. DOI:10.1111/j.1524-4733.2007.00213.x.
303. Vrijens B, Vincze G, Kristanto P, Urquhart J, Burnier M. Adherence to prescribed antihypertensive drug treatments: longitudinal study of electronically compiled dosing histories. The British Medical Journal. 2008; 336(7653):1114-7. DOI:10.1136/bmj.39553.670231.25.
304. Osterberg L, Blaschke T. Drug therapy: Adherence to Medication. The New England Journal of Medicine [Review]. 2005; 353:487-97.

305. ISPOR Medication Compliance and Persistence Special Interest Group (MCP): Accomplishments. International Society for Pharmacoeconomics & Outcomes Research. Available from: http://www.ispor.org/sigs/mcp_accomplishments.asp#definition
306. Biradar SS, Kapatae R, Reddy S, Raju AS. Importance of role of pharmacist mediated adherence in hypertensive patients a brief overview. International Journal of Research and Development in Pharmacy and Life Sciences. 2012; 1(1):11-15.
307. Mancia G, De Backer G, Dominiczak A, Cifkova R, Fagard R, Germano G, et al. 2007 Guidelines for the Management of Arterial Hypertension: The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). European Heart Journal. 2007; 28(12):1462-536.
308. Jin J, Sklar GE, Min Sen Oh V, Chuen Li S. Factors affecting therapeutic compliance: A review from the patient's perspective. Therapeutics and Clinical Risk Management. 2008; 4(1):269-86.
309. Atreja A, Bellam N, Levy SR. Strategies to enhance patient adherence: making it simple. Medscape General Medicine. 2005; 7(1):4.
310. Bosworth. HB. Medication Adherence: Making the Case for Increased Awareness. Duke University Medical Centre; 2012. Available from: http://www.scriptyourfuture.org/wp-content/uploads/2014/02/NCLDuke_BriefingPaper_FINAL.pdf.
311. Mohan S, Campbell NR. Hypertension management: time to shift gears and scale up national efforts. Hypertension. 2009; 53(3):450-1. DOI:10.1161/HYPERTENSIONAHA. 108.127076.
312. Ogedegbe G. Barriers to optimal hypertension control. Journal of Clinical Hypertension (Greenwich). 2008; 10(8):644-6.
313. Yach D, Hawkes C, Gould CL, Hofman KJ. The global burden of chronic diseases: overcoming impediments to prevention and control. Journal of the American Medical Association. 2004; 291(21):2616-22. DOI:10.1001/jama.291.21.2616.
314. Mallion JM, Schmitt D. Patient compliance in the treatment of arterial hypertension. Journal of Hypertension [Review]. 2001; 19(12):2281-3.
315. Bitter N. Maintaining long term control of blood pressure: The role ofimproved compliance. Clinical Cardiology. 1997; 18:12-26. DOI:10.1002/ clc.4960181504.
316. Gonzalez J, Noga M. Medication Therapy Management. Journal of Managed Care Pharmacy. 2008; 14(6):S8-S11.
317. National heart foundation of Australia. Improving adherence in cardiovascular care. 2011. Available from: http://www.heartfoundation.org.au.
318. Marshall GN, Hays RD. The Patient Satisfaction Questionnaire. Short Form (PSQ-18). Santa Monica, CA: RAND corporation; 1994.

319. Farmer KC. Methods for measuring and monitoring medication regimen adherence in clinical trials and clinical practice. Clinical Therapeutics. 1999; 21(6):1074-90; discussion 1073. DOI:10.1016/S0149-2918(99)80026-5.
320. George J, Kong DC, Stewart K. Adherence to disease management programs in patients with COPD. International Journal of Chronic Obstructive Pulmonary Diseases. 2007; 2(3):253-62.
321. Rudd P, Byyny RL, Zachary V, LoVerde ME, Mitchell WD, Titus C, et al. Pill count measures of compliance in a drug trial: variability and suitability. The American Journal of Hypertension. 1988; 1(3 Pt 1):309-12.
322. Cramer JA, Mattson RH, Prevey ML, Scheyer RD, Ouellette VL. How often is medication taken as prescribed? A novel assessment technique. Journal of the America Medical Association 1989; 261:3273-7.
323. Wetzels GEC, Nelemans PJ, Schouten J, van Wijk B, Prins M. All that glitters is not gold: a comparison of electronic monitoring versus filled prescriptions-an observational study. BioMed Central Health Services Research. 2006; 6:8.
324. Mengden T, Vetter H, Tousset E, Uen S. Management of patients with uncontrolled arterial hypertension: the role of electronic compliance monitoring, 24hr ambulatory blood pressure monitoring and Candesartan/HCT. BioMed Central Cardiovascular Disorders. 2006; 6:36.
325. Denhaerynck K, Schafer-Keller P, Young J, Steiger J, Bock A, De Geest S. Examining assumptions regarding valid electronic monitoring of medication therapy: development of a validation framework and its application on a European sample of kidney transplant patients. BioMed Central Medical Research Methodology. 2008; 8:5. Available from: http://www.biomedcentral.com/1471-2288/8/5
326. Garfield FB, Caro JJ. Achieving patient buy-in long-term compliance with anti-hypertensive treatment. Disease Management and Health Outcomes. 2000; 7(1):13-20.
327. Gangolli LV, Duggal R, Shukla A. Review of Health care in India. Santacruz (East) Mumbai: Centre for Enquiry into Health and Allied Themes (CEHAT); 2005. Available from: http://www.cehat.org/publications/PDf%20files/r51.pdf.
328. Gupta G. Healthcare in Delhi: The Appreciation Deserved and Criticism Justified. Working Paper No 222. New Delhi: Centre for Civil Society; 2009.
329. World Bank. World Development Report 1993; Investing in Health. New York: Oxford University Press; 1993.
330. Nanda P, Baru RV. Private Nursing Homes and their Utilisation: A case study of Delhi. New Delhi: Voluntary Health Association of India; 1993.
331. Vishwanathan H, Rohde J. The Rural Private Practitioner. New Delhi: Oxford University Press; 1985.

332. Singh R, Mukherjee M, Kumar R, Singh R, Pal R. Study of Risk factors of Coronary Heart Disease in Urban Slums of Patna. Nepal Journal of Epidemiology 2012; 2(3):205-12.
333. Mohan S, Singh K, Prabhakaran D, Rajon V. India Heart Beat. Challenges and options in prevention and control of non communicable diseases in India Issue 4, 2012.
334. Srivastava L. Report of the working group on disease burden for 12th five year plan. Noncommunicable diseases. 2011.
335. Directorate of Health Servies. Health Facilities in Delhi. Delhi: DHS, GOVT. of NCT of Delhi; 2009. Available from: http://www.health.delhigovt.nic.in.
336. Urban Health Division. National Urban Health Mission (2008-2012). Meeting the Health challenges of Urban Population Specially the urban Poor (with special focus on urban slums). New Delhi: Ministry of Health and Family Welfare, Governemnt of India; 2008.
337. Governing India's metropolises: Case Studies of four cities. New Delhi: Routledge; 2009; p. 340.
338. Government of Delhi. Medical and Public Health. Delhi. Available from: http://www.delhi.gov.in/wps/wcm/connect/d4c513804c2c319f81b0859991226613/53+-+64...
339. Central Intelligence Agency (US). World Fact Book.Field listing:Hospital Bed Density 2011. Available from: https://www.cia.gov/library/publications/the-world-factbook/fields/2227.html.
340. Sunder R. A Household Survey of Medical Care, NCAER. New Delhi; 1992.
341. Krishnan TN. Access to Health and the Burden of Treatment in India: An Inter-State Comparison. In: Rao M, editor. Disinvesting in Health: The World Bank's Prescriptions for Health. New Delhi: Sage Publications; 1999.
342. Bisht R. Understanding Environmental Health: A Study of Some Villages of Pauri Garhwal 1993 [M.Phil Dissertation].Jawaharlal Nehru University.
343. Vijaya S. Factors Determining Health of Home Based Women Weavers: A Case Study of Karnur 1997 [M.Phil Dissertation]. Jawaharlal Nehru University.
344. Kakade N. The development of Public Health Services and their Utilization: A Case Study of The Bombay Municipal Corporation 1998 [M.Phil Dissertation].Jawaharlal Nehru University.
345. Gumber A, Kulkarni V. Health Insurance for Workers in the Informal Sector, Detailed Results from a Pilot Study. New Delhi: National Council of Applied Economic Research; 2000.
346. Ellis RP, Alam M, Gupta I. Health Insurance in India : Prognosis and Prospectus. Economic and Political Weekly. 2000; 35(4)
347. Riley LW, Ko AI, Unger A, Reis MG. Slum health: diseases of neglected populations. BioMed Central International Journal of Health and Human Rights. 2007; 7(2):2. DOI:10.1186/1472-698X-7-2.

348. Gupta R. Prevention & control of CVD in women & children in India. Indian Journal of Medical Research [Editorial]. 2013; 138(3):281-4.
349. Waeber B, Burnier M, Brunner H. How to improve adherence with prescribed treatment in hypertensive patients? Journal of Cardiovascular Pharmacology. 2000; 35((Suppl 3):S23–26.
350. Mills EJ, Nachega JB, Buchan I, Orbinski J, Attaran A, Singh S, et al. Adherence to antiretroviral therapy in sub-Saharan Africa and North America: a meta-analysis. Journal of the American Medical Association. 2006; 296(6):679-90. DOI:10.1001/jama.296.6.679.
351. Bangsberg DR, Hecht FM, Charlebois ED, Zolopa AR, Holodniy M, Sheiner L, et al. Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. AIDS. 2000; 14(4):357-66.
352. World Bank. Country classification. 2011. Available from: http://go.worldbank.org/AJGKUS0E80.
353. Natioal Collaborating Centre for Methods and Tools. Quality assessment tool for quantitative studies. Hamilton, ON: McMaster University; 2008.
354. NICE. Methods for the development of NICE public health guidance (third edition). National Institute for Health and Care Ecellence; 2012.
355. Moher D, Liberati A, Tetzlaff J, Altman D, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Medicine. 2009; DOI:10.1371/journal.pmed1000097.
356. Osamor PE, Owumi BE. Factors Associated with Treatment Compliance in Hypertension in Southwest Nigeria. Journal of Health, Population and Nutrition. 2011; 29(6):619-28.
357. Nagarkar AM, Gadhave SA, Sharma I, Choure A, Morisky D. Factors influencing medication adherence among hypertensive patients in atertiary care hospital, Pune, Maharastra. National Journal of Community Medicine. 2013; 4(4):559-63.
358. Al-Ramahi R. Adherence to medications and associated factors: A cross-sectional study among Palestinian hypertensive patients. Journal of Epidemiology and Global Health. 2015; 5(2):125-32. DOI:10.1016/j.jegh.2014.05.005.
359. Boima V, Ademola AD, Odusola AO, Agyekum F, Nwafor CE, Cole H, et al. Factors Associated with Medication Nonadherence among Hypertensives in Ghana and Nigeria. International Journal of Hypertension. 2015; 2015:205716. DOI:10.1155/2015/205716.
360. Lalić J, Radovanović RV, Mitić B, Nikolić V, Spasić A, Koraćević G. Medication Adherence in Outpatients with Arterial Hypertension. Acta Facultatis Medicae Naissensis. 2013; 30(4):209-218. DOI:10.2478/afmnai-2013-0013.
361. Bilal A, Riaz M, Shafiq N, Ahmed M, Sadaf Sheikh, Rasheed S. Non-Compliance to Anti-Hypertensive Medication and its Associated Factors among Hypertensives. Journal of Ayub Medical College Abbottabad [Original article]. 2015; 27(1):158-163.

362. Khanam MA, Lindeboom W, Koehlmoos TL, Alam DS, Niessen L, Milton AH. Hypertension: adherence to treatment in rural Bangladesh--findings from a population-based study. Global Health Action. 2014; 7:25028. DOI:10.3402/gha.v7.25028.
363. Praveen KN, Halesh LH. Antihypertensive treatment: a study on correlates of non adherence in a tertiary care facility. International Journal of Biological and Medical Research [Original Article]. 2010; 1(4):248-252.
364. Ismael DH, Qadir SC. Factors Affecting Treatment Compliance of Hypertensive Patients in Erbil City. Kufa Journal for Nursing Sciences. 2015; 5(2)
365. Joho AA. Factors Affecting Treatment Compliance Among Hypertension Patients in three District Hospitals - Dar es Salaam [Masters thesis]: Muhimbili University of Health and Allied Sciences.; 2012.
366. Bhandari B, Bhattarai M, Bhandari M, Ghimire A, Pokharel PK, Morisky DE. Adherence to Antihypertensive Medications: Population Based Follow up in Eastern Nepal. Journal of Nepal Health Research Council. 2015; 13(29):38-42.
367. Hussain SM, Boonshuyar C, Ekram A. Non-Adherence To Antihypertensive Treatment in Essential Hypertensive Patients in Rajshahi, Bangladesh. Anwer Khan Modern Medical College Journal. 2011; 2(1):9-14. DOI:http://dx.doi.org/10.3329/akmmcj.v2i1.7465
368. Gelaw BK, Gelaw YK, Satessa DGa, G/Mariam ET. Assessment of Adherence of Patients with Anti- Hypertensive Medication and Factors for Non- Adherence in Amhara Region Dessie Referral Hospital, Ethiopia. International Journal of Chemical and Natural Sciences. 2013; 2(1):51-57.
369. Hareri HA, Gedefaw M, Simeng B. Assessment of prevalence and associated factors of adherence to antihypertensive agents among adults on follow up in Adama Referal hospital, East Shoa, Ethiopia-cross sectional study. International Journal of Current Microbiology and Applied Sciences. 2014; 3(1):760-70.
370. Ambaw AD, Alemie GA, W/Yohannes MS, Mengesha ZB. Adherence to antihypertensive treatment and associated factors among patients on follow up at University of Gondar Hospital, Northwest Ethiopia. BioMed Central Public Health. 2012; 12(282) Available from: http://www.biomedcentral.com/1471-2458/12/282.
371. Saleem F, Hassali M, Shafie A, Atif M. Drug attitude and adherence: a qualitative insight of patients with hypertension. Journal of Young Pharmacists. 2012; 4(2):101-7. DOI:10.4103/0975-1483.96624.
372. Odusola AO, Hendriks M, Schultsz C, Bolarinwa OA, Akande T, Osibogun A, et al. Perceptions of inhibitors and facilitators for adhering to hypertension treatment among insured patients in rural Nigeria: a qualitative study. BioMed Central Health Services Research. 2014; 14(624):624. DOI:10.1186/s12913-014-0624-z.

371. Nsitou M B, Stéphane M, Bousso, Bwira B. Patients-related predictors of poor adherence to antihypertensive treatment in Congo-Brazzaville: a cross-sectional study. Global Journal of Medicine and Public Health. 2013; 2(5).

374. Campbell PC, Oladeyi OO. Compliance To and Knowledge of Anti-Hypertensive Therapy amongst Hypertensive Patients Attending Lagos University Teaching Hospital (Luth), Idi-Araba, Lagos, Nigeria. IOSR Journal of Dental and Medical Sciences. 2014; 13(5):108-115.

375. Hareri HA, Abebe M. Assessments of Adherence to Hypertension Medications and Associated Factors among Patients Attending Tikur Anbessa Specialized Hospital Renal Unit, Addis Ababa, Ethiopia 2012. International Journal of Nursing Science. 2013; 3(1):1-6. DOI: 10.5923/j.nursing.20130301.01.

376. Ali M, Bekele M, Teklay G. Antihypertensive medication non-adherence and its determinants among patients on follow up in public hospitals in Northern Ethiopia. International Journal of Clinical Trials. 2014; 1(3):95. DOI:10.5455/2349-3259.ijct 20141103

377. Olowookere A, Olowookere S, Talabi A, Etonyeaku A, Adeleke O, Akinboboye O. Perceived family support and factors influencing medication adherence among hypertensive patients attending a Nigerian tertiary hospital. The Annals of Tropical Medicine and Public Health. 2015; 8(241):245.

378. Fina Lubaki J-P, Mabuza L, Malete N, Maduna P, Mdimande J. Reasons for non-compliance among patients with hypertension at Vanga Hospital, Bandundu Province, Democratic Republic of Congo: A qualitative study. African Journal of Primary Health Care & Family Medicine. 2009; 1(1). DOI:10.4102/phcfm. v1i1.68.

379. Ahmed S. Assessment of adherence to antihypertensive treatment among patients attending a health care facility in North India. International Journal of Research in Medical Sciences [Original article]. 2015; 4(1):117-124.

380. Kamran A, Sadeghieh AS, Biria M, Malepour A, Heydari H. Determinants of Patient's Adherence to Hypertension Medications: Application of Health Belief Model Among Rural Patients. The Annals of Medical and Health Sciences Research [original]. 2014; 4(4):922-26.

381. Shima R, Farizah MH, Majid HA. A qualitative study on hypertensive care behavior in primary health care settings in Malaysia. Patient Prefer Adherence. 2014; 8:1597-609. DOI:10.2147/PPA.S69680.

382. Eizubier AG, Husain AA, Suleiman A, Hamid ZA. Drug compliance among hypertensive patients in Kassala, Eastern Sudan. Eastern Mediterranean health journal = La revue de santé de la Méditerranée orientale = al-Majallah al-ṣiḥḥīyah li-sharq al-mutawassiṭ. 2000; 6(1):100-5.

383. Srikanth J, Kulkarni S. Hypertension in elderly: Prevalence and health care seeking pattern in an urban slum of Bangalore city. International Journal of Recent Scientific Research [Research article]. 2015; 6(3):2952-57.
384. Ramli A, Ahmad NS, Paraidathathu T. Medication adherence among hypertensive patients of primary health clinics in Malaysia. Patient Prefer Adherence. 2012; 6:613-22. DOI:10.2147/PPA.S34704.
385. Srivastava AK, Kandpal SD, Sati H. Predictors for adherence in hypertensive therapy- A study in rural area of District Dehradun. Indian Journal of Community Health. 2015; 27(3):320-26.
386. Hu H, Li G, Arao T. How hypertensive patients in the rural areas use home blood pressure monitoring and its relationship with medication adherence: A primary care survey in China. Open Journal of Preventive Medicine. 2013; 03(09):510-516. DOI:10.4236/ojpm.2013.39069.
387. Kusuma YS. migrants' Perception on Barriers to treatment Seeking for Hypertension: a Qualitative Study from Delhi, India. Ethno Medicine. 2010; 4(3):173-6.
388. Hashmi SK, Afridi MB, Abbas K, Sajwani RA, Saleheen D, Frossard PM, et al. Factors associated with adherence to anti-hypertensive treatment in Pakistan. PLoS One. 2007; 2(3):e280. DOI:10.1371/journal.pone.0000280.
389. Barreto MdS, Reiners AAO, Marcon SS. Knowledge about hypertension and factors associated with the non-adherence to drug therapy. Revista Latino-Americana de Enfermagem. 2014; 22(3):491-498. DOI:10.1590/0104-1169.3447.2442.
390. Silva Barreto Md, Schiavon Ganassin G, Matsuda LM, Marcon SS. Dissatisfaction with the Health Service and Non-Adherence to Antihypertensive Medication Treatment in Brazil*. Open Journal of Nursing. 2015; 05(01):49-57. DOI:10.4236/ojn.2015.51006.
391. Dosse C, Cesarino C, Martin J, Castedo M. Factors associated to patients' non compliance with hypertension treatment. Latino-am Enfermagem. 2009; 17(2):201-6.
392. Gadkari AS, McHorney C. Unintentional non-adherence to chronic prescription medications: how unintentional is it really? BioMed Central health services research. 2012; 12(98).
393. Benson J, Britten N. Patients' decisions about whether or not to take antihypertensive drugs: qualitative study. The British Medical Journal. 2002; 325:873–77.
394. Cioe PA. Women's Perceptions of Coronary Heart Disease-An integrative review. Journal of Cardiovascular Nursing 2005; 20(3):170-76
395. Samb B, Desai N, Nishtar S, Mendis S, Bekedam H, Wright A, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low-income and middle-income countries. Lancet. 2010; 376(9754):1785-97. DOI:10.1016/S0140-6736(10)61353-0

396. Chia LR, Schlenk EA, Dunbar-Jacob J. Effect of personal and cultural beliefs on medication adherence in the elderly. Drugs Aging. 2006; 23(3):191-202.
397. Strecher VJ, Rosenstock IM. The Health Belief Model. In: Glanz K, Rimer B, Lewis F, editors. Health Behavior and Health Education Theory, Research and Practice. 3 ed. San Fransisco: Wiley & Sons; 1997. p. 47-9.
398. Becker MH. The Health Belief Model and Sick Role Behavior. Health Education Quarterly. 1974; 2(4):409-419.
399. Janz NK. The Health Belief Model in understanding cardiovascular risk factor reduction behaviors. Journal of Cardiovascular Nursing. 1988; 24(6):39-41.
400. Jokisalo E, Kumpusalo E, Enlund H, Halonen P, Takala J. Factors related to non-compliance with antihypertensive drug therapy. Journal of Human Hypertension. 2002; 16(8):577-83. DOI:10.1038/sj.jhh.1001448.
401. Carpenter R. Perceived threat in compliance and adherence research. Nursing Inquiry. 2005; 12(3):192-9. DOI:10.1111/j.1440-1800.2005.00269.x.
402. Edo TA. Factors affecting compliance with anti hypertensive drug treatment and required lifestyle modifications among hypertensive patients on praslin Island [Masters thesis]. South Africa: University of South Africa; 2009.
403. Green LW, Kreuter MW. Health promotion: an educational and environmental approach. 2 ed. London: Mayfield Publishers; 2000; p. 162.
404. Hypertension Study Group V. Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India: a multicentre study. Bulletin of the World Health Organization. 2001; 79:490-500.
405. Winfield EB, Whaley AL. A comprehensive test of the health belief model in the prediction of condom use among African American college students. Journal of Black Psychology. 2002; 28(4):330-46.
406. Horne R. Patients' beliefs about treatment: the hidden determinant of treatment outcome? Journal of Psychosomatic Research. 1999; 47:491-5. DOI: 10.1016 / S0022-3999(99)00058-6.
407. Munro S, Lewin S, Swart T, Volmink J. A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS. BioMed Central Public Health 2007; 7(104):116.
408. Onoruoiza IS, Musa A, Umar BD, Kunle YS. Using Health Beliefs Model as an Intervention to Non Compliance with Hypertension Information among Hypertensive Patient. IOSR Journal Of Humanities And Social Science (IOSR-JHSS). 2015; 20(9):11-16. DOI:10.9790/0837-20951116.
409. Johnson RB, Onwuegbuzie AJ, Turner LA. Towards a definition of mixed methods research. Journal of Mixed Methods Research. 2007; 1(2):112-133.

410. Pickering TG. Now we are sick: labeling and hypertension. Journal of Clinical Hypertension (Greenwich). 2006; 8(1):57-60.
411. Cameron R. A sequential mixed model research design: Design, analytical and display issues. International Journal of Multiple Research Approaches. 2009; 3(2):140-152.
412. Creswell JW, Plano C, Vicki L. Designing and conducting mixed methods research. Thousand Oaks, California: Sage Publications, Inc; 2007.
413. Charles T, Abbas.T. Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences. Thousand Oaks, CA: Sage Publications, Inc; 2009; p. 151.
414. Dobhal S, Pande B. The Economic Times. Income inequality up both in rural and urban areas, 2008. New Delhi:7th February.
415. UN-Habitat. State of the World's Cities 2008/2009. Harmonious Cities. London: United Nations Human Settlements Programme; 2008.
416. Government of the National Capital territory- Delhi (NCTD). Economic Survey of Delhi 2005-06. 2006. Available from: http://delhi.gov.in/wps/wcm/_connect/DoIT_Planning/planning/economic+survey+of+dehli/content3/table14
417. Census and Registrar General. Census of india 2001. New Delhi: Office of the Registrar General & Census Commissioner, Ministry of Home Affairs, India; 2001.
418. Ali S. Magnitude of Slum Problem in Delhi. In: Environmental situation of slums in India. Delhi: Uppal Publishing House 2003.
419. Arora A. Non-Motorized Transport in Peri-urban Areas of Delhi, India. Nairobi; 2011. Available from: http://www.unhabitat.org/grhs/2013.
420. Government of Delhi. Economic Survey of Delhi 2008-09. New Delhi: Government of the National Capital Territory of Delhi; 2009. Available from: http://delhiplanning.nic.in/Economic%20Survey/Ecosur2008-09/Ecosur2001-02.htm.
421. Hindi. In: Brown K, editor. Encyclopedia of Language and Linguistics. 2 ed: Elsevier; 2005.
422. Country Reports-India Facts and Culture. 2015. Available from: http://www.countryreports.org/country/India.htm.
423. Ministry of Minority Affairs, Government of India. Baseline Survey of North-East District, NCT Delhi. Minority Concentrated Districts Project. Jamia Millia Islamia, New Delhi; 2007.
424. Panagariya A, Megha M. A comprehensive analysis of poverty in India. Policy Research Working Paper no. 6714, 2013. Wahington, DC: The World Bank.;
425. South Delhi Municipal Corporation. Colonies under jurisdiction of SDMC. Delhi; 2016. Available from: http://mcdonline.gov.in/tri/sdmc_mcdportal/colonylist.php.

426. Gurav RB, Kartikeyan S. Levels of blood pressure in an urban community. Bombay Hospital J. 2003; Available from: http://www.bhj.org/journal/2001_4301_jan/original_148.htm.
427. Mosca L, Mochari H, Christian A, Berra K, Taubert K, Mills T, et al. National study of women's awareness, preventive action, and barriers to cardiovascular health. Circulation. 2006; 113(4):525-34. DOI:10.1161/CIRCULATIONAHA.105.588103
428. CDC. Behavioral Risk Factor Surveillance System Questionnaire. 2011.
429. Allen JK, Purcell A, Szanton S, Dennison CR. Perceptions of cardiac risk among a low-income urban diabetic population. Journal of Health Care for the Poor and Underserved. 2010; 21(1):362-70. DOI:10.1353/hpu.0.0241.
430. Burns N, Grove SK. The practice of nursing research: conduct, critique & utilisation 5ed. Philadelphia: W.B.Saunders; 2005; p. 374
431. Polit DF, Beck CT, Hungler BP. Essentials of nursing research: methods, appraisal and utilization. Philadelphia: Lippincott; 2001; p. 242.
432. The IPAQ group. International Physical Activity Questionnaire (Short Last 7 Days Self-administered Format). 2002. Available from: http://www.ipaq.ki.se/.
433. Chogle A, Mistry K, Deo S. Comparison of the Indian version of Health Assessment Questionnaire Score and Short Form 36 Physical Function Score in rheumatoid arthritis using Rasch analysis. Indian Journal of Rheumatology 2008; 3:52-7.
434. Bean D, Cundy T, Petrie KJ. Ethnic differences in illness perceptions, self-efficacy and diabetes self-care. Psychology & Health. 2007; 22(7):787-811. DOI:10.1080/14768320600976240.
435. Rodriguez-Llanes JM, Ranjan-Dash S, Degomme O, Mukhopadhyay A, Guha-Sapir D. Child malnutrition and recurrent flooding in rural eastern India: a community-based survey. The British Medical Journal Open. 2011; 1(2):e000109. DOI:10.1136/bmjopen-2011-000109.
436. Lwanga SK, Lemeshow S. Sample Size Determination in Health Studies: A Practical Mannual. Geneva: World Health Organization; 1991.
437. Gupta R, Pandey RM, Misra A, Agrawal A, Misra P, Dey S, et al. High prevalence and low awareness, treatment and control of hypertension in Asian Indian women. Journal of Human Hypertension. 2012; 26(10):585-93. DOI:10.1038/jhh.2011.79.
438. WHO. Conducting the Survey,Data entry, Data Analysis, and Reporting and Disseminating results. In: WHO STEPS Surveillance; 2008.
439. Marshall G. "Kish grid." A Dictionary of Sociology. 1998. Available from: http://www.encyclopedia.com.
440. WHO. Guide to Physical Measurements (Step 2). In: WHO STPES Surveillance. Geneva, Switzerland: World health Organization; 2008. p. 1-14.

441. WHO. Waist Circumference and Waist-Hip Ratio, Report of a WHO Expert Consultation. World Health Organization; 2008
442. International Business Machines Corp. IBM SPSS Statistics 19 Documentation 2012. Available from: http://www-304.ibm.com/support/docview.wss?uid=swg27022445.
443. Britten N. Qualitative interviews in medical research. The British Medical Journal. 1995; 311(6999):251-3.
444. Francis J, Johnston M, Robertson C, Glidewell L, Entwistle V, Eccles M, et al. What is an adequate sample size? Operationalising datasaturation for theory-based interview studies. Psychology and Health. 2010; 25:1229-45.
445. Guest G. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. Field Methods. 2006; 18(1):59-82. DOI:10.1177/1525822x05279903.
446. Rolison JJ, Y. Hanoch SW, and P.-J. Liu,. Risk-taking differences across the adult life span: a question of age and domain. Journals of Gerontology B Psychological Sciences and Social Sciences. 2014; 69(6):870-880.
447. Denzin N, Lincoln Y. Introduction: The discipline and practise of qualitative research. In: Denzin N, Lincoln Y, editors. Collecting and interpreting qualitative materials 3ed. Thousand Oaks: Sage Publications; 2008. p. 1-43.
448. Shenton AK. Strategies for ensuring trustworthiness in qualitative research projects. Education for Information. 2004; 22:63-75.
449. Viera AJ, Garrett JM. Understanding interobserver agreement: the kappa statistic. Family Medicine. 2005; 37(5):360-3.
450. Tashakkori A, Teddlie C. Handbook of mixed methods in social & behavioral research. Thousand Oaks, CA: Sage Publications; 2003.
451. Chaturvedi S, Pant M, Neelam, Yadav G. Hypertension in Delhi: prevalence, awareness, treatment and control. Tropical Doctor. 2007; 37(3):142-5. DOI:10.1258/ 004947507781524593.
452. Anand MP. Prevalence of hypertension amongst Mumbai executives. Journal of the Associantions of Physicians of India. 2000; 48(12):1200-1.
453. Gupta R, Sharma AK, Gupta VP, Bhatnagar S, Rastogi S, Deedwania PC. Increased variance in blood pressure distribution and changing hypertension prevalence in an urban Indian population. Journal of Human Hypertension. 2003; 17(8):535-40. DOI:10.1038/sj.jhh.1001588.
454. Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, et al. High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. Diabetologia. 2001; 44(9):1094-101. DOI:10.1007/s001250100627.
455. Mohan V, Deepa M, Deepa R, Shanthirani CS, Farooq S, Ganesan A, et al. Secular trends in the prevalence of diabetes and impaired glucose tolerance in urban South

India--the Chennai Urban Rural Epidemiology Study (CURES-17). Diabetologia. 2006; 49(6):1175-8. DOI:10.1007/s00125-006-0219-2.

456. Stamler J, Vaccaro O, Neaton JD, Wentworth D. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. Diabetes Care. 1993; 16(2):434-44.

457. Joshi SR, Saboo B, Vadivale M, Dani SI, Mithal A, Kaul U, et al. Prevalence of diagnosed and undiagnosed diabetes and hypertension in India--results from the Screening India's Twin Epidemic (SITE) study. Diabetes Technology and Theraputics. 2012; 14(1):8-15. DOI:10.1089/dia.2011.0243.

458. Anjana RM, Pradeepa R, Das AK, Deepa M, Bhansali A, Joshi SR, et al. Physical activity and inactivity patterns in India - results from the ICMR-INDIAB study (Phase-1) [ICMR-INDIAB-5]. International Journal of Behavioural Nutrition and Physical Activity. 2014; 11(1):26. DOI:10.1186/1479-5868-11-26.

459. Bhardwaj S, Misra A, Misra R, Goel K, Bhatt SP, Rastogi K, et al. High prevalence of abdominal, intra-abdominal and subcutaneous adiposity and clustering of risk factors among urban Asian Indians in North India. PLoS One. 2011; 6(9):e24362. DOI:10.1371/journal.pone.0024362.

460. Singh RB, Pella D, Mechirova V, Kartikey K, Demeester F, Tomar RS, et al. Prevalence of obesity, physical inactivity and undernutrition, a triple burden of diseases during transition in a developing economy. The Five City Study Group. Acta Cardiology. 2007; 62(2):119-27. DOI:10.2143/AC.62.2.2020231.

461. Vijayakumar G, Arun R, Kutty VR. High prevalence of type 2 diabetes mellitus and other metabolic disorders in rural Central Kerala. Journal of the Association of Physicians of India. 2009; 57:563-7.

462. Taka T, Tragler A. Prevalence of Obesity and the Factors Influencing it among Women in a Slum of Mumbai. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). 2014; 13(4):76-79.

463. Stubbs CO, Lee AJ. The obesity epidemic: both energy intake and physical activity contribute. Medical Journal of Australia. 2004; 181(9):489-491.

464. Gupta V, Yadav K, Anand K. Patterns of tobacco use across rural, urban, and urban-slum populations in a north Indian community. Indian Journal of Community Medicne. 2010; 35(2):245-51. DOI:10.4103/0970-0218.66877.

465. Sekhri T, Kanwar RS, Wilfred R, Chugh P, Chhillar M, Aggarwal R, et al. Prevalence of risk factors for coronary artery disease in an urban Indian population. British Medical Journal Open. 2014; 4(12):e005346. DOI:10.1136/bmjopen-2014-005346.

466. Gaziano TA, Abrahams-Gessel S, Denman CA, Montano CM, Khanam M, Puoane T, et al. An assessment of community health workers' ability to screen for cardiovascular disease risk with a simple, non-invasive risk assessment instrument in Bangladesh,

Guatemala, Mexico, and South Africa: an observational study. Lancet Global Health. 2015; 3(9):e556-63. DOI:10.1016/S2214-109X(15)00143-6.

467. Mendis S, Lindholm LH, Anderson SG, Alwan A, Koju R, Onwubere BJ, et al. Total cardiovascular risk approach to improve efficiency of cardiovascular prevention in resource constrain settings. Journal of Clinical Epidemiology [Multicenter Study]. 2011; 64(12):1451-62. DOI:10.1016/j.jclinepi.2011.02.001.

468. Otgontuya D, Oum S, Buckley BS, Bonita R. Assessment of total cardiovascular risk using WHO/ISH risk prediction charts in three low and middle income countries in Asia. BioMed Central Public Health. 2013; 13:539. DOI:10.1186/1471-2458-13-539.

469. Ndindjock R, Gedeon J, Mendis S, Paccaud F, Bovet P. Potential impact of single-risk-factor versus total risk management for the prevention of cardiovascular events in Seychelles. Bulletin of the World Health Organization. 2011; 89(4):286-95. DOI:10.2471/BLT.10.082370.

470. Angus J, Evans S, Lapum J, Rukholm E, St Onge R, Nolan R, et al. "Sneaky disease": the body and health knowledge for people at risk for coronary heart disease in Ontario, Canada. Social Science & Medicine. 2005; 60(9):2117-28. DOI:10.1016/ j.socscimed.2004.08.069.

471. Walcott-McQuigg JA. Psychological factors influencing cardiovascular risk reduction behavior in low and middle income African-American women. Journal of the National Black Nurses Association. 2000; 11(1):27-35.

472. Oliver-McNeil S, Artinian N. Women's perception of personal cardiovascular risk and their risk-reducing behaviors. The American Journal of Critical Care. 2002; 11(3):221-27.

473. Pancioli AM, Broderick J, Kothari R, Brott T, Tuchfarber A, Miller R, et al. Public perception of stroke warning signs and knowledge of potential risk factors. Journal of the American Medical Association. 1998; 279(16):1288-92.

474. Homko CJ, Zamora L, Santamore WP, Kashem A, McConnell T, Bove AA. Gender differences in cardiovascular risk factors and risk perception among individuals with diabetes. Diabetes Education. 2010; 36(3):483-8. DOI:10.1177/0145721710366757.

475. Choi S, Rankin S, Stewart A, Oka R. Perceptions of coronary heart disease risk in Korean immigrants with type 2 diabetes. Diabetes Education. 2008; 34(3):484-92. DOI:10.1177/0145721708316949.

476. Emslie C, Hunt K, Watt G. Invisible women? The importance of gender in lay beliefs about heart problems. Sociology of Health and Illness. 2001; 23(2):203-233. DOI:10.1111/1467-9566.00248/.

477. Kumar N, Unnikrishnan B, Thapar R, Mithra P, Kulkarni V, Holla R, et al. Factors associated with adherence to antihypertensive treatment among patients attending a tertiary care hospital in Mangalore, South India. International Journal of Current Research Review [Research article]. 2014; 6(10):77-85.

478. Tsiantou V, Pantzou P, Pavi E, Koulierakis G, Kyriopoulos J. Factors affecting adherence to antihypertensive medication in Greece: results from a qualitative study. Patient Prefer Adherence. 2010; 4:335-43. DOI:10.2147/PPA.S12326.

479. Bane C, Hughes CM, Cupples ME, McElnay JC. The journey to concordance for patients with hypertension: a qualitative study in primary care. Pharmacy World and Science. 2007; 29(5):534-40. DOI:10.1007/s11096-007-9099-x.

480. Jolles EP, Padwal RS, Clark AM, Braam B. A Qualitative Study of Patient Perspectives about Hypertension. ISRN Hypertension. 2013; 2013:1-10. DOI:10.5402/2013/671691.

481. Svensson S, Kjellgren KI. Adverse events and patients' perceptions of antihypertensive drug effectiveness. Journal of Human Hypertension. 2003; 17(10):671-5. DOI:10.1038/sj.jhh.1001596.

482. Bovet P, Burnier M, Madeleine G, Waeber B, Paccaud F. Monitoring one-year compliance to antihypertension medication in the Seychelles. Bulletin of the World Health Organization. 2002; 80(1):33-9.

483. Salako BL, Ajose FA, Lawami E. Blood pressure control in a population where antihypertensive drugs are given free. East African Medical Journal. 2003; 80:529-31.

484. Barnes L, Moss-Morris R, Kaufusi M. Illness beliefs and adherence in diabetes mellitus: a comparison between Tongan and European patients. The New Zealand Medical Journal. 2004; 117:743.

485. Beune EJ, Haafkens JA, Agyemang C, Schuster JS, Willems DL. How Ghanaian, African-Surinamese and Dutch patients perceive and manage antihypertensive drug treatment: a qualitative study. Journal of Hypertension. 2008; 26(4):648-56. DOI: 10.1097/HJH.0b013e3282f4d20b.

486. Marshall IJ, Wolfe CD, McKevitt C. Lay perspectives on hypertension and drug adherence: systematic review of qualitative research. The British Medical Journal. 2012; 345:e3953. DOI:10.1136/bmj.e3953.

487. Gascon JJ. Why hypertensive patients do not comply with the treatment: Results from a qualitative study. Family Practice. 2004; 21(2):125-130. DOI:10.1093/fampra/cmh202.

488. Bhojani U, Mishra A, Amruthavalli S, Devadasan N, Kolsteren P, De Henauw S, et al. Constraints faced by urban poor in managing diabetes care: patients' perspectives from South India. Global Health Action. 2013; 6:22258. DOI:10.3402/gha.v6i0.22258.

489. The World Bank. Physicians (per 1,000 people) 2016. Available from: http://data.worldbank.org/indicator/SH.MED.PHYS.ZS.

490. Bhojani U, Devedasan N, Mishra A, De Henauw S, Kolsteren P, Criel B. Health system challenges in organizing quality diabetes care for urban poor in South India. PLoS One. 2014; 9(9):e106522. DOI:10.1371/journal.pone.0106522.

491. Schmittdiel JA, Uratsu CS, Karter AJ, Heisler M, Subramanian U, Mangione CM, et al. Why don't diabetes patients achieve recommended risk factor targets? Poor adherence

versus lack of treatment intensification. Journal of General Internal Medicine. 2008; 23(5):588-94. DOI:10.1007/s11606-008-0554-8.

492. Torley D, Zwar N, Comino EJ, Harris M. GPs' views of absolute cardiovascular risk and its role in primary prevention. Australian Family Physician. 2005; 34(6):503-4, 507.

493. Mosca L, Banka CL, Benjamin EJ, Berra K, Bushnell C, Dolor RJ, et al. Evidence-based guidelines for cardiovascular disease prevention in women. Circulation. 2007; 115:1481-1501.

494. Doroodchi H, Abdolrasulnia M, Foster JA, Foster E, Turakhia MP, Skelding KA, et al. Knowledge and attitudes of primary care physicians in the management of patients at risk for cardiovascular events. BioMed Central Family Practice. 2008; 9(1):42. DOI:10.1186/1471-2296-9-42.

495. Van Steenkiste B, van der Weijden T, Stoffers HE, Grol R. Barriers to implementing cardiovascular risk tables in routine general practice. Scandinavian Journal of Primary Health Care. 2004; 22(1):32-7.

496. Ford ES, Jones DH. Cardiovascular health knowledge in the United States: findings from the National Health Interview Survey, 1985. Preventive Medicine. 1991; 20(6):725-36.

497. Thimmayamma BVS. A handbook of schedules and guidelines in socio-economic and diet surveys. National Institute of Nutrition Press, Hyderabad: Indian Council of Medical Research, National Institute of Nutrition; 1987; p. 18-23.

498. Das M, Isaakidis P, Armstrong E, Gundipudi NR, Babu RB, Qureshi IA, et al. Directly-observed and self-administered tuberculosis treatment in a chronic, low-intensity conflict setting in India. PLoS One. 2014; 9(3):e92131. DOI:10.1371/journal.pone.0092131.

499. Chatterjee S, Choudhury N. Medical communication skills training in the Indian setting: Need of the hour. Asian Journal of Transfusion Science. 2011; 5(1):8-10. DOI:10.4103/0973-6247.75968.

500. Eisenstat S, Siegel LA, Carlson K, Ulman K. Putting Group Visits Into Practice: A Practical Overview to Preparation, Implementation, and Maintenance of Group Visits at Massachusetts General Hospital. Boston, Massachusetts: Women's Health Associates, The John D. Stoeckle Center for Primary Care Innovation, Massachusetts General Hospital; 2012. Available from: http://www.massgeneral.org/stoecklecenter/assets/pdf/group_visit_guide.pdf

501. Trento M, Passera P, Tomalino M, Bajardi M, Pomero F, Allione A, et al. Group visits improve metabolic control in type 2 diabetes: a 2-year follow-up. Diabetes Care. 2001; 24(6):995-1000.

502. Rahaghi FF, Chastain VL, Benavides R, Ferrer G, Ramirez J, Mehta J, et al. Shared medical appointments in pulmonary hypertension. Pulmonary Circulation. 2014; 4(1):53-60. DOI:10.1086/674883.

503. Bray P, Thompson D, Wynn JD, Cummings DM, Whetstone L. Confronting disparities in diabetes care: the clinical effectiveness of redesigning care management for minority patients in rural primary care practices. Journal of Rural Health. 2005; 21(4):317-21.

504. Iihara N, Nishio T, Okura M, Anzai H, Kagawa M, Houchi H, et al. Comparing patient dissatisfaction and rational judgment in intentional medication non-adherence versus unintentional non-adherence. Journal of Clinical Pharmacy and Therapeutics. 2014; 39(1):45-52. DOI:10.1111/jcpt.12100.

505. Oliveira TL, Miranda LdP, Fernandes PdS, Caldeira AP. Eficácia da educação em saúde no tratamento não medicamentoso da hipertensão arterial. Acta Paulista de Enfermagem. 2013; 26(2):179-184. DOI:10.1590/s0103-21002013000200012.

506. Edwards A, Hood K, Matthews E, Russell D, Russell I, Barker J, et al. The effectiveness of one-to-one risk communication interventions in health care: a systematic review. Medical Decision Making. 2000; 20(3):290-7.

507. National Programme on prevention and control of cardio-vascular diseases, diabetes and stroke (NPCDCS): Managing Non-Communicable Diseases. New Delhi: Press Information Bureau, Government of India; 2010. Available from: http://pib.nic.in/newsite/efeatures.aspx? relid=76249.

508. Fine LJ, Cutler JA. Hypertension and the treating physician: understanding and reducing therapeutic inertia. Hypertension. 2006; 47(3):319-20. DOI:10.1161/01.HYP.0000200692. 23410.c9.

509. Hajjar I, Miller K, Hirth V. Age-related bias in the management of hypertension: a national survey of physicians' opinions on hypertension in elderly adults. Journal of Gerontology series A: Biological Sciences and Medical Sciences. 2002; 57(8):M487-91.

510. Perk J, De Backer G, Gohlke H, Graham I, Reiner Z, Verschuren M, et al. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). European Heart Journal. 2012; 33:1635-701. DOI:http://dx.doi.org/10.1093/eurheartj/ehs092ehs092.

511. Babu BV, Kar SK. Domestic violence against women in eastern India: a population-based study on prevalence and related issues. BioMed Central Public Health. 2009; 9:129. DOI:10.1186/1471-2458-9-129.

512. Vlassoff C. Gender differences in determinants and consequences of health and illness. J0urnal Health Population Nutrition. 2007; 25(1):47-61. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17615903.

513 Bennoune K. Secularism and Human Rights: A Contextual Analysis of Headscarves, Religious Expression, and Women's Equality Under International Law Columbia Journal of Transnational Law. 2007; 45(2):1-60

514. Menon VU, Kumar K, Gilchrist A, Sugathan T, Sundaram K, Nair V, et al. Prevalence of known and undetected diabetes and associated risk factors in central Kerala--ADEPS. Diabetes Research and Clinical Practice. 2006; 74(3):289-94.

515. Fathima FN, Raghunath D, Hegde SK, Agrawal T, Misquith D, Sreekantiah P. Predictive Accuracy of a Cardiovascular Disease Risk Prediction Model in Rural South India – A Community Based Retrospective Cohort Study. Indian Journal of Community Health. 2015; 27(1):110-116.

516. Cainzos-Achirica M, Blaha MJ. Cardiovascular risk perception in women: true unawareness or risk miscalculation? BioMed Central Medicine. 2015;13:112. DOI:10.1186/s12916-015-0351-2.

517. Ikechuwku EO, Obinna UP, Ogochukwu AM. Predictors of Self Reported Adherence to Antihypertensive medication in a Nigerian Population. Journal of Basic and Clinical Pharmacy. 2010; 1(2):133-138.

518. The British National Formulary (BNF). 57 ed. UK: British Medical Journal Group and RPS Publishing; 2009; p. 71-147.

519. Venkatachalam J, Abrahm SB, Singh Z, Stalin P, Sathya GR. Determinants of Patient's Adherence to Hypertension Medications in a Rural Population of Kancheepuram District in Tamil Nadu, South India. Indian Journal of Community Medicine. 2015; 40(1):33-7. DOI:10.4103/0970-0218.149267

520. Rao BB, Kabra PR, Sreedhar M. Factors associated with adherence to antihypertensive treatment among hypertensive persons in a urban slum area of Hyderabad. Indian Journal of Basic and Applied Medical Research [research article]. 2014; 4(1):471-77. Available from: www.ijbamr.com.

521. Turki AK, Sulaiman SA. Adherence to Antihypertensive Therapy in General Hospital of Penang: Does Daily Dose Frequency Matter? Jordan Journal of Pharmaceutical Sciences. 2009; 2(2).

522. Atulomah NO, Florence OM, Oluwatosin A. Treatment adherence and risk of non-compliance among hypertensives at a Teaching Hospital in Ogun state, southwest Nigeria. acta SATECH [Research article]. 2010; 3(2):143-49.

523. Saleem F, Hassali M, Shafie A, Awad A, Bashir S. Association between Knowledge and Drug Adherence in Patients with Hypertension in Quetta, Pakistan. Tropical Journal of Pharmaceutical Research. 2011; 10(2):125-132.

524. Zyoud HS, Al-Jabi WS, Sweileh MW, Morisky ED. Relationship of treatment satisfaction to medication adherence: findings from a cross-sectional survey among hypertensive patients in Palestine. Health and Quality of Life Outcomes 2013. 2013; 11:191.

525. Mukora-Mutseyekwa FN, Chadambuka EM. Drug adherence behavior among hypertensive out-patients at a tertiary health institution in Manicaland province, Zimbabwe, 2011. Patient Prefer Adherence. 2013; 7:65-70. DOI:10.2147/PPA.S4029.

Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

Appendix 1: Ethical approval from the Human Research Ethical Committee (HREC), Curtin University

MEMORANDUM

Curtin University

To:	A/Professor Jaya Earnest School of Nursing and Midwifery
CC:	A/Professor Jaya Earnest
From	Professor Peter O'Leary, Chair HREC
Subject	Ethics approval Approval number: HR42/2015
Date	05-Mar-15

Office of Research and Development
Human Research Ethics Office

TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Office for the project: 6067

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in New Delhi, India.

Your application was reviewed by Human Research Ethics Committee at Curtin University at their meeting on the 3/02/2015

Thankyou for providing the additional information requested by the Human Research Ethics Committee. The information you provided was satisfactory and your proposal is now approved.

Please note the following conditions of approval:

1. Approval is granted for a period of four years from **05-Mar-15** to **05-Mar-19**
2. Research must be conducted as stated in the approved protocol.
3. Any amendments to the approved protocol must be approved by the Ethics Office.
4. An annual progress report must be submitted to the Ethics Office annually, on the anniversary of approval.
5. All adverse events must be reported to the Ethics Office.
6. A completion report must be submitted to the Ethics Office on completion of the project.
7. Data must be stored in accordance with WAUSDA and Curtin University policy.
8. The Ethics Office may conduct a randomly identified audit of a proportion of research projects approved by the HREC.

Should you have any queries about the consideration of your project please contact the Ethics Support Officer for your faculty, or the Ethics Office at hrec@curtin.edu.au or on 9266 2784. All human research ethics forms and guidelines are available on the ethics website.

Yours sincerely,

Professor Peter O'Leary
Chair, Human Research Ethics Committee

Appendix 2: Ethical approval from Sigma International Review Board, Delhi, India

Sigma-IRB (Institutional Review Board)
(A Division of Sigma Research and Consulting PvtLtd)
C 23, South Extension I, First Floor
New Delhi-110049

t (+ 91 11) 4619 5555
f (+ 91 11) 4619 5500
www.sigma-india.in

CIN No: U74140DL2008PTC182567

APPROVAL DOCUMENT

DATE: 17.08.2015

TO: Dr Lipi Dhar

PROJECT TITLE: " **Perceptions of Global Coronary Heart Disease (CHD) Risk, and Adherence to Anti-hypertensive Treatment among Low Income Urban Women in Sarai Kale Khan, Delhi, India".**

IRB Number: 10008/IRB/D/15-16

Thank you for submitting the protocol, informed consent and tools of thestudy "**Perceptions of Global Coronary Heart Disease (CHD) Risk, and Adherence to Anti-hypertensive Treatment among Low Income Urban Women in Sarai Kale Khan, Delhi, India"** for review by the SIGMA-IRB.

We are pleased to inform you that the study protocol, informed consent and tools have been approved by the Sigma IRB Committee in accordance with the compliance of the Title 45, Code of Federal Regulations, sub-part A (Common Rule).

All research activities must be conducted in accordance with this approved submission. You are requested to ensure fulfillment of the following requirements:

1. Changes, amendments, and addenda to the protocol, informed consent, or other study materials must be submitted to the SIGMA-IRB for re-review and approval **prior** to implementation.

2. Any unanticipated problems, adverse events, protocol violations, social harm, or any new information becoming available which could change the risk/benefit ratio must be reported to the SIGMA-IRB.

Following SIGMA-IRB Committee members discussed this submission:

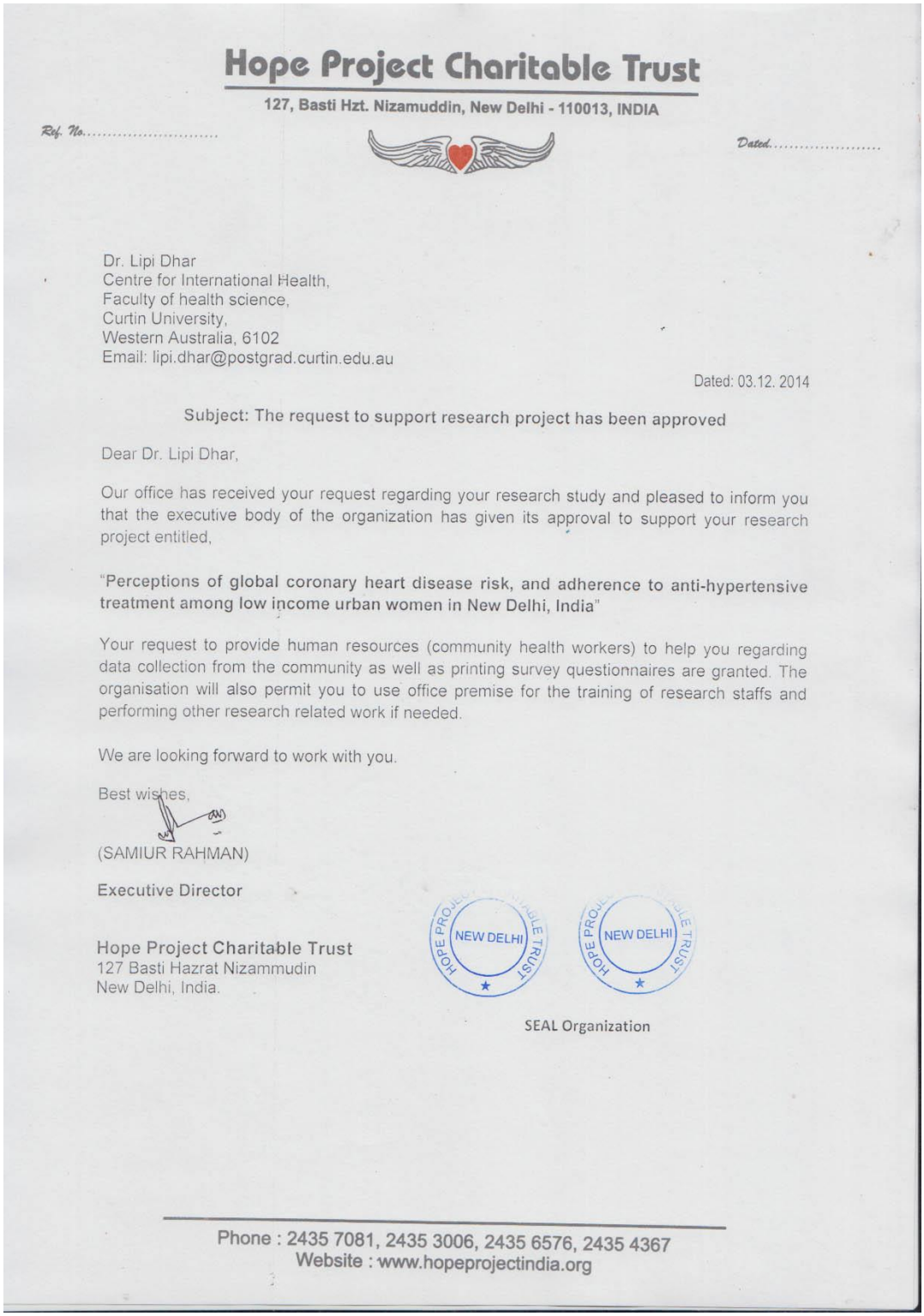
1. Prof VemuriMuralidhar
2. Dr U V Somayajulu
3. Dr S Mondal
4. Bhavna Bajaj

The SIGMA-IRB concluded that the Principal Investigator has taken sufficient safeguard to carry out the study. Therefore, the SIGMA-IRB approves this proposal.

Signature:
Prof VemuriMuralidhar
(Chairman of Sigma-IRB) Date: 17.08.2015

Signature
Dr Jaya Earnest, Curtin University Date: 17.08.2015
[Principal Investigator]

Appendix 3: Supporting letter from the concerned NGO



Hope Project Charitable Trust

127, Basti Hzt. Nizamuddin, New Delhi - 110013, INDIA

Ref. No.....

Dated.....

Dr. Lipi Dhar
Centre for International Health,
Faculty of health science,
Curtin University,
Western Australia, 6102
Email: lipi.dhar@postgrad.curtin.edu.au

Dated: 03.12. 2014

Subject: The request to support research project has been approved

Dear Dr. Lipi Dhar,

Our office has received your request regarding your research study and pleased to inform you that the executive body of the organization has given its approval to support your research project entitled,

"Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in New Delhi, India"

Your request to provide human resources (community health workers) to help you regarding data collection from the community as well as printing survey questionnaires are granted. The organisation will also permit you to use office premise for the training of research staffs and performing other research related work if needed.

We are looking forward to work with you.

Best wishes,

(SAMIUR RAHMAN)

Executive Director

Hope Project Charitable Trust
127 Basti Hazrat Nizammudin
New Delhi, India.

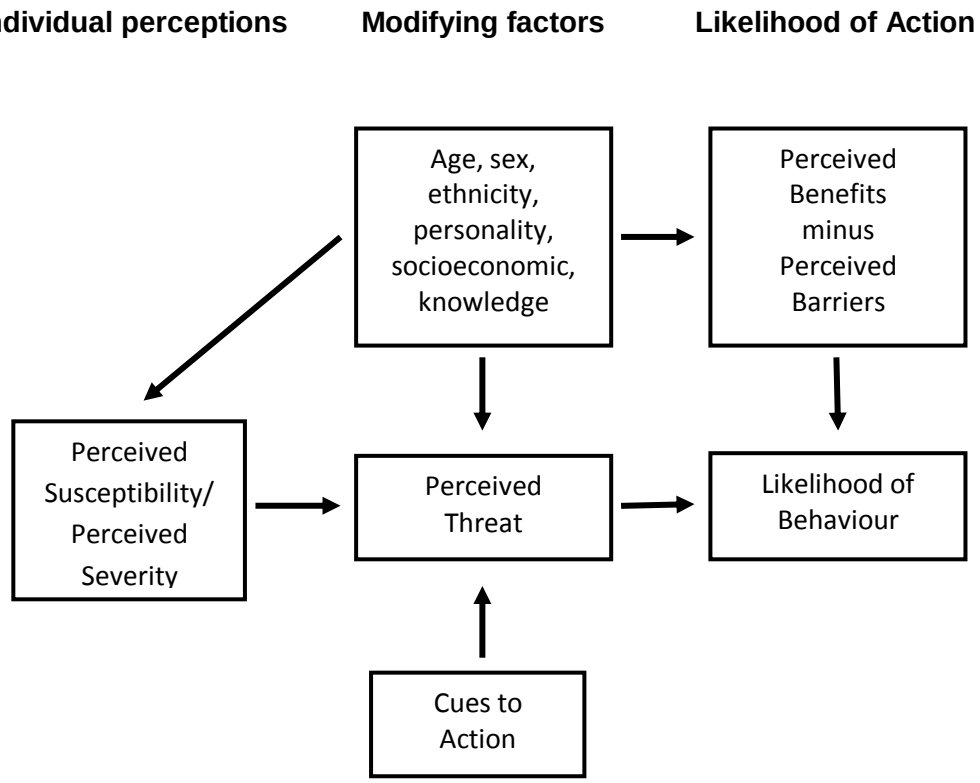
HOPE PROJECT CHARITABLE TRUST NEW DELHI

HOPE PROJECT CHARITABLE TRUST NEW DELHI

SEAL Organization

Phone : 2435 7081, 2435 3006, 2435 6576, 2435 4367
Website : www.hopeprojectindia.org

Appendix 4: The Health Belief Model (HBM)[397]



Appendix 5: Life style modifications and their effect on hypertension[6]

Modification	Recommendation	Approximate SBP reduction (range)
1.Weight reduction	Maintain normal body weight (BMI 18.5-24.9 kg/m^2)	5-20 mmHg/ 10 kg weight reduction
2. Adopt the DASH eating plan	Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat	8-14 mmHg
3. Dietary sodium reduction	Reduced dietary salt intake to <2400mg sodium per day or <6000 sodium chloride per day	2-8 mmHg
4. Moderation of alcohol consumption	Limit alcohol consumption to no more than 2 drinks (e.g. 24 oz bear, 10 oz wine or 3 oz 80-proof whiskey) per day in men and to no more than one drink per day in women and lighter weight persons	2-4 mmHg
5. Physical activity	Engage in regular aerobic exercises such as brisk walking at least 30 minutes per day most of the week	4-9 mmHg

KYE: BMI=Body Mass Index; SBP=Systolic Blood Pressure

Appendix 6: Common antihypertensive medications, their mechanism of action and adverse effects[518]

Antihypertensive	Mechanism of action	Adverse effects
Angiotensin Converting Enzyme inhibitors e.g. Lisinopril	Blocking the conversion of angiotensin-1 to angiotensin-11, a potent vasoconstrictor and thereby leading to reduced vascular resistance	Hypotension Persistent dry cough Angioedema Impotence Alopecia
Diuretics:		
Thiazides e.g. Bendrofluazide	Increasing fluid loss from the body. Inhibiting sodium reabsorption at the distal convoluted tubules	Hyperuricemia (gout) Hyponatraemia Postural hypotension Impotence
Loop Diuretics e.g Frusemide	Inhibiting potassium re-absorption at the ascending limb of the loop of Henle in the renal tubule.	Hypokalemia Hyponatraemia Hypomagnesaemia Hypochloraemic alkalosis
Potassium Sparers e.g. Spironolactone	Antagonising aldosterone and potassium sparing diuresis.	Hyponatremia Hyperkalemia Gastro-intestinal (GI)tract disturbances Impotence Menstrual irregularities
Beta adrenoceptor blockers e.g. Atenolol	Blocking beta-adrenoceptors in the heart, peripheral vasculature, pancreas, liver, bronchi.	GI tract disturbances Bradycardia Hypotension Bronchospasm
Calcium channel blockers e.g. Amlodipine	Blocking the inward flow of Ca+ ions through active cell membranes	Bradycardia A-V block Hypotension Sleep disturbances Pedal oedema
Angiotensin II receptor antagonists e,g. Valsartan	Blocking angiotensin-II receptors	Anemia Neutropenia Cough Headache
Alpha adrenergic blockers e.g. Prazosin	Blocking post-synaptic adrenoceptors producing vasodilation.	Postural hypotension Drowsiness Palpitations Priapism Urinary incontinence
Centrally acting drugs e.g. Methyldopa	Stimulating alpha-adrenergic receptors in the brain thus inhibiting the sympathetic nervous system	GI tract disturbances Stomatitis Hypersensitivity- reaction Impotence Failure of ejaculation Decreased libido

Appendix 7: Participant Information Sheet

International Heath Program
School of Nursing, Midwifery and Para medicine
Faculty of Health Science

Participant Information Sheet

PhD research project title:

"Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India"

PhD student and Researcher
Dr. Lipi Dhar
International Health Programme,
School of Nursing, Midwifery& Para medicine,
Curtin University
Kent Street, Western Australia 6102
Email:lipi.dhar@postgrad.curtin.edu.au
Mobile: +61426239050

Principal Investigator
Professor Jaya Earnest
Building 401, Curtin University
Kent street, Western Australia 6102
Telephone: +61 89266 4151
Email: J.Earnest@curtin.edu.au
webhttp://www.curtin.edu.au/

Associate supervisor
Dr. Supreet Kaur
PhD (nutrition)
All India Institute of Medical Sciences
Telephone: +91-9717387654
Email:supreetaiims@gmail.com

Co-Investigator
Dr. Mohammed Ali
Building 401, Curtin University
Kent street, Western Australia 6102
Telephone: +61 892663974
Email: M.Ali@curtin.edu.au
webhttp://www.curtin.edu.au

Background: Coronary heart disease (Disease of the Heart/ Heart attack) is one of the leading causes of death in India. The causes of heart attack include high blood pressure, high cholesterol, diabetes (high blood sugar), tobacco smoking, unhealthy diet, obesity, physical inactivity and high tobacco use. In most cases theses can be controlled or treated. Women who have any one of the above causes, especially high blood pressure, have a high risk of developing heart disease. Controlling high blood pressure will bring down the risk of having heart disease and make the individuals' life better.

Purpose: The purpose of this PhD research study is to find out total coronary heart disease risks, perceptions of their total risks, and adherence to treatment recommendations of women with high blood pressure living in a low income urban area of Delhi, India.

What the project will involve:

The first part of the research project involves a personal interview where trained and experienced health workers of our research team will ask you questions about your age, education, employment, income, tobacco use, drinking habits, fruit and vegetable intake, physical activity and medical history of high blood pressure. If you have high blood pressure, they will also ask some more specific questions about your health and treatment in the last two weeks. The interview will take about 30-45 minutes.

The second part of the study involves clinical and physical measurements; where research staff, after interviewing you, will measure your blood pressure (BP), height, weight, waist and hip circumference. These measurements will take approximately 10-15 minutes.

Possible benefits:

- Taking part in this study will enable you to know your risks of developing heart disease. If you are at such risk, we will refer you to the appropriate health care provider at the nearest government hospital (Safdarjung Hospital). They can carry out the necessary medical tests, advise you of various ways in which to control or reduce your risks of developing heart disease, and prescribe you medications that can control your high blood pressure or any complications that you may have developed as a result of high blood pressure.
- Some of the risk factors for heart disease are also common for other health conditions such as diabetes, cancers and lung disease. For example, smoking can cause both cancers and lung disease, and overweight or sedentary lifestyle can make you more likely to develop diabetes and certain cancers. Thus, by becoming aware of these risk factors, you can take the appropriate steps to manage these risk
- Your participation in this study will help us understand more about how to reduce the risk of heart disease among women living in low income urban settlements in Delhi.

Possible Risks: No physical harm or financial burden will result from your involvement in this study.

Voluntary participation and withdrawal from the project: Please note that your participation is voluntary. You are free to refuse to answer any particular question(s) or any physical procedures. You have the right to withdraw yourself at any phase of the study procedure even after having initially agreed to participate, without prejudice or any negative consequences; non participation will not affect your rights/access to usual services you receive from the NGO or other health care services.

Confidentiality: Information that is obtained from you will be completely confidential and will not be revealed to others. You will not be identified in the resulting report.

Reimbursement: You will not be paid for participating in this study**.** As a token of appreciation for your participation and time, you will be provided a kitchen utensil.

Questions or concerns: You can find out more about the study, if needed, or you have any further questions/concerns regarding this study please contact Dr. Lipi Dhar (mobile no: +918586893522) or Dr. Supreet Kaur (mobile no: +91-9717387654). If you have any ethical concerns regarding the study you can contact: Dr U V Somayajulu, The Secretary, Sigma IRB member secretary, Sigma Research and Consulting Private Limited (Contact no: +91 11 4619 5555)

Do you understand what I have just explained or should I explain again?

THANK YOU VERY MUCH FOR PARTICIPATING IN THE STUDY

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR42/2015). The committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. Its main role is to protect participants. If needed, the verification of approval can be obtained either by writing to the Curtin University Human Ethics Committee, c/- office of research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning 92662784 or by emailing hrec@curtin.edu.au

Appendix 8: Participant Consent Form

International Heath Program
School of Nursing, Midwifery and Para medicine
Faculty of Health Science

Participant Consent Form

I …….. agree to participate in the research project entitled,

"Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India"

In giving my consent I acknowledge that:

1. I have been given an Information Sheet about this study and have been given time to consider whether I want to take part.
2. The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.
3. I have been told about the possible advantages and risks of taking part in the study and I understand what I am being asked to do.
4. I know that I do not have to take part in the study and that I can withdraw at any time during the study without it any way affecting my medical care.
5. I understand that my involvement is strictly confidential. I understand that any research data gathered from the results of the study may be published however no information about me will be used in any way that is identifiable.

----------	----------	----------
Name of Participant	Signature of Participant	Date

If participant with low literacy

(A literate witness must sign)

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness_____

Signature of witness _____

Date _____

Thumb print of participant

Appendix 9: Questionnaire

International Heath Program
School of Nursing, Midwifery &Para medicine
Faculty of Health Science

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India

No of questionnaire	
Code of the household	
Code of the participant	

Full name of the participant

Full address of the household

Contact number:

Date	

Section 1 *Demographic information

Please provide your response to the following questions by giving Tick (√) in the box or answer in space provided

Questions		Response	
Q1	How old are you in years?	Years ----------	
Q2	What is the highest level of education you have completed?	Illeterate	☐
		Can sign only	☐
		Primary school completed (up to year 5)	☐
		Completed year 10	☐
		Completed year 12	☐
		College/University completed	☐
		Other (specify)	☐
		Don't know/ can't remember	☐
Q3	What is your religion?	Hindu	☐
		Muslim	☐
		Christian	☐
		Sikh	☐
		Other ----------	
Q4	What is your marital status?	Never married	☐
		Currently married	☐
		Separated	☐
		Divorced	☐
		Widowed	☐
Q5	Which of the following best describes your main work status over the past 12 months?	Government employee	☐
		Nongovernment employee	☐
		Self-employed	☐
		Unskilled/manual labourer	☐
		Homemaker	☐
		Retired/ pensioner	☐
		Unemployed	☐

		Other ----------
Q6	What were the average earnings of your entire house hold (per month) in the past 12 months? (in INR)	_____ Don't know
Q7	Type of family:	Nuclear ☐ Joint ☐ Others: (specify)----------
Q8	No. of household members: (specify)	----------
Q9	Does anybody come with you if you need clinic visits in generally?	Yes ☐ ☐

Section 2 Behavioural measurements

Now I am going to ask you some questions about various health behaviours. This includes things like tobacco use, drinking alcohol, eating fruits and vegetables and physical activity**.

	Questions **Response**	**No**	**Yes**
Q10	Did you consume smoked tobacco in the last one month?	☐	☐
Q11	Do you currently use smoked tobacco product daily?	☐	☐
Q12	Did you consume any smokeless tobacco such as gutkha, naswar, khaini, zarda paan, betel in the last one month? (use show card)	☐	☐
Q13	Do you currently use smokeless tobacco product daily?	☐	☐
Q14	Have you ***ever*** consumed an alcoholic drink such as beer, wine, spirits, or other alcohol-based drink	☐	☐
Q15	Have you consumed alcohol within the past 30days?	☐	☐

Q. 16	**Over the last one month how often you eat the following food items: daily, weekly, occasionally, or never?**	**DAILY**	**3-4 TIMES/ WEEK**	**WEEKLY**	**OCCASIONALLY**	**NEVER**
A	Cereals (Chapati, rice, daliya, suji, bajra, jowar, ragi etc.)					
B	Milk or milk products (Curd, chach, lassi, paneer, khoa, tea, coffee etc.)					
C	Pulses or beans (All dals like arhar, moong, rajma, chana, urad etc)and soyabean					
D	Green leafy vegetables (Palak, sarson, cholaiy, soya, methi etc.)					
E	Roots and tubers (Potato, sweet pototo, colocasia, yam etc)					
F	Other vegetables (All other vegetables excluding above mentioned)					
G	Fruits (Apple, grapes, mango, guava, banana, melons, papaya, berries etc.)					
H	Eggs					
I	Fish (Fish and other seafood)					
J	Chicken or meat					
K	Nuts and oilseed (almonds, cashew nut, raisin, apricot, peanut etc.)					
L	Fats and oils (All fats used in cooking)					
M	Sugar and Jaggery					
N	Fried foods (Poori, pakora, samosa, cutlet, tikki, parantha, vada, kachori, mathri etc.)					

O	Junk foods (Burger, pizza, noodles, pasta, patties, French fries etc.)					
P	Sweets (Indian and other sweets)					
Q	Aerated drinks (Carbonated beverages)					

17. How much salt (in Kg) is consumed in your household in a month? ---------- --Kg
18. How much cooking oil in total is used in your household during last one month?
    (Refined oil (all types), mustard oil, coconut oil, fish oil, Dalda, desi ghee) ----------Kg

****Physical activity**

Think about all the vigorous activities that you did in the last 7 days. **Vigorous physical activities** refer to activities that take hard physical effort and make you **breathe much harder than normal**. Think *only* about those physical activities that you did for **at least 10 minutes at a time**

Q19a	During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, construction work, running,or fast bicycling?	Days per week --------- None ☐	if none go to Q21a
Q19b	How much time did you spend doing vigorous physical activities on one of those days?	Hours per day ------ Minutes per day ------ Unsure/ don't know ☐ Refused ☐	

Think about all the moderate activities that you did in the last 7 days. **Moderate activities** refer to activities that take moderate physical effort and make you **breathe somewhat harder than normal**. Think only about those physical activities that you did for **at least 10 minutes at a time**

Q20a	During the last 7 days, on how many days did you do moderate physical activities (carrying light loads <20kg, various sports, household and domestic chores,carrying buckets of water or loads of laundry to and from wells - Do not include walking)	Days per week --------- None ☐	if none go to Q22
Q20b	How much time did you usually spend doing moderate physical activities on one of those days?	Hours per day ---------- Minutes per day --------- Unsure/ don't know ☐ Refused ☐	

Think about the time you spent walking in the **last 7 days**. This includes at work and at home, **walking** to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure. Think only about walking that you did for **at least 10 minutes at a tim**			
Q21a	During the last 7 days, on how many days did you walk for at least 10 minutes at a time?	Days per week None	---------- ☐
Q21b	How much time did you usually spend walking on one of those days?	Hours per day Minutes per day Unsure/ don't know Refused	---------- ---------- ☐ ☐

Section 3 *Assessment of heart disease risk factors knowledge

Please provide your response to the following questions by giving Tick (√) in the box or answer in space provided

Q.22 *Which* of the following increase the risk of having a heart attack?	***Yes***	***No***	***Not sure***
a) Smoking cigarettes			
b) Weight loss			
c) Obesity			
d) Depression			
e) Hypertension			
f) High cholesterol level in the blood			
g) Daily exercise			
h) Stress			
i) Sleeping too much			
j) Diabetes Mellitus			

Section 4 Assessment of Knowledge of women's greatest health problem and family history of heart attack

Please provide your response to the following questions by giving Tick (√) in the box or answer in space provided

Q23 *Which of the following do you consider the greatest health problem for women in India?	AIDS ☐ Cancer (general) ☐ Diabetes ☐ Heart disease/Heart attack ☐ Drug addiction/Alcoholism ☐ Obesity ☐ Hypertension ☐ Smoking ☐ Stroke ☐ Don't know ☐ Other ☐ Please specify----------
Q24 **To the best of your knowledge, do you have a parent, brother or sister, or child related by blood, who has been diagnosed with heart disease by a health care provider?	Yes ☐ No ☐ Don't know/ Not sure ☐ Refused ☐

Section 5 History of hypertension and its treatment

Q25 Have you ever been told by a doctor or other health worker that you have high blood pressure or high BP? Yes ☐ No ☐

If no go to Q no 38

Q26 How long have you had high BP? Years ----------months

Q27 Are you currently on medication for your high BP? Yes ☐ No ☐

If no go to Q 38

Q28 How long are you on medication for high BP? Years____ Months--------

Q29 Is your BP medications helps you feeling better?

Yes ☐ No ☐ Can't say ☐

Q30 What was your BP the last time you had it measured?

Systolic ---------- mmofHg Diastolic ----------mmofHg Don't Know ☐

Q31 Are you satisfied with the benefit of your present BP treatment?

Satisfied ☐ Not satisfied ☐ Can't say ☐

Q32 Descriptions of the prescribed BP medicine(s):

	Medicine name	How many times does it need to be taken/day	If you feel any side effects	
			Yes	No

Q33a Did you miss any of your doses for high BP in the last seven days? Yes ☐ No ☐

If yes, which medicine(s) was it? ----------

Q33b. How many times did you miss your doses in the last seven days? No.----------

Q34.Is your medication(s) for high BP easily available?

Yes ☐ No ☐ Don't know ☐

Q35. What is the medicine cost per month for your high BP? INR----------/ month

Q36. Have you ever been advised by your doctor about the following advice?

	Yes	No
a. To reduce salt intake	☐	☐
b. to lose weight	☐	☐
c. to stop tobacco use	☐	☐
d. to start or do more exercise	☐	☐

Q37 . If yes, which of the above advice are you currently following? please circle one

a) b) c) d)

Q38. At present do you have any other illness (es)? (For ex: Diabetes, high cholesterol, kidney disease, arthritis, lung disease or any other chronic diseases)

Yes ☐ No ☐

if yes please specify the name of the disease ----------

Q 39. Are you currently on medication for the above disease(s) Yes ☐ No ☐

Q40. Did your doctor treat your high BP in a friendly and courteous manner?

Yes ☐ No ☐ Cannot say ☐

Q 41. Did your doctor explain the treatment regimen (i.e: what, when, why, how and how long) and likely side effect of medication for your high BP?

Yes ☐ No ☐

Q 42. If yes, are you satisfied with the medication information for high BP provided by your doctor?

Yes ☐ No ☐

Q 43. Did your doctor explain the reasons for carrying out any medical tests?

Yes ☐ No ☐

Section 6 Assessments of CHD risk perception and the Illness perception

***Assessment of CHD risk perception**

Q 44. In the next 5 years, how many paisa in a Rupee do you think is your risk for developing heart disease compared to a woman of similar age as you? (If you make no changes in your current lifestyle such as diet, medication adherence level, physical activity level and tobacco use)

Make an X on the line



0 Paisa 10 20 30 40 50Paisa 60 70 80 90 1Rupees

(No risk) (High risk)

****Assessment of The Illness Perception for high blood pressure** Q 45. For the following questions, please circle the number that best corresponds to your views:		
I.	How much does high BP affect your life?	0--------1--------2------3-----4------ -5--------6--------7-----8--------9-------10 No affects at all Severely affect my life
II.	How long do you think hypertension or high BP will continue?	0-------1------ -2-------3-----4--------5--------6--------7----- 8--------9-------10 A very short time Forever
III.	How much control do you feel you have over your high BP	0------ 1-------- 2------3------4---- --5--------6--------7------8-------9--------10 Absolutely no control Extreme amount control
IV.	How much do you think your treatment can help your high BP?	0---- --1--------2------3-------4---- --5--------6-------7-------8--------9--------10 Not at all Extremely Helpful
V.	How much do you experience symptoms from your high BP	0------ 1-------2-------3-------4-------5--------6-------7-------8--------9-------10 No symptoms at all Many severe symptoms
VI.	How concerned are you about your high BP?	0------1----- --2-------3-------4--------5-------6-------7-------8-------9--------10 Not at all concerned Extremely Concerned
VII.	How well do you feel you understand your high BP?	0-------1-- ----2--------3-------4-------5-------6--------7------8-- ----9-----10 Do not understand Understand very clearly
VIII.	How much does your high BP affect you emotionally? (e.g. does it make you angry, scared, upset or depressed?	0-------1------ 2--------3-- ----4-------5-------6--------7------8------ 9------10 Not at all affected emotionally Extremely affected emotionally

Please list in rank-order the three most important factors (Stress, lifestyle, heredity) that you believe caused your high BP. ***The most important causes for me:-***

1. _____
2. _____
3. _____

Section 7: Clinical and Physical Measurements

Clinical Measurements

BP Reading 1	Systolic (mmHg) ----------	Diastolic (mmHg)	----------
BP Reading 2	Systolic (mmHg) ----------	Diastolic (mmHg)	----------
BP Reading 3	Systolic (mmHg)----------	Diastolic (mmHg)	----------

Heart rate **(per minute)**

Reading 1	Reading 2	Reading 3

Physical Measurements

1	Height	**Cm**	----------
2	Weight	**kg**	----------
3	Waist circumference	**Cm**	----------
4	Hip circumference	**Cm**	----------

Appendix 10: Interviewer Guide- for hypertensive women

International Heath Program
School of Nursing, Midwifery and Para medicine
Faculty of Health Science

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India

Introduction including informed consent

I want to thank you for taking the time to meet with me today.

We are undertaking a research project that aims to guide policy planners in the development of interventions to reduce heart attack risk among women with hypertension living in low income urban area in India.

I am----------, I would like to talk to you about your high blood pressure, its treatment, medication use and your expectation from health care providers regarding treatment. You are being invited to participate in this study because your participation will help us to understand more about how to reduce the risk of heart attack among hypertensive women.

The interview will take 30 to 60 minutes. I will be taping the session because I don't want to miss any of your comments. Because we're on tape, please be sure to speak up so that we don't miss your comments. I can assure that full confidentiality and anonymity will be maintained and you will not be identified in the resulting report.

Remember, you don't have to talk about anything you don't want to and if you wish you can withdraw during the interview at any time without prejudice or any negative consequences; non participation will not affect your rights/access to other services/care.

Are there any questions about what I have just explained?

Are you willing to participate in this interview?

_____ _____ _____

Interviewee Witness Date

Questions:

The condition

1. How did you find out that you had high blood pressure?
2. Has high BP influence your quality of life?
3. How much do you experience symptoms from your high BP?

Understanding of risk, own vulnerability to heart disease

4. What are the risks connected with high BP?
5. Do you feel you are at risk of heart disease? Why/why not?
6. What do you do to stay healthy and lower your risk of heart disease?
7. How do you think other people perceive your condition (health professionals, friends, family, people in general)

Experiences with medication use and adherence pattern

8. What have you been told by the health care providers about high BP and its treatment?

9. What would you say is the most important to you to control high BP?
10. What would you say is the least important to you to control high BP?
11. Are you satisfied with your current treatment? How much do you think your medication can help to control your high BP? Why? Why not?
12. How do you self-administer these prescribed anti-hypertensive medicines/pills daily?
13. What do you think about missing a single drug dose? What do you do so that you do not forget to take your medicines
14. What information have you received about your medicine? Are you satisfied with this information *(prompt: how it works, side effect, how long to use, drug interaction, what to do if forget)*
15. What is your opinion about your prolonged regimen?
16. What makes it hard, if any, that you encounter to take antihypertensive medication as prescribed by your doctor? *(Prompt: Not taking problem seriously? Forget fullness? Feeling well? Drug reaction or side effect? Too many medicines? Medicine not working properly? Family commitments? Priority? Lack of transport?)*

(Alternatively, next question for women with high medication adherences)

What are the factors that motivate you to take your antihypertensive medication as prescribed by your doctor? *(prompt: Belief in therapy? Experience with*

medication? Supportive family members? Relationship with GP? Previous events? Prioritizing health?Time management?)

Experience with health service

17. Where do you prefer to go for your treatment?
    Public health facility? Private health practitioners*?* Please explain why?
18. Have you received advice from your GP about lowering your risk for heart disease? If yes, what did your GP say you should do to lower your risk?
19. In the past 5 years, has your GP assessed your risk of or tested you for heart disease?
20. Is there anything you would like to say about the care you have received whilst attending the service facility?

Appendix 11: Interviewer Guide- for Health care Providers

International Heath Program
School of Nursing, Midwifery and Paramedics
Faculty of Health Science

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India

Introduction Including Informed Consent

I want to thank you for taking the time to meet with me today.

We are undertaking a research project that aims to guide policy planners in the development of interventions to reduce heart attack risk among women with hypertension living in low income urban area in India.

I am----------, I would like to talk to you about your perception on perceived coronary heart disease risk of women with hypertension living in low income urban areas and their adherence pattern to antihypertensive treatment recommendations. You are being invited to participate in this study because your participation will help us to understand more about how to reduce the risk of heart attack among hypertensive women.

The interview will take 30 to 60 minutes. I will be taping the session because I don't want to miss any of your comments. Because we are on tape, please be sure to speak up so that we don't miss your comments.

I can assure that full confidentiality and anonymity will be maintained and you will not be identified in the resulting report. Remember, you don't have to talk about anything you don't want to and if you wish, you can withdraw during the interview at any time without prejudice.

Are there any questions about what I have just explained?

Are you willing to participate in this interview?

_____ _____ _____

Interviewee Witness Date

Questions:

1. Think about your women patients, living in low income urban areas, who have a more difficult time keeping their blood pressure under control. Do you feel they are at risk of heart disease? Why/why not?
2. Do you think they are aware of their heart disease risk as a consequence of uncontrolled hypertension?
3. Do you use CHD risk prediction chart to assess and communicate CHD risk to your patient in your daily practice?
4. Do you think they view the seriousness of heart disease risk differently than their actual risk?
5. Can you influence how they perceive their risk? Why/why not?
6. Do you think some of your patients feel that there is nothing they can do to prevent downstream effect of hypertension? (prompt: heart attack)
7. What are the adherent characteristics to your treatment recommendations among them? Please explain your experiences.
8. Do you think some patients hold certain beliefs about hypertension that may make affect how they adhere to your treatment recommendations
9. What factors do you think associated with high level of medication adherence among them?
10. What factors do you think associated with low level of medication adherence in women?
11. What strategies would you recommend to help women better understand how to take their medications as recommended?
12. Do you have sufficient opportunity during routine health service to counsel patient about prevention of coronary heart disease? Please explain your experiences.

Appendix 12: Hindi version of participants' documents

Participant Information Sheet /प्रतिभागी सूचना पत्र

International Heath Program
School of Nursing, Midwifery and Para medicine
Faculty of Health Science

प्रतिभागी सूचना पत्र

पीएचडी शोध परियोजना शीर्षक

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India

भारत के, दिल्ली में, कम आय वाले शहरी महिलाओं में संपूर्ण कोरोनरी हृदय रोग के खतरा की धारणाओं और उच्च रक्तचाप विरोधी उपचार के पालन संबंधित शोध

अनुसंधानकर्ता
डॉ लिपि धर
पीएचडी छात्र, कर्टिन विश्वविद्यालय
केंट स्ट्रीट, 6102 पश्चिमी ऑस्ट्रेलिया
Mobile no: +61426235090
Email: lipi.dhar@postgrad.curtin.edu.au

मुख्य पर्यवेक्षक
एसोसिएट प्रोफेसर जया अर्नेस्ट
बिल्डिंग 401, कर्टिन विश्वविद्यालय
केंट स्ट्रीट, 6102 पश्चिमी ऑस्ट्रेलिया
टेलीफोन +61 89266 4151
Email:J.Earnest@curtin.edu.au

एसोसिएट पर्यवेक्षक
सुप्रीत कौर
पीएचडी (Nutrition)
अखिल भारतीय आयुर्विज्ञान संस्थान
टेलीफोन +91-9717387654
Email:supreetaiims@gmail.com

सह- पर्यवेक्षक
डॉ मोहम्मद अली
बिल्डिंग 401, कर्टिन विश्वविद्यालय
केंट स्ट्रीट, 6102 पश्चिमी ऑस्ट्रेलिया
टेलीफोन +61 89266 3974
Email: M.Ali@curtin.edu.au

पृष्ठभूमि- कोरोनरी हृदय रोग (हृदय रोग / दिल के दौरे) भारत में मौत के प्रमुख कारणों में से एक है। दस में से नौ ऐसे मामलों में कारकों को नियंत्रित या इलाज किया जा सकता है। इन कारकों में उच्च रक्तचाप, उच्च कोलेस्ट्रॉल, मधुमेह, तंबाकू के इस्तेमाल, अस्वास्थ्यकर आहार, मोटापा, और शारीरिक निष्क्रियता शामिल है। जिन महिलाओं में इन जोखिम कारकों में से किसी भी एक उपस्थित है आमतौर पर उच्च रक्तचाप, उन महिलाओं में हृदय रोग होने का खतरा अधिक है। उच्च रक्तचाप का नियंत्रण भविष्य में हृदय रोग के जोखिमको कम करने के लिए मदद करता हैं।

शोध अध्ययन की प्रकृति और उद्देश्य: हम भारत में कम आय शहरी क्षेत्र में उच्च रक्तचाप के साथ जी रही महिलाओं के बीच हृदय रोग के खतरे को कम करने के उपायों को विकसित करने के लिए, नीति नियोजकों का मार्गदर्शन

के उद्देश्य से इस शोध अध्ययन के उपक्रम कर रहे हैं ।

शोध अध्ययन में क्या शामिल होगा: शोध अध्ययन के पहले भाग में, एक व्यक्तिगत साक्षात्कार शामिल हैं। अनुसंधान दल के प्रशिक्षित और अनुभवी स्वास्थ्य कार्यकर्ता आपको अपनी उम्र, चिकित्सा शिक्षा, रोजगार, आय, तंबाकू के इस्तेमाल, शराब सेवन, फल और सब्जियों का सेवन, शारीरिक गतिविधि, उच्च रक्तचाप और अन्य बीमारी का इतिहास के बारे में प्रश्न पूछेंगी। अगर आपको उच्च रक्तचाप है, वे पिछले दो हफ्तों में आपके स्वास्थ्य और उपचार के बारे में कुछ अधिक विशिष्ट प्रश्न पूछेंगी। इस साक्षात्कार में लगभग 30-45 मिनट का समय लगेगा । अध्ययन के दूसरे भाग में क्लीनिकल और शारीरिक माप है; जहां अनुसंधान स्टाफ, साक्षात्कार के पूरा होने के बाद, आपके रक्तचाप (बीपी) की जांच, और ऊंचाई, वजन, कमर और कूल्हे परिधि को नाप करेंगे. इन मापों में लगभग 15-20 मिनट लगेंगे ।

शोध अध्ययन में भागीदारी का संभव लाभ:

- हम आशा करते हैं कि इस अनुसंधान परियोजना में आपकी भागीदारी आपको अपने स्वास्थ्य के बारे में और अधिक जागरूक बनने के लिए मदद करेगा। यदि आपको उच्च रक्तचाप है, तो आप अपने रक्तचाप को नीचे लाकर एक दिल का दौरा होने के अपने जोखिम को कम कर सकते हैं। यदि आवश्यक हो, हम आपके हृदय रोग के जोखिम को रोकने के लिए तथा निवारण करने के लिए निकटतम सरकारी अस्पताल में भेज देंगे (सफदरजंग अस्पताल)
- इस अध्ययन में भाग लेने वाले प्रतिभागि, पहले से दिल की बीमारी होने के खतरे में हैं, उन्हें भी मदद मिलेगी। यदि आवश्यक हो, हम उन्हें उनके हृदय रोग के जोखिम को कम करने के लिए निकटतम सरकारी अस्पताल में भेज देंगे (सफदरजंग अस्पताल)
- इस शोध अध्ययन में आपकी भागीदारी, भारत में कम आय वाले शहरी क्षेत्रों में रहने वाले महिलाओं में हृदय रोग के खतरे को कम करने के बारे में अधिक मात्रा में समझने के लिए, हमें मदद करेगा।

शोध अध्ययन में भागीदारी का संभव खतरा: इस अनुसंधान परियोजना में आपकी भागीदारी से आपको न कोई शारीरिक नुकसान या वित्तीय बोझ होगा ।

शोध अध्ययन में स्वैच्छिक भागीदारी और वापसी: कृपया ध्यान दें कि आपकी भागीदारी स्वैच्छिक है । आप किसी विशेष प्रश्न का जवाब देने के लिए या किसी भी शारीरिक प्रक्रियाओं को मना करने के लिए स्वतंत्र हैं । किसी भी लाभ या नुकसान के बिना अनुसंधान प्रक्रिया के किसी भी चरण में अपने आपको वापस लेने के का आप का अधिकार है; यहां तक कि, शुरू में भाग लेने के लिए सहमत होने के बाद भी आप अपने आप को वापस ले सकते हैं: गैर भागीदारी अन्य स्वास्थ्य सेवाओं का उपयोग करने से आपके अधिकारों को प्रभावित नहीं करेगा ।

गोपनीयता: आप से प्राप्त की गई सूचना पूरी तरह से गोपनीय होगी और दूसरों को नहीं बताया जाएगा। और जिसके परिणामस्वरूप रिपोर्ट में आपको पहचान नहीं जा सकता।

प्रतिपूर्ति: इस अध्ययन में भाग लेने के लिए आपको भुगतान नहीं किया जाएगा। आपकी भागीदारी और समय के लिए सराहना की निशानी के रूप में, आपको एक रसोई बर्तन उपलब्ध कराया जाएगा।

<u>प्रश्न या चिंतायें:</u> अगर आपको अनुसंधान परियोजना के बारे में कुछ और प्रश्न हैं, कृपया आप अनुसंधानकर्ताओं के साथ संपर्क करें; डॉ लिपि धर(मोबाइल नंबर:+91-8586,893522) या सुप्रीत कौर (मोबाइल नंबर:+91-9717387654)
अगर आपको अध्ययन के बारे में किसी भी नैतिक चिंता है, तो आप संपर्क कर सकते हैं: डॉ यू वी सोमयाजुलु, सिग्मा आईआरबी सदस्य सचिव, सिग्मा रिसर्च एंड कंसल्टिंग प्राइवेट लिमिटेड (संपर्क नंबर: +91 11 4619 5555)

क्या आप समझे जो मैं बस समझाया है? या मुझे फिर से स्पष्ट करना चाहिए?

क्या आप इस सूचना पत्र की एक प्रतिलिपि चाहते हैं?

<u>शोध अध्ययन में भाग लेने के लिए बहुत बहुत धन्यवाद</u>

इस अनुसंधान परियोजना (HR42/2015) स्वीकृति संख्या) कर्टिन विश्वविद्यालय मानव रिसर्च आचार समिति द्वारा अनुमोदित किया गया है. समिति में आम जनता , शिक्षाविदों, वकीलों, डॉक्टरों और देहाती देखभाल करने वालों के प्रतिनिधि शामिल है. इसका मुख्य भूमिका प्रतिभागियों की रक्षा के लिए है. यदि आवश्यक हो, अनुमोदन के सत्यापन, कर्टिन विश्वविद्यालय मानव आचार समिति , सी/ अनुसंधान और के कार्यालय विकास, कर्टिन विश्वविद्यालय, जीपीओ बॉक्स U1987, पर्थ, 6845 या 92662784 से लेखन या फोन द्वारा या तो ईमेल करके प्राप्त किया जा सकता है *hrec@curtin.edu.au*

Participant Consent Form/ भागीदार सहमति फॉर्म

International Heath Program
School of Nursing, Midwifery and Paramedicine
Faculty of Health Science

अनुसंधान में भाग लेने हेतु सहमति

मैं.....खुशी से निम्नलिखित अनुसंधान परियोजना में भाग लेने के लिए सहमत हूँ,

"Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India"

"भारत के दिल्ली में, कम आय वाले शहरी महिलाओं में संपूर्ण कोरोनरी हृदय रोग का खतरा की धारणाओं और उच्च रक्तचाप विरोधी उपचार के पालन संबंधित शोध"

मैं अपनी सहमति दे कर स्वीकार करती हूँ कि

1. मुझे इस परियोजना के बारे में एक सूचना पत्र दिया गया है, और मैं भाग लेना चाहती हूँ या नहीं, इस पर विचार करने के लिए समय दिया गया है ।
2. अनुसंधान परियोजना के उद्देश्यों, प्रकियाओं, आवश्यक तरीकों, तथा अनुसंधान कब तक जारी रहेगा मुझे समझाया गया है, और इस परियोजना के बारे में मुझे सभी प्रश्न का संतोषजनक जवाब मिल गया है ।
3. मुझे परियोजना में भाग लेने के संभव फायदे और खतरों के बारे में बताया गया है । मुझे पता है, मुझे क्या करने के लिए कहा जा रहा है ।
4. मुझे पता है कि, इस परियोजना में भाग लेना मेरे लिए स्वैच्छिक है । और मैं किसी भी लाभ या नुकसान के बिना परियोजना अवधि के दौरान किसी भी समय अपने आप को वापस ले सकती हूँ ।
5. मैं समझती हूँ कि मेरी भागीदारी पूरी तरह से गोपनीय है। मैं समझती हूँ कि अनुसंधान परियोजना के परिणामों से एकत्र हुआ अनुसंधान डेटा प्रकाशित किया जा सकता है हालांकि, मेरे बारे में पहचाने जाने योग्य कोई जानकारी किसी भी तरह से उपयोग नहीं की जाएगी ।

| --- | --- | --- |
| *प्रतिभागी का नाम* | *प्रतिभागी के हस्ताक्षर* | *तारीख* |

अगर प्रतिभागि निरक्षर:

मैंने संभावित भागीदार के लिए सहमति पत्र को सही पढ़ते देखा है, और उस व्यक्ति को सवाल पूछने का मौका था । मैं इस बात की पुष्टि करता हूं, उस व्यक्ति ने स्वतंत्र रूप से सहमति दी है।

गवाह का नाम_____ प्रतिभागी के अंगूठे का निशान

गवाह का हस्ताक्षर _____ तारीख _____

Questionnaire

International Heath Program
School of Nursing, Midwifery & Paramedics
Faculty of Health Science

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India

भारत के दिल्ली में, कम आय वाले शहरी महिलाओं में संपूर्ण कोरोनरी हृदय रोग के खतरा की धारणाओं और उच्च रक्तचाप विरोधी उपचार के पालन संबंधित शोध

प्रश्नावली की संख्या	| | | |
घर की कोड	| | | |
प्रतिभागी का कोड	| | | |

प्रतिभागी का पूरा नाम ----------

घर का पूरा पता ----------

संपर्क नंबर: ----------

दिवस	| | | | | | |

भाग 1 * जनसांख्यिकीय जानकारी

बॉक्स में टिक (√) देकर अपने निम्नलिखित प्रश्नों के उत्तर प्रदान करें या दिए गए स्थान में लिखs

प्रश्न		उत्तर
Q1	आप कितने साल के हैं?	साल ----------
Q2	आपका शिक्षा का उच्चतम स्तर क्या है?	निरक्षर ☐ सिर्फ साक्षर ☐ प्राथमिक स्कूल (5 वर्ष तक) पूरा ☐ माध्यमिक स्कूल पूरे किए (10 वर्ष) ☐ उच्च माध्यमिक स्कूल पूरे किए (12 साल) ☐ कॉलेज / विश्वविद्यालय पूरा ☐ पता नहीं / याद नहीं कर सकते ☐ अन्य (निर्दिष्टकरे)----------
Q3	आपका धर्म क्या है?	हिंदू ☐ मुस्लिम ☐ ईसाई ☐ सिख ☐ अन्य (निर्दिष्टकरे)----------
Q4	अपनी वैवाहिक स्थिति क्या है?	कभी नहीं शादी की ☐ वर्तमान में शादीशुदा हूँ ☐ अलग ☐ तलाकशुदा ☐
Q5	निम्नलिखित जो पिछले 12 महीनों में अपने मुख्य कार्य स्थिति का सबसे अच्छे से वर्णन करता है	सरकार कर्मचारी ☐ गैर सरकारी कर्मचारी ☐ स्वरोजगार ☐ अकुशल / मैनुअल मजदूर ☐ गृहिणी ☐ सेवानिवृत्त / पेंशनभोगी ☐ बेरोजगार ☐ अन्य ----------
Q6	पिछले 12 महीनों में (प्रति माह) अपने पूरे घर के औसत आय क्या थे? (INR में)	रु: अनिश्चित / कोई जवाब नहीं पता ☐

Q7	परिवार के प्रकार:	सिंगल/ एकल ☐ संयुक्त ☐ अन्य: (निर्दिष्ट करे) ----------
Q8	घर के सदस्यों की संख्या	----------
Q9	जब आपको डॉक्टर के पास जाने के लिए आवश्यकता होती है तो ज्यादातर कोई आपके साथ जाता है?	हां ☐ नहीं ☐

भाग 2 व्यवहार माप

अब मैं आपको विभिन्न स्वास्थ्य व्यवहार के बारे में कुछ सवाल पूछने जा रहा हूँ। इस में तंबाकू के इस्तेमाल, शराब पीने की, खाने में फल और सब्जियों और शारीरिक गतिविधि की बातें शामिल है।

प्रश्न		हां	नहीं
Q10	आपने पिछले एक महीने में धूम्रपान किया था ?	☐	☐
Q11	आप वर्तमान में दैनिक धूम्रपान करते हैं?	☐	☐
Q12	आपने पिछले एक महीने में गुटखा, पाउडर, खैनी, जर्दा पान, के रूप में किसी भी निर्धूम तंबाकू का उपभोग किया था?	☐	☐
Q13	आप वर्तमान में दैनिक निर्धूम तंबाकू का उपयोग करते हैं?	☐	☐
Q14	क्या आपने कभी बियर, शराब, या अन्य अल्कोहल पेय के रूप में सेवन किया है?	☐	☐
Q15	आपने पिछले 30 दिनों के अंदर शराब का सेवन किया है?	☐	☐

अगले सवाल आपके द्वारा आमतौर पर खाद्य वस्तुओं, फलों और सब्जियों खाने के बारे में पूछते हैं।							
Q.16	पिछले एक महीने में, कितनी बार आप निम्नलिखित खाद्य वस्तुओं खाते हैं?	दैनिक 2 या अधिक बार	दैनिक एक बार	साप्ताहिक **3-5** बार	साप्ताहिक 1-2 बार	कभी कभी	कभी नहीं?
A	अनाज ((चपाती, चावल, दलिया, सूजी, बाजरा, ज्वार, रागी आदि)						
B	दूध या दूध के उत्पाद (दही, चाच, लस्सी, पनीर, खोआ, चाय, कॉफी आदि)						
C	दाल या सेम (सभी दालों जैसे अरहर, मूंग, राजमा, चना, उड़द आदि) और सोयाबीन						
D	(हरी पत्तेदार सब्जियों) पालक, सरसों, cholaiy, सोया, मेथी आदि						
E	जड़ें और कंद (मीठे आलू, आलू, colocasia, रतालू आदि)						
F	अन्य सब्जियों (सभी अन्य सब्जियों उपर्युक्त को छोड़कर)						
G	फल (सेब, अंगूर, आम, अमरूद, केला, तरबूज, पपीता, जामुन आदि						
H	अंडे						
I	मछली (मछली और अन्य समुद्री भोजन)						
J	चिकन या मांस						
K	नट और तिलहन (बादाम, काजू, किशमिश, खूबानी, मूंगफली आदि)						
L	वसा और तेल (खाना पकाने में इस्तेमाल कर रहे हैं क सभी वसा)						
M	चीनी और गुड़						
N	तले हुए खाद्य पदार्थ ((Poori, पकोरा, समोसा, कटलेट, टिक्की, परांठे, वड़ा, kachori आदि)						

O	जंक फूड (बर्गर, पिज्जा, पास्ता, नूडल्स, फ्रेंच फ्राइज़ आदि)						
P	मिठाई (भारतीय और अन्य मिठाई)						
Q	वातित पेय (कार्बोनेटेड शीतल पेय- कोक, पेप्सी, सोडा आदि)						
Q17	कितना नमक (किलो में) एक महीने में अपने घर में सेवन किया जाता है? ----------किलोग्राम						
Q18	कितना खाना पकाने के तेल, कुल में पिछले एक महीने के दौरान अपने घर में इस्तेमाल किया गया था (रिफाइंड तेल (सभी प्रकार के), सरसों का तेल, नारियल तेल, मछली के तेल, डालडा, देसी घी) ---------- किलोग्राम						

शारीरिक गतिविधि

आपके द्वारा पिछले **7** दिनों में की गई सभी जोरदार गतिविधियों के बारे में सोचो। जोरदार शारीरिक गतिविधियों का मतलब है कठिन शारीरिक प्रयास और सामान्य से बहुत कठिन सांस लेने की जरूरत। आप, एक बार में कम से कम **10** मिनट के लिए की गई शारीरिक गतिविधियों के बारे में सोचो।

Q19a	पिछले 7 दिनों के दौरान, कितने दिन आपने जोरदार शारीरिक गतिविधियों की ? (उदाहरण के लिए: बहुत भारी सामान उठाना, खुदाई के काम करना, या तेजी से साइकिल चलना)	कितने दिन -प्रति सप्ताह कोई नहीं	---------- ☐
Q19b	आमतौर पर कितना समय आपने उन दिनों में से एक दिन जोरदार शारीरिक गतिविधियों कर खर्च किया?	घंटे प्रति दिन मिनट प्रति दिन बताने से इनकाकर दिया /अनिश्चित	---------- ---------- ☐

आपके द्वारा पिछले 7 दिनों में किया गया सभी मध्यम गतिविधियों के बारे में सोचो। मध्यम गतिविधियों का मतलब है मध्यम शारीरिक प्रयास और सामान्य से कुछ हद तक कठिन सांस लेने की जरूरत। आप एक बार में कम से कम 10 मिनट के लिए किया गया शारीरिक गतिविधियों के बारे में सोचो।

Q20a	पिछले 7 दिनों के दौरान, कितने दिन आपने मध्यम शारीरिक गतिविधियों की? [उदाहरण के लिए: धीमी साइकिल से चलना, विभिन्न खेल, कपड़े धोना, पानी की बाल्टी उठाना (पैदल चलना शामिल न करें]	कितने दिन -प्रति सप्ताह--------- कोई नहीं ☐
Q20b	आमतौर पर कितना समय आपने उन दिनों में से एक दिन मध्यम शारीरिक गतिविधियों कर खर्च किया?	घंटे प्रति दिन ---------- मिनट प्रति दिन - -------- अनिश्चित / बताने इनकार कर दिया ☐
पिछले 7 दिनों में चलने पर बिताए गए समय के बारे में सोचो। यह चलना किसी भी काम, यात्रा, और मनोरंजन, खेल, व्यायाम, या फुर्सत में किया गया है। घर में भी चलना शामिल है। आप एक बार में कम से कम 10 मिनट चलने के बारे में सोचो		
Q21a	पिछले 7 दिनों के दौरान, आप एक बार में कम से कम 10 मिनट के लिए कितने दिन चले है?	कितने दिन -प्रति सप्ताह ---------- कोई नहीं ☐
Q21b	कितना समय आपने आमतौर पर उन दिनों में से चलने पर खर्च किया?	घंटे प्रति दिन ---------- मिनट प्रति दिन ---------- अनिश्चित/ बताने से इनकार कर दिया ☐

भाग 3 हृदय रोग के खतरा कारकों की ज्ञान का मूल्यांकन

दिए गए स्थान में टिक (√) देकर अपनी प्रतिक्रिया प्रदान करें

Q.22 निम्नलिखित में से कौन सा दिल का दौरा होने की खतरे को बढ़ा सकते है?	हां	नहीं	यकीन नहीं
a) तंबाकू के इस्तेमाल			
b) वजन में कमी			
c) मोटापा			
d) उदासी			

e) उच्च रक्तचाप			
f) रक्त में कोलेस्ट्रॉल/ उच्च वसा स्तर			
g) दैनिक व्यायाम			
h) तनाव			
i) बहुत ज्यादा नींद			
j) मधुमेह			

भाग 4 महिला स्वास्थ्य समस्या के बारे में ज्ञान का मूल्यांकन, तथा परिवार में दिल का दौरा पड़ने का इतिहास

दिए गए स्थान में टिक (√) देकर अपनी प्रतिक्रिया प्रदान करें

Q.23 निम्न में से कौन सा आप मानते हैं भारत में महिलाओं के लिए सबसे बड़ी स्वास्थ्य समस्या है?	एड्स ☐ कैंसर ☐ मधुमेह/डायबिटीज ☐ दिल की बीमारी/दिल का दौरा ☐ मादक पदार्थोंकी लत/शराबखोरी ☐ मोटापा ☐ उच्च रक्तचाप ☐ तंबाकू के इस्तेमाल ☐ स्ट्रोक ☐ पता नहीं ☐ अन्य: ☐ (निर्दिष्ट करे) ----------
Q.24 क्या आपके परिवार में किसी को दिल की बीमारी कभी डॉक्टर द्वारा बताई गई है? (माता पिता, भाई या बहन, या रक्त से संबंधित बच्चे?)	हां ☐ नहीं ☐ यकीन नहीं ☐ कहने से इनकार कर दिया ☐

भाग 5 उच्च रक्तचाप और उसके उपचार का इतिहास

Q25 एक चिकित्सक या अन्य स्वास्थ्य कार्यकर्ता द्वारा कभी भी बताया गया है किआपको उच्च रक्तचाप है?

हा ☐ नहीं ☐

अगर नहीं, Q37 के लिए जाना

Q26 आपके उच्च रक्तचाप से ग्रस्त स्थिति की अवधि क्या है? सालों ----------महीने--------

Q27 क्या आप उच्च रक्तचाप के लिए वर्तमान में दवा पर हैं? हा ☐ नही ☐

अगर नहीं Q38 के लिए जाना

Q28 कितना समय से आप उच्च रक्तचाप के लिए दवा पर हैं? सालों ---------- महीने--------

Q29 आपके उच्च रक्तचाप की दवाएं आपको बेहतर महसूस करने में मदद करती है?

हा ☐ नहीं ☐ कह नहीं सकते ☐

Q30 पिछली बार मापा गया अपने रक्तचाप / बीपी क्या था?

Systolic ---------- mmofHg Diastolic ----------mmofHg कह नहीं सकते ☐

Q31 आप उच्च रक्तचाप के लिए अपने वर्तमान इलाज के फायदे से संतुष्ट हैं?

संतुष्ट ☐ संतुष्ट नहीं ☐ कह नहीं सकते ☐

Q32 निर्धारित बीपी दवा का वर्णन:

	दवाओं के नाम	हर दिन आपको कितनी बार खाने की जरूरत हैं?	यदि आपको कोई साइड इफेक्ट लगता है

Q33a. क्या आप पिछले सात दिनों में, उच्च रक्तचाप की किसी भी खुराक नहीं लिया ?

हा ☐ नहीं ☐

यदि हां, यह क्या दवा था? ----------

Q33b. कितने बार आप पिछले सात दिनों में अपनी खुराक नहीं लिया? संख्या.----------

Q34. उच्च रक्तचाप के लिए आपकी दवा आसानी से उपलब्ध है?

हा ☐ नहीं ☐ कह नहीं सकते ☐

Q35. आपके उच्च रक्तचाप के लिए प्रति माह चिकित्सा मूल्य क्या है? रुपये ---------- / महीने

Q36a. आपको कभी भी अपने चिकित्सक द्वारा निम्नलिखित सलाह के बारे में कहा गया है?

	हा	नहीं
a. नमक का सेवन कम करने	☐	☐
b. वजन कम करने के लिए	☐	☐
c. तंबाकू के इस्तेमाल को रोकने के लिए	☐	☐
d. शुरु करना या अधिक व्यायाम करना	☐	☐

Q37 यदि हां,आप वर्तमान में ऊपर की सलाह का क्या अनुसरण कर रहे हैं कृपया एक सर्कल कर दीजिये

a) b) c) d)

Q38. वर्तमान में, आपको कोई और बीमारी है? हा ☐ नहीं ☐

(उदाहरण के लिए: मधुमेह, उच्च कोलेस्ट्रॉल/रक्तवसा, गुर्दे की बीमारी गठिया, फेफड़ों के रोगों या किसी भी अन्य पुराने रोगो) यदि हां, रोग का नाम निर्दिष्ट करें ----------

Q39. आप के द्वारा उल्लेख की गई बीमारी के लिए आप वर्तमान में दवा पर हैं?

हा ☐ नहीं ☐

Q40. क्या आपके चिकित्सक एक दोस्ताना और विनम्र तरीके से आप का इलाज करते हैं?

हा ☐ नहीं ☐ कह नहीं सकते ☐

Q41. क्या आपके चिकित्सक अपने उच्च रक्तचाप इलाज के लिए दवा (अर्थात क्या, क्यों, कब, कैसे, कब तक), और दवा के संभव साइड इफेक्ट की व्याख्या की थी?

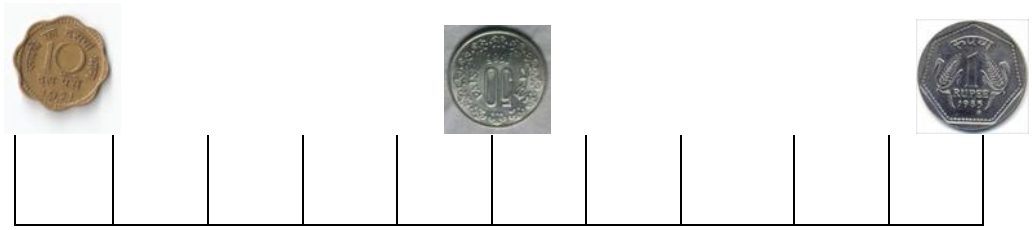
हा ☐ नहीं ☐

Q42. यदि हां, आपके चिकित्सक द्वारा प्रदान की गई दवा की जानकारी के साथ आप संतुष्ट हैं? हा ☐ नहीं ☐
Q43. क्या आपके अपने चिकित्सक किसी भी चिकित्सा परीक्षण करने के लिए कारणों की व्याख्या की थी? हा ☐ नहीं ☐

भाग 6 स्वयं में दिल का दौरा होने का खतरा की धारणा और उच्च रक्तचाप से ग्रस्त होने की धारणा

Q 44. अगले 5 साल में, एक रुपया में कितना पैसा आपको लगता है कि आपको दिल की बीमारी होने का खतरा है अपनी उम्र के बराबर एक महिला की तुलना में? (अगर आप अपने वर्तमान जीवन शैली में कोई बदलाव नहीं करते हैं जैसे आहार, दवा पालन, शारीरिक गतिविधि, तंबाकू के इस्तेमाल के रूप में)?

लाइन पर एक एक्स (x) बनाओ



Q 45.	उच्च रक्तचाप से ग्रस्त होने की धारणा निम्नलिखित प्रश्नों के लिए, अपने विचारों से सबसे अच्छा मेल खाने वाले नंबर पर सर्कल करना
I.	**उच्च रक्तचाप** आपके **जीवन को कितना प्रभावित करता है**? 1---------2---------3-------4--------5-------6---------7-------8-------9----------10 **प्रभावित नहीं करता है** **बुरी तरह प्रभावित करता है**

II.	आपकी सोच के अनुसार उच्च रक्तचाप कितना समय तक रह सकता है? 1---------2---------3---------4--------5----------6---------7---------8---------9---------10 बहुत ही कम समय हमेशा के लिए
III.	आपके अनुसार, आपको अपने उच्च रक्तचाप पे कितना काबु है? 1---------2---------3---------4--------5----------6---------7----------8--------9---------10 बिल्कुल कोई काबु नहीं बेहद काबु है
IV.	आपके अनुसार, आपका इलाज उच्च रक्तचाप को कितना मदद कर सकता हैं? 1-------- 2---------3--------4---------5----------6---------7----------8--------9---------10 बिल्कुल नहीं अत्यंत सहायक
V.	आप उच्च रक्तचाप के लक्षणों को किस हद तक महसुस करते हैं? 1----------2----------3--------4---------5----------6---------7----------8---------9--------10 कोई लक्षण नहीं बहुत गंभीर लक्षण
VI.	आप अपने उच्च रक्तचाप के बारे में कितने चिंतित हैं? 1----------2----------3--------4---------5----------6---------7-----------8--------9--------10 चिंतित नहीं अत्यंत चिंतित
VII.	आपको क्या लगता है आप अपने उच्च रक्तचाप को कितने समझते हैं? 1--------2----------3---------4--------5----------6---------7-----------8--------9--------10 समझ में नहीं आता बहुत स्पष्ट रूप से समझता हूँ
VIII.	आपका उच्च रक्तचाप आपको भावनात्मक रूप से कितना प्रभावित करता है? (जैसे यह आपको, डर, गुस्सा परेशान करने या उदास करता है?) 1--------2----------3---------4--------5----------6---------7-----------8--------9---------10 नहीं प्रभावित करता हैं बहुत ही भावनात्मक रूप से प्रभावित करता हैं
IX.	श्रेष्टता क्रम में अपने उच्च रक्तचाप के तीन महत्वपूर्ण कारण सूची दें. मेरे लिए सबसे महत्वपूर्ण कारण: - 1. _____ 2. _____ 3. _____

Interviewer Guide- for hypertensive women

International Heath Program
School of Nursing, Midwifery and paramedics
Faculty of Health Science

साक्षात्कारकर्ता गाइड- उच्च रक्तचाप महिला प्रतिभागियों के साथ साक्षात्कार

Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India

"भारत के, दिल्ली में, कम आय वाले शहरी महिलाओं में संपूर्ण कोरोनरी हृदय रोग का खतरा की धारणाओं और उच्च रक्तचाप विरोधी उपचार के पालन संबंधित शोध"

परिचय और सूचित सहमति

मैं आज मेरे साथ मिलने के लिए समय निकालने के लिए आपको धन्यवाद देना चाहती हूँ।

हम भारत में कम आय शहरी क्षेत्र में उच्च रक्तचाप के साथ जी रही महिलाओं के बीच हृदय रोग के खतरे को कम करने के उपायों को विकसित करने के लिए, नीति नियोजकों का मार्गदर्शन के उद्देश्य से एक अनुसंधान परियोजना के उपक्रम कर रहे हैं।

मेरा नाम _____ है और मैं आपकी उच्च रक्तचाप, उसके उपचार, दवा का उपयोग और इलाज के लिए चिकित्सक से आपकी उम्मीद के बारे में बात करना चाहती हूँ। आपको इस अनुसंधान परियोजना में भाग लेने के लिए आमंत्रित कर रहे हैं क्योंकि आपकी भागीदारी उच्च रक्तचाप से ग्रस्त महिलाओं में हृदय रोग के खतरे को कम करने के बारे में अधिक मात्रा में समझने में हमें मदद करेंगे।

इस साक्षात्कारमें 30 से 60 मिनट लगेंगे। मैं आपकी बात को रिकॉर्ड करूँगी क्योंकि मैं अपनी टिप्पणी के किसी भी हिस्से को छोड़ना नहीं चाहती हूँ। मैं विश्वास दिलाता हूँ आपके सभी प्रतिक्रियाओं को गोपनीय रखा जाएगा। आपकी गुमनामी बनाए रखा जाएगा और आपको जिसके परिणामस्वरूप रिपोर्ट में पहचान नहीं की जा सकेगी।

कृपया याद रखें, जिसके बारे में आप बात नहीं करना चाहते हैं आपको उन मामलों की बात करने की जरूरत नहीं है। और आप चाहें तो किसी भी लाभ या नुकसान के बिना किसी भी समय पर साक्षात्कार के दौरान आप जा सकते हैं; गैर भागीदारी अन्य सेवाएं के लिए आपके अधिकारोंको प्रभावित नहीं करेगा। आपके और कोई सवाल है ?

आप इस साक्षात्कार में भाग लेने के लिए तैयार हैं ?

_____ _____ _____

प्रतिभागी गवाह तिथि

प्रश्न:

बीमारी

1. कैसे पता चला कि आपको उच्च रक्तचाप हैं?
2. आप अपने उच्च रक्तचाप के लिए किसी भी लक्षण अनुभव करते हैं? अगर हाँ, कितना?
3. क्या उच्च रक्तचाप आपके दैनिक जीवन को प्रभावित किया है?

उच्च रक्तचाप का खतरा, और हृदय रोग के लिए खुद के खतरे को समझना

4. उच्च रक्तचाप के साथ जुड़े खतरे क्या हैं?
5. क्या आपको लगता है आप हृदय रोग/ दिल की बीमारी के खतरे में हैं? क्यों / क्यों नहीं?
6. आप स्वस्थ रहने के लिए और हृदय रोग का खतरा कम करने के लिए क्या करते हैं?
7. आपको क्या लगता है, अन्य लोग आपकी हालत को कितना गंभीर समझते हैं? (स्वास्थ्य सेवा लोगों, मित्रों, परिवार, सामान्य लोग)

दवा का उपयोग और पालन पद्धति के साथ अनुभव

8. उच्च रक्तचाप और उसके उपचार के बारे में स्वास्थ्य सेवा कार्यकर्ताओं द्वारा आपको क्या बताया गया है? आप क्या महसूस करती हैं यह निर्देश का पालन करना आसान है या नहीं?
9. आप क्या कहेंगे उच्च रक्तचाप को नियंत्रित करने के लिए आप के लिए सबसे महत्वपूर्ण क्या है?
10. आप क्या कहेंगे उच्च रक्तचाप को नियंत्रित करने के लिए आप के लिए सबसे कम महत्वपूर्ण क्या है?
11. क्या आप अपने मौजूदा इलाज से संतुष्ट हैं? आप क्या महसूस करती हैं आपकी दवा आपके उच्च रक्तचाप को नियंत्रित करने में कितना मदद करती हैं? क्यों? क्यों नहीं?
12. कैसे आप दैनिक कार्यकलापों में अपने दैनिक दवा को व्यवस्थित करते हैं?
13. आप दवा की एक खुराक भूल जाने के बारे में क्या सोचते हैं? आप अपनी दवाइयाँ लेना ना भूलने के लिए क्या करते हैं?
14. आपको अपनी दवा के बारे में क्या जानकारी मिला है? (यह कैसे काम करता है, साइड इफेक्ट, कितनी देर तक उपयोग करने के लिए, भूल जाने पर क्या करना) आप इस जानकारी के साथ संतुष्ट हैं?
15. आपके लंबे समय तक इलाज के बारे में आपकी राय क्या है?
16. क्या आपके चिकित्सक द्वारा निर्धारित रूप में दवा लेना आपके लिए कठिन बना देता है?

    Check list: गंभीरता से समस्या नहीं ले रही है? भूलकर? अच्छा महसूस करते हैं? ड्रग्स क्या प्रतिक्रिया है? बहुत सारे दवा? चिकित्सा ठीक से काम नहीं कर रहा? पारिवारिक प्रतिबद्धताओं? प्राथमिकता? परिवहन की कमी?

    <u>(अगला सवाल उच्च दवा पालन के साथ महिलाओं के लिए)</u>

    आपके चिकित्सक द्वारा निर्धारित रूप में अपने उच्चरक्तदाबरोधी दवा लेने के लिए क्या कारण आपको प्रेरित करने हैं? Check list: चिकित्सा में विश्वास? दवा के साथ अनुभव? सहायक परिवार के सदस्यों? जीपी के साथ रिश्ता? पिछली घटनाओं? स्वास्थ्य को प्राथमिकता? समय प्रबंधन?

स्वास्थ्य सेवा के साथ अनुभव

17. अपने इलाज के लिए आप कहां जाना पसंद करते हैं? लोक स्वास्थ्य सुविधा? प्राइवेट स्वास्थ्य चिकित्सकों? कृपया बताएं क्यों?
18. क्या अपने आपकी दिल की बीमारी के खतरे को कम करने के बारे में अपने चिकित्सक से सलाह प्राप्त की है? यदि हाँ, आपके चिकित्सक ने खतरे को कम करने के लिए क्या बताया?
19. पिछले 5 वर्षों में, आप का चिकित्सक, आपके दिल की बीमारी का खतरे का मूल्यांकन किया है या दिल की बीमारी के खतरा के लिए आपकी जांच की?
20. क्या आप स्वास्थ्य सेवाओं से मिली आपकी देखभाल के बारे में कुछ कहना चाहते हो?

Appendix 13: Statement of accuracy of Hindi translation

STATEMENT OF ACCURACY OF TRANSLATION

Date: 12-08-15

Project Title: Perceptions of global coronary heart disease risk, and adherence to antihypertensive treatment among low income urban women in SaraiKaleKhan, Delhi, India

Statement of Translation:

I, Dr. Neelam Roy, fluent in Hindi and English have proof read the Hindi texts of the English documents (mentioned below) version number 2 dated 31-07-15 and declare that to the best of my knowledge, and under penalty of perjury that the attached Hindi Documents are true and accurate translation of the English documents version number 2 dated 31-07-15

Translator's / Proof reader Name (Print):

Dr. Neelam Roy
Professor, Community Medicine Department
Safdarjung Hospital and Vardhaman Mahavir Medical College and Hospital
New Delhi

Neelam

Signature

Date 12.08.15

This Statement of Accuracy of Translation must be attached to the translation.

DR. NEELAM ROY
Professor
Department of Community Medicine
Vardhman Mahavir Medical College
& Safdarjung Hospital
New Delhi - 110029

Name of the documents are:

1. Questionnaires-quantitative
2. Participant Information Sheet
3. Participant Consent Form
4. Interviewer guide for hypertensive women

Appendix 14: Permission to use copy righted question 'Brief Illness Perception Questionnaire'

Re: Regarding permission to use Brief Illness Perception Questionnaire (B-IPQ)

Elizabeth Broadbent <lizbroadbent@me.com>
Mon 9/02/2015 4:39 PM
To: Lipi Dhar <lipi.dhar@postgrad.curtin.edu.au>;
Yes you may use the questionnaire. We already have a Gujarati and a Hindi version. See the website www.uib.no/ipq/

On 9/02/2015, at 7:03 pm, Lipi Dhar <lipi.dhar@postgrad.curtin.edu.au> wrote:
Dr. Elizabeth Broadbent,
Department of Psychological Medicine,
Faculty of Medical and Health Sciences,
University of Auckland,
Auckland, New Zealand.

Dear Dr. E. Broadbent,
I am a PhD student at the International Health Programme in the School of Nursing and Midwifery at Curtin University, Perth, Western Australia. My PhD research topic is, "Perceptions of global coronary heart disease risk, and adherence to anti-hypertensive treatment among low income urban women in Delhi, India", with Associate Professor Jaya Earnest and Dr. Mohammed Ali being my supervisors.
Part of our study involves carrying out a survey to understand the perceptions of these hypertensive women about their illness, and for this the Brief illness Perception Questionnaire (B-IPQ) you have developed and validated would be invaluable instruments. We would very much appreciate if you can give consent for us to use the B-IPQ in our study. This scale will be translated from English into Hindi (local language in Delhi) with back translation and resolution of any discrepancies.

Thank you in anticipation.

Kind regards,
Lipi Dhar
PhD student
International Health Programme,
School of Nursing and Midwifery,
Faculty of Health Sciences,
Kent Street, Curtin University,
Western Australia 6102

Appendix 15: Over view of the included studies

Author and year Country	Study aim	Sample size (N), sampling method and patient population[a]	% women	Design and data collection tool	Prevalence of MNA (%) and % of female not adhering	Factors associated with medication adherence/ MNA
1. Khanam et al. 2014 [362] **Bangladesh**	To describe hypertension and factors affecting adherence to treatment among hypertensive person	N=29,960 Stratified two stage sampling from the population of three rural sites	52.6	Cross-sectional/ Questionnaire	26 / -	Factors associated with MNA: male sex (AOR = 1.67; 95% CI: 1.42–1.97), hypertension diagnosed by unqualified providers (AOR = 1.52: 95% CI: 1.31–1.77), and patients with cardiovascular comorbidity (OR = 0.79; 95% CI: 0.64–0.97).
2. Hussain et al. 2011 [367] **Bangladesh**	To identify factors that influence non-adherence to antihypertensive therapy	N=120 Simple random sampling from eligible hypertensive patients of inpatient departments of a medical college and a private clinic	30.8	Cross-sectional / Questionnaire	85 / -	Factors determining MNA: lower level of education (OR = 6.34; 95% CI: 1.65–24.41), low family income (OR = 11.60; 95% CI: 3.77–35.65), poor Knowledge levels regarding management and consequence of untreated hypertension (OR = 24.50; 95% CI: 6.28–95.58), believes and understanding of disease (OR = 12.90; 95% CI: 1.65–100.63), lack of accompanying person to go to the physician /hospital (OR= 3.54; 95% CI: 1.04–11.99), deficiencies in information from service provider (OR = 5.16; 95% CI%:1.13–23.66) and government hospital (OR = 35.29; 95% CI: 9.76–127.63).

3. Barreto et al. 2015[389] **Brazil**	To investigate the association between dissatisfaction with the public health service and MNA to antihypertensive therapy.	N=392 Hypertensive patients were selected randomly and stratified way from eligible patients in outpatients of primary health care	60	Cross-sectional/ Medicines Team Questionnaire-Qualiaids (QAM-Q)	42.1/ -	Factors associated with MNA: dissatisfaction with the health services: reception service (OR=1.6; 95%CI:1.08–2.46; p = 0.01), scheduling appointment (OR= 2.1; 95% CI:1.31–3.29; p = .000), care received from the health team (OR = 3.8 ; 95 %CI: 2.24–6.45; p = .000), solvability of health problems (OR= 5.4; 95% CI: 3.08–9.56; p =0.00), group activities (OR = 4.7; 95% CI: 2.77–7.81; p = .00) and physician professional (OR = 6.5; 95% CI: 3.47–12.3; p = .00)
4. Dosse et al. 2009[391] **Brazil**	To determine attendance of patients to medical appointments; the % of adherence to medication and non-medication regimens, and also identify the main reasons of hypertensive patients report for MNA	N=68 Hypertensive patients registered in the outpatient clinic of a teaching hospital	64.71	Cross-sectional/ Morisky-Green test	86.76 / -	Main reasons reported for MNA: emotional factor (69.1%), could not tell the reason (10.3%) and eating habits (8.8%). Statistically significant relation between men and women- reasons reported: could not tell the reason (p = .006), alcohol consumption (p = .013), and associated disease (p = .049)
5. Hu et al. 2013[386] **China**	To explore how and why patients adopt home blood pressure monitoring (HBPM) and examine the association between HBPM and medication adherence.	N=318 Eligible hypertensive patients from a community health centre.	71.7	Cross-sectional/ Questionnaire	38.67/38.59	Risk factors of MNA: shorter duration of hypertension (AOR = 3.31; 95% CI: 1.91–5.72; p <.001) and less frequency in performing BP measurements (AOR = 2.33; 95% CI: 1.42–3.83; p <.001)

6. Nsitou et al. 2013[373] **Congo**	To assess the level of compliance in hypertensive patients and identify patients-related predictors of MNA	N=212 Eligible hypertensive patients of outpatient departments of three urban hospital	57.5	Prospective cross-sectional /Questionnaire	32.5/ 27.86	Patient related predictors that could predict poor adherence by bivariate analysis: no Knowledge of the treatment (OR = 4.16; 95% CI; 2.25–7.68; p = $<10^{-5)}$ no knowledge of high BP related complications (OR = 2.9; 95% CI: 1.61–5.29; p = .000), other pays for the medicine (OR = 2.17; 95% CI:1.20–3.92; p = .009), no Knowledge of the severity of hypertension (OR = 3.25; 95% CI: 1.5–7.02; p = .001), costly medication (OR = 0.42; 95% CI: 0.23–0.76; p = .004), no tensinometer for self-monitoring (OR = 3.16; 95% CI: 1.44–6.92; p = .002) and not existence of family member to remind to take medication (OR = 0.52 ; 95% CI: 0.29–0.93) p = .03. After adjustment by logistic regression, statistically significant association with poor compliance: knowledge of the treatment (p = .0170) and perception of the severity of complication (p = .0373)
7. Fina Lubaki et al. 2009[378] **Congo**	To explore reasons for MNA among patients with hypertension	N=3 focus groups. Purposive sampling from hypertensive patients of a cardiovascular clinic	-	Qualitative study/ Focus group interviews		Major causes of MNA: side effects of the medications, lack of information and support, difficulty in obtaining the medication and fact that the disease is mainly silent.
8.Hareri et al. 2014[369] **Ethiopia**	To assess the prevalence of poor adherence and factors associated to	N=365 Systematic random sampling technique to select	51.2	Cross-sectional/ Semi structured	40.5	Factors hinder adherence: age group (46–55) (AOR=0.30; 95% CI: 0.142–0.640), lack of medication information

	anti-hypertensive treatment	hypertensive patients from a specialized hospital		questionnaire		(AOR=0.12; 95% CI: 0.258–0.583) and presence of co-morbidities (AOR = 0.50; 95% CI: 0. 290–0.893). Muslim followers were 3 times more likely to be adherent to their treatment (AOR = 3.20; 95% CI:1.69–6.08)
9. Ali et al. 2014[376] **Ethiopia**	To investigate antihypertensive medication non-adherence and its determinants among patients	N=121 All eligible hypertensive patients from outpatients of two referral hospitals	62	Prospective cross-sectional / MMAS-8 and patients medications charts	26.4	Factors significantly associated with MNA: family support (AOR = 0.170; 95% CI: 0.030–0.905); spot blood pressure (AOR = 0.052, 95% CI: 0.003–0.242), place of patient residence (AOR = 0.184; 95% CI: 0.024–0.597) and hypertension related complications (AOR = 21.73; 95% CI: 1.568–418.42)
10. Gelaw et al. 2013[368] **Ethiopia**	To assess the adherence of the patients to anti-hypertensive medication and main risk factors contributing to MNA	N=91 Purposive sampling was conducted among eligible hypertensive patients who attended a referral Hospital during the study period	56.06	Cross-sectional / Questionnaire	68.13	Factors contributed to MNA significantly: economic problems (p =.04), less awareness about hypertension and its treatment (p <.01), social drug use (p <.01). Other factors were distance, forget fullness, insufficient information about the effect of MNA and adverse effect understanding
11. Hareri et al. 2013[375] **Ethiopia**	To assess medication adherence and factors associated with it among hypertensive patients	N=286 Systematic random technique was used to selected eligible hypertensive patient from a specialised hospital	57.7	Cross-sectional/ Questionnaire	30.8/ 59.1	Respondents less likely to adhere to medication who had: private business (AOR = 0.28, 95% CI: 0.130–0.606; p = .001) and duration of diagnosis of five or more years (AOR = 0.11; 95% CI: 0.01–0.95; p = 0.045). Respondents more likely to adhere to anti-hypertensive medication: who

						were married (AOR = 2.00; 95% CI: 1.33–6.74), attended most of the time private clinic to receive health care (AOR = 6.34; 95% CI: 1.17–33.96), treatment duration two to four years (AOR = 3.81; 95% CI: 1.26–11.51) and who were motivated (AOR = 2.84; 95% CI: 1.47–5.43)
12. Ambaw et al. 2012 [370] **Ethiopia**	To assess adherence to antihypertensive therapy and associated factors among hypertensive patients on follow up	N=384 Systematic random sampling technique to select patients from an university teaching hospital	63	Cross-sectional study/ MMAS 4	35.4/ 33.5	Variables, significantly associated with treatment adherence: female sex (AOR = 0.48; 95% CI: 0.28–0.82), knowledgeable about hypertension and its treatment (AOR = 6.21; 95% CI: 3.22–11.97), decreased distance from the hospital (AOR = 2.02; 95% CI: 1.19–3.43), having no or one co morbidity (AOR = 2.5; 95% CI: 1.01–6.21) and who have controlled hypertension (AOR = 2.93; 95% CI: 1.73–4.96)
13. Boima et al. 2015 [359] **Ghana and Nigeria**	To determine factors associated with MNA among hypertensive patients	N=357 All eligible patients were recruited from four hospitals from Ghana and Nigeria	57.5	Cross sectional study / MMAS 8	66.7/65.4	Adherence showed association with concern about medications (r = −0.0347, p = .002) and knowledge of hypertension (r = 0.14, p = .006). MNA was related with: depression (r = −0.208, p < 0.001), formal education (p = 0.001), younger age (p=.000), use of herbal preparation (p = 0.014), insured participants (p = 0.032) and poor BP control (p = 0.006).

14. Srivastava et al. 2015 [385] **India**	Measuring the medication adherence using validated tools and investigating the patient, disease, medication and health care system related factors affecting adherence to antihypertensive therapy.	N=440 Multistage sampling method to select eligible hypertensive patient from the community	54.7	Cross sectional/ Self-report and MMAS 4	27/ 30.8	Older people was found to be significantly and independently associated with better adherence. Patients on mono therapy were less adherent compared to those on two or three drugs. Patients who were aware of the association between certain risk factors for hypertension had better adherence.
15. Srikanth et al. 2015 [383] **India**	To provide screening for hypertension to all the elderly and assess their compliance to medication	N=304 All elderly individuals >60 years residing in an urban slum.	66.7	Cross-sectional/ MMAS 8	38.6/-	Pearson's Chi square test showed significant association ($p<.005$) between compliance to medication and number of drugs consumed. With increase in number of drugs to be consumed, the adherence to medication decreased ($p = .039$)
16. Venkatachalam et al. 2015 [519] **India**	To study the factors determining adherence to antihypertensive medication	N=473 All eligible hypertensive individual willing to participate from a community.	52.2	Cross-sectional/ MMAS-4	75.89/ 74.5	The participants exhibited poor adherence with lifestyle factors like unrestricted meal habits (OR = 4.8), alcohol consumption (OR = 3.1), smoking (OR = 12.9), and salt intake >5 gm (OR = 3.6). Adherence was significantly higher among respondents taking only one medication and once daily compared with individuals taking four types of medication and as frequent as three or more times a day.
17. Kumar et al. 2014 [477] **India**	To assess the level of adherence and the factors influencing adherence among hypertensive patients	N=120 All eligible consenting hypertensive patients attending medicine	36.7	Cross-sectional / MMAS 8	45.8/ 50	Factors significantly associated with good adherence: absence of side-effects (OR = 0.1; 95% CI: 0.03–0.52; p = .003)

		outpatient department and peripheral outreach clinic of a medical college				availability of free medication (OR= 0.4; 95%CI: 0.2–0.9; p = .030) and regular checkup of BP (OR = 0.5; 95% CI: 0.2–0.9; p = 0.034)
18. Rao et al. 2014[520] **India**	To assess adherence to antihypertensive therapy and to assess associated factors for adherence among hypertensive patients	N=220 Eligible hypertensive patient residing in an urban slum settlement	59.1	Cross-sectional / MMAS 4	39.4/ 35.8	Factors contributed to treatment adherence significantly(p<.05): patient >60 years of age (67.2%) (OR = 1.91; 95% CI: 3.40-1.08), married people (84.7%) (OR = 3.45; 95% CI: 8.43–1.37); nonsmokers (74.8%) (OR = 3.83; 95% CI: 7.01–2.12), non-tobacco users (68.9%) (OR = 6.36; 95% CI:14.63–2.93) and people consuming 1 tablet a day (67.7%) (OR = 2.26; 95% CI: 4.11–1.26)
19. Nagarkar et al. 2013[357] **India**	To translate and validate MMAS-8 and to determine association between patient characteristics and medicine adherence in hypertension	N=174 Randomly selected hypertensive patients attending medicine outpatients of a district hospital	44.87	Cross-sectional / MMAS 8	76.5 / 70.7	MNA was significantly associated with patients (p<.05): age less than 57 year (OR = 3.348; 95% CI: 1.665–6.732), living in nuclear family setup (OR = 2.670; 95% CI: 1.378–5.175) and not experience of symptoms of hypertension (OR = 0.414; 95% CI: 0.192–0.892)
20. Ahmad, S. 2013[379] **India**	To assess the level of adherence and associated factors to antihypertensive treatment	N=334 Purposive sampling of hypertensive patients reporting to a urban health and training centre	41.6	Cross-sectional/ MMAS 8	42.8 / 53.95	Good adherence to treatment was present more among males (OR = 1.25) and in those patients who were either receiving one medicine per day (OR = 4.27), or taking medicine once a day (OR = 1.96). Poor adherence to anti-hypertensive treatment was seen in patients with the habit

						of alcohol consumption (OR = 0.52), tobacco chewing (OR = 0.73) and smoking (OR = 0.40)
21. Bhandari,S. 2011[10] **India**	To determine the prevalence and predictors of adherence to modern antihypertensive pharmacotherapy	N=348 All the eligible hypertensive patients living in a selected urban slum	68	Cross-sectional/ Questionnaire	27 / 28.7	Factors significantly associated with adherence (p<.05): duration of hypertension for ≥5 years (AOR = 2.98; 95% CI:1.73-5.14), hypertension was detected during checkups for conditions related to hypertension (AOR = 2.35; 95% CI: 1.25–4.39), living with ≤4 family members (AOR = 2.01; 95% CI: 1.52–3.50), family income of ≥3000 rupees (AOR = 2.56; 95% CI: 1.47 – 4.45), getting free drugs (AOR = 4.16: 95% CI:1.36–12.69), perceived BP under control (AOR = 2.23: 95% CI: 1.17–4.26) and satisfied with current treatment (AOR = 3.77; 95%CI:1.32–10.76)
22. Dennis et al. 2010[39] **India**	To assess medication adherence in hypertensive patients and to identify the main barriers associated with medication adherence.	N=608 Randomly selected hypertensive patients from the outpatient of internal medicine department of a teaching hospital	48.68	Cross-sectional / BMQ and by detailed patient interviews	49.67/-	Belief barrier was reported in 39.14% patients. Access barrier and recall barrier were reported by 82.57% and 62.17%, respectively. 78.62% of patients reported that it is difficult to pay for the medication and 54.93% indicated that it is difficult to get a refill timely. Logistic regression analysis showed that the education level was not contributing to non-adherence (OR = 0.75, 95% CI: 0.64–0.87). However, duration of hypertension, (p =

						.031) showed a significant contributory effect to MNA (p = .031). Chi square analysis showed no relation between the adherence pattern and the number of antihypertensive medications being prescribed.
23. Praveen et al. 2010 [363] **India**	To determine factors that are associated with non-adherence to antihypertensive treatment	N=804 All eligible hypertensive patient from the outpatients of General Medicine department of a tertiary care hospital	70%	Cross-sectional/ Questionnaire	29/ 34.5	Factors independently associated with MNA (p<.05): female sex (OR = 2.95, 95% CI: 1.39–6.24), not understand drug regimen well (OR = 4.06, 95% CI:1.01–16.32), affordability to only some/none of prescribed drugs (OR =3.70, 95% CI: 1.8–7.59) and longer time since last visit to a health care facility (OR = 7.26; 95% CI: 2.65–19.86)
24. Kusuma, Y.S. 2010[387] **India**	To gain insights into the perceptions of socio-economically disadvantaged migrants in Delhi regarding treatment seeking behaviour for hypertension	N=14 key informants and 3 focus groups. Purposive sampling from a community	-	Qualitative / In-depth interviews with key informants and focus group discussions	-	Treatment seeking for hypertension was not adequate. Several patient- and provider-related issues have emerged as barriers in treatment seeking and adherence.
25. Kamran et al. 2014 [380] **Iran**	To determine the factors of adherence to hypertension medication based on HBM	N=671 Two stage random sampling methods to select eligible hypertensive patients from rural health care centres	74.81	Cross-sectional/ MMAS 4	76 / 75.3	MNA was significantly associated with: unrestricted meal habits (OR = 4.8; 95% CI: 37.5), smoking (OR = 1.9; 95% CI: 1.3–2.9) and salt intake >5 g (OR = 19.7; 95% CI: 12.2–31.7). Respondents with regular physical activity and non-smokers were more adherent to medication when compared to respondents with sedentary lifestyle and smoking (p <.01).

26. Ismael et al. 2015 [364] **Iraq**	To assess the level of compliance to treatment and identified factors contributing to poor compliance	N=200 Purposive sampling was used to select participants among all eligible hypertensive patients in a general teaching hospital	34	Cross-sectional/ Questionnaire	55 / 61.7	Major factor for MNA was forgetfulness. There was a significant association between high level of adherence and age group of >65 years (p = .000), male gender (p = .003), no formal education (p = .000), and duration of hypertension less than 10 years (p = .003). Also there was significant relation between adherence and benefit of treatment, barrier of treatment, severity of disease, susceptibility to complication and reminder by advice from nurses (strongest predictor)
27. Shima et al. 2013 [381] **Malaysia**	To explore patients' experiences with their illnesses and the reasons which influenced them in not following hypertensive care recommendations	N=2 Purposive sampling from patients attending follow-up at primary health clinics	56	Qualitative study/ One to one in-depth interviews	-	Most of the reasons given for not taking antihypertensive medication were side effects or fear of the side effects of antihypertensive medication, patients' attitudes, lack of information from health care professionals and insufficient social support
28. Ramli et al. 2012 [384] **Malaysia**	To assess adherence to medications by adult patients undergoing hypertensive treatment	N=653 Random sampling method to select hypertensive patients from 7 primary health care clinics	62.8	Cross-sectional multicentre study / The Hill-Bone Adherence to Blood Pressure Therapy Scale and MMAS-8	46.6 / 43.7	Female patients were found to be more likely to be adherent than male patients (OR = 1.38; 95% CI: 1.00–1.90; p = .05]). Patients from the Malay (OR = 1.68; 95% CI: 1.03–2.73) and Chinese ethnic group (OR = 2.64; 95% CI: 1.52–4.58) were also more likely to adhere, compared to patients from the Indian subgroups. The mean number of drugs that patients were taking was higher in non-adherers (3.67) than in

						adherers (3.17 [t = 3.81, df = 651; p = .001])
29. Turki.et al. 2009[521] **Malaysia**	To identify patients with poor adherence to antihypertensive therapy and compare the levels of adherence with daily dose frequency of antihypertensive therapy	N=518 Convenience sampling to select hypertensive patients from a clinic of a general hospital	42.6	Cross-sectional/ MMAS 4	51.3	Study found a significant relationship between daily dose frequency groups and adherence at level p< .001. It shows that that who have more daily dose frequency, will show higher level of adherence towards antihypertensive medications
30. Bhandari et al 2015[366] **Nepal**	To explore the extent of adherence towards prescribed antihypertensive treatment and to elucidate the factors of MNA	N=154 Participants were selected from all the diagnosed hypertensive patients of a selected community by simple random sampling method		Cross-sectional/ MMAS 4	43.5/ 54.2	Predictors of MNA by logistic regression analysis (p<.05): Illiteracy (OR = 5.34; 95% CI: 1.23-23), price of medicine (OR = 5.14; 95% CI: 1.1–23.9), missed medicine due to cost (OR = 0.143; 95% CI: 0.02–0.78), no family history of hypertension (OR = 4.46, 95% CI: 1.21–16.4), irregular follow up (OR = 6.39: 95% CI:1.22–33.3) and more than one pills per day (OR = 5.33; 95% CI: 1.19–23.7).
31.Olowookere et al. 2015[377] **Nigeria**	To assess perceived family support and other factors that determine medication adherence among hypertensive patients	N=420 Adult patients on antihypertensive medications attending a medical outpatient clinic	51	Cross-sectional/ Questionnaire	39	Common reasons for MNA include belief of cure (43%), high cost of treatment (33%), and the experiencing of side effects (27%). Patients with good family support had better adherence compared to those with poor family support (p <.05). MNA was higher among newly diagnosed hypertensive patients, those with higher pill burden, and those without family support (p <.05).

32. Campbell et al. 2014[374] **Nigeria**	To assess compliance and knowledge of antihypertensive therapy amongst outpatients attending a hypertensive clinic	N=262 Multistage sampling technique was used to select the eligible hypertensive patients from outpatients of a hypertension clinic	52.6	Cross-sectional/ Morisky Green	74.81/ 78.83	The significant reasons for MNA (p<.05): forgetfulness (OR = 14.8; 95% CI: 3.9–54.8); ran out of prescribed drugs (OR = 1.3; 95% CI: 0.1–0.4); avoiding side effects (OR = 3.0; 95% CI: 1.4–6.7) and absence of symptoms (OR = 3.3; 95% CI: 1.3–8.0). Factors significantly associated with adherence to antihypertensive treatment: religion (X2 = 5.0068, df = 1, p = .025) and knowledge (X2 = 6.6848; df = 1, p =.0097; F-exact test= 0.0184)
33. Odusola et al 2014[372] **Nigeria**	To explore patients views on hypertension management.	N=40 Purposive sampling from a rural primary health care	60	Qualitative design/ Individual interview	-	Facilitators of medication adherence included affordability of care (through health insurance), trust in orthodox 'western' medicines, trust in doctor, dreaded dangers of hypertension, and use of prayer to support efficacy of pills. Inhibitors of medication adherence included inconvenient clinic operating hours, long waiting times, under-dispensing of prescriptions, side-effects of pills, faith motivated changes of medication regimen, herbal supplementation/substitution of pills, and ignorance that regular use is needed. Local practices and norms were identified as important inhibitors to the uptake of healthier behaviors.

34. Osamor et al.2011 [356] **Nigeria**	To investigate the factors associate with self-reported compliance among hypertensive subjects in a poor urban community	N=440 and 8 focus groups. Consecutive sampling method was used to recruit participants from a list of hypertensive patients of a poor urban community. A purposive sampling technique was used for FGD from hypertensive patients.	65.2	Survey and qualitative interviews / Questionnaire	41.5	Factors associated with adherence: regular clinic attendance (p<.0001); not using non-western prescription medication (p<.00l); support from family members (p = .038); friends who were concerned about the respondent's hypertension (p<.0001) and helpful in reminding the respondent about taking medication (p<.0001). Beliefs about cause of hypertension were not associated with compliance (p = -0.090). Reasons given for MNA in focus group discussion: feeling better, forget to take medication and cost.
35. Atulomah et al. 2010 [522] **Nigeria**	To collect information about perceived severity and threat to life from poor treatment response and medication adherence in hypertensive people	N=130 Systematic random technique was used to select hypertensive patients from a teaching hospital	45.6	Cross-sectional/ Questionnaire	30.7	Bivariate analysis revealed that perception of severity of hypertension complications from poor treatment and threat to life positively correlated with medication adherence (r= 0.46; p<.0001).
36. Bilal et al. 2015 [361] **Pakistan**	To determine the frequency and factors associated with non-compliance to anti-hypertensive medications	N=113 Purposive sampling was conducted among all the eligible hypertensive patients of inpatients department of a specialized Hospital	64	Cross-sectional / Questionnaire	68.14/ 58.33	MNA was found to be associated with: male gender p = .008; less monthly income p = .046; unemployed persons (p = .002); duration of hypertension <5 years (p = .03); mono therapy and di-therapy (p = .02) and who paid themselves for their drugs (p = .06)

37. Saleem et al. 2012 [371] **Pakistan**	To explore the perceptions and experiences of hypertensive patients toward medication use and adherence.	N=16 Purposive sampling among hypertensive patients of a government hospital	25	Qualitative study / One to one in-depth interviews	-	The majority of the patients carried specific unrealistic beliefs regarding the long-term use of medication; yet these beliefs were heavily accepted and practiced by the society. Physician's attitude, patient's past experiences, and knowledge related to hypertension were noted as major contributing factors thus resulting in non-adherence to prescribed therapy.
38. Saleem et al. 2011 [523] **Pakistan**	To evaluate the association between patient's knowledge of hypertension management and medication adherence	N=385 Eligible hypertensive patients from two tertiary care hospitals	31.2	Cross-sectional observational/ Drug Attitude Inventory (DAI-10)	64.7	Study shows an inverse association between knowledge scores of hypertension and adherence level. Correlation coefficient between total score of knowledge of hypertension and total adherence was –0.170 (p<.001)
39. Hashmi et al.2007 [388] **Pakistan**	To measure adherence to antihypertensive therapy and to investigate the factors associated with adherence in the studied population	N=460 Randomly selected participants from eligible hypertensive patients of two tertiary care hospitals	54.6	Cross-sectional/ MMAS4 and Self-report on Pill taken	23 / 23.8	Factors significantly improved adherence (univariate analyses) were increasing age, better awareness, increasing number of pills prescribed (by multivariate analyses): number of drugs that a patient was taking (p = .02) and whether he/she was taking medication regularly or only for symptomatic relief (p = .00001)
40. Al-Ramahi et al. 2015 [358] **Palestine**	To assess adherence to antihypertensive therapy and to investigate the effect of a range of	N=450 Simple random sample from patients visiting outpatient clinics of governmental	56.2	Cross-sectional/ MMAS8	54.2/ 54.2	Factors significantly associated with MNA: younger age (<45 years) (AOR = 1), living in a village (AOR = 1), forgetfulness (AOR= 5.12; 95% CI: 3.12–8.41),

	demographic and psychosocial variables on medication adherence.	primary healthcare centers in addition to a group of private clinics and pharmacies				dissatisfaction with treatment (AOR = 2.93; 95 %CI: 1.22–7.02), side effects (AOR = 4.58; 95% CI: 1.87–11.25), fear of getting used to medication (AOR = 8.00; 95% CI: 2.44–26.19) and evaluating health status as very good, good or poor (AOR = 1). Other factors (by univariate analysis): having lower income (p = .035); receiving a higher number of antihypertensive tablets (p = .001); a higher dosing frequency (p = <.0001) and having no other chronic disease (p = .009).
41. Zyoud et al. 2013[524] **Palestine**	To investigate factors associated with adherence to antihypertensive therapy among hypertensive patients and assess the relationship between medication adherence and treatment satisfaction	N=410 Convenient sampling of hypertensive patients from outpatients of a clinic and a hospital	52%	MMAS-8	36.8	After adjusting the covariates using multiple regression, global treatment satisfaction was statistically significantly (p = 0.001) associated with medication adherence (R = 0.373; adjusted R2 = 0.122; F = 8.107; df = 8; p <.001)
42. Lalic et al. 2013[360] **Serbia**	To evaluate the degree of adherence in hypertensive patients and to study risk factors affecting adherence and the effects of non-adherence on BP	N=170 All eligible hypertensive patients treated in a primary health care outpatients	65.9	Cross-sectional/ MMAS 8	25.88	MNA was associated with elderly patients, longer duration of therapy and side effects of drugs. (p<0.01). Patients <65 years were found to be more likely to adhere to their medication regimen, compared to elderly patients ($\chi 2$ = 21.3; p<0.01; OR = 6.0; 95% CI: 2.76–13.04). BP values over 140/90 mmHg were reported in 59.1% of

						MNA patients and in 21.4% of adherent patients ($\chi 2$ = 19.84; p<0.01; OR = 5.30; 95% CI: 2.39–11.85)
43. Edo, TA. 2009[402] **Seychelles**	To describe factors that affected compliance with hypertension medications and lifestyle modification strategies in hypertensive people	N=102 Systematic random sampling from all eligible hypertensive patients registered at two public health centres	56.86	Quantitative, descriptive-co relational study/ Validated questionnaire and clinic note	29.41	Significant determinants of compliance behaviour: individual perception of the benefits of hypertension treatment (p = .0004); individual perception of risks of hypertension treatment (p = .0120) and cues to action (p = .0025)
44. Bovet et al. 2002[482] **Seychelles**	To examine the compliance to medication among newly diagnosed hypertensive patients screened from the general population of the Seychelles	N=50 Eligible hypertensive patients form a subset of participants in a population-based cross sectional survey	34	Population based survey and follow up / Medication Event Monitoring System (MEMS)	Initially 26%-after 12 months 32%	12-month adherence was higher with : skilled workers (p = .034); who knew their BP before diagnosis (p = .028) and who thought current lifestyle was important for future health (p = .050)
45. Elzubier et al.2000[382] **Sudan**	To estimate adherence with drug use, associated factors, and the effect of adherence on BP control	N=198 Registered eligible hypertensive patient attended medicine department of a teaching hospital	76.3	Cross sectional/ Pill count	40.4	Using multiple logistic regression analysis only variable that is positively and significantly associated with MNA is being unable to buy drugs (p<0.001)
46. Joho et al. 2012[365] **Tanzania**	To investigate factors affecting treatment adherence with antihypertensive therapy among hypertensive patients with the guide of the HBM conceptual framework	N=135 Randomly selected patient from three hypertensive clinics	56.3	Cross sectional/ Questionnaire	44 / 35.44	With the use of bivariate analysis treatment compliance showed significant positive association with perceived benefit (r = 0.27; p = .001) cues to action(r= 0. 19; p = .022). Treatment adhrence showed significant negative association with: perceived barrier to treatment (r = -0.53; P = .000)

47. Mukora-Mutseyekwa et al. 2013 [525] **Zimbabwe**	Measurement of BP control achievement, estimating prevalence of drug adherence behaviour and establishing the association between drug adherence behaviour and achievement of BP control	N=102 Convenience sampling from outpatients of a tertiary hospital	69.6	Cross-sectional/ MMAS 4	59.8/66.19	Participants with normal BP measurements were more than three times as likely to report maximal adherence to prescribed drug schedule (AOR = 3.37: 95% CI: 1.38–8.24)

KYE: MNA=medication non-adherence; BP=Blood pressure; OR=Odds Ratio; AOR=Adjusted Odd Ratio; MMAS=Morisky Medication Adherence Score; BMQ=Belief about Medication Questionnaire; r =Pearson's correlation coefficient

[a]Patients population comprised of both male and female