

School of Public Health

**A cohort study of the utilisation of institutional delivery services and pregnancy
outcomes in the Kaski district of Nepal**

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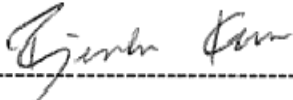
Declaration

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

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

This thesis contains a series of four original papers on the utilisation of institutional delivery services and pregnancy outcomes in central Nepal. The contributions of the co-authors of the published papers are stated in Appendix D. The copyright permissions to include the published articles in this thesis are included in Appendix E.

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Abstract

Background

Improving maternal health is the fifth goal out of eight within the Millennium Development Goals (MDG), with a target of 75% reduction in maternal mortality between 1990 and 2015. A majority of maternal deaths are caused by lack of proper treatment of pregnancy complications due to non-utilisation of available institutional delivery services or delays in accessing such services. Consequently, skilled attendance at birth is the main indicator of progress in maternal health as well as a strategy to reduce the maternal mortality. Despite a number of interventions to increase the use of institutional delivery services, including the provision of free institutional delivery services with delivery incentives to women, about 65% of births still occur at homes in Nepal.

Several reasons need to be considered to understand why women continue to deliver at home. First of all, women may not perceive the need to have professional care since pregnancy and child-birth can be treated as normal life events, and women and their families may not be aware of associated risks. Even if there is a perceived need, there are several barriers to accessing institutional delivery services. These barriers can be grouped into four categories: socio-cultural, distance, cost and quality. Socio-cultural, cost and perceived quality are related with the first delays of deciding to seek care while distance and transportation are related with second delays of reaching the facility within the ‘three delays framework’ of institutional delivery service use.

To make obstetric services affordable and accessible to every woman in low income countries, the ‘health centre intrapartum care strategy’ has been advocated. This strategy recommends pregnant women to deliver at those health centres which are near to their residence, are capable of providing basic emergency obstetric care, and are linked to referral hospitals for comprehensive emergency obstetric services. However, the referral system in some maternity services may not be functional and women may perceive health centres as being of low quality. As a result, they may not use health centres and may bypass them to deliver at hospitals.

Objectives

In these contexts, the aims of this research work were to find out: i) if women perceive the need for professional help and prepare for childbirth; ii) whether such preparation is eventually associated with delivery at a health care facility; iii) the crucial barriers to accessing institutional delivery services, i.e. the first and second delay factors; iii) the reasons for home delivery; and iv) the frequency of bypassing the birth centres, characteristics of bypassers and reasons for bypassing to deliver at hospitals. In addition, this study also aimed to determine pregnancy outcomes in terms of pregnancy and delivery complications and associated factors for caesarean delivery.

Methods

A community based prospective cohort study was designed. The study was approved by the ethics committee of Curtin University and the Nepal Health Research Council. A cohort of 701 currently pregnant women, of five months or more gestational age, was recruited from randomly selected five urban wards (n=380) and seven rural areas (n=321) of the Kaski district of Nepal. Data were collected through validated questionnaires, derived from Nepal Demographic and Health Survey and previous studies, by 15 local female data enumerators via face to face-to-face interviews at respondents' houses. The data enumerators searched for and identified pregnant women in their locality, with the help of female community health volunteers and health facility registrations for antenatal care visits.

A baseline interview was conducted, upon recruitment, to solicit information about socio-demographics, household assets, health knowledge, and birth preparedness and complication readiness from December 1, 2011, to January 31, 2012. The baseline interview was followed by a second interview by the same data enumerators within 45 days of delivery, to solicit information about utilisation of antenatal care and delivery care and about illness during pregnancy, delivery and postpartum. The data was summarised by means and percentages, and bivariate association was checked by chi-square and t-test. The association between each outcome and its influencing factors was further evaluated by logistic regression. All analyses were performed using SPSS version 18.

Results

Of the 748 women approached, 701 took part in the baseline interview providing a response rate of 93.7%. Of the 701 women in the baseline interview, 639 were followed up via a second interview. The excluded women in the follow-up were those who had antepartum stillbirths (n=9), lost to follow up (n=43), who delivered on the way to hospital (n=5), who had intrapartum stillbirths at home (n=3) and who experienced early neonatal deaths after home delivery (n=2).

The place of delivery was known for 644 participants out of the 701 baseline respondents: 547 (85%) gave birth in a health facility and 97 (15%) at home. Of the 547 women who delivered at a health facility, 77 delivered at birth centres, 419 at the public hospital and 51 at private hospitals.

Level of birth preparedness was high, with 65% of the women reported as preparing for at least four of the five arrangements: identification of delivery place, identification of transport, identification of blood donor, money saving, and antenatal care check-up. The greater the number of arrangements made, the more likely were the women to have skilled attendance at the birth (Odds Ratio (OR) 1.51, $p < 0.001$). For those pregnant women who intended to save money for the birth costs, identified a delivery place or identified a potential blood donor, their likelihood of actual delivery at a health facility increased by two- to three-fold. However, making arrangements for transportation and antenatal care check-ups were not significantly associated with skilled attendance at birth.

About 90% of women from urban areas and 78% of women from rural areas delivered in health care facilities. Among the 547 facility deliveries, 48% of women delivered within 5 hours of reaching the health facility and 90% delivered within 25 hours of arrival. Women were more likely to deliver in a health facility if they were educated especially with higher secondary or above qualifications (Adjusted Odds Ratio (AOR) 12.39, 95% Confidence Interval (CI) 5.09 to 30.17), attended four or more antenatal care visits (AOR 2.15, 95% CI 1.25 to 3.69), and lived within 30 minutes of the facility (AOR 11.61, 95% CI 5.77 to 24.04). For the 97 women who delivered at home, 72 (74.2%) were unplanned events, mainly due to quick precipitation of labour making it impossible to reach a health facility.

Of the 353 pregnant women who had access to local birth centres as their nearest health facility, the place of delivery was known for 330 women: 258 (73.1%) women delivered at a health facility and 72 (20.4%) delivered at home. Of the 258 women who delivered at a health facility, 77 (29.8%) delivered at their nearest birth centre while 181 (70.2%) women bypassed birth centres to deliver at hospitals. Bypassers tended to be wealthy and had intrapartum complications, but the likelihood of bypassing apparently decreased with higher parity and frequent (≥ 4) antenatal care visits. Availability of operation facility, adequacy of medical supplies and equipment, and competent health staff at the hospitals were the main reasons for their decisions to bypass birth centres.

Of the 639 deliveries, caesarean delivery accounted for 13.3%. Age, urban residency, college-level education and, particularly presence of intrapartum symptoms significantly increased the likelihood of caesarean delivery. Prepartum, intrapartum, and postpartum symptoms were reported by 21.1%, 24.4% and 10.2% of women, respectively. Common danger signs included prolonged labour, severe abdominal pain, swollen hands and/or body and heavy bleeding.

Conclusions

The level of birth preparedness and utilisation of institutional delivery services in the study district was comparatively high. Birth preparedness was positively associated with utilisation of institutional delivery services. Distance and women's education were crucial factors in institutional delivery service uptake. The risk of bypassing birth centres for childbirth was high in the study district, mainly because of low perceptions of medical supplies and equipment in birth centres. Obstetric complications and stillbirth rates were relatively high in the study district. Caesarean delivery appeared to meet obstetric needs and has been performed with medical indications, particularly after the onset of labour. Continuation of the birth preparedness programme, with particular emphasis on options for transportation, and upgrading of quality of available birth centres will help to increase the utilisation of institutional delivery services.

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Abbreviations

AOR	Adjusted Odds Ratio
BP/CR	Birth Preparedness and Complication Readiness
CS	Caesarean Delivery
JHPIEGO	Johns Hopkins Programme for International Education in Gynecology and Obstetrics
MDG	Millennium Development Goal
MoHP [Nepal]	Ministry of Health and Population, Nepal
OR	Odds Ratio
NDHS	National Demographic and Health Survey
UNDP	United Nation Development Programme
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
WHO	World Health Organisation

1 INTRODUCTION

This chapter briefly describes causes of maternal mortality and strategies to reduce it. Institutional delivery service utilisation, the most important strategy, will be described, along with the challenges to increasing its usage within the context of Nepal. Around this, the research questions of this thesis have been posed. Finally, an outline of the thesis is given.

1.1 Determinants of maternal mortality

McCarthy and Maine (1992) provided a detailed framework of determinants to analyse maternal mortality and morbidity. They identified three types of determinants: distal, intermediate, and proximal or immediate outcomes. Distal determinants include: i) women's status in the family and community, such as education, occupation, income, and social and legal autonomy; ii) family's status in the community, such as family income, land, education and occupations of family members; iii) community's status, such as community traditions and resources. Intermediate determinants include the health and reproductive status of women, and the accessibility and utilisation of health services (McCarthy & Maine 1992).

These two types of determinant operate to produce immediate causes of maternal mortality, which begins with pregnancy and might end in pregnancy related complications such as haemorrhage, infection, pregnancy-induced hypertension and/or obstructed labour. The World Health Organisation (WHO) estimated that around 287, 000 maternal deaths occurred in 2010 (WHO 2012). Among the immediate causes, haemorrhage was the leading cause of maternal death in Africa (33.9%) and in Asia (30.85 %), while in Latin America and the Caribbean, hypertensive disorders were responsible for the most deaths (25.75%) (Khan et al. 2006). There are far more women who suffer maternal morbidity, since it is estimated that, for every maternal death, at least 25 more women suffer from maternal morbidity in the form of near-miss events, pregnancy-related complications and long-term disabilities (Filippi et al. 2006). Overall the burden of maternal

mortality and morbidity to a nation is immense in terms of its social development, economical productivity and infant health outcomes (Agampodi et al. 2012).

The distal and intermediate determinants, especially women's status, women's education and the provision of obstetric services, have been more rapidly changed and drastically improved in high income countries over the past decades compared to low income countries. Further, professionalisation of delivery care with the provision of emergency obstetric care has been achieved in developed countries (De Brouwere et al. 1998). That is why, currently, almost all (over 99%) maternal deaths occur in low- and middle-income countries, mainly in Sub-Saharan Africa (56% of total global maternal deaths) and Southern Asia (29% of total global maternal deaths) (WHO 2012). Maternal mortality stands as the "largest discrepancy of all public-health statistics" between high- and low-income countries, with a lifetime risk of 1:16 in Sub-Saharan Africa and 1:30000 in Sweden (Ronsmans & Graham 2006).

1.2 Strategies to reduce maternal mortality

The fifth out of 8 MDGs is to reduce maternal mortality by three quarters between 1990 and 2015. A number of strategies exist to reduce maternal deaths. These include maternal specific interventions including antenatal care, intrapartum care, postpartum care, family planning and safe abortion, as well as non-maternal specific interventions, including education, empowerment and nutrition (Campbell & Graham 2006). Because the immediate causes of maternal mortality are haemorrhage, infections, hypertensive disorders and obstructed labour around the time of delivery and presumably in attempted home delivery (Ronsmans & Graham 2006), more women could be saved if these complications could be professionally and promptly treated. This is possible if women deliver under the supervision of skilled personnel, preferably in a health facility irrespective of nature and complication of pregnancy, because pregnancy complications are unpredictable. In fact, the 'proportion of births attended by skilled health personnel' is a main indicator for evaluation of the achievement of MDG 5 in regard to improving maternal health.

As a result, skilled attendance at birth and intrapartum care remains an important strategy of the safe motherhood programme to reduce maternal mortality globally. More specifically, since not every pregnant woman in low- and middle-income

countries may obtain hospital services which can provide emergency obstetric services, primary health care centres can serve as the linkage between community and referral hospitals to provide obstetric care. Indeed, the ‘health-centre intrapartum care strategy’ has been advocated as ‘the best bet to bring down high rates of maternal mortality’ in low- and middle-income countries (Campbell & Graham 2006). According to this strategy, women deliver at their nearest health centres, which are capable of providing basic emergency obstetric care, and are linked to referral hospitals for comprehensive emergency obstetric services. Basic emergency obstetric care includes seven ‘signal functions’ except the provision of blood transfusion and caesarean delivery (WHO 2009). The seven signal functions are: i) administration of parenteral antibiotics; ii) administration of uterotonic drugs; iii) administration of parenteral anticonvulsants for pre-eclampsia and eclampsia; iv) manual removal of the placenta; v) removal of retained products; vi) performance of assisted vaginal delivery; and vii) performance of basic neonatal resuscitation.

Because rural areas are characterised typically by poor physical accessibility and lack of human and material resources for blood transfusion and caesarean delivery, the ‘health-centre intrapartum care strategy’ is an affordable way to provide emergency obstetric care to rural people in low- and middle-income countries. Consequently, many low- and middle-income countries, including Nepal have upgraded various lower level health centres to provide basic emergency obstetric care.

1.3 Maternity service provision in Nepal

Following the Nairobi conference of Safe Motherhood, in 1987, and the international conference on Population and Development, in 1994, Nepal prominently identified Safe Motherhood as a national priority programme. A task force formulated the national Safe Motherhood plan of action in 1994 and the Safe Motherhood Programme was initiated in 1997 (Pradhan et al. 2010). The Safe Motherhood Programme, from its inception, has attracted significant international donations and cooperation, and it is highlighted in all major health-related policies and plans. As a result, a lot of programmatic activities, policy formulation and infrastructure development have occurred. For example, a national Safe Motherhood policy was formulated, in 1998, followed by a national Safe Motherhood plan (2002-2017). The

national Safe Motherhood plan (2002-2017) was revised in 2005 to produce the Safe Motherhood and Newborn Health Long Term Plan (2006-2017).

The National Safe Motherhood Programme provides essential maternity services to all women in Nepal, through an extensive four-tiered district health system: sub-health post, health post, primary health care centre and district hospital. In addition, there are outreach mobile clinics and female community health volunteers at the peripheral level. At the sub-health posts, maternal and child health workers provide antenatal and postnatal care, and assist in home deliveries. Auxiliary nurse midwives provide antenatal and postnatal care at health posts; some of these have birthing facilities. The primary health care centres and district hospitals provide antenatal, postnatal and delivery care as well as emergency obstetric services (MoHP [Nepal] 2013).

Overall, there has been substantial growth in primary care health facilities in Nepal reaching into peripheral areas. The Department of Health Services of Ministry of Health and Population (MoHP [Nepal]), Nepal has grouped the health facilities that provide delivery services into three types: birthing centres (that do not provide all basic emergency obstetric care services), basic emergency obstetric care sites, and comprehensive emergency obstetric care sites. However, the term ‘birth centre’ has been used to denote all facilities that may or may not provide all basic emergency obstetric services in Nepal. Within a period of eight years from 2004/5 to 2012/13, there has been a significant increase in availability of institutional delivery services (from 227 birthing centres to 1555; from 13 basic emergency obstetric care sites to 163; and from 34 comprehensive emergency obstetric care sites to 123) (MoHP [Nepal] 2009; MoHP [Nepal] 2013). The government of Nepal has incorporated two important programmes into its national Safe Motherhood Programme: Birth Preparedness and Complication Readiness (BP/CR) and *Aama Surakchhya Karyekram* (Safer Mother Programme)”. These two programmes have been implemented through the district health system. Overall, the structure and provision mechanism of maternity services in Nepal is good, showing good coverage and availability.

The BP/CR framework was first adopted in the government’s ‘*SUMATA*’ programme in 2002. This programme encouraged families to care for women during pregnancy,

to share their work and to prepare for the birth (JHPIEGO 2004b). BP/CR was then introduced in a number of districts, in partnership with several non-government organisations. Various cadres of health personnel, both facility-based health workers who are government employees receiving a regular salary (maternal and child health workers, auxiliary nurse and midwives), as well as community-based volunteers (female community health volunteers and traditional birth attendants), were trained in counselling techniques and use of the birth preparedness tools (flip-charts and key chains) to communicate the BP/CR messages. Female community health volunteers identified and counselled expectant mothers in their own locality, whereas facility-based health workers counselled pregnant women during antenatal check-ups (McPherson et al. 2006; McPherson et al. 2010). The BP/CR programme was scaled up, throughout the country, in 2009. The district health facilities, as well as female community health volunteers, use pictorial charts that depict preparation activities and danger signs.

The “*Aama Surakchhya Karyekram*” includes two components: the safe delivery incentive programme (initiated in July, 2005) and free delivery care for normal, complicated and caesarean births at all health facilities capable of providing these services (initiated in January, 2009). The safe delivery incentive programme provides incentives to women, as well as payments to health facilities (MoHP [Nepal] 2013).

1.4 Maternal health progress in Nepal

Nepal’s Maternal Mortality Ratio (MMR) was one of the highest in the world during the 1990s. WHO and the United Nations Development Programme (UNDP) estimated it as 1,500 per 100,000 live births in 1990, 826 in 1995 and 670 in 2005, while the National Demographic and Health Surveys (NDHS) calculated it as 515 per 100,000 live births in 1991, 539 in 1996 and 281 in 2006 (Karkee 2012). A recent maternal mortality and morbidity study estimated the figure as 229 per 100,000 live births in 2010, using a surveillance system where community informants reported births and deaths of women of reproductive age (Pradhan et al. 2010). A WHO and World Bank document, prepared after country-wide multi-stakeholder policy reviews, claims that Nepal reduced maternal mortality by 80% (i.e. achieved the MDG 5 target) from 850 to 170 per 100,000 live births between 1991 and 2011 (PMNCH et al. 2014). However, some researchers have not agreed on

this as they put the target at 134 per 100,000 live births by 2015 (Bhandari et al. 2011).

Differences in estimation of maternal mortality are due to varied methodological approaches. Whatever the accurate figure is, there has been progress in reducing maternal mortality as well as in utilisation of maternity services over the past decade as a result of good maternity service provision with BP/CR and the “Safer Mother Programme”. Nepal reportedly reduced its maternal mortality significantly and received the MDG award for this in September 2010 (Nepal 2010). Figure 1.1 summarises utilisation of maternity services over the past decade: four or more antenatal care visits; skilled attendance at birth; postnatal care visits within two days of delivery; and contraceptive prevalence rate by married women. The skilled attendance at birth increased from 9% in 1996 to 19% in 2006 and 36% in 2011 (MoHP[Nepal] et al. 2012; Pant et al. 2008). This still means that at least 64% of births took place without the presence of a skilled birth attendant, mainly in homes.

1.5 Challenges to improve maternal health in Nepal

Nepal is a small but diversified country in terms of geography, ethnicity, languages and culture. The country has three distinct ecological regions (Mountain, Hill, and Plain: Figure 2.1) extending from east to west, with 105 recorded ethnicities over 75 districts. More than 80% of the land is covered with hills and mountains, which are very difficult to access by mechanical transport, and pose challenges for health care delivery. Table 1.1 shows the current basic demographic and health status indicators of Nepal.

Nepal is predominantly a patriarchal, caste-based and son-preferred society, which limits women’s ability to make informed choices, to take control of their reproductive lives and to demand biomedical care during pregnancy and child-birth (Brunson 2010; Nanda et al. 2012; Regmi & Madison 2009). Girls are married early and engage mainly in household and agricultural work (median age of marriage is 17.5 years and median age at first birth is 20.2 years). About 40% of women aged 15-49 have no education, compared to 14% of men in the same age group. The national total fertility rate dropped from 3.1 in 2006 to 2.6 in 2011, yet 27% of

married women have an unmet need for family planning. Abortion was legalised by the Nepalese government only in 2002 (MoHP[Nepal] et al. 2012).

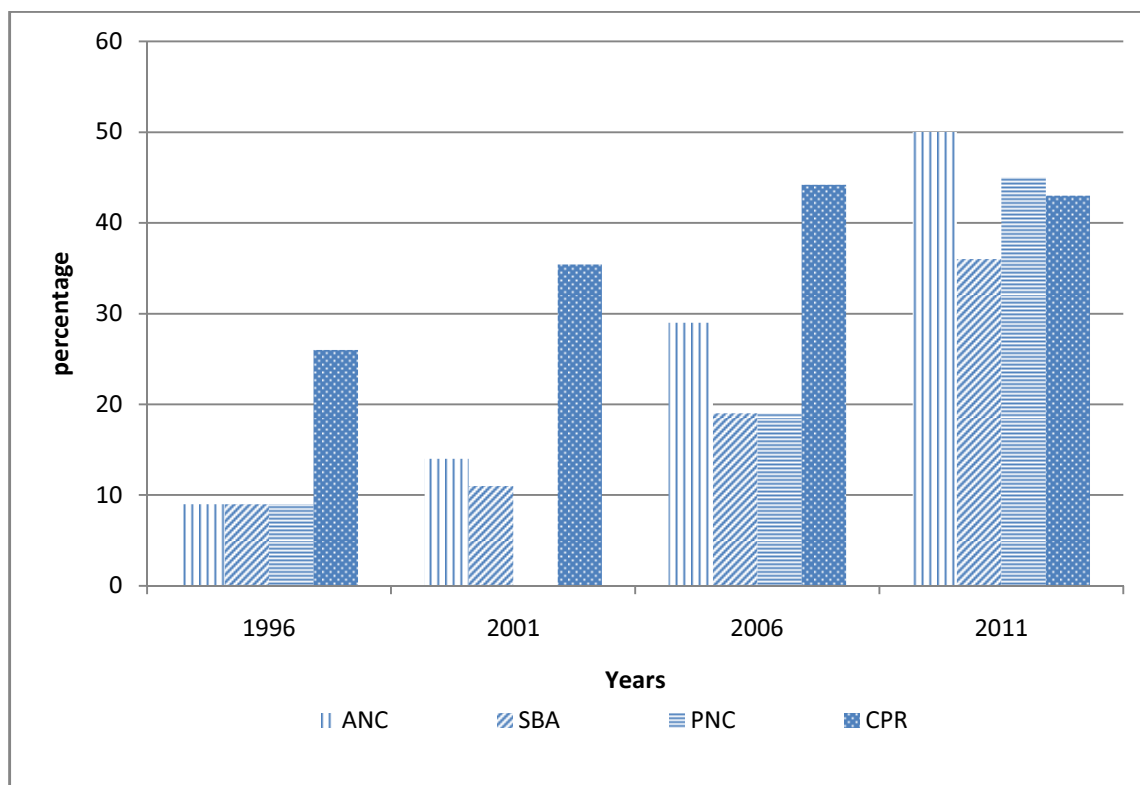


Figure 1.1: Progress in utilisation of maternity services in Nepal. (ANC = Antenatal care visits, ≥ 4 ; SBA= Skilled attendance at birth; PNC= Postnatal care visits within two days of delivery; CPR= Contraceptive prevalence rate, i.e. percentage of married women using a modern method of family planning; Data from Nepal Demographic and Health Surveys of the respective year, PNC for 2001 is not available.)

The referrals and linkages of peripheral health care centres with district and zonal hospitals are almost non-functional and detached. Women often bypass the birth centres to deliver at hospitals, even when the institutional delivery services are free of charge at health centres (Family Health Division/ Nepal Health Sector Support Programme 2013). Utilisation of institutional delivery services and improvement in maternal health vary significantly according to area of residence, income and castes. The lower caste groups are poor and marginalised while the indigenous (Janajati group) castes have traditional customs affecting delivery and pregnancy care.

Table 1.1: Demographic and health indicators of Nepal

Total area (km ²)*	147,181
Population (million)*	
Female	13.6
Male	12.9
Urban	4.5
Rural	22
GDP per capita (US\$)#	717
Annual health expenditure per capita (US \$)#	12
Poverty (% of population below US \$ 1 per day)#	16.4
Gini coefficient#	0.32
Adult literacy (aged 5 years and over, %)*	
Male	75.1
Female	57.4
Total	65.9
Life expectancy at birth (years; for 2006)*	64.1
Crude birth rate (%) [§]	24.3
Crude death rate (%; for 2006) [§]	8.3
Population growth rate (%)*	1.35
Total fertility rate (number of children per woman) [§]	2.6
Contraceptive prevalence rate (any modern methods, %) [§]	43
Abortion rate (% of pregnancies that ended in abortion) [§]	8
Unmet need for family planning (% of married women) [§]	27
Maternal mortality ratio (per 100,000 live births) [®]	229
Infant mortality rate (per 1,000 live births) [§]	46
Stunted children (%) [§]	41
Median age of marriage (years) [§]	17.5
Median age of women at first birth (years) [§]	20.2

Data sources: *National Population and Housing Census, 2011; #Nepal Living Standard Survey, 2011; §Nepal Demographic and Health Survey, 2011; ®Maternal Mortality and Morbidity Study, Family Health Division, 2010 (recent WHO estimate for 2013 is 190).

A survey of maternal mortality and morbidity, in 2009, reported that over 90% of all maternal deaths in Nepal were related to pregnancy complications and over 40% of the deaths occurred at home (Pradhan et al. 2010). Utilisation of skilled care varies from a figure of 54 % in eastern Terai to a low of 15% in western mountain area. Women at the poorest quintile had approximately eight times less access to skilled care when compared to their richest quintile. Skilled attendance at birth ranges from 30% in rural areas to 70% in urban areas (MoHP[Nepal] et al. 2012). The target for skilled attendance at birth by 2015 is 60% (MoHP[Nepal] et al. 2012). The low utilisation of institutional delivery services is of great concern for maternal survival in Nepal.

1.6 Determinants of utilisation of institutional delivery services

There are multiple factors involved in determining institutional delivery service utilisation. The determinants include social, economic, cultural, geographical, and health service-related factors, and these can operate at the individual, household, community, and larger social and political levels (Gabrysch & Campbell 2009; Stephenson et al. 2006; Thaddeus & Maine 1994). In general, the determinants can be simplified as socio-cultural, cost, distance and quality. The role and importance of particular determinant may vary from one place to another. Cultural values in some societies are so strict that women have been restricted to the use delivery services in a health facility or, even need to live in a cow shed after delivery (Thapa et al. 2001). The physical accessibility of services, particularly considering the geographical landscape of plain and hills, has a great impact on the utilisation of institutional delivery services in Nepal. Further, availability of transportation and the condition of roads also can affect utilisation.

First of all, there is a major underlying concept that needs to be addressed: the perceived need or benefit of using institutional delivery services by women and their families. This ‘perceived need or benefit’ is the initiating factor that motivates or necessitates women and families to choose and seek the maternity care (Griffiths & Stephenson 2001). If women do not perceive such need or benefit, they will not seek professional care. Women and their families or communities may think that pregnancy and childbirth are normal events which do not require attendance at a health facility or consultation with health personnel until and unless there is a

complication. Thus, a distinction between preventive obstetric care (using professional care irrespective of problems and complications in pregnancy) and emergency obstetric care should be noted (Gabrysch & Campbell 2009).

If women perceive a need, this is reflected in their intention and preparation to deliver at health facilities. Women's obstetric knowledge helps them to decide whether professional help will be needed during pregnancy and childbirth. The BP/CR programme has been promoted to equip women, families and communities with obstetric knowledge and to help in their preparation activities for delivery (JHPIEGO 2004a). Do women have enough obstetric knowledge and make a birth plan in Nepal? Do obstetric knowledge and a birth plan really translate into performance of the planned action, i.e. delivery at a health facility?

Even if women and families perceive the need for using health facilities for delivery, they may further be obstructed either by cultural values, distance, cost or quality of care. The roles of socio-cultural, economic and physical factors can change over time as societies become more aware, literate and developed. Nepali society is becoming more literate, aware and progressive, particularly in the area of women's autonomy and health infrastructure development. Expansion and upgrading of peripheral health care centres with birthing facilities has improved the accessibility of institutional delivery services. In this context, how important are the socio-cultural, economic and physical factors in institutional delivery service utilisation within Nepal? When service users have access to more than one facility and there is no mechanism of 'gate keeping' or referral, lower level facilities are likely to be bypassed (Ager & Pepper 2005; Parkhurst & Ssenooba 2009). Hence, are rural birth centres adequately utilised for child-birth, or mostly bypassed to deliver at urban hospitals in Nepal? Why do women bypass the rural birth centres which are nearest to their localities?

1.7 Objectives of the study

The overall aim of the study was to investigate: factors associated with the use of institutional delivery services; reasons for the choice of delivery location; and pregnancy outcomes in a central hills district of Nepal. The specific objectives of the study were as follows:

1. *To measure women's birth preparedness and to evaluate its association with the use of institutional delivery services.*
2. *To predict determinants of use of institutional delivery services in the Kaski district of Nepal.*
3. *To investigate reasons for choice of delivery location in the Kaski district of Nepal.*
4. *To identify any bypassing phenomena for child-birth and factors associated with it, in the Kaski district of Nepal.*
5. *To assess obstetric complications during ante-, intra- and post-partum stages in the Kaski district of Nepal.*
6. *To determine factors associated with caesarean delivery in the Kaski district of Nepal.*

1.8 Significance of the study

Though BP/CR intervention has been popularly implemented in a number of countries, including Nepal, any evidence of it increasing facility-based deliveries is lacking. Studies are mostly cross-sectional which cannot establish a link between knowledge or preparedness and the use of institutional delivery services. Other studies are 'before-after' comparisons that measure the increase in obstetric knowledge or birth preparedness level after this intervention (Gabrysch & Campbell 2009; Maine 2007; Solnes Miltenburg et al. 2013). Hence, a follow-up community-based study is needed to address the evidence gap. The findings of this study will have implications for BP/CR programme in general and will evaluate this programme as it has been implemented in the proposed study district of Nepal.

A number of factors affect the utilisation of maternity services and operate at the individual, household, community, and larger social and political levels. Since social, cultural and health systems can differ from one geographic area to another, the role of each factor may vary accordingly. Hence, it is important to identify the main barriers for utilisation in a particular context so that relevant effective interventions can be made. This research aims to elucidate the contextual barriers in the use of

institutional delivery services in central Nepal, within the context of provision of free maternity services; implementation of BP/CR programme; and expansion of delivery facilities in rural health care centres. Accordingly, the results can be highly relevant in guiding the provision of appropriate maternity services and formulating strategies to increase the use of institutional delivery services.

Effective utilisation of institutional delivery services is the key to improve maternal health and to achieving the MDG in regard to of maternal mortality. Saving maternal lives has a far reaching implication for overall family, community, and social development of a country.

1.9 Outline of the thesis

This thesis is presented in the form of a series of published papers, with an exegesis consisting of an introduction, a review of literature and an outline of methodology. This thesis consists of five chapters, together with a list of references and appendices at the end, as follows:

Chapter 1, after describing the background information and statement of the problem, lays down the research objectives.

Chapter 2 gives a comprehensive literature review on BP/CR and determinants of use of institutional delivery services based on the three delays framework. It also includes a brief review of obstetric complications and caesarean delivery.

Chapter 3 describes the methodology, with reference to the questionnaire in the appendices. It provides detailed information about the study location, study population, study design and sampling and data analysis strategies.

Chapter 4 describes the results and discussions through four published papers. These papers collectively address all six objectives of this thesis, in a coherent way.

Chapter 5 sums up conclusions of the four papers with study limitations and recommendations.

At the end, there is a list of references cited in the text and appendices. Appendices include a literature review paper (Appendix A), questionnaires (Appendix B), ethical approvals, consent and participant information forms (Appendix C), statements of

authors' contributions for each publication (Appendix D), and copyright permissions from the respective publishers to include the papers in this thesis (Appendix E).

2 LITERATURE REVIEW

This chapter presents a critical review of the literature on determinants of use of institutional delivery services and pregnancy outcomes in terms of obstetric complications and mode of delivery. The ‘three delays framework’ has been used in this dissertation work to describe factors associated with the utilisation of institutional delivery services. A published review paper on factors associated with utilisation of maternity services in Nepal with summary table of included studies has been attached in Appendix A. Further, the relevant literature also has been reviewed in four published papers in the fourth chapter.

The electronic databases Medline, EMBASE, Science Direct, PubMed, CINAHL, BiMED Central and Google Scholar were searched for relevant literatures. Key words used to identify the relevant literature were: 1. Maternal health care (matern*/obstetric*/reproduct*/delivery/antenatal/postnatal/postpartum/newborn); 2. Health service use (utilization / access* / health service / use); and 3. Determinants or influencing factors (factor / determinant /barrier / quality/ decision). First, search was conducted by combining the first two concepts in the title and abstract field using Boolean terms, word truncation and wildcards. Later, the third concept was also included. Inclusion criteria of the articles were: (i) both quantitative and qualitative studies; (ii) reported in English; (iii) published in peer reviewed journals; and (iv) had antenatal, delivery or postnatal as outcomes.

2.1 Theoretical frameworks in health service utilisation

Behaviour change is an important concept to achieve better health outcomes and increase the utilisation of health services (Aboud & Singla 2012). Two behavioural theoretical frameworks have been widely used to study factors associated with health service utilisation: one is Andersen’s Behaviour Model and the other is Health Belief Model. According to the behavioural model proposed by Andersen, health service utilisation factors are grouped into external environment factors, predisposing factors, enabling factors, and need factors (Andersen 1995). Figure 2.1 summarises these factors within the context of the utilisation of institutional delivery services. Need factors are fundamental to health service utilisation; that is, one should perceive a condition as susceptible and severe enough before seeking care to gain

benefits. This means that pregnant women and their families must recognise pregnancy and childbirth as special conditions where life-threatening situations may arise without any prediction, so as to perceive a need for institutional delivery.

A similar notation of ‘perceived need’ has been emphasised by the Health Belief Model in utilising health services. According to this model, health services are utilised only when one recognises a health problem (i.e. perceived susceptibility) in connection with its perceived severity, and the benefits and barriers (Janz & Becker 1984). In institutional delivery service utilisation, this means that pregnant women need to be aware of the negative consequences of pregnancy and delivery and to be convinced that these negative consequences can be avoided with professional help or by delivering in a health facility. The women also need to be convinced that such help or health facilities are within physical and economic access. The model is relevant for the utilisation of institutional delivery services where many women may think: that professional help is not necessary; that there are not serious and life-threatening outcomes; and that various barriers including economic, cultural and physical, exist to their utilisation of the delivery services.

2.2 Determinants of the utilisation of institutional delivery services

Thaddeus and Maine (1994) proposed the ‘three delays framework’ to study the determinants of utilisation of institutional delivery services in the context of maternal mortality within low income countries (Figure 2.2). They developed the framework during a review for the Prevention of Maternal Mortality Programme of Columbia University’s Centre for Population and Family Health. This conceptual framework has been commonly used for identifying barriers to the utilisation of institutional delivery services and for developing interventions to minimise those barriers so that more women seek professional care and use health facilities for childbirth (Barnes-Josiah et al. 1998; Combs Thorsen et al. 2012; Hussein et al. 2012; Pacagnella et al. 2012). The BP/CR approach has been developed, based on this framework (JHPIEGO 2004c; Stanton 2004) and it has been widely promoted by the WHO, the United Nations Population Fund (UNFPA) and other international agencies as an important intervention for maternal survival.

The three delays are the first delays in deciding to seek care, the second delays in reaching a health care facility and the third delays in receiving appropriate care for obstetric complications (Figure 2.2). Any delays can cause maternal death. The first and second delays are relevant in use of institutional delivery services while the third delays refer to actual quality of the health facility, which can impede in providing adequate and appropriate care after reaching the health facility. Factors pertaining to perceived need, socio-cultural factors and perceived quality of health care are associated with the first delays of deciding whether to seek care, while factors pertaining to costs and distance (i.e. accessibility of health services) are associated with the second delays of identifying and reaching a health facility (Figure 2.2).

This conceptual framework is compatible with the two behavioural theoretical models described earlier. The need factors, together with the predisposing and enabling factors of Andersen's Behavioural Model, constitute the 'first delay factors' in deciding whether to seek care. Some of the enabling factors, including wealth, cost, occupation, distance to health facility and transportation to health facility, constitute the 'second delay factors' in regard to reaching the health facility. The perceived susceptibility, severity, benefits and barriers are the factors of the Health Belief Model that help women to decide to seek care to avoid the first delays. Actual barriers of cost, distance and transportation are related to the second delays.

The popularity of the three delays framework in studying the utilisation of institutional delivery services lies in its identification of the three delays and associated factors for each delay, so that interventions are appropriately identified and targeted for each delay and the associated factors. In other words, this framework puts the delays causing maternal death and non-utilisation of institutional delivery services in the context of individual, household, community and health system factors, transcending medical causes. The first two delays are within the control of individual women and their families but the third delays are not. The third delays can only be modified by community and health systems. Delays play an important role in maternal survival because a majority of maternal deaths could be avoided with timely professional help in the delivery. This means that accessing appropriate care in time is fundamental for maternal survival, and this is the basis of the three delays framework (Thaddeus & Maine 1994). This is because most

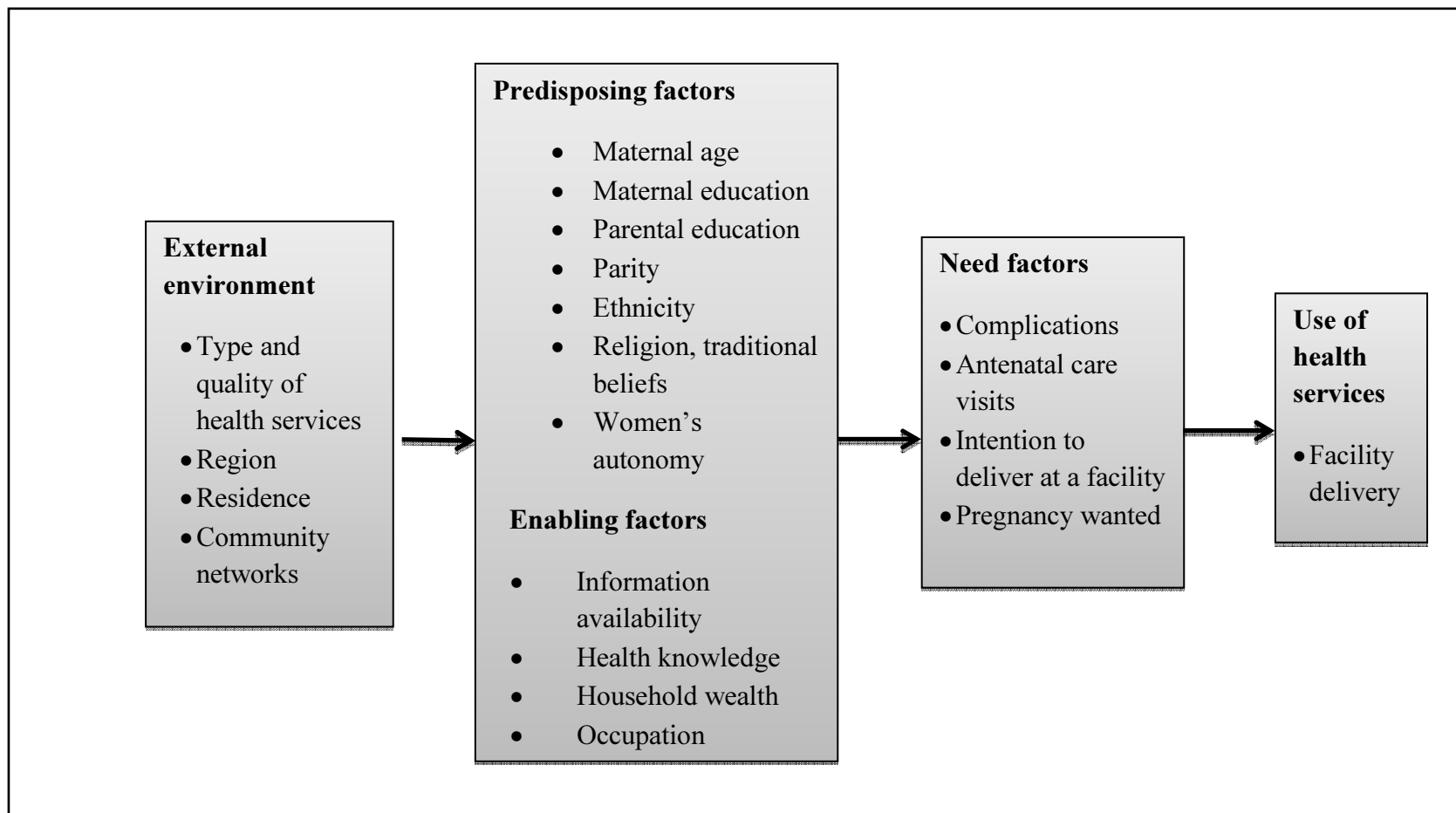


Figure 2.1: Factors associated with the utilisation of institutional delivery services according to Andersen's Behavioural Model

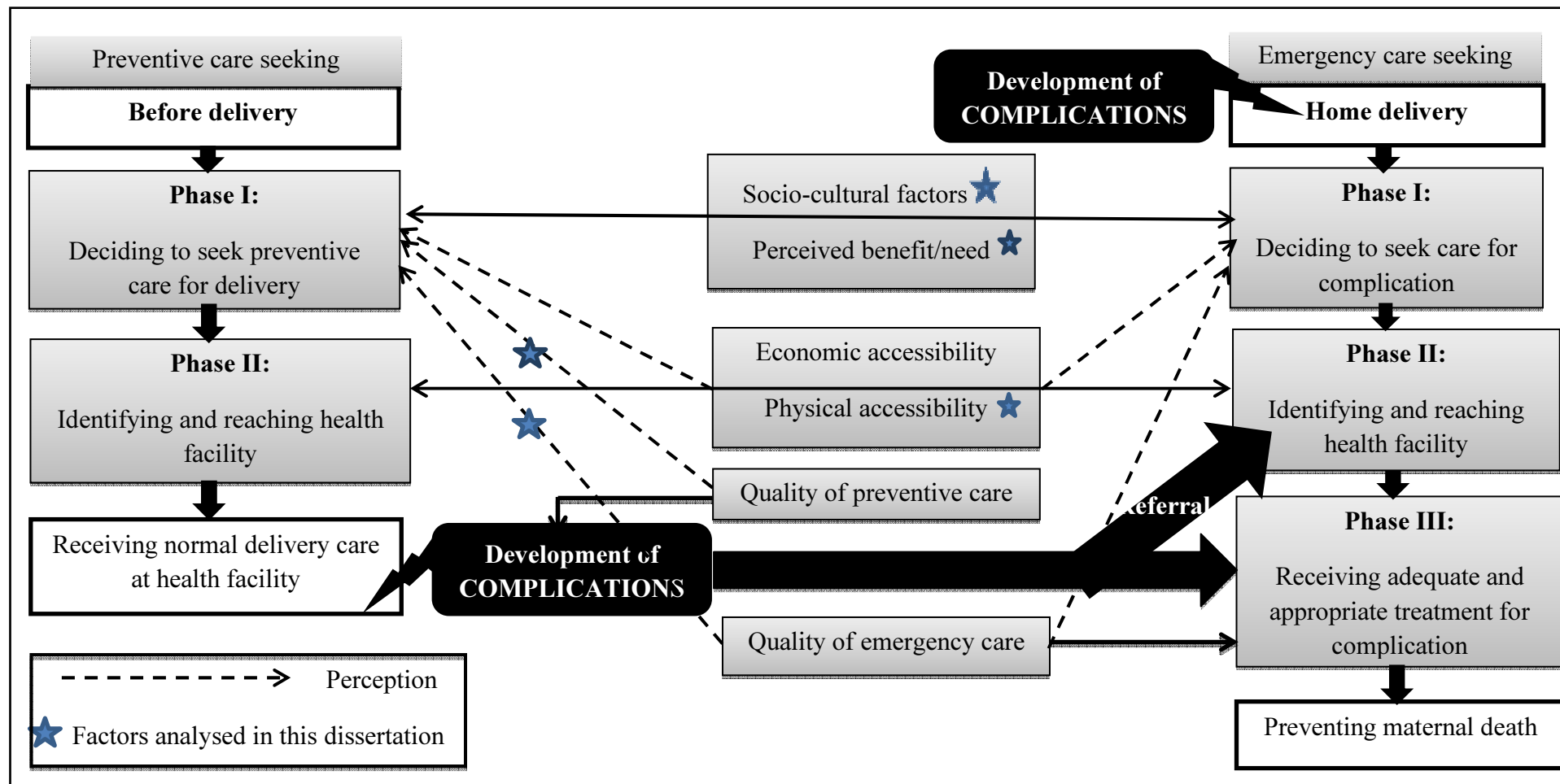


Figure 2.2: The 'three delays framework' for utilisation of institutional delivery services and maternal mortality [Original framework by Thaddeus and Maine (1994); expanded by Gabrysch and Campbell (2009); source Gabrysch and Cambell (2009)]

pregnant women in low-income countries seek care after complications arise, and they reach a health facility in a critical condition.

Indeed, the three delays framework of Thaddeus and Maine refers to factors involved in the interval between the onset of an obstetric complication at home and its outcome (Thaddeus & Maine 1994). In other words, the framework assumes a complication arising in home delivery and considers what would be the subsequent barriers to accessing the necessary institutional delivery services. This can be termed as ‘emergency obstetric care-seeking’ and is related more to receiving appropriate quality care to avoid maternal deaths. Since women are expected to visit, and deliver in, a health care facility irrespective of the nature of their pregnancy or any complications, Gabrysch and Campbell (2009) expanded this framework to accommodate the period from early pregnancy to the anticipated normal delivery in a health facility, which can be termed as ‘preventive obstetric care-seeking’ and related more to service utilisation (Figure 2.2).

Thus, a distinction between ‘preventive obstetric care’ and ‘emergency obstetric-care’ can be made. The importance and role of determinants might vary between these two care-seeking attitudes as the contexts and needs of emergency obstetric care are different from those of preventive obstetric care (Gabrysch & Campbell 2009). The third delay is related only to emergency obstetric care because it refers to receiving appropriate care in case of complications. However, it is noteworthy to mention that both care-seeking attitudes have similar determinants and barriers in relation to the first and second delays to utilisation of the institutional delivery services, as shown in Figure 2.2. So, the original framework of Thaddeus and Maine also is applicable in preventive obstetric care. This means that the framework is relevant to explain both maternal mortality and utilisation of institutional delivery services.

In a previous review, twenty factors were listed that were associated with the first and second delays, and they can be grouped into perceived need/benefit, socio-cultural factors, economic factors and physical accessibility factors (Gabrysch & Campbell 2009). In the following sections, a review of studies related to these factors is presented. Perceived quality and its role in the choice of health facility for delivery also is discussed.

2.2.1 Perceived need/benefit for utilisation of institutional delivery services

Women and their families or communities may think that pregnancy and childbirth are normal events which do not require attendance at a health facility or consultation by health personnel. This notion may have cultural and social roots since their older generations might have delivered at home without professional help. Based on interviews with women who gave birth both in health centres and at home, in Bangladesh, Afsana and Rashid (2001) found that acceptance by rural women of delivery in a health facility was minimal and that most women attended a health facility only when there were complications. In a quantitative household survey of 1,490 postpartum women in Bangladesh, it was found that a total of 769 women reported a 'serious or very serious' complication during their last pregnancy and/or delivery. Out of 769 women, the majority (86%) sought delivery care by bringing medicine and/or treatment to the home or by bringing a provider to the home (Moran et al. 2007).

Thus, it is first necessary to understand whether women, families and communities perceive the need for, or the benefits of, using institutional delivery services. There are not many studies that measure the perceived needs of women and, in fact, the notion of perceived need is very complex to measure. Perceived need or benefit is influenced by pregnancy-related factors such as awareness, health knowledge of pregnancy and risks, importance given to pregnancy, community customs, previous facility use, parity and pregnancy complications. It also is influenced by perceptions of distance, cost and quality (Gabrysch & Campbell 2009). Current pregnancy complications and severity of illness usually necessitate the utilisation of institutional delivery services (Paul & Rumsey 2002).

Women who perceive the need for professional help can be expected to have antenatal check-ups, to have the intention of delivering at a health facility and to make adequate preparations. In fact, raising women's obstetric knowledge and making them to prepare for delivery is the main behaviour change strategy utilised by the BP/CR programme (JHPIEGO 2004a). Promoting birth preparedness improves preventive behaviours, improves the knowledge of mothers about danger-signs, and leads to improvement in their care-seeking during any obstetric emergency (McPherson et al. 2006; Moran et al. 2006).

2.2.1.1 Obstetric knowledge

Obtaining knowledge about various aspects of pregnancy and delivery care, such as any unexpected life-threatening problem that can occur during pregnancy, delivery or after delivery, helps women in seeking professional care and using a health facility for child birth. A woman's lack of pregnancy knowledge might lead to unawareness of her own pregnancy problem and delay her antenatal and delivery care. Women can get such knowledge from a variety of sources, including health personnel, friends, radio, television, or educational reading materials.

Obstetric knowledge mainly refers to knowing the danger signs during pregnancy and delivery. The common antepartum danger signs include vaginal bleeding, swollen hands and/or body, severe abdominal pain, loss of consciousness/convulsions, blurred vision, severe headache and severe fever. Similarly, the intrapartum danger signs include vaginal bleeding, prolonged labour, retained placenta, swollen hands and/or body, and loss of consciousness/convulsions. The postpartum danger signs include vaginal bleeding, severe fever, smelly water discharge, swollen hands and/or body, and loss of consciousness/convulsions.

Studies carried out in various countries have reported low levels of obstetric knowledge among pregnant women. In a South African study, about 48% of all pregnant women did not know any of the danger signs of pregnancy and only 17% knew about vaginal bleeding (Hoque & Hoque 2011). In Jordan, only 61.1% of the women attending antenatal care services recognised at least one danger sign of pregnancy and delivery (Okour et al. 2012). About half of the women studied in Uganda and Tanzania could not tell any danger sign of pregnancy and childbirth and the commonest danger sign known to the women who could was vaginal bleeding (Kabakyenga et al. 2011; Pembe et al. 2009).

Similarly, most of the women (81%) attending antenatal care in Kassala, eastern Sudan, were not aware of the danger signs of pregnancy (Ali et al. 2010). Kyrgyz and Tajik women and men had limited knowledge about possible complications during pregnancy, childbirth and postpartum. None of the Kyrgyz women and only two percent of the Tajik women spontaneously mentioned all three of the key danger

signs during pregnancy that include severe vaginal bleeding, swollen hands/face, and blurred vision. None of the Kyrgyz or Tajik women mentioned all four key danger signs during labour and childbirth that include severe vaginal bleeding, prolonged labour, convulsions, and retained placenta (Wiegers et al. 2010).

In a cross-sectional survey of 600 women who gave birth in the two years preceding a survey in Tanzania, only 14.8% of the women knew three or more obstetric danger signs. The obstetric danger signs most commonly known included vaginal bleeding in pregnancy, foul smelling vaginal discharge and cessation of the baby's movement (Urassa et al. 2012).

Among 743 pregnant women who participated in a community-based cross-sectional study in southern Ethiopia, 30.4%; 41.3% and 37.7% knew at least two of the danger signs during pregnancy, childbirth and the postpartum period, respectively. The most common spontaneously mentioned danger signs during pregnancy were vaginal bleeding (49.9%), difficulty of breathing (14.1%) and loss of consciousness (12.7%). The most commonly mentioned danger signs of labour and childbirth were excessive bleeding (55%), placenta not being expelled within 30 minutes after delivery (51.4%), labour lasting more than 12 hours (43.2%) and loss of consciousness (10.9%). The danger signs of the post-partum period commonly mentioned included severe bleeding (59%), difficulty of breathing (17.9%), loss of consciousness (14.4%) and extreme weakness 13.9% (Hailu M et al. 2010). Vaginal bleeding is the most common event in pregnancy and childbirth and also is a common cause of maternal death (Ronsmans & Graham 2006).

Literacy and higher socio-economic status can facilitate access to obstetric knowledge (Gabrysch & Campbell 2009). Educational status was the best predictor of awareness of danger signs and birth preparedness in south-eastern Nigeria. However, parity was a better predictor than educational level in regard to knowledge of severe vaginal bleeding as a key danger sign during pregnancy (Ekabua et al. 2011). Residential area can affect women's obstetric knowledge. More urban women knew the obstetric danger signs in Ethiopia (Hailu M et al. 2010).

Health education and awareness programmes have had varied outcomes, such that the relationship between health knowledge and health behaviour is inconclusive

(Aboud & Singla 2012). In the area of institutional delivery services utilisation, evidence is now accumulating that maternal obstetric knowledge makes a significant difference in delivery behaviour. The specific knowledge of danger signs and possible life-threatening outcomes can make women concerned to take care during pregnancy and to use professional help. Limited capacity to recognise the danger signs was a major obstacle to seeking care and utilisation of services in Nepal (Mesko et al. 2003). Sharma and colleagues (2007), from comparative analysis of the NDHS surveys of 2001 and 1996, showed that maternal health service utilisation increased during this period and that this increase was partially related to the increased level of maternal health information disseminated through various mass media sources during the period.

A number of intervention studies have increased facility-based deliveries. They include an awareness-raising campaign of maternal health risks in Burkina Faso, counselling about pregnancy complications during prenatal care in rural Mali, the BP/CR package in Nepal and the birth plans consisting of information on the danger signs in rural Tanzania (Brazier et al. 2009; Gage 2007; Hodgins et al. 2010; Magoma et al. 2013). Similarly, in a study in Eritrea, it was noted that women's knowledge of birth danger signs increased significantly in the intervention area after participatory educational sessions and this was significantly associated with giving birth in a health care facility (Turan et al. 2011). Perceived risk of complications was the main reason in deciding to deliver at a health facility in Uganda, while women's views of pregnancy and birth-related complications did not justify their use of professional care in the first instance in Bangladesh (Parkhurst et al. 2006).

Similarly, a number of survey studies including 1,700 postpartum women in Zambia, 974 postpartum women in southern Tanzania, 205 postpartum women in Laos and an analysis of 2008 Ghana Demographic and Health Survey data, found that obstetric knowledge variables were significantly associated with the use of institutional delivery services and that a link between antenatal care visits and the use of institutional delivery services could be explained by the increase in maternal obstetric knowledge (Ensor et al. 2013; Greenaway et al. 2012; Mpembeni et al. 2007; Phoxay et al. 2001). However, most of these studies have assessed the effects of obstetric knowledge as a part of the intervention packages and the assessment of

obstetric knowledge at the post-partum stage can be biased because women will have gained the knowledge after using the services or after experiencing the complications themselves.

2.2.1.2 Birth preparedness and its association with utilisation of institutional delivery services

According to the behaviour change theories of both planned action and transtheoretical theory, intention or attitude changes often precede the performance of a particular behaviour (Fishbein & Ajzen 1980; Prochaska & Velicer 1997). Women's specific preparation activities or 'birth plan' show their intention to deliver at a health facility and this should precede the actual utilisation of institutional delivery services. These preparation activities commonly include identifying a health facility and skilled birth attendant, attending a health facility for an antenatal check-up, arranging transport, saving money to cover the costs, and identifying a potential blood donor (JHPIEGO 2004c).

Though many studies have described the interventions of community mobilisation and birth preparedness packages, and also assessed birth preparedness levels, only a few have evaluated the effect on behaviour change. In southern Ethiopia, birth preparedness was found to be low: 20.5% of pregnant women identified a skilled provider; 8.1% identified a health facility for delivery; 7.7% prepared for transportation; and 2.3% identified a potential blood donor (Hailu M et al. 2011). Agarwal and colleagues conducted a study in the slums of Indore city, India. They considered women knowing three components out of four as being well-prepared and knowing two or less components as being less-prepared. The four components were identification of a skilled birth attendant, identification of a health facility, arrangement for transport and saving money to cover costs. About 48% of pregnant mothers were found to be well-prepared, and skilled attendance at the birth was three times higher for well-prepared mothers compared to less-prepared mothers (Agarwall et al. 2010).

A cluster randomised trial in Tanzania was conducted, with 404 pregnant women in the intervention arm and 501 pregnant women in the control arm, to assess the effectiveness of birth plans in using skilled care. The intervention involved the

introduction and promotion of a birth plan by health care providers during antenatal care visits. This included discussions on planned place of delivery, the importance of skilled delivery care, transport arrangements to the delivery site or during an emergency, financial arrangements for the delivery or emergency care services if needed, identification of possible blood donors, identification of a birth companion if desired and appropriate, and support in looking after the household while the woman was at the health facility. The study found that delivery in a health unit was 16.8% higher in the intervention arm than in the control arm (Magoma et al. 2013).

A maternal health intervention to increase the accessibility of skilled care, by improving the availability and quality of maternity care provided, was implemented in a rural Ouargaye district of Burkina Faso and the results were compared with another control district (Diapaga) of the country. The intervention included activities to improve the quality, availability and accessibility of routine and emergency obstetric care. These activities were complemented by a communication strategy, which focussed on birth preparedness counselling during women's antenatal care visits, and an intensive community-level campaign to raise awareness of maternal health risks and the benefits of planning and actual delivery within a health facility. The results showed that, even when women had to pay for normal and complicated deliveries in both districts, the use of institutional delivery services in the Ouargaye district increased from 29% at baseline to 57% at endline compared to increase from 34% at baseline to 36% at endline in the Diapaga (Brazier et al., 2009). However, the authors confessed that it was difficult to attribute a particular component as the cause of the increased rate of use of institutional delivery services in the intervention district.

Hossain and Ross (2006) evaluated the Dinajpur Safe Mother Initiative in Bangladesh. The initiative included activities designed to improve the quality of care in the health facilities. Additionally, in the intervention districts, a community mobilisation intervention including birth planning, community support for finding transportation and blood donation, was implemented. Both the knowledge of obstetric danger signs and the percentage of women delivering in health facilities increased significantly in the intervention districts compared with the control districts. Turan and colleagues (2011) evaluated a community-based intervention that

aimed to increase women's birth preparedness and knowledge of birth danger signs, as well as numbers giving birth at a health care facility in rural North Eritrea. Interventions included participatory educational sessions by volunteers in the intervention areas, and results were compared with a similar area that received no intervention. Both knowledge of obstetric danger signs and the percentage of births at a health facility changed significantly from baseline in the intervention area compared to the non-intervention area.

However, McPherson and colleagues (2006) reported that implementation of birth preparedness packages in one district of Nepal did not increase skilled attendance at births, despite raising the level of birth preparedness practices. They evaluated a district-wide field trial of the BP/CR implementation through the government health system in the eastern plain district of the country. The BP/CR package focussed on individual preparation rather than large community awareness and mobilisation. Although 89% of the post-intervention respondents stated that skilled attendance was important, only 18% actually had skilled attendance at the delivery, probably due to the cultural preference for home delivery unless there was an emergency and to the lack of power to self-decide among the participants. Similarly, another pre-/post comparison of birth preparedness intervention in two plain districts of Nepal observed only a marginal increase in the use of institutional delivery services, from 24.0% to 28.4% (Hodgins et al. 2010).

In Burkina Faso, controlling for education, parity, average distance to health facility and number of antenatal care visits, planning to save money was associated with skilled attendance at the birth but planning for a skilled provider at delivery and planning for transportation in the case of emergency were not significantly associated with skilled attendance at the birth in (Moran et al. 2006). However, a retrospective study in Bangladesh, involving 246 participants, observed that intention to deliver at home or at a health facility was strongly associated with eventual corresponding delivery at home or in a health facility (Edmonds et al. 2012).

2.2.1.3 Relation between antenatal care and the utilisation of institutional delivery services

Like maternal education, antenatal check-ups usually are positively associated with utilisation of institutional delivery services. The more antenatal care visits women make, the more they are likely to deliver in a health facility. Increased antenatal care is an indication of perceived need of delivery care or of current complications of pregnancy. Antenatal care also increases women's obstetric knowledge along the pathway of deciding to seek delivery care (Ensor et al. 2013).

Antenatal counselling, the birth plan and social networks reduced the 'first delay' regarding decision-making at the time of an obstetric emergency in Afghanistan (Hirose et al. 2011). Both the quality and source of antenatal counselling influenced the use of institutional delivery services in Tanzania and Kenya (Fotso et al. 2009b; Rockers et al. 2009). Using data from India's National Family Health Surveys, Mishra and Retherford(2008) found that even after controlling for demographic, geographic, socioeconomic and pregnancy complication factors, antenatal care had more effect on professional assistance at delivery than the pregnancy complications. Similarly, using prospectively collected data from 2005 to 2009, in Bangladesh, Pervin and colleagues (2012) concluded that antenatal care visits were associated with increased uptake of facility-based delivery and improved perinatal survival.

However, making any antenatal visits may not guarantee subsequent use of institutional delivery services. Women utilised antenatal care for periodic examinations, vaccinations and obtaining iron tablets or blood pressure checks, in Tanzania, but the inability of health care providers to counsel appropriately and consistently during antenatal care visits resulted in subsequent low utilisation of skilled delivery care (Magoma et al. 2010). Another study in Tanzania reported that almost all (99.8%) women attended antenatal care once during their last pregnancy but only 46.7% delivered in a health facility (Mpembeni et al. 2007).

2.2.2 Socio-demographic and distance factors

Almost all published studies concerned with the utilisation of institutional delivery services have included socio-demographic and distance factors. These factors, in fact, are background variables as well as confounders for service utilisation. Socio-

demographic factors usually include maternal age, marital status, ethnicity, religion, traditional beliefs, family composition, mother's education, husband's education and women's status. These factors act primarily on decision-making as to whether or not to seek care; thus, are relevant to the first delays.

2.2.2.1 Maternal Age

Older women have accumulated knowledge on maternal health care, including the use of health services. They may show more confidence about pregnancy and childbirth and they are more influential in household decision-making than younger women. Consequently, older women may be reluctant to give birth in a health care facility while younger women may be more likely to accept modern health services and to utilise maternal health services. A study analysing data from 144 countries found a J-shaped curve for the age distribution of maternal mortality, with a slightly increased risk of mortality in adolescents (15-19 years) compared with women aged 20-24 years, and the highest risk of mortality in women older than 30 years (Nove et al. 2014).

Utilisation of institutional delivery services is not consistent with maternal age. Some studies have found that maternal age is not significant in the use of institutional delivery services (Paul & Rumsey 2002; Wagle et al. 2004). Some studies have found higher use of skilled attendance among older mothers (Letamo & Rakgoasi Daniel 2003; Navaneetham & Dharmalingam 2002). There was little variation in maternal health care by maternal age in a bivariate analysis of data of various countries in sub-Saharan Africa but, after controlling for the effect of background factors such as parity, premarital births and educational attainment, teenagers (15-19 age) were found more likely than older women (35-49 years) to initiate antenatal care late, make inadequate antenatal care visits and have an unskilled birth attendants (Magadi et al. 2007). It is to be noted that maternal age is correlated with parity, educational level, marital status and whether a pregnancy was wanted.

2.2.2.2 Marital status

Marital status has an influence on women's autonomy and control over their financial resources and this, in turn, may influence their utilisation of institutional delivery services. Studies have found either no association (Gyimah et al. 2006;

Mekonnen & Mekonnen 2003) , less institutional delivery among married women (Letamo & Rakgoasi Daniel 2003; Onah et al. 2006), or less institutional delivery among single or unmarried women (Duong et al. 2004) . Societies are different in their acceptance of different types of marital status and having babies. In Nepal, it is rare and culturally unflavoured for an unmarried woman to have a baby.

2.2.2.3 Ethnicity, religion and custom

Ethnicity and religion often shape the culture, beliefs, norms and values of societies in relation to childbirth and service use. These issues are more important in a country like Nepal. Nepal is culturally diverse, with more than 100 recorded ethnic groups (Central Bureau of Statistics 2012). Many traditional beliefs and customs, linked with ethnicity and religion, are prevalent and influence the effective use of services, primarily acting on the decision to seek care. Lower caste groups face discrimination while using health services.

A study was carried out in 48 slum communities of Mumbai covering a population of 280000. A total of 1708 (16%) births occurred at home, out of 10,754 births. The most commonly cited reason for home birth was ‘custom’ (Das et al. 2010). Similarly, in a study in Ethiopia, 88% of respondents delivered at home and the common reasons for this included closer attention from family members and relatives, and custom (Teferra et al. 2012). Thapa and colleagues (2001) described the traditional beliefs and customs in the remote rural western areas of Nepal that had a significant negative impact on the use of maternal health services. They reported that many women used an animal shed for delivery, mainly due to cultural beliefs that the household deity would get angry if the delivery took place within the home, and that periods of menstruation and childbirth are considered to be polluted days.

Mesko and colleagues (2003) reported that the cultural requirement of maternal seclusion for up to 12 days after delivery caused delays in seeking care for postnatal complications in central Nepal. However, another study in central Nepal reported that ethnicity, age of mother, age of ritual observance of menarche, and type and size of family were not significantly associated with the place of delivery (Wagle et al. 2004).

Midwives in Cambodia often need to act as ‘cultural brokers’ because Khmer women use a different vocabulary and set of beliefs than professional midwives to describe problems during pregnancy, birth and postpartum. Such beliefs have prevented Khmer women from seeking timely intervention for pregnancy problems and delivery care (White 2002). In Uganda, despite good policies and concerted efforts, adherence to traditional birthing practices, as well as the beliefs that pregnancy is a test of endurance and that maternal death is a sad but normal event, were responsible for not using the available maternal services sufficiently (Kyomuhendo 2003).

Various studies have reported that certain ethnic and indigenous women were less likely to have skilled attendance at delivery, mainly due to discrimination. Examples include: indigenous women in Latin America (Brentlinger et al. 2005; De Broe 2005; Gleis et al. 2003); ethnic minorities in China (Short & Zhang 2004); members of lower castes in India (Navaneetham & Dharmalingam 2002); Catholics in Vietnam; (Toan et al. 1996) and non-whites in South Africa (Burgard 2004).

2.2.2.4 Family composition and parity

Living as a nuclear family may or may not be suitable for utilisation of institutional delivery services. In an extended family, decisions about seeking delivery care may need to be made together with parents. The extended family may provide support by looking after small children while the pregnant women takes time to utilise services. The mother-in-law usually makes decisions about work, care-seeking and the delivery process in rural Nepal (Simkhada et al. 2010) while husbands in Uganda, and local healers or traditional birth attendants in Bangladesh, could influence care-seeking (Parkhurst et al. 2006). The social influence of the spouse, other relatives, and/or traditional birth attendants, and the perception of normal versus abnormal pregnancy, were factors related to choice of delivery in Uganda (Amooti-Kaguna & Nuwaha 2000).

Primiparous women do not have any previous experience, so they may consider the first birth difficult and place higher value on the first delivery. That is why first and lower order births usually take place in a health care facility (Mekonnen & Mekonnen 2003). In Nepal, studies have reported that multiparity was a significant risk factor for a home delivery (Bolam et al. 1998; Shrestha et al. 2012; Wagle et al.

2004). However, other studies have not found any association between number of children under five years in the household (Gage 2007) or preceding birth intervals and the use of institutional delivery services (Magadi et al. 2000). Women of higher parity can draw on their maternity experiences and are likely to give less attention to seeking professional care. However, very high order births are often risky, requiring professional care.

2.2.2.5 *Mother's education*

Literature generally reports that a mother's education is highly correlated with her utilisation of institutional delivery services (Gabrysch & Campbell 2009). A study in Peru made a quantitatively important and statistically reliable estimate of the positive effect of maternal schooling on the use of skilled care, even after adjusting for the effects of service availability and the socio-economic status of the household (Elo 1992). Matsumura and Gubhaju (2001) analysed the national family health survey data of 1996 from Nepal and found that women's education and economic status, and extended households, have a positive influence on maternity service utilisation. Socio-demographic variables, including maternal age, education, parity and wealth, were associated with having the delivery assisted by a skilled attendant (Neupane & Doku 2013) and with the timing and number of antenatal care visits (Neupane & Doku 2012) in a multivariable logistic analysis of the NDHS, 2006.

Levels of education are classified differently and often shown that a higher level of education is associated with more skilled attendance at delivery. However, a higher level of education may not guarantee higher levels of health service utilisation (Lasker 1981). Educated women will have a number of benefits, including increased knowledge of the benefits of preventive health care, awareness of health services, socialisation to interact with formal services outside the home environment, familiarity with modern medical culture, better communication with the husband, greater decision-making power, increased self-worth and self-confidence (Caldwell et al. 1982; Furuta & Salway 2006; Raghupathy 1996; Thaddeus & Maine 1994). Further, higher education also is co-related with higher socio-economic status. However, an exact mechanism of how maternal education brings about increased maternal health service utilisation has not been completely explained (LeVine et al. 2004).

2.2.2.6 Husband's education

Like mother's education, the husband's education is also positively related to skilled attendance at the delivery and acts by similar pathways to that of mother's education. The husband's education level has had a positive effect on utilisation of institutional delivery services in Nepal (Dhakal et al. 2007; Thapa et al. 2001). Including husbands in antenatal health education also has had a positive influence on birth preparedness and post-partum visits in Nepal (Mullany et al. 2007). However, the effect is often less than that of the mother's own education. Educated husbands may be more open toward modern medicine, aware of the benefits of skilled attendance and more able to communicate with health workers and to demand appropriate care.

2.2.2.7 Women's status

Studies can measure women's status via many dimensions such as freedom of movement, aspects of decision-making, control over earnings, and communication and sharing of housework with the husband. Most of them find a significant positive association between women's status and their use of skilled attendance (Bloom et al. 2001; Duong et al. 2004; Furuta & Salway 2006; Gleit et al. 2003; Magadi et al. 2000; Stekelenburg et al. 2004).

Brunson (2010) conducted an ethnographic study of delivery care in semi-urban parts of Kathmandu, Nepal. She concluded that pregnant women are in a social position that lacks the power to demand biomedical care, with her family and menfolk remaining largely uninvolved in the care-seeking process. She coined the term "gendered politics" to describe such a culture at the household level.

Furuta and Salway (2006), through an analysis of data from the NDHS 2001, found that few women reported participation in household decision-making, and even fewer had any control over their own earnings. While involvement in decision-making had no significant impact on antenatal and delivery care, spousal discussions on family planning and working mothers having control over their earnings were linked to an increased likelihood of maternal service use. Similarly, women's involvement in decision-making was not significantly associated with maternal service use but other indicators of women's empowerment, including women's age at the birth of their first child, their education and their knowledge about sexually transmitted diseases,

significantly increased their utilisation of maternal health services in Nepal (Pandey et al. 2012). In Pakistan and Kenya, women's decision-making power and autonomy within their households have a significant positive correlation with maternal health services uptake (Fotso et al. 2009a; Hou & Ma 2013).

2.2.2.8 Region and place of residence

Several studies have reported strong urban-rural differences in the utilisation of institutional delivery services, with increased utilisation by urban women (Say & Raine 2007). Urban areas are usually inhabited by educated and wealthy people who have easy access to services and information. Urban areas have a good network of roads, and health facilities are located nearby. In rural areas, health facilities are located very far and take considerable time to reach. Further, women may perceive urban hospitals to be of higher quality to provide safe delivery compared to rural health posts.

A review study of inequalities in the use of maternal health care in low- and middle-income countries found only a few studies that did not show higher facility use by urban women compared to rural women (Say & Raine 2007). In Ethiopia, the odds of urban women delivering with skilled attendance were more than 8.5 times compared to rural women (Mekonnen & Mekonnen 2003).

2.2.2.9 Distance and transport

Distance to health facilities affects their use in two ways: firstly, as a disincentive to seek care in the first place and, secondly, as an actual obstacle in reaching a facility after a decision has been made to seek it (Gabrysch & Campbell 2009). Delivering women and their families may not even attempt to reach a facility when the facility is too far and it is very difficult for a pregnant woman to walk or be carried, especially in rural areas with poor roads and means of transportation. The effect of distance is further exacerbated by poor roads and unavailability of transportation vehicles. In cases of complications in home delivery, women and families actually try to reach the facility, whereby the obstacle effect is more relevant (Thaddeus & Maine 1994). When people have the choice between several facilities, they sometimes travel further if the target facility is perceived to offer superior quality care. Distance is, thus, relative to service quality, severity of illness and transport options.

Both qualitative and quantitative studies mention distance as an important deterrent for delivery in health facilities. Distance can be measured either by physical means (i.e. kilometres) or by time taken to reach a health facility. Distance and transportation barriers were found to be significant in the receipt of four or more antenatal visits, and in the utilisation of institutional delivery services, in several studies (Gage 2007; Hounton et al. 2008; Mpembeni et al. 2007). The distance effect is peculiar when labour starts unexpectedly or at night, and in the absence of transport options (D'Ambruoso et al. 2005; Duong et al. 2004; Mesko et al. 2003). Even in urban areas, the effect of distance and availability of transport has been found to be important in the timely utilisation of emergency institutional delivery services (Chaudhary 2005).

Since labour pain can happen unexpectedly and women often are far from a health facility, quick transportation and 'maternity waiting homes' can play an important role in the utilisation of institutional delivery services. The expectant mothers can come early and wait in 'maternity waiting homes' for their delivery nearby to a health facility. Maternity waiting homes have been used in many countries but they differ in structure and provision of services, and have varying degrees of success (Hussein et al. 2012). Maternity waiting homes have previously been constructed in rural west Nepal but were not used effectively by pregnant women because of unawareness of their availability and their lack of facilities (Shrestha et al. 2007).

2.2.3 Economic accessibility

Economic accessibility includes the household's socio-economic status, woman's occupation, husband's occupation, family income and cost of use of institutional delivery services. The cost of delivery at a health facility also includes the cost of transport and opportunity costs of travel time (indirect cost). In general, higher socio-economic and income status has a positive effect on the utilisation of institutional delivery services. Economic factors can be important deterrents for the use of institutional delivery services, especially for low-income, marginalised and slum communities (Fotso et al. 2009b; Kesterton et al. 2010; Kowalewski et al. 2002; More et al. 2009; Zere et al. 2011).

However, women's occupation status has mixed effects. Some studies have found that working mothers are more likely to deliver at a facility, while others indicate

working mothers are more likely to deliver at home. Matsumura and Gubhaju (2001) found that women's working status has a negative influence on institutional delivery service use in Nepal. Furuta and Salway (2006) also found no significant association between women's employment and institutional delivery but did find a significant association with higher household economic status. Here, the type and nature of work is relevant, because working conditions may also indicate poverty level when women are working for daily survival, usually in informal sectors.

Similarly, higher household economic status was found to be positively associated with institutional delivery in Nepal (Wagle et al. 2004). However, one study did not find poverty indicators as significant risk factors for home delivery near Kathmandu (Bolam et al. 1998). No studies in Nepal have analysed the effect of direct or indirect cost of delivery on seeking the delivery care. One study identified 'perceived cost' as a deterring factor in seeking care beyond the household (Mesko et al. 2003).

The provision of free maternity services, or a reduction in user fees, encourages the poorest quintile of women to use appropriate health services if those women are aware and understand the costs and services included under such schemes. In Vietnam, even with compulsory health insurance, poor women are less likely to make use of institutional delivery services, compared with middle- and high-income women (Sepehri et al. 2008). While there are free maternity services at policy level, the actual implementation might be different and users still might have financial constraints. Substantial 'hidden costs' have been found in accessing institutional delivery services in Tanzania, mainly in transport and provider fees (Kruk et al. 2008). In Bangladesh, substantial costs were incurred, mainly in caesarean section, though maternity services were claimed to be free at policy levels (Nahar & Costello 1998). Jeffery and Jeffery (2010) described how a maternal death in rural north India was aggravated by cost, the lack of care from rural government facilities and staff, and the high costs of private treatment, even though the government's policy emphasised public institutional delivery.

The 'safer mother programme' in Nepal (free maternity services and incentives on use of institutional delivery services) has had a favourable impact on increasing the use of maternity services (Powell-Jackson et al. 2009; Witter et al. 2011). Similar findings have been reported from Burkina Faso (De Allegri et al. 2011) and Ghana

(Mills et al. 2008) after reduction of user fees. Implementation of voucher programme (vouchers providing access to four antenatal care visits, a facility-based delivery including caesarean section and treatment of delivery complications) in Kenya (Bellows et al. 2013) and of the New Co-operative Medical System (an insurance system including a maternal health care benefit package) in China (Long et al. 2010) significantly increased the facility-based deliveries. The relative effect of the safer mother programme on various other barriers (such as caste, distance, wealth, maternal education, etc.) in Nepal needs to be extensively evaluated.

2.2.4 Choice of health facility and perceived quality

On one hand, expansion of birth centres and maternity services in lower level health posts is necessary to increase service coverage and provide accessible and affordable maternity services to rural people. This can also lower the service burden of higher level hospitals. This is the main rationale behind the ‘health centre intra-partum care strategy’. On the other hand, even though services are available nearby free of charge, it is not guaranteed that they will be utilised, especially if they are not deemed by mothers to be beneficial. Using in-depth and semi-structured interviews in rural and urban populations of Pune, India, Griffiths and Stephenson (2001) found that socio-economic status was not a barrier to maternal service use when women perceived the benefits of the service. In an integrative review, Hadjigeorgiou and colleagues (2012) conclude that women worldwide wish to exercise their rights and make informed choices about where to give birth. They found that perceptions of safety and women’s autonomy influence birthplace choices (Hadjigeorgiou et al. 2012).

Use of health services or, more specifically, choice of health facility often depends upon the client’s perceptions of quality or ‘reputation’ of the facility, even when they have to pay or travel further (Ager & Pepper 2005; Parkhurst & Ssengooba 2009). Bypassing of lower level health centres to seek health care at hospitals that are farther away has been observed in many low- and middle-income countries (Akin & Hutchinson 1999; Bronstein & Morrisey 1991; Hotchkiss et al. 2007; Kahabuka et al. 2011; Leonard et al. 2002).

In assessing obstetric care, women can be influenced by health-system factors, including a respectful provider attitude, availability of drugs and medical equipment, and competent staff (Kruk et al. 2009b). A major reason that women did not come to hospitals in Guatemala was the lack of humanised treatment and service providers who were trained in interpersonal communication skills to overcome this problem (Bailey et al. 2005). A qualitative study in Cambodia suggests that a woman's choice of health facility was influenced by her perceptions of safety and staff attitudes. One of the reported barriers to the effective utilisation of public maternity services was staff attitudes and a lack of supportive care during labour and in the postpartum period (Ith et al. 2013). Positive client perceptions of maternity services, including doctor and nurse skills, was an important factor in the utilisation of institutional delivery services in Vietnam (Duong et al. 2004) and Tanzania (Kruk et al. 2010).

Lower level birth centres often lack competent health personnel and medical equipment for life-saving surgery in cases of emergency. In a study in Nigeria, most of the primary healthcare facilities did not provide optimal basic emergency obstetric care services because they lacked staff, ambulances and an uninterrupted electricity supply (Erim et al. 2012). So, women can have low perceptions of the quality of such birth centres and bypass them to deliver at urban hospitals. Such 'bypassing' is more common when there is no referral systems. Referral systems for emergency obstetric care in many low- and middle-income countries is non-functional and women often bypass local facilities to access delivery facilities farther away (Murray & Pearson 2006; Parkhurst & Ssengooba 2009). Perceptions of higher technical quality in hospitals have attracted women to deliver at hospitals instead of health centres that did not provide emergency operations and lacked competent midwives or doctors (Ith et al. 2013; Jacobsen et al. 2012; Kruk et al. 2009a; Parkhurst & Ssengooba 2009)..

About 42.2% of women in a rural district of Tanzania bypassed their nearest facility (commonly, a dispensary or health centre) to deliver their baby in mission facilities and government district hospitals (Kruk et al. 2009a). Similarly, mothers also bypassed their nearest health facility for child health care services. About 46.3% to 59.5% of mothers interviewed in a rural district of Kenya bypassed the lowest level municipal facility in favour of district or provincial hospitals when seeking antenatal care, child immunisation or other child health services (Audo et al. 2005); and 59%

of caretakers had not utilised their nearer primary health care facilities during the index child's sickness episode in Tanzania (Kahabuka et al. 2011).

The bypassing rate can be affected by several factors, including transportation, distance and 'popularity' of the destination facility. Parkhurst and Ssengooba (2009), via analysis of data from public health facilities performing deliveries in a rural district of Uganda, showed that bypassing rates were different for the health facilities studied. Patients' characteristics such as economic status, education and severity of illness can also influence on the choice of health facility or whether to bypass the lower level health facilities. In a study in Chad, rich individuals were found to bypass low-quality health facilities and aim for more expensive, higher quality facilities (Gauthier & Wane 2011).

However, Kruk and colleagues (2009) did not find any association between women's wealth and education, and their bypassing for childbirth in Tanzania. The participants were relatively homogeneous in terms of asset ownership and demographic characteristics (Kruk et al. 2009a). Intrapartum complications may need a life-saving intervention such as caesarean section, which is often not available in lower level facilities providing delivery services. So, women may seek hospital care following complications during pregnancy or in attempted home births, or they may go hospitals to deliver because they anticipate complications. Lower parity women, especially nulliparous women, are likely to be anxious and may anticipate delivery problems. So, lower parity women are more likely to bypass the birth centres, as was observed in this Tanzanian study (Kruk et al. 2009a).

In spite of the availability of emergency obstetric care in birth centres close to women's residences, women in Nepal have been found to bypass these birth centres to deliver at referral hospitals at district health headquarters (Department of Community Medicine and Family Health 2004; Family Health Division/ Nepal Health Sector Support Programme 2013). However, the extent and their reasons for bypassing birth centres for childbirth in Nepal have not been adequately investigated. Moreover, no study was found from Nepal which documented women's opinions and assessed the perceived quality of maternity services in Nepal.

2.3 Pregnancy outcomes

Pregnancy is a special stage in a woman's life. Complications of pregnancy and childbirth make up two out of the ten leading causes of death and disability among women of reproductive ages in low- and middle-income countries (WHO 2008) and are among 'substantial causes' of the global disease burden (Murray et al. 2012). The mortality estimate is just the tip of the iceberg of pregnancy outcomes since at least 20-fold more women are estimated to suffer maternal morbidity in the form of near-miss events, pregnancy-related complications and long-term disabilities (Filippi et al. 2006; Fortney & Smith 1996). In the following sections, literature on obstetric complications; stillbirths and mode of delivery are briefly reviewed.

2.3.1 Obstetric morbidity

Maternal morbidity includes acute or chronic problems which mainly stem from pregnancy-related complications during antepartum, intrapartum and postpartum periods and are aggravated by underlying factors including gender inequality, domestic violence, early marriage, adolescent pregnancy and poor reproductive health services. The acute complications include haemorrhage, pre-eclampsia and eclampsia, prolonged or obstructed labour, infection and unsafe abortion. A range of maternal morbidities are likely to remain because of hidden sufferings, under-reporting and inadequate investigation within low-income countries, including Nepal, where births predominantly take place at homes (UK All Party Parliament Group 2009).

A few hospital-based studies in Nepal have reported alarming obstetric morbidities among Nepalese women. A maternity hospital-based study found that 94% of 274 women admitted for delivery had maternal morbidity during antepartum (Smith et al. 1996). In a study among 2,072 women who presented with gynaecological complaints in west Nepal, every fourth woman had genital prolapse (Bonetti et al. 2004). It has been estimated that as many as 600,000 to 1,000,000 women in Nepal suffer from uterine prolapse (UK All Party Parliament Group 2009). Such high prevalence of uterine prolapse is an indication of poor maternity care and heavy work during pregnancy and postpartum, as well as the general poor status of women. In a study in the Makawanpur district of Nepal, women were found working until the first signs of labour (Mesko et al. 2003).

In a large survey of 8,798 women in central Nepal who had reported a birth in the previous two years, a total of 3,557 (40%) reported illness in their pregnancy, i.e. they had experienced one of these symptoms: vaginal bleeding, signs of possible pre-eclampsia and eclampsia, fever or vaginal discharge. The most commonly recalled maternal complications were prolonged labour of more than 12 hours (41%), postpartum haemorrhage (27%) and retained placenta (8%) (Mesko et al. 2003). Similarly, two community-based studies in India reported obstetric morbidity as 17.7% during labour and 42.9% during puerperium (Bang et al. 2004), and 18% in antenatal and intrapartum periods and 23.4% in the six weeks postnatal period (Bhatia 1995).

However, in areas of low socio-economic informal settlements, the incidence of morbidity can be high: 36% of women described serious delivery related complications and 75% of women reported post-partum morbidity in community-based study in the slum areas of Dhaka, Bangladesh, where self-reported morbidity included a broad range of symptoms, and even included the chronic condition of uterine prolapse (Fronczak et al. 2005). Similarly, more than half of the women in low socio-economic settlements of Karachi, Pakistan, reported at least one post-partum illness symptom (Fikree et al. 2004). Self-reported complications might vary, based on women's self-evaluation, contextual cultural values and definitions of morbidity, over a broad range of illnesses associated with pregnancy (Liskin 1992).

2.3.2 Stillbirths

Stillbirth is another 'invisible' adverse pregnancy outcome and it is associated with maternal morbidity and mortality. It mainly occurs in rural families and has not been paid adequate attention in policy agenda, including MDGs (Lawn et al. 2011).

There is no consensus on a definition of stillbirth. However, stillbirth can be defined as late foetal death at ≥ 28 completed weeks of gestation, including antepartum stillbirth (before the onset of labour) and intrapartum stillbirth (after the onset of labour and before birth). Early neonatal death refers to death within seven days after a live birth (Lawn et al. 2011). A hospital-based study in Nepal reported a rate of 1.45% stillbirths (Shrestha & Yadav 2010) while a survey in central Nepal estimated the stillbirth rate to be 3.1% (Manandhar et al. 2010). Similarly, varied rates of stillbirth have been reported in India, China and Nigeria, and such inconsistencies

might arise from thresholds in defining stillbirths from 18 to 28 weeks gestation (Lawn et al. 2011).

2.3.3 Caesarean delivery

Caesarean Delivery (CS) has been on the increase in low- and middle-income countries, corresponding to an increase in hospital delivery rates as advocated by the safe motherhood programme to achieve the MDG 5 in regard to maternal mortality. The average rate in low- and middle-income countries has been estimated to be 12.3% (Stanton & Holtz 2006). The rates among tertiary hospitals in Nepal range from 12-25% (Family Health Division/ Nepal Health Sector Support Programme 2013) whereas the NDHS 2011 estimate a national rate of 4.6% (MoHP[Nepal] et al. 2012). Although there is no consensus about optimal CS delivery rates, the WHO recommends a minimum of 5% to a maximum of 15% (WHO 1994). It is evident that a higher rate of CS without medical indication can be associated with increased risks of maternal and neonatal morbidity (Lumbiganon et al. 2010; Villar et al. 2006) whereas a lower rate of CS indicates an unmet need for obstetric complications.

It is anticipated that 15% of pregnancies develop complications which may necessitate medical care including CS (WHO 1994). However, women, their families or health staff can be prompted to have or perform CS for a variety of reasons besides medical indications. The reasons might vary according to contexts and are associated with demographic, socio-economic, institutional and psychological factors (McCourt et al. 2007; Padmadas et al. 2000; Tang et al. 2006).

Higher maternal age, intrapartum complications, urban residency, and education level have been found to be associated with CS delivery (Leone et al. 2008). An operation may be needed, in the case of intrapartum complications, to save the lives of mothers and newborns. Higher age is associated with medical risk factors including reduced uterine function and pelvic compliance, that might promote a physician's or mother's preference for CS (Bell et al. 2001; Lin & Xirasagar 2005). Higher parity, antenatal visits and higher economic status were reported from Egypt and the Palestinian territory to be associated with CS delivery (Abdul-Rahim et al. 2009; Khawaja et al. 2004). However, antenatal care did not show any significant association with CS deliveries in Kerala, India (Padmadas et al. 2000). Studies in

India and Brazil found that CS delivery was significantly higher in private hospitals compared to public hospitals (Mishra & Ramanathan 2002; Potter et al. 2001).

3 METHODOLOGY

This chapter provides information on the study site and population. Then, the study design is described, along with sampling and recruitment procedures, data collection instruments, data collection procedures and data analysis strategy, to achieve the study objectives laid down in Chapter 1.

3.1 Study location

This study was conducted in the Kaski district of the Western Development Region of Nepal. The Kaski district is centrally located in the hills ecological region of Nepal (Figure 3.1). It is a relatively developed district and ranks third in terms of the human development index among 75 districts in Nepal (United Nations Development Programme, 2004). The district is administratively divided into 42 Village Development Committees (VDC) and two municipalities. Geographically, the district has a central valley housing the two municipalities and a few VDCs in the urban areas (Figure 3.2). The central valley is popularly known as Pokhara city. The rest of the VDCs spread out into the rural hilly terraces. A VDC is divided into small geographical units called 'wards' and consists of one or more human settlements known as 'villages'. Rural areas are now connected to the central valley by ungravelled roads with jeep and bus transportation (Figures 3.3 and 3.4). However, the transportation is infrequent and often obstructed during monsoon season.

Pokhara is the regional capital of the Western Development Region and the second largest city of Nepal. The city is a popular destination for tourists who visit Nepal. There are a few lakes adjacent to the city and the regional airport. The city also attracts people from neighbouring districts for education, employment and health care. It has a regional government hospital, two teaching hospitals of private medical colleges and several nursing homes and pharmacies. The three hospitals provide free delivery services and serve as referral centres for emergency obstetric care. In particular, the regional government hospital is popular for maternity services. It has an 85% bed occupancy rate in maternity wards and receives an average of 7500 delivery cases annually (Family Health Division/ Nepal Health Sector Support Programme 2013).

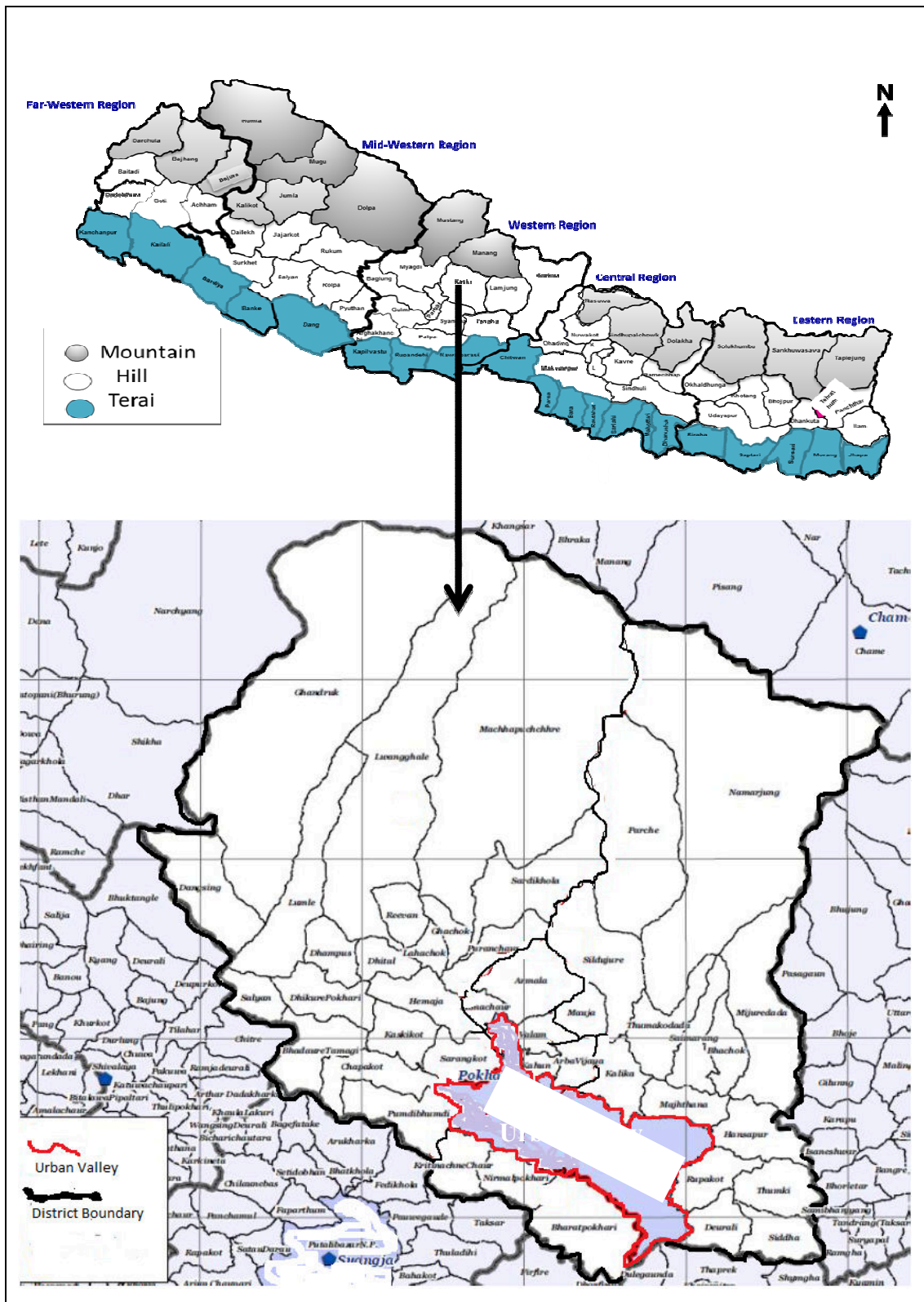
For the purpose of health service provision, the District Public Health Office of Kaski has divided the rural part of the district into 13 *illakas*. Each *illaka* consists of two to six VDCs and has at least one health post or primary health care centre that provides basic emergency obstetric care. These health posts or primary health care centres are popularly called ‘birth centres’ (**Figure 3.5**), where skilled birth attendants provide basic emergency obstetric care services. Staff nurses and auxiliary midwives with additional training in midwifery skills are qualified as skilled birth attendants in Nepal, and they lead the maternity and delivery care in these birth centres (MoHP [Nepal] 2006). Additional competent auxiliary midwives with skilled birth training also have been contracted to provide 24-hour institutional delivery service at each designated birth centre within the Kaski district.

3.2 Study population

The district has a population of 490,429 and a literacy rate of 82%, according to the latest census data (Government of Nepal, 2012). Most of the population reside in the southern part of the district because the northern part is remote and mountainous. Approximately half of the population live in the central urban valley. About half (49%) of the population belong to an ‘upper caste’, 34% belong to ‘janajati’, 16% belong to a ‘lower caste’ and the remaining 1% are ‘religious minorities’. Both upper caste and lower caste people have Indo-Aryan origin. The upper caste people mainly consist of *Brahmin, Chhetri, Thukari, and Sanyasi*. The lower caste people mainly consist of *Kami, Damai, Sarki, Badi, and Gaine*. The janajati people have mainly Tibeto-Burman origins consisting of *Gurung, Newar, Thakali, Magar, Sherpa, and Tamang* in this district. The people of religious minorities are mainly Muslim and Christian.

The female population in the 15-49 age group numbers 117,561 and the expected annual number of expected pregnancies in the district is 13,800 (District Public Health Office Kaski 2009-2010). The study population consisted of all the pregnant women who were resident in the study area and who delivered during the study period from November, 2011, to October, 2012.

Figure 3.1: Map of Nepal and the Kaski district



(Source: <http://un.org.np/sites/default/files/Kaski.pdf>)

Figure 3.2: Study site showing parts of the urban valley and rural areas



Figure 3.3: Rural areas showing ungravelled roads



Figure 3.4: Transportation to rural areas



Figure 3.5: Birth centre in a rural study site



3.3 Study design

A community-based prospective cohort study was designed. A total of 748 women of 5 months or more gestational age was approached for recruitment for this study, with an expected 10% refusal rate. The cohort of pregnant women who were enrolled was followed up after delivery within 45 days.

3.3.1 Sampling and recruitment

A list of wards from the two municipalities (urban areas) and of *illakas* from rural areas was prepared. *Illakas* in the rural areas and wards within the two municipalities were randomly chosen. From the selected seven *illakas* (*Naudanda, Deurali, Bhedabari, Majhatahna, Kristi, Chapakot, and Bharatpokhari*) in rural areas and six wards in the municipalities, women who were five months or more pregnant were recruited, until the desired sampling quota was filled, based proportionally on the expected total number of pregnancies in each selected area. All pregnant women who had completed at least their fifth month of pregnancy were searched and recruited from the selected wards and *illakas*. In each selected *illaka*, the village that contained the birthing centre was purposely chosen. All eligible pregnant women in that village were invited to participate. Additional women were recruited from another adjacent village wherever necessary to meet the sampling quota. About 50 % of the sample was derived from the rural areas.

The annual total number of expected pregnancies in the district was estimated to be 13,800 (approximately 13% of the female population of the age group 15-49, with a General Fertility Rate of 117) (JHPIEGO 2004c). The probability of finding a pregnant woman in a one-time visit is about half of this annual number (six months of a year pregnancies) since the gestation period is nine months and for the first three months, the pregnancy is often not reported. A sample size of 700 pregnant women of 5 months or more gestational age, which approximately represented one in five pregnant women of this gestational age at one-time visit, was deemed appropriate and feasible within the available resources for this study. Out of 748 women who were approached, 701 were eventually recruited, with a refusal rate of 6.3% in this study.

3.3.2 Data collection instruments

Questionnaires were derived from the existing validated national Demographic Health Survey, the maternal and neonatal baseline health survey previously used in three districts of Nepal (MoH [Nepal] & JHU 2001) and the WHO safe motherhood need assessment survey (WHO 2001). The Questionnaire was translated into Nepali, and back-translated into English. It was pretested with 50 pregnant women for cultural appropriateness, content validity and understanding, and it was corrected before the main survey. Finally, a structured questionnaire comprising of two parts was prepared: part A (baseline interview, section 1 and 2) and part B (follow-up interview, section 3 and 4) (Appendix B).

The structured questionnaire sought information on: i) socio-economic and demographic information (section 1); ii) health knowledge, birth preparedness and complication readiness (section 2); iii) utilisation of antenatal care and illness during pregnancy (section 3); and iv) utilisation of institutional delivery services (section 4).

3.3.3 Data collection procedures

Fifteen local female data enumerators, who were local residents of each selected area, were employed. It was convenient for local female data collectors to track the pregnant women after delivery within their localities. The data enumerators were trained for the conduction of interview and informed about the content of the questionnaire. The training sessions included the purpose of the study, timing of data collections, general knowledge of pregnancy and delivery related to interview, and a description of maternity services delivery in the Kaski district. Data enumerators were informed about good interview techniques, namely: to clarify the purpose of the interview; to take consent and assure respondents about confidentiality of the interview; to be neutral and non-judgemental; to establish good rapport and trust; to speak clearly and to repeat the question if respondents do not understand; to choose a suitable time with a sitting arrangement; and to answer any concerns at the end of the interview. They also were instructed to follow the order and exact wording of questions; not to read the options in multiple choice questions; not to give respondents any clues to answer the questions, but to probe wherever necessary; and to be careful about answers of a sensitive nature and with all attitude questions.

The baseline interview (section 1 and 2 of the questionnaire) was conducted among pregnant women at their recruitment between December 1, 2011, and January 31, 2012. For each participant, the second interview was conducted within 45 days of delivery by the same data collector. Women who experienced stillbirths or had early neonatal deaths were excluded from the second follow-up interview due to ethical concerns as it would be inappropriate to interview a woman after such a tragic loss. Both first and second interviews were conducted at the women's houses.

All data enumerators passed tenth grade and had basic knowledge of maternity and birth preparedness issues. The rural data collectors were village facilitators in a programme called Decentralised Action for Children and Women, conducted by the Government of Nepal and the United Nations Children Funds (UNICEF). The urban data collectors were social workers based in each selected urban ward office. Data enumerators were responsible for searching and identifying pregnant women within their locality, using the records of health facility registrations for antenatal care visits and with the assistance of female community health volunteers. Female community health volunteers are local cadres at the village level in Nepal, who counsel their fellow women about various health issues including pregnancy and childbirth. They are called volunteers because they do not receive a regular government salary and the position is voluntary. They act as a bridge between the community and the local health centre (Glenton et al. 2010). According to the District Public Health Office, there were 922 female community health volunteers in Kaski, in 2012.

3.3.4 Data analysis

3.3.4.1 Measurement of variables

Variables used in this study are broadly grouped into 4 categories: i) socio-demographic, ii) health knowledge and birth preparedness, iii) utilisation of maternity services, and iv) pregnancy outcomes. The measurement scales of these variables are described in Table 3.1.

3.3.4.2 Data analysis strategy

Data were entered into the Statistical Package for Social Sciences SPSS version 18 (IBM, Armonk, NY, USA). Errors in data collection by data enumerators were

Table 3.1: Description and measurement of variables

Variables	Measurement scale	Description of variables
A. Socio-demographic		
Age at marriage		Age of the women at marriage in years
Age at current pregnancy		Current age of the women at recruitment in years
Gestational age at recruitment		Duration of pregnancy at recruitment in weeks
Residence		Areas of residence
	<i>Rural</i>	Living in villages
	<i>Urban</i>	Living in Pokhara valley
Caste		Caste was recorded according to the government's classification used in the health system
	<i>Upper caste</i>	'Upper caste' Indo-Aryan people.
	<i>Lower caste</i>	'Lower caste' Indo-Aryan people
	<i>Janajati</i>	Tibeto-Burman people that include <i>Newar, Gurung, Thakali, Magar, Sherpa, and Tamang</i> in this study
	<i>Religious minorities</i>	Muslim and Christian people
Education		Educational level was classified on the basis of number of years of schooling
	<i>No schooling</i>	Never gone to school
	<i>Primary</i>	Grades 1-5
	<i>Secondary</i>	Grades 6-10
	<i>College/higher secondary</i>	After 10th grade
Wealth status		Wealth status was generated by principal component analysis on these household assets: cooking fuel, flooring material, television, mobile phone, sofa, cupboard, type of toilet, and type of water source. The asset score of first component was divided into quintiles: from 1 (poorest) to 5 (richest)
Employment		Categorised on the basis of earnings:
	<i>Employed</i>	Full-time salaried job

	<i>Semi-employed</i>	Wage-based labour, small business or employed abroad
	<i>Unemployed</i>	Agricultural worker, housewife or jobless, i.e. no earning
Parity		Number of children born to the women (dead or alive) at the time of the baseline interview

B. Health knowledge and birth preparedness

Information on pregnancy and delivery

Whether the women received any information regarding pregnancy and delivery care:

Yes

No

Maternity issues discussion

Whether the women have spoken about pregnancy care and delivery place with family members:

Yes

No

Awareness of birth preparedness

Women's spontaneous answers that they: should save money; should identify transportation; should have a check-up in a health facility; should prepare new clothes for newborn; should buy a delivery kit; should identify a health facility for the deliver; should identify a blood donor; should identify a skilled birth attendant.

Birth preparedness

Arrangements of these five indicators: identification of delivery place, identification of transport, identification of a blood donor, money saving, and antenatal care check-ups.

C. Utilisation of maternity services

Previous facility use for delivery

Whether the women had her latest previous birth in a health facility (only for multiparous women):

Yes

No

Frequency of antenatal care visit

Total number of antenatal care visits made to any type of health facility during pregnancy, before giving birth:

	<i><4</i>	
	<i>≥4</i>	
Place of delivery	<i>Home</i>	
	<i>Facility</i>	Delivery at a health facility (either public or private). This is also termed as ‘utilisation of institutional delivery services’ or ‘skilled attendance at birth’ in this study. A health facility may be a birth centre, public hospital or private hospital.
Bypassing status		Whether delivery took place at the nearest birth centre or it was bypassed to deliver at a hospital (for those women who had a birth centre as the nearest accessible health facility):
	<i>Yes</i>	
	<i>No</i>	
Distance to nearest health facility		This was estimated by the time taken (in minutes, either on foot or by vehicle, if applicable) to reach the nearest governmental health facility:
	<i>≤ 30 minutes</i>	
	<i>31-60 minutes</i>	
	<i>> 60 minutes</i>	

D. Pregnancy outcomes

Previous complication	Multiparous women’s experiences of previous complications in pregnancy and childbirth
Antepartum symptoms	Experiences of any of the following symptoms in the antenatal period of the current pregnancy: heavy bleeding (soaked clothes/bed/floor), swollen hands and/or body, loss of consciousness/convulsions, blurred vision, severe headache, severe fever, severe abdominal pain, severe vomiting
Intrapartum symptoms	Experiences of any of the following symptoms in intrapartum period of the current delivery: heavy bleeding, prolonged labor (>12 hours), retained placenta (placenta not expelled within 30 minutes), swollen hands and/or body, loss of consciousness/convulsions.

Postpartum symptoms		Experiences of any of the following symptoms within one week after delivery: heavy bleeding, severe fever, smelly water discharge, swollen hands and/or body, loss of consciousness/convulsions.
Stillbirths		Stillbirth was defined as late foetal death at 28 or more completed weeks of gestation:
	<i>Antepartum stillbirth</i>	Before the onset of labor
	<i>Intrapartum stillbirth</i>	After the onset of labor but before birth
Mode of delivery		
	<i>Vaginal</i>	
	<i>Caesarean</i>	

checked (for example, missing data and ambiguous ticking of multiple choice answers) and then verified with the concerned data enumerators during the data entry phase. After completion of data entry, the data files were cleaned for possible errors by checking the distribution of each variable. Frequency distribution for a categorical variable and central value location, with range and outliers, for a numerical variable were carried out. All missing data and errors found were coded with missing value codes.

Data were summarised by means and proportions. Mainly the chi-square test and t-test were used to assess univariable associations and group differences (home vs facility, bypassers vs non-bypassers, caesarean delivery group vs vaginal delivery group). The main analytical strategies, as per the outcome measures and objectives are summarised in Table 3.2.

Table 3.2: Outcome measures and statistical analyses

Paper/Objective	Purpose of analysis	Outcome measures	Statistical method
I/1	Evaluation of association of	Place of	Univariable logistic regression

	birth preparedness with place of delivery	delivery	
II/2	Prediction of factors associated with use of institutional delivery services	Place of delivery	Multivariable logistic regression with stepwise backward elimination
III/4	Elucidation of characteristics of bypassers	Bypassing status	Multivariable logistic regression with simultaneous entry of variables
IV/6	Predictions of factors associated with CS delivery	Mode of delivery	Multivariable logistic regression with stepwise backward elimination

3.4 Ethical considerations

The project was approved by the Human Research Ethics Committee of Curtin University (Approval number HR 130/2011; Appendix C), Ethical Review Board of Nepal Health Research Council (Approval number 88/2011; Appendix C) and the District Public Health Office of Kaski.

An information sheet was read and given to each participant before obtaining her signed or thumb-print informed consent (Appendix C). Participants were assured of their freedom to withdraw without any negative consequence. Confidentiality of the information provided was maintained throughout the study.

Completed questionnaires were kept at the homes of the data enumerators and collected by the principal investigator once per month. These data enumerators did not meet each other and did not travel out of their localities to collect data. The identities of the subjects from each selected area were not revealed beyond the research team comprising of the principal investigator, one research assistant and the data enumerator from that area.

All subjects were identified via Identification Code (ID) numbers in the analysis. All electronic data were stored and analysed in a password-protected computer, accessible to the principal investigator only.

4 RESULTS AND DISCUSSIONS

The findings and discussions of this thesis are presented as a series of four papers that address the six objectives of this study and were published in international peer-reviewed journals. Before presenting the papers, baseline sample characteristics will be described and a study flow chart will be provided.

4.1 Respondent characteristics

Figure 4.1 shows the study flow chart. A total of 748 pregnant women (398 from urban and 350 from rural areas) were approached for interview and 47 refused to participate. Thus, a total of 701 pregnant women (380 from urban and 321 from rural areas) were successfully recruited for the baseline interview, giving a response rate of 93.7%.

Table 4.1 gives characteristics of the baseline respondents. Mean gestational age at recruitment was 27.9 (SD 5.49) weeks. The women were, on average 23.5 (SD 4.17) years of age while their husbands were, on average age, of 28 (SD 5.22) years of age. The marriage age for the respondents was quite young (19.3 years). The majority of participants received primary or above education (92%) and were not earning (79%). About half of them were expecting their first child (52%), were from an upper caste (52%) and were in the age between 20 and 24 years (50 %). Among the multiparous women, a majority (62%) had used a health facility to deliver the latest child prior to the survey, and about 21% said that they had complications with the latest birth prior to the survey.

As shown in Figure 4.1, only 649 women were approached for a second interview because 43 women were lost to the follow-up and 9 women had antepartum stillbirths. Out of 649 women, 639 women eventually took part in the second interview because ten women were excluded: five women who delivered on the way to a health facility and five women who had neonatal deaths after giving birth at home. Thus, the place of delivery was known for a total of 644 women (97 at home and 547 in health facilities). Out of the 547 women who delivered at health facilities, 470 delivered at a hospital and 77 delivered at a birth centre.

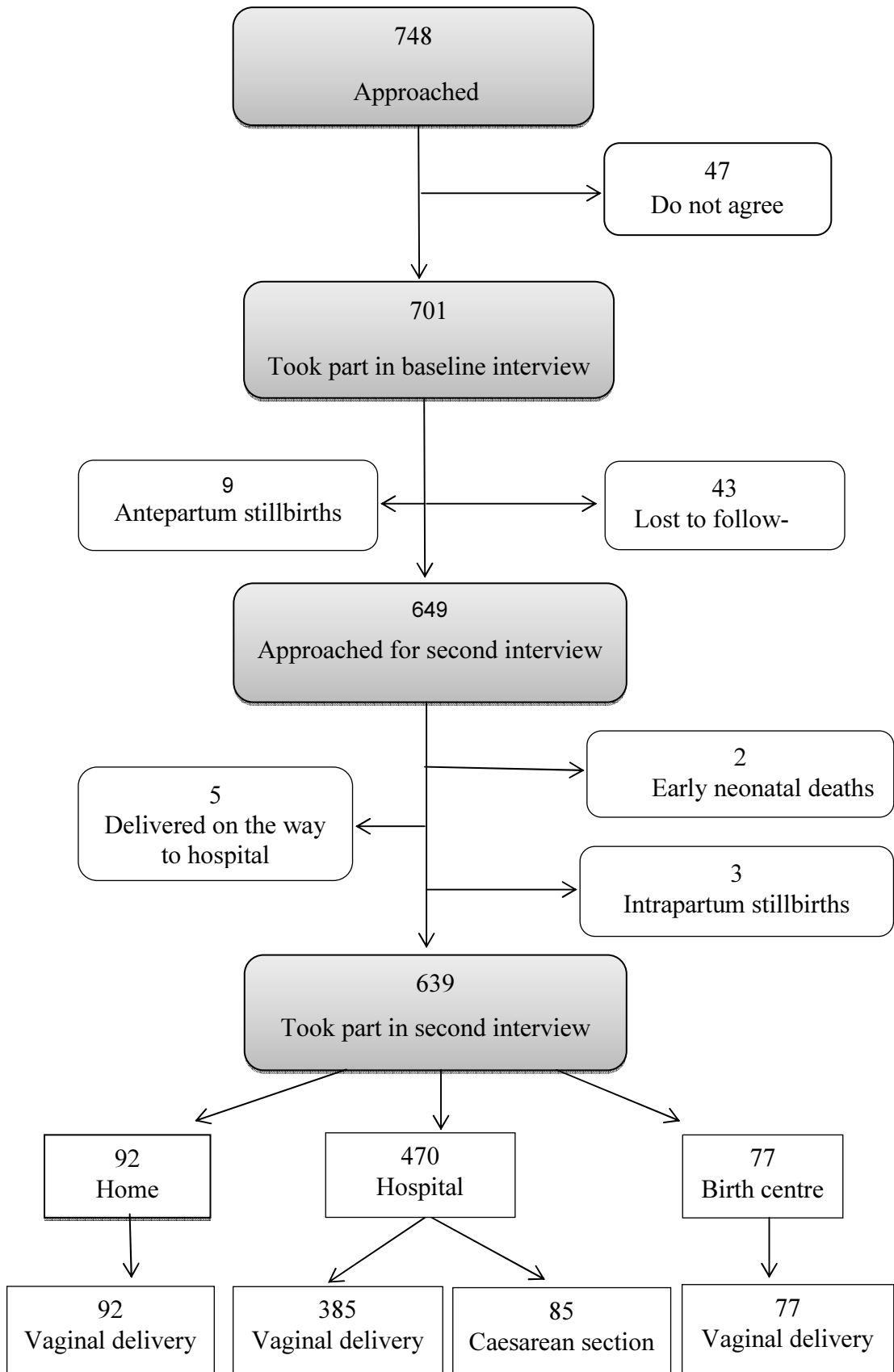


Figure 4.1: Flow chart of respondents through the study

Table 4.1: Respondent characteristics at baseline interview (n=701)

Characteristics	n (%)
Residence: Urban	380 (54.2)
Rural	321 (45.8)
Ethnicity: Upper Caste	368 (52.5)
Lower Caste	173 (22.4)
Janajati	158 (24.7)
Religious Minority	3 (0.4)
Age: Under 20	104 (14.8)
20-24	351 (50.1)
25+	246 (35.1)
Literacy: Literate	647 (92.3)
Illiterate	54 (7.7)
Educational level: No Schooling	57 (8.1)
Primary	155 (22.1)
Secondary	257 (36.7)
Higher Secondary	232 (33.1)
Husband's educational level: No Schooling	10 (1.4)
Primary	142 (20.3)
Secondary	270(38.5)
Higher Secondary	279 (39.8)
Employment status: Unemployed	553 (78.8)
Semi-employed	115 (16.4)
Employed	33 (4.7)
Husband's employment status: Unemployed	111 (15.8)
Semi-employed	468 (66.8)
Employed	122 (17.4)
Parity: Zero	363 (51.8)
First	199 (28.4)
Second	94 (13.4)
Third and above	45 (6.3)
Family: Extended	446 (64.1)
Nuclear	250 (35.9)
Previous complication* : Yes	71 (21)
No	267 (79)
Previous facility use*: Yes	211 (62.2)
No	127 (37.8)
	Mean (SD)
Gestational age at recruitment (weeks)	27.9 (±5.49)
Age (years)	23.5 (±4.17)
Husband's Age (years)	28.25 (±5.22)
Age at marriage	19.38 (±2.50)

*Multiparous women (n=328)

4.2 Series of papers

The present researcher was responsible for all decisions relating to the design and implementation of the research protocols, together with the drafting, analysis and interpretation of the data in all four of the published papers. Copyright approval has been granted by the respective publishers to replicate the published papers in this chapter and all copyright, and licensing requirements of the journals have been followed. Papers I and IV were published by Elsevier and Paper III was published by Oxford University Press. Both publishers have copyright policy that allows authors to include published articles in dissertation works, provided that this is not published commercially (Appendix E). Paper III was published by BioMed Central, with open access, where authors retain the copyright to their articles.

- Objective 1 is addressed by paper I :
 - Karkee R, Lee A, Binns C. 2013. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery*, 29 (10):1206-1210.
<http://dx.doi.org/10.1016/j.midw.2013.05.002>
- Objectives 2 and 3 are addressed by paper II:
 - Karkee R, Binns C, Lee A. 2013. Determinants of use of institutional delivery services after implementation of safer mother programme in Nepal: a prospective cohort study. *BMC Pregnancy and Childbirth*, 13:193. <http://dx.doi.org/10.1186/1471-2393-13-193>
- Objectives 2 and 4 are addressed by paper III:
- Karkee R, Lee AH, Binns CW. 2013. Bypassing birth centres for childbirth: an analysis of data from a community-based prospective cohort study in Nepal. *Health Policy and Planning*. <http://dx.doi.org/10.1093/heapol/czt090>

- Objectives 5 and 6 are addressed by paper IV:
 - Karkee R, Lee AH, Khanal V, Pokharel PK, Binns CW. 2014. Obstetric complications and cesarean delivery in Nepal. *International Journal of Gynaecology & Obstetrics*, 125 (1): 33-36.
<http://dx.doi.org/10.1016/j.ijgo.2013.09.033>

4.2.1 Paper I: Birth preparedness and skilled attendance at birth in Nepal: Implications of achieving Millennium Development Goal 5

Karkee R, Lee A, Binns C. 2013. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery*, 29 (10):1206-1210. <http://dx.doi.org/10.1016/j.midw.2013.05.002>

Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5

ABSTRACT

Objective: To assess birth preparedness in expectant mothers and to evaluate its association with skilled attendance at birth in central Nepal.

Design: A community-based prospective cohort study using structured questionnaires.

Setting: Kaski district of Nepal.

Participants: A total of 701 pregnant women of more than 5 months gestation were recruited and interviewed, followed by a second interview within 45 days of delivery.

Measurements: Outcome was skilled attendance at birth. Birth preparedness was measured by five indicators: identification of delivery place, identification of transport, identification of blood donor, money saving and antenatal care check-up.

Findings: Level of birth preparedness was high with 65% of the women reported preparing for at least 4 of the 5 arrangements. It appears that the more arrangements made, the more likely were the women to have skilled attendance at birth (OR = 1.51, $p < 0.001$). For those pregnant women who intended to save money, identified a delivery place or identified a potential blood donor, their likelihood of actual delivery at a health facility increased by two to three fold. However, making arrangements for transportation and antenatal care check-up were not significantly associated with skilled attendance at birth.

Conclusions: Intention to deliver in a health care facility as measured by birth preparedness indicators was associated with actual skilled attendance at birth. Birth preparedness packages could increase the proportion of skilled attendance at birth in the pathway of meeting the Millennium Development Goal 5.

Keywords: Birth preparedness, intention, skilled birth attendants, Nepal

INTRODUCTION

Maternal mortality remains a major issue for health systems despite the progress made in reducing the maternal mortality ratio in many countries (Hogan et al., 2010). The key strategy incorporated in safe motherhood programmes for achieving the Millennium Development Goal 5 of Maternal Health is to ensure all deliveries take place in the presence of skilled birth attendants (Cambell and Graham, 2006; Starrs,

2006). To become a skilled birth attendant, a health worker must undertake accredited training and education to gain midwifery skills that are essential to manage a normal delivery, to recognize and manage obstetric complications, or refer those complications in time if needed (World Health Organisation, 2004). The adoption of this strategy has enabled the reduction of maternal mortality in several countries such as Malaysia and Sri-Lanka (De Brouwere et al., 1998; Koblinsky et al., 1999; Pathmanathan et al., 2003). Moreover, the 'Three Delay Framework' has been widely used to explain obstacles to health care facilities resulting in maternal death (Thaddeus and Maine, 1994): delay in decision to seek care, delay in reaching a health care facility, and delay in receiving treatment for obstetric complications. They arise due to a variety of reasons including lack of money, distance, quality of service, inadequate community and family awareness, and insufficient knowledge about maternal and newborn health issues.

The elements of birth preparedness have been promoted by international agencies as part of their maternal mortality reduction strategies. Birth preparedness and complications readiness (BP/CR) is the process of planning for normal birth and anticipating the actions needed in case of an emergency. It is the initial prerequisite step to seek skilled birth attendance, and indicates the perceived need of a skilled birth attendant for delivery. BP/CR assists women to seek and reach midwifery care during pregnancy and child birth, especially when they experience obstetric complications or are far away from a health facility. It can reduce the first and second types of delay in obtaining obstetrical care (Stanton, 2004). BP/CR components at the individual level include knowing danger signs of pregnancy, childbirth and postpartum, identifying a health facility and skilled birth attendant, attending a health facility for an antenatal check-up, arranging transport, saving money, and identifying a potential blood donor (JHPIEGO, 2004b).

Nepal has made a substantial progress in reducing maternal mortality and is likely to achieve the Millennium Development Goal 5 (Hussein et al., 2011; WHO 2012). Community mobilization strategies that utilized counselling have made a positive impact on maternal and child health in Nepal (Manandhar et al., 2004; Morrison et al., 2005; Morrison et al., 2010). The BP/CR framework was first adopted in the government's 'SUMATA' program in 2002. This program encouraged families to

care for women during pregnancy, to share their work, and to prepare for birth (JHPIEGO, 2004a; Sood et al., 2004). Birth preparedness packages were then introduced at a number of districts in partnership with several non-government organisations. Community health workers, including maternal and child health workers, village health workers and community volunteers, were trained in counselling techniques and use of the birth preparedness tools (flip-charts and key chains) to communicate the BP/CR messages. Female community health volunteers identified and counselled expectant mothers in their locality, whereas facility-based health workers dealt with pregnant women during antenatal check-ups (McPherson et al., 2006; McPherson et al., 2010). BP/CR has now been incorporated into the national safe motherhood program of Nepal and implemented throughout the district health system. The district health facilities as well as female community health volunteers use pictorial charts that depict preparation activities and danger signs.

The government of Nepal implemented the ‘safer mother programme’ in January, 2009. This programme provides monetary incentives to women who have attended the recommended four antenatal care visits and delivered at designated birth facilities. It also provides free delivery services at such facilities and encourages women to deliver under skilled attendance, preferably at designated birth centres (Ministry of Health and Population, 2009). Staff nurses and auxiliary midwives with additional training on midwifery skills are qualified as skilled birth attendants in Nepal, and can lead the maternity and delivery care in birth centres. In-service skilled birth training has been provided to midwives since 2006 (Ministry of Health and Population, 2006).

BP/CR is acclaimed as “a process indicator in the pathway to maternal survival and a demand-creation intervention that promotes key messages and behaviour change via inter-personal communication through community health volunteers” (JHPIEGO, 2004a). Although BP/CR has been widely accepted, its effectiveness as a means of increasing the use of skilled birth attendants remains uncertain (Maine, 2007; Miller et al., 2003; Solnes et al., 2013). Studies have been undertaken to measure change in birth preparedness level after educational intervention, rather than measuring the increase in skilled attendance at birth (Sood et al., 2004). Therefore, the aim of this

study was to assess birth preparedness level in expectant mothers and to evaluate its association with skilled attendance at birth in a central hills district of Nepal.

METHODS

Study location and setting

This study was conducted in the Kaski district of the Western Development Region of Nepal, a hilly area with a population of 490,429 and literacy rate of 82% according to the latest census data (Government of Nepal, 2012). Kaski is a relatively developed district and ranks third in terms of the human development index among 75 districts in Nepal (United Nations Development Programme, 2004). The district is administratively divided into 42 Village Development Committees (VDC) and two municipalities. Geographically, the district has a central valley housing the two municipalities and a few VDC in the urban areas. The rest of the VDC spread out into the rural hilly terraces. Pokhara is the regional capital and attracts people from neighbouring districts for education, employment and health care. It has a regional government hospital, two teaching hospitals of private medical colleges and several nursing homes and pharmacies. The three hospitals serve as tertiary referral centres for emergency obstetric care and provide free delivery services.

The District Public Health Office of Kaski has divided the rural part of the district into 13 *illakas* for health service provision. Each *illaka* has at least one health facility (birth centre) where skilled birth attendants provide basic emergency obstetric care services. Additional competent auxiliary midwives with skilled birth training were contracted to provide 24-hour delivery service at each designated centre. Therefore, facility delivery is equivalent to skilled attendance at the target setting.

Study design and participants

A community-based prospective cohort study design was adopted. The female population in the 15-49 age group was about 117,500 with 13,800 expected pregnancies annually (District Public Health Office, Kaski, 2010). Our study population consisted of all pregnant female residents who delivered during the period December 2011 to October 2012. The probability of finding women who were 5 or more months pregnant during a single visit constituted about one quarter of the annual number of expected pregnancies in the district. A sample size of 700 pregnant

women represented about 20% of the eligible women in the Kaski district and the number deemed appropriate for the study sample within our available budget.

Illakas in the rural areas and wards within the two municipalities were first randomly chosen. From the selected seven *illakas* in rural areas and six wards in municipalities, we recruited women who were 5 months or more pregnant until the desired sampling quota was filled, based on the probability proportional to the expected number of pregnancies in each selected area. Of the total 748 eligible women initially approached, 701 participants took part in the baseline interview, giving a response rate of 93.7%.

Data collection and ethics

The questionnaire used in the interview was adapted from the Maternal and Neonatal Baseline Health Survey of Nepal (Johns Hopkins University, 2001), and the Safe Motherhood Needs Assessment Survey (World Health Organisation, 2001). The translated questionnaire was pretested on 50 pregnant women for cultural appropriateness, content validity and understanding. It sought information on socio-demographics, birth preparedness and complication readiness. Participants were asked whether they had heard of birth preparedness and if yes, “What kind of preparation should you do beforehand for the delivery?” The pregnant women were then prompted if they had made preparation for each of the five measures: identification of delivery place; identification of transport; identification of blood donor; money saving; and antenatal care check-up. A follow-up second interview was conducted within 45 days postpartum to obtain information on skilled attendance at birth by the same data enumerators who conducted the baseline interview.

To implement data collection, 15 female data enumerators who were local residents from each selected area were employed. These data enumerators were trained by the first author to conduct the face-to-face interviews. All of them had completed 10th grade education and possessed basic knowledge on maternity and birth preparedness issues. They were responsible for searching and identifying pregnant women in their locality with the assistance from health facility registrations for antenatal care visits and female community health volunteers.

The project was approved by the Human Research Ethics Committee of Curtin University (approval number HR 130/2011), Ethical Review Board of Nepal Health Research Council (approval number 88/2011) and the District Public Health Office of Kaski. An information sheet was read and given to each participant before obtaining her signed or thumb-print informed consent. Confidentiality of the information provided was maintained throughout the study. Completed questionnaires were kept at the home of the data enumerators and collected by the first author once per month. These data enumerators did not meet each other and did not travel out of their localities. Participants were assured of their freedom to withdraw without any negative consequence.

Statistical analysis

The main socio-demographic variables are listed in Table 1. Caste was recorded according to the government's classification used in the health system: upper caste, lower caste, janajati and religious minorities. 'Upper caste' and 'lower caste' refer to Indo-Aryan people, whereas 'janajati' refers to Tibeto-Burman people that include *Newar, Gurung, Thakali, Magar, Sherpa, and Tamang* in this study. The term 'religious minorities' denotes mainly Muslim and Christian people. Education level was categorised as: no schooling, primary (1-5 grade), secondary (6-10 grade), and higher secondary (after 10th grade). Employment status was categorised as: employed (full-time salaried job), semi-employed (wage based labour, small business or employed abroad), and not earning (agricultural, housewife, or nothing).

Birth preparedness was measured by five indicators: identification of delivery place, identification of transport, identification of blood donor, money saving, and antenatal care check-up. These arrangements, taken from the government's birth preparedness package, were depicted in pictorial charts for counselling and information dissemination. The outcome variable was skilled attendance status at birth, defined as whether delivery occurred in a health care facility or not. Odds ratios (OR) were used to assess the association between birth preparedness indicators and skilled attendance at birth. All statistical analyses were performed in the SPSS package version 18.

RESULTS

The final sample consisted of 701 pregnant women at baseline. Table 1 presents the characteristics of the participants. Mean gestational age at recruitment was 27.9 (SD5.49) weeks and the women were on average 23.5 (SD4.17) years of age. The majority of participants received primary or above education (92%) and were not earning (79%). About half of them (52%) were expecting their first child.

With regard to birth awareness, nearly three-quarters (74%) of the women had heard of the government's maternity incentive scheme while 80% had heard of 'birth preparedness'. Among those who had heard of 'birth preparedness', most women (90%) said they should 'save money', followed by 'identify transportation' (64.8%), 'check-up in health facility' (52.8%) and 'prepare new clothes' (49.2%). Table 2 summarizes results of birth preparedness arrangements. The great majority of women had reported check-up at antenatal care clinic (97%) and said they saved money (93%). Indeed, 65% of women were prepared for at least 4 activities, with the exception of identification of a potential blood donor. The overall mean percentage of women who actually prepared for the five activities (BP/CR index) was 72.4%. Only two women reported making no attempt to prepare for these activities.

Table 3 shows the association between birth preparedness activities and skilled attendance at birth. The final analysis excluded 57 women from the cohort who were either lost to follow up (n = 43), had a fetal death (n = 9), or delivered on the way to a facility (n = 5). Of the total 644 participants remaining in the cohort, 547 (85%) had skilled attendance at birth. It appears that the more arrangements made, the more likely were the women to have skilled attendance at birth (OR = 1.52, p < 0.001). For those pregnant women who had or intended to save money, identified a delivery place or identified a potential blood donor, their likelihood of actual delivery at a health facility increased by two to three fold. However, making arrangements for transportation or antenatal care visit were not significantly associated with skilled attendance at birth.

DISCUSSION

This large prospective cohort study of pregnant women found that the number of arrangements made during pregnancy had a significant impact on the actual delivery location. A cluster randomised trial in Tanzania (Magoma et al., 2013) also observed

that skilled delivery care uptake was 16.8% higher in the intervention arm (n= 404) than in the control group (n= 501). The intervention involved the introduction and promotion of birth plan by health care providers during antenatal care visit. Other community interventions in Burkina Faso (Brazier et al., 2009), Bangladesh (Hossain and Ross, 2006), and Eritrea (Turan et al., 2011) also reported positive association between birth preparedness and skilled attendance at birth. However, McPherson et al. (2006) reported that implementation of birth preparedness packages in one district of Nepal did not increase skilled attendance at birth despite raising the level of birth preparedness practices. They evaluated a district-wide field trial of the BP/CR implementation through the government health system in eastern plain district, which has a lower level of adult literacy than Kaski. Although 89% of the post-intervention respondents stated that skilled attendance was important, only 18% had actual skilled attendance at delivery, probably due to preference of home delivery unless there was an emergency and lack of self-decision power among the participants (McPherson et al., 2006).

In this study, identification of blood donor and identification of delivery place were significantly associated with having skilled attendance at birth. A retrospective study in Bangladesh involving 246 participants similarly observed the strong correlation between intention and eventual delivery at home (Edmonds et al., 2012). Saving money for birth expenses also appeared to have a positive effect on delivery at a health care facility. This finding for expectant mothers in Nepal was supported by a previous cross-sectional study in Burkina Faso based on 180 post-partum women (Moran et al., 2006).

Check-up at an antenatal care clinic and identification of transport were not significantly associated with skilled attendance at birth. Almost all mothers (97%) received some antenatal care. Reasons might encourage women to make such visits include “seeking information about pregnancy status”, “receiving iron tablets”, and “having tetanus vaccine”. A similar rate of high use of antenatal care, but relatively low prevalence of skilled attendance at birth, was also reported in Tanzania (Magoma et al., 2010; Mpembeni et al., 2007). Availability and reliability of transport has strong impact on skilled attendance at birth in rural settings (Edmonds et al., 2012). However, identifying transportation does not necessarily imply that

transport is reliable and comfortable, or is readily available when required, especially in rural settings. Although rural areas in Nepal are accessible mainly by non-gravelled roads with infrequent traffic, transportation did not appear to be a significant barrier to birth facilities which are located in nearby health posts.

Our study contributes to the proposition that birth preparedness packages can enhance skilled attendance at birth, which is supported by the theory of Planned Behaviour (Fishbein and Ajzen, 1980). Pregnant women who had identified birth activities tended to deliver at a health facility, but intention was not always converted into actual behaviour. Such ‘switching behaviour’ for some women was also observed in previous studies conducted in Bangladesh (Edmonds et al., 2012) and rural Karnataka, India (Matthews et al., 2005). Skilled attendance at birth is part of a complex decision process around the three ‘delays’. Birth preparedness formed during pregnancy is a positive intention in favour of addressing those delays, but there are other contextual factors which may impede access to skilled care.

The level of birth preparedness was found to be high in our study area, when compared to Southern Ethiopia (Hailu et al., 2011) and India (Agarwall et al., 2010). Birth preparedness packages in the study area have been actively implemented through the government district health system. In addition, non-government organisations have advocated safe motherhood and female rights for the past few years. The observed association between birth preparedness level and skilled attendance at birth indicates that birth preparedness packages may encourage expectant mothers to seek delivery care which in turn increase the ratio of skilled attendance at birth. Since the ‘proportion of births attended by skilled health personnel’ is a main indicator of Millennium Development Goal 5, our result suggested that birth preparedness contributes to Millennium Development Goal 5. It is also indicative that Nepal has made a significant progress in educational and behavioural change intervention for safe motherhood, which is necessary to increase skilled attendance at birth to meet the Millennium Development Goal 5.

Several limitations should be considered. Birth preparedness was assessed via five indicators but such self-reported arrangements could not be verified. Moreover, the measurement of preparedness can differ by probing or not probing a specific

question, so that a courtesy bias in favour of positive response could not be ruled out. This study did not take into account skilled home deliveries, as monitoring skilled birth at home is difficult to implement in practice. The national health system surveillance data showed the proportion of skilled births at home is very low at 1.78% (Ministry of Health and Population, 2011).

CONCLUSION

Birth preparedness is positively associated with skilled attendance at birth. Birth preparedness packages, if able to change the intention, are likely to change the behaviour as well and increase the proportion of skilled attendance at birth in the pathway of meeting the Millennium Development Goal 5.

Conflict of interest statement

No conflict of interest declared for all authors.

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Table 1.Characteristics of participants (n = 701) from Kaski district, Nepal, 2012.

Characteristic	n (%)
Ethnicity	
Upper caste	368 (52.5)
Lower caste	173 (22.4)
Janajati	158 (24.7)
Religious minorities	3 (0.4)
Age (years)	
< 20	104 (14.8)
20-24	351 (50.1)
≥ 25	246 (35.1)
Education level	
No schooling	57 (8.1)
Primary	155 (22.1)
Secondary	257 (36.7)
Higher secondary	232 (33.1)
Employment status	
Not earning	553 (78.8)
Semi-employed	115 (16.4)
Employed	33 (4.7)
Parity	
0	363 (51.8)
1	199 (28.4)
2	94 (13.4)

≥ 3	45 (6.3)
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Table 2. Birth preparedness by pregnant women (n = 701) in Kaski district, Nepal, 2012.

Birth preparedness	n (%)
Antenatal care check-up	678 (96.7)
Money saving	649 (92.5)
Identification of delivery place	608 (86.7)
Identification of transport	507 (72.3)
Identification of blood donor	97 (13.8)
None of the above	2 (0.3)
One arrangement	22 (3.1)
Two arrangements	56 (8)
Three arrangements	165 (23.5)
Four arrangements	369 (52.6)
All five arrangements	87 (12.4)

Table 3. Association between birth preparedness and skilled attendance at birth (n =644)

Birth preparedness indicator	Skilled attendance n (%)	Without skilled attendance n (%)	Total n (%)	Odds ratio (95% confidence interval)	p
Identification of delivery place					<0.001
No	60 (11.0)	25 (25.8)	85 (13.2)	1	
Yes	487(89.0)	72 (74.2)	559 (86.8)	2.81 (1.66, 4.77)	
Identification of transport					0.189
No	145 (26.5)	32 (33.0)	177 (27.5)	1	
Yes	402 (73.5)	65 (67.0)	467 (72.5)	1.36 (0.85, 2.17)	
Money saving					0.027
No	37 (6.8)	13(13.4)	50 (7.8)	1	
Yes	510 (93.2)	84 (86.6)	594 (92.2)	2.13 (1.08, 4.18)	
Identification of blood donor					0.016
No	460 (84.1)	91 (93.8)	551 (85.6)	1	
Yes	87 (15.9)	6 (6.2)	93 (14.4)	2.86 (1.21, 6.76)	
Antenatal carecheck-up					0.605
No	17 (3.1)	4 (4.1)	21 (3.3)	1	
Yes	530 (96.9)	93 (95.9)	623 (96.7)	1.34 (0.44, 4.07)	
Mean number of arrangements made (SD)	3.68 (0.91)	3.29 (1.01)	3.62 (0.93)	1.51 (1.22, 1.88)	<0.001

4.2.2 Paper II: Determinants of facility delivery after implementation of safer mother programme in Nepal: a prospective cohort study

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RESEARCH ARTICLE

Open Access

Determinants of facility delivery after implementation of safer mother programme in Nepal: a prospective cohort study

Rajendra Karkee^{1*}, Colin W Binns² and Andy H Lee²

Abstract

Background: There are several barriers for pregnant women to deliver in a health care facility. This prospective cohort study investigated factors affecting facility delivery and reasons for unplanned place of delivery after implementation of the safer mother programme in Nepal.

Methods: Baseline interviews using a validated questionnaire were conducted on a sample of 700 pregnant women representative of the Kaski district in central Nepal. Follow-up interviews of the cohort were then conducted within 45 days postpartum. Stepwise logistic regression analysis was performed to determine factors associated with the facility delivery outcome.

Results: Of the 644 pregnant women whose delivery location had been identified, 547 (85%) gave birth in a health care facility. Women were more likely to deliver in a health facility if they were educated especially with higher secondary or above qualification (adjusted odds ratio (OR) 12.39, 95% confidence interval (CI) 5.09 to 30.17), attended 4 or more antenatal care visits (OR 2.15, 95% CI 1.25 to 3.69), and lived within 30 minutes to the facility (OR 11.61, 95% CI 5.77 to 24.04). For the 97 women who delivered at home, 72 (74.2%) were unplanned, mainly due to quick precipitation of labour making it impossible to reach a health facility.

Conclusions: It appeared that facility delivery occurs more frequent among educated women and those who live nearby, even though maternity services are now freely available in Nepal. Because of the difficult terrain and transportation problem in rural areas, interventions that make maternity service physically accessible during antenatal period are needed to increase the utilisation of health facility for child birth.

Keywords: Determinants, Factors, Facility delivery, Childbirth, Maternal health services, Nepal

Background

Almost all maternal deaths occur in developing countries [1], where the majority of women deliver at home without skilled birth attendance. These mothers are at increased risk from unpredictable obstetric complications, often ending in death either at home or after transfer to a health facility [2,3]. Many of these deaths could be avoided by the provision of skilled care, preferably at a health care facility [4]. Consequently, the safe motherhood programme aims to increase the proportion of facility delivery by identifying

and overcoming barriers in the utilisation of delivery service by pregnant women.

In Nepal, the government has promoted several interventions including the establishment of maternity waiting homes [5], birth preparedness and complication readiness, as well as a safer mother programme to increase the proportion of delivery at health care facility [6]. The safer mother programme consists of: (1) a safe delivery incentive component (initiated in July 2005), that provides cash incentives to women who deliver in a designated health facility; and (2) provision of free delivery care for normal, complicated, and caesarean section births (initiated in January 2009) [7]. In spite of these efforts, 65% of women still deliver at home [8], which presents a challenge for

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Nepal in reducing maternal mortality to achieve the Millennium Development Goal 5.

Barriers in accessing adequate obstetric care may be classified into three delays [3,9]. The 'first delay' is related to decision to seek care; the 'second delay' factors are causes of delay in travelling to the facility; whereas the 'third delay' concerns access to care after arrival at the health facility. Twenty factors associated with the first two phases of delays have been identified as potential barriers to delivery service utilisation, but they remain inconsistent between studies [9]. This implies that determinants are context specific and their effects vary from one geographic and social setting to another. Previous studies in Nepal were either analyses of the Demographic Health Survey [10-13] or cross sectional studies [14-16], conducted before implementation of the safer mother programme.

In the present prospective cohort study, we investigate factors affecting facility delivery and reasons for unplanned place of delivery after implementation of the safer mother programme in Nepal.

Methods

Study setting and location

This study was conducted in the Kaski district of the Western Development Region of Nepal, a hilly area with a population of 455,000 in 2010 [17]. The district is administratively divided into 42 Village Development Committees (VDC) and two municipalities. Geographically, the district has a central valley housing the two municipalities and a few VDCs in the urban areas. The rest of the VDCs spread out into the rural hilly terraces. Pokhara is the regional capital which attracts people from neighbouring districts for education, employment and health care. It has a regional government hospital, two teaching hospitals of private medical colleges and several nursing homes and pharmacies. The three hospitals provide free delivery services and serve as referral centres for emergency obstetric care. The majority of deliveries took place in the public hospital (80%), followed by private hospitals (16%) and birth centres (4%). In the year July 2011 to August 2012, the public hospital received about 7500 delivery cases, of which 350 (4.6%) involved complications and 1700 (22.6%) underwent caesarean section [18].

For the purpose of health service provision, the District Public Health Office of Kaski has divided the rural district into *illakas*. Each *illaka* includes several VDCs and at least one functioning birth centre to provide free basic emergency obstetric care services. Monetary incentives are provided to women who attend the recommended four antenatal care visits and deliver at a birth centre. Rural areas are connected with the central urban valley by non-gravelled roads, but transportation is infrequent and often obstructed during the monsoon season.

The government of Nepal has classified the population into upper caste, lower caste, janajati and religious minorities. 'Upper caste' and 'lower caste' people have Indo-Aryan origin whereas 'janajati' refers to the Tibeto-Burman people. In the Kaski district, about half (49%) of the population belong to upper caste, 34% belong to janajati, while 16% are classified as lower caste and the remaining 1% as religious minorities. The female population in the 15-49 age group is 117,500 with 13,800 expected pregnancies annually [17]. Our study population consisted of all pregnant female residents who delivered during the period December 2011 to October 2012.

Study design and participants

A community-based prospective cohort study was conducted to recruit women who were 5 months or more pregnant from the two urban municipalities. For rural areas 7 of the 13 *illakas* were chosen at random. Within each selected *illaka*, a village that contained the birth facility was purposely chosen. All pregnant women in that village were invited to participate. Additional women were recruited from another adjacent village whenever necessary. Of the total 748 pregnant women (398 from urban, 350 from rural) approached, 701 (380 from urban, and 321 from rural) agreed to participate in the baseline survey, giving an overall response rate of 93.7%.

Data collection and ethics

The study questionnaire was taken from the National Health and Demographic Survey, an instrument that has been widely used and validated in many countries, including Nepal [8]. The translated questionnaire was pretested on 50 pregnant women for cultural appropriateness, content validity and understanding. Baseline interviews, conducted between December 2011 and January 2012, sought information on socio-demographic and household characteristics including assets, childbirth history, knowledge and preparedness about pregnancy and child birth, and time to reach the nearest birth centre in rural areas and hospital in urban areas. A follow-up second interview was conducted within 45 days postpartum to obtain information on utilisation of antenatal and delivery care service.

From the selected areas, 15 female local residents were recruited and employed as data enumerators. All of them had completed 10th grade education and possessed basic knowledge on maternity issues. They were responsible for searching and identifying pregnant women in their localities, and trained by the first author to conduct the subsequent face-to-face interviews. The project protocol was approved by the Human Research Ethics Committee of Curtin University (approval number HR 130/2011), Ethical Review Board of Nepal Health Research Council (approval number 88/2011) and the District Public Health Office of Kaski. An information sheet was

provided and read to each participant before obtaining her signed or thumb-print informed consent. Confidentiality of the information provided was maintained throughout the study. Participants were assured of their freedom to withdraw without any negative consequences.

Statistical analysis

The main socio-demographic and maternity related variables are listed in Table 1. An asset score for socioeconomic status was generated from the first component of a principal components analysis [19], utilising survey questions related to household assets. The asset score was then used to develop wealth quintiles. Distance to the nearest birth facility was estimated by the time took (either on foot or by vehicle) to reach the facility and categorised as less than 30 min, between 30 and 60 min, and over 60 min. Four levels of education level was recorded: none, primary (1-5th grade), secondary (6-10th grade), higher secondary or above (after 10th grade). Employment status was categorised as employed (full-time salaried job), semi-employed (wage based labour, small business or employed aboard), and unemployed (agricultural, housewife, or jobless). For caste, only 3 respondents belonged to religious minorities and they were merged with the janajati group to facilitate analysis.

The outcome variable was place of delivery. Univariate statistics were first conducted to compare the profile of participants between the home delivery and facility delivery groups. Stepwise logistic regression analysis was then performed to ascertain the determinants of facility delivery. Independent variables considered in the regression model were either significant factors from the univariate analysis or plausible confounders from previous studies in Nepal [11,15,16]. Crude and adjusted odds ratios (OR) and corresponding 95% confidence intervals (CI) for the facility delivery prevalence were reported. All statistical analyses were performed in the SPSS package version 18 [20].

Results

Participant characteristics

The average gestational age of women at recruitment was 27.9 weeks (range 16 to 38 weeks). Majority of the participants were under 25 years of age (62%), received primary or above education (92%), and were unemployed (79%). More than half of them were expecting their first child (52%), living with their extended family (64%), and belonged to the upper caste (52%). Of the 338 women who had given birth before, 62% had used a health facility and 21% had some complications for the last delivery. Almost all (98%) pregnant women had made at least one antenatal care visit. On average, it took 62 (SD 39) min for rural women travelled to the nearest birth centre but only 31 (SD 15) min for urban women.

Facility delivery

Of the 701 baseline respondents, place of delivery was identified for 644 (92%) women from their second interview. However, 43 women were lost to follow up, 9 had a prenatal death, and 5 delivered on their way to a facility. About 90% of women from urban area and 78% of women from rural area delivered in a health care facility. Among the 547 facility deliveries, 77 (14%), 419 (76.6%) and 51 (9.3%) women delivered at birth centres, regional public hospital and private hospitals, respectively. About 48% of women delivered within 5 hours of reaching a health care facility and 90% delivered within 25 hours of arrival.

Comparison between home delivery and facility delivery groups

Table 1 presents the characteristics of the participants by place of delivery. The two groups appeared to be different in terms of caste, household wealth, education level (both women and their husband), husband's employment status, residential location, and distance to the nearest health facility. Moreover, a higher proportion of women in the facility delivery group attended four or more antenatal care visits and discussed maternity issues with family members than their counterparts who delivered at home.

Table 2 shows the results of logistic regression analysis. Education level, distance to the nearest health facility, and frequency of antenatal care visits emerged as significant determinants of facility delivery, after accounting for the apparent collinearity between plausible confounding factors. Women who completed the recommended four antenatal visits were more likely to deliver at a facility than those without (adjusted OR 2.15, 95% CI 1.25 to 3.69). Similarly, women tended to deliver at a health facility if they were educated especially with higher secondary or above qualification (adjusted OR 12.39, 95% CI 5.09 to 30.17), or lived within 30 minutes to the nearest facility (adjusted OR 11.61, 95% CI 5.77 to 24.04).

Reasons for unplanned home and facility delivery

Within the facility delivery group, 75 (13.7%) women said they had not initially planned to deliver at a facility. Table 3 lists the most popular reasons given for their unplanned delivery. As expected, almost half of them reported development of complications at home or following the advice of a health worker. For the 97 women who delivered at home, 72 (74.2%) were unplanned, mainly due to quick precipitation of labour making it impossible to reach a health facility.

Discussion

The observed facility delivery prevalence of 85% is comparable to the estimate of 81% in 2010 provided by the District Public Health Office of Kaski [17], but much higher than the 35% facility delivery reported by the

Table 1 Characteristics of participants (n = 644) by delivery location, Kaski, Nepal, 2012

Characteristics	Home delivery	Facility delivery	Total	Chi-square test p-value
n	97	547	644	
Women's age (years)				0.640
15-19	17 (17.5%)	76 (13.9%)	93 (14.4%)	
20-24	47 (48.5%)	279 (51%)	326 (50.6%)	
25-40	33 (34%)	192 (35.1%)	225 (34.9%)	
Parity				0.208
0	42 (43.3%)	292 (53.4%)	334 (51.9%)	
1	30 (30.9%)	149 (27.2%)	179 (27.8%)	
2	15 (15.5%)	73 (13.3%)	88 (13.7%)	
3-7	10 (10.3%)	33 (6%)	43 (6.7%)	
Women's education level				< 0.001
No education	24 (24.7%)	31 (5.7%)	55 (8.5%)	
Primary	27 (27.8%)	107 (19.6%)	134 (20.8%)	
Secondary	34 (35.1%)	204 (37.3%)	238 (37%)	
Higher secondary or above	12 (12.4%)	205 (37.5%)	217 (33.7%)	
Husband's education level				< 0.001
No education	4 (4.1%)	6 (1.1%)	10 (1.6%)	
Primary	32 (33%)	93 (17%)	125 (19.4%)	
Secondary	44 (45.4%)	204 (37.3%)	248 (38.5%)	
Higher secondary or above	17 (17.5%)	244 (44.6%)	261 (40.5%)	
Husband's employment				0.003
Employed	7 (7.2%)	105 (19.2%)	112 (17.4%)	
Semi-employed	67 (69.1%)	363 (66.4%)	430 (66.8%)	
Unemployed	23 (23.7%)	79 (14.4%)	102 (15.8%)	
Residential location				< 0.001
Rural	64 (66%)	233 (42.6%)	297 (46.1%)	
Urban	33 (34%)	314 (57.4%)	347 (53.9%)	
Caste				< 0.001
Lower caste	42 (43.3%)	119 (21.8%)	161 (25.1%)	
Janajati	15 (15.5%)	125 (22.9%)	140 (21.8%)	
Upper Caste	40 (41.2%)	301 (55.2%)	341 (53.1%)	
Household wealth quintile				< 0.001
1 (lowest)	39 (41.1%)	99 (18.2%)	138 (21.6%)	
2	25 (26.3%)	97 (17.8%)	122 (19.1%)	
3	14 (14.7%)	107 (19.6%)	121 (18.9%)	
4	10 (10.5%)	114 (20.9%)	124 (19.4%)	
5 (highest)	7 (7.4%)	128 (23.5%)	135 (21.1%)	
Information received on pregnancy and delivery				0.790
No	23 (23.7%)	123 (22.5%)	146 (22.7%)	
Yes	74 (76.3%)	424 (77.5%)	498 (77.3%)	
Maternity issues discussed with family				0.014
No	47 (50%)	200 (36.6%)	247 (38.6%)	
Yes	47 (50%)	346 (63.4%)	393 (61.4%)	

Table 1 Characteristics of participants (n = 644) by delivery location, Kaski, Nepal, 2012 (Continued)

Frequency of antenatal care visit				0.009
< 4	35 (37.2%)	133 (24.3%)	168 (26.2%)	
≥ 4	59 (62.8%)	414 (75.7%)	473 (73.8%)	
Distance to nearest health facility				< 0.001
≤ 30 minutes	22 (22.7%)	355 (64.9%)	377 (58.5%)	
31–60 minutes	46 (47.4%)	144 (26.3%)	190 (29.5%)	
> 60 minutes	29 (29.9%)	48 (8.8%)	77 (12%)	

National Demographic Health Survey [8]. A similar rate of facility delivery (81%) was obtained in previous studies conducted in the urban Kathmandu valley [16] and Pokhara city [21]. Moreover, health system surveillance data revealed an average 43% facility delivery rate with a wide range (7% to 93%) across districts [6]. Such geographical differences in utilisation should be taken into account when planning for service expansion and allocation of resources by the government.

Women's education level, distance to the nearest health facility and frequency of antenatal care visits were found to be significantly associated with the likelihood of facility delivery. Our results are consistent with the literature [9,22]. Previous studies in Nepal had also shown that a distance of more than one hour to the facility could exert a negative impact on delivery service use [11], while mothers with no education were more likely to deliver at home [15].

Birth preparedness was high in the study district and almost all women made at least one antenatal visits. Health workers at the birth centres and hospitals counselled women about preparation activities and danger signs of pregnancy and delivery. Female community health volunteers provided information to pregnant women in the

communities and encouraged them to use the nearest health facility for delivery [23].

Apparently, demographic factors such as age, parity, household wealth and caste became non-significant in the stepwise regression model, even though they appeared to be plausible predictors of facility delivery in the univariate analysis as well as previous studies in Nepal [15,16] or other countries [24–29]. Firstly, these factors are highly correlated with the women's education level. Secondly, the discrepancy in results might be due to the introduction of incentive scheme and the provision of free delivery care after implementation of the safer mother programme. In the past few years, maternity services have reached out to different social strata with regards to age, wealth and caste. Similar effects have been reported by studies in Burkina Faso [30] and Ghana [31] after the reduction of user fees. Indeed, data from the District Public Health Office of Kaski showed that facility utilisation increased from 49% in 2008 to 72% in 2009 and 81% in 2010. Increases in facility delivery have also been observed in other districts of Nepal [7].

Because of the hilly landscape, poor or non-existent roads and the absence of systematic transport in rural areas, distance remains as the major obstacle to use a

Table 2 Determinants of facility delivery from backward stepwise logistic regression, Kaski, Nepal, 2012

	Crude OR (95% CI)	Adjusted OR (95% CI)	p value
Women's education level			< 0.001
No education	1	1	
Primary	3.07 (1.55, 6.05)	3.57 (1.60, 7.94)	
Secondary	4.64 (2.43, 8.85)	5.66 (2.62, 12.22)	
Higher secondary or above	13.22 (6.0, 29.11)	12.39 (5.09, 30.17)	
Frequency of antenatal care visit			0.005
< 4	1	1	
≥ 4	1.84 (1.16, 2.93)	2.15 (1.25, 3.69)	
Distance to nearest health facility			< 0.001
≤ 30 minutes	9.74 (5.18, 18.32)	11.61 (5.77, 24.04)	
31–60 minutes	1.89 (1.07, 3.33)	1.72 (0.93, 3.19)	
> 60 minutes	1	1	

Table 3 Most important reasons for unplanned delivery, Kaski, Nepal, 2012

Unplanned facility delivery (n = 75)		Unplanned home delivery (n = 72)	
Reasons	Frequency	Reasons	Frequency
Developed complications at home	32 (42.7%)	Labour too quick to reach health facility	53 (73.6%)
On health worker's advice	33 (44%)	Lack of transport or nearby facility	8 (11.1%)
On friends or neighbours' advice	10 (13.3%)	No one to accompany to facility	4 (5.6%)
		Family custom	7 (9.7%)

health facility. Even in urban areas, the distance and availability of transport affect the timely utilisation of delivery services. The main reason behind unplanned home birth was quick precipitation of labour, followed by lack of transport or nearby facility, similar to other studies in Nepal [16,21] and India [27].

There are several options to be considered to further increase the rate of facility delivery. One possibility is to establish more birth centres. However, building new or upgrading existing facilities that can provide comprehensive emergency obstetric care within easy reach of every rural woman is unlikely to be a feasible solution for Nepal in the foreseeable future. An arrangement for rapid transportation in rural areas, which help women to reach a rural birth centre or a nearby hospital quickly, also poses as a challenging logistic problem due to the difficult terrain and resource constraints.

Maternity waiting homes at or near the health facility may offer a viable option particularly for women residing in remote areas, whereby they could arrive early before the due date and wait for their delivery. Maternity waiting homes have been used in other countries but they generally differ in structure and provision of services, resulting in varying degrees of success [32]. Although maternity waiting homes had been constructed and introduced in rural west Nepal, they were not utilised effectively by pregnant women, possibly due to unawareness of their availability and/or lack of adequate facilities [5]. Improving and increasing maternity waiting homes may be an acceptable and affordable way to enhance the facility delivery rate and should be further investigated.

Several issues should be considered when interpreting the findings. The present study was conducted on mostly literate, young, nulliparous women, in a district of Nepal which has a relatively high adult literacy rate of 66.8% and ranks third in terms of the human development index amongst the 75 districts in Nepal [33]. This might limit the generalizability of our findings to the whole country. Selection bias could not be ruled out because all participants were voluntary. Our recruitment process, nevertheless, ensured that they were representative of the pregnant women population in the entire catchment region of Kaski district. Moreover, to improve the accuracy of their responses, face-to-face interviews were conducted by

female data enumerators who were residents of the selected areas and thus aware of the local context and issues.

Conclusions

In this study, women's education level, frequency of antenatal care visits, and distance to the nearest health facility were found to be significant determinants of facility delivery, even though maternity services are now freely available in Nepal, suggesting that such services are more likely to be utilised when they are nearby. Because of the difficult terrain and transportation problem in rural areas, interventions that make maternity service physically accessible during antenatal period are needed to increase the utilisation of health facility for child birth. In particular, the option of offering maternity waiting homes for women close to delivery should be considered for further investigation.

Competing interests

The authors declare that they have no competing interest.

Authors' contributions

RK managed the project and data collection, performed statistical analysis and drafted the manuscript. CWB developed the study protocol and revised the manuscript. AHL contributed to the study design, data analysis and revision of the manuscript. All three authors read and approved the final version for publication. All authors read and approved the final manuscript.

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4.2.3 Paper III Bypassing birth centres for childbirth: an analysis of data from a cohort study in central Nepal.

Karkee R, Lee AH, Binns CW. 2013. Bypassing birth centres for childbirth: an analysis of data from a community-based prospective cohort study in Nepal. *Health Policy and Planning*. <http://dx.doi.org/10.1093/heapol/czt090>

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Bypassing birth centres for childbirth: an analysis of data from a community-based prospective cohort study in Nepal

ABSTRACT

Background: In Nepal, women residing in rural areas tend to bypass local birth centres and deliver at urban hospitals, despite the availability of obstetric care in these centres. This study investigated the incidence of bypassing, characteristics of bypassers, and their reasons for bypassing the birth centres.

Methods: A prospective cohort study was undertaken in the Kaski district of central Nepal. The 353 pregnant women of 5 months or more gestation recruited from the community had access to local birth centres. They were interviewed at baseline using a structured questionnaire, and were followed up within 45 days postpartum.

Comparisons were made between women who delivered at birth centres and those who gave birth at hospital. Logistic regression analysis was performed to determine the factors affecting the risk of bypassing.

Results: Of the final sample of 258 participants who delivered in a health facility, 181 women (70.2%) bypassed their nearest birth centres to deliver at hospitals.

Bypassers tended to be wealthy and have intrapartum complications, but the likelihood of bypassing apparently decreased by higher parity and frequent (≥ 4) antenatal care visits. Availability of operation facility, adequacy of medical supply and equipment, and competent health staff at the facility were the main reasons for their bypassing decision.

Conclusions: The risk of bypassing for childbirth was high in central Nepal. Provision of quality and reliable emergency obstetric services together with well

trained and competent staff at birth centres are recommended to reduce bypassing and pressure on the public hospital system.

INTRODUCTION

Most of the maternal deaths in developing countries occur at home in rural areas (Ronsmans & Graham 2006). When women experience complications during pregnancy and childbirth at any point, referral and timely emergency management is crucial. Therefore, a core principle for maternal and newborn health program is a continuum of care from household and community to clinical care settings (Kerber et al. 2007; World Health Organization 2005). In this continuum, primary health care centres serve as the linkage between community and referral hospital to provide obstetric care. Indeed, ‘health centre intrapartum care strategy’ has been advocated as “the best bet to bring down high rates of maternal mortality” in developing countries (Campbell & Graham 2006). This strategy recommends pregnant women to deliver at those health centres capable of providing basic emergency obstetric care and are linked to referral hospitals for comprehensive emergency obstetric services. Since rural areas are characterised typically by poor physical accessibility and lack of human and material resources, especially for instrumental delivery and caesarean section, the strategy is an affordable way to provide emergency obstetric care to rural people in developing countries.

Nepal has integrated the primary health care approach to provide essential health services through a four-tiered district health system (Karkee & Jha 2010): (1) female community health volunteers and outreach clinics in wards and villages at peripheral level, (2) health posts at village development committee level, (3) primary health care centres at *illaka* level, and (4) district hospitals at district headquarters. Under this system, continuum of maternity care comprises female community health volunteers who counsel on antenatal care and birth preparation; provision of

antenatal and postnatal care at health posts; provision of antenatal, delivery, and postnatal care at primary health care centres; and provision of comprehensive emergency obstetric services at district hospitals (KC et al. 2011). Selected health centres have been upgraded to provide normal delivery services or basic emergency obstetric care (Rath et al. 2007). Staff nurses and auxiliary nurses with additional training on midwifery skills, who are qualified as skilled birth attendants, lead the obstetric care in such birth centres in Nepal (MoHP [Nepal] 2006).

Primary health care centres are not frequently accessed in many developing countries (Ager & Pepper 2005). Consumers often ‘bypass’ such centres to seek health services at hospitals (Akin & Hutchinson 1999; Bronstein & Morrissey 1991; Hotchkiss et al. 2007; Kahabuka et al. 2011; Leonard et al. 2002). Similarly, many women bypass local facilities to access delivery service at hospital farther away (Murray & Pearson 2006; Parkhurst & Ssengooba 2009). In Nepal, despite the availability of emergency obstetric care service in local birth centres, women residing nearby still prefer to deliver at hospital in district health quarters (Department of Community Medicine and Family Health 2004; Family Health Division/ Nepal Health Sector Support Programme 2013). However, the extent and reasons of bypassing for childbirth has not been adequately investigated. The present study aimed to determine the incidence of bypassing, identify the characteristics of bypassers, and examine their reasons for bypassing the local birth centres.

METHODS

Study setting

Nepal is low-income country in South Asia with diversified ecology and ethnicity. Hills and mountains make up 75% of the land that are difficult to access and pose challenges for health service provision. About 83% of the population lives in rural areas (Central Bureau of Statistics 2012). Maternal delivery services are free at all public and selected private health facilities. Monetary incentives are also offered to women who have attended the recommended four antenatal care visits and delivered at a health facility under the “safe motherhood program” (MoHP [Nepal] 2011).

This study was conducted in the Kaski district of the Western Development Region of Nepal, a hilly area with a population of 490,429 and literacy rate of 82% according to the latest census (Central Bureau of Statistics 2012). There are about 117,500 females aged 15-49 years in the district with 13,800 expected pregnancies annually. The district is administratively divided into 42 Village Development Committees (VDC) and two municipalities. About half the population lives in urban areas in the central valley which houses the two municipalities and a few VDCs. The rest of the VDCs spread out into the rural hilly terraces. The central valley, called Pokhara, has a public hospital and two teaching hospitals of private medical colleges. These three hospitals serve as referral hospitals for emergency obstetric care. In particular, the public hospital is a popular site for delivery, receiving 7500 delivery cases with an average of 85% bed occupancy rate in maternity wards between July 2011 and August 2012 (Family Health Division/ Nepal Health Sector Support Programme 2013).

For the purpose of health service provision, the District Public Health Office of Kaski has divided the rural district into 13 *illakas*. Each *illaka* includes several VDCs

and at least one functioning ‘birth centre’ to provide free basic obstetric care services. Rural areas are connected with the central urban valley by non-gravelled roads, but transportation is infrequent and often obstructed during the monsoon season.

Study design and participants

A community-based prospective cohort study of maternity service utilisation was undertaken between December 2011 and October 2012, when 701 women of 5 months or more pregnant were recruited from six wards in Pokhara and seven *illakas* in the rural district. Details of the sampling strategy had been explained elsewhere (Karkee et al. 2013). The present study focused on the subgroup of 353 women whose nearest health facility from their residence was a ‘birth centre’. Comparisons were then made between women who delivered at birth centres and those who gave birth at hospital. The project was approved by the Human Research Ethics Committee of Curtin University (approval number HR 130/2011), Ethical Review Board of Nepal Health Research Council (approval number 88/2011) and the District Public Health Office of Kaski. An information sheet was given and read to each participant before obtaining her signed or thumb-print informed consent. Confidentiality of the information provided was maintained throughout the study. Participants were assured of their freedom to withdraw without any negative consequences.

Data collection

Baseline face-to-face interview of the cohort sought information on socio-demographic and household characteristics including income and assets, and

knowledge of the nearest birth centre. A follow-up interview was conducted within 45 days postpartum to investigate their utilisation of antenatal and delivery care, as well as antepartum and intrapartum morbidities. The reasons for bypassing the birth centre and for choosing the hospital were also solicited using a structured questionnaire. Both baseline and follow-up interviews were conducted during household visits by female data enumerators, who were local residents from each selected area and trained by the first author following a standardised protocol. All of them had completed 10th grade education and possessed basic knowledge on maternity issues. They identified and recruited pregnant women in their localities with the help of community health volunteers and through antenatal registration in the birth centres.

Statistical analysis

Table 1 lists the independent variables of interest. An asset score for socioeconomic status was generated from the first component of a principal components analysis (Filmer & Pritchett 2001), utilising questions related to household assets. The asset score was then used to derive wealth level (low, high). Distance to birth centre was measured by the time (min) taken on foot and/or by vehicle to reach the facility. Education level were categorised as none or primary, secondary or above. Caste was categorised according to the government's health system classification, namely, upper caste, lower caste, janajati and religious minorities. 'Upper caste' and 'lower caste' refer to the Indo-Aryan people, whereas 'janajati' refers to Tibeto-Burman people. The term 'religious minorities' denotes Muslims and Christians, but none of our respondents belonged to this caste.

During the follow-up interview, the participants were asked if they experienced any serious complication during antepartum and intrapartum period. Common antepartum symptoms were heavy bleeding, swollen hand and body, loss of consciousness and convulsions, blurred vision, severe headache, high fever, severe abdominal pain, and severe vomiting. Intrapartum complications included heavy bleeding, prolonged labour exceeding 12 hours, placenta not delivered within 30 minutes, loss of consciousness and convulsions.

The outcome variable was bypassing status of the participants. In addition to descriptive statistics, comparison between bypassers and non-bypassers was made using logistic regression analysis, with both crude and adjusted odds ratios (OR) and corresponding 95% confidence intervals (CI) to profile the likelihood of bypassing the local birth centres. All statistical analyses were performed in the SPSS package version 18.

RESULTS

Sample characteristics

The mean gestational age of the 353 women at recruitment was 28.4 weeks (range 18 to 38 weeks), who took on average 61 (SD 38) minutes to travel to the nearest birth centre on foot and/or by vehicle if applicable. The majority (67.7%) of participants were under 25 years of age. More than half of them were expecting their first child (52%) and belonged to the upper caste (57%). About a quarter of women reported at least one complication during current pregnancy (25.2%) and delivery (28%). Almost all (98.4%) women had made at least one antenatal care visit in the birth centres and aware of the availability of normal delivery services.

Bypassing

Figure 1 shows the flowchart of participants and their eventual delivery location. Of the initial 353 pregnant women in the cohort, the attrition rate was 6.5% and 258 women delivered at a health facility. Within this group, 77 women (29.8%) delivered at the nearest birth centres while 181 women (70.2%) bypassed birth centres to deliver at hospitals. The bypassing percentage ranged from 20% to 100% among these birth centres. The great majority of bypassers (90.1%) delivered at the public hospital. Bypassers travelled on average 81.4 (SD 70) min to the hospitals in Pokhara valley, usually by taxi, jeep or bus, even though the nearest birth centre was located within 54 (SD 34) min of travel. The non-bypassers mainly walked or were carried to the birth centres located within 64 (SD 45) min of travel on average.

Comparison between bypassers and non-bypassers

Table 1 presents characteristics of the subgroup of 258 women delivered at facility with respect to bypassing status. The mean age was 23.4 (SD 3.9) years for bypassers and 22.7 (SD 4.0) years for non-bypassers. The crude odds ratios suggested that the risk of bypassing was positively associated with education level, household wealth and the presence of intrapartum morbidity, but inversely associated with the frequency of antenatal care visit, whereas the effects of age, parity, caste, distance to birth centre and presence of antepartum morbidity were not significant. However, multivariable logistic regression results confirmed that women were more likely to bypass nearest birth centres to deliver at hospital if they were relatively wealthy (OR 2.50, 95% CI 1.27-4.93) and had intrapartum complications (OR 3.41, 95% CI 1.44-8.05) Conversely, their likelihood of bypassing apparently decreased by higher parity

(OR 0.25, 95% CI 0.08-0.72) and frequent (≥ 4) antenatal care visits (OR 0.38, 95% CI 0.17-0.85). The effect of education level became smaller and no longer statistically significant after adjustment for other factors, whereas a lack of evidence was found for the association between the women's age and the risk of bypassing.

Reasons for bypassing

Table 2 shows the reasons given by bypassers for their delivery decision. The most popular reason for bypassing birth centres was 'no operation facility' (75%), followed by 'inadequate drugs and equipment' (61%). Their decision to deliver at hospital was mainly due to 'adequate drugs and equipment' (85%) and 'competent health staff' (72%) at the hospital. On the other hand, attitude of the service provider appeared to have little influence on their bypassing decision.

DISCUSSION

Facility delivery rates in Nepal have been increasing after removal of user fees in 2009 and introduction of incentives (Witter et al. 2011). Nevertheless, a recent demographic and health survey estimated only 35% of pregnant women deliver at health facilities (MoHP [Nepal] et al. 2012). In view of the large variations in delivery rate between districts (MoHP [Nepal] 2011), our study district appeared to have a good coverage with a facility delivery rate at 73.1%, yet 70.2% of pregnant women who delivered in facilities bypassed their nearest birth centre to deliver at hospital. This bypassing incidence was higher than previous reports in other developing countries. For example, 42.2% of rural Tanzanian mothers bypassed their nearest health facility to deliver in mission facilities and government district hospital (Kruk et al. 2009a). In Kenya, between 46.3% and 59.5% of mothers residing in a

rural district bypassed the municipal facility in favour of district or provincial hospitals when seeking antenatal care, infant immunization or other child health services (Audo et al. 2005).

Bypassing for delivery can be affected by transportation, distance and ‘popularity’ of the destination facility. In rural Uganda, bypassing rates were different between health facilities (Parkhurst & Ssenooba 2009). Similarly, the bypassing percentages varied substantially between birth centres in our study, which might be related to road connection in the rural areas. The public hospital in Pokhara is a regional tertiary hospital providing emergency obstetric care. It is a popular destination for delivery services among residents of Kaski and neighbouring districts (Family Health Division/ Nepal Health Sector Support Programme 2013). Moreover, birth preparedness packages had been implemented in Nepal (Pradhan et al. 2012) and birth preparedness was found to be high in the study district (Karkee et al. 2013), which might partly explain the observed high facility delivery rate. However, the increased awareness could lead to a demand for high quality care and increase the likelihood of bypassing the birth centres.

In this study, bypassers tended to be more wealthy than non-bypassers. Although delivery services are free at hospitals and women receive incentives to compensate for transportation costs, there can still be substantial costs associated with additional medicines, travelling and lodging (Borghgi et al. 2006; Simkhada et al. 2012). Travel from the rural areas of Kaski district often requires hiring a taxi or jeep to avoid uncomfortable and unreliable public transport. Accommodation in the city for those accompanying the pregnant women can be costly. Therefore, poorer families were

less likely to bypass local birth centres which could incur extra costs to them. Rich individuals in Chad were similarly found to bypass low-quality health facilities in favour of more expensive higher quality facilities (Gauthier & Wane 2011). Wealth did not appear to be associated with bypassing for childbirth in Tanzania (Kruk et al. 2009a) . However, the participants involved in that study were relatively homogeneous in terms of asset ownership and demographic characteristics.

Intrapartum complications may require a lifesaving operation such as caesarean section which is currently not available in birth centres. As expected, women would seek specialist hospital care following complications at home or birth centre, and avoid the risk by delivering at hospital.

Interestingly, women with frequent antenatal care visits were less likely to bypass the birth centres. More antenatal care visits might indicate their trust and dependency on the nearby facility for service and counselling, which ultimately influence their decision to deliver at the birth centres. Our finding that higher parity reduced the likelihood of bypassing is consistent with a previous study in Tanzania (Kruk et al. 2009a), where higher parity women were less anxious and worry about delivery problems than their nulliparous counterparts.

In assessing obstetric care, women can be influenced by a respectful provider's attitude and availability of drugs and medical equipment (Kruk et al. 2009b). The main reasons for choosing hospital delivery by our bypassers were competent staff and adequacy of drugs and equipment at the urban hospitals, but not provider attitude, unlike the Tanzanian study (Kruk et al. 2009a) and a qualitative study in Cambodia (Ith et al. 2013). Within the Kaski district, women might be familiar with

the local setting and have established a good relation with the birth centre staff, so that provider attitude was not an issue, whereas the urban hospitals are often crowded with high bed occupancy rate in the maternity ward. Therefore, they bypassed because of perceived high technical quality of the hospitals. The role of perceived technical quality in bypassing the nearest health facility has been demonstrated in the literature (Ith et al. 2013; Jacobsen et al. 2012; Kruk et al. 2009a; Parkhurst & Ssengooba 2009). In spite of the additional travel time and cost incurred, the influx of pregnant women to public hospital for childbirth deserves further inquiry and attention, particularly resource considerations by policy makers to cope with the increasing demand of emergency obstetric care.

Our study has several limitations. Selection bias could not be avoided because all participants were volunteers. There was inherent bias in participant response due to different interviewers despite the use of a structured questionnaire. Therefore, all data enumerators were trained by the first author to solicit information in the same manner following a standardised protocol. In this study, we did not assess the technical quality of birth facilities to confirm the perception of bypassers. Similarly, information was lacking on other potential factors which might be associated with bypassing, such as previous pregnancy complications and hospital delivery experience. Furthermore, some cases, especially women with intrapartum complications, might have been referred by birth centre nurses to deliver at the urban hospitals. However, referral in maternity services is almost non-functional in Nepal and in practice emergency transportation has to be arranged by the patients themselves. Indeed, analysis of delivery registration data of the public hospital

revealed that 98% of the cases were admitted without referral (Family Health Division/ Nepal Health Sector Support Programme 2013).

CONCLUSION

An analysis of data from a community-based prospective cohort study found that 70% of pregnant women bypassed their nearest birth centre to deliver mainly at urban public hospital in the Kaski district of Nepal. The risk of bypassing appeared to be related to wealth, parity, frequency of antenatal care visit, and intrapartum complications of the women, while availability of operation facility, adequacy of medical supply and equipment, and competent health staff at hospital were the underlying reasons expressed by our participants who bypassed the birth centres. To reduce bypassing and pressure on the public hospital system, provision of quality and reliable emergency obstetric services together with well trained and competent staff at local birth centres should be considered by health policy makers.

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Table 1. Characteristics of bypassers and non-bypassers for childbirth in Kaski District, Nepal

Factors	Non-bypassers (n = 77)		Bypassers (n = 181)		Crude odds ratio for bypassing (95%CI)	Adjusted odds ratio for bypassing (95% CI)	p*
	n	%	n	%			
Distance to birth centre (10-min): mean, SD	64	45	54	34	0.93 (0.87, 1.02)	0.94 (0.87, 1.02)	0.172
Age (years)							0.053
15-19	15	19.5	28	15.5	1	1	
20-24	41	53.2	90	49.7	1.17 (0.56, 2.43)	1.48 (0.61, 3.60)	
25-40	21	27.3	63	34.8	1.60 (0.72, 3.57)	4.57 (1.19, 12.84)	
Education level							0.229
none/primary	26	33.8	38	21	1	1	
secondary and above	51	66.2	143	79	1.91 (1.06, 3.46)	1.64 (0.73, 3.69)	
Parity							0.028
0	37	48.1	104	57.5	1	1	
1	22	28.6	42	23.2	0.67 (0.35, 1.28)	0.44 (0.19, 1.01)	
2-7	18	23.4	35	19.3	0.69 (0.35, 1.36)	0.25 (0.08, 0.72)	
Caste							0.157
lower caste	28	36.4	40	22.1	1	1	
upper caste	36	46.8	117	64.6	2.27 (1.23, 4.18)	1.91 (0.89, 4.1)	
Janajati	13	16.9	24	13.3	1.29 (0.56, 2.96)	0.95 (0.37, 2.45)	
Household wealth							0.008
low	26	34.7	38	21.2	1	1	
high	49	65.3	141	78.8	1.96 (1.08, 3.57)	2.50 (1.27, 4.93)	
Frequency of antenatal care visit							0.019
< 4	11	14.3	57	31.5	1	1	
≥ 4	66	85.7	124	68.5	0.36 (0.17, 0.73)	0.38 (0.17, 0.85)	
Antepartum morbidity							0.977
no	63	81.8	128	70.7	1	1	
yes	14	18.2	53	29.3	1.86 (0.96, 3.61)	1.01 (0.42, 2.41)	
Intrapartum morbidity							0.005
no	62	81.6	109	61.9	1	1	
yes	14	18.4	67	38.1	2.72 (1.41, 5.24)	3.41 (1.44, 8.05)	

* from multivariable logistic regression model with all factors included

Table 2. Reasons given by bypassers (n = 181) for childbirth in Kaski district, Nepal

Reasons for bypassing birth centre*	n (%)	Reasons for delivery at hospital*	n (%)
No operation facility	136 (75)	Adequate drugs and equipment	154 (85)
Inadequate drugs and equipment	111 (61)	Competent health staff	131 (72)
Not competent health staff	46 (25)	I used it before	20 (11)
Health facility not clean	5 (2)	Others used it/recommended	5 (2)
Nurse on leave at birth centre	3 (1.65)	Provider good attitude	2 (1.1)
Do not know about the facility	2 (1.1)		
Provider bad attitude	1 (0.55)		

*Multiple responses

4.2.4 Paper IV Obstetric complications and caesarean delivery in Nepal

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Obstetric complications and cesarean delivery in Nepal

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Keywords: Cesarean delivery; Nepal; Obstetric complications; Pregnancy outcomes; Stillbirth

Synopsis: During the study period, cesareans accounted for 13.3% of deliveries, appeared to meet obstetric need, and were significantly associated with intrapartum symptoms in central Nepal.

ABSTRACT

Objective: To determine the incidence of obstetric complications, the stillbirth rate, and the factors associated with cesarean delivery in central Nepal.

Methods: A community-based prospective cohort study was undertaken in the Kaski district during 2011–2012. In total, 701 women who were at least 5 months pregnant were recruited and interviewed. Participants were followed-up and interviewed again within 45 days after delivery.

Results: Of the 658 women who remained in the cohort after 43 were lost to follow-up, 12 (1.8%) had stillbirths. Cesareans accounted for 13.3% of the total deliveries. Age, urban residency, college-level education, and particularly presence of intrapartum symptoms significantly increased the likelihood of cesarean delivery. Prepartum, intrapartum, and postpartum symptoms were reported by 21.1%, 24.4%, and 10.2% of women, respectively. Common danger signs included prolonged labor, severe abdominal pain, swollen hand and body, and heavy bleeding.

Conclusion: Obstetric complications and stillbirth rates were relatively high in central Nepal. Cesarean delivery appeared to meet obstetric need and was performed with medical indication, particularly after the onset of labor.

1. Introduction

Complications of pregnancy and childbirth are 2 of the 10 leading causes of death and disability among women of reproductive age in low- and middle-income countries [1]. Beside maternal mortality, many more women experience maternal morbidity in the form of near-miss events, pregnancy-related complications, and long-term disabilities [2]. Stillbirth is another “invisible” adverse pregnancy outcome associated with maternal morbidity and mortality. It occurs mainly in rural families and receives relatively little attention in policy agenda such as the Millennium Development Goals [3].

Maternal morbidity includes acute and chronic problems resulting from pregnancy-related complications during the prepartum, intrapartum, and postpartum periods. It may be aggravated by gender inequality, domestic violence, early marriage, adolescent pregnancy, and poor reproductive health services. Acute complications include hemorrhage, pre-eclampsia/eclampsia, prolonged or obstructed labor, infection, and unsafe abortion. It is anticipated that 15% of pregnancies will involve complications that require additional medical care or cesarean delivery [4]. However, women may choose to undergo cesarean delivery for a variety of psychological, social, or provider-induced reasons [5].

The rate of cesarean delivery has been increasing in low-resource countries, coinciding with increasing hospital delivery rates—as advocated by the Safe Motherhood Initiative to reduce maternal mortality [6]. In Nepal, the cesarean rates among tertiary hospitals ranged from 12% to 25% [7]. Although there is

no consensus on an optimal rate, a high level of cesarean delivery performed without medical indication could increase the risk of maternal and neonatal morbidity [8], whereas a low cesarean rate may reflect unmet demand due to obstetric complications.

A previous hospital-based study in Nepal reported that 94% of women admitted for delivery developed maternal morbidities during the prepartum period [9]. Moreover, between 600 000 and 1 million Nepalese women were estimated to experience uterine prolapse [10]. Such high prevalence of uterine prolapse is an indication of poor care. Gender discrimination and the patriarchal nature of society have limited the ability of women to make informed choices, take control of their reproductive life, and seek proper care during pregnancy and childbirth [11]. Consequently, a range of maternal morbidities is likely to remain in Nepal, where many births still take place at home.

In the literature, studies on pregnancy outcomes in low-income countries are based predominantly on hospital data systems, record reviews, or birth logs. Such hospital-based data do not cover those women who deliver at home or who have prepartum stillbirths. There has been no community-based study that monitors and explores the reasons for cesarean delivery in Nepal. A community-based longitudinal approach has the advantage of effectively tracking pregnancy outcomes and events of women at the household level, and their use of maternity services during the entire pregnancy and childbirth period. Therefore, the aim of the present community-based study was to

determine the incidence of obstetric complications, the stillbirth rate, and the factors associated with cesarean delivery in a large cohort of pregnant women residing in central Nepal.

2. Materials and methods

A community-based prospective cohort study was undertaken in the Kaski district of central Nepal between December 1, 2011, and October 30, 2012, 2012. The study was approved by the Human Research Ethics Committee of Curtin University (approval number HR 130/2011), the Ethical Review Board of the Nepal Health Research Council (approval number 88/2011), and the District Public Health Office of Kaski. An information sheet was distributed and read to each participant before obtaining her signed or thumb-print informed consent. Confidentiality of the information provided was maintained throughout the study. Participants were assured of their freedom to withdraw without any negative consequences.

Details of the study area, target population, and sampling have been described previously [12]. Briefly, 701 women from urban and rural areas who were at least 5 months pregnant were recruited and interviewed. The urban central valley of Kaski district, Pokhara, has a regional public hospital and 2 private hospitals, which provide comprehensive obstetric services including cesarean delivery. In rural areas, birth centers provide basic obstetric services only—referring women to hospitals when complications arise that might require cesarean delivery. The regional public hospital is the main delivery center, accounting for 80% of all deliveries in the district. From

July 2011 to August 2012, approximately 1700 cesareans (22.6% of the total 7500 deliveries) were performed at this hospital [7].

Fifteen female data collectors were recruited and employed from local areas to identify and interview pregnant women in their locality, with the assistance of female community health volunteers and local health facility registrations for prenatal care visits. These female community health volunteers act as a bridge between the community and the local health center [13]; they keep track of pregnant women in their village, and counsel and motivate pregnant women to use prenatal and delivery services.

The baseline interview—conducted between December 1, 2011, and January 31, 2012—sought information on the sociodemographic and obstetric characteristics of the pregnant women. Participants were interviewed again during another household visit within 45 days after delivery to determine whether they had experienced any serious complication(s) during the prepartum, intrapartum, and postpartum (within 1 week) periods. A list of common symptoms was prepared to probe and verify such danger signs at each stage; the list was also used by health workers and community volunteers for counseling pregnant women: (1) prepartum symptoms: heavy bleeding (soaked clothes/bed/floor), swollen hand and body, loss of consciousness/convulsions, blurred vision, severe headache, severe fever, severe abdominal pain, and severe vomiting; (2) intrapartum symptoms: heavy bleeding, prolonged labor (>12 hours), retained placenta (placenta not delivered within 30 minutes), swollen hand and body, and loss of

consciousness/convulsions; (3) postpartum symptoms: heavy bleeding, severe fever, smelly water discharge, swollen hand and body, and loss of consciousness/convulsions.

The main demographic variables are listed in Table 1. An asset score was generated from the first component of a principal component analysis, utilizing national survey questions on household assets, and was then used to develop wealth quintiles. Four levels of education were recorded: none; primary (grade 1–5); secondary (grade 6–10); and college (after grade 10). Caste was categorized according to the government's classification used in the health system: upper caste; lower caste; janajati (indigenous people); and religious minorities. Only 3 respondents belonged to the religious minorities caste, which was subsequently merged with the janajati group.

Pregnancy outcomes included self-reported obstetric danger signs, stillbirth, and method of delivery. Stillbirth was defined as late fetal death at 28 or more completed weeks of gestation: prepartum stillbirth (before the onset of labor) and intrapartum stillbirth (after the onset of labor and before birth) [3]. Early neonatal death referred to death within 7 days of live birth [3]. Sample demographic and obstetric characteristics were first compared between vaginal and cesarean delivery groups using descriptive statistics. Stepwise logistic regression was then conducted to determine pertinent factors associated with cesarean delivery. All statistical analyses were performed using SPSS version 18 (IBM, Armonk, NY, USA). Statistical significance was set at $P < 0.05$.

3. Results

From the initial cohort, 43 women were lost to follow-up; of the remaining 658, 12 (1.8%) had stillbirths. Figure 1 shows the detailed flow of participants through the study. There were 14 perinatal deaths but no maternal deaths were recorded. In total, 639 women took part in the second interview, giving a final response rate of 91%. Table 1 presents the characteristics of the final sample. The mean age of the women was 23.6 ± 4.2 years (range, 15–40 years). Approximately one-third of participants had college-level education, and three-quarters had 4 or more prenatal visits. Approximately half of the women belonged to the upper caste group and were primiparous.

As shown in Figure 1, more than one-quarter (26.4%) of the deliveries occurred at home or in birth centers. The majority (65.6% [n= 419/639]) of deliveries took place at the public hospital, and cesareans accounted for 13.3% of the total number of deliveries. When comparisons were made between participants who delivered vaginally and those who underwent cesarean delivery, the 2 groups were significantly different with respect to age, education, residential location, wealth status, and presence of intrapartum symptoms (Table 1). Stepwise logistic regression confirmed that 4 pertinent factors were significantly associated with cesarean delivery: age ($P=0.004$); urban residential location ($P<0.001$); college-level education ($P=0.040$); and presence of intrapartum symptoms ($P<0.001$) (Table 2). Table 3 summarizes the obstetric danger signs reported by the Nepalese mothers. The incidence rates of prepartum, intrapartum, and postpartum

symptoms were 21.1%, 24.4%, and 10.2%, respectively. Common danger signs during the prepartum period included severe abdominal pain and swollen hand/body, whereas prolonged labor and heavy bleeding were the main maternal complications encountered during the intrapartum period. After delivery, heavy bleeding remained a common problem for mothers.

4. Discussion

The present study provided a community-based report on obstetric danger signs and cesarean delivery in central Nepal. A major strength lies in the prospective assessment of pregnancy outcomes from a large cohort of community-dwelling women. The observed stillbirth rate of 1.8% is comparable to the hospital-based estimate of 1.45% [14] but lower than the 3.1% prevalence from a previous survey in central Nepal [15]. Similar rate variations have been reported in other low-resource countries, and such inconsistencies might arise from stillbirth thresholds ranging from 18 to 28 or more weeks [3]. Stillbirth rates vary from 0.31% in high-income countries to 2.67% in South Asia and 2.90% in Sub-Saharan Africa [3].

WHO has recommended a cesarean rate between 5% and 15% [4]. The rate of 13.3% in the present study was close to the average rate of 12.3% in low-resource countries [6] but much higher than the estimate of 4.6% derived from a recent national Demographic and Health Survey [16]. The Kaski district ranks third in human development index among 75 districts in Nepal, with public and private tertiary hospitals providing full maternity services in the urban area and with an accessible network of roads connected to the

rural areas. Therefore, cesarean delivery in the study district appears to meet obstetric need, indicating that mothers do have access to this emergency operation.

The finding that age, intrapartum symptoms, urban residency, and higher education level were significantly associated with cesarean delivery is supported by the literature [17], but unlike in some countries [18,19] no apparent association was evident in relation to parity, frequency of prenatal visits, or economic status. The public hospital, which is located in the urban area, contributes to the majority of deliveries in the Kaski district. Cesarean delivery is needed in the event of severe intrapartum complications in order to save the life of the mother and/or the infant. Furthermore, older women are susceptible to reduced uterine function and pelvic compliance, which might promote physician or maternal preference for cesarean [20]. Nevertheless, cesarean delivery was apparently conducted following medical indication in most cases, particularly after the onset of labor, although detailed examination of the underlying medical reasons and of the timing of the decision for cesarean is required to confirm the indication.

In the present study, approximately one-quarter of women reported obstetric symptoms during the intrapartum period. A community-based study in India found more episodes of complications during puerperium (42.9%) than during labor (17.7%) [21]. In areas of low socioeconomic status such as informal settlements, the incidence of self-reported morbidity may be as high as 75% and include a broad range of symptoms and chronic conditions [22]. The

finding that only 10% of Nepalese mothers reported postpartum symptoms might have been due to the early timing of the household interviews—which were often held within 1 week after childbirth, so any subsequent chronic problems were not accounted for. Moreover, self-reported complications can vary considerably according to women’s evaluation, contextual cultural values, and definitions of morbidity on a broad range of pregnancy-related illnesses [23].

Despite the relatively low incidence of postpartum symptoms, the common maternal danger signs recalled by the participants were similar to those reported in a community survey in the Makawanpur district of Nepal: swollen legs/face (29%) and fever lasting more than 1 day (23%) during the prepartum period; prolonged labor lasting more than 12 hours (41%) during the intrapartum period; and hemorrhage (27%) and vaginal discharge (13%) during the postpartum period [24].

Although the use of self-reported danger signs as a proxy for complications without medical verification is a limitation, validation studies have shown satisfactory concordance between self-reports of obstetric complications and clinically verified data [22]. Most obstetric symptoms are apparent to women and can be recalled without difficulty. Another limitation concerns the lack of information on other obstetric factors that might influence the decision for cesarean delivery, such as previous history of cesarean, type of pregnancy, gestational age, and financial incentives for providers. Nevertheless, the

observed associations in the present study appeared to be logical and the identified factors were plausible for Nepalese women.

In conclusion, rates of obstetric complications and stillbirth were high in central Nepal. Cesarean delivery, which accounted for 13.3% of the total deliveries, appeared to meet obstetric need and was performed with medical indication, particularly after the onset of labor. A further confirmation study is recommended to take account of the full range of personal, obstetric, and institutional factors, together with the expectation and the timing of the decision for cesarean delivery.

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Conflict of interest

The authors have no conflicts of interest.

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Figure 1 Flow chart of participants through the study.

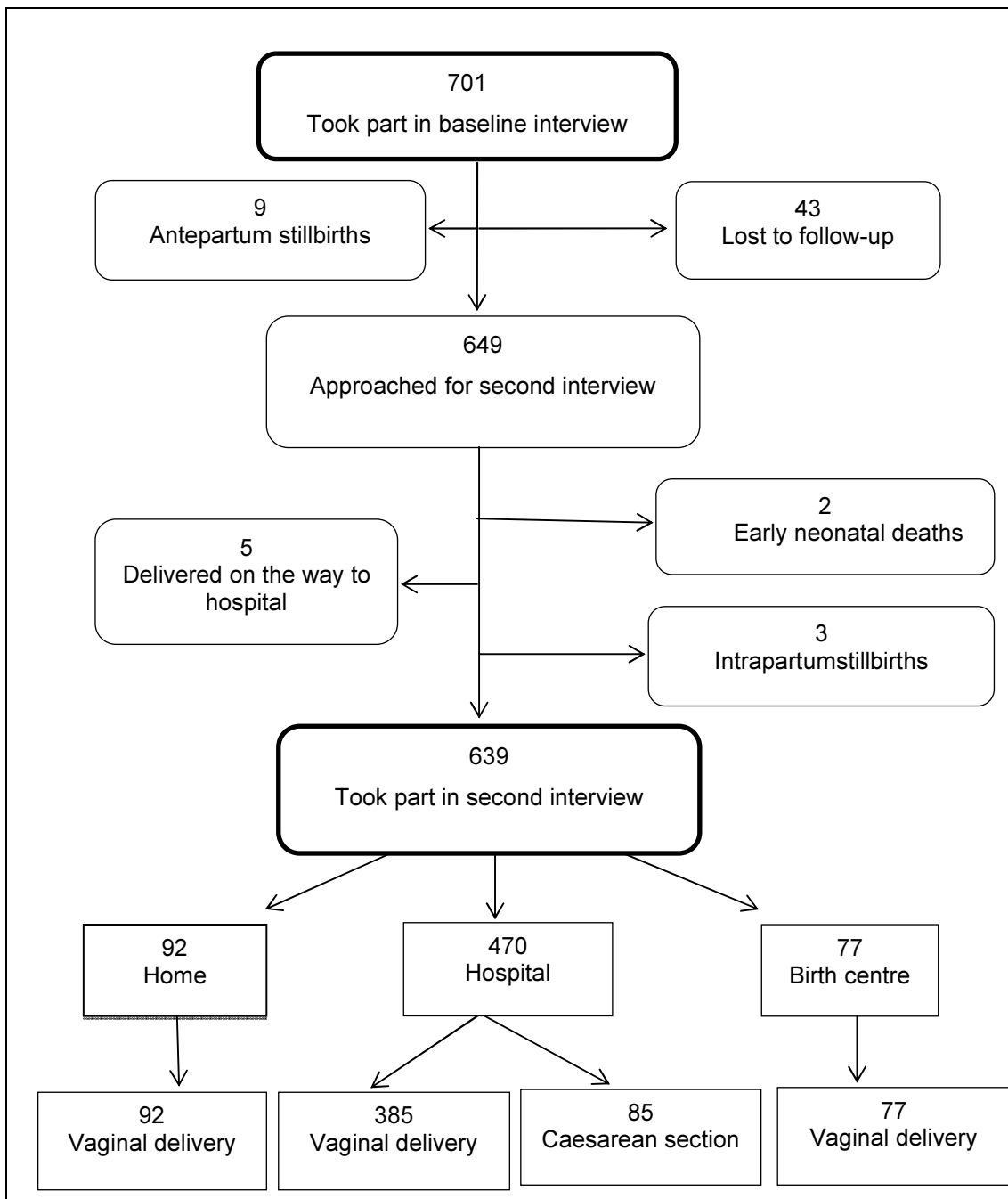


Table 1 Demographic and obstetric characteristics of participants by delivery method (n=639)^a

Characteristic	Vaginal delivery (n=554)	Cesarean delivery (n=85)	Total	<i>P</i> value
Age, y	23.38 ± 4.07	24.97 ± 4.64	23.6 ± 4.2	0.001
Caste				
Upper caste	295 (53.3)	44 (51.8)	339 (53.1)	0.065
Janajati	114 (20.6)	26 (30.6)	140 (21.9)	
Lower caste	144 (26.0)	15 (17.6)	159 (24.9)	
Education level				
None	48 (8.8)	5 (5.9)	53 (8.3)	0.029
Primary	119 (21.4)	14 (16.5)	133 (20.8)	
Secondary	211 (38.0)	25 (29.4)	236 (36.9)	
College	176 (31.7)	41 (48.2)	217 (34.0)	
Wealth quintile				
1	125 (22.7)	12 (14.1)	137 (21.5)	0.002
2	114 (20.7)	7 (8.2)	121 (19.0)	
3	101 (18.3)	20 (23.5)	121 (19.0)	
4	96 (17.4)	27 (31.8)	123 (19.3)	
5	115 (20.9)	19 (22.4)	134 (21.1)	
Residential location				
Urban	279 (50.4)	64 (75.3)	343 (53.7)	<0.001
Rural	275 (49.6)	21 (24.7)	296 (46.3)	
Delivery location ^b				
Private hospital	37 (9.6)	14 (16.2)	51 (10.9)	0.100
Public hospital	347 (90.4)	72 (83.8)	419 (89.1)	
Frequency of prenatal visits				
<4	147 (26.5)	19 (22.4)	166 (26.0)	0.413
≥4	407 (73.5)	66 (77.6)	473 (74.0)	
Parity				
1	288 (52.1)	43 (50.6)	331 (51.8)	0.470
2	157 (28.3)	20 (23.5)	177 (27.7)	

3	72 (13.0)	16 (18.8)	88 (13.8)	
≥4	37 (6.7)	6 (7.1)	43 (6.7)	
Prepartum symptoms				
No	440 (79.6)	63 (74.1)	503 (78.8)	0.252
Yes	113 (20.4)	22 (25.9)	135 (21.1)	
Intrapartum symptoms				
No	431 (78.8)	44 (52.4)	475 (75.3)	<0.001
Yes	116 (21.2)	40 (47.6)	156 (24.4)	
Postpartum symptoms				
No	498 (89.9)	76 (89.4)	574 (89.8)	0.890
Yes	56 (10.1)	9 (10.6)	65 (10.2)	

^a Values are given as mean ± SD or number (percentage) unless otherwise indicated.

^b For hospital delivery only.

Table 2 Factors associated with cesarean delivery (n=639)

Factor	Odds ratio ^a (95% confidence interval)	P value
Age	1.08 (1.02–1.15)	0.004
Education level		
None	1	
Primary	1.65 (0.52–5.21)	0.040
Secondary	2.12 (0.70–6.38)	
College	3.43 (1.17–10.07)	
Residential location		
Rural	1	<0.001
Urban	2.94 (1.68–5.15)	
Intrapartum symptoms		
No	1	<0.001
Yes	4.15 (2.49–6.91)	

^a From backward stepwise logistic regression; variables excluded were caste, wealth quintiles, frequency of prenatal visits, parity, and prepartum symptoms.

Table 3 Self-reported obstetric danger signs

Danger sign	No. (%)
Prepartum	
Heavy bleeding	52 (8.1)
Swollen hand and body	66 (10.3)
Loss of consciousness and convulsions	11 (1.7)
Blurred vision	19 (3)
Severe headache	40 (6.3)
Severe fever	10 (1.6)
Severe abdominal pain	70 (11)
Severe vomiting	7 (1.1)
Any of the above	135 (21.1)
Intrapartum	
Heavy bleeding	51 (8)
Prolonged labor	124 (19.4)
Retained placenta	27 (4.2)
Swollen hand and body	19 (3)
Loss of consciousness and convulsions	25 (3.9)
Any of the above	156 (24.4)
Postpartum	
Heavy bleeding	43 (6.7)
Severe fever	17 (2.7)
Smelly water discharge	11 (1.7)
Swollen hand and body	16 (2.5)
Loss of consciousness and convulsions	9 (1.4)
Any of the above	65 (10.2)

5 CONCLUSIONS AND RECOMMENDATIONS

This chapter pulls together the conclusions from the findings of the four papers, together with study limitations, to interpret the findings. Based on the findings and conclusions, it then suggests intervention strategies to increase the utilisation of institutional delivery services, and areas for future research.

5.1 Conclusions and recommendations

The birth preparedness programme implemented in the study district has an observable impact. Women have perceived the need for professional care, birth preparedness was high and a majority of women delivered at health facilities. Even among the women who delivered at home, a majority had planned to deliver at a health facility but happened to deliver at home mainly due to quick precipitation to reach to a health facility. Birth preparedness was positively associated with utilisation of institutional delivery services. Birth preparedness packages, if able to change intention, are likely to change behaviour as well and to increase the proportion of institutional deliveries in the pathway of meeting the MDG 5. This birth preparedness programme should be continued on a full scale in Nepal and similar other low-income countries.

Antenatal care was positively associated with subsequent delivery in a health facility. Women should be encouraged to have regular antenatal care, whereby they can be counselled about pregnancy and delivery care, associated risk and the need for professional care. Women should make at least four recommended antenatal care visits. Distance and women's education are two important determinants of their utilisation of institutional delivery services. Girls' education will have a long-term impact on maternal health service utilisation and maternal health outcomes.

Due to the difficult terrain and transportation problems in rural areas of Nepal, interventions that make maternity services physically accessible during the antenatal period are needed to increase the utilisation of health facilities for child birth. There can be several options to overcome physical accessibility barriers. For example: management of community ambulances or similar transportation vehicles such as jeeps; establishment of birth centres; or promotion of skilled attendance at home

births. In particular, the provision of transport connecting birth centres with hospitals and the option of offering maternity waiting homes for women close to delivery should be considered as important interventions to ease the barrier of distance.

The risk of bypassing the nearest birth centres to deliver at hospitals was high and was related to wealth, parity, frequency of antenatal care visits and intrapartum complications of the women. However, the main reasons given by women to bypass the birth centres were their lack of important factors: facilities for operations, medical supplies, medical equipment and competent health staff. Consequently, assurances about the technical quality of birth centres and emergency obstetric referral can motivate women to use birth centres. Quality of obstetric care needs to be maintained while expanding birth centres. On the other hand, perceptions of safety and technical quality of institutional delivery services overrode the interpersonal aspects of care when choosing the public hospital and bypassing the birth centre. Respectful provision of emotional and cultural support plays a central role in the quality of maternity services. Interpersonal aspects of maternity care need to be improved in hospital systems in Nepal.

Rates of obstetric complications and stillbirth were high in central Nepal. Caesarean delivery met obstetric needs and was performed with medical indication, particularly after the onset of labour. Further confirmation studies are recommended to take account of the full range of personal, obstetric and institutional factors, together with the expectation and the timing of any decision for caesarean delivery in Nepal.

5.2 Study strengths and limitations

This study defined all institutional deliveries as skilled attendance at birth because all birth centres in the study district were found to have skilled birth attendants as defined by the health system in Nepal, and operated on a 24-hours per day basis. However, availability of skilled birth attendants might not be the case throughout the country, especially in remote areas where birth centres might not have skilled attendants during childbirth. Further, this study did not take account of skilled attendance at home deliveries, as monitoring of skilled birth in homes is difficult. Though institutional delivery is the policy of the Government of Nepal, skilled attendance at homes can still save mothers' lives in remote areas where pregnant

women and relatives need to travel a long distance, often on foot, to reach a health facility that can provide emergency obstetric services.

Unlike many previous studies which adopted a cross-sectional design, this study is peculiar in its cohort study design. Although cross-sectional design can assess the role of fixed socio-demographic factors including age, education, distance, wealth, parity, etc., the cohort study design was essential in investigating the association between birth preparedness and institutional delivery, and also in measuring the bypassing status of birth centres. In a cross-sectional design, prospective assessment and time-relation of birth preparedness with subsequent delivery at health facilities could not be established. Similarly, follow-up of women, especially rural women who had access to birth centres as their nearest health facilities that could provide delivery services, helped to track their eventual delivery behaviour. This study, however, missed collection of information as to whether the rural women who bypassed the birth centres were referred by those birth centres to deliver at urban hospitals. Some women having antepartum or intrapartum problems might have been advised to go to hospitals. However, the referral mechanism in the study district is almost non-functional. Further, women who bypassed the birth centres perceived them as being of low technical quality in terms of equipment and competent health staff, which could not be professionally audited as part of the study.

This study was community-based, whereby local female data collectors, who were aware of local contexts and issues, identified the pregnant women, tracked them after delivery and conducted face-to-face interviews at the respondents' homes. The community-based sampling and recruitment, and low refusal rate (6.3%) enabled study participants to be representative of the Kaski district. Yet, the majority of participants were still young and nulliparous. The community orientation of the study was essential to cover all types of places of delivery. This enabled the investigator to solicit obstetric morbidity data, irrespective of place of delivery, even though many morbidity assessment studies are hospital-based. However, all morbidity symptoms assessed were self-reported and no clinical verifications could be made. Further, this study also lacked information on various obstetric factors that might influence the decision for a caesarean delivery, such as previous history of caesarean section, type of pregnancy, gestational age and financial incentives for providers.

This study used 15 local, female data enumerators. Use of different interviewers might introduce individual differences in conducting the interviews, in spite of using a structured questionnaire. That is why all data enumerators were trained by the principal investigator to conduct interviews by strictly following the order and wording of the questionnaire. Another concern is that respondents could be biased because the interviewers were locally known women. Though there was minimal recall bias in assessing preparedness activities, all preparedness activities were spontaneously self-reported and could not be verified. For example, when women replied that they had arranged transportation, attempts were not made to discover which transportation and whether this existed or it was feasible for the women. Further, the measurement of preparedness can differ by probing or not probing a specific question, and this study measured preparedness without probing.

Nepal, though a small country, is extremely diverse in its geography, culture, and social development. Kaski, the study district as described earlier in Chapter 3, is comparatively developed and, most importantly, physically accessible even though it is in a hilly region. Most of the rural areas are connected to the urban valley, and to local birth centres, by ungravelled roads. Almost half of the population lives in the urban valley, which has a regional public hospital and several private hospitals that offer free delivery services. The women's literacy and the human development index of the Kaski district are relatively high. That is why the overall utilisation rate of institutional delivery services and birth preparedness are high in the Kaski district compared with the average statistics of Nepal. Unfortunately, not all districts of Nepal enjoy similar physical accessibility, health infrastructure and social development. So, estimations of institutional deliveries, bypassing rate, birth preparedness and caesarean delivery rate in this study do not represent Nepal and conclusions cannot be generalised to the whole of Nepal.

This study has been based in a quantitative paradigm, as informed by the three delays framework, in assessing the factors associated with institutional deliveries. Being a quantitative study, this study could not investigate in detail the reasons for home delivery and for bypassing the birth centres, which would have been better explored by qualitative methods.

5.3 Recommendations for future research

This study did not distinguish between preventive obstetric care-seeking and emergency obstetric care-seeking strategies. Although, as explained in the literature review in Chapter 2, there are similar barriers in assessing institutional delivery services, the relative importance of barriers may be different because the context and consequences in two situations differ. In emergency obstetric care, there is a clear threat to women's lives and the physical accessibility of health facilities can have a greater impact. So, it will be appropriate to study the barriers and their relative importance in each situation.

Birth preparedness studies in the future can verify the preparedness activities to assess whether such activities are likely to be implemented by women and their families. In doing so, it may be necessary to study community resources because transportation and blood donation are often community phenomena. Even if a woman replied that she was prepared for transportation, this depends upon the availability of transportation within the community whenever needed. Other strong study designs to assess the effectiveness of birth preparedness are a comparative study or a randomised control trial. Future studies should apply these study designs whenever possible. This study could not apply either of these designs because the birth preparedness programme has been implemented all over Nepal, including the study district.

The literature is conclusive about the positive role of antenatal care and women's education in the utilisation of institutional delivery services but less clear on how these two factors work toward the positive outcome. Women's education can have several pathways in its impact: for example, by increased health and obstetric knowledge or by increased cognitive skills associated with higher education. Antenatal care increases women's obstetric knowledge and highlights pregnancy problems. Future studies can elucidate the pathways of educational and antenatal care impact. It would be particularly interesting to know whether obstetric knowledge has greater role or the educational impact mostly stems from the cognitive factor. Further, education and obstetric knowledge can have a combined role.

Distance has been identified as an important barrier in accessing health facilities for deliveries. Future research should evaluate different interventions to ease this barrier. One particular option for further investigation in Nepal is whether maternity waiting homes are acceptable for women and their families, and why. If maternity waiting homes are acceptable and affordable, they will enhance the uptake of institutional deliveries in Nepal. Another area of investigation in this regard is utilisation of the nearest birth centres and a referral mechanism to hospitals. Women indicated that they perceived the quality of birth centres to be lower, but this should be verified professionally with a quality audit. So, whether women's perceptions match with observations of quality is an important area for further investigation.

There are some instances when qualitative methods will reveal knowledge and problems in detail. Qualitative studies should be conducted to further understand and explore the reasons behind home delivery and bypassing the birth centres. Women's experiences of quality of care during childbirth and the role of family members in decision-making about institutional delivery services, deserve qualitative investigation.

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APPENDICES

Appendix A: Published review paper

Karkee R, Lee AH, Binns CW: Why women don't utilize maternity services in Nepal: a literature review. *WHO South-East Asia Journal of Public Health* 2013, 2(3-4):135-141. [http://www.searo.who.int/publications/journals/seajph/seajphv2n\(3-4\)p135.pdf](http://www.searo.who.int/publications/journals/seajph/seajphv2n(3-4)p135.pdf)

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Why women do not utilize maternity services in Nepal: a literature review

Rajendra Karkee^{1,2}, Andy H Lee², Colin W Binns²

ABSTRACT

The structure and provision mechanism of maternity services in Nepal appears to be good, with adequate coverage and availability. Utilization of maternity services has also improved in the past decade. However, this progress may not be adequate to achieve the Millennium Development Goal to improve maternal health (MDG 5) in Nepal. This paper reviews the factors that impede women from utilizing maternity services and those that encourage such use. Twenty-one articles were examined in-depth with results presented under four headings: (i) sociocultural factors; (ii) perceived need/benefit of skilled attendance; (iii) physical accessibility; and (iv) economic accessibility. The majority of the studies on determinants of service use were cross-sectional focusing on sociocultural, economic and physical accessibility factors. In general, the education of couples, their economic status and antenatal check-ups appeared to have positive influences. On the other hand, traditional beliefs and customs, low status of women, long distance to facilities, low level of health awareness and women's occupation tended to impact negatively on service uptake. More analytical studies are needed to assess the effectiveness of the Safer Mother Programme, expansion of rural birth centres and birth-preparedness packages on delivery-service use. Moreover, it is important to investigate women's awareness of the need of facility delivery and their perception of the quality of health facilities in relation to actual usage.

Key words: Millennium Development Goal 5, safe motherhood, utilization, maternal health service, Nepal

INTRODUCTION

Safe motherhood has been a national priority programme in Nepal since formulation of the National Safe Motherhood policy in 1998. The National Safe Motherhood plan (2002–2017), revised in 2005, formed the basis of the current Safe Motherhood and Newborn Health Long Term Plan (2006–1017).¹ This Safe Motherhood Programme has attracted international support for programmatic activities, policy formulation and infrastructure development to improve maternal health in line with Millennium Development Goal (MDG) 5.

As a result of these programmes, there is good coverage of maternity services across most of Nepal. The Safe Motherhood Programme provides essential maternity services to all women through an extensive four-tiered district health system: (i) sub-health post; (ii) health post; (iii) primary health care centre; and (iv) district hospital. In addition, there are outreach mobile clinics and female community health volunteers at the peripheral level. At the sub-health posts, maternal and child health workers provide antenatal and postnatal care and

assist in home deliveries. Auxiliary nurse midwives provide antenatal and postnatal care at health posts, some of which have birthing facilities. The primary health care centres and district hospitals provide antenatal, postnatal and delivery care as well as emergency obstetric services. There has been a substantial growth in primary health care facilities that reach out to peripheral areas.

The Government of Nepal – in partnership with Jhpiego and other nongovernmental organizations – has incorporated birth preparedness and complication readiness packages into the Safe Motherhood Programme. The Government also launched the *Aama Surakhhya Karyekram* (Safer Mother Programme), which includes two components: the safe delivery incentive programme (initiated in July 2005) and free delivery care for uncomplicated, complicated and caesarean section births at all health facilities capable of providing these services (initiated in January 2009). The incentive programme provides cash to women as well as payment to the health facility.

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There has been an increase in the utilization of maternal services over the past decade. For example, antenatal visits, the use of skilled birth attendants and contraceptive usage increased from 9%, 10% and 28.5% in 1996 to 29%, 19% and 48%, respectively, in 2006.² An indicator of MDG 5 is to achieve 60% of births by skilled birth attendants by 2015³; in 2011 this figure was 36% in Nepal.⁴ Utilization of skilled birth attendants varies by place of residence, family income and ethnicity.⁵ Delivery at a health facility linked to a referral hospital remains the core strategy of the Safe Motherhood Programme to reduce maternal mortality,⁶ since the majority of maternal deaths result from pregnancy-related complications such as haemorrhage, infections, hypertensive disorders and obstructed labour.⁷ Therefore, the low utilization of maternity services in Nepal is of great concern.

Three major reviews on factors associated with maternity service use have been published. Thaddeus and Maine⁸ reviewed the determinants of maternal mortality and proposed the “three delays”. They classified the factors that account for these delays into four broad categories: sociocultural, distance, cost and quality. Say and Raine⁹ investigated inequalities in the use of maternal health care. They found wide urban–rural and rich–poor variations and concluded that such variations were usually framed by contextual issues relating to funding and organization of health care, as well as social and cultural issues. Based on these two reviews and more than 80 original research articles, Gabrysch and Campbell¹⁰ identified 20 potential determinants associated with maternity service usage. These previous reviews also indicated that the impact of determinants is context specific, such that a particular factor significant in one geographical setting might not be relevant in another. The aim of this paper is to review the factors that impede or encourage the use of maternity services in Nepal.

the potentially relevant articles were retrieved and quality assessment and data extraction were then undertaken.

Conceptual framework on determinants of maternal service use

Since the determinants of maternal service use are context specific, study methodologies vary and thus a formal systematic review of this broad topic was impractical.¹⁰ The results of this review are therefore presented in a narrative form, organized according to the four themes: (i) sociocultural factors; (ii) perceived need/benefit of skilled attendance; (iii) physical accessibility; and (iv) economic accessibility.

Search outcomes

The search of the first three concepts (maternal health care, health service use, and influencing factors) in the title and abstract field yielded 19 036 articles (Figure 1). When the geographical region (Nepal) was added, the result narrowed to 151 articles. These articles were screened for relevance. Only 21 articles, which are summarized in Table 1, satisfied the inclusion criteria. The majority of studies were carried out in and around the Kathmandu valley. One study used qualitative methods; some studies employed a combination of qualitative and quantitative methods; others applied quantitative methods including an analysis of secondary data derived from national surveys.

METHODS

Search strategy and inclusion criteria

The electronic databases Medline, EMBASE, Science Direct, PubMed, CINAHL, and BioMED Central were searched for relevant articles. Key words used to identify the four main concepts were: (i) maternal health care (matern*/ obstetric*/ reproduct*/ delivery/ antenatal/ postnatal/ postpartum/ newborn); (ii) health service use (utilization/access*/ health service/ use); (iii) determinants or influencing factors (factor/ determinant/ barrier/ quality/ decision); and (iv) geographical area (Nepal). First, a search was conducted by combining the first two concepts in the title and abstract fields using Boolean terms, word truncation and wildcards. A further search then included the other two concepts. All articles were exported to EndNote for criteria analysis. Inclusion criteria of the articles were: (i) published during 1990–2012; (ii) quantitative or qualitative study; (iii) reported in English; (iv) related to Nepal and published in peer-reviewed journals; and (v) antenatal, delivery or postnatal factors as outcomes. The full texts of

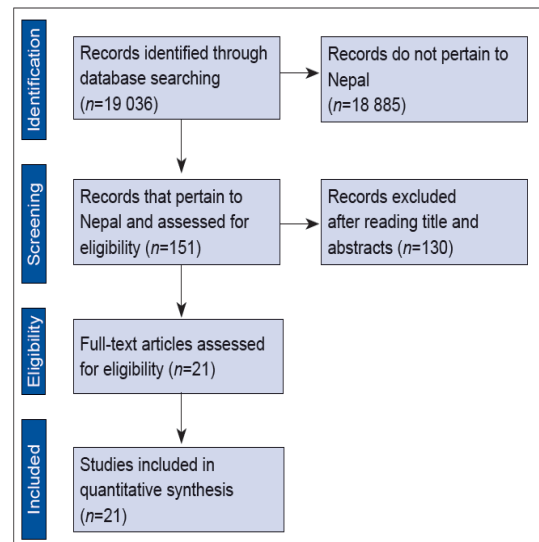


Figure 1: Selection process for the literature review

Table 1: Summary of studies on determinants of maternity service use in Nepal

Author(s)	Study design	Independent variables	Sample	Year; location	Findings
Acharya and Cleland ²⁹	Cross-sectional	Distance, quality	592 women	1994; western and mid-western Nepal	High structural quality of the nearest health posts had a positive effect on service uptake
Bolam et al. ¹³	Cross-sectional survey with community follow-up	Maternal education, maternal age, parity, poverty indicators	357 Pregnant women	1996; Kathmandu	Poor maternal education and multiparity increased the likelihood of home delivery
Brunson ²³	Household survey, participant observation, case studies	Woman's social position, custom	250 households and 30 case studies	2003–2005; Kathmandu	Women were not in a position to demand biomedical care
Chaudhary ³¹	Cross-sectional hospital-based	Cost, distance, availability of transport, antenatal check-up, obstetric factors	45 women who delivered on the way to hospital	2004; Kathmandu	Delivery on the way to hospital was caused by (i) lack of ability to recognize onset of labour and (ii) transport delay
Dhakal et al. ¹⁷	Cross-sectional community-based	Women's and husband's occupation and education, ethnicity, parity, antenatal check-ups	150 mothers	2006; Kathmandu	Wealth, husband's education and antenatal check-ups positively influenced postnatal care
Furuta and Sakway ¹¹	Nepal Demographic Health Survey data analysis	Women's position: decision-making, working, control over earnings; education; spousal discussion of family planning	8400 ever-married women	2001; Nepal	Spousal discussion, working plus control of earnings and women's secondary education increased antenatal care and delivery-service use
Hodgins et al. ²⁷	Pre- and post-intervention surveys	Birth-preparedness package (antenatal counselling on danger signs and preparation activities)	900 recently delivered women in each of the two districts	2005 (baseline) and 2007 (endline); Jhapa and Banke districts	Delivery in a health facility increased only marginally
Hotchkiss ³⁰	Analysis of Nepal Living Standard Survey data	Age, education, birth order, religion, women's employment, household characteristics, physical accessibility	1434 women	1996; Nepal	Improved physical access has significant impact but further physical increase would have modest impact
Matsumura and Gubhaju ¹⁴	Analysis of National Family Health Survey data	Education, work status, job type, income, decision-making, family structure, region	1388 women	1996; Nepal	Women's education, good economic status and extended households had positive influences while women's employment had a negative influence
McPherson et al. ²⁶	Pre- and post-intervention survey	Birth preparedness: antenatal-care visit, financial preparations, transport preparations, knowledge of danger signs (prolonged labour and excessive bleeding)	300 mothers of infants younger than 1 year	2002 (baseline) and 2004 (endline); Siraha district	No increase in skilled birth attendance but increase in postnatal care
Mesko et al. ²¹	Cross-sectional, case studies, focus groups	Traditional beliefs, information availability, health knowledge, cost	8798 women; 30 case studies; and 43 focus groups	2001; Makawanpur district	Cultural requirement for maternal seclusion; poor health knowledge of danger signs; and perceived expense delayed care-seeking
Mullany et al. ¹⁸	Randomized controlled trial	Husband's health education	442 women seeking antenatal services	2004; Kathmandu	Husband's antenatal health education had a positive impact on birth preparedness and postpartum visits
Neupane and Doku ¹⁹	Analysis of Nepal Demographic and Health survey data	Sociodemographic variables: age, place of residence, education, parity, occupation, religion, smoking status, wealth index, sufficiency of advice	4136 women aged 15–49 years	2006; Nepal	Maternal age, education, parity, wealth and sufficiency of advice were associated with skilled attendance at birth

Neupane and Doku ²⁰	Analysis of Nepal Demographic and Health survey data	Sociodemographic variables: age, place of residence, education, parity, occupation, religion, smoking status, wealth index	4136 women aged 15-49 years	2006; Nepal	Maternal age, education, parity and wealth were associated with timing and the number of antenatal-care visits
Pandey et al. ²⁴	Analysis of Nepal Demographic and Health survey data	Women's empowerment	7878 previously pregnant women	2006; Nepal	Women's age at birth of their first child, their education and knowledge about sexually transmitted diseases increased utilization of antenatal and delivery services
Sharma et al. ²⁸	Analysis of National Family Health Survey (1996) and Nepal Demographic Health Survey (2001) data	Women's status, information availability, household characteristics, region	8148 women for prenatal care; 8218 for delivery care; and 7788 for postnatal care	1996, 2001; Nepal	Health workers' visits, educational status and household economic status have a positive influence
Shrestha et al. ²⁵	Community-based cross-sectional study	Age, education, residence, ethnicity, parity, number of antenatal-care visits	732 married women of reproductive age	2011; Kavrepalanchok district	Multiparity, teenage pregnancy, few or no antenatal visits were likely to be associated with home delivery
Simkhada et al. ²²	In-depth interview	Sociocultural factors	30 mothers; 10 husbands and 10 mothers-in-law	2006; Kathmandu	Mothers-in-law frequently had a negative influence on uptake of antenatal care
Thapa et al. ¹⁶	Household survey, focus group discussions, in-depth interviews	Custom and beliefs, level of knowledge, woman's education, husband's education, religion, ethnicity, parity, age, husband's occupation	657 women who gave birth during previous 5 years; 29 participants in 4 focus groups; and 14 key-informants	1996; Jumla district	Local customs, traditional beliefs and lack of knowledge caused high-risk delivery practices; husband's education level was positively associated with hygienic delivery practices
Tuladhar et al. ¹⁵	Prospective hospital-based study	Education, parity, age, antenatal care	114 attempted home-delivery cases	2004–2008; Kathmandu	Low education, multiparity and young age were associated with complications of home delivery
Wagle et al. ¹²	Cross-sectional	Distance, economic status, education, parity, antenatal-care visits, obstetric history, age of mother, ethnicity, family structure	308 postpartum women	2002; Kathmandu and Dhading district	Distance, low socioeconomic status, low education and not seeking antenatal care were significantly associated with home delivery

RESULTS

Sociocultural factors

Sociocultural factors include maternal age, marital status, ethnicity, religion, traditional beliefs, family composition, mother's education, husband's education and women's status. Most of the reviewed studies analysed at least one of these factors. Higher female education was found to be positively associated with facility use, while women who delivered at home had a lower level of education.¹¹⁻¹⁵ Higher male education also had a positive effect on service use.^{16,17} The inclusion of husbands in antenatal health education appeared to improve birth preparedness and postpartum visits.¹⁸

An analysis of the national family health survey data suggested that women's education and economic status, and extended households, are positively associated with service use.¹⁴ Moreover, sociodemographic factors including maternal age, education, parity and wealth were associated with delivery assisted by a skilled attendant,¹⁹ as well as timing and number of antenatal care visits.²⁰ Thapa et al.¹⁶ described traditional beliefs and customs in the remote western area of Nepal, which had a significant negative impact on the use of maternal health services. They found that many women used an animal shed for delivery, mainly due to cultural belief that the household deity would be angry if delivery took place inside the house, and that menstruation and childbirth were considered to be pollution. The cultural requirement of maternal seclusion up to 12 days after delivery might cause delays in seeking care for

postnatal complications in central Nepal.²¹ However, ethnicity, age of the mother, ritual observance of menarche, type and size of family were not significantly associated with the place of delivery.¹² Mothers-in-law tended to have a negative influence on service use.²²

An ethnographic study of childbirth²³ concluded that pregnant women lack the power to demand biomedical care, and that men remain largely uninvolved in the care-seeking process. In our review, few women participated in household decision-making, and even fewer had any control over their own earnings. Although involvement in decision-making had no significant impact on antenatal and delivery care, spousal discussion on family planning and earnings were linked to an increased likelihood of health service use.¹¹ Similarly, other indicators of women's empowerment, including age at birth of their first child and education and knowledge about sexually transmitted diseases, could significantly increase the use of maternal health services.²⁴

Perceived need/benefit of skilled attendance

A range of factors such as knowledge of pregnancy and health risks, importance given to pregnancy, previous facility use, antenatal visits and pregnancy complications, can affect whether a woman perceives the need for facility delivery. Some studies reported that multiparity was perceived as a significant risk factor for a home delivery,^{12,13,25} and associated with use of postnatal care.¹⁷ Having an antenatal check-up usually leads to subsequent health service use. However, birth-preparedness interventions that include antenatal counselling on danger signs and preparation activities appeared to exert no impact²⁶ or marginal impact on skilled attendance.²⁷ Based on a comparative analysis of the 1996 and 2001 Nepal Demographic Health Surveys, Sharma et al.²⁸ showed that the use of maternal health services increased during this period, partly because of improved dissemination of maternal health information through various mass media sources. Only one study²⁹ reported that the structural quality of the nearest health post had an important effect on the use of health services. (Structural quality was assessed in terms of physical infrastructure, number of staff, availability of drugs and provision of maternal and child health clinics.)

Physical accessibility

Physical accessibility includes place of residence, distance to the health facility and transport availability. Residence in rural and mountainous areas makes it difficult to access health facilities and may be responsible for not seeking maternal care.¹² Improved physical access may thus enhance the use of antenatal care and birth delivery by a trained health-care provider, but further physical advantage would offer only a modest impact.³⁰ Distance and availability of transport were also found to be important in urban areas for the timely utilization of emergency delivery services.³¹

Economic accessibility

Economic accessibility encompasses household socioeconomic status, husband and wife's occupation, family income and cost of facility delivery. The latter includes transportation and opportunity costs of travel time. Higher household economic status was found to be positively associated with facility use.^{11,12} However, one study near Kathmandu found that poverty indicators were not a significant risk factor for home delivery.¹³ No study investigated the effect of direct or indirect cost of delivery, and only one study identified "perceived cost" as a deterrent in seeking care beyond the household.²¹ Women's employment or working status appeared to have a negative influence on the use of health services,¹⁴ and women who work but have no control over the use of their earnings are least likely to receive antenatal and delivery services.¹¹

DISCUSSION

Nepal is a culturally diverse country with 125 recorded ethnic groups.³² Despite this, detailed investigation of the ethnic and cultural impact on the use of maternal services in the country is lacking. Many traditional beliefs and customs, linked with ethnicity and religion, can influence the effective use of maternity services, primarily the decision to seek care. The effects of ethnicity on the uptake of maternity services have been reported in Guatemala and China.^{33,34} In Cambodia, professional midwives often act as "cultural brokers" because Khmer women use their own vocabulary to describe problems during pregnancy, birth and the postpartum period.³⁵ In Uganda, adherence to traditional birthing practices and belief that pregnancy is a test of endurance are responsible for insufficient use of maternal services.³⁶ The main reason for home delivery in slums in Mumbai, India, and in Ethiopia is custom.^{37,38} The mother-in-law usually makes decisions about a pregnant woman's workload, care-seeking and the delivery process in rural Nepal,²² while husbands in Uganda and local healers or traditional birth attendants in Bangladesh influence care-seeking.³⁹

It is unsurprising that the majority of studies conducted in Nepal and other countries have emphasized sociocultural and demographic factors.¹⁰ On the other hand, emphasis on sociocultural factors can mask the relative importance of factors such as those related to service delivery, where communities may be accused of having poor pregnancy outcomes because of their cultural and social system.

Almost all studies found distance as a deterring factor in seeking maternity care in Nepal. The effect of distance is exacerbated by poor roads and limited availability of transportation vehicles. For these reasons, the expansion of birth centres and maternity services in lower-level health posts may lead to increased service uptake. Such birth centres have increased in numbers⁴⁰ but it remains unclear whether they are adequately used for antenatal care and delivery or provide a quality obstetric service. In Uganda, women often bypass local facilities to deliver at a hospital that is further away.⁴¹ Various options of transportation, maternity waiting rooms, together with the combined impact of distance and perceived quality of facility delivery, deserve further investigation.

Economic factors also deter the use of maternal health services, especially in low-income and marginalized communities. In Viet Nam, even with compulsory health insurance, poor women are less likely to deliver in a facility than middle- and high-income women.⁴² The provision of free maternity services or reduction in user fees may encourage women with a low income to use appropriate health services. However, there may still be substantial “hidden costs” involved, such as transport and provider fees⁴³ and costs associated with caesarean section.⁴⁴

Nepal’s Safer Mother Programme has resulted in increased use of maternity services.⁴⁵ Elsewhere, initiatives that have significantly increased facility-based deliveries can be seen in Kenya, which implements a voucher programme that enables access to four antenatal care visits, a facility-based delivery including caesarean section, and treatment of delivery complications,⁴⁶ and in China, where a cooperative medical insurance scheme includes a maternal health-care benefit package.⁴⁷ Nevertheless, even when free services are available nearby, there is no guarantee that they will be utilized unless deemed by mothers to be beneficial. Further research is therefore required to understand the impact of Nepal’s Safer Mother Programme on the use of maternal services, especially with respect to different castes and economic groups.

Few studies have attempted the complex task of assessing women’s perceived need for health-facility delivery. This can be influenced by pregnancy-related factors as well as distance, cost and quality. A positive perception of the added value of delivery in a facility is usually the motivating factor for women and families to seek maternity care.⁴⁸ On the other hand, since pregnancy and childbirth are often considered normal events, if this value is not perceived, professional care is unlikely to be sought.⁴⁹

Birth-preparedness and awareness-raising programmes may help mothers to seek and demand care. Perceived complications and health knowledge,^{39,50} and women’s intention about where to deliver,⁵¹ were associated with use of professional medical care in Bangladesh. Antenatal counselling, use of a birth plan and access to a social network reduced delays in seeking care for an obstetric emergency in Afghanistan.⁵² Unlike Nepal, birth-preparedness packages increased skilled delivery care in Bangladesh,⁵³ Burkina Faso⁵⁴ and the United Republic of Tanzania.⁵⁵ Further studies are needed to assess the effect of birth-preparedness packages on skilled attendance at birth in Nepal.

CONCLUSION

The majority of the studies relating to determinants of maternal service use in Nepal were cross-sectional focusing on sociocultural, economic and physical accessibility factors. In general, increased educational and economic status of couples and antenatal check-up attendance appeared to have a positive influence on the use of maternity services. On the other hand, traditional beliefs and customs, low status of women, long distance, low level of health awareness and women’s occupation tended to have a negative impact on service uptake.

However, the relative importance of these factors should be examined in the changing context of culture, values and the health system. More analytical studies are also needed to assess the effectiveness of Nepal’s Safer Mother Programme, expansion of rural birth centres and birth-preparedness packages in delivery-service use. Finally, it is important to investigate women’s awareness of the value of facility delivery and the relation between their perception of the quality of health facilities and actual usage.

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Appendix B: Questionnaires used in the study

Part A: Socio-demographic and perceived need (Baseline interview, pregnant women 5-8 months; at recruitment)

Respondent ID /_____/_____/_____/	Name of village/ward:.....
Village/Ward ID /_____/_____/	Name of the mother.....
Interviewer ID /_____/_____/	Duration of pregnancyweeks
Date of Interview Month.....Day.....	

Section 1. Socio-economic and demographic information

First, I ask you some general questions about yourself.

101	What is your age (years)?Years
102	At what age did you get married?Years
103	What is your family name?
104	What is your religion?	1. Hindu 2. Buddhist 3. Muslim 4. Other (Specify).....
105	Can you read a letter or newspaper?	1. Yes 0. No
106	What is the highest level of education you attended?	1. No schooling 2. Primary 3. Secondary 4. Higher education
107	Can your husband read a	1. Yes

	letter or newspaper?	0. No
108	What is the highest level of education your husband attended?	1. No schooling 2. Primary 3. Secondary 4. Higher education
109	How many members are there in your house? Decide whether this family is joint or nuclear 1. Extended 2. Nuclear
110	What is your main occupation? <i>(Tick only one; Don't read the list)</i>	1. Employed/ salaried job (name.....) 2. Semi-employed a. wage based labour b. small business c. employed aboard 3. Unemployed (housewife, agricultural)
111	What is your husband's main occupation? <i>(Tick only one; Don't read the list)</i>	1. Employed/ salaried job (name.....) 2. Semi-employed a. wage based labour b. small business c. employed aboard 3. Unemployed (agricultural)
112	What is your family income per month?	NPR.....
113	Is this your first pregnancy?	1. Yes → go to 119 0. No
Now please try to recall <u>all of your</u> past pregnancies and deliveries:		
114	How many pregnancies have you had before?

115	How many children have you given birth, including stillbirths?	Number..... Son.....Daughter.....Stillborn.....
116	What is the age of your youngest child?Months
117	Have you had any complications in your previous pregnancy and childbirth?	1. Yes 0. No
118	Have you used any institutional delivery services before?	1. Yes 0. No
119	Main source of drinking water:	1. Piped water in home/yard 2. Common piped water near home 3. Surface water (river/spring/ponds)
120	Toilet facility in the household:	1. Flush toilet 2. Ventilated improved pit latrine 3. Pit latrine 4. No facility
121	Do you share this toilet facility with other households?	1. Yes 0. No
122	<u>Main source</u> of cooking fuel:	1. Electricity/LPG gas 2. Biogas 3. Kerosene 4. Wood 5. Other (Specify).....
123	Do you have a separate kitchen for cooking?	1. Yes 0. No
124	<u>Main material</u> of the floor of the house:	1.Natural (earth/mud) 2.Semi-polished (partly cemented) 3.Polished(cemented/marbled/carpeted)
125	Does your household	

	have:	
	a. Electricity	1. Yes 0. No
	b. Radio	1. Yes 0. No
	c. TV	1. Yes 0. No
	d. A mobile phone	1. Yes 0. No
	e. A sofa	
	f. A cupboard	1. Yes 0. No
		1. Yes 0. No

Section 2. Perceived need (health knowledge, birth preparedness and complication readiness)

Health knowledge		
201	Have you received any information regarding pregnancy and delivery care?	1. Yes 0. No →go to 203
202	<u>If yes</u> , where did you get this information <u>at first?</u> <i>(Tick only one option; also note down which health facility or which health worker?)</i>	1. At health facility (DH, PHC, HP, SHP, Private clinic) 2. From health workers (VHW, MCHW, FCHV/TBA) 3. Friend/neighbour 4. Radio 5. TV 6. Other (specify).....
203	In your opinion, can unexpected problems occur during any pregnancy, delivery or after delivery that could endanger the life of a woman?	1. Yes 2. No 3. Do not know
204	Have you known about the government plan of the “ <u>Safe delivery incentive scheme</u> ”?	1. Yes 0. No
205	Have you ever heard about “ <u>birth preparedness</u> ”?	1. Yes 0. No →go to 207

206	<p>What kind of preparation should you do <u>beforehand for the delivery of the baby?</u></p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p> <p><i>Probe: Any others?</i></p>	<ol style="list-style-type: none"> 1. Identification of health facility to deliver 2. Arrangement to have skilled birth attendant at birth 3. Save money 4. Identify transportation 5. Identify people who can donate blood 6. Buy delivery kit “<i>sutki samagri</i>” 7. Prepare “<i>bhoto, topi and blanket</i>” for the newborn baby 8. Others (specify).....
<p>Knowledge of danger signs: There are danger signs that can occur during pregnancy; during childbirth; after childbirth and to the neonate. I will ask you what danger signs you know.</p>		
207	<p>In your opinion, what are the common <u>danger signs</u> that can occur <u>during pregnancy?</u></p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p> <p><i>Probe: Any others?</i></p>	<ol style="list-style-type: none"> 1. Vaginal Bleeding 2. Swollen hands and body 3. Loss of consciousness and convulsions 4. Blurred vision 5. Severe headache or dizziness 6. Fever 7. Severe abdominal pain 8. Other (specify).....
208	<p>In your opinion, what are the common <u>danger signs during labour and childbirth?</u></p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p> <p><i>Probe: Any others?</i></p>	<ol style="list-style-type: none"> 1. Severe vaginal bleeding 2. Prolonged labour for more than 12 hours 3. Placenta not delivered within 30 minutes after delivery 4. Loss of consciousness and convulsions 5. Swollen hands and body 6. Others (specify).....
209	<p>In your opinion, what are the common <u>danger signs</u> to the mother during the <u>first four weeks after delivery?</u></p>	<ol style="list-style-type: none"> 1. Severe vaginal bleeding 2. High fever 3. Smelly water discharge from vagina 4. Swollen hands and body

	<p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p> <p>Probe: Any others?</p>	<p>5. Loss of consciousness and convulsions</p> <p>6. Others (specify).....</p>	
210	<p>In your opinion, what are the neonate <u>danger signs</u>? (0-28 days)</p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p> <p>Probe: Any others?</p>	<p>1. Feeding difficulties or not sucking or vomiting</p> <p>2. Difficulty in breathing</p> <p>3. Feels cold or hot or has high fever</p> <p>4. Rashes or pimples in skin</p> <p>6. Very small baby/no weight gain</p> <p>7. Infection on umbilical cord</p> <p>8. Others (specify).....</p>	
Birth preparedness			
211	<p>Where are you planning to deliver your baby?</p>	<p>1. Home (ask question 212)</p> <p>2. Health facility(ask question 213)</p> <p>3. Undecided/do not know</p> <p>4. Other (specify).....</p>	
212	<p>a) Who will attend and assist you during the period of childbirth?</p> <p><i>(Ask this question only if respondent is planning to deliver at home; see question 311)</i></p> <p>Tick only one option</p> <p>b) Have you or your family thought of buying a delivery kit for delivery purposes?</p>	<p>No-SBA</p> <p>1. Family member</p> <p>2. Neighbours and friends</p> <p>3. Traditional birth attendants (TBA, FCHV)</p> <p>1. Yes</p> <p>0. No</p>	<p>SBA</p> <p>4. Health workers (MCHW, ANM, SN, HA, Doctor)</p> <p>5. Undecided or do not know</p>
213	<p>Which health facility will you go to?</p> <p><i>(Ask this question only if respondent is planning to go to health facility, see question 311)</i></p> <p>Also note down the name of health facility</p>	<p>Government:</p> <p>1. Hospital</p> <p>2. PHCC</p> <p>3. HP/SHP</p>	<p>Private:</p> <p>4. Nursing home</p> <p>5. Pharmacy</p> <p>6. Others (Specify).....</p>

214	In your opinion, is it necessary to deliver a baby in a health facility?	1. Yes 2. No 3. Do not know	
215	Have you spoken with anyone outside of a health facility about where you should give birth to your baby?	1. Yes 0. No	
216	Have you/your family thought of arranging transportation to a health facility if needed/in emergency?	1. Yes 0. No	
217	Have you or your family <u>saved money</u> for delivery purposes if needed?	1. Yes 0. No	
218	Have you or your family identified blood donor if needed?	1. Yes 0. No	
219	In your opinion, does a pregnant woman need to have antenatal check-ups?	1. Yes 0. No → go to 223	
220	How many times (at least) should a pregnant woman go for antenatal check-ups?	No. of times.....	
221	In your opinion, why should a pregnant woman go to, or what will a pregnant woman get from, the ANC? <i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i> <i>Probe: Any others?</i>	1. For a medical check- up 2. To get iron tablets 3. To get TT shots 4. To check blood pressure 5. To get de-worming tablets 6. To receive health education on nutrition and hygiene 7. To learn danger signs of pregnancy, delivery and postpartum 8. Others.....	
222	Have you gone to an ANC visit?	1. Yes	

		0. No
Awareness of availability of services		
223	<p>In your knowledge, which is the nearest governmental health facility that offers normal institutional delivery service?</p> <p><i>(Ask the name of the facility and note it down)</i></p> <p>Checkout whether this is the right or wrong answer.</p>	<p>.....</p> <p>....</p> <p>1. Right 0. Wrong</p>
224	<p>In your knowledge, which is the nearest governmental facility that offers emergency obstetric care services (surgery and blood transfusion)?</p> <p><i>(Ask the name of the facility and note it down)</i></p> <p>Checkout whether this is the right or wrong answer.</p>	<p>.....</p> <p>1. Right 0. Wrong</p>

Were all the questions answered by the pregnant woman alone? 1. Yes 2. No

If No, who joined the interview and helped the pregnant woman to answer?

1. Husband
2. Mother-in-law
3. Other.....

Thank you. See you on the second interview.

(END OF THE FIRST INTERVIEW)

Part B: Utilisation and perceived quality (Follow up interview of post-partum women within 4 weeks)

Respondent ID /_____/_____/_____/	Name of the mother:
Village/Ward ID /_____/_____/	Birth Date : Month.....Day.....
Interviewer ID /_____/_____/	Gestational Age :weeks
Date of Interview Month.....Day.....	Sex of Baby 1. Son 2. Daughter
	Weight of Baby: At birth.....Kilo (If available; ask for hospital card)
	At.....weeks.....Kilo

I would like to ask you about your health during pregnancy, where you delivered and what happened.

Section 3.Utilisation of antenatal care, and illness during pregnancy

Antenatal care		
301	How many antenatal care visits did you make in this recent pregnancy?	1.None 2. One 3.Two 4.Three 5. Four or More <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> } →go to 303 </div>
302	Why did you NOT visit for antenatal care? <i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says)</i>	1. Did not see need 2. Family didn't see need or allow 3. Facility too far 4. Too expensive 5. Services are poor 6. No time to go 7. Nobody to accompany 8. Did not know where to go

		9. Other (specify).....
303	At how many months of pregnancy did you visit for an antenatal check-up for the first time?months
304	Where did you receive antenatal care for this pregnancy? <i>(Also write down the name of the health care facility: if more than one, tick all applicable)</i>	Home: 1.Respondent's home via VHW/FCHV 2. Health personnel's home Public Facility: 3. Hospital 4. PHCC 5. HP Private Facility: 6. Nursing home 7. Pharmacy 8. Other (specify).....
Prenatal Illness		
305	Did you speak with anyone outside of a health facility about danger signs of serious health problems during pregnancy, childbirth, or soon after?	1. Yes 0. No →go to 308
306	If yes , to whom did you speak at first ? <i>(Tick only one option)</i>	1. Husband 2. Mother-in-law 3. Other family member 4. Friend 5. Health worker
307	During this pregnancy, did you experience any serious health problems related to the pregnancy before you delivered your baby ?	1. Yes 0. No →go to 501
308	If yes , what sort of problems did you have during your pregnancy before you delivered your baby ? <i>You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i> <i>Probe: Any others?</i>	1. Vaginal Bleeding a. any bleeding b. soaked clothes, bed or floor 2. Swollen hands and body 3. Loss of consciousness and convulsions 4. Blurred vision 5. Severe headache

		6. Fever for more than one day 7. Severe abdominal pain 8. Others (specify) a) b)..... c).....										
309	Did you do anything to treat the illness at home?	1. Yes 0. No →go to 312										
310	What did you do?										
311	Did you seek care for this problem outside the home?	1. Yes 0. No →go to 319										
312	Where did you go for help at first ?	<table border="1"> <tr> <td>Government:</td> <td>Private:</td> </tr> <tr> <td>1. Hospital</td> <td>4. Nursing home</td> </tr> <tr> <td>2. PHCC</td> <td>5. Pharmacy/clinic</td> </tr> <tr> <td>3. HP</td> <td>6.Traditional healers</td> </tr> <tr> <td></td> <td>7. Others.....</td> </tr> </table>	Government:	Private:	1. Hospital	4. Nursing home	2. PHCC	5. Pharmacy/clinic	3. HP	6.Traditional healers		7. Others.....
Government:	Private:											
1. Hospital	4. Nursing home											
2. PHCC	5. Pharmacy/clinic											
3. HP	6.Traditional healers											
	7. Others.....											
313	How did you go there?	1. Ambulance 2. Taxi 3. Bus 4. Walked 5. Carried 6. Other (specify).....										
314	How long was it from the time you recognised you had a problem until you got treatment?	Hours..... Or Days.....										
315	Were you referred or transferred or did you go another place for further treatment?	1. Yes 0. No →go to 318										
316	Where did they refer you or where did you go?										
317	Who was the most important person who decided whether or not to seek assistance for this problem? <i>(Tick only one option)</i>	1. Yourself 2. Your husband 3. Mother-in-law 4. Father-in-law										

		5. Other (specify).....
318	<p>(if you ticked 2 in Q. No. 312)</p> <p>If no, why did you not seek care for this problem?</p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p>	<p>1. Did not see need</p> <p>2. Family didn't see need or allow</p> <p>3. Facility too far</p> <p>4. Too expensive</p> <p>5. Services are poor</p> <p>6. No time to go</p> <p>7. Nobody to accompany</p> <p>8. Did not know where to go</p> <p>9. Other (specify).....</p>

Section 4: Utilisation of institutional delivery services

401	Where did you deliver your baby?	<p>1. Health facility</p> <p>2. On the way to health facility</p> <p>3. Home →go to 414</p> <p>3. Workplace</p> <p>4. Other (specify).....</p>
If delivered in a health care facility		
402	Did you plan to give birth at the facility?	<p>1. Yes</p> <p>0. No →go to 404</p>
403	Can you tell me the three major reasons why you gave birth in a health facility rather than elsewhere?	<p>1.....</p> <p>2.....</p> <p>3.....</p>
404	If not planned , tell me the important reason why you went there?	<p>1. Developed complications at home</p> <p>2. Health workers advised to go</p> <p>3. Friends/neighbour advised to go</p> <p>4. Other (specify).....</p>
405	Who was the most important person to decide about delivering in the health care facility? <i>(Tick only one option)</i>	<p>1. Yourself</p> <p>2. Your husband</p> <p>3. Mother-in-law</p> <p>4. Father-in-law</p> <p>5. Other (specify).....</p>

406	<p>Which health facility did you go to? <i>(Ask the name of the facility and note it down)</i></p> <p>..... </p> <p>Check out if this is the nearest facility having birthing services</p> <p>If not the nearest facility, ask Why did you not go to the nearest facility (name it)?</p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says)</i></p> <p>Why did you go to the farthest/current health facility (name it)?</p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p>	<p>Government:</p> <ol style="list-style-type: none"> 1. Hospital 2. PHCC 3. HP <p>Private:</p> <ol style="list-style-type: none"> 4. Nursing home 5. Pharmacy 6. Others..... <ol style="list-style-type: none"> 1. Yes 0. No <ol style="list-style-type: none"> 1. Did not know about the facility 2. Poor provider knowledge 3. Bad provider attitude (unfriendly, rude) 4. Inadequate drugs and equipment 5. Facility does not perform deliveries/operations 6. Not clean/tidy 7. Other (specify)..... <ol style="list-style-type: none"> 1. Best doctors, nurses, other staff in this area 2. Good behaviour and attitude of health personnel 3. Adequate drugs and equipment 4. A friend or relative has used it before and recommended it 5. I have used it before and had a good experience
-----	--	---

		6. Other (specify).....
407	How did you go there?	1. Ambulance 2. Taxi 3. Bus 4. Walked 5. Stretcher 6. Others (specify).....
408	How long did it take to reach the health facility on foot and/or by transportation?	Hours..... OR Days.....
409	How long after reaching the health facility did you give birth?	Hours..... OR Days.....
410	Who accompanied you to the health facility where you gave birth?	1..... 2..... 3..... 4.....
411	What kind of birth did you have?	1. Normal vaginal birth 2. Instrumental/assisted delivery (forceps or vacuum) 3. Planned caesarean delivery 4. Emergency/unplanned caesarean delivery
412	<u>During labour and birth</u> , did you experience any serious health problems related to birth?	1. Yes 0. No→ go to 501
413	<u>If yes</u> , what problems did you experience? <i>You may tick more than one option. Do not read the</i>	1. Severe vaginal bleeding 2. Prolonged labour for more than i) 12hrs, ii) 24hrs, iii) 48 hrs

	<p><i>options. Tick options depending on what respondent says.)</i></p> <p><i>Probe: Any others?</i></p>	<p>3. Placenta not delivered within i) half an hour ii) 1 hour iii) 2 hours</p> <p>4. Swollen hands and body</p> <p>5. Loss of consciousness and convulsions</p> <p>6. Others (Specify).....</p>
414	Did you have complications after delivery until now?	<p>1. Yes</p> <p>0. No → go to 710</p>
415	<p>If yes, what are the complications?</p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i></p>	<p>1. Vaginal bleeding i. any vaginal bleeding ii. bleeding which soaked clothes, bed or floor</p> <p>2. High fever</p> <p>3. Smelly water discharge from vagina</p> <p>4. Swollen hands and body</p> <p>5. Loss of consciousness and convulsions</p> <p>6. Prolapsed uterus</p> <p>6. Other (specify).....</p>
If delivered in home,		
416	Did you plan to give birth at home?	<p>1. Yes</p> <p>0. No → go to 416</p>
417	<p>If yes, what is the main reason that you did not give birth in a health facility?</p> <p><i>(Stress the main reason; listen to them and tick only one option)</i></p>	<p>1. You did not think necessary</p> <p>2. Husband/family didn't think it necessary or allow it</p> <p>3. Facility too far</p> <p>4. Too expensive</p> <p>5. No time to go</p> <p>6. Services are not good</p> <p>7. Other (specify).....</p>

418	<p>What is the main reason that you gave birth at home?</p> <p><i>(Stress the main reason; listen to them and tick only one option)</i></p>	<ol style="list-style-type: none"> 1. Family/community custom 2. Labour too quick to reach institution 3. None to accompany woman 4. Convenience at home 5. Facility/health care provider not good 6. Lack of transport and /or facility too far 7. Not enough money 8. Other (specify).....
419	<p>Who was the most important person to decide about delivering in the home?</p> <p><i>(Tick only one option)</i></p>	<ol style="list-style-type: none"> 1. Yourself 2. Your husband 3. Mother-in-law 4. Father-in-law 5. Other (specify).....
420	<p>Who attended the delivery and helped during the childbirth?</p> <p><i>(Tick only one option)</i></p>	<ol style="list-style-type: none"> 1. Doctor/HA/Nurse/ANM/MCHW 2. VHW/FCHV/TBA 3. Mother-in-law/other family member 4. Relative/friend/neighbour 5. None 6. Other (Specify).....
421	<p>During labour and birth, did you experience any serious health problems related to birth?</p>	<ol style="list-style-type: none"> 1. Yes 0. No
422	<p>What problems did you experience?</p> <p><i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent say.)</i></p>	<ol style="list-style-type: none"> 1. Severe vaginal bleeding 2. Prolonged labour for more than <ol style="list-style-type: none"> i) 12hrs ii) 24hrs iii) 48 hrs 3. Placenta not delivered within <ol style="list-style-type: none"> i) half an hour ii) 1 hour iii) 2 hours 4. Swollen hands and body 5. Loss of consciousness and convulsions 6. Others (Specify).....

423	Did you have complications after delivery until now?	1. Yes 0. No
424	If yes, what are the complications? <i>(You may tick more than one option. Do not read the options. Tick options depending on what respondent says.)</i>	1. Vaginal bleeding i. any vaginal bleeding ii. bleeding which soaked clothes, bed or floor 2. High fever 3. Smelly water discharge from vagina 4. Swollen hands and body 5. Loss of consciousness and convulsions 6. Prolapsed uterus 6. Other (specify).....

Appendix C: Ethical approvals, participant information and consent forms

Memorandum

To	Prof Colin Binns, Public Health
From	A/Professor Stephan Millett, Chair, Human Research Ethics Committee
Subject	Protocol Approval HR 130/2011
Date	29 November 2011
Copy	Mr Rajendra Karkee Public Health Prof Andy Lee Public Health

Office of Research and Development
Human Research Ethics Committee
TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for providing the additional information for the project titled "*Consumer perception of maternity services in Nepal*". The information you have provided has satisfactorily addressed the queries raised by the Committee. Your application is now **approved**.

- You have ethics clearance to undertake the research as stated in your proposal.
- The approval number for your project is **HR 130/2011**. Please quote this number in any future correspondence.
- Approval of this project is for a period of twelve months **17-11-2011 to 17-11-2012**. To renew this approval a completed Form B (attached) must be submitted before the expiry date **01-11-2012**.
- If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Faculty Graduate Studies Committee.
- The following standard statement **must be** included in the information sheet to participants:
This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 130/2011). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. Its main role is to protect participants. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Applicants should note the following:

It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **FORM B** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development:

When the project has finished, or

- If at any time during the twelve months changes/amendments occur, or
- If a serious or unexpected adverse event occurs, or
- 14 days prior to the expiry date if renewal is required.
- An application for renewal may be made with a Form B three years running, after which a new application form (Form A), providing comprehensive details, must be submitted.

Regards,



SM A/Professor Stephan Millett
Chair Human Research Ethics Committee



Nepal Health Research Council

Estd. 1991

NHRC

Ref. No. *036*

Executive Committee

Executive Chairman
Prof. Dr. Chop Lal Bhusal

Vice - Chairman
Dr. Rishi Ram Koirala

Member-Secretary
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Dr. Devi Gurung

Representative
Ministry of Finance
National Planning Commission
Ministry of Health & Population
Chief, Research Committee, IOM
Chairman, Nepal Medical Council

28 November 2011

Mr. Rajendra Karkee
Principal Investigator
Curtin University, Australia

Ref: Approval of Research Proposal entitled **Consumer Perception of Maternity Services in Kaski District, Nepal**

Dear Mr. Karkee,

It is my pleasure to inform you that the above-mentioned proposal submitted on 2 November 2011 (**Reg. no. 88/2011** please use this Reg. No. during further correspondence) has been approved by NHRC Ethical Review Board on 23 November 2011 (2068-08-07).

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol.

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission.

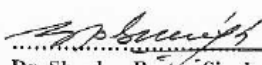
Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

As per your research proposal, total research amount is NRs. 200,000.00 and NHRC processing fee is US\$. 100.00.

If you have any questions, please contact the research section of NHRC

Thanking you.

Sincerely Yours,


Dr. Shanker Pratap Singh
Member Secretary

Project title: A cohort study of the utilisation of institutional delivery services and pregnancy outcomes in the Kaski district of Nepal.

INFORMATION SHEET (English Version)

Dear Madam:

My name is Rajendra Karkee. I am an Assistant Professor at BP Koirala Institute of Health Sciences, Dharan, Nepal. I am currently studying for my PhD at Curtin University, Perth, Australia. I am conducting research into perceptions and utilisation of maternity services in the Kaski District, Nepal. It will help us to understand more of the views and problems in utilising the maternity services by women in the Kaski District. This research has been approved by the Human Research Ethics Committee, Curtin University, and permission has been obtained from the Nepal Health Research Council.

If you agree to participate, I will be asking you questions four times: firstly now, secondly within 14 days of your delivery, thirdly at 3 months and fourthly at 6 months after your delivery. It will take about half an hour each time. An interviewer will be available to help you should there be any problem in answering the questions.

This information is needed for my study, and will not be used for any other purpose. All that you say during the interview will be strictly confidential and will not be shown to anyone. All data will be analysed and reported in groups for the purpose of this study only. No names will be used in any subsequent publications, neither of you nor your child. You may withdraw at any time from the interview or any duration of the study. There is not any right or wrong answer and I just want to know your views. I respect your decision if you wish NOT to participate or withdraw at any time. Please note there will not be any negative consequences and this would not affect in any way treatment of yourself and your child.

If you have any concerns or questions about this study, you can contact me or my supervisor or the ethics committee of Curtin as follows:

Researcher contact detail:

RajendraKarkee

E-mail: rajendra.karkee@postgrad.curtin.edu.au Ph: +977-9842064635

Supervisor contact detail:

Professor Colin Binns, School of Public Health, Curtin University , GPO Box U1987, Perth, Western Australia 6845

E-mail: c.binns@curtin.edu.au Ph: +61 8 9266 2952

Curtin University Human Research Ethics Committee detail:

Miss Linda Teasdale, Manager, Research Ethics, Office of Research and Development, Curtin University, GPO Box U1987, Perth, Western Australia 6845

E-mail: hrec@curtin.edu.au Ph: +61 8 9266 2784

Thank you very much for your co-operation.

Yours sincerely,

RAJENDRA KARKEE

Project title: A cohort study of the utilisation of institutional delivery services and pregnancy outcomes in the Kaski district of Nepal.

CONSENT FORM

(English Version)

Dear Madam:

I have just informed you about the purpose of the study and the interview. If you agree to take part in this interview, you will need to sign this consent form and a copy of the information sheet will be given to you.

Do you have any questions regarding this interview?

.....

.....May I start the interview?

Has respondent agreed to participate?

1. Yes (take the signature or thumb print of the respondent and proceed to interview)
2. No (do not proceed with interview)

Respondent's signature:

.....

OR

Thumb print:

Left.....Right.....

Interviewer's signature:

.....

Place of interview:

.....

.....


Date:

Appendix D: Statements of contributions (co-authors)

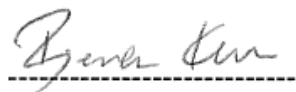
To Whom It May Concern

I, Colin W Binns, contributed as a Supervisor of the PhD. I had an ongoing close involvement with the research, including contribution to the project proposal, discussing the content of papers, the reading of drafts and making suggestions of improvements to the four published papers. The candidate was responsible for all decisions related to the design and implementation of research, data collection, data analysis, drafting of manuscripts and interpreting the data in all the four published papers.

- I. Karkee R, Lee A, Binns C. 2013. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery*, 29(10):1206-1210..
- II. Karkee R, Binns C, Lee A. 2013. Determinants of use of institutional delivery services after implementation of safer mother programme in Nepal: a prospective cohort study. *BMC Pregnancy and Childbirth*, 13(1):193.
- III. Karkee R, Lee AH, Binns CW.2013. Bypassing birth centres for childbirth: an analysis of data from a community-based prospective cohort study in Nepal. *Health Policy and Planning* , doi: 10.1093/heapol/czt090
- IV. Karkee R, Lee AH, Khanal V, Pokharel PK, Binns CW. 2014. Obstetric complications and cesarean delivery in Nepal. *International Journal of Gynaecology & Obstetrics*, 125 (1): 33-36



Colin W Binns (Supervisor and co-author)



Rajendra Karkee (candidate)

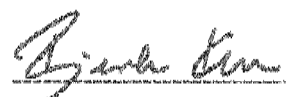
To Whom It May Concern

I, Andy H Lee, contributed as a Co-supervisor of the PhD. I had an ongoing close involvement with the research, including contribution to the project proposal, discussing the content of papers, the reading of drafts and making suggestions of improvements to the following published papers. The candidate was responsible for all decisions related to the design and implementation of research, data collection, data analysis, drafting of manuscripts and interpreting the data in all the four published papers.

- I. Karkee R, Lee A, Binns C. 2013. Birth preparedness and skilled attendance at birth in Nepal: Implications for achieving Millennium Development Goal 5. *Midwifery*, 29(10):1206-1210..
- II. Karkee R, Binns C, Lee A. 2013. Determinants of use of institutional delivery services after implementation of safer mother programme in Nepal: a prospective cohort study. *BMC Pregnancy and Childbirth*, 13(1):193.
- III. Karkee R, Lee AH, Binns CW.2013. Bypassing birth centres for childbirth: an analysis of data from a community-based prospective cohort study in Nepal. *Health Policy and Planning* , doi: 10.1093/heapol/czt090
- IV. Karkee R, Lee AH, Khanal V, Pokharel PK, Binns CW. 2014. Obstetric complications and cesarean delivery in Nepal. *International Journal of Gynaecology & Obstetrics*, 125 (1): 33-36



Andy H Lee (Co-supervisor and co-author)

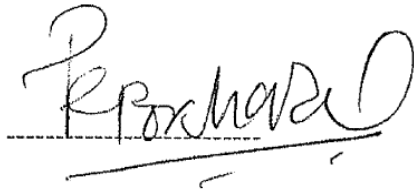


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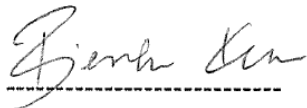
To Whom It May Concern

I, Paras K Pokharel, provided advice on the measurement instruments, reviewed drafts and suggested revisions to the following paper. The candidate was responsible for all decisions related to the design and implementation of research, data collection, data analysis, drafting of manuscript and interpreting the data in the following paper:

IV. Karkee R, Lee AH, Khanal V, Pokharel PK, Binns CW. 2014. Obstetric complications and cesarean delivery in Nepal. *International Journal of Gynaecology & Obstetrics*, 125 (1): 33-36

A handwritten signature in black ink, appearing to read 'P. Pokharel', written over a horizontal dashed line.

Paras K Pokharel (co-author)

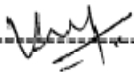
A handwritten signature in black ink, appearing to read 'Rajendra Karkee', written over a horizontal dashed line.

Rajendra Karkee (candidate)

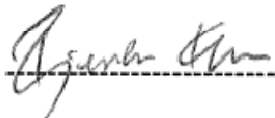
To Whom It May Concern

I, Vishnu Khanal, provided advice on the measurement instruments, reviewed drafts and suggested revisions to the following paper. The candidate was responsible for all decisions related to the design and implementation of research, data collection, data analysis, drafting of manuscript and interpreting the data in the following paper:

IV. Karkee R, Lee AH, Khanal V, Pokharel PK, Binns CW. 2014. Obstetric complications and cesarean delivery in Nepal. *International Journal of Gynaecology & Obstetrics*, 125 (1): 33-36



Vishnu Khanal (co-author)



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