School of Public Health

A Cohort Study of Mastitis, Related Risk Factors and Breastfeeding Practices in Shiraz, Southwest of Iran

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Author's Declaration

I declare to the best of my knowledge and belief that this thesis contains no material previously published by any other person, except where due acknowledgement has been made. This thesis contains no material that has been accepted for award of any other qualification in any university.

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Dedicated to Iranian Mothers

Abstract

Human breastmilk is the optimal source of infant nutrition, and the benefits of breastfeeding for both mothers and infants are well documented. The World Health Organization recommends exclusive breastfeeding for the first six months of life, and continued breastfeeding with appropriate supplementary food until two years of age or beyond. The Iranian government has made concerted efforts to improve breastfeeding practices in recent decades, resulting in an increase in the rate of any breastfeeding. However, there are still obstacles to the practice of exclusive breastfeeding. Data on the rate of exclusive breastfeeding since birth are rare in this community. Mastitis is a common complication of breastfeeding, but there have been no studies on the incidence of mastitis among Iranian mothers and its impact on the duration of breastfeeding. The objectives of the Shiraz Infant Feeding Study (SIFS) were to identify the incidence of and potential risk factors for mastitis, and to investigate breastfeeding practices to 26 weeks postpartum among mothers living in Shiraz, South West Iran.

The baseline questionnaire was completed by 700 mothers recruited from three public and two private hospitals shortly after delivery. Mothers were then followed up at one, three, four, and six months when they attended Maternal and Child Health (MCH) clinics for routine postpartum visits and infant health care. Logistic regression analysis was used to identify independent predictors of the early initiation of breastfeeding, the prevision of traditional prelacteal feeds, the in-hospital use of formula and incidence of mastitis. The duration of exclusive, full and any breastfeeding were determined using life-table survival analysis, and Cox hazard regression analysis was employed to identify those variables independently associated with the duration of each level of breastfeeding.

In total, 98.6% (690) of mothers initiated breastfeeding while in hospital, with 74.3% fully breastfeeding their infants at discharge. However, less than one third of infants (29.9%) had been exclusively breastfed since birth with, two thirds of neonates (65.4%) having received prelacteal traditional foods and or formula (34.9%) during

their hospital stay. Mothers who had undergone caesarean section and who had not experienced early skin to skin contact were more likely to delay initiation of breastfeeding, offer traditional prelacteal feeds and to give formula to their infants in hospital. Infants whose mothers were poorly educated and who did not attend an antenatal class during pregnancy were more likely to receive traditional prelacteal foods in hospital. Admission to NICU (Neonatal Intensive Care Unit) and birth weight greater than 3000 gram were predictors for formula use in hospital.

By 26 weeks of age 87% of infants were still receiving breastmilk, 28% of them were fully breastfed, but only 1% of infants had been exclusively breastfed from birth to 26 weeks. Inadequate milk supply was the most frequent reason (96%) for introducing formula or stopping breastfeeding. Using a pacifier was the strongest factor associated with shorter duration of exclusive, full and any breastfeeding.

Of the 672 mothers interviewed in MCH clinics, 130 mothers (18.6%, 95% CI [16.4%, 22.3%]) self-reported having experienced at least one episode of mastitis in the six month postpartum period. More than half of the first episodes of mastitis (n=72, 55.4%) occurred during the first four weeks postpartum. These findings are remarkably consistent with those reported for Western women. All mothers with mastitis were prescribed one or more antibiotics. There was no difference in duration of breastfeeding between mothers who did or did not experience mastitis, while multivariate analysis indicated that cracked nipples, engorged breasts, expressed milk, and using a pacifier were strong predictors of mastitis.

The results of this study show that although breastfeeding initiation was near universal, few infants were exclusively breastfed to six months of life. Successful exclusive breastfeeding depends on a successful start. While four out of five hospitals in this study were certified as Baby Friendly Hospitals, the majority of mothers did not commence breastfeeding within one hour of birth and two thirds of infants received traditional prelacteal foods and/ or formula in hospital. These results emphasis that the adherence to the “Ten steps of successful breastfeeding” needs to be emphasised and monitored closely in this community.

Definitions

Any breastfeeding: Giving of breastmilk from breast or expressed with or without liquids, formula (Labbok, 2006).

Bottle feeding: Infant has received any liquid or semi-solid food by a bottle with teat or nipple (WHO, 2001).

Breastfeeding: It is similar to "any breastfeeding". While an infant receives breastmilk, can receive any food or liquid including non-human milk.

Breastfeeding on demand: Breastfeeding without any limitation on frequency and length of feeding.

Cessation of breastfeeding: The discontinuation of breastfeeding and sucking completely.

Colostrum: The yellowish liquid produced in the breast in the first three or four days after delivery (WHO, 2010).

Complementary feeding: Breastmilk (including milk expressed or from a wet nurse) and solid or semi-solid food and any other liquid including non-human milk or formula (WHO, 2008a).

Duration of breastfeeding: The length of time that a baby received breastmilk

Early initiation of breastfeeding: Putting a newborn infant to the breast one hour of birth (WHO, 2008a).

Ever breastfeeding: The infant has been given breastmilk on at least one occasion.

Ever mastitis: Nursing mother has experienced at least one episode of mastitis.

Exclusive breastfeeding: Infant is fed only breastmilk (including milk expressed or from a wet nurse), allows the infant to receive ORS, drops, and syrups (vitamins, minerals and medicines) (WHO, 2008a).

Full breastfeeding: The combination of exclusive and predominant breastfeeding (Labbok, 2006).

Infant formula: An infant formula product represented as a breastmilk substitute for infants and which satisfies the nutritional requirements of infants aged up to four to six months (Food Standards Australia and New Zealand, Standard 2.9.1).

Lactation or purpura mastitis: The inflammation of breast tissue during lactation.

Mixed feeding: While infants are breastfed, they may receive other fluid including water, and non-human milk before six months of age (UNICEF., 2008; WHO, 2008c).

Predominant breastfeeding: Infant is fed breastmilk (including milk expressed or from a wet nurse), and certain liquids (water, water based drinks or fruit juice), ritual fluids, ORS, drops, and syrups (vitamins, minerals and medicines), but nothing else (in particular, non-human milk, food-based fluids) (WHO, 2008a).

Prelacteal feeds: Offering any liquid or food including sugar water, formula milk, herbal tea, honey or dates to the neonate before the first breastfeeding (WHO, 2008a).

Rooming-in: Remaining of infants with their mothers 24 hours a day (WHO, 1998).

Skin to skin contact: Placing of the naked baby, head covered with a dry cap a warm blanket across the back, prone on the mother's bare chest (Moor, Anderson, Bergman, & Dowswell, 2012).

Supplementary feeding: Any non-breastmilk, including water or glucose water given to breast-fed babies after the first breastfeed.

List of Abbreviations

AHR	Adjusted hazard ratio
AOR	Adjusted odds ratio
BFHI	Baby Friendly Hospital Initiative
BSL	Blood sugar level
BMI	Body mass index
CI	Confidence interval
CHR	Crude hazard ratio
COR	Crude odds ratio
C/ S	Caesarean section
DHS	Demographic Health Survey
EBF	Exclusive breastfeeding
EIBF	Early initiation of breastfeeding
IQ	Intelligence quotient
LBW	Low birth weight
MCH clinics	Maternal and Child Health clinics
NICU	Neonatal Intensive Care Unit
OR	Odds ratio
ORS	Oral Rehydration Salt/Solution
RCT	Randomised control trial
SCN	Special Care Nursery
SIFS	Shiraz infant feeding study
SSC	Skin to skin contact
SPSS	Statistical Package for the Social Sciences
SUMS	Shiraz University of Medical Science
UNICEF	United Nations Children's Fund
UAE	United Arab Emirates
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

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Chapter 1

Chapter 1

Introduction

In this chapter a synopsis of the study is provided, including an overview of the importance of breastfeeding and of breastfeeding studies in Iran, limitations of earlier studies of breastfeeding in Iran, the study's location, an overview of the health system in Iran, the significance of the study, and the study objectives.

1.1 Public health importance of breastfeeding

Breastfeeding, as a natural method of feeding, is a prime source of nutrition for human infants. In comparison to formula feeding, breastfeeding has several immediate and long-term health outcomes for both infants and mothers which are described here briefly.

1.1.1 Infant health outcomes of breastfeeding

1.1.1.1 Short-term infant health outcomes

Diarrhoea

There is evidence in high and low income countries, that human breastmilk reduces the risk of gastrointestinal infection among children aged 12 months. For instance, a large systematic review of studies in high-income countries concluded that breastfeeding protects infants against non-specific gastrointestinal infections in infancy period (Ip, Chung, Raman, Trikalinos, & Lau, 2009). Similarly, a systematic review reported that breastfeeding reduces the incidence and prevalence of diarrhoea and consequent hospitalisation of infants with diarrhoea in developing countries (Lamberti, Walker, Noiman, Victora, & Black, 2011). It has been estimated that half of all diarrhoea episodes, and 72% of hospitalisation for diarrhoea, could be prevented with optimal breastfeeding practices (Victora et al., 2016). There is evidence that

human breastmilk has immune defence properties including immunoglobulins, nonspecific immune proteins, iron bonding proteins and cellular components (Field, 2005; Labbok, Clark, & Goldman, 2004), which are important in reducing the incidence of gastrointestinal disease in the infancy.

Respiratory tract infection

There is consistent epidemiologic evidence that breastfeeding decreases the incidence and severity of respiratory tract infections (Dennis, 2002; Ip et al., 2009). For instance, a recent systematic review found that breastfeeding prevents around a third of respiratory infections and could reduce hospitalisations for respiratory infections by 57% (Victora et al., 2016). A review of 10 studies investigating the association of breastfeeding and infant's lung function concluded that breastfeeding improves lung growth, as the number of alveoli is increased and completed in the infancy period and reduces respiratory tract infections (Waidyatillake et al., 2013). The possible mechanism is the existence of growth factors in colostrum and immunoglobulins in human milk.

Otitis media

Acute otitis media is an inflammatory condition, which is common in infancy and might lead to deafness in children (Kubba, Pearson, & Birchall, 2000). Studies reported a reduced risk of otitis media among infants with breastfeeding (Dennis, 2002; Ip et al., 2009) . For instance, in a recent review Victora et al. (2016) concluded that breastfeeding can be an effective protection against acute otitis media in children aged 24 months, however, the results are inconclusive for older children. Another review indicated that bottle and formula feeding increase the risk of acute otitis media and a history of exclusive breastfeeding minimize the risk of otitis media (Abrahams & Labbok, 2011).

1.1.1.2 Long term infant health outcomes

Obesity

The association between breastfeeding and a lower risk of obesity in infants is consistently reported in several studies (Binns, Lee, & Low, 2016; Horta & Victora, 2013; Ip et al., 2009). A recent review of 113 studies reported a reduction of 26% (95%

CI: [22-30]) of obesity or overweight in infants who were breastfed for longer periods (Victora et al., 2016). The lower incidence of obesity may be because breastfed infants self-regulate their energy intake in and prevents them from overfeeding (Horta & Victora, 2013). In addition, the plasma insulin level is high in formula-fed infants and it may be a stimulator of fat deposition and to develop obesity (Connolly & Tracewell, 2012).

Diabetes

The general consensus of several studies is that the risk of type 2 diabetes may be reduced among individuals who have been breastfed in infancy (Binns et al., 2016; Horta & Victora, 2013; Ip et al., 2009). A review using pooled results from 11 studies concluded that breastfeeding can reduce the incidence of type 2 diabetes by 35% (95% CI [14, 51]) (Victora et al., 2016). The possible biological explanation is that there are variations in insulin secretion based on infant feeding, formula fed infants may have a high level of insulin, which contributes to β-cell failure and leads to diabetes.

Cognitive development

Numerous reviews have reported a positive association between breastfeeding and cognitive outcomes (Binns et al., 2016; Horta & Victora, 2013; Kramer et al., 2008; Oddy et al., 2011; Victora et al., 2015). The results of a recent review of 16 studies concluded that breastfeeding results in higher performance in intelligence tests in childhood and adolescence (Victora et al., 2016). A plausible explanation is that breastmilk contains polyunsaturated fatty acids that may be crucial for brain development. It is difficult to eliminate bias in these studies, but the increasing number of studies with positive associations lends support to the link.

Sudden infant death

Studies report that breastfeeding protects infants from sudden death (Ip et al., 2009). For instance, a meta-analysis of 288 studies concluded that breastfeeding, particularly exclusive breastfeeding had a protective effect against sudden infant death (Hauck, Thompson, Tanabe, Moon, & Vennemann, 2011).

1.1.2 Maternal health outcomes of breastfeeding

Numerous maternal health advantages of breastfeeding have been identified, including a decrease of postpartum haemorrhage. Breastfeeding in the fourth stage of labour decreases the risk of postpartum bleeding with an increase in uterine contraction (Allen & Hector, 2005; Gartner et al., 2005; Labbok, 2001).

The risk of ovarian cancer and postmenopausal breast cancer in nursing mothers is reduced (Binns et al., 2016; Chowdhury et al., 2015; Dennis, 2002; Ip et al., 2009). A recent review concluded that with each year of breastfeeding, a reduction of 4.3% in the incidence of breast cancer occurred, the review also reported that the risk of ovarian cancer reduced by 30% among mothers who breastfed their infants longer (Victora et al., 2016).

Numerous reviews have also described an association between nursing and reduction of maternal diabetes in the postpartum period (Binns et al., 2016; Victora et al., 2016). Several studies have shown the effect of breastfeeding on weight retention in postpartum, and that nursing mothers lose excess weight faster than non-breastfeeding mothers (Baker et al., 2008; Binns et al., 2016).

The health consequences associated with breastfeeding have been the subject of numerous extensive reviews and for the most part the evidence is unequivocal. Breastfeeding is associated with numerous short and long-term health outcomes for both the infant and mother and breastfeeding promotion is a globally important public health strategy.

1.2 Overview of breastfeeding in Iran

Initiation of breastfeeding is almost universal in Iran, and the practice is based on culture and religion, as Islam teaches that mothers should breastfeed their infants for two years (Marrandi & Ezzeddin Zanjani, 2012). A range of practices and policies have been launched across Iran following the Islamic revolution in 1979 to promote infant feeding and reduce neonatal and infant mortality and morbidity (Marandi & Ezzeddin Zanjani, 2012). For instance, advertisements for formula were prohibited in 1986; Baby Friendly Hospitals were launched in 1991; and training courses and workshops on the promotion of breastfeeding were instituted for health workers and

midwives. Additionally, 24 weeks of paid maternity leave was made available in 2006 (Olang, Farivar, Heidarzadeh, Strandvik, & Yngve, 2009), and recently increased to one year, in 2016 with a one hour breastfeeding break when mothers return to work.

Following these initiatives, the incidence of "any breastfeeding" has increased over the past three decades from 62% in 1993 to 82% in 2006 and 90% in 2011 (Kalantari & Roudsari, 2013), and infant mortality rate per 1,000 live births has decreased from 54 in 1990 to 36 in 2000, 30 in 2006, and 18 in 2012 (Kalantari & Roudsari, 2013; Mehrdad, 2009). However, an analysis of the Demographic Health Survey (DHS) in 2000 documents that the rate of exclusive breastfeeding of infants aged six months or less was 44%, and this rate has been steadily declining to 40% in 2004 and to 20%-25% in 2008 (Kalantari & Roudsari, 2013; Ministry of Health, 2000a). Despite concerted efforts to promote breastfeeding, exclusive breastfeeding practices in Iran fall short of international guidelines (WHO, 2011).

1.3 Limitations of earlier breastfeeding studies in Iran

While a number of studies have investigated breastfeeding practices in Iran, the methodological limitations in these studies make it difficult to compare the results of studies and limit their usefulness.

Design

The major limitation of the majority of earlier surveys investigating breastfeeding practices in Iran is that the studies have been cross-sectional and retrospective in design. An advantage of cross-sectional surveys is that data can be collected relatively quickly; however, the accuracy of data is subject to recall bias, since mothers are recalling their past practices or events. A literature review of 11 studies investigating maternal recall of breastfeeding practices concluded that maternal recall was reliable for determining the initiation and overall duration of breastfeeding if recall of the duration of breastfeeding was within a period of three years or less (Li, Scanlon, & Serdula, 2005). However, recall of the age of introduction of food and fluids other than breastmilk is less reliable, placing in doubt the validity of retrospective cross-sectional studies that report the duration of exclusive breastfeeding. In addition, retrospective recall of duration can result in "heaping" of data (Winikoff, 1981) . For instance, women who terminated breastfeeding at three

weeks or five weeks but reporting this event two or three years after cessation may round this to 4 weeks. Heaping is less likely to occur in prospective studies with short intervals between follow- up surveys when mothers are recalling current practices or recent events.

Retrospective studies that investigate breastfeeding outcomes, and in particular duration of exclusive breastfeeding, may be subject to social desirability bias, with mothers providing what they perceive to be "socially acceptable" responses. This may especially be the case with face-to-face interviews when responses are not anonymous (Lippitt, Masterson, Sierra, Davis, & White, 2014). Furthermore, the information can be biased if it is achieved after a significant period of time (Binns, Fraser, Lee, & Scott, 2009), as women may report practices that are socially acceptable at the time of reporting and not actual practices that may have been socially acceptable at the time that they were feeding their child.

Analysis of results

Most of the studies in Iran that associate the prevalence and duration of breastfeeding with possible predictor variables including, sociodemographic and biomedical factors and hospital practices, failed to evaluate the variables in a multivariate analysis adjusting for potential confounding factors. A multivariate analysis of influences on breastfeeding practice provides a picture of the coincidence and interaction between variables.

Definition of breastfeeding

Not all studies have provided definitions of breastfeeding or used definitions consistent with the WHO definitions. Furthermore, even when studies have used the WHO definition of exclusive breastfeeding they may overestimate the prevalence of exclusive breastfeeding. For instance, the prevalence of exclusive breastfeeding reported in the Demographic Health Surveys is based on the WHO current status indicators, whereby mothers are asked to recall the types of food given in the last 24 hours (WHO, 2008b). Evidence shows that the current status indicator overrates the prevalence of exclusive breastfeeding, compared to an indicator that assesses exclusive breastfeeding since birth (Aarts et al., 2000). The current status indicator is not a valid indicator of exclusive breastfeeding since birth (Binns et al., 2009), as those infants

who received prelacteal feeds or irregularly receive other liquid or foods would be categorised as being exclusively breastfed if they had not received them the day before the survey. Few studies in Iran have investigated exclusive breastfeeding from birth.

Mastitis

Studies of Western women suggest that as many as one in five breastfeeding women will experience mastitis (Amir, Forster, Lumley, & Mclachlan2007; Cullinane et al., 2015; Kinlay, O'Connell, & Kinlay, 2001; Scott, Robertson, Fitzpatrick, Knight, & Mulholland, 2008). Mastitis may contribute to the early termination of breastfeeding and deprive infants of the many benefits of breastfeeding (Fetherston, 1996; Schwartz, Gillespie, Bobo, Longeway, & Foxman, 2002). To date no study has reported the incidence of mastitis and its impact on breastfeeding duration amongst Iranian women.

1.4 Study location

1.4.1 Overview of Iran, Shiraz

The Islamic Republic of Iran is the modern descendant of the Persian civilisation, which was established around 3,000 years ago. It is located in a strategic region between Asia, Europe and Africa. Modern Iran has an area of 1,648,195 square kilometres, making it the seventeenth largest country in the world. There are 34 administrative provinces, which are further divided into 336 districts (Olang et al., 2009). The population of Iran is 80 million, with roughly 75% living in urban areas and 25% living in rural areas. The median age of the population is 27 years, and there are 1.5 million births per annum. The most important industry in Iran is oil and natural gas production, and it is the fourth largest producer and the fifth largest exporter of oil in the world (Mehrdad, 2009). Iran’s gross national income per capita was $ 4,520 in 2011(Olang, Heidarzadeh, Strandvik, & Yngve, 2012).

Shiraz, the capital of Fars Province, has a population of 1.5 million and is located in the southwest of Iran, around 200km from the Persian Gulf. Shiraz is described as the city of poets, literature, and flowers. Its economy is based on primary production, including grapes, citrus fruit, cotton and rice. It is also a major centre for Iran’s electronic industries and carpet production. The moderate climate and green gardens make it a popular tourist attraction.

1.4.2 The health system in Iran

The mission of the health system in Iran is: "every resident has the right to the highest accessible level of health services" (Mehrdad, 2009). This is the mission mandated by the Minister of Health for guiding health policy and service delivery, which is delegated to Medical Universities across the country. Iran has 50 Medical Universities in the provinces which are required to facilitate public health and provision of health care. Primary health care is provided by health centres in urban areas, and in rural areas by 18,000 health houses (Asadi-Lari, Sayyari, Akbari, & Gray, 2004; Mehrdad, 2009) (Figure 1.1). The efforts made in the provision of primary health care have reduced the mortality of children less than 5 years old from 30 per 1,000 in 2006 to 18 per 1,000 in 2012 (Bagheri Lankarani, Alavian, & Peymani, 2013; UNICEF, 2013).

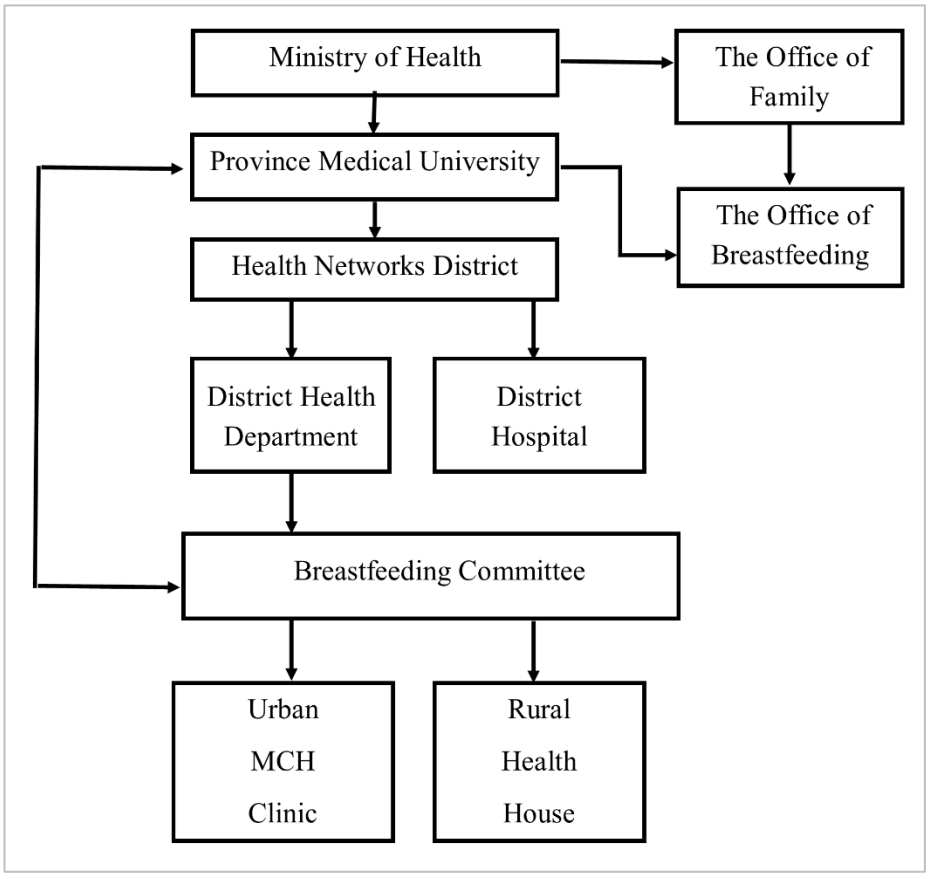

Figure 1.1: Primary health care and breastfeeding support structure in Iran (Mehrdad, 2009)

The National Committee for Breastfeeding Promotion in Iran was launched in 1991 to advance breastfeeding practices to assist in the decline in mortality and

morbidity of neonates and infants. The health network that exists in each district within a province has a breastfeeding committee. The main breastfeeding committee established in each of the Medical Universities supervises the district breastfeeding committees, and the rate of breastfeeding is reported annually to the Ministry of Health's Office of Breastfeeding (Olang et al., 2009).

Urban Health Care Centres cover a population 15,000 residents. Their mission was revised in 2004, and now includes: increasing the duration of breastfeeding rates, improving the rate of exclusive breastfeeding in the first six months of life, advocating for minerals, iron drops, and vitamins A, D, and increasing the number of Baby Friendly Hospitals (Mehrdad, 2009; Olang et al., 2009; UNICEF, 2013). Child health is monitored through routine visits by parents and their infants to MCH clinics in urban areas and Health Houses in rural areas from one month until 72 months of age. These centres provide prenatal and postnatal care, vaccination coverage, family planning care, and child care monitoring, and the services are free of charge (Bagheri Lankarani et al., 2013; Mehrdad, 2009). Health indicators including child immunization have markedly advanced, and 99% of infants were immunized in 2012 (Bagheri Lankarani et al., 2013; Mehrdad, 2009; UNICEF, 2013).

The Shiraz University of Medical Sciences (SUMS) in southern Iran, supervises 35 hospitals in Shiraz and all hospitals and health centres in Fars province. Shiraz has two health centres that cover 52 Maternal and Child Health clinics serving 387,403 households (Kavosi, Keshtkaran, Hayati, Ravangard, & Khammarnia, 2014).

1.5 Significance of the study

Breastfeeding is a cultural practice in Iran, however the data on exclusive breastfeeding are scarce. The importance of exclusive breastfeeding to six months is applicable to all infants, but is more significant in developing countries where the rate of neonatal and infant mortality as well as incidence of infections remain comparatively high. The rate of exclusive breastfeeding reported is different between Iranian studies and falls far short of international recommendations. Prelacteal foods that is any liquid or food given to neonates before initiating breastfeeding negatively affects exclusive breastfeeding rates and interferes with an infant's healthy gut microbiome. However, no study has investigated the factors associated with prelacteal

feeding in Iran. This present study provides the first accurate prospective statistics for Iran and identifies influential variables that lead to the termination of exclusive breastfeeding. The incidence of lactation mastitis and its risk factors that may lead to early cessation of exclusive breastfeeding, or even to the complete cessation of breastfeeding, has not been investigated in Iran and other Middle-Eastern countries. This has short and long term health consequences for the infants and their mothers. For the first time the longitudinal Shiraz Infant Feeding Study (SIFS) provides information on the incidence of mastitis, using commonly used diagnostic criteria, and associated risk factors that will assist in devising management protocols and educational prevention programs.

1.6 Objectives of the study

The primary aim of this study is to investigate the incidence of mastitis and related risk factors and factors associated with the practice of infant breastfeeding to six months postpartum in Shiraz, Iran. The specific objectives are to investigate the:

1. Prevalence and predictors of prelacteal feeding.
2. Incidence of mastitis among lactating mothers within six months postpartum.
3. Risk factors associated with the incidence of mastitis.
4. Duration of 'any' and 'exclusive breastfeeding' to six months postpartum.
5. Factors associated with duration of exclusive, full, and any breastfeeding to six months postpartum.

1.7 Outline of chapters

The thesis is composed of seven chapters.

This the first introductory chapter included a brief overview of breastfeeding, breastfeeding in Iran, the Iranian health system, limitations of previous Iranian breastfeeding studies and the study location. Finally, the significance and objectives of the study have been described.

Chapter 2 reviews the literature relevant to the study. It includes a review of breastfeeding practices from the past to the present in Iran. The factors associated with breastfeeding outcomes in Iran and other Middle-Eastern countries are identified and

compared with developed countries. Finally, the pathophysiology, incidence and determinants of mastitis are explored.

Chapter 3 describes the methodology used in the study, including details of study instruments, ethical considerations, and sample size, the method of data collection and cleaning and analysis of data. This chapter also includes a CONSORT recruitment and follow-up flow chart and describes the sociodemographic and biomedical characteristics of participants.

Chapter 4 presents a detailed analysis of in-hospital feeding practices including a discussion of the results and a comparison of the findings with other Iranian and Middle-Eastern studies.

Chapter 5 comprehensively describes the incidence and risk factors of mastitis and its impact on breastfeeding in Southwest Iran, and compares and contrasts the findings with other available studies.

Chapter 6 gives the detailed findings of the determinants of breastfeeding duration (exclusive, full and any), discusses the main results by comparing with other available studies.

Chapter 7 summarises the key findings of this study and offers recommendations for policy, practice and future research.

Chapter 2

Chapter 2

Literature Review

The first part of this chapter provides an extensive review of literature related to breastfeeding practices in Iran and other Middle-Eastern countries. The second part reviews the incidence of mastitis in developed and developing countries and determinants and risk factors of mastitis.

2.1 Breastfeeding in Iran

Breastfeeding is an almost universal practice in Iran, and it has been influenced by religion, history and culture.

2.1.1 Islam and breastfeeding

The practice of breastfeeding has a religious framework in Islam. Islam teaches that mothers should breastfeed their infants for two years, which corresponds with WHO recommendations that breastfeeding continue until two years of age or beyond (WHO & UNICEF., 2003). Eight verses of the Holy Quran discuss breastfeeding, and some religious texts emphasise that the Prophet Mohammad said "for a baby there is no milk better than his or her own mother's milk" (Marandi & Ezzeddin Zanjani, 2012), and when breastfeeding is not possible the parents can mutually allow a wet nurse feed their infant (Shaikh & Ahmed, 2006). The month of Ramadan is a special time for Muslims with refraining from food and drink and this practice is obligatory during this period. However, in recognition of the maternal demands of breastfeeding, and its importance to the infant, it is permissible for lactating mothers to postpone fasting until after they discontinue breastfeeding. Therefore, the Islamic teachings about breastfeeding, that reach back to 1,400 years ago, are congruent with global recommendations, and breastfeeding practices in Iran and other Middle-Eastern countries are firmly based on religious recommendations.

2.1.2 Breastfeeding before and after revolution in Iran

The history of writings about breastfeeding in Iran has been traced back to the eleventh century AD, when a Persian physician called Avicenna wrote the "Canon Text book" (Modanlou, 2008). In the book a chapter is devoted to breastfeeding and neonatal care, and breastmilk is referred to as "white blood", and a unique food for infants until 24 months postpartum. Avicenna recommended that a wet nurse be employed for mothers who are not able to breastfeed their infants (Modanlou, 2008). Anecdotal reports say that mothers universally practised breastfeeding in ancient Iran and in the event that a mother was unable to nurse, relatives or nursing neighbours often volunteered to breastfeed the newborn infant. However, there are no reliable documents to support this.

The earliest identified study conducted in Iran in the early 1960s prior to the Islamic revolution, revealed that breastfeeding was a cultural practice but "full cream dried cow's milk" was available in health clinics for infants who were underweight (Polak, Toubia, & Bamdad, 1964). However, the practice of infant feeding in Iran before the Islamic revolution in 1979 was influenced by the rise of the formula industry. Formula was commonly advertised in public and at this time formula feeding was considered a normal practice in rural and urban areas of this society (Marandi, Afzali, & Hossaini, 1993). Following the Islamic revolution, new targets and policies to improve breastfeeding were proposed, and began in 1980s with the promotion and support of breastfeeding becoming a public health priority. The prohibition of media advertising for formula was the first target in 1986 (Marandi & Ezzeddin Zanjani, 2012), and in the 1986 Iran was the first country in the Middle East to officially endorse the WHO International Code of Marketing of Breast Milk Substitutes (Olang et al., 2009), and rooming-in was adopted in maternity hospitals at the same time. However, despite these initiatives a retrospective study of 900 mothers in 1990 reported that only 38% of mothers breastfed their infants (Marandi et al., 1993).

In 1991, the National Committee for Breastfeeding Promotion was established by the Minister of Health to advance breastfeeding practices. Training workshops, educational and research activities for the promotion of breastfeeding were initiated across the country, targeting midwives, nurses, health workers, general physicians, paediatricians and obstetricians. Training workshops were based on the

40-hour breastfeeding training course recommended by WHO/ UNICEF (UNICEF & WHO, 1989). Pamphlets, books, and video resources teaching about breastfeeding were provided in the postpartum wards for mothers (Marandi & Ezzeddin Zanjani, 2012). At that time the Iranian Breastfeeding Promotion Society, a non-government association, was launched to support nursing mothers through telephone services (Olang et al., 2009).

The Demographic and Health Survey in1991 reported that while 90% of Iranian mothers initiated breastfeeding and 56% of them breastfed their infants one year, only 7% of infants were breastfed exclusively to four months (Kalantari & Roudsari, 2013). This result indicated that breastfeeding was a traditional practice within Iranian society, however, obstacles to the continuation of exclusive breastfeeding still existed, and an effective intervention was necessary to improve breastfeeding outcomes in Iran. Thus, in 1994, the policy of setting up "Baby Friendly Hospitals" was implemented in maternity hospitals to encourage increased breastfeeding rates. In 1994 22% of maternity hospitals achieved Baby Friendly Hospital certificates, and by 2006, and in 2010, 80% and 90% were certificated respectively (Kalantari & Roudsari, 2013; Olang et al., 2009). Iran now has the highest number of baby friendly hospitals among Middle-Eastern countries (UNICEF, 2013; Zareai, O'Brien, & Fallon, 2007). To further promote and support breastfeeding, the Maternity Protection Act of the International Labour Organization provides guidelines that covers governmental working mothers only (Olang et al., 2009).

Following the efforts of the Iranian government during the last two decades to support and promote breastfeeding, an improvement in the duration of breastfeeding has been observed in rural and urban areas. For instance, in 1992, 62% of urban and 72% of rural mothers breastfed their infants for 12 months, and in 2010 this figure had increased to 84% in rural and urban areas (Marandi & Ezzeddin Zanjani, 2012). However, an analysis of the Demographic Health Surveys (DHS), documented the rate of exclusive breastfeeding of infants under six months to be 44% (Kalantari & Roudsari, 2013; Ministry of Health, 2000b), which fell to 40% in 2004, and fell further to 20-25% in 2008 (Khamnian, Azarfar, Ravanshad, Hashemian, & Hasanpour, 2013). A retrospective study of 63,071 babies less than two years old in the 30 provinces of Iran in 2005 reported that while 90% of mothers breastfed their infants at one year and

57% at two years, the rate of exclusive breastfeeding in infants less than six months in rural areas was 29% and 27% in urban areas (Olang et al., 2009). Therefore, although the efforts of the government during the last two decades have improved the duration of breastfeeding, exclusive breastfeeding practices are still below the national targets and recommendations (Table A.1, Appendix A).

2.2 Breastfeeding practices in Middle-Eastern countries

This review examines contemporary breastfeeding rates in the past two decades in Middle-Eastern countries with the results of the two most recent studies from each country being reported. However, some countries in this region, including Syria, Iraq, Palestine and Yemen, have been struggling with war for a long time, and available data on breastfeeding practices are scarce. While the countries in this region share the common religion of Islam, there are significant cultural differences related to ethnic differences between Arab, Persian and Turkish populations.

2.2.1 Breastfeeding initiation in Middle-Eastern countries

Comparison of the initiation of breastfeeding in healthy term infants shows similarities across all ethnic groups in the region in recent decades (Table 2.1). For instance, in Arab countries initiation of breastfeeding ranged from 90.4% in Kuwait (Nassar et al., 2014) to 100% in Bahrain (Musaiger & Abdulkhalek, 2000) and Egypt (El Shafei & Labib, 2014). Similarly, in Iran, the Integrated Monitoring Evaluation Survey (IMES) (Olang et al., 2009) and a cross-sectional survey (Noughabi, Tehrani, Foroushani, Nayeri, & Baheiraei, 2014), reported an initiation rate of 90% and 100% retrospectively amongst this Persian population. Again in Turkey, initiation rates ranged from 96.8% (TDHS, 2003) to 98.1% (Yesildal et al., 2008) (Figure 2.1). Initiation rates have remained generally high in the Middle-Eastern region because the predominant religion is Islam, and breastfeeding is consistent with Islamic recommendations in the Quran.

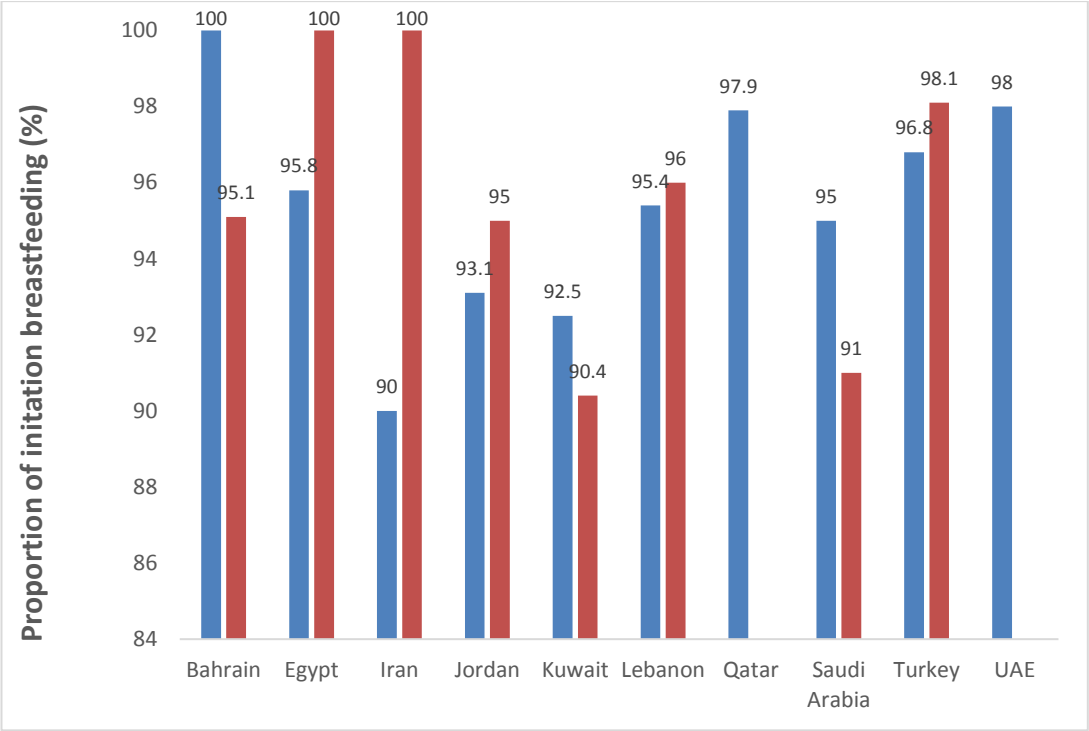

Figure 2.1: Initiation of breastfeeding in Middle Eastern countries

2.2.2 Early Initiation of breastfeeding

Prospective cohort studies document the association of early initiation of breastfeeding (within one hour of birth) with a low risk of neonatal mortality (Imdad, Yakoob, & Bhutta, 2011). An early initiation rate of greater than 60% has been reported for the region overall by WHO (EMRO of WHO, 2012). However, this overall rate doesn't highlight the disparities between Middle-Eastern countries. For instance, in Arabian countries early initiation rates ranged from 10.4% in Egypt (Al Ghawass & Ahmed, 2011) to a high of 80.6% in UAE. In Iran, Noughabi et al. (2014) reported an early initiation of 43.5% in Tehran, and in Turkey this rate ranged from 53.9% (TDHS, 2003) to 66% (Yesildal et al., 2008).

A plausible explanation for a low rate of early initiation of breastfeeding in some Middle-Eastern countries is that giving prelacteal foods is a common practice in the region according to traditional beliefs. Evidence reveals that neonates who are put in the breast within one hour of birth are less likely to be fed prelacteal foods (Penders et al., 2006). Prelacteal feeds consist of any food, or liquids given to neonates before initiating breastfeeding. Honey, crushed dates and herbal tea are traditional foods offered to newborn infants according to cultural and religion beliefs. For instance, in Bahrain where only 39.8% of mothers practised early initiation of breastfeeding, 39%

of their infants received traditional foods during the first three days after delivery (Musaiger & Abdulkhalek, 2000). Similarly, a cross-sectional study in Egypt reported that 53% of mothers offered prelacteal foods to their infants during the first three days of life (Al Ghawass & Ahmed, 2011) and Radwan et al. (2013), reported that traditional foods were given to 27% of Emirati infants in hospital. A recent cross-sectional study reported that Jordanian mothers offered herbal tea to their infants as the first food in the belief that it helped to pass meconium and reduced neonatal jaundice (Abuidhail, 2014). The provision of prelacteal foods is an unhealthy practice, particularly when the practice replaces colostrum and its immunoglobulin properties, which protect infants against diarrhoea and pneumonia, and its biological laxative properties that helps to clean meconium from the infant bowel (Hussein & Aziz, 2013; Pillegi, Policastro, Abramovici, Cordioli, & Deutsch, 2008).

Data on early initiation of breastfeeding in Western countries is rare, and only one study was identified, reported that 43% of mothers from 21 out of 53 countries across the WHO European Region initiated breastfeeding within one hour after delivery (Bosi, Eriksen, Sobko, Wijnhoven, & Breda, 2016).

Table 2.1: Summary of breastfeeding studies (1999-2014) in Middle Eastern countries

Country	Author, Year	Sample, study design	Ever BF %	EBF %		Early initiation BF %	Comments
				<4mon	<6mon		
Bahrain	Musaiger,2000	Sample: 200 Child age: 0-24 mon	100.0	NP	NP	39.8	Small sample size
	Conducted:1999	**Design:** Cross- sectional, Retrospective recall					Introduction of traditional foods during the first 3 days was 39.0
	Al Sairafi, 2002	Sample: 408 Child age: 0-24 mon	95.1	10.0	9.7	NP	WHO EBF definition is provided Measure of EBF was not since birth
	Conducted:2002	**Design:** Cross-sectional, Retrospective recall					Introduction traditional foods was before 4 mon (64%) Median duration any BF 7.9 mon
Egypt	Al Ghwass,2011	Sample: 1059 Child age: 6-12 mon	95.8	NP	9.7	10.4	EBF definition consist with WHO Using multivariate analysis
	Conducted: 2010	**Design:** Cross-sectional, Retrospective recall in rural					During the first 3 days, 53% of infants received traditional foods
	El Shafei, 2014	Sample: 822 Child age: 0-24 mon	100.0	50.0	29.9	32.4	WHO EBF definition used Measure of EBF was not since birth and based on maternal recall
	Conducted: 2012	**Design:** Cross- sectional, retrospective recall					Using multivariate analysis

Country	Author, Year	Sample, study design	Ever BF %	EBF %		Early initiation BF %	Comments
				<4mon	<6mon		
Iran	Olang: 2009 Conducted: 2005-2006	Sample: 63,071 Child age: < 24 mon **Design:** Cross-sectional, retrospective recall	90.0	57.0	28.0	NP	WHO EBF definition used Integrated Monitoring Evaluation System study
	Noughabi: 2014 Conducted:2011	Sample: 538 Child age:6-24 mon **Design:** Cross-sectional	100.0	NP	46.5	43.5	WHO EBF definition used Measure of EBF was not since birth and based on maternal recall Mean EBF was 4.5 mon
Jordan	JPFHS 2012 Conducted:2012	Sample: : 15,190 Child age: < 24 mon **Design**: Cross-sectional, retrospective	93.1	9.0	2.0	18.6	WHO EBF definition used Measure of EBF was not since birth and refers to 24 hrs preceding the survey Mean any BF11.7 mon Mean EBF 2.1 mon
	Abuidhail: 2014 Conducted: NP	Sample: 572 **Design:** Longitudinal	95.0	6.0	1.0	NP	EBF definition was consist with WHO Measure of EBF was since birth

Country	Author, Year	Sample, study design	Ever BF %	EBF %		Early initiation BF %	Comments
				<4mon	<6mon		
Kuwait	Dashti: 2010	Sample: 373	92.5	NP	0.0	44.6	WHO EBF definition used
		Child age: 0-6 mon					Measure of EBF was since birth
	Conducted: 2009						
		Design: Cohort					
	Nassar: 2014	Sample: 234	90.4	NP	NP	NP	Measure of BF based on maternal recall
	Conducted:2012-2013	Child age: 2-3years					
		Design: Cross-sectional, retrospective recall					
Lebanon	Batal: 2006	Sample: 830	95.4	23.4	10.1	18.3	WHO EBF definition used
	Conducted: 2005	Child age: 1-5 years					Only 37.6 of mothers given breast milk to infants after birth
		Design: Cross-sectional, retrospective recall					62.4% of infants received prelacteal foods including infant formula, glucose water, herbal tea and orange blossom water
	Hamade: 2013	Sample: 552	96.0	27.0	NP	18.3	WHO EBF definition used
							Measure of EBF was since birth
	Concluded: 2009	**Design:Longitudinal**,					Multivariate regression analysis used
		birth to 12 weeks					Only Primiparouse included

Country	Author, Year	Sample, study design	Ever BF %	EBF %		Early initiation BF %	Comments
				<4mon	<6mon		
Qatar	Al Kohje: 2012	Sample: 770	97.9	NP	18.9	57.0	EBF definition consist with WHO
		Child age:< 24mon					Measure of EBF referred to 24 hrs recall
	Conducted:2009						Mean any BF duration 11.9 mon
		Design: Cross-sectional, retrospective recall					
Saudi Arabia	Al-Hreashy: 2008	Sample: 578	95.0	NP	1.7		WHO EBF definition used
		Child age: 0-6 mon					
	Conducted: 2005						
		Design: Cross sectional, retrospective recall					
	Amin: 2011	Sample: 641	91.0	19.2	12.2	11.2	EBF definition consist with WHO
		Child age: 0-24 mon					Using multivariate logistic regression analysis
	Concluded: 2010						
		Design: Cross-sectional					Mean any BF duration 6 mon
		Retrospective recall					

Country	Author, Year	Sample, study design	Ever BF %	EBF %		Early initiation BF %	Comments
				<4mon	<6mon		
Turkey	TDHS: 2003	Sample: 13.049	96.8	NP	20.8	53.9	WHO EBF definition used
		Child age: < 5years					Measure of EBF was not since birth and refers to 24 hrs preceding the survey
	Conducted: 2003						
		Design: Cross-sectional,					40% of infants received prelacteal foods
		Retrospective recall					Mean any BF duration 4.8 mon
							Mean EBF 2.1
	Yesildal: 2008	Sample: 158	98.1	NP	22.4	66.0	WHO BF definition used
		Child age:0- 24 mon					Small sample size
	Conducted: 2006						
		Design: Cross-sectional,					
		Retrospective recall					
United	Radwan:2013	Sample: 593	98.0	7.4	1.9	80.6	WHO EBF definition used
Arab		Child age: 0-24 mon					Traditional prelacteal foods offered to 27% of infants in hospital
Emirates	Conducted: 2013						
		Design: Cross-sectional, retrospective recall					Mean any BF duration 8.5 mon

2.2.3 Exclusive breastfeeding rates in Middle-Eastern countries

Exclusive breastfeeding to 6 months is recommended by international authorities to improve health and development of infants (WHO, 2011). A systematic review of studies from 78 countries during 2000-2010 found that globally, around 50% of infants less than one month of age and 30% of babies aged one to five months were being exclusively breastfed (Cai, Wardlaw, & Brown, 2012). In the Middle East and North Africa (MENA) region, 60% of mothers were found to continue breastfeeding to12 months (EMRO of WHO, 2012), however a low rate of 40% of exclusive breastfeeding in infants less than six months had been reported previously from this region (WHO, 1989). More recently, in the Middle-Eastern countries the average rate of exclusive breastfeeding at four months was reported at 24% (WHO, 1989) with individual rates of: Lebanon 7%, Yemen 15%, Jordan 32%, Pakistan 16%, and Iran 48%. In spite of the highest rate of ever breastfeeding, the prevalence of exclusive breastfeeding has remained low in the Middle East region. For instance, in Arabian countries, exclusive breastfeeding at or to six months ranged from 0% in Kuwait to 29.9% in Egypt, in Turkey ranged from 20.8% to 22.4% , and 28% to 46.5% of Iranian mothers breastfed their infants exclusively in six months (Figure: 2-2)

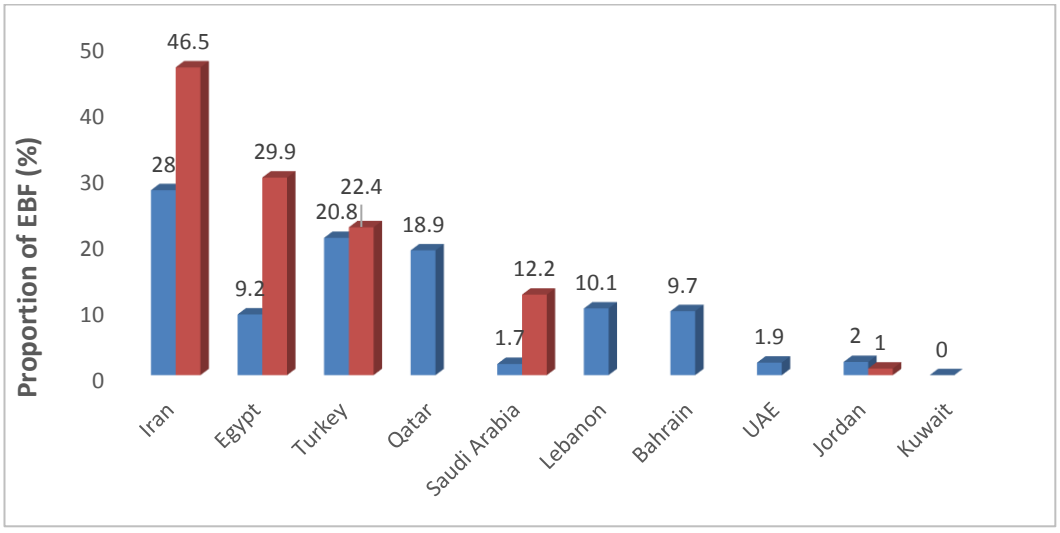

Figure 2.2: Prevalence of exclusive breastfeeding to 6 months in selected Middle Eastern countries

The rate of exclusive breastfeeding in Middle-Eastern countries is lower than international recommendations but to investigate and compare breastfeeding practices, a consistent, accurate classification of breastfeeding practices is essential. The World Health Organization's definition of exclusive breastfeeding is infants receiving

breastmilk including milk expressed or from a wet nurse, oral rehydration solution (ORS), drops and syrup including minerals and vitamins and medications (WHO, 2008b). However, in some studies in Iran (Rakhshani & Mohammadi, 2009; Roudbari, Roudbari, & Fazaeli, 2009), and other Middle-Eastern countries (Abuidhail, Al-Modallal, Yousif, & Almresi, 2014; Al Ghawass & Ahmed, 2011; Musaiger & Abdulkhalek, 2000), exclusive breastfeeding was defined to include infants tasting foods and water based drinks. In addition, to monitor exclusive breastfeeding practices, WHO recommended that the current age of infants and the type of food given in the past 24 hours be considered for mothers with infants less than 24 months of age (WHO, 2008b). However, studies show that current method of feeding indicators may overestimate the prevalence of exclusive breastfeeding (Aarts et al., 2000; Engebretsen et al., 2007) and do not meet the WHO standard of exclusive breastfeeding since birth (Binns et al., 2009), because a proportion of infants who received other foods or liquid prior to the 24 hour recall period are classified as being exclusively breastfed. Therefore, various definitions and inconsistency reported in studies may led to misinterpretation of results between studies (Aarts et al., 2000).

2.3 Comparison of Factors Associated with the Initiation and Duration of Breastfeeding between Middle-Eastern and Western Countries

In this section, variables associated with early initiation and duration of breastfeeding in Iran and other Middle-Eastern countries are reviewed and compared with findings from research into these factors across developed countries. Computerised searches of PUBMED and Google Scholar were conducted. Studies were limited to those which addressed breastfeeding practices conducted in Middle-Eastern countries, used multivariate statistical analysis of the data to control for potential confounders and effect mediators, were written in the English language and published prior to June 2016. There was no restriction on early published studies, however most studies conducted prior to the 2000s were excluded because they had not employed multivariate analytical techniques. No reports from conferences or newsletters that documented rates and duration breastfeeding were considered.

The successful practice of breastfeeding depends on many inter-related variables relating to the mother, infant and social support. In this review variables

associated with breastfeeding are categorised as sociodemographic, biomedical, hospital related and psychosocial factors. The data on the determinants of breastfeeding initiation in Middle East is scarce, as the practice is almost universal in this community. This review, therefore identified factors associated with early initiation and duration of breastfeeding among Middle-Eastern mothers. The determinants of exclusive or full breastfeeding duration were reported separately. Search terms included breastfeeding, early initiation, duration, exclusive breastfeeding, determinants and predictors. In addition the terms Middle East and Middle-Eastern, along with individual country names, were used to identify studies conducted in the region.

A total of eight studies conducted in Iran and 17 studies conducted in other Middle-Eastern countries that met the inclusion criteria and related to one or more of the outcomes of interest were identified. No Iranian study investigated the determinants of the early initiation of breastfeeding but two studies from other Middle-Eastern countries were identified that explored the determinations of this practice. Four Iranian studies that investigated the determinants of any duration of breastfeeding and four studies that investigated the determinants of the duration of exclusive breastfeeding were found (Table 2.2). Finally, five studies and one review conducted in other Middle-Eastern countries were identified that explored the determinants of the duration of any breastfeeding (Table 2.3) and nine that investigated the duration of exclusive or full breastfeeding (Table 2.4)

Table 2.2: Studies of the duration of breastfeeding among Iranian mothers*

Variables	Positive association	Negative association	No association
Sociodemographic			
Maternal age, older			**Any BF** Hajian, 2005; **Any BF** Rakhshani, 2009; **Any BF** Olang, 2012; **EBF** Mortazavi,2015
Maternal educational level (higher)	**EBF** Khamnian, 2013		**Any BF** Hajian, 2005; **Any BF** Rakhshani, 2009; **Any BF** Olang, 2012; **EBF** Mortazavi, 2015
Maternal employed		**Any BF** Olang, 2012	**Any BF** Hajian, 2005; **Any BF** Rakhshani, 2009
Income level: High level			**EBF** Khamanian, 2013; **EBF** Mortazavi, 2015
Rural location	**Any BF** Hajian, 2005; **Any BF** Rakhshani, 2009; **Any BF** Olang, 2012		
Biomedical factors			
Caesarean delivery			**EBF** Mortazavi, 2015
Parity (multiparous)	**EBF** Mortazavi, 2015		**EBF** Khamanian, 2013
Infant gender (male)			**Any BF** Hajian, 2005
Hospital related			
Attended antenatal class	**EBF** Dalili, 2013		
Use of pacifier		**Any BF** Olang, 2012	**EBF** Noughabi, 2014
Use of bottle		**Any BF** Olang, 2012; **EBF** Noughabi, 2014	
Early initiation of BF	**EBF** Noughabi, 2014		**EBF** Dalili, 2013
Psychosocial Factors			
Support from family			**EBF** Noughabi,2014
Mother's intention to breastfeed	**EBF** Noughabi, 2014		

EBF= Exclusive breastfeeding duration, **Any BF**= Overall breastfeeding duration

Table 2.3: Studies of the duration of any breastfeeding in Middle Eastern countries

Variables	Positive association	Negative association	No association
Sociodemographic			
Maternal age, older	Ertem, 2001;Balci, 2012; Al-Juaid, 2014 **review**		Dashti, 2014; Nassar, 2014
Maternal education level (higher)	Ertem, 2001; Dashti, 2014	Balci, 2012; Al-Juaid, 2014 **review**	Nassar, 2014
Maternal employed			Balci, 2012; Dashti, 2014
Higher income		Al-Juaid, 2014 **review**	Balci, 2012
Rural area	Al-Juaid, 2014 **review**		
Biomedical factors			
Caesarean delivery			Balci, 2012; Dashti, 2014
Parity (multiparous)	Al-Juaid, 2014 **review**; Dashti, 2014		Balci, 2012
Infant gender (male)			Balci, 2012; Dashti, 2014
Hospital practises			
Roomed-in			Dashti, 2014
Pacifier used		Dashti, 2014	
Given prelacteal foods			Dashti, 2014
Early initiation of breastfeeding	Nassar, 2014		
Breastfeeding on demand			Dashti, 2014
Psychosocial factors			
Father's baby or grandmother's baby prefer to use BF	Dashti, 2014; Nassar, 2014		

Table 2.4: Studies of exclusive or full breastfeeding in Middle-Eastern countries

Variables	Positive association	Negative association	No association
Sociodemographic			
Maternal age, older		**EBF** El Shafei, 2014	**Full BF** Al- Sahab, 2008; **EBF** Al-Ghawass, 2011 ; **EBF** Radwan, 2013; **EBF** Hamade, 2013; **Full BF** Dashti, 2014
Maternal education level, (higher)	**Full BF** Dashti, 2014	**EBF** Batal, 2006; **EBF** El Shafei, 2014	**Full BF** Khassawneh, 2006; Al-Ghawass, 2011; Radwan, 2013; Hamade, 2013
Maternal employed	**EBF** Karacam, 2007	**Full BF** Khassawneh, 2006; **Full BF** Al- Sahab, 2008; Hamade, 2013; **Full BF** Dashti, 2014	**EBF** Al-Ghawass, 2011; **EBF** Radwan, 2013; **EBF** El Shafei, 2014
Income level: High Level			**Full BF** Khassawneh, 2006; **EBF** Hamade, 2013
Rural areas	**EBF** Batal, 2006		
Biomedical factors			
Caesarean delivery		**Full BF** Khassawneh, 2006	**EBF** Karacam, 2007; **Full BF** Al-Sahab, 2008; **EBF** Al-Ghawass, 2011; **EBF** Hamade, 2011; **EBF** Radwan, 2013; **EBF** El Shefei, 2014
Parity (multiparous)	**Full BF** Al- Sahab, 2008; **EBF** El Shafei, 2014		**Full BF** Khassawneh, 2006; **EBF** Batal, 2006; **EBF** Al- Ghawass, 2011, **EBF** Radwan, 2013; **EBF** Hamade, 2013; **Full BF** Dashti, 2014
Infant gender (male)	**EBF** Al-Ghawass, 2011		**Full BF** Khassawneh, 2006; **EBF** Radwan, 2013

Variables	Positive association	Negative association	No association
Infant experienced health problems/ NICU			
Attended antenatal class	**EBF** El Shefei 2014		
Hospital practises			
Roomed-in	**EBF** Radwan, 2013		
Given formula		**EBF** Alikasifoglu, 2001	
Pacifier used		**EBF** Al-Ghawass, 2011	**Full BF** Dashti, 2014
Given prelacteal foods	**EBF** Hossain, 1995		**Full BF** Dashti, 2014
Early initiation of breastfeeding	**EBF** Al-Ghawass, 2011,		**EBF** Hossain, 1995; **EBF** Batal, 2006
Breastfeeding on demand	**EBF** Radwan, 2013; **Full BF** Dashti, 2014		**EBF** Alikasifoglu, 2001
Psychosocial factors			
Support from mother or husband	**EBF** Hamade, 2013; **Full BF** Dashti, 2014		

2.3.1 Sociodemographic factors

2.3.1.1 Maternal age

Early initiation of breastfeeding

The World Health Organisation defines the early initiation of breastfeeding (EIBF) as being put to the breast within one hour of birth (UNICEF., 2008). However, this definition is not consistently used in studies. For instance, Edmond et al. (2006) explored the association of delayed breastfeeding initiation and neonatal mortality and defined early initiation of breastfeeding as being within the first day. Given the relatively small number of studies that have investigated this outcome, this review has reported the determinants of early initiation of breastfeeding as defined by the study.

No study in Iran has reported the predictors of early initiation of breastfeeding, while a study conducted by Orun et al. (2010) in Turkey found no association between early initiation of breastfeeding and maternal age. A recent study involving six low and middle income countries found no association with maternal age and early initiation of breastfeeding in the South Asian (India and Pakistan) and Latin American (Argentina and Guatemala) sites, however, older maternal age was associated with lack of early initiation of breastfeeding in the African countries (Kenya and Zambia) (Patel et al., 2015).

As early initiation of breastfeeding is commonly practiced in Western countries, the determinants of this practice have not been widely studied in these countries. However, studies in Western countries have consistently reported older maternal age to be more likely associated with initiation of breastfeeding than younger mothers (Dennis, 2002; Scott & Binns, 1999; Thulier & Mercer, 2009).

Duration of any breastfeeding

The relationship between maternal age and duration of breastfeeding between Iranian women and other Middle-Eastern countries is inconsistent. For instance, Iranian studies failed to find an association between maternal age and duration of any breastfeeding (Hajian-Tilaki, 2005; Olang et al., 2012; Rakhshani & Mohammadi, 2009). Similarly, two Kuwaiti studies found no association between maternal age and duration of breastfeeding (Dashti, Scott, Edwards, & Al-Sughayer, 2014; Nassar et al.,

2014). In other Middle-Eastern countries, however Ertem et al. (2001) reported that Turkish mothers aged less than 20 years were at a greater risk (RR: 1.38, 95% CI [1.07,1.76]) to stop breastfeeding earlier than mothers aged more than 20 years. Similarly, Balci et al. (2010) found a direct association between maternal age and longer duration of breastfeeding among Turkish women, and a recent review in Saudi Arabia, reported a longer duration of breastfeeding with increased maternal age (Al Juaid, Binns, & Giglia, 2014) .

In contrast, numerous literature reviews exploring the factors influencing breastfeeding duration in Western countries have reported consistently a direct association between maternal age and breastfeeding duration (Callen & Pinelli, 2004; Dennis, 2002; Scott & Binns, 1999).

Duration of exclusive or full breastfeeding

The majority of studies which have explored the association between maternal age and exclusive or full breastfeeding duration amongst mothers in Iran and other Middle-Eastern countries have failed to find an association with maternal age. The only Iranian study found no relationship between maternal age and exclusive breastfeeding duration (Mortazavi et al., 2015). Similarly two Lebanese surveys found no association between maternal age and full or exclusive breastfeeding duration (Al-Sahab, Lanes, Feldman, & Tamim, 2010; Hamade, Chaaya, Saliba, Chaaban, & Osman, 2013). A study in the United Arab Emirates failed to find any association of maternal age and exclusive breastfeeding duration (Radwan, 2013) and Dashti et al. (2014) in a Kuwaiti study found no relationship between mother's age and full breastfeeding duration. While, an Egyptian study found no association between maternal age and exclusive breastfeeding (Al Ghawass & Ahmed, 2011), more recently reported that younger Egyptian mothers (≤ 25 years old), were more likely to exclusively breastfeed longer than mothers older than 25 years (El Shafei & Labib, 2014).

2.3.1.2 Maternal education

Early initiation of breastfeeding

A high level of maternal education has been positively associated with breastfeeding behaviour. For instance, studies of Western mothers have documented a consistent relationship between the level of education and initiation of breastfeeding

(Dennis, 2002; Scott & Binns, 1999; Thulier & Mercer, 2009). However, no study in Iran and Middle-Eastern countries has evaluated the relationship between maternal education and early initiation of breastfeeding. Patel et al. (2015) reported that lower levels of maternal education was associated with a slightly increased risk of not initiating breastfeeding early in the African and South Asian countries studied but not the Latin American countries.

Duration of any breastfeeding

Iranian studies failed to find an association between educational level obtained and duration of any breastfeeding (Hajian-Tilaki, 2005; Olang et al., 2012; Rakhshani & Mohammadi, 2009), but the results from other Middle-Eastern countries are inconsistent. For instance, a Kuwaiti study reported that women with 12 or more years of education were less likely to discontinue any breastfeeding in comparison to mothers with less than 12 years education (RR: 0.68, 95% CI [0.47, 0.96]) (Dashti et al., 2014), however a second Kuwaiti study found no association between maternal education and any breastfeeding duration (Nassar et al., 2014). Ertem et al. (2001) found that, Turkish mothers with 12 years or less of education were more likely to stop any breastfeeding than mothers with more than 12 years education (RR: 1.29, 95% CI [1.00,1.65]). However, a more recent study in Turkey (Balcı et al., 2012), and a recent review conducted in Saudi Arabia reported that breastfeeding duration is longer among mothers with low levels of education (Al Juaid et al., 2014).

There is consistent evidence in Western studies that a high level of education is associated with longer breastfeeding duration (Dennis, 2002; Meedya, Fahy, & Kable, 2010; Thulier & Mercer, 2009).

Duration of exclusive or full breastfeeding

While a Khamnian et al. (2013) reported a positive association between a high level of education and exclusive breastfeeding duration amongst Iranian women, a more recent Iranian study failed to report an association of maternal education and duration of exclusive breastfeeding (Mortazavi et al., 2015). However, Kuwaiti women with 12 or more years of education were less likely to stop full breastfeeding compared with women less than 12 years education (RR: 0.74, 95% CI [0.56, 0.97]) (Dashti et al., 2014). Conversely, a Lebanese (Batal, Boulghourjian, Abdallah, & Afifi,

2006) and an Egyptian (El Shafei & Labib, 2014) study, reported an inverse association between maternal education level and exclusive breastfeeding duration. However, the results of other surveys in Jordan (Hamade et al., 2013) and UAE (Radwan, 2013) have not found any association between maternal education level and duration of exclusive breastfeeding. Similarly, an Egyptian study failed to find any association with education (Khassawneh, Khader, Amarin, & Alkafajei, 2006).

A study in England indicated that the higher education level achieved by women, the more likely they were to continue exclusive breastfeeding (Howel & Ball, 2013), but a Canadian study found no such association (Semenic, Loiselle, & Gottlieb, 2008).

2.3.1.3 Maternal employment

Early initiation of breastfeeding

A high level of education and high rates of employment and entry into the workforce among new mothers may influence breastfeeding behaviour in Middle-Eastern countries. No study in Iran investigated the effect of return to work on the early initiation of breastfeeding. In general, investigators in Western countries have not found an association between return to work and initiation of breastfeeding (Dennis, 2002; Gielen, Faden, O'Campo, Brown, & Paige, 1991; Scott & Binns, 1999). However, an UK study reported that mothers who returned to work prior to six weeks postpartum were less likely to initiate breastfeeding compared with those who returned to work after six weeks (Noble, 2001).

Any breastfeeding duration

Maternal employment and return to work may be related to shorter breastfeeding duration as mothers start to bottle feed or discontinue breastfeeding prematurely in order to accommodate working. Studies that have explored the relationship between maternal employment and any breastfeeding duration in Iran and other Middle-Eastern countries, have shown inconsistent results. For instance, one study in Iran reported a negative association between returning to work and breastfeeding duration (Olang et al., 2009), but two other Iranian studies failed to find an association (Hajian-Tilaki, 2005; Rakhshani & Mohammadi, 2009). Similarly, recent Kuwaiti (Dashti et al., 2014) and Turkish studies (Balcı et al., 2012) found no association between return to work and duration of any breastfeeding.

Exclusive or full breastfeeding duration

While no study in Iran has investigated the association between maternal employment and exclusive or full breastfeeding duration, a Turkish study reported working mothers were less likely to stop exclusive breastfeeding and start complementary food than unemployed mothers (OR: 0.488, 95% CI:[.288, 0.827]) (Karacam, 2008). Conversely, four studies in other Middle-Eastern countries reported a negative association between return to work and exclusive (Hamade et al., 2013) or full breastfeeding duration (Al-Sahab et al., 2010; Dashti et al., 2014; Khassawneh et al., 2006). However, three studies have failed to identify any association (Al Ghawass & Ahmed, 2011; El Shafei & Labib, 2014; Radwan, 2013). Therefore, these findings show an inconsistency between maternal employment and duration of exclusive or full breastfeeding in Middle-Eastern countries.

The results of studies in Western countries that investigated the relationship between employment and exclusive or full breastfeeding duration are also inconsistent. For instance, an Australian study of 586 mothers reported a negative association between return to work prior to six months and full breastfeeding duration (Scott, Binns, Oddy, & Graham, 2006) and Bonet et al. (2015) reported that French mothers who did not return to work after eight months were more likely to continue full breastfeeding at four months compared with mothers who return to work prior to eight months (AOR: 10.6, 95% CI [5.4 , 20.7]). Similarly, a study in Canada found that unemployed women were more likely to breastfed exclusively at six months than employed women (Al-Sahab et al., 2010). However, return to work was not significantly associated with full duration of breastfeeding among New Zealand mothers (McLeod, Pullon, & Cookson, 2002).

2.3.1.4 Income status

Early initiation of breastfeeding

Socioeconomic status is influenced by family income. Although evidence from Western societies indicates a positive association between higher income and breastfeeding initiation (Riva et al., 1999; Scott & Binns, 1999), no study in Iran has investigated the relationship between initiation of breastfeeding and income status.

However, a Turkish study to identify any association between early initiation of breastfeeding and household income (Örün et al., 2010).

Any breastfeeding duration

Although no study has reported an association between family income and duration of any breastfeeding in Iran, a recent review reported a longer duration of breastfeeding among low-income Saudi families (Al Juaid et al., 2014). A Turkish study, however, has not found such an association (Balcı et al., 2012). Western countries have reported that higher economic status is related to longer duration of any breastfeeding (Meedya et al., 2010).

Exclusive or full breastfeeding duration

Studies in Iran failed to identify an association between level of family income and exclusive breastfeeding duration (Khamnian et al., 2013; Mortazavi et al., 2015). A Jordanian (Khassawneh et al., 2006) and Lebanese (Hamade et al., 2013) study also failed to show any association between income status and full or exclusive breastfeeding, respectively.

These inconsistent findings and differences between Western and Middle-Eastern countries may be explained by the fact that breastfeeding is traditionally and widely practiced in Middle-Eastern countries. Significant socioeconomic differences in breastfeeding practices are less apparent in countries where breastfeeding is a near universal and sustained practice (Scott, Binns, Graham, & Oddy, 2006).

2.3.1.5 Residence location (Rural vs. Urban)

Duration of any and exclusive breastfeeding

Some studies have explored the differences in breastfeeding practices between rural and urban communities in a number of Middle-Eastern countries. A cross -sectional study including 600 Iranian mothers found that a low risk of termination of breastfeeding about 25% in rural areas (Hajian-Tilaki, 2005). Rakhshani (2009) also reported that the weaning rate of breastfeeding in infancy in urban areas was 1.5 times more than in rural areas. A cohort study of all urban and rural areas of Iran reported that the risk of early weaning at 6 months increased among residents in urban areas (AOR: 16.8, 95% CI [8.1, 26.0]), however, no association was

found between duration of breastfeeding after six months and rural and urban areas (Olang et al., 2009). Consistently, a Saudi review reported a longer duration of breastfeeding among rural mothers (Al Juaid et al., 2014). A Lebanese study found that rural mothers breastfed exclusively for a longer time in comparison to urban mothers (Batal et al., 2006).

These results may reflect important cultural influences and the practice of breastfeeding in lower socioeconomic communities where access to modern health systems is restricted and exposure to infant formula is less. In addition, rural mothers were less likely to be employed and may be less involved in contributing to family economic resources, which allows them to have more time to continue breastfeeding.

Again the results from Western countries are inconsistent. For instance, while Sparks (2009) reported the initiation rate of breastfeeding among rural mothers was higher than urban mothers, Barton (2001) reported duration of breastfeeding is shorter among US mothers who are poor and live in rural areas as rural mothers encounter barriers to breastfeeding support, including lack of access to professional health workers and breastfeeding consultants. In a study of Australian women Scott et al. (2001) found no association between site of residence (urban vs rural) and overall duration of breastfeeding.

2.3.2 Biomedical factors

2.3.2.1 Parity

Early initiation of breastfeeding

The association of parity with early breastfeeding initiation has not been investigated in Iran, however, parity was not found to be associated with early initiation of breastfeeding in a Turkish study (Örün et al., 2010).

Any breastfeeding duration

In Middle-Eastern studies, multiparous women were found to be more likely to continue any breastfeeding compared with primiparous women in a Kuwaiti study (Dashti et al., 2014), which is consistent with a Saudi review (Al Juaid et al., 2014). However, no differences were found in the continuation of breastfeeding between

multiparous and primiparous Turkish mothers (Balcı et al., 2012). Studies in Western countries have consistently reported a positive association between multiparty and duration of breastfeeding (Dennis, 2002; Scott & Binns, 1999).

Exclusive or fully breastfeeding duration

An Iranian study found no association between parity and duration of exclusive breastfeeding (Khamnian et al., 2013), while a second Iranian study reported that multiparous women exclusively breastfed for longer than primiparous women (Mortazavi et al., 2015). Similarly, a Lebanese study reported that multiparous mothers were more likely to continue full breastfeeding compared with primiparous mothers (Al-Sahab et al., 2010). Additionally, a study reported that Egyptian mothers with one child were less likely to breastfeed exclusively at six months (OR: 0.3, 95% CI [0.14, 0.9]) (El Shafei & Labib, 2014). However, the majority of Middle-Eastern studies have found no association between parity and full breastfeeding duration (Dashti et al., 2014; Khassawneh et al., 2006) or exclusive breastfeeding duration (Al Ghawass & Ahmed, 2011; Batal et al., 2006; Hamade et al., 2013; Radwan, 2013). Therefore, these results suggest that the association of parity with exclusive or full breastfeeding in Middle-Eastern countries is inconsistent.

Multiparty may be a proxy indicator of prior breastfeeding success, as a cohort study of 870 UK mothers found that multiparous mothers who had not experienced breastfeeding previously were more likely to discontinue breastfeeding exclusively after four weeks (RR: 1.77, 95% CI [1.14, 2.73]) than primiparous women (Howel & Ball, 2013).

2.3.2.2 Normal delivery vs Caesarean section

Early initiation of breastfeeding

Caesarean section can adversely impact on early initiation of breastfeeding, as it delays the onset of lactation, and interferes with mother and infant interaction and infant sucking (Prior et al., 2012). Nevertheless, the only study of this factor in the Middle East found no association between caesarean section and early initiation of breastfeeding among Turkish mothers (Örün et al., 2010). However, several studies in industrial societies have reported a negative association between caesarean section and early breastfeeding. For instance, a review of 53 studies concluded that caesarean

section has a significant negative association with early initiation of breastfeeding (OR: 0.78; 95% CI [0.76, 0.79]) (Prior et al., 2012).

Any breastfeeding duration

Recent studies in Turkey (Balcı et al., 2012) and Kuwaiti (Dashti, Scott, Edwards, & Al-Sughayer, 2010) failed to report any association of method of delivery and duration of any breastfeeding. Several studies in Western countries also have found no such an association (Howel & Ball, 2013; Riva et al., 1999). A possible explanation is that once lactation is initiated, caesarean section does not have a long-lasting negative influence on breastfeeding duration (Scott & Binns, 1999).

Exclusive or full breastfeeding duration

Most studies in Iran and other Middle-Eastern countries which have investigated the association between mode of delivery and duration of exclusive or full breastfeeding have failed to find a negative association. The only Iranian study found no association between method of delivery and exclusive breastfeeding (Mortazavi et al., 2015). Similarly, several studies in Middle East have failed to find a negative association between caesarean section and exclusive (Al Ghawass & Ahmed, 2011; El Shafei & Labib, 2014; Hamade et al., 2013; Karacam, 2008; Radwan, 2013) or full breastfeeding duration (Al-Sahab et al., 2010). Only one Jordanian study found an adverse association between caesarean section and full breastfeeding duration (Khassawneh et al., 2006).

Conversely, many studies in Western societies have consistently reported a negative association between caesarean section and exclusive or full breastfeeding duration. For instance, a Canadian cross -sectional study of 248 participants found that caesarean section was significantly associated with a shorter duration of exclusive breastfeeding (Semenic et al., 2008). Similarly, another Canadian study of 5,615 mothers reported that normal delivery positively affects longer exclusive breastfeeding duration (Al-Sahab et al., 2010). Moreover, a review including 53 studies reported a shorter duration of full or exclusive breastfeeding among mothers delivered by caesarean section (Prior et al., 2012). These differences may be explained in part by variations in definition of exclusive breastfeeding because prelacteal feeds, which are commonly given to infants of Middle-Eastern countries, would not be detected in

cross-sectional studies if exclusive breastfeeding was defined using the 24 hour recall method.

2.3.2.3 Gender

Breastfeeding practices might be influenced by preferences for a specific gender in some cultures and communities. For instance, females may be discriminated against in poor societies and rural areas where families have more children and have traditional preferences for sons (Barcellos, Carvalho, & Lleras-Muney, 2014).

Early initiation of breastfeeding

No association between infant gender and early initiation of breastfeeding were reported in rural areas of Egypt (Hossain, Reves, Radwan, Habib, & DuPont, 1995) and a Turkish study (Örün et al., 2010). No Western and Iranian studies have investigated whether there is an association between an infant's gender and early initiation of breastfeeding.

Any breastfeeding duration

The infant's gender has not been associated with duration of any breastfeeding in Iran (Hajian-Tilaki, 2005), in other Middle-Eastern countries (Balcı et al., 2012; Dashti et al., 2014) or Western countries (Grjibovski, Yngve, Olov Bygren, & Sjöström, 2005; Scott et al., 2006)

Exclusive or full breastfeeding duration

The association between a baby's gender and exclusive or full breastfeeding duration amongst Middle-Eastern mothers has been found to be inconsistent. Duration of exclusive breastfeeding was longer among boys born to Egyptian mothers who lived in rural areas (Al Ghawass & Ahmed, 2011), however, Emeriti (Radwan, 2013) and Jordanian (Khassawneh et al., 2006) studies failed to find such an association.

Although the results for studies in Western countries found no association between a baby's gender and the duration of full or exclusive breastfeeding, a retrospective cohort study of 391 mothers in Japan, an industrialised country, reported that female infants continued fully breastfeeding longer than males (Nakao, Moji, Honda, & Oishi, 2008). In this case it has been suggested that mothers or health

workers may think male infants need more nutrition, therefore they may offer formula or supplemental foods earlier than to female babies.

2.3.2.4 Infant experienced health problems (admission to NICU)

Initiation of breastfeeding

A baby's admission to a Neonatal Intensive Care Unit (NICU) or Special Care Unit (SCN) can adversely influence the initiation and duration of breastfeeding. Problems identified at birth may be an obstacle to early initiation of breastfeeding, and can separate mother and infant and interfere with the infant's ability to breastfeed.

A recent Kuwaiti study reported that infants who were not admitted to the SCN were more likely to initiate breastfeeding (AOR: 5.67, 95% CI [2.49, 12.95]) (Dashti et al., 2010). However, an earlier review failed to identify an association between admission to NICU and initiation of breastfeeding in developed countries (Scott & Binns, 1999).

Duration of breastfeeding

No study in Iran and other Middle-Eastern countries reported association between admission to NICU and duration of any or full breastfeeding. However, studies that have investigated the association of an infant's admission to NICU and duration of breastfeeding in Western countries have reported inconsistent results. A Canadian study reported a longer exclusive breastfeeding duration among infants who were not admitted to NICU (AOR: 1.51, 95% CI [1.12,2.03]) (Al-Sahab et al., 2010). However no such association was found in a review (Thulier & Mercer, 2009) or a retrospective cohort study (Häggkvist et al., 2010) of 29,621 Norwegian mothers.

2.3.3 Hospital related factors

2.3.3.1 Baby Friendly Hospital Initiative

The Baby Friendly Hospital Initiative (BFHI) is an intervention strategy commenced in 1991 by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) to improve and support the initiation, duration and exclusivity of breastfeeding (UNICEF & WHO, 1989). Maternity hospitals receive baby friendly certification by meeting and observing the 'Ten Steps to Successful

Breastfeeding" (Munn, Newman, Mueller, Phillips, & Taylor, 2016; WHO, 1998) (Table 2.5) . Policies and practices of maternity hospitals are covered in steps 1- 9, and the tenth step provides breastfeeding support for nursing mothers after their return to communities.

Table 2.5: Ten Steps to Successful Breastfeeding (WHO, 1998)

1	Have a written breastfeeding policy that is routinely communicated to all health care staff.
2	Train all health care staff in skills necessary to implement this policy.
3	Inform all pregnant women about the benefits and management of breastfeeding.
4	Help mothers initiate breastfeeding within half an hour of birth.
5	Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants.
6	Give newborn infants no food or drink other than breastmilk, unless medically indicated.
7	Practise rooming-in that is, allow mothers and infants to remain together-24 hours a day.
8	Encourage breastfeeding on demand.
9	Give no artificial teats or pacifies (also called dummies or soothers) to breastfeeding Infants.
10	Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

Nearly 20,000 maternity cares and hospitals have received BFHI certification, in 2011, Iran ranked first among Middle-Eastern countries, with 90% of hospitals certified (Kalantari & Roudsari, 2013). Evidence suggests that baby friendly hospital practices impact on breastfeeding rates. A recent review of 58 studies (2016) of developed and developing countries, concluded that BFHI has a positive effect on the duration of breastfeeding (Perez-Escamilla, Martinez, & Segura-Perez, 2016). No study in Middle-Eastern countries has reported on the association between BFHI status and breastfeeding outcomes, although associations with individual "steps" have been reported.

2.3.3.2 Antenatal class

Duration of breastfeeding

Step three recommends that all pregnant women should be informed about the benefits and management of breastfeeding. Evidence reveals that antenatal

education about breastfeeding may prolong breastfeeding duration. A cross-sectional study of 175 Iranian mothers concluded that education on breastfeeding in prenatal care lengthens the duration of exclusive breastfeeding (Dalili et al., 2014). Similarly, an Egyptian study reported a high rate of exclusive breastfeeding among mothers who attended antenatal classes on breastfeeding (AOR: 9.2, 95% CI [4.0,22.4]) (El Shafei & Labib, 2014). However, a Kuwaiti study failed to identify a positive association between antenatal classes and the initiation of breastfeeding (Dashti et al., 2010). The results of Western countries are consistent. A Cochrane review of 16 studies involving 8,262 women mostly from developed countries, concluded that antenatal peer counselling was significantly effective in increasing initiation while a combination of a booklet, video and lactation consultant increased the duration of exclusive breastfeeding at three months compared to routine antenatal care (Lumbiganon et al., 2012).

2.3.3.3 Early initiation of breastfeeding

Duration of breastfeeding

Initiation of breastfeeding in the first hour of life is step four of the 'Ten Steps to Successful Breastfeeding'. Although newborns have been sucking in the uterus and continue with an innate sucking capacity after birth, the actions need to be strengthened through teaching and support in the immediate postpartum period. The initiation of breastfeeding immediately after birth may contribute to longer breastfeeding duration. The result of a cross- sectional study of 547 mothers reported a positive association between early initiation of breastfeeding and duration of exclusive breastfeeding among Iranian mothers (OR: 2.35, 95% CI [1.17, 4.72]) (Noughabi et al., 2014). However, another Iranian study found no an association (Dalili et al., 2014). A cross -sectional study of 280 Kuwaiti mothers reported that the late initiation of breastfeeding was a risk factor for the discontinuation of any breastfeeding (AHR: 1.01, 95% CI [1.00,1.01]) (Nassar et al., 2014) and a recent cross-sectional study found an increase in duration of exclusive breastfeeding among Egyptian mothers who initiated nursing in the first hour postpartum, compared with mothers who put the baby to the breast later (AOR: 2.2, 95% CI [1.1,4.3]) (Al Ghawass & Ahmed, 2011). However, earlier studies in Egypt (Hossain et al., 1995) and Lebanon (Batal et al., 2006) failed to identify an association between early sucking and exclusive

breastfeeding duration. Therefore, the impact of early feeding on breastfeeding duration is inconsistent among Middle-Eastern studies. Similarly, a review of the effect of early feeding on the duration of breastfeeding in developed societies reported inconsistent findings (Dennis, 2002).

2.3.3.4 Introduction of traditional food

Duration of breastfeeding

The sixth step of the 'Ten Steps to Successful Breastfeeding' prohibits any liquid, or food be given to infants unless there is a medical indication for it. The provision of prelacteal feeds (including traditional foods) may interfere with the production of milk and reduce the duration of breastfeeding. While no study has investigated the effect of prelacteal food on the duration of breastfeeding in Iran, a longitudinal study followed 358 nursing mothers and their infants for 24 months postpartum to identify any association between giving fluids and breastfeeding duration. The study found that introduction of fluids during the first month postpartum increased the risk of termination of predominant breastfeeding (Mortazavi et al., 2015). An early Egyptian cross- sectional study of 152 neonates and their mothers reported that newborn infants who received prelacteal food including herbal tea or glucose water were more likely to have exclusive breastfeeding terminated at age 0-11 weeks compared with neonates who received breastmilk as their first feed (Hossain et al., 1995). However, a cohort study of 380 Kuwaiti nursing mothers, the majority (81%) of whose infants received traditional food in hospital, failed to identify any association of receiving traditional food and breastfeeding duration (Dashti et al., 2014). Although giving traditional food is not a common practice among Western societies, a Cochrane review of 8 studies including 984 lactating mothers and their infants suggested a negative association between receiving glucose water in the first few days after birth and breastfeeding duration (Becker & Remmington, 2014).

Giving traditional foods and ritualistic fluids to newborn infants is a preventable practice among Middle-Eastern countries (Nasreddine, Zeidan, Naja, & Hwalla, 2012). In addition to being associated with a shorter duration of breastfeeding, the practice of giving traditional food deprives newborns infants of nutritional and immune-protective benefits of colostrum.

2.3.3.5 Formula use in hospital

Duration of breastfeeding

The evidence reveals that the introduction of formula in hospital or a few days after birth is adversely associated with breastfeeding duration, as this practice can reduce the baby's sucking, the motivation of the mother to breastfeed, and the production of milk (Saadeh & Casanovas, 2009). Studies in Iran and Middle-Eastern countries that have investigated the effect of formula on the duration of breastfeeding have documented consistent results. For instance, a retrospective survey of 30 provinces of Iran found that the provision of formula significantly increased the risk of early cessation of breastfeeding (AOR: 16.8, 95% CI [8.1,26.0]) (Olang et al., 2012). Another cohort study of 538 Iranian mothers also concluded a negative association between the use of formula in hospital and exclusive breastfeeding duration in the six months of life (AOR: 0.53, 95% CI [0.37,0.78]) (Noughabi et al., 2014). Similarly, a Turkish longitudinal study investigated mothers for four months and reported that formula feeding in hospital was associated with early weaning of exclusive breastfeeding (AOR: 1.425, 95% CI [1.425, 1.885]) (Alikasşifoğglu et al., 2001).

Results of studies on the impact of formula feeding on breastfeeding duration in Western societies are inconsistent. An early review didn't find consistent evidence related to the association of in-hospital infant formula and breastfeeding duration (Scott & Binns, 1999). Yet another review, found a negative association between formula use in-hospital and breastfeeding duration (Dennis, 2002). Similarly, a longitudinal survey of 1,085 US women reported that mothers whose infants were given formula in- hospital were more at risk of stopping breastfeeding early (AOR: 2.3, 95% CI [1.5,3.3]) (DiGirolamo, Thompson, Martorell, Fein, & Grummer-Strawn, 2005). Some evidence, however, suggests that the introduction of formula in -hospital can be a marker of early breastfeeding difficulties rather than a factor in weaning of breastfeeding (Sheehan, Bridle, Hillier, & Feightner, 1999).

2.3.3.6 Rooming-in

Duration of breastfeeding

Rooming mothers and newborns together 24 hours after birth is the seventh step of 'Ten Steps to Successful Breastfeeding'. Infants who experience rooming- in are found to sleep quietly, breastfeed frequently, gain weight rapidly and continue breastfeeding longer as it promotes feeding on demand (Dennis, 2002; Saadeh & Casanovas, 2009). One study conducted in the Middle East reported a positive association of rooming-in on exclusive breastfeeding and duration among Emeriti nursing mothers (AOR: 4.48, 95% CI [2.14, 9.39]) (Radwan, 2013). However a Kuwaiti study failed to find an association between rooming- in and any breastfeeding or full breastfeeding duration (Dashti et al., 2014). Western studies consistently have reported that rooming-in is significantly associated with successful lactation practices. The evidence suggests that rooming-in improves early mother- infant bonding that is positively related to lactation duration (Dennis, 2002; Scott & Binns, 1999).

2.3.3.7 Breastfeeding on demand

Duration of breastfeeding

There is evidence that newborn infants should be fed whenever they show a hunger to feed and feeding on demand is encouraged as step 8. As infants breastfeed for different durations at varying times, the effectiveness of milk transfer is regulated. Consequently, infants feed with more sucking and longer duration than infants who are breastfed on fixed feeding schedules (Saadeh & Casanovas, 2009). No Iranian study has investigated the association of feeding on demand and duration of breastfeeding. Although a cohort study of 385 Kuwaiti mothers and their infants failed to identify an association of demand feeding in hospital and duration of any breastfeeding, a significant association was reported between feeding on demand and the duration of full breastfeeding (AOR: 1.28, 95% CI [1.01,1.62]) (Dashti et al., 2014). Similarly, a cross-sectional study involving 593 Emirati mothers reported a significant association of demand feeding and the continuation of exclusive breastfeeding (AOR: 2.92, 95% CI [1.39, 6.14]) (Radwan, 2013). However, a recent survey in Turkey, did not find a positive relationship between demand feeding and

exclusive breastfeeding at four months postpartum after controlling for confounding variables (Alikasşifoğglu et al., 2001).

2.3.3.8 Pacifier use

Duration of breastfeeding

Step 9 recommends that no artificial teats or pacifiers be given to breastfeeding infants as their use has been shown to reduce the frequency of breastfeeding and may lead to a reduction of breastmilk production and consequently, early discontinuation of breastfeeding (WHO, 1998).

The limited number of studies of Iranian and Middle-Eastern mothers in general have reported an association between pacifier use and shorter duration of breastfeeding. For instance, a retrospective study of all provinces of Iran reported a correlation between using a pacifier and discontinuation of breastfeeding at six months (AOR: 2.4, 95% CI [2.0, 4.6]) and after six months (AOR: 2.6, 95% CI [1.38 , 4.19]) (Olang et al., 2012). Although, a cohort study of 538 Iranian mothers failed to identify an association between the introduction of a pacifier and the duration of exclusive breastfeeding after controlling for potentially confounding variables (Noughabi et al., 2014).

A prospective cohort study of 373 Kuwaiti mothers identified the introduction of a pacifier before four weeks of age as a risk factor for stopping any breastfeeding (AHR: 1.66, 95% CI [1.18,2.33]), however, no association was found between a pacifier use and stopping full breastfeeding (Dashti et al., 2014). While a cross - sectional study of 1,059 Egyptian mothers reported that infants who did not use a pacifier were more likely to be breastfed exclusively at six months (AOR: 11.3, 95% CI [7.2,17.7]) (Al Ghawass & Ahmed, 2011).

Studies of Western countries have consistently reported a negative association. There is evidence that a pacifier use is associated with early cessation of breastfeeding even amongst mothers who plan to breastfeed and are highly motivated (Clara Aarts, Hörnell, Kylberg, Hofvander, & Gebre-Medhin, 1999; Scott et al., 2006). More recently, an Italian longitudinal study of 542 nursing mothers reported a shorter duration of exclusive breastfeeding amongst mothers who introduced a pacifier within the first two weeks postpartum (AOR: 2.38, 95% CI: [1.35,4.20]) (Lindau et al., 2015).

The association between the use of a pacifier and breastfeeding duration is somewhat controversial and it has been proposed that pacifier use was a consequence rather than a cause of breastfeeding difficulty. For instance, an early Randomised Control Trial (RCT) study of 281 lactating Canadian mothers and their infants identified pacifier use as a marker of breastfeeding difficulty (Kramer et al., 2001) and a recent review (O'Connor, Tanabe, Siadaty, & Hauck, 2009), and a meta-analysis of two trials of 1,915 babies suggested that duration of breastfeeding cannot be influenced by use of a pacifier in mothers who are motivated to breastfeed (Jaafar, Jahanfar, Angolkar, & Ho, 2011).

2.3.4 Psychosocial factors

2.3.4.1 Social support

Duration of breastfeeding

Although the process of lactation is a natural physiological phenomena, breastfeeding is not innate, and is a learned behaviour that needs a supportive social environment. Social support can be categorised as being emotional, tangible and educational and provided by formal and informal advice, and the knowledge and guidance of lactation consultants and professional health workers, mother, family and partner (Dennis, 2002; Scott & Binns, 1999). These supports have been reported to increase the rate of initiation and continuation of breastfeeding, however, negative advice and social support can decrease breastfeeding practices.

In a cohort study of 572 Iranian nursing mothers, after controlling for potential confounding, although no association was found between support from the husband and continuation of exclusive breastfeeding, conflicting infant feeding advice was found to have a negative effect on duration of exclusive breastfeeding (OR: 0.53, 95% CI: [0.37,0.78]) (Noughabi et al., 2014). A cross-sectional study of 280 Kuwaiti nursing mothers reported that women who were supported and encouraged by their husband were less likely to terminate breastfeeding prior to six months postpartum (Nassar et al., 2014). A second study conducted in Kuwait also found a positive effect on mothers' initiation and duration of full breastfeeding when their husband preferred breastfeeding over formula feeding (Dashti et al., 2014). Similarly, a Randomised Control Trial survey of 751 Lebanese women found that mothers who were emotionally advised and supported by their women were 1.9 times more likely to

breastfeed exclusively at 8-12 weeks postpartum (Hamade et al., 2013). These results suggest that in the Middle East, nursing mothers traditionally respect and rely on the advice and supports of their mothers, mothers- in- law and husbands.

Consistently, numerous Western studies have found that support from family or health workers has a positive effect on the duration of breastfeeding. A cohort study of 587 Australian women found that infants whose fathers and grandmothers preferred breastfeeding were less likely to stop full breastfeeding before six months or any breastfeeding up to 12 months postpartum (Scott et al., 2006). Another cohort study of 1,163 US mothers reported that mothers who received support and encouragement from clinicians were less likely to terminate breastfeeding at 12 weeks postpartum (Taveras et al., 2003). A number of reviews have also concluded that there is a positive association between social support and breastfeeding duration (Dennis, 2002; Meedya et al., 2010; Scott & Binns, 1999; Sikorski, Renfrew, Pindoria, & Wade, 2003).

2.3.4.2 Prenatal breastfeeding intention

Duration of breastfeeding

An early decision to breastfeed may be a strong indicator for breastfeeding, as mothers who have formed this intention are able to conquer difficulties experienced during nursing and to continue breastfeeding longer. Few studies have investigated the association between mother's intention and breastfeeding practices in Middle-Eastern countries. A cross-sectional study involving 547 mothers in Iran found a significant association between maternal infant feeding intention before delivery and exclusive breastfeeding in the first six months (OR: 5.85, 95% CI: [2.88,11.9]) (Noughabi et al., 2014). Numerous Western studies reported positive association between prenatal intention and continuation breastfeeding (Dennis, 2002; Meedya et al., 2010; Sheehan et al., 1999). For example, a cohort Australian study involving 14,000 mothers found mothers with the intention of breastfeeding at 32 weeks pregnancy were more likely to initiate and continue breastfeeding in the first six months than those who were uncertain about what feeding method to use (Donath & Amir, 2003).

2.3.5 Breastfeeding and the Middle-Eastern economic transition

The Middle East economically, politically and religiously is a complex region. The modern Middle East started after discovering oil and the countries bordering the Persian Gulf became extremely wealthy nations. Rapid economic

development, modernisation and urbanisation in these communities have changed life styles, and an increase in disposable income along with advertisements for formula milk have modified infant feeding practices (Al-Shehri, Farag, Baldo, Al-Mazrou, & Aziz, 1995). The introduction of modern technologies, urbanisation, and availability of different brands of infant formula, integrated with medicalisation of infant health care, have reduced the traditional practices and lead to a decline in breastfeeding rates. A study conducted in Saudi Arabia in 1995 found an inverse association between modernisation in a wealthy economy and the duration of breastfeeding (Al-Shehri et al., 1995). A decrease in breastfeeding duration was apparent among urban, higher income people with higher level of education. Overall, modernisation, industrialisation and adaptation of new lifestyles combined with the availability of formula milk products tend to counteract religious recommendations on the duration of breastfeeding, and may explain the differences in breastfeeding behaviours evident in rural, urban areas and countries of varying wealth in the Middle East.

2.4 Mastitis

The aim of this section of the literature review is to describe the pathophysiology of mastitis and to identify and review studies reporting the incidence, risk factors for and the management of mastitis, and the association of mastitis and duration of breastfeeding.

2.4.1 Pathophysiology of mastitis

Lactation mastitis is an inflammation of connective tissue involving more than one lobule of-the mammary glands, which may be experienced by lactating mothers (Lawrence, 2002), and can develop as early as the second and third weeks following delivery (Amir, 2014; WHO, 2000). The consequence of pain, distress, and days in bed may lead to early cessation of breastfeeding (Foxman, D'Arcy, Gillespie, Bobo, & Schwartz, 2002). The popular clinical consensus is that incomplete emptying of milk and delayed drainage, which leads to milk stasis are the primary factors implicated in mastitis (WHO, 2000). However, the aetiology of mastitis is the subject of increasing research interest by both clinical and microbiologists, and is still far from being fully understood.

Human milk contains important immunological factors including immunoglobulin A, B and C and Cytokines including IL8 which can be protective

against infection both infants (Trend et al., 2016), and the mammary gland (Rodriguez & Fernandez, 2017). In addition, it includes a complex microbiota which as well as having implications for establishing the infant gut microbiome (Fallani et al., 2010), and infant health, is important for mammary health (Rodriguez & Fernandez, 2017). A healthy milk biota contains a balance of many different classes of bacteria. While the role of bacterial pathogens remains unclear (Kvist, Larsson, Hall-Lord, Steen, & Schalén, 2008), research suggests that a mammary dysbiosis 'changes in the qualitative and quantitative composition of milk microbiota' frequently leads to acute (infectious) or subacute (non-infectious) mastitis (Rodriguez & Fernandez, 2017). While some bacterial strains have the ability to prevent infection and inflammation, under certain circumstances (discussed later) other 'normal' milk microbiota might exert photogenic effects.

Staphylococcus aureus is the bacteria found most commonly in the milk of women with acute mastitis (Jiménez et al., 2015; Kvist et al., 2008), although it has also been found in the milk of approximately one third of healthy women (Kvist et al., 2008). *S. aureus* can produce toxins that can lead to an inflammation of the breast tissue and the characteristic localised breast symptoms (e.g. redness, heat, pain) associated with mastitis (Rodriguez & Fernandez, 2017). Once these toxins reach the blood stream they can disrupt the host cytokine response resulting in systemic symptoms including fever, chills and aches. If unsuccessfully treated acute mastitis may lead to abscess and septicaemia, and many require hospitalisation (Wambach, 2003).

Other species that are part of the normal milk microbiota include coagulase-negative staphylococci (CNS), the most common being *S. epidermis* (Jiménez et al., 2015), and *mitis* and *salivarius* streptococci (Rodriguez & Fernandez, 2017). Under normal conditions these species form thin biofilms that line the epithelium of the mammary ducts. These species don't produce the toxins responsible for acute mastitis, hence an overgrowth of these bacteria does not result in systemic symptoms and breast symptoms are generally milder. However, under certain conditions these bacteria can form thick biofilms inside the ducts resulting in a narrowing and eventual blocking of the ducts and milk flow, resulting in breast engorgement (Rodriguez & Fernandez, 2017). Subacute mastitis is accompanied by an increase in the cytokine interleukin 8

(IL8) and sodium in breastmilk, and these biomedical changes may lead to reduced milk secretion (Arroyo et al., 2010; Fetherston, Lai, & Hartmann, 2006). Traditionally, the diagnosis of infection was based on nonspecific clinical signs, and antibiotics were prescribed (Ingman, Glynn, & Hutchinson, 2014; Martín, Heilig, Zoetendal, Smidt, & Rodríguez, 2007), however, the analysis and culturing of breastmilk is recommended in the diagnosis of mastitis to detect whether there is an increase of bacterial colonies in the milk (WHO, 2000). Bacteria have an unclear role in acute mastitis and evidence reveals that the majority of lactating mothers with significant pathogens in their milk recover spontaneously from mastitis (Kvist et al., 2008). In addition, the breastmilk of healthy mothers contains some pathogenic bacteria, hence the separation of mastitis into infectious and non-infectious is not practical (Kvist et al., 2008).

2.4.2 Incidence of mastitis

Most of the studies investigating mastitis, have been conducted in Western countries with reported rates ranging from 3% - 33% of breastfeeding mothers, but WHO reports the rate at under 10% (WHO, 2000). The highest reported incidence of mastitis is 33% reported in an early study of American women (Riordan & Nichols, 1990). This was a descriptive study of women attending two conference sponsored by the International Lactation Consultant Association (ILCA) and La Lech League International (LLLI) and the population at risk were those attending who had ever breastfed. However, as Kvist points out, this cannot be considered as a true incidence rate because no time limit was stated and hence the "population at risk" could not be identified (Kvist, 2013). For this reason this present review was limited to cohort studies which followed a sample of women for a stated period of time. Of the 10 studies identified, one was a retrospective cohort study (Kaufmann & Foxman, 1991) and all other studies followed mothers prospectively.

The incidence rates for mastitis in the cohort studies identified differ widely both within and between countries (Table 2.6). For instance, while a retrospective US study of 966 mothers conducted in the early 1990_s reported an incidence rate of 2.9% over a 7 week period (Kaufmann & Foxman, 1991), the most recent prospective USA study of 946 mothers found an incidence of 8.1% (Foxman et al., 2002). Yet Australian studies have reported higher rates of mastitis. For example, an early study of 306 mothers who were followed for three months postpartum, identified an

incidence rate of 27.1%, of which 51% of cases occurred in the first two weeks (Fetherston, 1996). In another study, Kinlay et al. (1998) followed 1,075 mothers during six months postpartum and found that lactation mastitis occurred among 20% of mothers. In an analysis of data from two studies (a Randomised Control Trial and a longitudinal survey) of 1,193 Australian lactating mothers, an incidence rate of 17.3% mastitis was reported during six months postpartum, of which 71% occurred in the first two months (Amir et al., 2007). A recent cohort study that followed 360 mothers for two months postpartum found the rate of mastitis was 20% with 73% of the sample population experiencing it in the first four weeks (Cullinane et al., 2015). Similarly, 23.7% of mothers in a New Zealand study of 350 women followed for one year postpartum experienced at least one episode of mastitis (Vogel, & Hutchison, 1999) While a longitudinal Scottish study of 420 breastfeeding mothers who were followed for six months postpartum, found an incidence for mastitis of 18% with 53% of first episodes occurring in the first month (Scott et al., 2008).

To date no studies have reported the incidence and risk factors of mastitis in Iran or any other Middle-Eastern countries. Only two studies conducted in low and middle income countries were identified. The first, a cohort study of 670 Chinese mothers, reported an incidence of 6.3%, of which 50% experienced mastitis in the first month (Tang, Lee, Qiu, & Binns, 2014). However, a recent Nepali study of 338 women reported an 8% incidence of mastitis in the first month postpartum (Khanal, Scott, Lee, & Binns, 2015).

The variation in incidence rates of mastitis may be explained largely by methodological differences between studies. For instance, the duration of follow-up which ranged from four weeks to 24 months, or the methods used to diagnose mastitis. Khanal et al. (2015) reported an 8% incidence in the first month postpartum among Nepali mothers, which is similar to the first month incidence of 9.5% reported for Scottish women (Scott et al., 2008). Given that approximately half of all cases occur in the first four weeks postpartum (Cullinane et al., 2015; Fetherston, 1996; Scott et al., 2008), it is reasonable to suggest that the six month incidence amongst Nepali women would be similar to that of Scottish women.

The lowest incidence rate of 2.9% over seven a week period was reported for a US study (Kaufmann & Foxman, 1991), for which cases were identified through the

medical records of those women who sought medical treatment from the hospital where they were delivered. In general, a woman is unlikely to seek hospital treatment unless she has a breast abscess. This is relatively rare with only 0.01% of Scottish women (Scott et al., 2008) and 0.04% of Australian women (Amir, Forster, Mclachlan, & Lumley, 2004) who experienced mastitis reportedly developing a breast abscess. Most women self-manage their condition or seek treatment from their general practitioner or other community-based health professional. For instance, just over a third of Scottish (Scott et al., 2008) and English (Potter, 2005), women who experienced mastitis were able to self- manage their condition without consulting a health professional.

Nevertheless, while there is no standard diagnostic criteria for mastitis (Amir, Trupin, & Kvist, 2014), four prospective studies (three Australian and one Scottish) used similar diagnostic criteria to define cases of acute mastitis (Amir et al., 2014; Cullinane et al., 2015; Kinlay et al., 2001; Scott et al., 2008). These criteria included a range of breast symptoms (pain, redness, lump) and at least one of fever or flu-like symptom. All of these studies followed women prospectively for six months postpartum and reported similar overall incidence rates of between 17% to 20%, with more than half of cases occurring in the first four weeks (Amir et al., 2007; Cullinane et al., 2015; Scott et al., 2008). This suggests that roughly 1 in 5 breastfeeding mothers will experience at least one episode of acute mastitis within the first six months postpartum, with at least half of first episodes occurring in the first month postpartum.

Table 2.6: Incidence of mastitis in cohort studies

Author & Year	Setting & design	Period followed	Defined mastitis	Outcome	Comments
Kaufmann, 1991	**Location**: United States **Study:** Retrospective cohort Sample size: 966	First 7 weeks	Physician diagnosis in hospital medical record	**Incidence**: 2.9 %	
Fetherston, 1997	**Location:** Australia **Study**: Prospective cohort Sample size: 306	3 months	Self-reported	**Incidence**: 27.1% 8.4% one recurrent episode 2.4% two recurrent episode 51% of cases occurred in the first 2 weeks	18% of mothers stopped BF due to mastitis. No breast abscess experienced.
Vogel, 1999	**Location:** New Zealand **Study:** Prospective Cohort Sample size: 350	12 months	Self-report	**Incidence:** 23.7% (one or more episodes) 41% experienced in the first month 21% of mastitis occurred before 3 months 10.8% of mastitis presented after 3 months 15% of mastitis occurred after 6 months	16% received antibiotics 2% of mothers weaned BF No cases of abscess reported Mastitis positively associated with BFD.
Kinlay, 2001	**Location:** Australia **Study:** Prospective cohort Sample size; 1075	6 months	79% of cases confirmatory diagnosed by medical practitioner 21% of cases self-reported	**Incidence**: 20%	
Foxman, 2002	**Location:** United States **Study:** Prospective cohort Sample size: 946	3 months	Self-reported or diagnosed by health professional	**Incidence**: 9.5% 1.3% of cases experienced two episodes	

Author & Year	Setting & design	Period followed	Defined mastitis	Outcome	Comments
Amir, 2007	**Location:** Australia **Study**: Combined data from an RCT and a longitudinal survey **Sample size:** 1193 primiparous women	6 months	Self –reported	**Incidence**: 17.3% 71% occurred in first 2 months 83% occurred in the first 3 months	Five mothers experienced breast abscess No association between BF duration and mastitis
Scott, 2008	**Location:** Scotland **Study:** Prospective cohort Sample size: 420	6 months	Self- reported	**Incidence**: 18% 68% one episode 23% two episodes 9% three or more episodes 53% of initial episodes occurred in the first 4 weeks	38% of mothers stopped breastfeeding Association between BF duration and mastitis
Tang, 2014	**Location**: China **Study:** Prospective cohort Sample size: 670	6 months	Self-reported	**Incidence**: 6.3% 59.5% experienced one episode. 50% of mastitis occurred in the first 4 weeks	
Cullinane, 2015	**Location:** Australia **Study:** Prospective Cohort Sample size: 360	2 months	Self-reported	**Incidence**:20% 73% of cases occurred in the first 4 weeks	Confirmed mastitis with nasal, nipple swabs and breastmilk sample
Khanal, 2015	**Location**: Nepal **Study:** Prospective Cohort Sample size: 338	1 month	Self-reported	**Incidence**: 8%	No association between mastitis and EBF duration

2.4.3 Risk factors associated with mastitis

The aetiology of mastitis is not fully understood, although it is a clinical syndrome that has been associated with a variety of potential risk factors.

Cracked nipples

Cracked and damaged nipples have consistently been associated with lactation mastitis (Cullinane et al., 2015; Foxman, Schwartz, & Looman, 1994; Kinlay et al., 2001; Kvist, Hall-Lord, & Larsson, 2007; Osterman & Rahm, 2000; Tang et al., 2014). For instance, in a New Zealand cohort study of 350 lactating mothers, after controlling for potentially confounding variables, women who reported sore nipples were twice as likely to experience mastitis in the first year (RR: 2.07, 95% CI: [1.17, 3.66]) (Vogel et al., 1999). An Australian study, after adjustment for confounding factors, also found that lactating mothers with cracked nipples were more likely to develop mastitis in the first six months postpartum (AOR: 1.7, 95% CI [1.14, 2.56]) (Amir et al., 2007). Traditionally, it has been postulated that cracked or sore and damaged nipples may provide pathogens with easy entry through the nipple to the lactiferous ducts leading to infection (Amir et al., 2007; Cullinane et al., 2015; Kaufmann & Foxman, 1991). However, cracked nipples may be a clinical sign mastitis (Delgado et al., 2009). Possibly caused by the highly virulent exfoliative toxins produced by *streptococcus aureus* (Bukowski, Wladyka, & Dubin, 2010), the dominant bacteria species found in the breastmilk of women with mastitis (Jiménez et al., 2015; Kvist et al., 2008).

Engorged breasts and blocked ducts

Breast engorgement is common in all cultures and is the "pathological overfilling" of the breasts with milk, characterised by hard, painful, tight breasts and difficulty breastfeeding (Mangesi & Zakarija- Grkovic, 2016). It is usually due to compromised milk removal, either from restricting feeding frequency and/or ineffective sucking, or less commonly overproduction of milk (Mangesi & Zakarija-Grkovic, 2016). Alternatively, as discussed previously, it may also be the result of an overgrowth of coagulase-negative staphylococci (CNS) which produce a thick biofilm which can block the milk ducts and reduce or block milk flow.

Several studies and reviews have consistently reported breast engorgement (Fetherston, 1998; Kinlay et al., 2001; Wambach, 2003) and blocked ducts (Fetherston, 1998; Kinlay et al., 2001) as contributors to mastitis in lactating mothers. For instance, a cohort study of 1,075 Australian breastfeeding mothers found that blocked ducts (OR: 2.43, 95% CI [1.68, 3.49]) and engorged breasts (OR: 1.42, 95% CI [1.05, 1.92]) were significantly correlated with the development of mastitis (Kinlay et al., 2001). This may be explained by a physiological process that occurs in the few days after delivery by which the circulation of blood and lymph increases in the breast and the milk 'comes in". The breasts over fill with milk, and mothers experience "fullness" accompanied by swollen breasts and tenderness, which may contribute to less frequent breastfeeding because of the discomfort. Distention of the alveoli, milk stasis and blocked ducts results. Thus, the areola of the engorged breast swells and infants are unable to pull the areola into their month so that nipples are chewed and sucked superficially, which causes fissures and cracked nipples to occur (Hill & Humenick, 1994; Kaufmann & Foxman, 1991; WHO, 2000). The time of peak breast engorgement can vary from 2-14 days (Weingrad & Tully, 2001) and persistent and prolonged engorgement may explain the high rate of mastitis in the first month postpartum. Breast engorgement can occur in later stages of lactation due to delayed or missed feeds or poor technique, which results in the infant failing to effectively drain the breast (Mass, 2004).

Expressed milk and use of breast pumps

The results of studies that have investigated the association between the expression of milk and mastitis are contradictory. An early Australian cohort study reported that expression of milk by hand or pump significantly reduced the risk of mastitis (AHR: 0.53, 95% CI [0.36, 0.78]) (Kinlay et al., 2001). However, a recent case –control study of 5,16 Spanish mothers found that using a pump for expression of milk was independently associated with an increased risk of mastitis (AHR: 2.78, 95% CI [1.68,4.58]) (Mediano, Fernández, Rodríguez, & Marín, 2014). Expression and effective milk removal is a crucial management step for engorged breasts, and blocked lactiferous ducts are a natural defence strategy to prevent the risk of Infection (Amir, 2014; WHO, 2000). The expression of breastmilk and the use of breast pumps are also practiced by mothers in the workforce to continue breastfeeding (Ortiz, McGilligan, & Kelly, 2004). However, milk expression can be problematic for

lactating mothers and consequently their infants. The evidence suggests that using a poor quality hand pump may be associated with increased prevalence of mastitis (Foxman et al., 2002) as it may not have a soft and flexible flange and thus traumatise the nipples (Lawrence, 2002). While expressing milk by electronic pumps may increase the milk supply, new nursing mothers may experience damaged nipples and breast pain that adversely influences milk supply (Brown, Bright, dwyer, & Foxman, 2005; Clemons & Amir, 2010). In addition, heavy expression of milk can cause damaged nipples due to overstretching of the breast, or increase breast swelling and engorgement that leads to mastitis (Pustotina, 2015; Rasmussen & Geraghty, 2011). While, expression of milk may cause minor trauma to breast and perhaps even be related to cracked nipples, the relationship to mastitis incidence is uncertain.

Candida infection and nipple and breast pain

Some studies have suggested that nipple thrush may predispose a mother to mastitis. An early Australian case control study of 98 lactating mothers reported that mothers in the *Candida* group were more likely to develop mastitis (Amir, 1991). *Candida Albicans*, a fungal pathogen that is colonised frequently in the gastrointestinal tract and vagina, is recognised as a cause of *Candida* infection that is a common source of oral thrush in infants. The incidence of *Candida* infection increases in the vagina during pregnancy and may be transmitted to the infant's mouth at delivery, then colonising in mothers' nipples and leading to a cycle of infection and re-infection during nursing (Carmichael & Dixon, 2002). The presence of *Candida* in the infant's mouth and damaged nipples during lactation were thought in earlier studies to be related to mastitis in mothers (Amir, 1991; Heinig, Francis, & Pappagianis, 1999). Some studies have found an association between the use of antifungal topical medication which are used to treat thrush and mastitis (Foxman et al., 2002; Mediano et al., 2014). For example, a US study of 946 lactating mothers reported the use of antifungal cream (RR: 6.8, 95% CI [2.13, 21.78]) as a risk factor for developing mastitis in the same week that cracked nipples occurred (Foxman et al., 2002).

However, while *Candida* commonly exists in the oral cavity and saliva of infants and can contaminate the nipples of nursing mothers, women with healthy immune systems do not experience *Candida* infection (Hale, Bateman, Finkelman, & Berens, 2009). A recent case control study comparing healthy mothers with those

mothers who experienced sore, traumatised nipples and shooting pain, failed to identify any *Candida* in the breastmilk of mothers with symptoms (Hale et al., 2009). Similarly, another case control study using new PCR technique to identify any fungal agent in the mammary gland, found that the milk of mothers with shooting pain in breast and *Candida* in nipples was clear of any *Candida (*Mutschlechner *et al.,* 2016*).*Therefore, studies reveal that *Candida* are a normal part of the human body and may not have a specific role in mastitis (Cullinane et al., 2015; Hale et al., 2009; Mutschlechner et al., 2016).

Use of a pacifier

The use of a pacifier is common in developed societies to soothe infants, improve sleep and decrease crying. The association between the use of a pacifier and mastitis is inconsistent in study findings. For instance, while an early New Zealand study of 350 mothers reported that the use of a pacifier within the first month reduced the risk of mastitis (RR: 0.41, 95% CI [0.22,0.79]) (Vogel, Hutchison, & Mitchell, 2001), an Australian cohort study of 1,075 nursing women found no association (Kinlay et al., 2001). However, an increased incidence of cracked nipples and soreness was reported among Italian mothers who used a pacifier or teat in hospital (Centuori et al., 1999). Moreover, artificial nipples including pacifiers, and bottle-feeding teats interfere with the natural physiological process of breastfeeding and milk removal and can lead to milk stasis that is a risk factor for mastitis (WHO, 2000). It can be hypothesised that prolactin, which is crucial to the production of milk, is stimulated by an appropriate sucking function with deep sucking at the breast. The introduction of a pacifier and teats interferes with the natural function of sucking and leads to superficial and non-nutritive sucking which predisposes nipple soreness and blocked ducts that are risk factors of mastitis. However, it is a controversial issue and studies report that breastfeeding problems experienced by mothers may lead to the use of a pacifier or bottle rather than the reverse (Righard, 1998; Victora, Behague, Barros, Olinto, & Weiderpass, 1997).

Nipple shield

The use of nipple shields that cover the nipples prior to breastfeeding has been associated with inappropriate sucking, and damaged nipples that develop mastitis. A mastitis case-control study in Spain found that the use of nipple shields was 4.4 times

higher amongst cases than controls (Mediano et al., 2014). Similarly, an Australian longitudinal study, found that the use of nipple shields was associated with an increased risk of mastitis (RR: 1.72, 95% CI [1.04, 2.86]) (Cullinane et al., 2015), and confirmed that the majority of mothers who suffer from damaged nipple use nipple shields to breastfeed.

Maternal stress

Lactation mastitis has been thought to be related to maternal stress. An early case-control study in Australia, found maternal stress to be a predictive factor for mastitis (Fetherston, 1998). A recent Chinese cohort study of 695 mothers investigated factors associated with mastitis and reported maternal stress as a risk factor in recurrent episodes of mastitis (RR: 3.15, 95% CI[1.56, 6.37]) (Tang et al., 2014). A plausible pathophysiological mechanism for the association can be that stress reduces oxytocin secretion that is crucial in sucking reflex and breast stimulation. Stress also contributes to an increased level of prolactin and thus, an incomplete removal of excess milk leading to milk stasis and blocked ducts that is a risk factor of mastitis (Wöckel, Abou-Dakn, Beggel, & Arck, 2008).

Maternal smoking

A reduced risk of mastitis associated with maternal smoking has been reported in some studies. For instance, an early cohort study found a reduced risk of mastitis among New Zealand mothers who smoked during lactation compared with non-smokers (RR: 0.19, 95% CI[0.04,0.85]) (Vogel et al., 1999). Similarly, a cohort study found that mastitis was experienced less among smoking mothers than in non-smoking mothers (HR: 0.47, 95% CI [0.04, 0.85]). An explanation for an association could be that smoking reduces prolactin secretion and milk supply such that, mothers who smoke produce less milk than non-smokers thereby reducing risk of breast engorgement and mastitis . However, it should be noted that this apparent protective association should in no way be used as evidence for recommending that breastfeeding women smoke.

2.4.4 Mastitis and duration of breastfeeding

Mastitis is a debilitating condition experienced by nursing mothers that is typically accompanied by pain and fever. The consequent pain, distress, and days in

bed may lead to early cessation of breastfeeding. An early prospective cohort study of 306 Australian women reported that 18% of mothers with mastitis who stopped breastfeeding gave mastitis as their primary reason (Fetherston, 1996). Further, a prospective cohort study of US mothers that identified factors of associated with breastfeeding duration found that the risk of discontinuation increased with occurrence of mastitis before three months postpartum (Schwartz et al., 2002).

Studies that have investigated an association between mastitis and breastfeeding duration have reported inconsistent results. For instance, a Scottish cohort study reported that mothers who developed mastitis were more likely to be breastfeeding at 26 weeks compared with those who didn't experience mastitis (Scott et al., 2008). Similarly, a New Zealand cohort study found that mastitis reduced the risk of short breastfeeding duration after adjusting for potential confounders (RR: 0.67, 95% CI [0.48, 0.94]) (Vogel et al., 1999). Researchers postulated that mastitis is more likely to be experienced by mothers with ample milk supply that increases the risk of milk stasis, thus mothers will continue breastfeeding to prevent blocked ducts. Finally, a study of Australian mothers failed to find an association between mastitis with duration of breastfeeding (Amir et al., 2007).

2.4.5 Management of mastitis

The management of mastitis which is recommended by the WHO (2000), and the Academy of Breastfeeding (Amir, 2014), is conservative self-management including continuation of frequent nursing or expressing milk from the affected breast and proper drainage of the breast to remove milk. In addition, supportive treatment is recommended, including bed rest, anti- inflammatory agents, analgesics, and drinking plenty of liquid (Amir, 2014; Barbosa-Cesnik, Schwartz, & Foxman, 2003; Pustotina, 2015). Self-care techniques including continuation of breastfeeding is the advice most often given by health care professionals to women with mastitis (Kinlay et al., 2001; Scott et al., 2008; Wambach, 2003). A minority of women however, may be inappropriately advised to stop breastfeeding from the affected breast or to discontinue breastfeeding altogether (Scott et al., 2008).

Antibiotic therapy is recommended if symptoms of mastitis do not improve after 24 hours of conservative and supportive treatment (Amir, 2014; WHO, 2000).

Penicillin-resistant *Staphylococcus aureus* is a common etiologic pathogen in infectious mastitis (Amir, Garland, & Lumley, 2006; Cullinane et al., 2015; Foxman et al., 2002; Osterman & Rahm, 2000; WHO, 2000). Penicillinase-resistant penicillins including flucloxacillin and dicloxacillin are usually recommended as the first line treatment (Amir, 2014). For mothers who are methicillin resistant or penicillin hypersensitive, vancomycin and clindamycin may be prescribed. Culturing the milk of the affected breast is recommended to indicate infection and identify the antibiotic sensitivity (WHO, 2000). However, mammary glands and connective tissue are inflamed during mastitis, and it can be difficult to isolate pathogens from breast milk. In addition, evidence reveals that the level of bacteria in breastmilk of mothers with mastitis and healthy nursing mothers is high (Kvist et al., 2008). Thus, culture is not a routine practice in the management and treatment of mastitis, and prescription of antibiotics may be based on the physician's perception of effectiveness.

The literature suggests that 77% -97% of mothers with mastitis in industrialised countries received antibiotics (Kvist et al., 2008). Evidence reveals that when guidelines and standards of prescription of antibiotics were followed, only 15% of mothers may receive antibiotics (Kvist et al., 2008). However, the rate of antibiotics prescribed in different countries varies widely. For instance, in Scotland antibiotics were prescribed to over half (53%) of mothers who developed mastitis (Scott et al., 2008), and a descriptive study in the US found, that antibiotics were prescribed for nearly all mothers with mastitis (Wambach, 2003). Low rates of antibiotic prescriptions have been reported for mothers in New Zealand (16%) (Vogel et al., 1999), and in Sweden (15%) (Kvist et al., 2007).

Treatment with antibiotics without confirmation by bacterial culture may lead to antimicrobial resistance, and there is limited evidence of the effectiveness of antibiotic therapy in mastitis (Jahanfar, Ng, & Teng, 2013). In addition, breastmilk normally contains several strains of bacteria that assist in developing the gut microbiota in the infant (Fallani et al., 2010), and have beneficial effects against disease (Fernández et al., 2013). Hence, using antibiotics inappropriately can adversely impact on bacteria in breastmilk and on the microbiota of infants (Jiménez et al., 2015). Some studies have trialled alternative treatments of mastitis, such as administration of probiotics that may decrease the symptoms of mastitis through

restoring healthy microbiota in breastmilk (Arroyo et al., 2010; Jiménez et al., 2015). However, a recent review concluded that further investigations are required to show probiotics be effective in treatment of mastitis (Amir, Griffin, Cullinane, & Garland, 2016).

Chapter 3

Chapter 3

Methodology

3.1 Overview

A prospective cohort study of 700 women living in Shiraz, a city in the south west of Iran, was conducted over the period June 2014 to March 2015. Mothers delivering in three government (public) maternity hospitals and two private hospitals were interviewed within 48 hours of the birth of their newborn and invited to participate in the study. Those mothers agreeing to participate and meeting the eligibility criteria completed a baseline questionnaire by face-to-face interview and were followed up by face-to-face interviews at one, three, four and six months postpartum in their local Maternal and Child Health (MCH) clinics where they attended for postpartum care and routine health care and infant monitoring.

3.2 Data Collection Instruments

The baseline and follow up questionnaires used in the study were generated from questionnaires that had originally been developed for use in the first (Scott & Binns, 1999) and second (Scott et al., 2006), Perth Infant Feeding Studies (PIFS). The PIFS questionnaires have been shown to have good face and content validity and they have subsequently been modified and translated for use in infant feeding studies in Vietnam (Duong, Binns, & Lee, 2004), China (Qiu, Zhao, Binns, Lee, & Xie, 2008), the Maldives (Abdulraheem & Binns, 2007) and Kuwait (Dashti et al., 2010). The original PIFS questionnaires were designed primarily to investigate the determinants of the incidence and duration of breastfeeding. Additional questions related to mastitis were generated from studies of mastitis in Scotland (Scott et al., 2008) and China (Tang et al., 2014). Questions in the original English version of the various questionnaires that were not relevant to the aims of this study or applicable to the Islamic Republic of Iran were omitted. For example, as alcohol intake is forbidden by

Iran's religion and culture, and legally prohibited, all questions relating to alcohol were removed.

The baseline study instrument was an eight page questionnaire consisting of 65 closed and open-ended questions that took approximately 20 minutes to complete (Appendix B). The closed questions were prospectively coded, and common responses to the open-ended questions were categorised and coded retrospectively. The baseline questionnaire investigated feeding practices in hospital and a variety of factors identified in the literature (Dennis, 2002; Scott & Binns, 1999; Thulier & Mercer, 2009) as being associated with the initiation and duration of breastfeeding:

- Sociodemographic factors (e.g. maternal age, education. employment status, father's employment status)
- Biomedical factors (e.g. delivery method, parity, BMI before and after delivery, blood sugar level before and after delivery, use of epidural, smoking practices, infant gender, infant birth weight,)
- Hospital practices (e.g. skin-to-skin contact, time to first breastfeed, demand feeding, prelacteal feeding, use of pacifiers, antenatal and postnatal education)
- Psychosocial factors (e.g. maternal attitudes and beliefs related to breast feeding, timing of making feeding decision)

The follow-up questionnaire, used at one, three, four, and six months postpartum was a 13 page structured interviewer-administered survey comprising 101 items, and took approximately 30 minutes to complete (Appendix C). The questions involved both closed and open ended questions and collected information on current feeding practices including: duration of breastfeeding, age of introduction of formula and solids and problems experienced during breastfeeding. It included additional questions derived from studies in Scotland (Scott et al., 2008) and China (Tang et al., 2014) to investigate the incidence and determinants of mastitis. Maternal infant feeding attitudes were assessed at baseline and at six months using the 17 item Iowa Infant Feeding Attitude Scale (IIFAS) (Mora, Russell, Dungy, Losch, & Dusdieker, 1999).

The baseline and follow-up questionnaires were translated into Farsi (Appendices D and E) and back-translated into English to ensure compatibility with the original English version, and the translation certified by a member of the

Department of English at the Shiraz University of Medical Sciences. The translated versions of the baseline and follow-up questionnaires were reviewed by a literacy expert from the Shiraz University to ensure that they were easy to read, understand and complete. The Farsi version of the baseline questionnaire was pilot-tested with a group of 20 mothers who delivered in Zynab hospital, a public maternity hospital, and Dena hospital, a private hospital. The mothers completed the questionnaire as a face-to-face interview and remarked on the ease of understanding and completion of the questionnaire.

3.3 Data Collection

3.3.1 Study setting

The study sample was recruited from three government maternity hospitals (Zynab, Hafez, Kowsar) and two private hospitals (Dena and Pars) in Shiraz from June 2014 to March 2015. The three government-run hospitals were chosen on the basis that they are the main maternity hospitals in Shiraz and emergency obstetric services are available there. The private hospitals serve mothers who prefer access to a private obstetrician and modern facilities. Therefore, the five hospitals were representative of all socioeconomic classes in Shiraz.

Official letters of introduction from the Vice-Chancellor for Research of the Shiraz University of Medical Sciences were provided for each hospital. A meeting was held with the hospital managers of each obstetric ward in order to introduce the principal researcher (the present author) and the five research assistants and to explain the purpose of the study and ensure cooperation with the study. Research assistants were student midwives who received three days of training by the principal researcher in the use of the data collection instruments and how to measure infant weight, length and head circumference. All five study hospitals were visited by the principal researcher daily who observed data collection closely and assisted with data collection as necessary.

Recruitment from each hospital was proportionate to the number of babies delivered by that hospital (Table 3.1). Mothers were recruited consecutively until the target sample size from each hospital had been achieved.

Table 3.1: Number of participants recruited from each hospital

Hospitals	No. Births 2013	%	No. of participants	%
Zynab	6,728	32	220	31
Hafez	5,834	28	200	29
Kowsar	6,073	29	200	29
Dena	1600	8	60	9
Pars	684	3	20	3
Total	20,919	100	700	100

3.3.2 Recruitment of sample

All hospitals were visited daily by a member of the research team who explained the purpose and requirements of the study. They were advised that their participation would involve the completion of an interviewer-administered baseline questionnaire and follow-up questionnaires at one, three, four and six months after birth, when they were scheduled to attend their local MCH clinic for their routine postnatal care. Mothers who met the eligibility criteria and who agreed to participate were invited to participate in the study.

Inclusion criteria:

- Maternal age over 18 years old
- Delivery of a singleton
- Healthy and full term infants (≥37 weeks gestation)
- Neonatal weight ≥ 2,500 grams
- Mothers who were Iranian and living in Shiraz

Exclusion criteria:

- Mothers who were medically unable to participate
- Infants admitted to NICU for more than 72 hours
- Complicated delivery rendering the mother too ill or fatigued to participate (e.g. postpartum bleeding)

Mothers who agreed to participate in this study signed the consent form and provided their phone number, address and the name of their local MCH clinic for follow- up interviews.

3.3.3 Administration of baseline interviews

Mothers in the selected hospitals were visited in the morning after their babies had been visited by the paediatrician. Mothers usually remained in the postpartum wards with their infants for one day after vaginal delivery and two days after an uncomplicated caesarean section. Thus, mothers who had a safe normal vaginal delivery, and were taking oral fluids and food were interviewed within 24 hours, but women who had undergone a caesarean section were visited in the second 24 hours to allow them to recover from the effects of anaesthesia.

Eligible mothers were interviewed face-to-face by a research team member to complete the baseline questionnaire. Interviewers were careful not to influence the mothers towards any specific feeding method. Information on gestational diabetes, pre-pregnancy weight, pregnancy weight gain, gestational age, infant gender, birth weight and length were extracted from the mother's hospital record.

3.3.4 Follow-up interviews

The follow-up interviews were conducted at the participant's local MCH clinic when they attended for routine postnatal and infant health visits at one, three, four and six months postpartum. Mothers who completed the baseline questionnaire were contacted by phone three weeks after delivery to confirm the name of their local MCH and the first interview at one month was scheduled. All follow-up interviews were conducted by the trained research assistants, MCH clinics were visited daily by the principal researcher to ensure data was collected correctly.

In addition to completing the interviewer-administered follow-up questionnaires the baby's weight, length and head circumference were measured at every visit using standard anthropometric procedures (WHO, 2006). The research assistant also measured the mother's weight. The most recent fasting blood sugar level, which is routinely measured with a glucometer was extracted from their clinic record at every visit. At the end of each interview an appointment for the next follow-up visit was scheduled. If for some reason mothers did not attend the MCH clinic as scheduled, they were contacted by phone and arrangements were made for a face-to face interview in the MCH clinic at another time.

During the follow-up interviews, attention was given to not influencing the mother towards any specific answer. No advice regarding mastitis and breastfeeding was given by the research assistants. When follow-up visits coincided with routine vaccinations, infants were vaccinated by health workers after interview to avoid agitation and distress for both mothers and babies during the interview.

3.4 Ethical Consideration

The project procedures and questionnaires were approved by the Human Research Ethics Committee of Curtin University, Australia (HR31/2014, Appendix F) and the Local Research Ethics Committee of Shiraz University of Medical Sciences, Iran (209/2014, Appendix G), and official letters of introduction were supplied by the Vice Chancellor of Research of the Shiraz University of Medical Sciences for all participating hospitals and MCH clinics.

All participants were given information sheets (Appendices H and I) and a verbal explanation of the project, and the researcher's contact details. Participating mothers provided signed informed consent (Appendices J and K), and were informed by interviewers that the anonymity and confidentiality of information provided was ensured throughout the conduct of the project and publication of findings. They were also advised that participation was fully voluntary and nonparticipation would have no impact on the treatment or care received by mothers and their infants in hospital or provided in the MCH clinics.

Each mother was allocated a unique identity number linked to her name, phone number and baseline and follow-up questionnaires. The participants' names and phone numbers were used to arrange follow-up visits in MCH clinics and identifiable personal information was kept separate from questionnaires. The project results are reported as aggregated data.

3.5 Sample Size

For breastfeeding practices:

Assuming the 'any breastfeeding rate' at six months to be 60% with a confidence precision (%) of .04, power of 80%, a sample of 574 mothers was calculated based on the formula:

n = [DEFF*Np (1-p)]/ [($d^2/Z^2_{1-\alpha/2}$*(N-1) +p*(1-p)],
Where:

n = sample size
DEFF = study design effect (assumed = 1),
N = population size
p = hypothezised population proportion
d = confidence precision
$Z_{1-\alpha/2}$ = the two-sided standard normal distribution Z value,
α = level of significance (5%)

This calculated sample size would give a 95% confidence interval of 56% to 64%. Considering an 18% drop-out rate, a target sample of around 700 mothers were needed and participants were recruited consecutively until the target sample was achieved in this study.

For mastitis study:

Recent studies have reported mastitis incidences from as well as 6% in Chinese women up to 18% in Scottish women. To our knowledge, there is no information about the incidence of mastitis among Iranian women, and the mind-point of the range, 12%, was used as the rate for the mastitis sample size calculation. With a precision % of 0.04, power of 0.8, a sample of 254 mothers would give a 95% confidence interval of 8% to 16%. Thus, the study of mastitis which used 675 of the 700 participants recruited in SIFS was amply powered.

3.6 Data Analysis

3.6.1 Data entry and cleaning

Data were coded and entered into the computer by using the Statistical Package for Social Science (SPSS version 16) and frequencies generated for all questions to identify coding and data entry errors. The out of range data were identified and compared with the original questionnaire and the data were cleaned appropriately.

3.6.2 Outcome measures

Outcomes of interest investigated in this study are defined in Table 3.2.

Table 3.2: Outcome measures

Outcome measure	Definition
Incidence of delayed initiation of breastfeeding (IDBF)	Percentage of infants who had received their first breastfeed more than one hour after birth
Incidence of formula use in hospital (IFF)	Percentage of infants who received formula in hospital
Incidence of traditional prelacteal feeding (ITPF)	Percentage of infants who had received traditional fluids or foods as their first feed
Incidence of mastitis (IM)	Percentage of women who experienced mastitis based on self-report of symptomology (A woman was considered to be a mastitis case if she reported having had a red, tender, hot, swollen area on any part of a breast, accompanied by one or more of the following: 1. An elevated temperature (either estimated or measured as being $\geq 38^0$ C) or 2. One or more of the constitutional symptoms of fever (body aches, headaches and chills).
Duration of any breastfeeding (DBF)	Age of infant when they stopped receiving any breastmilk
Duration of full breastfeeding (DFBF)	Age at which infant received regular feeds of formula or complementary foods. May have received prelacteal feeds and irregular feeds of formula in hospital and certain liquids including water and water-based drinks, fruit juice), ritual fluids and oral rehydration solution (ORS), drops or syrups (vitamins, minerals, medicines)
Duration of exclusive breastfeeding (DEBF)	Age at which infant first received anything other than breastmilk apart from ORS, drops or syrups (vitamins, minerals, medicines)

3.6.3 Explanatory variables

Explanatory variables listed and defined in Table 3.3 included sociodemographic, biomedical, psychosocial factors and hospital practices identified in the literature as being associated with one or more of the outcome measures.

Table 3.3: Explanatory variables

Explanatory variable	Categories
Sociodemographic	
Maternal age	<25, 25-29, ≥30 years
Maternal education	Primary to secondary, High school, University
Father's employment status	Employed, semi employed
Mother's employment status	Employed, Unemployed

Explanatory variable	Categories
Biomedical	
Method of delivery	Vaginal, Elective C-section, Emergency C-section
Parity	Primiparous, Multiparous
BMI pre-delivery	Normal weight, Over weight or obsess
BSL pre-delivery	Normal, Diabetic
Baby gender	Male, Female
Baby weight(grams)	2,500- 2,900, 3,000-3,499, 3,500 and more
Baby admitted to NICU	Yes, No
Hospital practices	
Having epidural	Yes, No
Attend in antenatal class	Yes, No
Teaching how to attach	Yes, No, Didn't need
Skin to skin contact	Yes, No
Time of the breastfeeding	≤ 1 hour, > 1 hour
Problems experienced	
Cracked nipples	Yes, No
Difficulty with attachment	Yes, No
Pain during nursing	Yes, No
Engorged breast	Yes, No
Expressed milk	Yes, No
Using nursing bra	Yes, No
Candida infection in nipples	Yes, No
Using pacifier	Yes, No
Level of feeding	No changed fully breastfeeding, Decreased breastfeeding, Increased breastfeeding
Prelacteal received	Yes, No
Formula used in hospital	Yes, No
Demand feeding	Yes, No

3.6.4 Statistical analysis

Descriptive statistics were generated for the main explanatory variables and the incidence of breastfeeding, delayed initiation of breastfeeding, use of formula in hospital, introduction of traditional prelacteal feeds and mastitis. The incidence density (i.e. the number of events occurring in people at risk of the illness) was calculated for

mastitis by dividing the number of episodes of mastitis in four week blocks by the number of completed weeks of breastfeeding (Amir et al., 2007).

Bivariate logistic regression analysis was used to investigate the association of explanatory variables and the incidence of delayed initiation of breastfeeding, use of formula in hospital, introduction of traditional prelacteal feeds and mastitis, respectively. Multivariate logistic regression analysis was conducted to identify independent predictors of each of these outcomes. All explanatory variables explored in the bivariate logistic regression analysis were loaded into a full model. The forward elimination method was applied to obtain a parsimonious model and only variables with a *p* value of less than .05 were retained in the final model. Associations are expressed as crude odds ratios (COR) or adjusted odds ratios (AOR) together with their 95% confidence interval.

Life-table survival analysis was employed to determine the duration of any, full and exclusive breastfeeding. This analysis utilises right-censored data that refers to data from those mothers who were still breastfeeding at the end of the study period (26 weeks) or who had dropped out of the study prior to discontinuing breastfeeding. The Kaplan-Meier and log-rank test were used to investigate the association of mastitis and overall (any) breastfeeding duration.

Simple bivariate Cox proportional hazard regression analysis was used initially to evaluate the association between the explanatory variables and duration of exclusive, full, and any breastfeeding. Subsequently, any variables found to be significantly (at 10%) associated with the breastfeeding duration in the unadjusted regression analysis were included in a multivariable Cox proportional hazard regression model, and adjusted for other variables or potential confounders to explore the adjusted risk of stopping breastfeeding. The backward elimination method was applied to obtain a parsimonious model and only variables with a *p* value of less than .05 were retained in the final model. The effects of any explanatory variables on the cessation of exclusive, full, and any breastfeeding up to six months (26 weeks) postpartum were assessed and expressed as crude hazard ratios (CHR) or adjusted hazard ratio (AHR) together with their 95% confidence interval. For both the simple and multiple Cox proportional hazard regression analysis, women who had discontinued breastfeeding on discharge from the hospital were not included in the regression modelling.

3.7 Participation Rate

A total of 1,571 mothers were invited to participate and assessed for eligibility. Of these, 852 failed to meet one or more of the inclusion criteria and 19 declined to participate. Relevant data were obtained from 700 mothers (97.3% of eligible mothers) who completed the baseline questionnaire. Of these, research assistants carried out follow-up interviews in MCH clinics with 672 mothers (96.0% mothers) at one month after birth, with 662 mothers (94.6% of mothers) at three and four months after birth, and with 660 mothers (94.3% of participants) at six months after birth (Figure 3.1). The overall drop-out rate of 5.7% was markedly less than the 18% allowed for when determining the required sample size.

3.8 Characteristics of participants

3.8.1 Sociodemographic

Of the 700 women who participated in the study, the majority were less than 30 years of age (59.5%), educated to high school level or higher (79.7%) and unemployed (82.1%) (Table 3.4).

3.8.2 Biomedical characteristics of Participants

The majority of women were primiparous (54.6%) and delivered by caesarean section (70.1%) with 34.7% of women having undergone an emergency caesarean section and 35.4% an elective caesarean section. The majority of infants weighed 2,500 - 3,499 grams (77.7%), and less than 3% of newborn infants were admitted to the neonatal intensive care unit (NICU) for less than 72 hours.

The results of pre-pregnancy BMI show that more than half the women were normal weight and 41.8% of mothers were overweight or obese. The majority of mothers in the pre-delivery period (60.7%) and a day after delivery (84.7%) had a normal blood sugar level (<93 mg/dl).

3.8.3 Hospital-related practices

Only 16.7% of infants' experienced skin to skin contact following birth. All infants were managed by rooming-in during maternity hospitalisation. Very few mothers (12.1%) attended an antenatal education program, but most of the mothers (73.3%), reported being taught positioning and attachment of the baby to the breast in the postnatal ward.

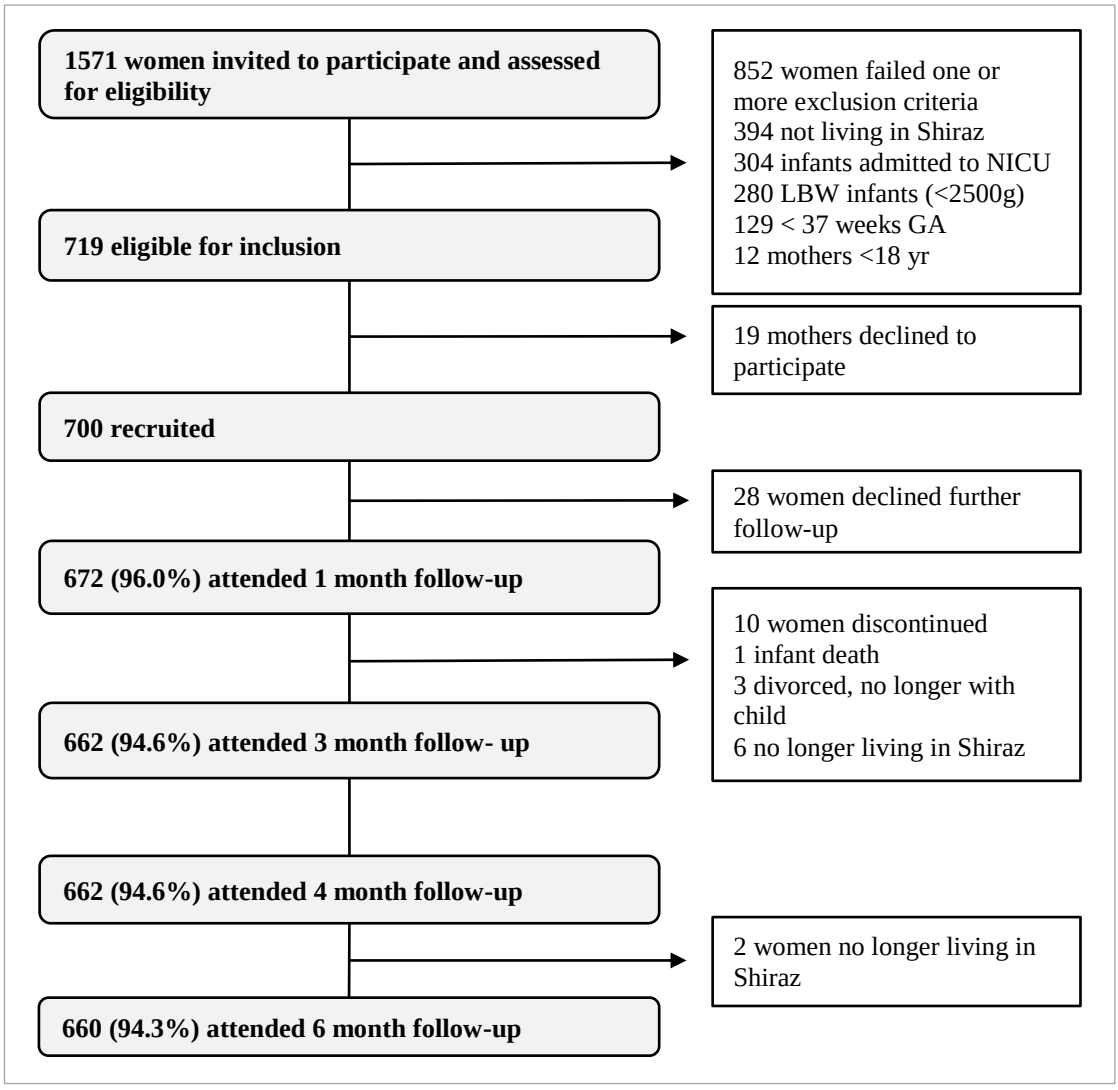

Figure 3.1: Flow diagram of recruitment and follow-up

Table 3.4: Sociodemographic and biomedical characteristics of participants (n=700)*

Characteristics	n	%
Sociodemographic		
Maternal age (years)		
<25	150	21.4
25 -29	265	37.9
≥30	285	40.2
Maternal education		
Primary to secondary	142	20.3
High school	287	41.0
University	271	38.7
Living situation		
A nuclear family	579	82.7
An extended family	121	17.3
Father's employment status		
Employed	242	34.6
Semi employed	458	65.4
Mother's employment status		
Employed	125	17.9
Unemployed	575	82.1
Maternity leave after delivery (n=125)		
Yes	114	16.3
No	11	1.6
Maternity leave duration after delivery (n=114)		
Less than 3 months	11	1.6
3 to 6 months	91	13.0
6 to 9 months	1	0.1
9 to 12 months	11	1.6
Infant characteristics		
Gender		
Male	353	50.4
Female	347	49.6
Birth weight (grams)		
2500-2999	224	32.0
3000-3499	320	45.7
≥3500	156	22.3
Baby admitted to NICU for less than 72 hrs		
Yes	18	2.6
No	682	97.4

Characteristics	n	%
Biomedical factors		
Parity		
Primiparous	382	54.6
Multiparous	318	45.4
BMI pre pregnancy		
Normal weight	408	58.3
Overweight or obese	292	41.7
BSL pre pregnancy (mg/dl)		
Normal	425	60.7
Diabetic	272	38.9
Type of delivery		
Vaginal delivery without episiotomy	28	4.0
Vaginal delivery with episiotomy	181	25.9
Elective caesarean section	248	35.4
Emergency caesarean section	243	34.7
Having epidural		
Yes	331	47.3
No	369	52.7
Skin to skin contact following delivery		
Yes	117	16.7
No	576	82.3
Don't know	7	1.0
The use of pacifier		
Yes	54	7.7
No	646	92.3
Attended in antenatal class		
Yes	85	12.1
No	615	87.9
Teaching how to attach baby breast feed		
Yes	513	73.3
No	112	16.0
Didn't need	75	10.7

*NICU = Neonatal intensive care unit, Infants admitted to the NICU for more than 72 hours were excluded from the study, BMI Body Mass Index normal = <25 kg/m^2, Overweight = More than 25 kg/m^2. BSL normal= Blood sugar <90 mg/dl, Diabetics= Blood sugar more than 90 mg/dl.

3.9 Sociodemographic and Biomedical Characteristics by Type of Hospital

Of the 700 participating mothers, the majority (n= 620, 88.6%) were recruited from a public hospital and (n=80, 11.45%) from a private hospital. The Chi-square test was performed to compare differences in characteristics between participants delivering at a public or private hospital (Table 3.5).

Table 3.5: Sociodemographic, biomedical and hospital practices by public and private hospitals*

	Public hospitals n=620		Private hospital n=80		
Variables	**n**	**%**	**n**	**%**	***p* value**
Sociodemographic					
Maternal age (Years)					
< 25	144	23.2	6	7.5	
25- 29	233	37.6	32	40.0	.003
≥30	243	39.2	42	52.5	
Maternal education					
Primary and secondary	138	22.3	4	5.0	
High school	273	44.0	14	17.5	<.001
University	209	33.7	62	77.5	
Father's employment status					
Employed	199	32.1	43	53.8	<.001
Semi-employed	421	67.9	37	46.2	
Mother's employment status					
Employed	94	15.2	31	38.8	<.001
Unemployed	526	84.8	49	61.2	
Biomedical factors					
Parity					
Primiparous	330	53.2	52	65.0	0.30
Multiparous	290	46.8	28	35.0	
Type of delivery					
Vaginal delivery	198	31.9	11	13.8	<.001
Elective caesarean section	189	30.5	59	73.8	
Emergency caesarean section	233	37.6	10	12.5	
BMI pre pregnancy					
Normal weight	368	59.4	40	50.0	.023
Over weight/ obese	198	31.9	37	46.2	

Variables	Public hospitals n=620		Private hospital n=80		*p* value
	n	%	n	%	
BSL pre delivery(mg/dl)					
Normal	349	56.3	76	95.0	<.001
Diabetics	269	43.2	4	5.0	
Infant gender					
Male	310	50.0	43	53.8	0.304
Female	310	50.0	37	46.2	
Birth weight of baby (grams)					
2500-2999	190	30.6	34	42.5	
3000-3499	293	47.3	27	33.8	.049
≥3500	137	22.1	19	23.8	
Admitted in NICU					
Yes	16	2.6	2	2.5	0.661
No	604	97.4	78	97.5	
Hospital practices					
The use of pacifier in hospital					
Yes	26	4.2	28	35.0	<.001
No	594	95.8	52	65.0	
Time to the first breastfeeding					
Less than one hour	210	33.9	15	18.8	.004
One hour or more	410	66.1	65	81.2	
Prelacteal received					
Yes	413	33.4	35	45	.045
No	207	66.6	43.8	56.2	
Skin to skin contact					
Yes	106	17.1	11	13.8	0.282
No	514	82.9	69	86.2	
Having epidural					
Yes	307	49.5	24	30.0	.001
No	313	50.5	56	70.0	
Attended in antenatal class					
Yes	80	12.9	5	6.5	.055
No	540	87.1	75	93.8	
Teaching how to attach baby breast feed					
Yes	448	72.3	65	81.2	0.148
No	101	16.3	11	13.8	
Didn't need	71	11.5	4	5.0	

*NICU= Neonatal intensive care unit, BMI= Body Mass Index, BSL=Blood Sugar Level

BMI normal = <25 kg/m^2, Overweight = more than25 kg/m^2, BSL normal= Blood sugar <90 mg/dl

Infant admitted to the NICU for more than 72 hours were excluded from the study

Although the number of participants in private hospitals was small in comparison with that of public hospitals, the characteristics of participants were significantly different. The mothers delivering at the private hospitals were more likely to be educated to university level, employed, and older than participants in public hospitals. This reflects the higher economic status of those able to pay for private medical care.

The percentage of elective caesarean section in private hospitals (73.8%) was significantly higher than that in public hospitals (30.5%). Less than one third of mothers (30%) delivering in a private hospital received epidural analgesia compared with just under half of mothers (49.5%) in public hospital. In private hospitals, 35% of newborn infants were given a pacifier compared to 4.2% in public hospitals, and 45% were given prelacteal foods compared with 33.4% in public hospitals.

Chapter

4

Chapter 4

In-Hospital Infant Feeding Practices

4.1 Introduction

The infant and maternal health benefits of breastfeeding are widely documented, and exclusive breastfeeding of infants for at least six months of life is recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) (WHO, 2008b). Studies that rigorously investigate breastfeeding practices in maternity hospitals can provide data and understandings that inform and improve the practices of health system authorities.

In Iran, 95% of births occur in maternity hospitals, where registered midwives are available and provide intrapartum care, and obstetricians are on call if mother or neonate is in risk. A healthy mother is visited and then admitted to labour by a midwife, and during labour and delivery, midwives who are on duty monitor mothers and neonates. Husband or family members are permitted to be present during labour or delivery. Mothers are visited during labour by an obstetrician if they or their foetus are at risk. After delivery, mother and infant are transferred to the postpartum ward, where nurses and midwives are responsible for postpartum care, and family members have liberal visiting rights.

When mothers have a planned or an emergency caesarean section, their newborn infant is transferred to nursery care by a midwife, and brought to the recovery room to breastfeed if the mother is conscious and stable. All mothers are supported and assisted with positioning and attachment in the postpartum ward, and video tapes are available to demonstrate breastfeeding techniques. When mothers are discharged from hospital they are given pamphlets on breastfeeding. In Shiraz telephone support or support through home visits is not available after discharge from maternity hospital. The first visit is one month after birth in Maternal and Child Health (MCH) clinics; however, if mother or neonate experience illness, paediatricians or obstetricians are available in maternity hospitals to provide treatment.

All most all maternity hospitals have Neonatal Intensive Care Units (NICUs), and infants who need more close observation are admitted to NICU, where paediatricians monitor infants and family members have limited access to infants. However, NICU mothers express their breastmilk and attempt to breastfeed their infants prior to discharge from hospital.

This chapter identifies and discusses early in-hospital feeding practices. Descriptive statistics of infant feeding practices are presented, including breastfeeding initiation, current feeding method, prelacteal feeding practices and the timing of breastfeeding initiation. This chapter also reports on, the sociodemographic, biomedical and hospital related factors independently associated with the delayed initiation of breastfeeding, prelacteal feeding and use of formula in hospital.

4.2 Methods

In total, 700 women were recruited within 48 hours of delivery from the maternity wards of three government and two private hospitals in Shiraz. Information on in-hospital feeding practices and hospital maternity practices were collected from mothers via a face to face interview.

4.2.1 Outcome variables

The three outcome variables investigated in this chapter are the incidence of delayed breastfeeding (first breastfeed initiated more than 1 hour after birth), the introduction of traditional prelacteal foods and the in-hospital use of formula.

4.2.2 Explanatory variables

The explanatory variables examined as potential determinants were derived from the literature and were divided into four categories, namely sociodemographic, biomedical, infant characteristics and hospital practices (Chapter 3: Table 3.3).

4.2.3 Statistical analysis

Bivariate logistic regression analysis was used to investigate the association of explanatory variables and the outcomes of interest. Multivariate logistic regression analysis was conducted to identify independent predictors of each of these outcomes. All explanatory variables explored in the bivariate logistic regression analysis were loaded into the full model and eliminated in a forward stepwise manner.

4.3 Results

4.3.1 In-hospital infant feeding practices

In total, 690 (98.6%) mothers initiated breastfeeding while in hospital (Table 4.1). On discharge from hospital, 74.3% of mothers were breastfeeding their infant breastmilk only and 23% were using a combination of breastmilk and formula. Almost two-thirds of infants (65.4%) received prelacteal feeds, with just over one third (38.7%) receiving traditional herbal prelacteal feeds.

Only 29.9 % newborn infants were exclusively breastfed since birth, as the remainder had received prelacteal feeds (65.4%) and or formula (34.9%) at some time during their hospital stay. While 97% of mothers fed their infants colostrum, only 34% of babies received colostrum as their first food in hospital. Of the mothers who had tried to breastfeed in hospital, only 32.2% breast fed their infants within one hour after birth.

Table 4.1: Infant feeding practices in hospital (n=700)*

Feeding Practices	n	%
Initiated breastfeeding	690	98.6
Infant feeding method at discharge		
Exclusive breastfeeding	520	74.3
Combination of breastfeeding and bottle formula feeding	161	23.0
Exclusive formula feeding	19	2.7
Infant feeding method since birth		
Exclusive breastfeeding	209	29.9
Full breastfeeding	311	44.4
Combination of breastfeeding and formula feeding	170	24.3
Exclusive formula feeding	10	1.4
Time of the first breastfeed		
Immediately after delivery till 30 minutes	97	13.9
30 minutes to one hour	128	18.3
1 to 2 hours	334	47.7
2 to 24 hours and more	141	20.1
Infant received formula in hospital		
Yes	244	34.9
No	456	65.1
Infant received prelacteal feed in hospital		
Yes	458	65.4
No	242	34.6

Feeding Practices	n	%
The first food of baby		
Colostrum	242	34.6
Formula	121	17.3
Glucose water	51	7.3
Animal butter	15	2.1
Traditional herbals preparations	271	38.7

*Predominant breastfeeding: Receiving breastmilk including milk expressed or from a wet nurse (WHO, 2000).

4.3.1.1 Reasons for breastfeeding in hospital

The reasons for breastfeeding as reported by mothers are listed in Table 4.2. The majority of mothers (94.7%) stated that breastmilk is the best food for the baby, and more than one third of them (38%) believed breastmilk protects infants against infections. Almost, one third of mothers (27%) reported that breastfed babies are more intelligent than formula fed babies. A reduced risk of breast cancer was another unprompted reason given by 5% of mothers, and 3.5% of mothers reported that their previous breastfeeding experience was satisfying.

Table 4.2: Mothers' reasons for breastfeeding in hospital

	n	%*
Reasons (prompted)		
The best for baby	646	94.7
Babies have fewer infection	261	38.3
Babies get more intelligent	188	27.6
Babies are healthier	106	15.5
Natural	101	14.8
Easy practice	101	14.8
Cheap	71	10.4
Promotes mother –infant bonding	26	3.8
Health workers advised it	15	2.3
Baby's father like it	14	2.1
Islam recommended it	6	0.9
Others reasons (Unprompted)		
Reduces breast cancer	35	5.1
Mother had good experience	24	3.5

*Percentages added up to more than 100 percent as some respondents gave multiple answer

4.3.1.2 Breastfeeding problems experienced by mothers in hospital

Almost, all mothers (99.7%) experienced one or more problems related to breastfeeding during their maternity stay. The common problems stated were pain during nursing (43.7%), problems with attachment (30.8%) and positioning (28.8%) (Table 4.3). Mothers also reported sore or cracked nipples (11.9%) and breast engorgement (6%).

Table 4.3: Problems experienced by breastfeeding mothers in hospital

Type of problems experienced	n	%*
Pain during nursing	305	43.7
Difficulties with attachment	215	30.8
Difficulties with positioning	201	28.8
Pain in latching on	162	23.2
Baby refused breastfeeding	114	16.3
Baby was too tired to feed	101	14.4
Cracked or sore nipple	83	11.9
Difficulty in sucking	10	3.2
Inverted nipple	22	3.2
Breast engorgement	4	0.6
No breastfeeding problem	2	0.3

*Percentages added up to more than 100 percent for some respondents gave multiple answers

4.3.1.3 Sources of breastfeeding information

Very few women attended an antenatal education class but, the majority of women received some type of breastfeeding-related information during their time (24-48 hours) in the postnatal ward. More than one half of mothers (53.6%) had received a pamphlet or booklet on breastfeeding, 40.9% had been given video tapes to watch in the postpartum ward, while a small proportion of them (1.8%) had had individual consultations. Only, 9.3% of mothers had been advised on breastfeeding by midwives and nurses during the postpartum period and 6.3% mothers did not receive any information and or advice in the post-partum ward (Table 4.4).

Table 4.4: Sources of breastfeeding-related information received post delivery

The type of information	n	%*
Pamphlet or booklet	374	53.6
Video tapes	286	40.9
Individual consultation	12	1.7
Advice from friends and relatives	12	1.7
Advice from midwives and nurses	65	9.3
No advice received	44	6.3

*Percentages added up to more than 100 percent as some respondents gave multiple answers

4.3.2 Factors related with delayed initiation of breastfeeding

4.3.2.1 Bivariate analysis

The association between delayed initiation of breastfeeding (one or more hours after delivery) and a variety of sociodemographic, biomedical and hospital practice factors are presented in Table 4.5. The crude odds ratios (COR) indicate young and poorly educated mothers were less likely to delay initiation of breastfeeding than older and more educated women. Mothers who had undergone either an elective or emergency caesarean section, had received epidural analgesia and whose husband was employed were significantly more likely to delay initiation of breastfeeding compared with mothers who had delivered vaginally, without analgesia and whose husbands were semi-employed. Similarly, delayed initiation of breastfeeding was more significant among neonates who did not have skin to skin contact with their mothers following delivery than neonates who experienced skin to skin contact with their mother. The bivariate analysis also indicated a higher rate of delayed initiation of breastfeeding among women who were overweight before pregnancy compared with women who were normal weight. However, neonates weighing more than 3,000 grams at birth were less likely to have had their first breastfeed delayed compared with neonates weighing less than 3,000 grams. The crude odds ratio revealed mothers with a female baby and those who did not attend any antenatal education program during pregnancy, were more likely to have initiated breastfeeding one or more hours after birth compared with mothers who took part in a program.

4.3.2.2 Multivariable analysis

Results show that mothers who had undergone an elective caesarean section were over 30 times (AOR: 30.579, 95% CI [17.688, 52.867]) and emergency caesarean section over 60 times (AOR: 61.161, 95% CI [32.442, 115.303]) more likely to initiate breastfeeding delay compare with mothers who delivered vaginally. Mothers who had not experienced skin to skin after delivery were nearly two times more likely to delay in putting their infant to the breast (AOR: 1.911 95% CI[1.013, 3.605]). Mothers who did not attend any antenatal education were two times more likely to start breastfeeding after one hour (AOR: 2.165, 95% CI [1.086, 4.318]).

Table 4.5: Factors associated with delayed initiation of breastfeeding*

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Sociodemographic						
Mother's age (years)						
<25	0.648	0.426, 0984	.042			NS
25- 29	0.812	0.565, 1.168	0.262			
≥30	1.0					
Mother's education						
Primary to secondary	0.336	0.218, 0.518	<.001			NS
High school	0.365	0.444, 0.937	.021			
University	1.0					
Father's employment status						
Employed	1.942	1.363, 2.767	<.001			NS
Semi-employed	1.0					
Mother's employment status						
Employed	1.398	0.906, 2.157	0.130			NS
Unemployed	1.0					
Biomedical						
Method of delivery						
Vaginal	1.0					
Elective caesarean section	34.743	20.608, 58,571	<.001	30.579	17.688, 52. 867	<.001
Emergency caesarean section	64.3389	35.151, 117.761	<.001	61.161	32.442, 115.303	<.001

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Parity						
Primiparous	1.261	0.917, 1.733	0.154			NS
Multiparous	1.0					
BMI pre pregnancy						
Normal weight	1.0					NS
Overweight and obese	1.461	1.053, 2.027	.023			
BSL pre delivery (mg/dl)						
Normal	0.962	0.695, 1.723	0.818			NS
Diabetic	1.0					
Infant characteristics						
Baby gender						
Male	1.0					NS
Female	1.390	1.011, 1.913	.043			
Baby birth weight(gram)						
2500-2900	1.0					
3000-3490	0.588	0.402, 0.861	0.731			NS
≥3500	0.849	0.372, 0.908	.017			
Baby admitted to NICU						
Yes	1.0					NS
No	0.596	0.194, 1.832	0.366			
Hospital practices						
Having epidural						
Yes	6.519	4.458, 9.541	<.001			NS
No	1.0					

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Attended in antenatal class						
Yes	1.0					
No	1.955	1.234, 3.098	.004	2.165	1.086, 4.318	.028
Teaching how to attach baby to breast						
Yes	1					NS
No	2.82	1.483, 2.924	<.001			
Skin to skin contact						
Yes	1					
No	1.539	1.011,2.343	.044	1.911	1.013, 3.605	.046

*COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, BMI=Body Mass Index normal weight= <20 kg/m^2, overweight =< 25-29.99 kg/m^2, and obese= ≥30 kg/$m^{2,}$, BSL normal= Blood sugar level:≤90 mg/dl, Diabetic= Blood sugar >90 mg/dl, NICU= Neonatal Intensive Care Unit, NS= No significant at 5%.

4.3.3 Factors predicting the use of traditional prelacteal foods in hospital

Prelacteal feeding is defined as introducing any liquid or food before the initiation of breastfeeding (WHO, 2008b) and this may include formula, glucose water and traditional foods or both. Almost two thirds of infants (65.4%) received a prelacteal feed. Only 34.6% of infants received colostrum as their first feed with (17.3%) of infants receiving formula and (7.3%) glucose water (rock sugar). Animal butter was given to (2.1%) as their first food and one third of infants (38.7%) received various other traditional herbal prelacteal foods. The focus of this analysis was to investigate the determinants of the provision of traditional prelacteal feeds which was the more common practice.

4.3.3.1 Bivariate analysis

The bivariate analysis (Table 4.6) shows that mothers less than 25 years of age and poorly educated were more likely to offer traditional prelacteal foods to their infants in the postpartum ward. Infants who received their first breastfeed more than one hour after delivery or those who did not have skin to skin contact after delivery were more likely to receive traditional prelacteal foods. Mothers who had never been taught to position and attach their infants were more likely to give traditional prelacteal foods to their infants. However, the infants of employed fathers were less likely to receive traditional prelacteal foods. Similarly, infants whose mothers had undergone either elective or emergency caesarean section and those infants admitted to NICU were less likely to be given traditional prelacteal foods.

4.3.3.2 Multivariable analysis

The results indicate that poorly educated mothers were over two times more likely (AOR 2.070, 95% CI [1.295, 3.309]) to give their infants traditional prelacteal foods in hospital than university educated women. Infants who did not experience skin to skin contact following birth were roughly two times more likely to be fed traditional prelacteal foods in the postpartum ward (AOR 2.118, 95% CI [1.304, 3.441]). Mothers who were not taught how to attach their babies (AOR 1.719, 95% CI [1.190, 4.481]), were more likely to give their infants traditional prelacteal foods than those who received instruction. Not being admitted to NICU was a predictor of offering

traditional prelacteal foods, those neonates who stayed with their mothers in postpartum ward 12 times were more likely to be receive prelacteal traditional foods (AOR 12.605, 95% CI [1.634, 97.218]) than neonates who were admitted to NICU. However, infants whose fathers were employed were 31% less likely to receive traditional prelacteal foods (AOR 0.694, 95% CI [0.485, 0.993]). Mothers who had undergone an elective caesarean section were almost half as likely (AOR 0.545, 95% CI [0.374, 0.826]) to offer their infants traditional prelacteal foods than those who delivered vaginally.

Table 4.6: Factors associated with traditional prelacteal foods*

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Sociodemographic						
Mother's age (years)						
<25	1.443	0.969,2.150	.071			NS
25-29	0.922	0.654, 1.301	0.645			
≥30	1.0					
Mother's education						
Primary to secondary	1.443	2.061, 4.786	<.001	2.070	1.295, 3.309	.002
High school	1.290	0.911, 1.826	0.151	1.063	0.743, 1.568	0.693
University	1.0					
Father's employment status						
Employed	0.541	0.390, 0.750	<.001	0.694	0.485, 0.993	.046
Semi-employed	1.0					
Mother's employment status						
Employed	0.813	0.545, 1.212	0.309			NS
Unemployed	1.0					
Biomedical						
Method of delivery						
Vaginal	1.0					
Elective caesarean section	0.576	0.396, 0.838	.004	0.545	0.374, 0.826	.005
Emergency caesarean section	0.649	0.446, 0.944	.024	0.720	0.468, 1.106	0.133

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Parity						
Primiparous	0.865	0.639, 1.171	0.348			NS
Multiparous	1.0					
BMI pre- pregnancy						
Normal weight	1.0					NS
Overweight and obese	0.903	0.663, 1.231	0.519			
BSL pre -delivery (mg/dl)						
Normal	1.263	0.926, 1.723	0.141			NS
Diabetic	1.0					
Infant characteristics						
Baby gender						
Male	1.0					NS
Female	1.029	0.762, 1.392	0.850			
Baby birth weight(gram)						
2500-2900	1.0					
3000-3490	0.941	0.666, 1.331	0.731			NS
≥3500	0.849	0.559, 1.288	0.441			
Baby admitted to NICU						
Yes	1.0					
No	12.204	1.615, 92.230	.016	12.605	1.634, 97.218	.015

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Hospital practices						
Having epidural						
Yes	0.862	0.637, 1.167	0.337			NS
No	1.0					
Attended in antenatal class						
Yes	1.0					NS
No	1.101	0.637, 1.167	0.337			
Teaching how to attach baby to breast						
Yes	1.0					
No	2.82	1.483, 2.924	<.001	1.719	1.190, 4.481	.004
Skin to skin contact						
Yes	1.0					
No	1.539	1.011, 2.343	.044	2.118	1.304, 3.441	.002
Time of the breastfeeding						
Less than one hour	1.0					NS
One hour or more	1.499	1.088, 2.067	.013			

*COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, BMI=Body Mass Index normal weight= <20 kg/m^2, overweight =<25-29.99kg/m^2, and obese= ≥30 kg/$m^{2,}$, BSL normal= Blood sugar level:≤90 mg/dl, Diabetic= Blood sugar >90 mg/dl, NICU= Neonatal Intensive Care Unit, NS= No significant at 5%.

4.3.4 Factors predicting the use of formula in hospital

4.3.4.1 Bivariate analysis

Just over one third (34.9%) of infants received formula at some time during their hospital stay. Table 4.7 lists the sociodemographic, biomedical and hospital factors that might be associated with using formula in hospital without adjusting for other variables and confounders. The crude odds ratio (COR) indicates the likelihood of infants receiving formula in hospital. Infants of mothers who were primiparous and educated to primary and high school level and employed were more likely to receive formula in hospital. Of the biomedical variables, infants of mothers who had undergone caesarean section, either elective or emergency, and who had received epidural anaesthesia were significantly more likely to have received infant formula in the postpartum ward. Infants of mothers who did not receive support to attach the baby and who had not experienced skin to skin contact with their mother following delivery were more likely to receive formula postpartum. Similarly, infants who received the first breastfeed one hour or more after delivery, were more likely to be given formula in hospital, but infants who were not admitted to the NICU were less likely to have received formula in-hospital than those admitted to NICU.

4.3.4.2 Multivariable analysis

No sociodemographic variables were found to be significantly associated with the use of formula in hospital. Of the biomedical factors, method of delivery was strongly, associated with receiving formula in hospital. Compared with infants who were delivered vaginally, those infants whose mothers had undergone an elective caesarean section were over five times more likely to receive formula (AOR: 5.314, 95% CI [3.158, 8.941]) and those whose mother had undergone an emergency caesarean section were over four times more likely (AOR: 4.413, 95% CI [2.613, 7.452]) to receive formula in hospital. Newborn infants 3500 grams and greater were more likely to have received formula in hospital (AOR: 1.824, 95% CI [1.143, 2.909]) compared with those weighing 2500 to 2999 grams. Those infants who had not experienced skin to skin contact following delivery, were four times more likely to receive formula in hospital (AOR: 4.052, 95% CI [2.050, 8.009]). Newborn infants who had not been admitted to the NICU following delivery were less likely to have received formula (AOR: .013, 95% CI [0.002, 0.111]).

Table 4.7: Factors associated with formula use in-hospital*

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Sociodemographic						
Mother's age (years)						
<25	0.737	0.484, 1.121	0.154			NS
25-29	0.803	0.566, 1.139	0.218			
≥30	1.0					
Mother's education						
Primary to secondary	0.471	0.320, 0.735	.001			NS
High school	0.620	0.439, 0.877	.007			
University	1.0					
Father's employment status						
Employed	1.340	0.970, 1.853	.076			NS
Semi-employed	1.0					
Mother's employment status						
Employed	1.541	1.039, 2.286	.032			NS
Unemployed	1.0					
Biomedical						
Method of delivery						
Vaginal	1.0					
Elective caesarean section	5.195	3.263, 8.271	<.001	5.314	3.158, 8.941	<.001
Emergency caesarean section	4.490	2.813, 7.167	<.001	4.413	2.613, 7.452	<.001

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Parity						
Primiparous	1.389	1.013, 1.903	.041			NS
Multiparous	1.0					
BMI pre-pregnancy						
Normal weight	1.0					NS
Overweight and obese	1.174	0.857, 1.608	0.317			
BSL pre-delivery (mg/dl)						
Normal	1.0					NS
Diabetic	0.879	0.639, 1.211	0.430			
Infant characteristics						
Baby gender						
Male	1.0					NS
Female	1.225	0.897, 1.672	0.202			
Baby birth weight(gram)						
2500-2900	1.0					
3000-3490	0.779	0.543, 1.119	0.177			
≥3500	1.261	0.829, 1.917	0.278	1.824	1.143, 2.909	.012
Baby admitted to NICU						
Yes	1.0					
No	0.029	0.004, 0.222	.001	0.013	0.002, 0.111	<.001

Variables	COR	95% CI	*p* value	AOR	95% CI	*p* value
Hospital practices						
Having epidural						
Yes	2.018	1.472, 2.768	<.001			NS
No	1.0					
Attended in antenatal class						
Yes	1.0					NS
No	1.416	0.858, 2.334	0.137			
Teaching how to attach baby to breast						
Yes	1.0					
No	1.449	1.007, 2.084	.046			
Skin to skin contact						
Yes	1.0					
No	5.783	3.112, 10.749	<.001	4.052	2.050, 8.009	<.001
Time of the breastfeeding						
Less than one hour	1.0					
One hour or more	3.925	2.640, 5.834	<.001			

*COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, BMI=Body Mass Index normal weight= 20 kg/m^2, overweight = <25-29.99 kg/m^2, and obese= ≥30 kg/$m^{2,}$, BSL normal= Blood sugar level:≤90 mg/dl, Diabetic= Blood sugar >90 mg/dl, NICU= Neonatal Intensive Care Unit, NS= No significant at 5%

4.4 Discussion

The initiation rate of breastfeeding was 98.6% in the present study, which compares favourably with rates reported (90%) in all provinces in Iran by Olang et al. (2009), and other Middle-Eastern countries including Kuwait 92.5% (Dashti et al., 2010), Egypt 95% (Al Ghawass & Ahmed, 2011), United Arab Emirates 98% (Radwan, 2013), Saudi Arabia 90% (Amin, Hablas, & Al Qader, 2011), Lebanon 95.4% (Batal et al., 2006) and Jordan 90% (Oweis, Tayem, & Froelicher, 2009).

WHO defines early initiation of breastfeeding as the proportion of children who were put to the breast within one hour of birth, while UNICEF in their Ten Steps to Successful Breastfeeding (1991) recommends that mothers be helped to initiate breastfeeding within 30 minutes of birth. UNICEF's Iranian office in 2013 reported 55.6% of mothers in hospital practiced early initiation of breastfeeding, while only 32.2% of mothers in this present study reported breastfeeding their babies within one hour after delivery. This finding needs to be understood in context. In Iran information on breastfeeding practices in hospital is based on the data recorded by Maternal and Child Health (MCH) clinics, where mothers and their infants attend at 1, 2, 3, 4, 6, 7, 12 and 18 months postpartum for routine postpartum care and vaccination. During the first postpartum visit at one month, responses to questions on breastfeeding practices in hospital are recorded, and reported to the Health Minster annually, and reported nationally every four years by the Iranian UNICEF office. However, mothers may not remember the actual time of initiating breastfeeding in hospital, and particularly, if they had a caesarean section or episiotomy, the rate may be overestimated. The only other Iranian data available on early initiation of breastfeeding, are provided by a retrospective survey conducted in 1993, only 6% of infants were breastfed within five hours of birth (Marandi et al., 1993). The present study demonstrates an improvement, but the proportion of infants breastfed within one hour of birth is still below the national and international recommendations. The early initiation rate of breastfeeding in other Middle-Eastern countries has been reported as 44.6% in Kuwait (Dashti et al., 2010), Bahrain 39.8% (Musaiger & Abdulkhalek, 2000), and Egypt 10.4% (Al Ghawass & Ahmed, 2011), suggesting that delayed breastfeeding is a common Middle-Eastern practice.

Although the initiation rate of breastfeeding in Iran is higher than in several other Middle-Eastern countries, only 29.9% of infants in this study were breastfed exclusively from birth, with most infants receiving traditional feeds or infant formula or both at some time during their hospital stay. Studies have shown that breastfeeding after discharge continues longer for infants who are exclusively breastfed in the postnatal ward (Kruse, Denk, Feldman-Winter, & Mojta Rotondo, 2005; Tavoulari et al., 2015). The Ten Steps to Successful Breastfeeding (WHO, 1998) outline a number of hospital practices to improve breastfeeding rates, however, no published study has evaluated hospital maternity practices in Iran and their effect on breastfeeding outcomes. While 90% of Iranian hospitals, including four of the five hospitals in this study, are Baby Friendly Hospital Initiative (Kalantari & Roudsari, 2013), a number of these steps are not being routinely practised and have negative breastfeeding outcomes. For instance, only one third initiated breastfeeding within the first hour of delivery, just over six out of 10 infants received prelacteal feeds, with four out of 10 infants receiving traditional prelacteal feeds, and just over three out of 10 infants received formula at some time during their hospital stay.

While maternal colostrum as the first food protects infants through its immuno-protective features (Edmond et al., 2006) and reduces the risk of neonatal mortality (Becker & Remmington, 2014), in the present study two thirds of infants were given prelacteal foods and only one third of infants received colostrum as their first food. Prelacteal foods as the first food offered to neonates during their first day of life is a relatively common cultural practice in Middle-Eastern countries. These include glucose water, traditional teas and infant formula that reduce the duration of exclusive breastfeeding (Boccolini, Pérez-Escamilla, Giugliani, & Boccolini, 2014; Dashti et al., 2010; Radwan, 2013).

The introduction of prelacteal foods is a public health issue, particularly in developing countries, as it interferes with the initiation and development of a healthy gut microbiome and increases the risk of neonatal morbidity and mortality (Edmond et al., 2006). In this present study, more than one-third of infants (38.8%) received a traditional herbal food as their first feed. These included purgative manna, flix weed, jujube tree, chicory and manne of hedyzaru that are traditionally and commonly used to reduce neonatal jaundice (Boskabadi & Bagheri, 2015). While an earlier study

conducted in Iran (Koosha, Hashemifesharaki, & Mousavinasab, 2008) reported that 18% of infants received butter and glucose water in the first five days, no study has reported the prevalence and the types of traditional herbal prelacteal foods in Iran to date.

The rate of prelacteal feeding practice is high in many developing communities, and related to cultural and religious beliefs (Dennis et al., 2007). For instance, in Pakistan the rate of prelacteal feeding has been reported at 50%, and the most common traditional foods were honey (24.7%) and animal butter (17.0%), the butter used as a laxative (Fikree, Ali, Durocher, & Rahbar, 2005). Another study conducted in Pakistan reported that 14% of mothers discarded colostrum in the belief that it is a poisonous and dirty liquid (Ali, Ali, Imam, Ayub, & Billoo, 2011). In many Muslim countries the practice of giving prelacteal foods is prevalent in the belief that something sweet before initiating breastfeeding as a taste feeding is the way of the prophet Mohammad (Raheem, Binns, Chih, & Sauer, 2014; Shaikh & Ahmed, 2006). A cohort study conducted in the Maldives reported that 10.6% and 7.4% of neonates received honey and dates, after birth in hospital as a ritual feed (Raheem et al., 2014). Similarly in the United Arab Emirates 23% of infants received crushed dates and traditional drinks (Radwan, 2013). In Egypt, another predominantly Muslim country, the prevalence of prelacteal food is reported as 58%, with traditional herbs and teas being the first food given in the hospital (El-Gilany & Abdel-Hady, 2014).

In the present study poorly educated women were more likely to give their infants traditional prelacteal feeds than better educated women and this finding has been reported for other societies where prelacteal feeding is a common practice. A cross- sectional study of 647 Egyptian mothers found that low level of maternal education was associated with offering traditional foods to infants (El-Gilany & Abdel-Hady, 2014). Similarly, an Indian cross-sectional study also reported lower maternal education as a predictor of prelacteal foods in Southern India (Patel, Banerjee, & Kaletwad, 2013). Mothers with a higher level of education may have access to knowledge and social networks, which will make them less subject to the influence of cultural beliefs and traditional values and behaviour. For instance, the present study found that neonates whose fathers were employed were less likely to receive traditional foods than neonates whose fathers were semi-employed. Although

no study has reported father's employment status as a predictor of traditional prelacteal feeding in postnatal ward, fathers who are employed are more likely to be educated. They may themselves be more aware of the importance of colostrum and help their wife to resist the pressure of grandmothers for instance, to follow traditional practices.

The high rates of in-hospital formula use reported in this study is a matter of concern, as the introduction of supplemental formula feeding has been shown to negatively influence the duration of exclusive breastfeeding as well as 'any' breastfeeding in Western countries (Blomquist, Jonsbo, Serenius, & Persson, 1994; Chantry, Dewey, Peerson, Wagner, & Nommsen-Rivers, 2014; McDonald et al., 2012; Riva et al., 1999), and a study in Turkey concluded that formula offered to healthy infants in the postpartum ward reduced the duration of exclusive breastfeeding after discharge (Alikasşifoğglu et al., 2001).

The only other Iranian survey to examine in-hospital use of formula reported that 68% of neonates received formula while still in the post-partum ward (Marandi et al., 1993). Just over one third of infants (34.9%) in this present study received formula prior to discharge which does suggest some improvement in this practice in the last 20 or so years. High rates of giving formula in-hospital is common practice among Middle-Eastern countries. For instance, in Lebanon 28.15% of infants were given formula as the first food (Batal et al., 2006), 43% of Jordanian infants (Oweis et al., 2009) and 44% of infants in Qatar were given formula in hospital (Al-Kohji, Said, & Selim, 2012). In a recent Kuwaiti study just over three quarters (76.4%) of infants received formula at some stage of their hospital stay (Dashti et al., 2010).

In the present study, several variables were found to be risk factors for one or more of the in-hospital feeding practices investigated. For example, delivery method was a strong predictor of delayed initiation of breastfeeding, offering of traditional feeding and use of formula in hospital. Infants delivered by elective caesarean section were two times, and emergency caesarean section three times, more likely to receive formula than infants delivered by vaginal delivery. Dashti et al. (2010) reported that Kuwaiti infants delivered by caesarean section were less likely to be breastfed exclusively during hospital stay. Similarly, Parry et al. (2013) in Hong Kong using a multivariate model reported that hospital practices and delivery method were factors associated with introduction of infant formula in hospital. Results of demographic and

health surveys conducted in seven Latin American countries using a multivariate model, reported that caesarean section is a risk of milk-based prelacteal feeds among women (Boccolini et al., 2014).

Evidence reveals the negative effect of caesarean section on the initiation of breastfeeding suckling (Prior et al., 2012; Qiu et al., 2008; Rowe-Murray & Fisher, 2002; Scott, 2006), which is probably due to delayed mother-infant interaction. Mothers delivering by caesarean section experience difficulties immediately postpartum including pain related to the operation, the effects of analgesia or anaesthesia, insertion of a catheter and abdominal incision, fasting and stress, all of which may interfere with the establishment of breastfeeding (Kutlucan et al., 2014; Parry, Ip, Chau, Wu, & Tarrant, 2013). Prolonged separation from the infant, and difficulties in positioning the infant to breastfeed following caesarean section have become common occurrences and hospital practices and may contribute to the offering of infant formula (Zanardo et al., 2010). However, infants delivered by caesarean section may breastfeed when their mothers are conscious enough to hold and put them on the breast, and medications introduced during caesarean section and in postpartum to manage pain can be safe when sucking. Thus, caesarean section is not necessarily a medically valid reason to offer formula in hospital.

While the optimal level of caesarean section recommended by WHO is 10%-15% in both developed and developing countries (WHO & HRP, 2015), this practice increased in Iran from 19.5% in 1976 to 42% in 2005 (Bahadori, Hakimi, & Heidarzade, 2013). A meta-analysis of 36 studies conducted between 2000 and 2012 reported that the prevalence of caesarean section was 48% and that fear from pain, a high level of education, private obstetrician and repeated caesarean section were the main reasons among Iranian women for delivering by caesarean section (Azami-Aghdash, Ghojazadeh, Dehdilani, Mohammadi, & Abad, 2014). The number of Iranian women who deliver by caesarean section appears to have increased further in the last decade as in this study seven out of every 10 infants were delivered by caesarean section with one third (35.4%) being delivered by elective caesarean section. In the private hospitals studied, seven out of every 10 infants were delivered by elective caesarean section. A study conducted in Tehran, the capital city of Iran, found the rate of caesarean section over a 30 year period increased from 14.3% in 1979

to 22.7% in 1989 and to 85.3% in 2009 (Badakhsh, Seifoddin, Khodakarami, Gholami, & Moghimi, 2012).The findings of this present study, demonstrates that rising rates of caesarean section in Iran may indirectly influence the introduction of formula by contributing to delayed initiation of breastfeeding in the maternity ward.

The current study however, found that neonates of mothers who delivered vaginally were more likely to receive traditional prelacteal foods than neonates whose mothers had undergone caesarean section. In Iran, midwifes and nurses provide postpartum care including support for new mothers to breastfeed and neonatal care. However, relatives have a great access to mothers and infants immediately following a vaginal delivery, when mothers are not closely supervised by staff. Relatives often bring traditional prelacteal foods without informing the midwives and nurses according to their beliefs. In contrast, relatives have restricted visiting access to women who deliver by caesarean section and who are more closely monitored by nursing staff.

This study found infants who did not experience skin to skin contact following delivery were significantly more likely to delay initiating breastfeeding, receive traditional prelacteal food, and formula in hospital than infants who have skin to skin contact. A Cochrane review of 30 studies involving 1,925 mothers and their infants concluded that skin to skin contact immediately after birth increases the exclusive breastfeeding rate at one and four months postpartum (Moore, Anderson, & Bergaman, 2007). Skin to skin contact as an early mother-neonate interaction, promotes successful breastfeeding outcomes, as it provides sensory experiences of touch, warmth and odour and promotes the release-of maternal oxytocin, which decrease maternal anxiety. In addition, skin to skin contact has been reported to reduce neonatal stress and assists the regulation of the neonate's body temperature and nursing behaviours (Bramson et al., 2010; Moore et al., 2012). While most healthy full term neonates are able to start sucking the mother's nipple immediately post-delivery, timing can be crucial in establishing breastfeeding. After two hours newborn infants are sleepy and difficult to arouse for breastfeeding (Moore et al., 2012). Therefore, early skin to skin contact and then early initiation of breastfeeding are less likely to be followed by the use of traditional prelacteal foods or formula during maternity hospitalisation.

The neonatal intensive care unit (NICU),where premature newborn infants, low birth weight and ill full-term babies are routinely admitted for monitoring and care, can adversely influence the establishment of breastfeeding as the mother's access to the unit and her infant is limited (El-Gilany & Abdel-Hady, 2014; Ladomenou, Kafatos, & Galanakis, 2007; Scott & Binns, 2002). Dashti et al. (2010) documented that admission of neonates to special care nursery, even for a short period (less than 72 hours) was negatively associated with initiation of breastfeeding. Similarly, the present study found that infants who were admitted to NICU for less than 72 hours were more likely to be given formula than infants who stayed with their mothers. There is evidence that the use of expressed breastmilk is a practical method for increasing the outcome of breastfeeding for infants who start life in neonatal care units (Merewood, Philipp, Chawla, & Cimo, 2003; Renfrew et al., 2010). The mother of an NICU infant may initiate breastfeeding by expressing in a room close to the NICU, to address the problem of limited access to the baby.

However, the current study found that neonates who stayed with their mothers were more likely to receive traditional foods than those who were admitted to the NICU. Again access to infants in the NICU by parents and family members is restricted and controlled, and neonates admitted to NICU are supervised by paediatricians who are responsible for prescribing their medications and foods. Traditional foods are not medically prescribed in the NICU where formula is the only supplemental food that is used. However, breastfeeding of healthy infants in the postnatal ward, where infants stay with their mothers is not closely observed.

This study found that babies weighing more than 3,500 grams were more likely to be fed formula in-hospital than infants with birth weight between 2,500 and 3,499 grams. The reasons for this finding was not explored and warrants further investigation. Anecdotal reports suggest that fear of hypoglycaemia may be a reason for offering formula in hospital. However, there is evidence that the foetus builds-up glycogen storage intrauterine, and in the postpartum period the liver converts this glycogen to glucose, and hence the stored glycogen is adequate for a full-term healthy neonate (Becker & Remmington, 2014; Cornblath et al., 2000). Therefore, healthy and normal weight newborn infants can readily breastfeed after birth without intervention.

There is some evidence to indicate that correct positioning and attachment is a skill that is acquired by practice after delivery, in the postpartum ward (Colson, 2008; Hannula, Kaunonen, & Tarkka, 2008; Henderson, Stamp, & Pincombe, 2001). Appropriate positioning and attachment assists to initiate and sustain breastfeeding as this practice prevents nipple pain and trauma in the postnatal period (Henderson et al., 2001).

In the current study, mothers who did not receive support or practice with attachment of the baby were more likely to give traditional foods to neonates. A systematic review that included 31 articles related to breastfeeding support interventions, concluded that hospital educational intervention on positioning and attachment improved initiation and duration of breastfeeding (Hannula et al., 2008).

Antenatal education provides information on breastfeeding during pregnancy in different forms to individuals and groups that can be imparted by pamphlet, brochure, video tape in routine antenatal care appointments, and this intervention improves breastfeeding outcomes (Lumbiganon et al., 2012). To improve successful breastfeeding the WHO recommends pregnant mothers receive antenatal education on the advantages of breastfeeding and early initiation of breastfeeding (UNICEF & WHO, 1989). In the present study, only 12.1% of mothers had attended an antenatal class, and those who did not attend prenatal education had delayed breastfeeding initiation. A cross-sectional study of 1,309 Brazilian pregnant mothers reported a positive association between prenatal education on the benefits of breastfeeding and an increased rate of early initiation of breastfeeding (Vieira et al., 2010). A Cochrane meta-analysis of 19 studies involving 8,506 pregnant mothers concluded that antenatal education improves the initiation rate of breastfeeding and any duration of breastfeeding (Lumbiganon et al., 2012).

In the present study, a high proportion of mothers reported breastfeeding difficulties in hospital. A Canadian study, reported that painful nipples, insufficient milk and latching-on difficulties are the most frequent problems experienced during breastfeeding (Lamontagne, Hamelin, & St-Pierre, 2008). The present study, 43.7% of mothers reported pain during nursing, and 23.2% experienced pain when their baby latched-on. In an Australian cohort study, 82.6% of mothers reported breastfeeding problems in hospital including sore breast (18%), cracked nipples (17%) and

engorgement (10%) (Scott & Binns, 2002). In the current study, 11.9% of mothers experienced cracked nipple, but more than one third reported attachment difficulties, and nearly one third experienced problems with positioning. In this study 70.1% of mothers delivered by caesarean section and of the 29.9% mothers who delivered vaginally, 25.9% of them had an episiotomy that is a common procedure in Iran. It is likely that these mothers experience difficulties in positioning that adversely influence breastfeeding practices. In addition, using a manual pump to express milk to minimise breast engorgement and pain is a routine practice in maternity hospitals of Shiraz. Manual pumps with a rough and inflexible flange damaged nipples and lead to pain. It is apparent that breast-related difficulties are prevalent during the production of milk, but are preventable and manageable with appropriate practice and support.

4.5 Conclusion

Although the initiation of breastfeeding is considered a cultural norm among Iranian mothers, few women exclusively breastfed their infants from birth. The finding of this study that the majority of neonates were born via caesarean section, initiated breastfeeding late, received prelacteal foods, and that few pregnant mothers attended antenatal classes and were taught how to breastfed their infants, is not consistent with international guidelines for care. The low practice of several of the "Ten Steps to Successful Breastfeeding", indicates that breastfeeding practices at Baby Friendly Hospitals in Iran should be monitored to identify barriers to their implementation and 'steps' that need revision and improvement. There is a need for further education of nurses' and midwives' to improve their-attitudes and knowledge of the conditions that support breastfeeding in antenatal care, and post-operative recovery, in the postpartum ward, and a revision of hospital policies to improve breastfeeding practices.

Chapter 5

Chapter 5

Mastitis

5.1 Introduction

Lactation mastitis is an acute inflammation of breast tissue affecting mothers who breastfeed (Barbosa-Cesnik et al., 2003; WHO, 2000). It is characterised by clinical symptoms ranging from local inflammation accompanied by pain and fever to abscesses and septicaemia that may necessitate weaning. Thus, mastitis is potentially a significant complication of breastfeeding (Osterman & Rahm, 2000). In Iran, breastfeeding is a universal practice (Marandi & Ezzeddin Zanjani, 2012; Noughabi et al., 2014; Olang et al., 2009), however no studies have reported the incidence of mastitis among Iranian women to date.

The purpose of this chapter is to report the incidence and determinants of mastitis, its impact on breastfeeding duration and to describe the type and appropriateness of the management advice received by mothers participating in the Shiraz Infant Feeding Study (SIFS).

5.2 Methods

In total, 672 mothers were followed-up at one, three, four and six months postpartum with face to face interviews in Maternal Child Health (MCH) clinics, where health workers provide routine postnatal care and monitor child health from one month postpartum. Mothers were interviewed by trained staff to collect information about breastfeeding practice, breast care, breastfeeding problems and mastitis.

5.2.1 Case definition

At each interview mothers self-reported mastitis with answers of Yes/ No. They also reported whether they had experienced symptoms associated with mastitis.

While there is no standard definition of mastitis (Amir et al., 2007) these symptoms were used to verify the mother's self-report. A woman was considered to be a mastitis case if she reported having had a red, tender, hot, swollen area on any part of a breast, accompanied by one or more of the following:

1. An elevated temperature (either estimated or measured as being $\geq 38^0$ C) or
2. One or more of the constitutional symptoms of fever (body aches, headaches and chills).

Symptoms had to have been present for a minimum duration of 24 hours (Kinlay, O'Connell, & Kinlay, 1998; Scott et al., 2008). Mothers who reported mastitis were asked further questions about management of symptoms and types and sources of treatment advice they had received. The main outcome variable is mastitis status with "Yes" coded as 1 and "No" coded as 0.

As the majority of episodes of mastitis reportedly occur in the first 4 weeks postpartum (Amir et al., 2007; Cullinane et al., 2015; Scott et al., 2008; Tang et al., 2014) and less frequently after 3 months postpartum, the analysis was focussed on cases occurring in the first 3 months. The occurrence of mastitis in the first 4 weeks postpartum and between 5 and 12 weeks postpartum were treated as separate outcomes to determine if the risk factors differed according to stage of lactation.

5.2.2 Explanatory variables

Factors associated with mastitis that have been reported in the literature, namely parity, method of delivery, breastfeeding problems (cracked nipples, attachment difficulties, pain on nursing, engorged breasts), whether the mother had worn a nursing bra, given her infant a pacifier, expressed her milk or changed the frequency of breastfeeding (Fetherston, 1998; Foxman et al., 1994; Kinlay et al., 2001), were included in the statistical analysis.

5.2.3 Statistical analysis

The mastitis incidence density was calculated by dividing the number of episodes of mastitis in four week blocks by the number of completed weeks of breastfeeding (Amir et al., 2007). The potential risk factors associated with mastitis occurring in the first 4 weeks postpartum and between 5 and 12 weeks postpartum

were explored as separate outcomes first using bivariate logistic regression. All explanatory variables were entered into a multivariable logistic regression model to identify those variables independently associated with the risk of mastitis during each time interval with a forward step-wise selection method. Crude odds ratios (COR) and adjusted odds ratios (AOR) and their corresponding 95% Confidence Interval (95% CI) were generated and reported. Kaplan-Meier survival analysis was used to investigate the association of mastitis and breastfeeding duration and the log-rank test was used to compare the difference between groups.

5.3 Results

5.3.1 Incidence of mastitis

Of the 672 mothers interviewed in MCH clinics, 130 mothers (18.6 %, 95% CI [16.4%, 22.3%]) self-reported having experienced at least one episode of mastitis in the six months postpartum period. Of these, 124 mothers reported one episode of mastitis and six mothers (9%) reported two episodes of mastitis. Of the first episodes of mastitis 72, or more than half (55.4%), occurred during the first four weeks postpartum and the incidence fell gradually thereafter (Figure 5.1). Thirty one episodes (23.8%) occurred in week's five to eight and three episodes in weeks nine to 12. The incidence density was highest in the first four weeks (27.3 episodes/number of women breastfeeding –weeks x 1,000) and approximately half this (12.2 episodes /number of women breastfeeding-weeks x 1,000) in the second four weeks postpartum (Table 5.1).

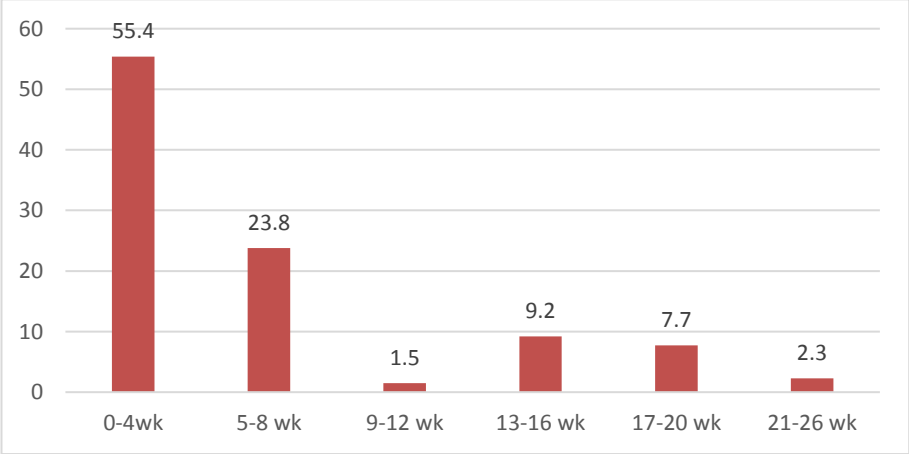

Figure 5.1: Proportion (%) of first episodes of mastitis occuring in each time period

Table 5.1: Incidence density of mastitis in Iranian, Australian[1] and Chinese[2] mothers within 6 months postpartum

Interval	Number of episodes of mastitis	Number of women breastfeeding-weeks	Incidence density (x1000)	Incidence density (x1000) Australian mothers	Incidence density (x 1000) Chinese mothers
0-4 weeks	72	2633	27.3	35.0	11.0
5-8 weeks	31	2545	12.2	16.6	6.5
9-12 weeks	4	2510	1.6	12.4	5.1
13-16 weeks	15	2472	6.1	9.4	2.9
17-20 weeks	10	2421	4.5	7.9	3.1
21-20 weeks	4	2321	1.3	1.7	1.8

[1]Amir et al., 2007, [2]Tang et al., 2014

All "cases" reported symptomology consistent with the case definition of mastitis including, moderate to severe breast skin tenderness (100%), skin redness (83%), and warmth (91%). In addition, 92% reported an elevated temperature and 80% reported flu-like symptoms.

5.4 Management of Mastitis

Table 5.2 displays the advice given to the mothers who developed mastitis. The majority of mothers (63%) were advised to continue feeding from the affected breast or feed from the affected breast, however 25 mothers (19.2%) were advised not to feed from the affected breast, and 6 mothers (4.6%) were advised to stop breastfeeding altogether. Mothers received other supportive advice including massaging the affected breast (29.9%), applying a heat pack (26.2%) and stopping nipple lotion (26.2%).

All mothers developing mastitis symptoms sought medical care and were diagnosed by a general practitioner (GP), general surgeon in a private clinic and/or midwives and nurses who worked as health workers in MCH clinics. Prescriptions for antibiotics were provided by a GP or general surgeon. Advice was given to mothers frequently by a GP (91.5%), midwife (42.3%), a general surgeon (23.8%), and nurse (21.5%). Mothers who needed more care or were experiencing recurrent symptoms were referred on to a GP by health workers or to a general surgeon by a GP. This is a common practice in Iran.

Table 5.2: Type of advice received by mothers with mastitis (n=130)

Advice	N	Percent of cases[#]
Feed frequency from affected breast	82	63.0
Feed from affected breast first	32	24.60
Stop feeding from affected breast	25	19.20
Stop breastfeeding	6	4.60
Massage affected breast	38	29.20
Apply heat pack	34	26.20
Discontinue nipple lotion	8	6.20
Have ultrasound treatment	2	1.50

[#]Cases may have received more than one type of advice

Table 5.3: Source of advice received

Sources	N	Percent of cases[#]
General physician	119	91.5
Midwife	55	42.3
Nurse	28	21.5
General surgeon	31	23.8

[#]Cases may have received more than one type of advice

All mothers with mastitis (100%) were prescribed one or more antibiotics. One quarter of mothers received an aggressive combination therapy which involved intravenous administration of Cephteriaxon, intramuscular gentamycin and Cefexim orally. The types of antibiotics prescribed either oral or intravenous administration are listed in Table 5.4. Only one case of breast abscess occurred in this study.

Table 5.4: Antibiotics prescribed during mastitis (n=130)

Antibiotics	N	Percent of cases
Cephexim (oral)	71	51.8
Cephteriaxon (IV), Gentamycin (IM), Cefexim (Oral)	33	25.4
Cephalexin (Oral)	24	17.5
Cephteriaxon (IV)	9	6.9

5.5 Mastitis and Breastfeeding Duration

The results showed no difference in duration of breastfeeding with 88% of women who experienced mastitis and 87% of women without mastitis still breastfeeding at 26 week (log-rank test χ^2 =0.107, df =1, p=0.743) (Figure 5.2). Of the 83 mothers in this study who stopped breastfeeding before 26 weeks, 10 (12%) reported stopping breastfeeding due to mastitis.

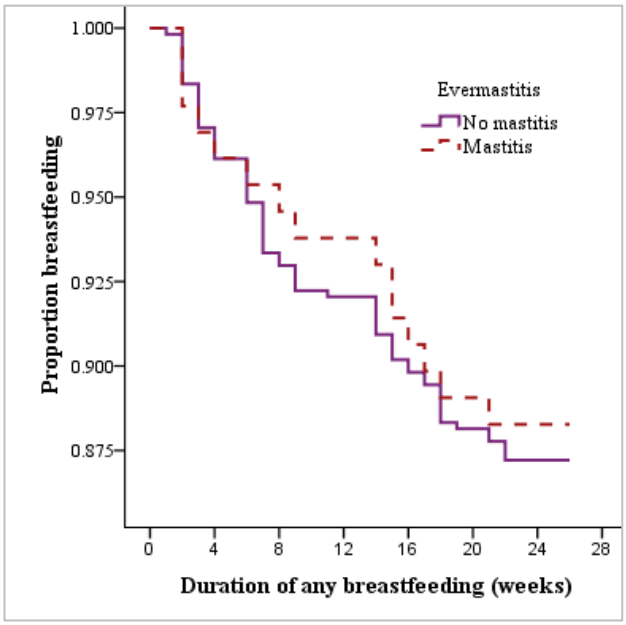

Figure 5.2: The association of mastitis and duration of breastfeeding

5.6 Factors Predicting Mastitis

5.6.1 Bivariate analysis

Variables that might be associated with developing mastitis within 1 and 3 months postpartum are listed in Table 5.5. As few mothers reported mastitis at four (n=18) and six months (n=11) follow-up interviews, variables were investigated only for mastitis reported at the one month (n=72) and between one and three months (n=35) postpartum interviews.

Mothers who did not experience problems during breastfeeding such as cracked nipples and breast engorgment or who wore a nursing bra, were less likely to develop mastitis in the first 4 weeks or between weeks 5 and 12 than those who experienced cracked nipples and engorged breasts or wore a nursring bra. Similarly,

women who had not expressed milk, did not give a pacifier to their infants were less likely to report mastitis by 4 weeks or between 5 and 12 weeks. Although, problems with attachment and pain during breastfeeding were not associated with mastitis in the first 4 weeks postpartum, mothers who continued to have attachment difficulties and pain during nursing between the first month and third month follow-up visits were more likely to develop mastitis between 5 and 12 weeks after delivery. Of the biomedical variables, parity and method of delivery did not have any association with developing mastitis at either time points. While level of breastfeeding was not associated with mastitis in the first 4 weeks postpartum, those women who had commenced mixed feeding between weeks 5 and 12 were more likely to have experienced mastitis than women who continued to fully breastfeed their infant.

Table 5.5: Factors associated with mastitis by 4 weeks and between 5 and 12 weeks (Bivariate analysis)*

	By 4 weeks (n=72 women who reported mastitis)					Between 5 and 12 weeks (n=35 women who reported mastitis)				
Variables	**n**	**%**	**COR**	**95% CI**	***p* value**	**n**	**%**	**COR**	**95% CI**	***p* value**
Cracked nipples										
Yes	327	51.3	1.0			20	3.0	1.0		
No	345	48.7	0.458	0.276, 0.759	.002	642	97.0	0.038	0.015, 0.100	<.001
Difficulty with attachment										
Yes	92	13.7	1.0			5	0.8	1.0		
No	580	86.3	0.833	0.421, 1.648	0.599	657	99.2	0.032	0.005, 0.199	<.001
Pain during nursing										
Yes	113	16.8	1.0			11	1.7	1.0		
No	559	83.2	1.389	0.670, 2.881	0.377	651	98.3	0.130	0.033, 0.513	.004
Engorged breast										
Yes	305	45.4	1.0			20	3.2	1.0		
No	367	54.6	0.483	0.294, 0.794	.004	642	97.0	0.018	0.007, 0.050	<.001
Expressed milk										
Yes	436	64.9	1.0			111	16.8	1.0		
No	236	35.1	0.146	0.062, 0.343	<.001	551	83.2	0.085	0.041, 0.177	<.001
Wearing a nursing bra										
Yes	206	30.7	1.0			186	28.1	1.0		
No	462	68.8	0.587	0.356, 0.968	.037	476	71.9	0.306	0.154, 0.608	.001

	By 4 weeks (n=72 women who reported mastitis)					Between 5 and 12 weeks (n=35 women who reported mastitis)				
Variables	**n**	**%**	**COR**	**95% CI**	***p* value**	**n**	**%**	**COR**	**95% CI**	***p* value**
Using pacifier										
Yes	277	39.6	1.0			318	48.0			
No	395	58.8	0.090	0.045, 0.179	<.001	344	52.0	0.079	0.024, 0.259	<.001
Parity										
Primiparous	367	54.6	1.0			362	54.7	1.0	1	
Multiparous	305	45.4	1.227	0.753, 1.999	0.411	300	45.3	0.896	0.451, 1.780	0.754
Level of feeding										
No change, fully breastfeeding	442	65.8	1.0			406	61.3	1.0		
Decreased level of breastfeeding	111	16.5	0.790	0.399, 1.567	0.501	141	21.3	2.902	1.395, 6.036	.004
Increased level of breastfeeding	119	17.7	0.499	0.199, 1.014	.054	115	17.3	0.878	0.288, 2.681	0.820
Method of delivery										
Normal delivery	196	29.2	1.0			191	28.9	1.0		
C-section	476	70.8	1.038	0.607, 1.774	0.892	471	71.1	1.243	0.572, 2.700	0.583

COR= Crude Odds Ratio

5.6.2 Multivariable analysis

A forward selection step-wise multivariable logistic regression analysis was used to determine which independent variables could predict mastitis by 4 weeks and between 5 and 12 weeks postpartum (Table 5.6).

Of the biomedical variables, only multiparty was significantly associated with mastitis in the first 4 weeks and between 5 and 12 weeks postpartum. Of the problems experienced during breastfeeding, difficulty with attachment, was not significantly associated with developing mastitis at either time interval. Having cracked or sore nipples was not associated with developing mastitis in the first 4 weeks postpartum, but women who experienced cracked nipples between 5 and 12 weeks were more likely to develop mastitis (AOR: 18.31, 95% CI [4.29, 0.575]). Similarly, pain during lactation was a significant predictor in developing mastitis between 5 and 12 weeks postpartum. Women who experienced pain during nursing were more likely to experience mastitis (AOR: 10.51, 95% CI [1.49, 74.16]), also, mothers who worn a nursing bra were more likely to experience mastitis between 5 and 12 weeks (AOR: 3.47, 95% CI [1.28, 9.43]).

Women who experienced breast engorgement were likely to experience mastitis in the first 4 weeks (AOR: 1.79, 95% CI [1.03, 3.09]), and between 5 and 12 weeks postpartum (AOR: 115.31, 95% CI [25.59, 519.67]). Mothers who expressed breastmilk also were more likely to experience mastitis (AOR: 4.96, 95% CI [2.03, 12.12]) in the first 4 weeks and between 5 and 12 weeks postpartum (AOR: 11.61, 95% CI [4.22, 31.97]). Introducing a pacifier to infants was another significant predictor for developing mastitis and women who gave a pacifier to their babies were more likely to develop mastitis in the first 4 weeks (AOR:11.25, 95% CI [5.49, 23.06]) and between 5 and 12 weeks postpartum (AOR:16.06, 95% CI [3.57, 72.35]). Similarly, multiparous mothers were more likely to develop mastitis in the first 4 weeks (AOR: 1.83, 95% CI [1.06, 3.17]) and between 5 and 12 weeks postpartum (AOR: 3.59, 95% CI [1.26, 10.21]). Mothers who had decreased the level of breastfeeding were less likely to experience mastitis in the first 4 weeks postpartum (AOR: 0.38, 95% CI [0.18, 0.79]).

Table 5.6: Factors associated with mastitis by 4 weeks and between 5 and 12 weeks (Multivariable)*

	By 4 weeks			Between 5 and 12 weeks		
Variable	**AOR**	**95% CI**	***p* value**	**AOR**	**95% CI**	***p* value**
Cracked nipples						
Yes			NS	18.31	4.29, 78.27	<.001
No				1.0		
Pain during nursing						
Yes			NS	10.51	1.49, 74.16	.018
No				1.0		
Engorged breast						
Yes	1.79	1.03, 3.09	.036	115.31	25.59, 519.67	<.001
No	1.0			1.0		
Expressed milk						
Yes	4.96	2.03, 12.12	<.001	11.61	4.22, 31.97	<.001
No	1.0			1.0		
Wearing a nursing bra						
Yes			NS	3.47	1.28, 9.43	.015
No				1.0		
Using pacifier						
Yes	11.25	5.49, 23.06	<.001	16.06	3.57, 72.35	<.001
No	1.0			1.0		
Parity						
Multiparous	1.83	1.06, 3.17	0.031	3.59	1.26, 10.21	.016
Primiparous	1.0			1.0		
Level of breastfeeding						
Decreased level of breastfeeding	0.38	0.18, 0.79	.010			N/S
Increased level of breastfeeding	0.47	0.20, 1.14	.093			
No change, fully breastfeeding	1.0					

AOR: Adjusted Odds Ratio, CI: Confidence Interval

* adjusted for all variables in the table in addition to difficulty with attachment, wearing a nursing bra and method of delivery

5.7 Discussion

This the first study to report the incidence of mastitis amongst breastfeeding mothers in Iran. In the present study, the incidence rate of mastitis was 18.6% in the first six months postpartum. This is comparable to incidence rates in developed countries including, Scotland 18% in the first six month (Scott et al., 2008), and Australia 17.3% in the first six months (Amir et al., 2007), and 20% in the first six months (Kinlay et al., 2001). No previous study has reported the incidence of mastitis in any Middle-Eastern country and to date very few studies have reported the incidence of mastitis in non-Western populations. An incidence of 6.3% in the first six months has been reported for China (Tang et al., 2014) and an incidence of 8% in the first month postpartum in Nepal (Khanal et al., 2015). The present study is one of few studies to report mastitis incidence density which allows for direct comparison between studies. For this study, the incidence density of 27.3% episode/number of women breastfeeding–weeks x 1,000 in the first four weeks postpartum was similar to an incidence density of 35.0 episodes/number of women breastfeeding –weeks x 1,000 reported for Australian women (Amir et al., 2007) but more than double that reported for Chinese women for the same period (Tang et al., 2014).

Variations in reports of mastitis incidence between reported studies may be related to the number of weeks postpartum for which mothers are followed up and /or the method used to identify cases. For instance, in a study conducted in New Zealand (Vogel, 1999), the rate of mastitis reported was 23.7% during one year postpartum. In a recent study conducted in Nepal, an 8% rate of mastitis during the first month postpartum was reported (Khanal et al., 2015), which is comparable to a first month incidence in this present study of 10.7% (72/672), 9.5% in Scotland (Scott et al., 2008) and 9.1% in Australia (Amir et al., 2007). Foxman et al. (2002) in the United States reported a 9.5% incidence of mastitis during the first three months postpartum, which was based on a health care provider-diagnosis of mastitis. In this current study, diagnosis of mastitis was self-reported and confirmed with self-report of a combination of symptoms indicative of mastitis, which is a method used in other studies with comparable rates of 18% from Scott et al. (2008) and, 17% (Amir et al. (2007). Scott et al. (2008) reported that more than one third of Scottish women self-managed their mastitis without seeking assistance from a health care provider. Hence incidence rates

that are based on health care provider diagnosis are likely to be lower than those derived from self-reporting.

The most effective management of mastitis is conservative, based on continuing breastfeeding at frequent intervals and expressing milk from the affected breast to drain the blocked duct and reduce engorgement (Amir, 2014; Jahanfar et al., 2013; WHO, 2000). A large proportion of mothers (63.1%) in this study received advice consistent with the accepted guidelines. Similarly, Kinlay et al. (1998) reported that 68% of women received advice to continue breastfeeding frequently. However, 6 mothers (4.6%) in the current were advised to stop breastfeeding altogether. This suggests that educational measures, including workshop training launched by the Iranian government to improve breastfeeding, is not being received or followed by all health workers who provide care to new mothers. In relative terms, this number may seem small, but stopping breastfeeding for any reason, particularly in the early postpartum period, is detrimental, as there are many benefits for mothers and infants. Efforts by authorities, should target professionals, with breastfeeding workshops in entry-level educational programs and continuing education to prepare health professionals for their responsibility in promoting breastfeeding and its beneficial outcomes. This will help ensure that mothers receive consistent and evidence-based care.

In the present study, all mothers received at least one antibiotic that was prescribed by either a GP or a general surgeon. WHO guidelines (2000), recommend the prescription of antibiotics based on bacteriological investigation. There is evidence that a positive culture may be the result of a common bacterial colonisation from normal skin flora, furthermore a negative culture cannot rule out lactation mastitis, therefore the interpretation of milk culture may be ambiguous (Kvist et al., 2008; Spencer, 2008). Hence, since culturing breastmilk is not a practical routine in Iran, prescription of antibiotics is routine and based on the severity of symptoms. Furthermore, when mothers seek help from their GP they expect to receive antibiotics rather than pain relief medications to relieve their symptoms.

There are variations between countries in the prescription of antibiotics to treat mastitis. For instance, similar to the current study Wambach (2003), in a descriptive study in the United States, reported that all mothers (100%) received oral

antibiotics when they had mastitis. In a recent Scottish study, 53% of mothers who developing mastitis were prescribed antibiotics (Scott et al., 2008). However, a descriptive study conducted by Kvist et al. (2008) in Sweden reported that 85% of cases recovered without antibiotics. The degree that women are prescribed antibiotics may reflect the level of anticipatory guidance and education with regards to self-managing mastitis that women receive in the early postpartum period. For instance, if a woman is warned that she may develop mastitis and is provided guidance on how to recognise the early symptoms of mastitis and self-manage the condition, she may do so successfully without having to resort to the use of antibiotics. It was not possible to ascertain from the literature to what extent anticipatory guidance is routinely provided in other countries, and women in this study were not asked if they had received anticipatory guidance about mastitis.

Staphylococcus aureus is the most common pathogenic bacterium found in laboratory investigations for infective mastitis (Delgado et al., 2009). Antibiotics recommended by WHO and Academy of Breastfeeding Medicine that cover possible bacteria in mastitis, are penicillinase resistant penicillins including Dicloxacillin and Flucxacillin. Of 130 mothers in this study who developed mastitis and received antibiotics, only 7 mothers were prescribed an antibiotic that was consistent with current recommendations. The majority of mothers received the third generation of cephalosporin either orally or intra-venously as the first line treatment in lactation mastitis. Increasing resistance to first generation cephalosporin is a crucial issue in Iran, where self-medication with antibiotics is a normal practice and antibiotics are available in pharmacies without a prescription (Sarahroodi & Arzi, 2009). In addition, gentamycin which was prescribed in the study, may have anti- inflammatory properties that prescription is consistent with guideline recommendations (WHO, 2000). However, a review concluded that there is little evidence of effectiveness of using antibiotics in the treatment of mastitis (Jahanfar et al., 2013). In addition, the inappropriate use of antibiotics can contribute to microbial-resistance and influence microbiotas in the body leading to a dysbiotic microbiome that contribute to infections (Langdon, Crook, & Dantas, 2016). The Iranian government should make efforts to decrease the inappropriate use of antibiotics and limit easy access to antibiotics without prescription, to reduce the number of bacteria becoming resistant to antibiotics.

Lactation mastitis has been identified as a significant factor in weaning decisions about breastfeeding (Wambach, 2003). In the present study, 10 of the 83 mothers (12.5%) who stopped breastfeeding before six months weaned their infants due to mastitis, thus depriving their infants prematurely of the great nutritional and immunological benefits of breastfeeding. Similarly, studies of Australian women (Fetherston, 1996) and of New Zealand women (Vogel et al., 1999) found 10.8% and 8.4% of women respectively, reported mastitis as their reason for discontinuation of breastfeeding. However, while a small number of women may give mastitis as their reason of discontinuing breastfeeding, most women who suffer the condition continue to breastfeed. For instance, although in the present study one in eight of those women who had stopped breastfeeding reported mastitis as the reasons, there was no significant independent association between mastitis and duration of breastfeeding. This is consistent with the findings of Amir et al. (2014), in a randomised clinical trial of 1,193 breastfeeding women in Australia, which failed to find an association between mastitis and the duration of breastfeeding. On the other hand, studies conducted in Scotland (Scott et al., 2008) and New Zealand reported that a history of mastitis was associated with longer overall duration of breastfeeding, and it has been postulated that mastitis is an indicator of an ample milk supply (Vogel et al., 1999)

A decline in the level of breastfeeding, whereby women changed from full or exclusive breastfeeding to mix feeding was associated in this study with a reduced risk of mastitis but only in the first 4 weeks. This finding was unexpected as an association with supplementary feeding and mastitis has been reported previously by Kinaly et al. (2001) and there is an increased risk of engorgement and blocked ducts if the level of breastfeeding declines suddenly, particularly in the early postpartum period when milk production is high (Grueger, 2013). This finding warrants further investigation in future studies to determine if it is a real or spurious association.

In the present study, a number of variables were found to be independently predictive of mastitis in the first 4 weeks or between 5 and 12 weeks postpartum. Cracked nipples have consistently been reported as an indicator of mastitis in developed countries (Amir et al., 2007; Foxman et al., 2002; Kinlay et al., 2001; Vogel et al., 1999) and may result from poor nursing techniques in latching the baby onto the nipple and removing from the nipple (Fetherston, 1998; Foxman et al., 2002;

Kaufmann & Foxman, 1991) .Trauma to the nipple following inappropriate attachment techniques and positioning, may be a factor in the entry of pathogens from the mother's skin that leads to mastitis. In this current study cracked nipples were a predictor of mastitis between weeks 5 and 12 but not in the first 4 weeks postpartum. The plausible reason is that, cracked or sore nipples are a common problem in the early postpartum period (Scott & Binns, 2002) and most women (47%) in this present study had experienced cracked and or sore nipples in the first month postpartum. However, if the problem persisted beyond the first month, cracked nipples were an independent predictor for mastitis between weeks 5 and 12. In Iran, the first routine maternal and child health clinic visits is scheduled at one month and there is no available community midwifery service to assist new mothers to successfully establish breastfeeding in the early postnatal period. Thus, more postnatal teaching about correct latching and positioning by midwives and nurses in hospital may minimise the risk of cracked nipples and mastitis after discharge.

Similarly, having engorged breasts was a strong predictor of mastitis between the 5 and 12 weeks. The results of this study are consistent with a prospective cohort study of 1,075 Australian women, conducted by Kinlay et al. (2001), and an earlier Australian case control study conducted by Fetherston (1998), both of which reported breast engorgement as a significant predictor of mastitis. Breast engorgement is a normal physiological process experienced by new mothers, usually 48-72 hours after delivery when milk "comes in" (Pérez-Escamilla & Chapman, 2001; Pustotina, 2015; WHO, 2000). However, it may also occur due to insufficient removal of milk from the breast or ineffective sucking during lactation, causing milk stasis, and increased pressure and release of milk into surrounding breast tissue causing an inflammatory response (Amir, 2014 ; Barbosa-Cesnik et al., 2003; Kaufmann & Foxman, 1991; WHO, 2000). In an engorged breast, the nipple can be stretched flat and the baby may be unable to pull the nipple into its mouth while the nipple may become fissured and cracked (Kaufmann & Foxman, 1991; WHO, 2000). Thus, the two conditions, breast engorgement and cracked nipples, can occur together and predispose the mother to mastitis. In an effort to reduce the likelihood of engorgement and associated problems, mothers should receive anticipatory guidance with regards to the risks associated with missing or delaying feeds and the relative advantages of demand feeding.

Expressing breastfeeding in the 4 weeks and between 5 and 12 weeks was a significant predictor of mastitis, which is consistent with the findings of a Spanish case-control study which reported the use of breast pumps as a risk factor in mastitis (Mediano et al., 2014). Milk expression may cause pain in the nipple from overstretching and inappropriate use of a breast pump may lead to nipple trauma and fissure (Johns, Forster, Amir, & McLachlan, 2013; Rasmussen & Geraghty, 2011). On the other hand, expressing breastmilk provides an opportunity for mothers to exercise lifestyle choices while continuing to nurse, and has been associated with the success and duration of breastfeeding (Binns, Win, Zhao, & Scott, 2006; Johns et al., 2013; Win, Binns, Zhao, Scott, & Oddy, 2006)

Furthermore, the association between breastmilk expression and mastitis found in this study may be an example of reverse causality. Expressing breastmilk and using breast pumps is frequently recommended to minimise breast engorgement and reduce bacterial colonisation inside the mammary gland and ducts when mothers develop mastitis (Kinlay et al., 2001; Mediano et al., 2014). Mothers were not asked in this study if they expressed milk before or after developing mastitis, hence, it is unclear whether breastmilk expression was the cause or consequence of mastitis.

Use of manual pumps in particular has been reported as a significant factor in development of mastitis (Gartner et al., 2005). In Shiraz, the use of manual breast pumps is a common feature on postpartum wards, and new mothers are encouraged to express milk after birth. The pumps commonly available in the postpartum wards and at home have a rough, non-pliable flange, and can cause nipple damage and nipple pain. In this study, 95% of mothers used manual pumps to express milk in the first month and 55% between 5 to 12 weeks. The main reason given by women in this study for expressing milk by manual pumps was to increase milk production, assist with establishing milk supply and reduce breast engorgement. This may explain why the prevalence of the practice was high in the first month and decreased over time. Conversely, in Australia the prevalence of the practice increased over time with a common reason given for expressing in the first six months was ‘to be able to go out and leave the baby’ (Johns et al., 2013). The majority of mothers in this study (63%) experienced pain during milk expression suggesting that the procedure might be traumatising the nipple and causing nipple damage. The present study did not ask how

frequently mothers expressed milk, but a recent Australian study found that expressing several times a day is a risk factor for development of mastitis (Cullinane et al., 2015).

The use of a pacifier was a significant predictor of mastitis both in the first 4 weeks and between 5 and 12 weeks. Pacifiers may contribute to the development of mastitis in a variety of interrelated ways. Firstly, the use of a pacifier may promote a non-nutritive, superficial sucking habit which does not effectively strip the breast of milk (Righard, 1998) leading to engorgement and blocked ducts (WHO, 2000). The use of a pacifier also has been associated with increased risk of sore and damaged nipples in a number of studies (Centuori et al., 1999; Sousa et al., 2015), while the pacifier may be a source of oral contamination and transmission of pathogens (Manning, Coughlin, & Poskitt, 1985; Nelson-Filho et al., 2015). Despite these biologically plausible mechanisms for the association between pacifier use and mastitis observed in this study, the possibility of reverse causality cannot be ignored, and it has been proposed that pacifier use is the marker for, or consequence of breastfeeding difficulties rather than a cause (Kramer et al., 2001).

In this study, 48% of mothers gave their infants a pacifier and there is widespread variation between countries in the prevalence of pacifier use. For instance, in Australia most infants (79%) are given a pacifier (Mauch, Scott, Magarey, & Daniels, 2012), whereas in Japan the prevalence is as low as 12% (Nelson, Yu, Williams, & Members, 2005) . In countries where pacifiers are not routinely used, mothers typically resort to other methods to soothe their infants such as carrying and rocking as well as breastfeeding (Mauch et al., 2012). Given that crying and fussiness is a common and frequent occurrence, then these mothers are likely to breastfeed frequently, thus reducing the likelihood of breastmilk stasis and engorgement, and consequently the risk of mastitis.

5.8 Conclusion

The prevalence of mastitis in Shiraz is similar to that reported in Western countries and approximately one in five breastfeeding mothers is likely to experience mastitis in the first six months postpartum. This study found that there was an extensive use of antibiotic treatment for lactation mastitis. It is important for all

physicians who prescribe antibiotics to avoid imprudent use of third generation cephalosporin, because antimicrobial resistance is a potential issue in Iran.

The risk factors identified in this study are potentially modifiable with appropriate support and anticipatory guidance in the early postpartum period. The length of stay in hospital following delivery is typically 24-48 hours in Iran and the level of breastfeeding support in this setting is limited and can be ineffective. Mothers do not receive routine postnatal care until one month postpartum, by which time they may have experienced their first episode of mastitis. It is recommended that the breastfeeding support offered in the hospital setting be improved and be supplemented with community-based midwifery services for up to two weeks. In particular, mothers should receive support and anticipatory guidance in hospital and/or shortly after discharge on: 1) the early recognition of the symptoms of mastitis and how to self-manage the condition conservatively; 2) the risks of introducing a pacifier, manual breastmilk pumps, and missing or delaying feeds; and 3) advice regarding the frequency of milk expression. These measures may help avoid the risk factors of mastitis which are commonly associated with poor breastfeeding technique.

Chapter 6

Chapter 6

Determinants of Breastfeeding Duration

6.1 Introduction

Breastfeeding benefits have been found to be related to the amount of breastmilk given. Exclusively breastfeed infants experience better health than those who are minimally breastfed or exclusively formula fed (Chantry, Howard, & Auinger, 2006; Horta & Victora, 2013; Slusser, 2007). The WHO and other international authorities including UNICEF(WHO & UNICEF., 2003), and the American Academy of Paediatrics (AAP), recommend exclusive breastfeeding for the first six months, with breastfeeding preferably continuing into the second year of life or longer (AAP, 2012).

The duration of breastfeeding is influenced by a complex mix of multiple factors including sociodemographic, biomedical and psycho-social factors (Semenic et al., 2008). Factors associated with breastfeeding duration in Iran and other Middle-Eastern countries have been investigated previously in Chapter 2.

6.2 Methods

In this study, 672 mothers were followed up at one, three, four, and six months postpartum with face to face interviews in Maternal and Child Health (MCH) clinics. Mothers were interviewed by trained staff to collect information about breastfeeding practices, problems encountered and reasons for changes in feeding method and discontinuing breastfeeding.

6.2.1 Outcome variables

The three outcome variables investigated in this chapter are the risk of ceasing exclusive, full and any breastfeeding up to six months (26 weeks) postpartum. The duration of exclusive, full, and any breastfeeding up to 26 weeks postpartum was measured in weeks using survival analysis. Duration was right censored for babies

who were still breastfed at the end of the study or at the time they withdrew from the study. The age of introduction of formula, solids and other fluids (e.g. water, fruit juice, and animal milks) determined the duration of full and exclusive breastfeeding with data being right censored according to the feeding method at the time of withdrawal from the study or at the end of the study. Exclusively breastfed infants were those infants exclusively breastfed since birth however, fully breastfed infants at discharge were those infants who left hospital receiving breastmilk only but may have received prelacteal feeds and supplementary formula in hospital and then transitioned to breastmilk only following discharge.

6.2.2 Explanatory variables

The explanatory variables to be examined as potential determinants were derived from the literature and were divided into four categories, namely socio-demographic, biomedical, infant characteristics and hospital practices (Chapter 3).

6.2.3 Statistical analysis

Survival analysis was performed to first, determine the prevalence of exclusive, full and any breastfeeding at 4, 12, 16 and 26 weeks postpartum, and second, explore the effect of explanatory variables on the hazard or risk of discontinuing exclusive, full, and any breastfeeding. Simple Cox proportional hazard regression analysis was used initially to evaluate the association between the explanatory variables and the duration of 'exclusive breastfeeding', 'full breastfeeding' and 'any breastfeeding', separately, without an adjustment of other variables or confounders. Factors found to be associated with the breastfeeding duration at 20% ($p \leq .2$) in the unadjusted analysis were included in a multiple Cox proportional hazard regression model, and adjusted for other variables/potential confounders to explore the adjusted risk of stopping breastfeeding. The backward elimination method was applied to obtain a parsimonious model and only variables with a *p* value of less than .05 were retained in the final model. The effects of explanatory variables on the cessation of exclusive, full, and any breastfeeding up to six months (26 weeks) postpartum were assessed and expressed as crude hazard ratio (CHR) or adjusted hazard ratio (AHR) together with their 95% confidence interval. In both the simple and multiple Cox proportional hazard regression analysis, women who had discontinued breastfeeding at discharge from the hospital were not included in the regression modelling.

6.3 Results

6.3.1 Breastfeeding duration

As reported in chapter 4, on discharge from hospital, 98.6% of mothers were still breastfeeding (‘any’), and 74.3% were fully breastfeeding but only 29.9% of mothers had breastfed their infants exclusively since birth as most infants had received prelacteal feeds or formula or both at some stage during their hospital stay. The prevalence of each level of breastfeeding is presented in Table 6.1 and Figure 6.1.By 26 weeks of age 87% of infants were still receiving breastmilk, 28% of infants, were fully breastfed but only 1% of infants had been exclusively breastfed from birth to 26 weeks. The median duration of full breastfeeding was 13 weeks and exclusive breastfeeding was less than 1 week (0.7).

Table 6.1: Prevalence (percentage and 95% CI) of breastfeeding in hospital to 26 weeks (n=700)

Interview	Any BF	Fully BF	Exclusive BF
At discharge	98.6 (97.7- 99.4)	74.3(71.1-77.5)	29.9 (26.5-33.3)
4 weeks	96.0 (94.5-97.4)	58.0 (54.3-61.7)	22.0 (18.8-25.1)
12 weeks	92.0 (89.9-94.07)	50.0 (46.2-53.8)	18.0 (15.07-20.9)
16 weeks	90.0 (87.7-92.3)	47.0 (43.2-50.8)	18.0 (15.07-20.9)
26 weeks	87.0 (84.4-89.57)	28.0 (24.6-31.4)	1.0 (0.24-1.7)

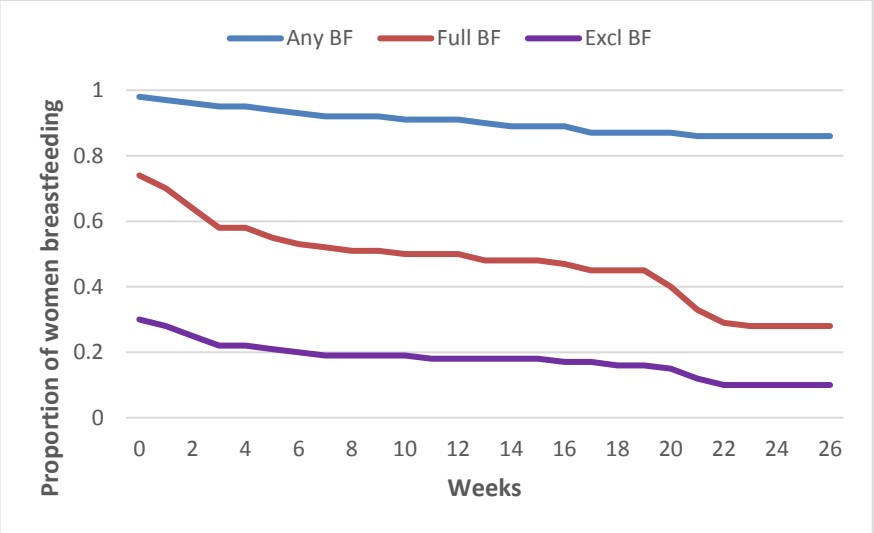

Figure 6.1: Proportion of women breastfeeding from birth to 26 weeks by level of breastfeeding

6.3.2 Reasons for changing to mixed feeding during the six months fallowing birth

Table 6.2 presents the reasons given by mothers for changing to mixed feeding at each follow-up visit up to 26 weeks postpartum. The most frequent reasons reported by mothers were insufficient milk supply (25%), suggestions from health workers (17%), and maternal illness.

Table 6.2: Reasons for changing to mixed feeding during the first 6 months postpartum (n=700)

	1 month (n = 91)		3 months (n = 98)		4 months (n = 108)		6 months (n = 114)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%***
Mother centred								
Not enough breastmilk	88	96.70	37	37.76	19	17.59	18	15.78
Health workers suggested	46	50.55	15	15.31	10	9.26	3	2.63
Mother depressed	13	14.29	1	1.02	1	0.93	1	0.88
Maternal illness	14	15.38	8	8.16	1	0.93	0	0.00
Breast infection	8	8.79	4	4.08	2	0.30	0	0.00
Return to work	7	7.69	7	7.14	7	1.58	2	1.75
Nipple problems	6	6.59	2	2.04	0	0.00	0	0.00
Friends suggested	5	5.49	2	2.04	0	0.00	2	1.75
Baby centred								
Baby illness	31	34.07	2	2.04	1	0.93	0	0.00
Baby was crying	18	19.78	1	1.02	1	0.93	1	0.88
Baby had not gained enough weight	10	10.99	5	5.10	4	3.70	3	2.63

* Percentages added up to more than 100 percent for respondents gave multiple answers.

6.3.3 Reasons for stopping breastfeeding during six months postpartum

Of the 672 mothers who were followed up in maternal child health clinics (MCH), 83 (12.4%) had stopped breastfeeding by 26 weeks (Table 6.3). Just under one third of these (n=25) gave the reason that the baby was refusing to breastfeed and two out of 17 women cited insufficient milk supply.

Table 6.3: Reasons for stopping breastfeeding (n=83)

Reason	n	%
Baby refused breastfeed	25	30.1
Maternal illness	20	24.1
Insufficient milk supply	17	20.5
Neonatal jaundice	11	13.3
Mastitis	10	12.0

6.3.4 Factors associated with breastfeeding duration-Bivariate Cox regression analysis

6.3.4.1 Sociodemographic factors

There was no significant association found between sociodemographic factors and the duration of exclusive breastfeeding (Table 6.4). However a mother's level of education and employment status were both associated with the duration of full and any breastfeeding.

Table 6.4: Association between sociodemographic, biomedical factors, hospital practices and the risk of cessation of exclusive, full and any breastfeeding before six months (n=700)

			Exclusive breastfeeding			Full breastfeeding			Any breastfeeding		
Variables	**n**	**%**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**
Sociodemographic											
Mother's age (Years)											
<25	150	21.4	1.090	0.781, 1.346	0.950	0.846	0.666, 1.076	0.174	0.777	0.442,1.365	0.381
25-29	265	37.9	0.936	0.754, 1.154	0.535	0.943	0.772, 1.151	0.562	0.650	0.396,1.066	.088
≥30	286	40.7	1.0			1.0			1.0		
Mother's education											
Primary to secondary	142	20.3	0.951	0.767, 1.180	0.648	0.666	0.513, 0.863	.002	0.439	0.213,0.904	.026
High school	287	41.0	0.862	0.72, 1.028	.098	0.912	0.750, 1.108	0.354	0.842	0.535,1.325	0.457
University	271	38.7	1.0			1.0			1.0		
Mother's employment status											
Employed	125	17.9	1.105	0.892, 1.345	0.357	1.247	0.995, 1.563	.055	1.778	1.100,2.872	.019
Unemployed	575	82.1	1.0			1.0			1.0		
Father's employment status											
Employed	242	34.6	0.928	0.786, 1.096	0.377	0.927	0.768, 1.119	0.427	0.974	0.621,1.528	0.910
Semi-employed	458	65.4	1.0			1.0			1.0		
Biomedical											
Method of delivery											
Vaginal delivery	209	29.9	1.0			1.0			1.0		
Caesarean section	491	70.1	0.885	0.743, 1.053	0.176	1.429	1.167, 1.751	.001	1.786	1.036, 3.079	.037

			Exclusive breastfeeding			Full breastfeeding			Any breastfeeding		
Variables	**n**	**%**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**
Parity											
Primiparous	382	54.6	1.089	0.922, 1.275	0.291	1.186	0.991, 1.418	.063	2.027	1.270,3.237	.003
Multiparous	318	45.4	1.0			1.0			1.0		
BMI before pregnancy											
Normal weight	408	58.3	1.0			1.0			1.0		
Over weight	235	33.6	1.038	0.87, 1.232	0.660	1.174	0.969, 1.422	0.100	0.68	.41, 1.13	0.143
Obese	57	8.1	1.068	0.79, 1.432	0.652	1.228	0.890, 1.694	0.211	1.201	.59, 2.43	0.611
BSL before delivery (mg/dl)											
Normal	425	60.7	1.054	0.901, 1.24	0.490	1.085	0.904, 1.301	0.381	1.16	.75,1.79	0.489
Diabetic	275	39.3	1.0			1.0			1.0		
Infant characteristics											
Baby gender											
Male	353	50.4	1.0			1.0			1.0		
Female	347	49.6	1.041	0.891, 1.220	0.551	0.999	0.836, 1.194	0.994	0.909	0.592,1.394	0.661
Baby weight birth (grams)											
2500-2999	224	32.0	1.0			1.0					
3000-3499	320	45.7	0.982	0.792, 1.212	0.825	0.827	0.674, 1.015	.069	0.82	.41,1.13	0.471
≥3500	156	22.3	0.851	0.695, 1.042	0.133	1.027	0.808, 1.307	0.825	0.73	.59,2.43	0.322
Baby admitted to NICU											
Yes	117	2.6	1.0			1.0			1.0		
No	583	97.6	1.441	0.903, 2.315	0.123	0.351	0.215, 0.573	<.001	1.528	0.483,4.836	0.471

			Exclusive breastfeeding			Full breastfeeding			Any breastfeeding		
Variables	**n**	**%**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**
Pacifier used											
≤4 weeks	311	44.4	1.299	1.098,1.537	.002	2.071	1.699, 2.525	<.001	36.791	9.019,150.08	<.001
>4weeks	70	10.0	1.242	0.947,1.628	0.117	2.465	1.837, 3.307	<.001	29.587	6.676,131.11	<.001
Never used pacifier	319	45.6	1.0			1.0			1.0		
Hospital practices											
Having epidural											
Yes	331	47.3	1.112	0.951, 1.304	0.1874	1.235	1.033, 1.475	.021	1.347	0.876, 2.070	0.174
No	369	52.7	1.0			1.0			1.0		
Skin to skin contact											
Yes	117	16.7	1.0			1.0			1.0		
No	583	83.3	1.414	1.130, 1.769	.002	1.637	1.264, 2.120	<.001	1.492	0.771, 2.888	0.235
Taught how to attach											
Yes	513	73.3	1.0			1.0			1.0		
No	112	16.0	0.891	0.691,1.163	0.414	0.879	0.686, 1.127	0.309	0.63	.33, 1.23	.087
Didn’t need	75	10.7	0.922	0.683,1.261	0.632	0.749	0.550, 1.021	.068	0.28	.09, 91	.035
Attended an antenatal class											
Yes	85.0	12.1	1.0			1.0			1.0		
No	615	87.9	1.053	0.825, 1.345	0.678	1.021	0.777, 1.340	0.882	1.563	0.721, 3.389	0.258
Time of the breastfeeding											
Less than one hour	225	32.1	1.0			1.0			1.0		
One hour or more	475	67.9	1.226	1.031,1.457	.021	1.506	1.233, 1.839	<.001	1.722	1.023, 2.900	.041

			Exclusive breastfeeding			Full breastfeeding			Any breastfeeding		
Variables	**n**	**%**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**	**CHR**	**95%CI**	***p* value**
Prelacteal received											
Yes	458	65.4		N/A		1.0			1.0		
No	242	34.5				0.685	0.565, 0.831	<.001	0.723	0468, 1.115	0.142
Formula use in hospital											
Yes	244	34.9		N/A		1.0			1.0		
No	456	65.1				0.286	0.237, 0.346	<.001	1.567	1.020, 2.409	.040
Demand feeding at one month											
Yes	486	72.3	1.0			1.0			1.0		
No	186	27.7	0.982	0.822, 1.173	0.876	1.014	0.831, 1.237	0.892	1.706	1.096, 2.654	.018
Demand feeding at three month											
Yes	414	62.5	1.0			1.0			1.0		
No	248	37.5	0.931	0.782, 1.092	0.394	1.569	1.306, 1.885	<.001	4.997	3.062, 8.156	<.001
Demand feeding at fourth month											
Yes	379	57.3	1.0			1.0			1.0		
No	283	42.7	0.0962	0.82, 1.130	0.703	1.663	1.387, 1.995	<.001	5.208	3.084, 8.796	<.001

CHR: Crude Hazard Ratio, CI: Confidence interval, NA: Not applicable

Level of maternal education

Of the sociodemographic variables, level of maternal education was found to be associated with the duration of full and any breastfeeding. Mothers with a lower education level (primary to secondary) were less likely to stop full breastfeeding (CHR: 0.666, 95% CI [0.513, 0.863] (Figure 6.2), and any breastfeeding (CHR: 0.439, CI [0.213, 0.904] before six months compared with mothers with university level education (Figure 6.3).

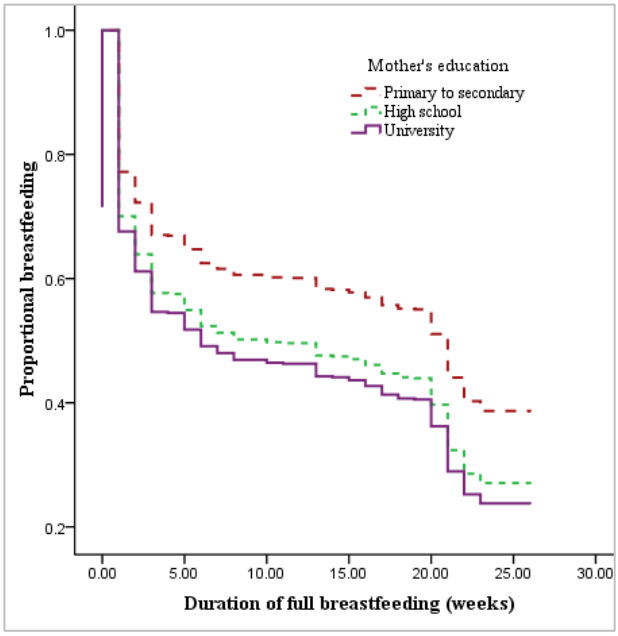

Figure 6.2: Association between maternal education and duration of full breastfeeding

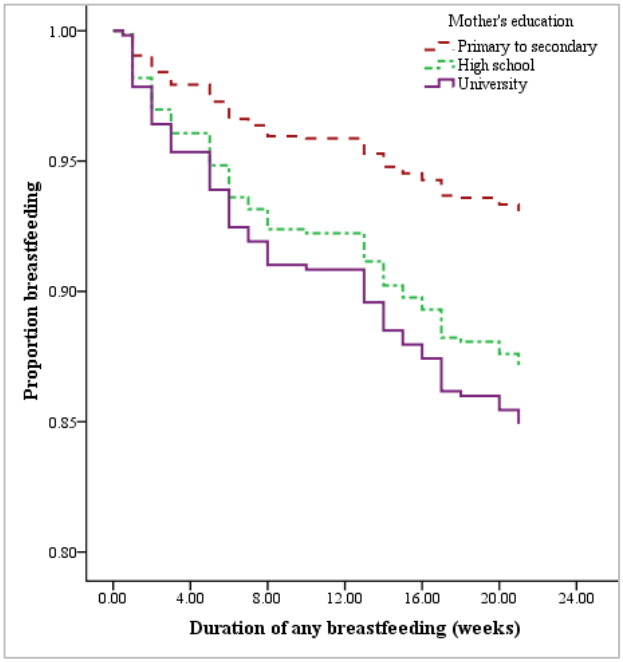

Figure 6.3: Association between maternal education and duration of any breastfeeding

Maternal employment status

There was no association between maternal employment status and duration of exclusive or full breastfeeding. However, mothers who were employed were more likely to discontinue any breastfeeding (Figure 6.4) (CHR: 1.778, 95% CI [1.100, 2.872]) compared with mothers who were unemployed.

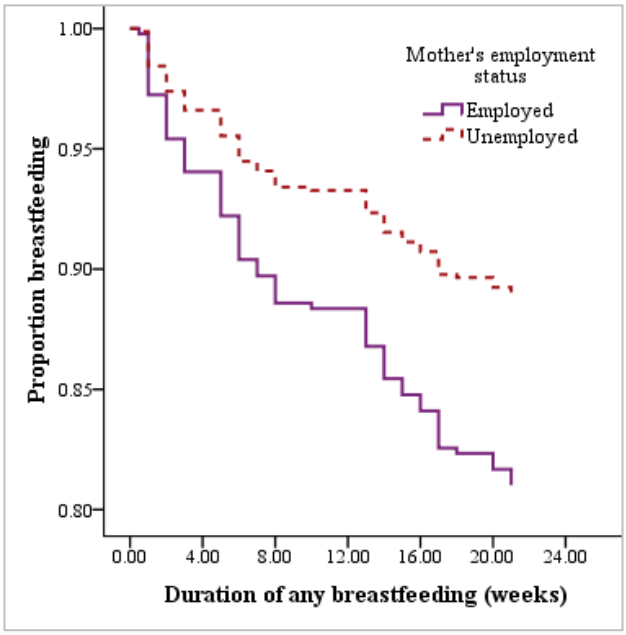

Figure 6.4: Association between maternal employment status and duration of any breastfeeding

6.3.4.2 Biomedical factors

Method of delivery

There was no association between method of delivery and duration of exclusive breastfeeding. However, mothers who had delivered by caesarean section were more likely to discontinue full breastfeeding (CHR: 1.429, 95% CI [1.167, 1.751]) (Figure 6.5) and any breastfeeding (CHR: 1.78, 95%, CI [1.270, 3.270]) (Figure 6.6) before six months postpartum than those who experienced vaginal delivery.

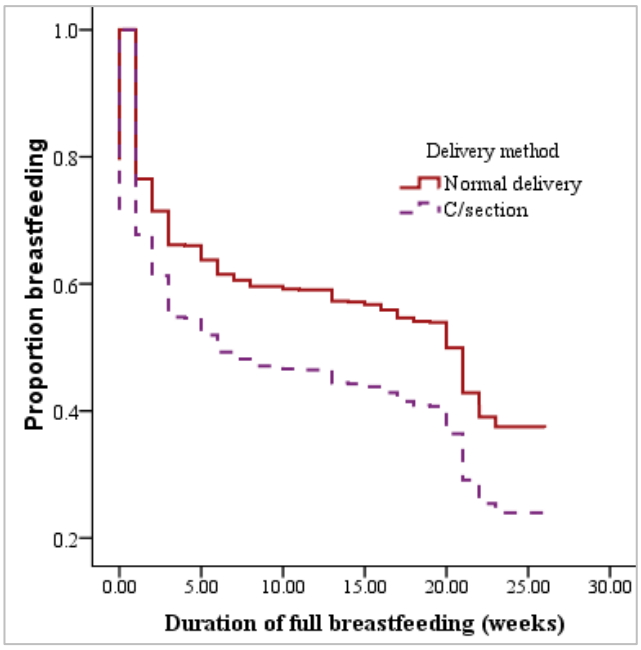

Figure 6.5: Association between method of delivery and duration of full breastfeeding

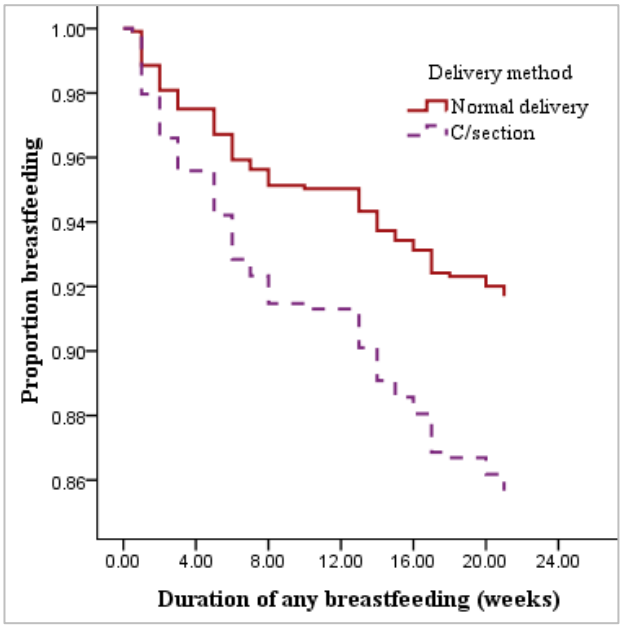

Figure 6.6: Association between method of delivery and duration of any breastfeeding

Parity

There was no association between parity and duration of exclusive breastfeeding. While, more multiparous mothers (31%) were still fully breastfeeding at six months compared to 25% of primiparous mothers, the risk of discontinuing full breastfeeding was not statistically significant (CHR: 1.186, 95% CI [0.991, 1.418]).

However, primiparous mothers were more likely to stop any breastfeeding before the baby was 26 weeks old compared with multiparous mothers (Figure 6.7) (CHR: 2.027, 95% CI [1.270, 3.273]).

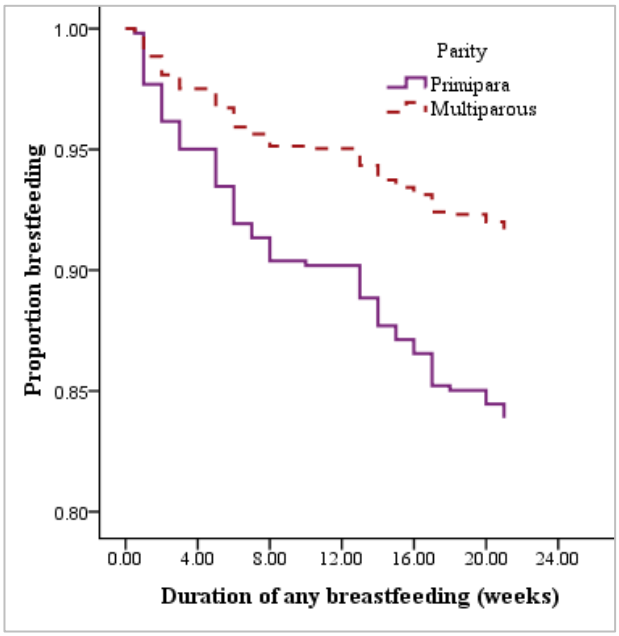

Figure 6.7: Association between parity and duration of any breastfeeding

Age of introducing a pacifier

The analysis found that the duration of exclusive, full and any breastfeeding were negatively associated with the introduction of a pacifier. Mothers who gave their infant a pacifier before four weeks postpartum were more likely to stop exclusive breastfeeding compared with mothers who never introduced a pacifier (CHR: 1.299, 95% CI [1.098, 1.537]) (Figure 6.8).

Mothers who used a pacifier for their infants (before four weeks (CHR: 2.071, 95% CI [1.699, 2.525]) or after four weeks (CHR: 2.465, 95% CI [1.837, 3.307)] postpartum were more significantly likely to stop full breastfeeding during the first six months than those mothers who did not give a pacifier to their babies (Figure 6.9).

Similarly, mothers who introduced a pacifier by four weeks (CHR: 36.791, 95% CI [9.019, 150.089]) or after four weeks postpartum (CHR: 29.587, 95% CI [6.676, 131.117]), were more likely to discontinue any breastfeeding compared with those who never introduced a pacifier to their infants (Figure 6.10). More than 98% of mothers who never introduced a pacifier to their infants, were still ‘any’ breastfeeding

at 26 weeks, compared with those who used a pacifier by four weeks postpartum (77%) and after four weeks following birth (82%).

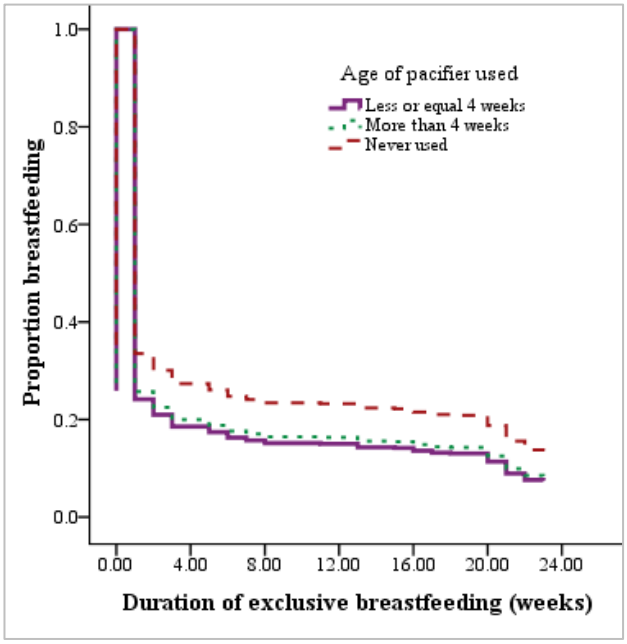

Figure 6.8: Association between age of pacifier used and duration of exclusive breastfeeding

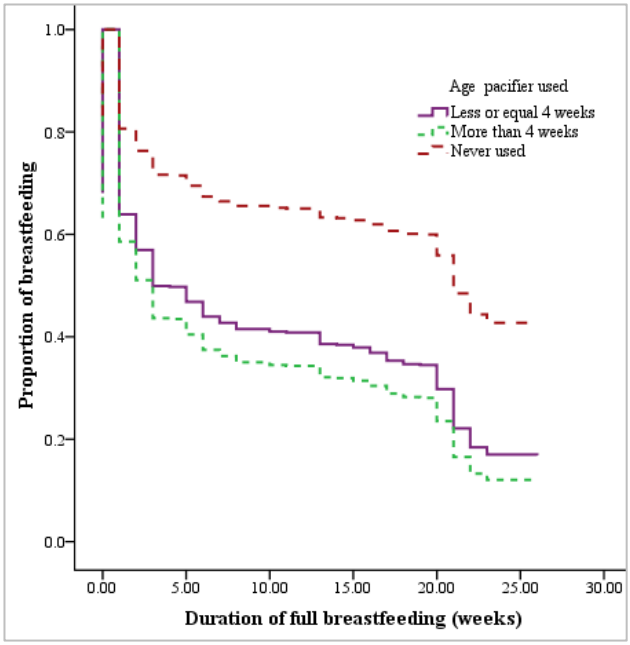

Figure 6.9: Association between age of pacifier used and duration of full breastfeeding

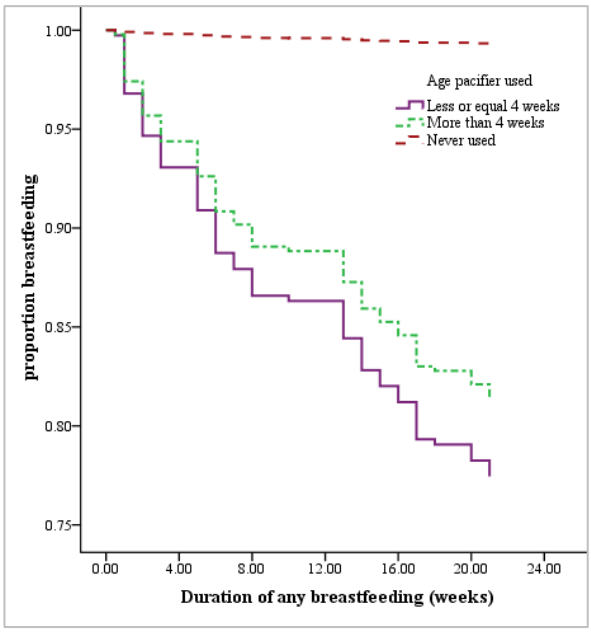

Figure 6.10: Association between age of pacifier used and duration of any breastfeeding

6.3.4.3 Factors related to hospital practices

Skin to skin contact

Mothers with did not experience early skin to skin contact were more likely to have a shorter exclusive (CHR: 1.414, 95% CI [1.130, 1.769]) (Figure 6.11) and full (CHR: 1.637, 95% CI [1.264, 2.120]) (Figure 6.12) breastfeeding duration compared with mothers who had early skin to skin contact in the delivery ward.

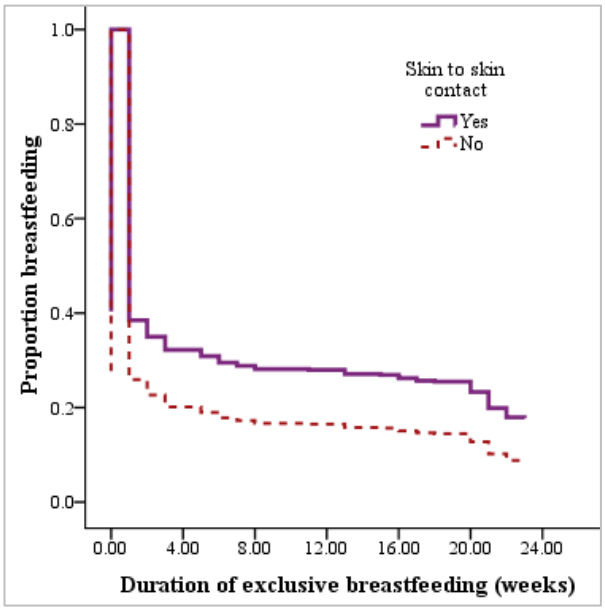

Figure 6.11: Association between skin to skin contact and duration of exclusive breastfeeding

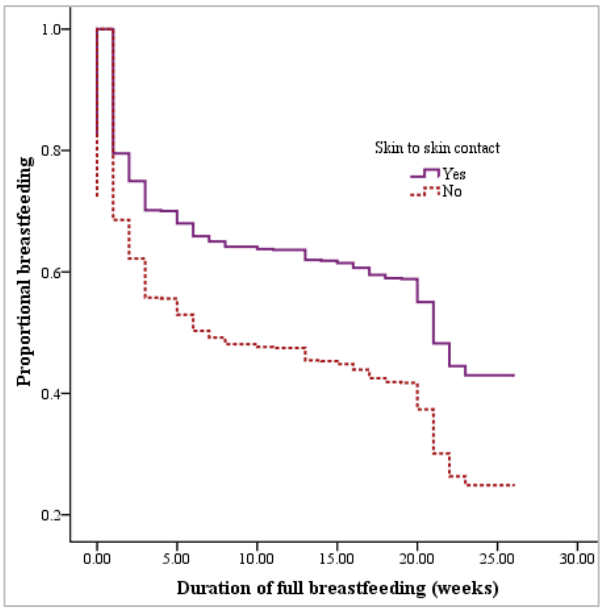

Figure 6.12: Association between skin to skin contact and duration of full breastfeeding

Time of the first breast feed

The time of first feeding was positively related to the duration of exclusive, full and any breastfeeding in the six months postpartum period. Those mothers who breastfed their newborn infants one hour or more after delivery, were more likely to stop exclusive breastfeeding (CHR: 1.226, 95% CI [1.031, 1.457]) (Figure 6.13), full breastfeeding (CHR: 1.506, 95% CI: [1.233, 1.839]) (Figure 6.14) and any breastfeeding (CHR:1.722, 95% CI [1.023, 2.900]) (Figure 6.15), within six months than mothers who first breastfed their babies less than one hour after delivery.

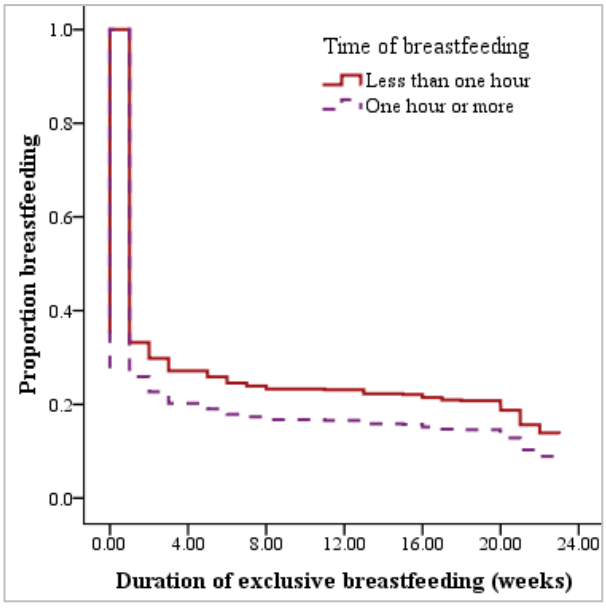

Figure 6.13: Association between time of first breastfed and duration of exclusive breastfeeding

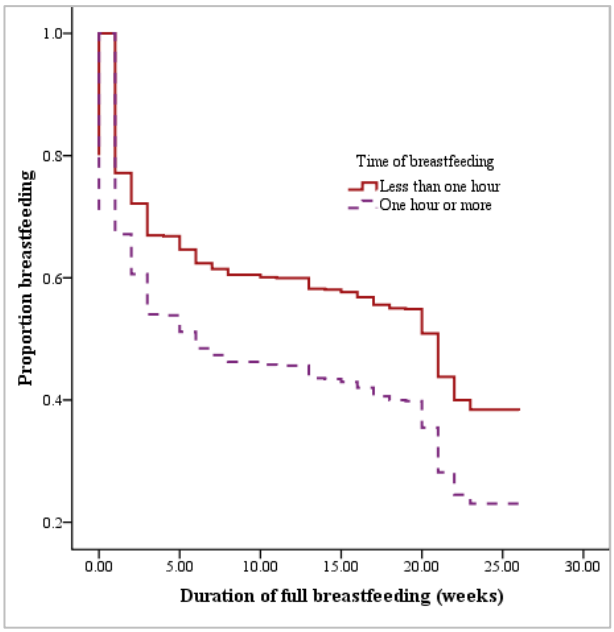

Figure 6.14: Association between time of the first breastfed and duration of full breastfeeding

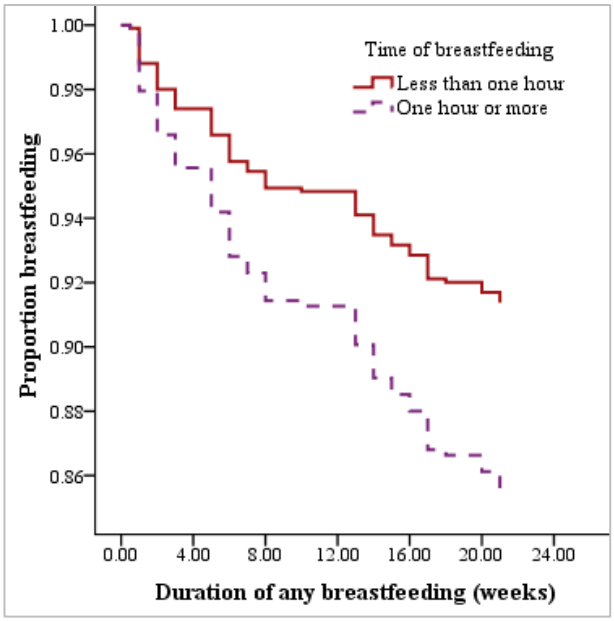

Figure 6.15: Association between time of the first breastfed and duration of any breastfeeding

Formula used in hospital.

Formula given in the maternity ward was negatively associated with the duration of full (Figure 6.16) and any breastfeeding (Figure 6.17) within 26 weeks postpartum. Women whose infants who had not received formula in hospital, were less likely to stop full breastfeeding (CHR: 0.286, 95% CI [0.237, 0.237, 0.346]) and any

breastfeeding (CHR: 0.638, 95% CI [0.415, 0.980]) during the first six months postpartum than women whose babies had received supplementary formula in-hospital.

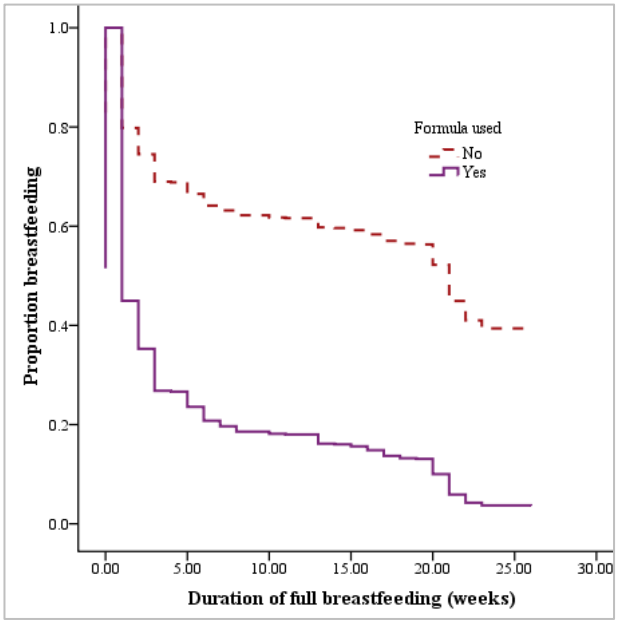

Figure 6.16: Association between introduction formula in hospital and duration of full breastfeeding

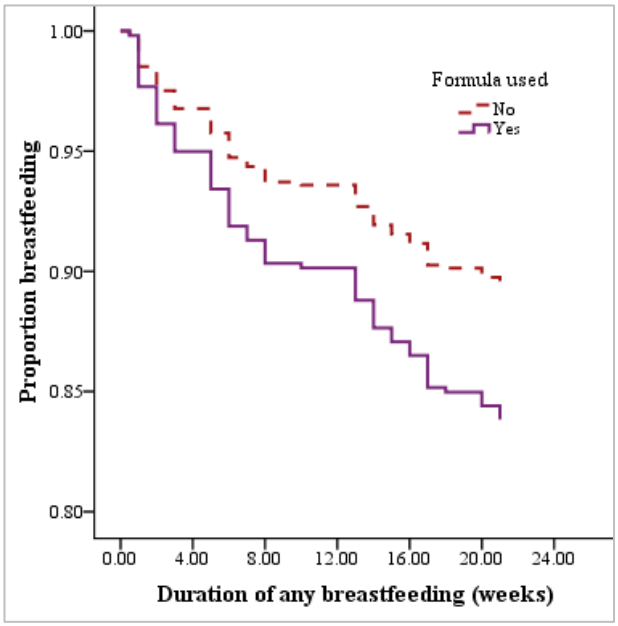

Figure 6.17: Association between introduction formula in hospital and duration of any breastfeeding

Demand feeding

There was no significant association between demand feeding and duration of exclusive breastfeeding. However, feeding on demand was strongly associated with longer duration of full and any breastfeeding.

Mothers were not breastfeeding their infants on demand at the third month postpartum (CHR: 1569, 95% CI [1.306, 1.885]) (Figure 6.18) and fourth month (CHR: 1.663, 95% CI [1.387, 1.995]) (Figure 6.19) were more likely to have fully breastfed for a shorter duration than mothers who breastfed their babies on demand in the third and fourth month postpartum.

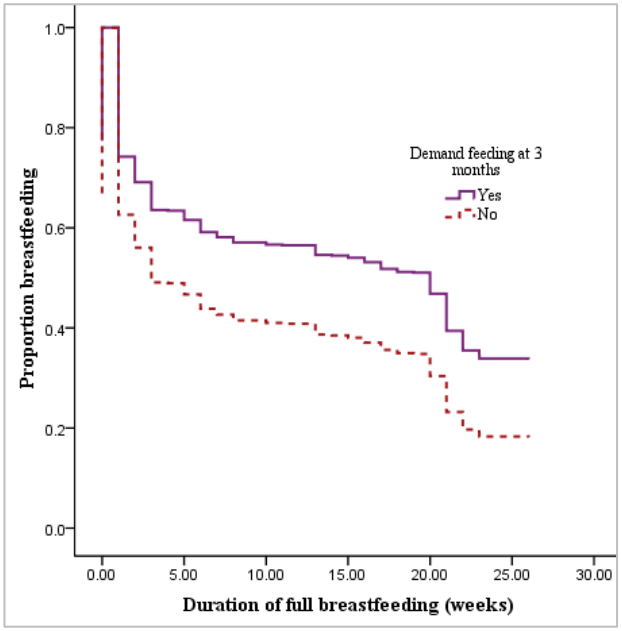

Figure 6.18: Association between demand feeding at three months and duration of full breastfeeding

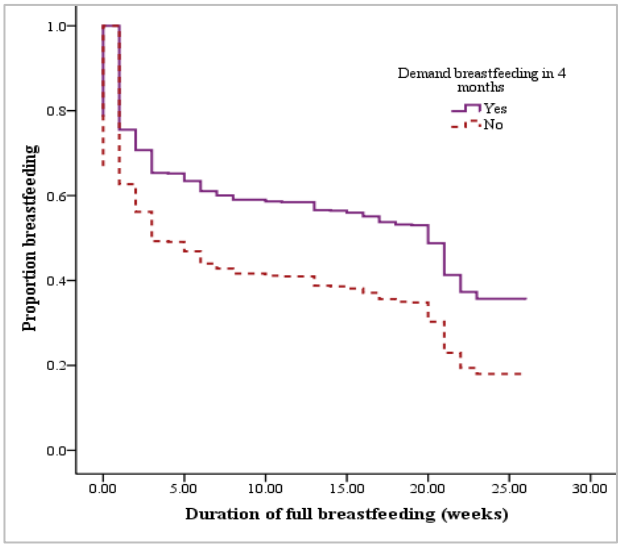

Figure 6.19: Association between demand feeding at four months and duration of full breastfeeding

Babies who did not breastfeed on demand at one month (CHR: 1.70, 95% CI: [1.09, 2.65]) (Figure 6.20), three months (CHR: 4.99, 95% CI [3.06, 8.15]) (Figure 6.21) and four months postpartum (CHR: 5.20, 95% CI [3.08, 8.79]) (Figure 6.22) were more likely to have a shorter duration of any breastfeeding than their counterparts who were breastfed on demand at these time points.

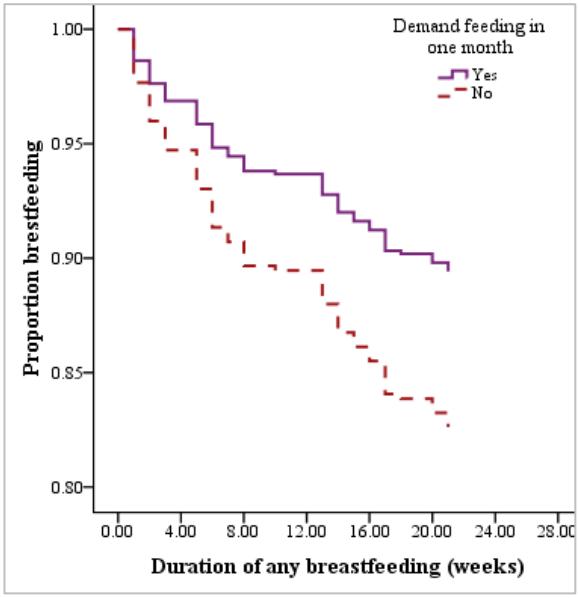

Figure 6.20: Association between demand feeding at one month and duration of any breastfeeding

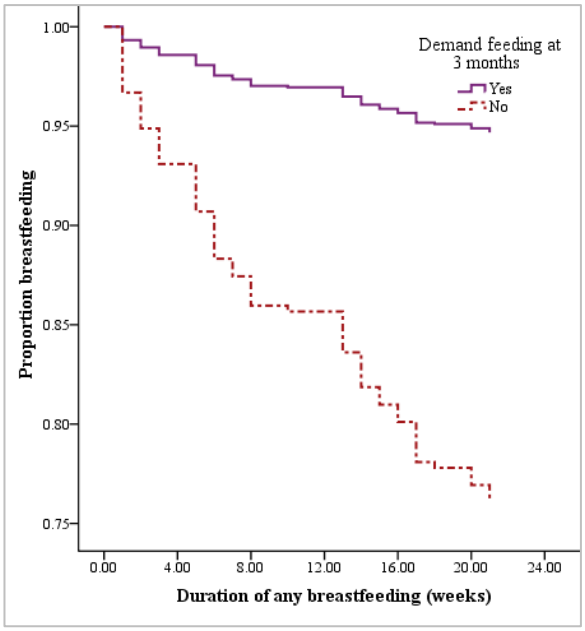

Figure 6.21: Association between demand feeding at three months and duration of any breastfeeding

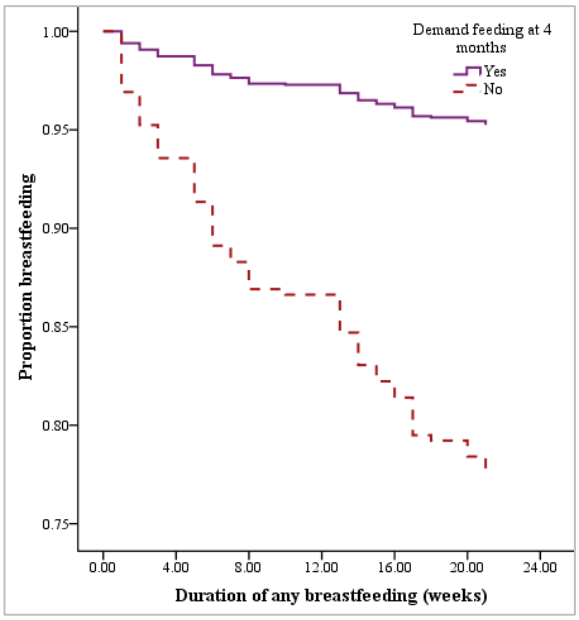

Figure 6.22: Association between demand feeding at four months and duration of any breastfeeding

6.3.5 Independent predictors of exclusive, full and any breastfeeding- Multivariable Cox proportional hazard regression analysis

Those variables independently associated with the duration of exclusive, full, and any breastfeeding up to six months are presented in Table 6.5.

6.3.5.1 Duration of exclusive breastfeeding- Multivariate Cox regression analysis

Only one variable was still significantly associated with exclusive breastfeeding duration after controlling for the effects of other variables and potential confounders (Table 6.5). Introduction of a pacifier within four weeks postpartum (AHR: 1.24, 95% CI [1,105, 1.47]) and after 4 weeks (AHR: 1.284, 95% CI [0.97, 1.69]) was independently associated with shorter duration of exclusive breastfeeding.

6.3.5.2 Duration of full breastfeeding

Mothers who introduced a pacifier within four weeks (AHR: 1.72, 95% CI [1.41, 2.11]) or after four weeks postpartum (AHR; 2.21, 95% CI [1.64, 2.99]) were more likely to discontinue full breastfeeding before six months postpartum compared to those mothers who did not give their baby a pacifier. Similarly, mothers who did not breastfeed their infants on demand at four months (AHR: 1.49, 95% CI: [1.24,

1.80]), were significantly more likely to cease fully breastfeeding their baby within the first six months postpartum compared with mothers who fed their babies on demand. Prelacteal feeding (AHR: 1.32, 955 CI [1.08, 1.62]) and the use of formula in hospital (AHR: 3.18, 95% CI [2.62, 3.87]) were also independently associated with the risk of discontinuing full breastfeeding in the first six months postpartum.

6.3.5.3 Duration of any breastfeeding

Mothers who introduced a pacifier by four weeks postpartum were significantly more likely to have stopped any breastfeeding duration in the first six months (AHR: 53.50, 95% CI [7.39, 386.95]) compared with those who never used a pacifier. While feeding on demand at three months postpartum (AHR: 2.90, 95% CI [1.65, 5.15]) was independently associated with longer “any breastfeeding” duration.

Table 6.5: Variables that independently associated with the risk of discontinuing exclusive, any and full breastfeeding before 6 months*

	Exclusive breastfeeding			Full breastfeeding			Any breastfeeding		
Variables	**AHR**	**95% CI**	***p* value**	**AHR**	**95% CI**	***p* value**	**AHR**	**95% CI**	***p* value**
Parity									
Primiparous	NS			NS			NS		
Multiparous									
Formula used									
Yes	NA			3.18	2.62, 3.87	<.001	NS		
No				1.0					
Prelacteal received									
Yes				1.32	1.08, 1.62	.007	NS		
No	NA			1.0					
Age of pacifier used									
≤ 4 weeks	1.24	1.05, 1.47	.011	1.72	1.41, 2.11	<.001	53.50	7.39,386.95	<.001
> 4 weeks	1.28	0.97, 1.68	.077	2.21	1.64, 2.99	<.001	38.84	5.05,298.62	<.001
Never used pacifier	1.0								
Demand of feeding at 3 month									
Yes	NS			NS			1.0		
No							2.90	1.64,5.15	<.001
Demand of feeding at 4 month									
Yes	NS			1.0			NS		
No				1.49	1.24, 1.80	<.001			

*Variables in full models included, mothers age, years of education, mother's employment status, delivery method, time of the breastfeeding, demand feeding in one month, teach how to attach, skin to skin contact, baby admitted to NICU, AHR: Adjusted Hazards Ratio, NS: Not Significant at 5%, NA: Not applicable

6.4 Discussion

The beneficial effects of breastfeeding are dose-related and greatest protection is provided with exclusive breastfeeding until six months and continued breastfeeding to the second year of life (WHO, 2011). Despite an initiation rate of breastfeeding of 98.6% in the present study, a minority of mothers practiced exclusive breastfeeding. Applying the strict WHO definition of exclusive breastfeeding (WHO, 2010), less than one third of infants in this study were breastfed exclusively at birth, declining to 1% at six months of age. This finding is significantly lower than EBF rates reported in other studies of Iranian women. For instance, Olang et al. (2010) reported rates of 56% at four months and 27.7% at six months, while Mortazavi reported a rate of 33% in the first month (Mortazavi et al., 2015).

Although the Eastern Mediterranean Regional Office of WHO has documented that 60% of mothers continue breastfeeding to one year in the Middle East, only 28% of infants aged less than six months are breastfed exclusively in the Middle East- North Africa (MENA) region (EMRO of WHO, 2012). This is lower than the average rate of 37% of children younger than six months in lower and middle income communities recently reported by Victoria (Victora et al., 2016) . In general, extremely low rates of exclusive breastfeeding have been reported for the Middle East region with very few infants being exclusively breastfed to six months as recommended. For instance, in a recent study conducted in the United Arab Emirates (UAE), only 1.9% of infants were breastfed exclusively at six months (Radwan, 2013) and another study reported that 1% of Jordanian women breastfed their infants exclusively until six months (Abuidhail et al., 2014). Similarly, in Kuwait, where 92.5% of mothers initiated breastfeeding, only 2% of infants were fully breastfeed by six months (Dashti et al., 2014).

This findings suggests that very few mothers in the Middle East region meet the international recommendations for exclusive breastfeeding, which is through to be primarily due to the common practice in this region of introducing prelacteal food to infants. For instance, in the current study two out of every three infants (65.4%) received prelacteal feeds, which is lower than the rate reported for Kuwait where 81.8% of infants received prelacteal foods (Dashti et al., 2010), but higher than that reported for the UAE where 27% of mothers offered their infants water and dates in hospital (Radwan, 2013).

In addition, providing water to infants is commonly, but inappropriately, advised in the Gulf countries to maintain water balance, particularly during hot weather (Radwan, 2013). Human milk, however, is species specific, and its composition, including water and minerals (e.g. sodium) is sufficient to support infants in a hot and humid climate (Almroth & Bidinger, 1990; Picciano, 2001), thus, hydration of infants is adequately maintained by exclusive breastfeeding even in the summer.

The prevalence of exclusive breastfeeding among mothers has been found to vary significantly across the provinces of Iran, from as low as 33% in the north-east (Mortazavi et al., 2015) to over 90% in the south-east (Roudbari et al., 2009) during the first month of age. Part of the variation in reported rates may be due to different methodology used in the studies. Accuracy and comparability of data for monitoring purposes depends on use of standardised definitions of breastfeeding (Binns et al., 2009), and indicators of infant feeding practices recommend by WHO (WHO, 2008b) for monitoring exclusive breastfeeding. However, data and information on exclusive breastfeeding since birth is rare in Iran. Studies carried out on exclusive breastfeeding have used a 'current status' indicator that evaluates the proportion of infants who have exclusively breastfed in the past 24 hours, and to date no study has investigated exclusive breastfeeding practice since birth. Hence it is highly likely in studies using this method that infants identified as being exclusively breastfed in previous studies had actually received prelacteal foods or infant formula in hospital, or formula following discharge but not necessarily during the 24 hours recall period.

There is evidence that the use of the 24 hour recall indicator recommended by WHO (WHO, 2008b) overrates the true prevalence of exclusive breastfeeding compared to recall since birth (Aarts et al., 2000; Binns, Lee, Sauer, & Hewitt, 2012; Engebretsen et al., 2007). For instance, a cross-sectional survey conducted in Tehran used the 24 hour recall method to determine the prevalence of exclusive breastfeeding and reported a high exclusive breastfeeding rate of 46.5% at six months (Noughabi et al., 2014). Another survey in the south of Iran used a retrospective study of maternal recall of 3 years and reported an unrealistically high exclusive breastfeeding rate of 92% at one month (Roudbari et al., 2009). Therefore, accurate and common definitions and methodology need to be developed for use in studies across the provinces of Iran to allow for direct comparison of results.

Despite the substantial recognised benefits of breastfeeding to both infants and mothers, in the present study, one out of eight mothers had weaned their baby from the breast by six months postpartum. Insufficient milk supply, baby refusing to suck and neonatal jaundice were reported as the main reasons for stopping breastfeeding. An earlier study found that 39% mothers in Tehran cited inadequate milk supply as the main reason for discontinuing breastfeeding (Marandi et al., 1993). In a more recent study, Olang et al. (2012) reported that of the 5.3% of Iranian mothers who had stopped breastfeeding by six months postpartum, inadequate milk supply was the reason given by 28% of women. Inadequate milk supply has been constantly documented as a significant contributor to premature cessation of breastfeeding in Middle-Eastern (Dashti et al., 2014; Khadivzadeh & Karimi, 2009; Radwan, 2013) and Western studies (Li, Fein, Chen, & Grummer-Strawn, 2008; Scott & Binns, 2002).

As the question regarding the reasons for stopping breastfeeding was open-ended, and all mothers who stopped breastfeeding nominated only one reason, it is difficult to determine why mothers stopped breastfeeding. A change in feeding method is frequently characterised by a sequence of events that precede the change. For instance, early breastfeeding behaviours practised in the maternity ward, including either the use of formula or a delay in breastfeeding, may negatively influence the establishment of breastfeeding and affect a mother's confidence (Brown, 2014), leading her to doubt the sufficiency of her breastmilk (Alikasşifoğglu et al., 2001; Gatti, 2008; Scott & Binns, 2002).

Furthermore, in the present study, insufficient milk supply was the reason nominated by the majority of mothers (96%) for changing feeding method from exclusively or fully breastfeeding to mixed feeding. Some evidence reveals that the majority of mothers start formula food in response to inadequate breastmilk before eventually stopping (Lewallen et al., 2006; Sacco, Caulfield, Gittelsohn, & Martínez, 2006). The change of fully breastfeeding to mixed feeding frequently leads to a cascade of events that includes the baby losing interest in breastmilk then refusing the breast and eventually weaning completely. Therefore, breastfeeding behaviours experienced in hospital and the change of feeding method in the postpartum period reduce nipple sucking, stimulation and breast emptying, which in turn affects milk production and supply.

While inadequate breastmilk is the most frequent reason given for cessation of lactating, it has been estimated that less than 5% of mothers are unable to fully lactate, due to anatomical and hormonal breast abnormalities (Butte, Garza, Smith, & Nichols, 1984). The capacity for producing milk in breastfeeding mothers is greater than the infant's appetite, and milk production in fully breastfeeding mothers is estimated to be 700- 800 millilitres in 24 hours (Daly & Hartmann, 1995). In addition, some evidence indicates that for more than 50% of mothers who perceived insufficiency of breastmilk, their babies were not underweight which would be a true indicator of insufficient milk supply (Hillervik-Lindquist, Hofvander, & Sjqlin, 1991; Verronen, 1982).

Although lactation-related reasons for stopping breastfeeding were frequently given by mothers who ceased breastfeeding in this study, reasons related to the baby's illness were also reported. In the present study, 13% of newborns with physiological jaundice who stayed with their mothers at home and did not need aggressive treatment were deprived of the benefits of breastfeeding. However, evidence indicates that neonatal hyperbilirubinemia is a physiological process in the neonatal period and that bilirubin levels in a full term newborn baby may reduce with adequate nursing and caloric intake, and increased frequency of breastfeeding and avoidance of formula (Moritz, Manole, Bogen, & Ayus, 2005).

The reasons given for stopping breastfeeding suggest that mother's perception of inadequate milk supply could be attributed to a lack of knowledge about the process of lactation rather than to actual inadequate production of breastmilk. Therefore, knowledgeable and supportive staff are needed to provide appropriate and adequate guidance to mothers and encourage the continuation of breastfeeding. Iranian health authorities provide video tapes and pamphlets in postpartum wards to improve breastfeeding practice, however, new mothers may be too tired after normal delivery or caesarean section to concentrate on this information, and thus information alone may not overcome breastfeeding obstacles experienced in the early postpartum period. In addition, there is a gap between hospital and the first visit at four weeks in Maternal and Child Health clinics, where mothers receive routine postpartum care. Lactation consultants, and/or community midwives therefore, should be available after hospital discharge to address challenges and discuss issues including interpretation of

feeding cues, indicators for assessing if newborn babies are receiving enough milk, such as weight gain and the number of wet nappies changed, and the importance of frequency of breastfeeding in prevention and treatment of physiological neonatal jaundice. Such an intervention may reduce the rate of premature weaning and be a significant strategy to improve exclusive breastfeeding rates in Iran.

The continuation of breastfeeding with appropriate introduction of complementary foods until two years of age or beyond is recommended by WHO and UNICEF (WHO & UNICEF., 2003). In the current study, 87% of mothers were still breastfeeding with 37% fully breastfeeding by 26 weeks. The median duration of full breastfeeding was 13.1 weeks. There are no available data on breastfeeding practices in Shiraz to compare with the present study, but the duration of breastfeeding amongst mothers has been reported to be different across the provinces of Iran. For instance, in the north-east of Iran, by six months 98% of infants were still predominantly breastfed (Mortazavi et al., 2015), and in Tehran the rate of mixed breastfeeding was reported to be 23.4% at six months, with 7.4% of infants still breastfed at 22 months (Noughabi et al., 2014). A recent survey from the north of Iran reported 66% and 40% exclusive breastfeeding rates at six months among Farsi and Torkaman mothers respectively (Veghari, Mansourian, & Abdollahi, 2011). In the north-west, 98% (Koosha et al., 2008) were reported to be breastfeeding at 12 months, while a national study reported that 90% of mothers were still breastfeeding at 12 months (Olang et al., 2012). These reports suggest that variations in breastfeeding duration may be partly related to socio-cultural context, as there are a number of ethnically diverse groups in Iran with specific history, culture and customs.

The duration of full breastfeeding reported in the present study is notably higher than that reported for Kuwait where only 2% of infants were fully breastfed at six months (Dashti et al., 2014) or in the UAE, where only 18.5% of infants were predominantly breastfed at four months, decreasing to 7.1% at six months (Radwan, 2013). The differences in duration of full breastfeeding between Iran and other Middle-Eastern countries may be attributable to cultural differences and to concerted actions taken by the Iranian government during the last two decades to improve breastfeeding rates. In 1991 Iran was the first Middle-Eastern country to adopt the WHO International Code of Marketing of Breast Milk Substitutes, the National Committee of Breastfeeding

Promotion was established in 1999, and in 2008, 80% of births occurred in accredited Baby Friendly Hospitals (Olang et al., 2009; Zareai et al., 2007).

This study provides further evidence of the importance of the "Ten steps to successful breastfeeding" (WHO, 1998) as each of the four risk factors associated with the premature discontinuation of one or more of any, full and exclusive breastfeeding were related to non-adherence to one of these steps:

- **Step 6:** Give newborn infants no food or drink other than breastmilk, unless medically indicated.
- **Step 8:** Encourage breastfeeding on demand
- **Step 9:** Given no artificial teats or pacifiers (also called dummies or soother) to breastfeeding infants.

Pacifier use was found to be strongest predictor of a shorter duration of exclusive, full and any breastfeeding. This finding is consistent with the results of a meta-analysis found that the use of a pacifier shortened the duration of exclusive breastfeeding before six months and duration of any breastfeeding before 24 months (Karabulut, Yalçin, Özdemir-Geyik, & Karaagaoglu, 2009). There is a paucity of studies to identify the incidence and timing of pacifier exposure in Iran, and to evaluate the effects of the use of a pacifier on breastfeeding duration among nursing mothers in Iran. However, Olang et al.(2012), in a retrospective study, reported a significant association between offering a pacifier and early weaning among nursing mothers in Iran, and another study in north-west of Iran reported pacifier use as a risk factor in short duration of exclusive breastfeeding (Koosha et al., 2008). The only other study reported for a Middle-Eastern country by Dashti et al. (2014) in Kuwait, found a negative association between pacifier use before four weeks of age and duration of breastfeeding.

The timing of introducing a pacifier is crucial in mediating the outcomes of breastfeeding. Evidence indicates the use of a pacifier in the first six weeks reduces the duration of full breastfeeding (Howard, Howard, Lanphear, Eberly, & Lawrence, 1999), and reduces breastfeeding at six months (Binns & Scott, 2002). Observational evidence also indicates that early introduction to the pacifier is related to discontinuation of exclusive breastfeeding at three to six months (Mascarenhas, Albernaz, Silva, & Silveira, 2006; Scott et al., 2006). However, the introduction of a pacifier after an age at which breastfeeding is likely to be successfully established has

not been associated with shortened breastfeeding duration in a number of studies (Dashti et al., 2014; Scott et al., 2006).

The purpose of using a pacifier, which is effectively an artificial nipple, is to calm and soothe infants, and its effect is usually assessed by whether the infant stops crying when distressed (Binns & Scott, 2002).

While the use of a pacifier is common practice in Western countries, including Australia, where eight out of ten mothers give their baby a pacifier (Mauch et al., 2012), they are less frequently used in other countries. For instance, in Japan less than one in eight mothers reportedly use a pacifier to sooth their infant (Nelson et al., 2005), while in present study just over half of infants (54.4%) were given a pacifier. However, this practice is discouraged by the WHO and UNICEF, and avoidance of pacifier use is recommended as step nine of the 'Ten steps to successful breastfeeding' (WHO, 1998).

Pacifier use encourages non-nutritive sucking and is associated with less frequent sucking at the breast, which reduces the production of milk (Jaafar et al., 2011). Furthermore, effective breast sucking requires a deep sucking action, while sucking on a pacifier is superficial, with a short, fast suck, and minimal effort (Neifert, Lawrence, & Seacat, 1995). Thus, the different techniques in pacifier sucking and breast sucking leads to nipple confusion, and may be a cause of breastfeeding failure (Victora et al., 1997). In addition, a pacifier is a potential source of contamination of the infant's mouth and may be associated with dental malocclusion (Nelson-Filho et al., 2015; Vogel et al., 2001). Therefore, any deleterious effects of pacifiers on the duration of breastfeeding may have important public health implications, particularly in less developed communities.

In the current study, feeding on demand was a strong predictor of the duration of full and any breastfeeding. A cohort study conducted in Kuwait reported a significant association between demand feeding in hospital and duration of full breastfeeding (Dashti et al., 2010). Another study reported a positive association between breastfeeding on demand and the duration of exclusive breastfeeding among Qatari women (Al-Kohji et al., 2012). Milk production is controlled by infant demand and milking frequency, and there is evidence that feeding on schedule may contribute to insufficient milk production (Daly & Hartmann, 1995). WHO encourages mothers

to feed on demand, which is step eight of the 'Ten steps to successful breastfeeding' (WHO, 1998). In humans, prolactin and oxytocin are the main hormones involved in milk production and supply and are secreted in the lactating breast (Yokoyama, Ueda, Irahara, & Aono, 1994). Prolactin is crucial for the establishment and maintenance of lactation and is physiologically stimulated by suckling, and oxytocin is a milk ejection hormone which is released during sucking (Glasier, McNeilly, & Howie, 1984). Therefore, sucking naturally stimulate oxytocin and increases the level of prolactin and oxytocin release, and in the absence of this process, failure and cessation of breastfeeding may occur.

Finally, Step 6 of the 'Ten steps to successful breastfeeding' recommends "Give newborn infants no food or drink other than breastmilk, unless medically indicated". (WHO, 1998). In this study even though three quarters of infants were receiving only breastmilk when discharged, those mothers whose infants had received either prelacteal feeds or formula whilst in-hospital were at greater risk of prematurely discontinuing full breastfeeding. Prelacteal feeds and in-hospital formula supplementation lead to nipple confusion (Dowling & Thanattherakul, 2001) reduced milk supply (Chantry et al., 2014). It can also impact negatively on maternal confidence (Brown, 2014) and cause women to doubt the adequacy of their milk supply, which was the main reason given by women in this study for changing from full breastfeeding to mixed feeding in the first month postpartum.

6.5 Conclusion

Breastfeeding is a health practice that is influenced by multiple variables, including biomedical factors, hospital practices and social circumstances. Despite international recommendations and Iranian government activities, the majority of Shirazian mothers do not exclusively breastfeed their infant to six months. The perception of inadequate milk production was the most commonly reported reason for stopping breastfeeding and pacifier use was the strongest negative predictor of duration of breastfeeding in this community. The risk factors associated with the premature discontinuation of breastfeeding identified in this study are all related to the "Ten steps to successful breastfeeding' and the Baby Friendly Hospital Initiative in hospitals and the community appears to be an important strategy for supporting the continuation of full breastfeeding, in particular.

Chapter 7

Chapter 7

Conclusion and Recommendations

In this chapter the main findings of the study are summarised and the limitations of the research discussed. Finally, recommendations for improving breastfeeding practices and is presented.

7.1 Main findings

The present study found that although almost all mothers initiated breastfeeding in hospital, less than one third of infants were breastfed exclusively from birth. The majority of infants were given prelacteal feeds, and seven out of 10 women delivered by caesarean section, which whether emergency or elective was associated with delayed initiation of breastfeeding and increased risk of formula use in hospital.

Approximately one in five mothers suffered at least one episode of mastitis in the first six months postpartum, and more than half of the first episodes occurred during the first four weeks postpartum. This is similar to incidences reported for Western mothers. The risk factors associated with mastitis are all related to poor breastfeeding technique and potentially modifiable.

In this study, the median duration of full breastfeeding was found to be 13 weeks, and just under nine out of 10 infants at 26 weeks of age were still breastfed, and three out of 10 infants were fully breastfed but only one in 100 were exclusively breastfed at 26 weeks of age. Insufficient milk was the most common reason for changing from breastmilk to a mixed feeding to formula feeding. Again the risk factors associated with the early cessation of breastfeeding were all potentially modifiable.

7.2 Strengths and limitations of the study

This study is the first cohort study to focus on mastitis and its risk factors and to longitudinally investigate breastfeeding practices in Iran. The strengths of the study is its large sample size, high response and low attrition rates. Mothers were recruited from the major public and private maternity hospitals across Shiraz which suggests that the findings are generalisable to the population from which the sample was drawn. Mothers were followed-up prospectively at frequent time points from birth to 26 weeks with events being recalled close to the time at which they occurred. However, the self-reporting of data, may have led to a social desirability bias, as participants may choose a response that is socially accepted or a behaviour that is common in society (Fisher & Katz, 2008). Although in this study it was unlikely to have occurred as the responses given generally followed culturally acceptable practices. Further, the study followed up mothers who lived in Shiraz and the results of this study are not necessarily generalizable to all Iranian mothers.

7.3 Recommendations for future studies

There are different tribes with various cultures in Iran, thus breastfeeding practices can differ from one province to another. Future prospective cohort studies of exclusive breastfeeding since birth in various provinces of Iran are required, as exclusive breastfeeding is a challenging issue across Iran. Furthermore, available information on mastitis is scarce in Iran, thus further studies to investigate the rate of mastitis, its risk factors and management practices among Iranian mothers are needed to confirm the findings of this study. In addition, a qualitative study exploring the reasons for offering prelacteal foods in hospital is required. Finally, longitudinal studies with 12 months follow-up in urban and rural areas are needed to measure age of introduction of solid foods and compare duration of breastfeeding in rural and urban areas.

7.4 Practice recommendations

The proportion of mothers who nursed their infants has increased markedly since revolution, however the rate of exclusive breastfeeding has remained low, because of using formula and traditional foods in hospital. The results of this study

indicate that despite nine out of 10 Iranian hospitals being certified as Baby Friendly Hospital and almost all Iranian mothers deliver in maternity hospitals, the 10 Steps to Successful Breastfeeding are not routinely practiced and hospital barriers to the successful practice of exclusive breastfeeding still exist. A variety of interventions are required to improve the rates and duration of exclusive breastfeeding:

Antenatal classes: Encouraging women to attend antenatal classes, along with a family member such as their mothers or mother-in-law, would provide an opportunity to educate the mother and elders about importance of early initiation of breastfeeding and the avoidance of traditional foods after birth. In addition, antenatal education should be offered to mothers and their families to provide preparation for labour and birth, this education may decrease maternal anxiety and encourage normal birth, thereby reducing the number of elective caesarean sections.

Emotional support during labour: Labour and child birth are painful physiological process that are accompanied with emotions of fear and anxiety. In Iran a women's husband or family relatives are not permitted in the delivery room to support them during labour and child birth, as is common practice in Australia and other Western countries. There is evidence that emotional support during labour can decrease the rates of caesarean section, as this can reduce a mother's level of anxiety and increase her confidence in her ability to deliver naturally. Not only would such a practice in Iran decrease the rates caesarean section but it would likely improve the rates of exclusive breastfeeding in hospital.

Professional supports in the postpartum ward: New mothers need information, education and support and then close observation of techniques of breastfeeding that begin with early skin to skin contact, early initiation of breastfeeding, and appropriate positioning and attachment. In Iran the main source of information on breastfeeding is provided by videotapes. Postpartum care however, needs professional staff who are only responsible to support nursing mothers, as new mothers prefer to communicate directly about breastfeeding. Furthermore, supportive care immediately after caesarean section by professional midwives, with mothers and infants remaining together in the recovery room and then being transferred together to the postpartum ward be a strategy to decrease the rates formula use and delayed initiation of breastfeeding among mothers who have undergone a caesarean section.

Supportive care after discharge: The introduction of short maternity stays (24-48 hours) has influenced the care, support and teaching of new mothers in Iran. While significant physiological functions including an increase in the production milk, engorged breasts and breastfeeding difficulties occur in the early days postpartum, the first follow-up visit mothers and their infants receive following discharge is one month after delivery in MCH clinics. Therefore, a home visit by a community midwife or referral to lactation consultant is required in the early postpartum period, with an emphasis on breastfeeding. Consultants should advise mothers to take enough fluids and nutrition to support of milk during postpartum period.

Anticipatory guidance: Mothers should receive anticipatory guidance in hospital and the early postpartum period on how to recognise the early symptoms of mastitis; the safe use breast pumps; the importance of demand feeding and the risks associated with introducing a pacifier and delaying or missing feeds. They should be advised how to conservatively manage the symptoms associated with mastitis, resorting only to the use of appropriate antibiotics if their symptoms persist beyond 24 hours.

Development of local practice guidelines related to the management of mastitis: The care and advice provided to women with mastitis by medical practitioners (obstetricians, general surgeons, and GPs), midwives and community-based maternal child health nurses should be based on the latest research evidence. Local evidence-based practice guidelines should be developed or the Academy of Breastfeeding Medicine Mastitis Clinical Protocol should be translated into Farsi to local use. To ensure the continuing best practice, local practice guidelines should be reviewed regularly, for example every 5 years, and disseminated widely through the professional journals of the relevant health professional groups. In particular, the routine prescription of antibiotics should be avoided and antibiotics should be prescribed if symptoms are sever and persist beyond 24 hours. This strategy will also reduce the over-prescription of antibiotics and antimicrobial resistance that is a growing issue in Iran.

Monitoring of adherence to the Baby Friendly Hospitals Initiative practices: The Baby Friendly Hospital Initiative is based on the “Ten steps to successful breastfeeding”, and although all but one of the hospital in this study were Baby Friendly Hospital Initiative accredited, several of these steps were poorly

adhered to. The government should closely monitor the practice of the "Ten steps of successful breastfeeding" in maternity hospitals in order to strengthen the Baby Friendly Hospital Initiative and other interventions needed to develop, promote, and support breastfeeding practices in Iran.

Education and training for health professionals: In Iran, new mothers are supported by midwives in the postpartum wards, who have the primary role of supporting women to initiate breastfeeding. Although midwives are educated through a comprehensive educational curriculum of four years at university and trained on breastfeeding in every practicum placement, they still require a regular professional development training program to address evidence-based lactation and baby breastfeeding information. The Iranian government provides approximately 6 hours of training workshops related to breastfeeding for postgraduate professionals including GPs, Paediatricians, Obstetricians, and General Surgeons before their graduation. Paediatricians and Obstetricians play significant role in promoting breastfeeding, however the majority of them rely on personal experience, hence training postgraduate professionals is essential to update and increase their knowledge about breastfeeding.

Employment of lactation consultants/ specialist midwives: It is recommended, that all maternity hospitals have on roster at all times at least one lactation consultant/ breastfeeding-specialist midwife who are experiencing ongoing difficulties with establishing breastfeeding. In particular, women who deliver by caesarean section should receive additional support and encouragement to breastfeed from these specialist practitioners. Ideally, specialist practitioners should be available in Maternal and Child Health clinic to assist mothers who have persistent breastfeeding-related problems, including mastitis.

This study has provided information on the prevalence of breastfeeding practices and problems in South Western Iran. It will be beneficial in designing promotion programs for parents and education programs for health staff. Improvement in infant feeding practices and breastfeeding rates would lead to a substantial improvement in infant health outcomes in Iran.

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Appendix

A

Appendix A

Breastfeeding Studies in Iran

See Over

Table A-1: Breastfeeding Studies in Iran

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Schoenborn, 1976	**Sample**: 95 women	**Design:** Cross sectional	Initiation rate	100.0	Small sample size
Conducted: NP	Child age: NP	**Data collection:** Face to face interview	EBF	67%	41% of mothers practice BF as a contraceptive
Aim: To describe the BF practice and protection of pregnancy	**Maternal age:** less than 40 years	**Sample selection**: Random, married mothers with one child	BF duration (mon)	% stopped BF	BF definition not provided
	Location: North-western section of Tehran		3	28.0	
	Setting: Health centres		4-6	18.0	
			7-12	26.0	
			12-24	28.0	
			Mean BF	105 mon	
			Mean age introduction of supplementary	4 mon	

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Malekafzali, 1988 Conducted: NP **Aim:** To study mother's behaviours in relation to BF	**Sample:** 10240 Urban, 10794 Rural Child age range: 12-23 months **Location:** All provinces of Iran **Setting:** Health centres in Urban & Rural 3 Urban groups: HP: High prevalence of BF MP: Moderate prevalence of BF LP: Low prevalence of BF 3 Rural groups Group Group two Group three	**Design:** Cross sectional **Data collection:** Face to face interview **Sample selection:** Selected by cluster sampling method based on the population of each district	BF Duration <4 Mon HP MP GI GII GIII 4-7 Mon HP MP LP GI GII GIII	% Stopped BF 17.0 22.0 11.0 17.0 22.0 10.0 12.0 14.0 6.0 8.0 12.0	The survey only evaluated BF Duration BF definition not provided Retrospective studyBetween 51% -68% mothers breastfed their infants for at least one year BF rate among illiterate group and literate was 58% and 51%

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Marandi, 1993 Conducted: Jan – Feb 1990 **Aim:** To investigate why mothers in Tehran wean their children early	**Sample:** 900 mothers **Child age:** 24-30 month Maternal age: <20- >35 Location: Tehran **Setting:** Public and Private hospitals	**Design**: Cross sectional **Data collection:** Face to face interview **Sample selection:** Systematic randomized sampling method	Initiation rate	96.9%	BF definition not provided NVD: 81% C/section:17% Reasons for starting bottle-feed: milk insufficiency:74% Infants cryed:67% 39% of mothers stopped breastfeeding
			EBF (at birth)	38%	
			Formula used in hospital	68%	
			Any BF (at birth)	62%	
			BF duration at 2 years	27%	
			EFF (at birth)	3.1%	
			Median BF duration	16 month	
			Mean BF duration	14 month	

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Shiva, 2003 Conducted: NP **Aim:** To study feeding practices in infants < 6 months	**Sample:** 451 mothers and their infants Child age: 6-18 month **Location:** North of Tehran **Setting:** 2 Health clinics of hospitals	**Design:** Cross sectional **Data collection:** Face to face interview **Sample selection:** 3 groups: Group A: FBF Group B: FF Group C:Combination BF and FF	Initiation rate	100% in the first 4 hours	EBF definition is consist with WHO (4-6 mo) C/section and hospitalization baby were significant factors affecting duration BF Insufficient BM was most reason for stopping BF
			FBF At 6 months	82%	
			Combined BF and FF at 6 months	6%	
			EBF	NP	
			Stopped BF in GB		
			Birth -4weeks	59.5%	
			4-12 weeks	21%	
			3-6 months	19.55	

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Hajian-Tilaki, 2005 Conducted: 1998 **Aim:** To determine the pattern of BF	**Sample:** 600 mothers and their infants **Child age:** 12-24 months **Maternal age:** <20- >40 years **Location:** North of Iran (Rural and Urban areas of Babol) **Setting:** Health centres	**Design:** Cross sectional **Data collection:** Face to face interviews **Sample selection:** Randomized sampling technique	Initiation rate	NP	BF definition not provided Duration BF in educated mothers was higher than illiterate mothers
			BF duration (months)		
			Urban		
			1	97.3	
			3	94.3	
			6	92.0	
			12	86.3	
			15	63.3	
			18	37.3	
			24	2.0	
			Rural		
			1	97.7	
			3	95.0	
			6	92.3	
			12	85.3	
			15	70.6	
			18	40.1	
			24	5.7	

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Tabatabaei, 2005	**Sample:** 2,007 children	**Design:** Cross sectional	Initiation rate	99.0	BF definition not provided
Conducted: 1998-2002	Child age: 2-6 year	**Data collection:** Data was from health centres records			Recall bias
Aim: To estimate BF continuation and its factors	**Maternal age:** <18- >35 years	**Sample selection:** Randomized sampling method	BF prevalence		Information is from file record
	Location: South East of Iran (urban of Zahedan)		6	91.6	BF continuation rate was higher among mothers over 35 years old, and was higher among infants who started supplementary foods after 6 months.
	Setting: Health care centres		12	81.7	
			18	54.5	
			24	2.0	
			Mean BF duration		
			1996	17.9 mo	
			1997	18.6 mo	
			1998	18.0 mo	
			1999	18.2 mo	
			2000	17.5 mo	

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Koosha, 2008 Conducted: 2004-2005 **Aim:** To investigate BF patterns and factors associated with EBF	**Sample:** 650 infants **Child age:** less than one year (classified into 13 age groups, age from birth to five days postpartum was categorized as 0 month) **Maternal age:** Mean 26.9 years **Location:** North west of Iran (Zanjan) **Setting:** Health care centres	**Design:** Cross sectional **Data collection:** face to face interview **Sample selection**: NP	**EBF** rate (5mon) Median duration EBF(mon) Initiation rate BF age (month) 0 1 2 3 4 5 6 7 8 9 10 11 12 EBF age (month) 0 1 2 3 4 5 6	50% 2 100.0 100.0 98.0 96.0 100.0 98.0 100.0 98.0 98.0 96.0 96.0 94.0 96.0 100.0 82.0 44.0 42.0 44.0 44.0 44.0 2.0	**EBF,PBF** definition are consist with WHO **Prelacteal food** considered offer liquids such as water, dextrose water and butter during first few days of life The number of daily feeding was associated with EBF Pacifier use and birth weight was related with duration of BF Measure of EBF was not since of birth During fifth days water or dextrose water introduced (18%)

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Roudbari, 2009 Conducted:2004-2005 **Aim:** To survey the patterns and duration BF and associated its factors	**Sample:** 450 mothers with their infants **Child age:** Less than 3 years **Maternal age:** <18- > 36 years Location: Zahedan **Setting:** Five Health centres	**Design:** Cross sectional **Data collection:** Face to face interview **Sample selection:** Randomized sample method	Initiation rate EBF At birth At one month Prevalence of BF Age 3 month 6 month 12 month 24 month Median BF duration	NP 98.0 92.0 85.0 69.0 56.0 8.0 15 month	BF definition not provided Measure EBF was not since birth Possibility of recall bias as maximum recall period was 3 Years Duration BF was longer in older mothers, BF at night increased duration BF
Olang, 2009 Conducted: 2005-2006 **Aim:** Investigating prevalence of duration and promotion of BF status	**Sample:** 63,071 infants **Child age:** less than 24 months Maternal age: NA **Location:** All provinces of in Iran (Urban and Rural) **Setting:** Information was obtained from health centres (Integrated Monitoring Evaluation System Survey) that reported to Health Minster annually.	**Design:** Cross sectional **Data collection:** Face to face interview **Sample selection**: 3 types of sampling : 1- Random cluster sampling 2- Convenience sampling 3- Random systematic sampling	Initiation rate EBF at 4 mon EBF at 6 mon Any BF at 12 mon Any BF at 24 mon	90.0 57.0 28.0 90.0 57.0	WHO BF definition used Retrospective study Measure of EBF was not since birth

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Rakhshani, 2009 Conducted: 2004 **Aim:** To evaluate BF continuation and its associated factors	**Sample:** 1,264 infants **Child age:** less than 3 years Maternal age: 13-50 **Location:** Zabol (South East of Iran) **Setting:** Health centres	**Design:** Historical cohort **Data collection:** data from files in health centres **Sample selection:** Randomized sample method	Initiation rate Mean EBF duration BF prevalence At 6 At 12 At 18 At 24 Mean BF Duration	100% 5.6 mon 98.0 92.0 76.0 0.97 20.8 mon	BF definition not provided Measure of EBF was not since birth (As mothers visit in health clinics one month after delivery) Duration of BF was lower in younger mothers(25yers) and mothers who lived in urban areas, and higher in illiterate mothers
Vafaee, 2010 Conducted: 2007 **Aim:** To determine the prevalence of EBF during the first six months of life	**Sample:** 1267 mothers and their infants **Child age**: 7-12 month **Maternal age:** < 20- 40 years **Location:** Mashhad (Northeast of Iran) **Setting:** 4 health care centres	**Design:** Cross sectional **Data collection:** Face to face interview Sample selection: Multiple Indicator Cluster survey	Initiation rate EBF prevalence At 4 months At 6 months NVD rate C/section rate	91.7% 91.4 56.4 61.1% 52%	WHO EBF definition used Measure of EBF was not since birth EBF rates was higher in educated mothers, older mothers, and mothers delivered by vaginal delivery The prevalence EBF was higher among mothers who breastfed their infants immediately after delivery

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Saki, 2010 Conducted: 2007 **Aim:** To explore the impact of type of delivery on the pattern of weight gain in EB neonates	**Sample:** 92 neonates and their mothers **Child age:** one month **Maternal age:** Mean 23 years Location: Shiraz **Setting:** Health care centres	**Design:** Cohort **Data collection:** face to face interview **Sample selection:** Random	Initiation rate NVD rate C/section rate	100% 62% 38%	Small sample size EBF definition is consisted with WHO Baby weight gain among NVD was higher than C/section
Savabi Esfahani, 2011 Conducted: 2009-2010 **Aim:** To determine continues EBF and some of the related factors	**Sample:** 291 mothers **Child age**: First month and six month Maternal age: 26-35 years Location: Isfahan **Setting:** Private and public hospitals	**Design:** Prospective descriptive **Data collection:** First mothers selected in 3 private and public hospitals then followed-up by phone **Sample selection:** Convenient sampling technique	The continuation EBF 1-4 weeks 5-8 weeks 9-12 weeks 13-16 weeks 17-20 weeks 21-25 weeks	 93.1% 91.4% 91.1% 90.8% 89.4% 86.6%	EBF definition not provided Duration of BF associated with mother's age Measure of EBF was not since birth

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Khamnian, 2013 Conducted: 2011 **Aim:** To determine the prevalence of BF and EBF and identify its factors associated with EBF	**Sample:** 750 mothers and their infants **Child age:** Infants less than 24 months Maternal age: < 25- 36 years **Location:** Zanjan (North western of Iran) **Setting:** Health care centres in Urban and Rural area	**Design**: Cross sectional **Data collection:** Face to face interview **Sample selection:** Multistage sampling method and cluster sampling	Initiation rate Incidence BF in 12 month Urban In 24 month Rural Mean EBF Duration Mean Any BF duration **EBF** at 6 months Introducing complementary food at 4 month BF rate at12-15 month BF rate at 20-23 month	NP 89% 53% 4.3mon 20.3mon 23.8% 63.3% 86.0% 53.4%	WHO EBF definition used Measure of EBF was not since birth EBF significantly increased with maternal educational level, and maternal age The main reason not EBF was insufficient BM (59%) and mother's employed (23%)

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Noughabi, 2014 Conducted: 2011 **Aim:** To determine the prevalence of EBF in six months and influencing factors	**Sample:** 538 mothers and their infants **Child age:** 6-24 months **Maternal age:** <25- >30 years Location: Tehran **Setting:** Home visit	**Design**: Cross sectional **Data collection:** Face to face in home visit **Sample selection:** Multi stage random cluster technique	Initiation rate	NP	WHO EBF definition used Measure of EBF was not since birth and based on maternal recall Receiving conflicting feeding advice pacifier used, Skin to skin contact, time the first BF, infant breastfed on demand, formula used in hospital significantly were associated with EBF
			EBF at 6 months	46.5	
			Mean EBF duration	4.4mon	
			BF rate at 23-24	7.4	
			EFF at 6 months	4.6	
			CBF at 6 months	23.4	
			NVD rate	39.77%	
			C/section rate	60.2%	

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Mortazavi, 2015 Conducted: 2011-2013 **Aim:** To determine the early introduction of water-based fluids and formula and the effect of these practices on BF survival	**Sample**: 358 mothers **Child age:** one month Maternal age: <20- > 30 years **Location:** Shahrod (Northeast of Iran) **Setting:**10 Urban health care centres	**Design:** Longitudinal **Data collection:** Face to face interview pregnant mothers at third trimester then followed up at one month until 24 months postpartum **Sample selection:** Convenient sampling technique	Initiation rate EBF at hospital **EBF** at one mon Predominant BF at one mon **Partial** BF at one mon Mean BF du Median BF du Survival rate BF At 6 months At 12 months At 18 months At 20 months At 24 months Prevalence receiving supplementary at 1mon Sugar water Water Herbal tea Formula C/section rate NVD rate	100.0 100.0 33.1 58.2 8.6 19 mon 21 mon 97.7 93.8 86.5 76.8 22.3 10.1 3.6 52.2 8.6 53% 48.8%	WHO BF definition used Measure of EBF was not since birth Maternal age ,BF difficulties were predictors of partial BF BF experience was associated with introduction supplementary at 1 month Low family income was a barrier to introduce of formula to infants

Author, study purpose, year	Sample, setting	Study design	Results		Comments
			Measure	Value	
Boskabadi, 2015 Conducted:2008-2012 **Aim:** To evaluate introduce some of traditional supplementary and its influence on BF behaviours	**Sample:** 454 mother and their neonates Child age: One month Maternal age: NP **Location:** Mashhad (Northeast of Iran) **Setting:** A neonatal clinic	**Design:** Case control **Data collection:** Face to face interview **Sample selection:** Randomized sample method (exclusively BF neonates and BMF neonates who received traditional remedies)			EBF definition not provided Delay in initiation of BF, and absent let-down reflex in neonates who received traditional remedy Number of feeding/day reduced in case group Using supplements reduce BF frequency and BF duration

Appendix

B

Appendix B

Baseline Questionnaire: English Version

A cohort study of mastitis, related risk factors and breastfeeding practices in Shiraz, Southwest of Iran

Baseline Questionnaire Subject ID ☐☐☐

1. How are you feeding your baby today?

Exclusively breastfeeding-no formula, other fluids or solids	1 Go to Q5
Fully breastfeeding –no formula but have had some juice or water	2 Go to Q5
Combination formula and breastfeeding	3 Go to Q5
Formula feeding only	4 Got to Q2

2. Was your baby ever breastfed (i.e. ever put to the breast)

Yes	1 Got to Q3
No	2 Go to Q4

3. Why did you change to formula feeding?

_____

_____

_____

4. If you decided to exclusively formula-feed your baby from the start, what were the reasons for this choice? (Please circle **any answers** that apply) (You can have more than one answer)
   a) formula is better for the baby 1
   b) bottle-feeding is easier 1
   c) I don't like breast-feeding 1
   d) I will go back to work soon after the birth 1
   e) breast-feeding will make my breasts sag 1
   f) the baby's father prefers bottle-feeding 1
   g) formula is just as good as breast-milk 1
   h) the baby's father can help with bottle-feeding 1
   i) I want to know much milk baby has at each feed 1
   j) my mother suggested bottle-feeding 1
   k) friend or relative suggested bottle-feeding 1
   l) health worker (e.g , doctor, nurse) suggested bottle-feeding 1

5. If breastfeeding or ever breastfed - Why did you choose to breastfeed your baby? (Choose any that apply)

a)	The baby's father wants me to breastfeed	1
b)	Islam recommends breastfeeding	1
c)	Breast milk is better for baby	1
d)	Breastfeeding is easier	1
e)	Breastfed babies are more intelligent	1
f)	Breastfeeding helps me to lose weight	1
g)	My mother or mother-in- law advise me to breastfeed	1
h)	Health workers advise me to breastfeed	1
i)	Breastfed infants have fewer infections	1
j)	Breastfeeding is natural	1
k)	Breastfeeding is cheaper	1
l)	Breastfeeding promotes mother-infant bonding	1
m)	Breastfeed babies are more healthful	1
n)	Other (please specify) _____	

_____

6. After your child was born, was he/she given the opportunity to independently find your breasts by being placed in skin-to-skin contact with you where he/she could move freely?

Yes	1 Go to Q7
No	2 Go to Q8
Don't know/can't say	3 Go to Q8

7. How long after your child was born was he/she placed in skin-to-skin contact with you?

Immediately or within a few minutes	1
More than a few minutes and up to half an hour	2
More than half an hour and up to one hour	3
More than one hour and up to two hours	4
More than two hours and up to 24 hours	5
Don't know	6

8. How long after the birth was it before you put your baby to the breast?

Immediately after birth, cord still attached	1
Within 15 minutes	2
Between 15 and 30 minutes	3
Between 30 minutes and 1 hour	4
Between 1 and 2hour	5
Between 2 and 24 hours	6
More than 24 hours after the birth	7

9. How much of the time have you kept your baby with you in your room?

all during the day and all of the night)	1
all during the day and part of the night	2
all during the day but not overnight	3
part of the day but not all of the day	4

Other (please specify) _____

10. How often are you feeding your baby?

Whenever baby seems hungry or unsettles	1
By the clock-about every 2 hours	2
By the clock-about every 3 hours	3
By the clock-about every 4 hours	4
Other (please explain) _____	

11. How long was it before your milk" came in" (breast full, engorged with milk)?

Within one day of the birth	1
The second day after the birth	2
The third day after the birth	3
Still waiting for milk to come in	4
Other (please specify) _____	

12. If your baby is/ was still hungry after a breastfeed, do /did you (or staff) give him/her a top-up formula feed?

Yes	1
No	2

13. Has your baby been diagnosed with any of the following conditions since birth?

Tongue tie	1
High palate	2
Sucking disorder	3
None of the above	4

14. Has your baby spent any time in the Neonatal Intensive Care Unit?

Yes	1
No	2

15. IF yes how long your baby was in the Neonatal Care Unit? _____ (Days)

16. What was the type of birth delivery?

Vaginal without episiotomy	1
Vaginal with episiotomy	2
Caesarean elective	4
Caesarean emergency	5

17. Did you have an epidural?

Yes	1
No	2

18. What was the first feed given to your baby?

Colostrum	1 Go to Q21
Infant formula	2 Go to Q19
Glucose water	3 Go to Q19
Animal margarine	4 Go to Q19
Herbals	5 Go to Q19

19. Did you provide the first yellowish milk to your baby (colostrum)?

Yes	1
No	2

20. If no, what was the reason for not giving colostrum for the baby?

The first milk is not a true milk	1
The first milk is a dirty liquid	2
The first milk is difficult to digestion	3
Other (please specify) _____	

_____

21. Has your baby received any formula in hospital?

Yes	1
No	2

22. Has your baby used a pacifier while in hospital?

Yes	1
No	2

23. Before the birth of your baby did you attend any classes about feeding your baby?

Yes	1
No	2

24. Before or after delivery of your baby, did you receive any of following on how to feed your new baby? (Circle all that applies)

	BEFORE	AFTER
a) Pamphlets or booklets on breastfeeding	1	1
b) Video tapes on how to breastfeed	1	1
c) Individual consultation at hospital	1	1
d) Advice from friends and relatives	1	1
e) Advice from midwives and nurses	1	1
f) None	1	1

i. Other (please specify) _____

_____

25. Did any staff member check how your baby's mouth was attached to your breast when you first started feeding?

Yes 1
No 2
Didn't need checking 3

26. Did any staff member teach you how to position and attach your baby to the breast?

Yes 1
No 2
Didn't need teaching 3

27. Hospital staff members sometimes have conflicting ideas and opinions about infant feeding. Do you feel you have been given conflicting advices by different members of this hospital staff about breastfeeding your baby?

Yes 1
No 2

28. If yes, please describe/ give examples

_____

_____

_____

29. If you breastfeed any of your previous children, for what period of time did you breastfeed each child?

a) 1st child _____months

b) 2nd child _____ months

c) 3rd child _____ months

d) 4th child _____ months

30. Were you given any formula by the hospital take home with you?

Yes 1
No 2

31. When did you first decide how you were going to feed your last baby?

Before I become pregnant	1
Early in my pregnancy	2
Late in my pregnancy	3
During labour	4
After my baby was born	5

32. Does the baby's father have any preference for how you feed your baby?

Yes, he prefers breastfeeding	1
Yes, he prefers bottle feeding	2
He does not mind how I feed our baby	3
Never really discussed the matter with him	4

33. Does your mother have any preference for how you feed your baby?

Yes, she prefers breastfeeding	1
Yes, she prefers bottle feeding	2
She does not mind how I feed my baby	3
Never really discussed the matter with her	4

34. Does your mother-in-law have any preference for how you feed your baby?

Yes, she prefers breastfeeding	1
Yes, she prefers bottle feeding	2
She does not mind how I feed my baby	3
Never really discussed the matter with her	4

35. For each the following statements please indicate how much you agree or disagree by circling the number that closely corresponds to your opinion. The number '1' indicates strong disagreement, whereas'5' indicates strong agreement.

	Strongly Disagree				**Strongly** agree
a) The benefits of breastfeeding last only as long as the baby is breast fed	1	2	3	4	5
b) Formula feeding is more convenient than breastfeeding	1	2	3	4	5
c) Breastfeeding increase mother infant bonding	1	2	3	4	5
d) Breast milk is lacking in Iron	1	2	3	4	5
e) Formula fed babies are more likely to be overfed than breastfed babies	1	2	3	4	5
f) Formula feeding is the better choice if the mother plans to go back to work	1	2	3	4	5
g) Mothers who formula feed miss one of the great joys of motherhood	1	2	3	4	5
h) Women should not breastfeed in public places such as restaurants	1	2	3	4	5
i) Breastfed babies are healthier than formula fed babies	1	2	3	4	5
j) Breastfed babies are more likely to be overfed than formula fed babies	1	2	3	4	5
k) Fathers feel left out if a mother breastfeeds	1	2	3	4	5
l) Breast milk is the ideal food for babies	1	2	3	4	5
m) Breast milk is more easily digested than formula	1	2	3	4	5
n) Formula is as health for an infant as breast milk	1	2	3	4	5
o) Breastfeeding is more convenient than formula	1	2	3	4	5
p) Breast milk is cheaper than formula	1	2	3	4	5
q) A mother who occasionally smoke should not breastfeed her baby	1	2	3	4	5

36. What if any difficulties with breastfeeding have you experienced **in hospital** (unprompted, but probe for more than one answer)

a)	Difficulties with positioning	1
b)	Difficulties with attachment (latching on)	1
c)	Pain in latching on	1
d)	Pain when nursing	1
e)	Pain when not nursing	1
f)	Pain all the time	1
g)	Cracked or sore nipples	1
h)	Breast engorgement	1
i)	Inverted nipples	1
j)	Breastfeeding is painful	1
k)	Baby has difficulties sucking	1
l)	Baby refuse to breast feed	1
m)	Baby too tired to feed i.e. falls asleep at breastfeeding	1

Demographic information

37. What is your age at last birth day (years)? _____

38. What is the highest level of education you have completed?

Primary school	1
Intermediate school	2
High school	3
Bachelor degree	4
Master	5
PhD	6
Others (please specify) _____	

39. What is your marital status?

Married	1
Divorced	2
Separated	3
Widowed	4

40. What is or was your occupation prior to having children?

Governmental employed	1
Nongovernmental employed	2
Self-employed	3
Home duties	4

41. Have you taken, or will you take, maternity leave for birth or care of this baby?

Yes	1
No	2

42. If yes, how many months of maternity leave will you have?

Less than 3 months	1
3 to < 6 months	
6 to < 9 months	2
Between 9-12 months	3

43. When you return to work, will you have any break time to breastfeed?

Yes	1
No	2

44. Does your work involve night shifts?

Yes	1
No	2

45. What is your husband's occupation?

Governmental employed	1
Nongovernmental employed	2
Self-employed	3
Unemployed	4

46. Do you live in

A nuclear family	1
An extended family	2

47. How many children do you have (including this baby)

Female _____ Male _____

48. **Before** you become pregnant, did you smoke cigarettes?

Yes	1
No (Go to Q50)	2

49. How many cigarettes did you smoke a day **before** you become pregnant?

_____

50. **While** you become pregnant, did you smoke cigarettes?

Yes	1
No (Go to Q52)	2

51. How many cigarettes did you smoke a day **while** you were pregnant?

_____

52. Before you were pregnant, did you smoke a water pipe?

Yes	1
No (Go to Q54)	2

53. How often did you smoke a water pipe a day before you were pregnant?

_____

54. While you were pregnant, did you smoke a water pipe?

Yes	1
No (Go to Q56)	2

55. How often did you smoke a water pipe a day while you were pregnant?

_____

56. Did the baby's father smoke cigarettes while you were pregnant?

Yes	1
No	2

57. Did the baby's father smoke a water pipe while you were pregnant?

Yes	1
No	2

58. Baby's date of birth _____/_____/_____

59. Baby's gender

Male	1
Female	2

Following information to be extracted from medical record

	Pre-pregnancy	At birth
60. Mother's weight (kg)?		
61. Mother's height (cm)?		
62. Mother's blood sugar?		
63. Baby's birth weight?		
64. Baby's birth length?		
65. Baby's head circumference?		

Interviewer ID: ----------

The name of hospital: ----------

The name of Health Clinic: ----------

Date of Interview: -------/ --------/ ---------

THANK YOU FOR COMPLETING THIS INTERVIEW

Appendix

C

Appendix C

Follow-Up Questionnaire: English Version

A cohort study of mastitis, related risk factors and breastfeeding practices in Shiraz, Southwest of Iran

Follow-up Questionnaire

Subject ID ☐☐☐

Mother's first name: ----------

Tel (home) ---------- Mobile ----------

Baby's first name _____Sex of baby: Female Male

Clinic_____

The following questions related to how you are feeding your baby.

	A 1month	B 3months	C 4months	D 6months
1. How are you feeding your baby today?				
Exclusive breastfeeding-no formula, other fluids or porridge.	1	1	1	1
Fully breastfeeding-no formula but have had some juice or water.	2	2	2	2
Combination formula and breastfeeding.	3	3	3	3
Formula feeding only	4	4	4	4

A_____

B_____

C_____

D_____

	A 1month	B 3months	C 4months	D 6months
2. (If you changed feeding methods) **why did you change feeding method?**				
a) Don't have enough breast milk	1	1	1	1
b) Have gone back to work or study	1	1	1	1
c) Baby's father disapproves	1	1	1	1
d) Formula makes the child grow bigger	1	1	1	1
e) Friends and relatives suggested bottle feeding	1	1	1	1
f) Health workers and doctors suggested bottle feeding	1	1	1	1
g) My mother or mother-in-law suggested bottle feeding	1	1	1	1
h) Formula feeding is easier	1	1	1	1
i) Baby was constantly crying	1	1	1	1
j) Baby did not gain enough weight	1	1	1	1
k) Other (please specify)	□	□	□	□

A_____

B_____

C_____

D_____

	1month	3months	4months	6months
3. How many times per day on average do you feed your baby?				
4. How many of these are breastfeeds? (use 00 if none)				
5. How many of these are formula feeds? (use 00 if none)				

6. How often are you feeding your baby?	**A 1mo**	**B 3mo**	**C 4mo**	**D 6mo**
Whenever baby seems hungry or unsettled.	1	1	1	1
By the clock-about every 2 hours.	2	2	2	2
By the clock-about every 3 hours.	3	3	3	3
By the clock-about every 4hours.	4	4	4	4
Other (please specify)	□	□	□	□

A_____

B_____

C_____

D_____

7. If your baby is/was still hungry after a breastfeed, do/did you give him/her a top-up formula feed?	**1month**	**3months**	**4months**	**6months**
Yes	1	1	1	1
No	2	2	2	2

8. Have you fed your baby any solid, semi-solid foods?	**1month**	**3months**	**4months**	**6months**
Yes	1	1	1	1
No	2	2	2	2

9. How old was your baby when you first gave them ANY solid or semi-solid food? _____(weeks) ***Leave blank until infant has had first solids.***

10. How old was your baby when he/she first had any of the following foods and drinks? *Leave blank until age entered. Write NO if still not tried at 6 month interview.*	
a) Infant formula	
b) Water as a drink	
c) Fruit juice	
d) Cow's milk as a drink	
e) Other animal milk e.g. goat, sheep	
f) Sugar water	
g) Porridge	
h) Any other kind of cereal	
i) Eggs	
j) Lentil and bean	
k) Soup with meat and vegetables	
l) Yogurt	

m) Fruits (e.g. dates, fresh fruit)	
n) Family food	
o) Herbals	
p) Other food (Specify)	□
q) Other food (Specify)	
r) Other food (Specify)	

(if started either fully or partially formula feeding since last interview)	A 1month	B 3months	C 4months	D 6months
11. How old in weeks was your baby when you started giving him/her a regular bottle (i.e. daily)?	_____	_____	_____	_____
12. Does your baby use a pacifier?				
Yes	1	1	1	1
No	2	2	2	2

13. **How old in weeks was your baby when you first gave him/her a pacifier? _____**(weeks)

14. When does your baby use a pacifier?

a) During the day	1
b) At night	2
c) During both the day and night	3

15. What was the reason(s) to give a pacifier to your baby? (Can have more than one reason)

a) To help put my baby to sleep	1
b) To sooth my baby when teething	1
c) To sooth my baby when upset/ irritable	1
d) To prevent my baby from sucking his/her thumb	1
e) To keep my baby comforted and quiet	1
f) As a distraction	1
g) Because it is a normal to use a pacifier	1
h) Because it reduces my baby's risk of SIDS	1
i) Because it is natural for babies to suck	1
j) To help in taking my baby off the breast after a feed	1
k) To help stretch the time between feeds	1
l) Don't know	1

16. Do you get any help to look after your baby?	**A 1month**	**B 3months**	**C 4months**	**D 6months**
a) Child's or children's father	1	1	1	1
b) Child's or children's grandmother (mother side)	1	1	1	1
c) Child's or children's grandmother (father side)	1	1	1	1
d) Another member of the family	1	1	1	1
e) Baby sitter	1	1	1	1
f) Child care services	1	1	1	1
g) Other (please specify)	□	□	□	□

A_____

B_____

C_____

D_____

17. Did you have any of the following people support you with feeding after discharge from hospital?
    a) Nurse or midwife 1
    b) Health workers in clinics 1
    c) Lactation consultant 1
    d) Your mother 1
    e) Your mother –in-law 1
    f) Your doctor 1
    g) Other 9specify) 1

	A 1mo	**B 3months**	**C 4mo**	**D 6mo**
18. Number of diarrhoeal episodes the baby had since was last spoke(Passing watery stools more than 3 times a day and each episode lasting for more than 2 days)	_____	_____	_____	_____

19. As you recently had a baby, we would like to know how are feeling. Please check the answer that best describes how you have felt **in the past 7 days,** not just how you feel today. (Ask at 1 and 6 months only)

	1month	**6months**
a) I have been able to laugh and see the funny side of things		
As much as I always could	1	1
Not quite so much now	2	2
Definitely not so much now	3	3
Not at all	4	4
b) I have looked forward with enjoyment to things:		
As much as I ever did	1	1
Rather less than I used to	2	2
Definitely less than I used to	3	3
Hardly at all	4	4
c) I have blamed myself unnecessarily when things went wrong		
Yes, most of the time	1	1
Yes, some of the time	2	2
Not very often	3	3
No, never	4	4
d) I have been anxious or worried for no good reason:		
No, not at all	1	1
Hardly ever	2	2
Yes, sometimes	3	3
Yes, very often	4	4
e) I have felt scared or panicky for no very good reason:		
Yes, quite a lot	1	1
Yes, sometimes	2	2
No, not much	3	3
No, not at all	4	4
f) Things have been getting on top of me		
Yes, most of the time I have not been able to cope at all	1	1
Yes, sometimes I have not been coping as well as usual	2	2
No, most of the time I have coped quite well	3	3
No, I have been coping as well as ever	4	4

g) I have been so unhappy that I have had difficulty sleeping		
Yes, most of the time	1	1
Yes, quiet a lot of the time	2	2
Not very often	3	3
No, not at all	4	4
h) I have felt sad or miserable		
Yes, most of the time	1	1
Yes, quiet often	2	2
Not very often	3	3
No, not at all	4	4
i) I have been so unhappy that I have been crying		
Yes, most of the time	1	1
Yes, quite often	2	2
Only occasionally	3	3
No, never	4	4
j) The thought of harming myself has occurred to me		
Yes, quite often	1	1
Sometimes	2	2
Hardly ever	3	3
Never	4	4

Problems with breastfeeding

	1mo	3mo	4mo	6mo
20. Have you had any difficulties with breast feeding since I spoke to you last (or you left hospital) so things like problems with your breast or problems with the baby feeding?				
Yes	1	1	1	1
No	2	2	2	2

21. What difficulties experienced (unprompted, but probe for more than one answer)	1mo	3mo	4mo	6mo
a) Difficulties with positioning	1	1	1	1
b) Difficulties with attachment (latching on)	1	1	1	1
c) Pain in latching on	1	1	1	1
d) Pain when nursing	1	1	1	1
e) Pain when not nursing	1	1	1	1
f) Pain all the time	1	1	1	1
g) Cracked or sore nipples	1	1	1	1
h) Breast engorge (too full)	1	1	1	1
i) Mastitis or breast infection	1	1	1	1
j) Inverted nipples	1	1	1	1
k) Baby not gaining enough weight	1	1	1	1
l) Baby has difficulties sucking	1	1	1	1
m) Baby gets too much milk or too fast	1	1	1	1
n) Poor 'let-down'	1	1	1	1
o) Baby refuse to breast feed	1	1	1	1
p) Baby too tired to feed i.e. Falls asleep at breastfeeding	1	1	1	1
q) Feeling that I'm not doing very well at breastfeeding	1	1	1	1
r) Not enough milk for baby	1	1	1	1
s) Other problems				
t) Other problems				

A_____

B_____

C_____

D_____

	1mo	3mo	4mo	6mo
22. Have you expressed your milk since we last spoke (or since you left hospital)?				
Yes	1	1	1	1
No	2	2	2	2

23. **How old was your baby in weeks when you first expressed your milk?** _____(weeks)

24. What method did/do you mainly use to express your milk?	1mo	3mo	4mo	6mo
Hand express	1	1	1	1
Manual pump	2	2	2	2
Electric pump	3	3	3	3

25. Why do/did you express your milk? (may have more than one reason)	1month	3months	4months	6months
a) Wanted some extra milk just in case	1	1	1	1
b) Feed to be given by someone else (going to work	1	1	1	1
c) Feed to be given by someone else (baby sitter)	1	1	1	1
d) Had too much milk /uncomfortable	1	1	1	1
e) Had mastitis	1	1	1	1
f) Baby ill	1	1	1	1
g) Self-ill	1	1	1	1

	1mo	3mo	4mo	6mo
26. Did you have difficulties expressing your milk?				
Yes	1	1	1	1
No Go to Q28	2	2	2	2

	1mo	3mo	4mo	6mo
27. What difficulties do/did you have? (can give more than one answer)				
Take too long	1	1	1	1
Was painful	1	1	1	1
Had trouble getting much/enough milk	1	1	1	1
28. Before you breastfeed do you wash your hand with soap and warm water				
Always	1	1	1	1
Usually	2	2	2	2
Whenever I can	3	3	3	3
Occasionally	4	4	4	4
Never	5	5	5	5
29. **Before you breastfeed do you wash your nipples?**				
Always	1	1	1	1
Usually	2	2	2	2
Whenever I can	3	3	3	3
Occasionally	4	4	4	4
Never	5	5	5	5
30. Have you worn a nursing bra since you left hospital/ we last spoke?				
Yes, currently using one	1	1	1	1
Yes, but have stopped	2	2	2	2
No	3	3	3	3

31. Have you used a nipple cream/ointment since you left hospital/we last spoke?				
Yes, currently using one	1	1	1	1
Yes, but have stopped	2	2	2	2
No	3	3	3	3
32. Have you used an antifungal nipple cream/ointment (e.g. for thrush) since you left hospital/ we last spoke?				
Yes, currently using them	1	1	1	1
Yes, but have stopped	2	2	2	2
No	3	3	3	3
33. **Have you had a thrush infection since you left hospital/we last spoke**?				
Yes	1	1	1	1
No	2	2	2	2

Questions about mastitis

	1mo	**3mo**	**4mo**	**6mo**
34. Have you had mastitis since you left hospital/we last spoke				
a. Yes	1	1	1	1
b. No Go to Q75	2	2	2	2
35. How many times have you had mastitis since you left hospital/we last spoke?	_____	_____	_____	_____
36. How old was your baby (in weeks) when you had mastitis since we last spoke (if more than 1 bout in period use age of first bout)	_____ weeks	_____ weeks	_____ weeks	_____ weeks

Please rate how your breasts felt when your mastitis was at its worst on scale of 1 to 5	**1mo**	**3mo**	**4mo**	**6m**
37. **The area of my breast affected by mastitis was:**				
1 2 3 4 5				
Normal Tenderness … Unbearable to touch				
38. The area of my breast affected by mastitis was				
1 2 3 4 5				
Normal Skin … Skin was very hot				
39. The area of my breast affected by mastitis was				
1 2 3 4 5				
Normal Skin colour … Skin was very red				

40. At the height of your mastitis was your temperature?	**1mo**	**3mo**	**4mo**	**6mo**
Below 37.4c	1	1	1	1
37.5 to 38c	2	2	2	2
38.1 to 38.5c	3	3	3	3
38.6 to 40 c	4	4	4	4
Over 40c	5	5	5	5

41. **If you don't know what your temperature was please estimate using the following scale?**	**1mo**	**3mo**	**4mo**	**6mo**
1 2 3 4 5	1	1	1	1
Normal … Slightly elevated … high … very high … extremely high	2	2	2	2
	3	3	3	3
Below 37.4c … 37.5 to 38 … 38.1 to 38.5c … 38.6 to 40c … over 40c	4	4	4	4
	5	5	5	5

42. If your temperature was elevated, how long did it take for your temperature to return to normal?	**1mo**	**3mos**	**4mo**	**6mos**
Within 24 hours	1	1	1	1
24-48 hours	2	2	2	2
More than 48 hours	3	3	3	3

43. Did you experience chills associated with mastitis?	**1mo**	**3mo**	**4mo**	**6mo**
1 2 3 4 5 Not at all severe shaking and chills				
44. Did you experience flu like aching?				
1 2 3 4 5 Not at all severe flu like aching				

45. Did you feel so ill you were confined to bed?	**1mo**	**3mo**	**4mo**	**6mo**
Yes	1	1	1	1
No	2	2	2	2
46. If YES, please circle the length of time:				
Less than 24 hours	1	1	1	1
24-48 hours	2	2	2	2
More than 48 hours	3	3	3	3
47. **Did you receive advice regarding the treatment of your mastitis from:**				
a) Local G P	1	1	1	1
b) Midwife	1	1	1	1
c) Health worker	1	1	1	1
d) Other (please specify)				

A_____

B_____

C_____

D_____

48. If you receive advice from more than one source, was the information conflicting:	**1mo**	**3mo**	**4mo**	**6mo**
1 2 3 4 5 Not at all conflicting extremely conflicting				

Please tick whether the following advice was given in the treatment of your mastitis By any of the following people

	GP	**Midwife**	**Clinic nurse**	Other person
49. Treatment advice	1	1	1	1
a) Stop feeding from the affected breast				
b) Stop breastfeeding altogether (Wean your baby)	1	1	1	1
c) Feed frequently from the affected breast	1	1	1	1
d) Feed from the affected breast first	1	1	1	1
e) Massage the affected area prior to and during a feed	1	1	1	1
f) Discontinue the use of nipple lotions or creams	1	1	1	1
g) Apply heat to the affected area prior to and during feed	1	1	1	1
h) Apply cold packs after feeding	1	1	1	1
i) Have ultrasound treatment to the affected area	1	1	1	1

50. What other people gave you advice? _____

	1mo	3mo	4mos	6mo
51. Were you given intravenous antibiotics to treat your mastitis?				
Yes	1	1	1	1
No	2	2	2	2
52. Were you prescribed antibiotic tablets to treat your mastitis?				
Yes	1	1	1	1
No	2	2	2	2

53. What type (name) of antibiotic were your given?

A_____

B_____

C_____

D_____

54. What was the reason given for your mastitis? --

A_____

B_____

C_____

D_____

In the **week before** you developed mastitis:

	1mo	3mo	4mo	6mo
55. Did you experience trauma to your breast from strenuous exercise?				
1 2 3 4 5				
Not injury severely traumatised				
56. Did you experience trauma to your breast from injury?				
1 2 3 4 5				
Not injury severely traumatised				
57. Did you experience trauma to your breast from cracked or grazed nipple?				
1 2 3 4 5				
Not injury Severely traumatised				
58. Did you use a nipple shield when feeding?				
1 2 3 4 5				
Never Always				
59. Did you use breast pads after feeds?				
1 2 3 4 5				
Never Always				
60. Did you apply nipple creams or lotions?				
1 2 3 4 5				
Never Always				

In the 48 hours before your mastitis?	1mo	3mos	4mos	6mo
61. Did you suffer from engorgement?				
1 2 3 4 5				
Not at all Extremely engorged				

62. Did you suffer from blocked ducts? 1 2 3 4 5 Not at all Extremely blocked				
63. Did you milk appear? 1 2 3 4 5 The same as usual Thicker than usual				
64. Did your feed baby? 1 2 3 4 5 Much less than usual same as usual Much more than usual				
65. Did you give your baby complementary formula? 1 2 3 4 5 Never same as usual Much more than usual				
66. Did you breastfeed your baby according to a preset routine? 1 2 3 4 5 Never Always				
67. Did you have to delay your baby's breastfeeds? 1 2 3 4 5 Never Always				
Did you experience restriction to any part of your breast from: **68. A tight bra?** 1 2 3 4 5 No restriction Severely restricted				
69. Tight clothing? 1 2 3 4 5 No restriction Severely restricted				
70. Did you wear a bra to sleep at night? 1 2 3 4 5 Never Always				
71. Did your baby have difficulty attaching to the breast? 1 2 3 4 5 Never Always				
72. Did your nipples generally hurt during a feed? 1 2 3 4 5 Never Always				
73. Immediately after a breastfeed was your nipple generally? 1 2 3 4 5 Normal Shape Extremely misshapen				

In the **week before** your mastitis:

74. Did your baby suffer from:	**1mo**	**3mo**	**4mo**	**6mo**
a) Thrush of the mouth	1	1	1	1
b) Thrush of the anal or genital area	1	1	1	1
c) Neither of these	1	1	1	1

END OF MASTITIS QUESTIONS

75. Do you have anaemia	**1mo**	**3mo**	**4mo**	**6mos**
Yes	1	1	1	1
No	2	2	2	2

For each of the following questions, circle the number that most closely indicates how you have been feeling during the past week?

		1 mo	3 mo	4 mo	6 mo
To what degree have 76. **You experienced fatigue(extreme tiredness)**	1 2 3 4 5 6 7 8 9 10 **Not at all deal** a **great**				
77. **How severe is the fatigue which you have been experiencing?**	1 2 3 4 5 6 7 8 9 10 **Mild** **severe**				
78. **To what degree has fatigue caused you distress?**	1 2 3 4 5 6 7 8 9 10 **No distress** **a great deal of distress**				

79. Over the past week, how often have you been fatigued	**1mo**	**3mo**	**4mos**	**6mo**
Every day	4	4	4	4
Most, but not all days	3	3	3	3
Occasionally, but most days	2	2	2	2
Hardly any days	1	1	1	1
80. To what degree has your fatigue changed during the past week?				
Increased	4	4	4	4
Fatigue has gone up and down	3	3	3	3
Stayed the same	2	2	2	2
Decreased	1	1	1	1

For each sentence how often it applies to you in general, during the past four weeks

Almost never 1 sometimes 2 often 3 usually 4	**1mo**	**3mo**	**4mo**	**6mo**
81. You feel lonely or isolated				
82. You feel calm				
83. You feel frustrated				
84. You are full energy				
85. You are under pressure from other people				
86. You are afraid for the future				
87. You feel under pressure from deadlines				

88. For each the following statements please indicate how much you agree or disagree by circling the number that closely corresponds to your opinion. The number '1' indicates strong disagreement, whereas'5' indicates strong agreement.
At 6 months only

	Strongly Disagree				**Strongly** agree	**6 mo**
a) The benefits of breastfeeding last only as long as the baby is breast fed	1	2	3	4	5	
b) Formula feeding is more convenient than breastfeeding.	1	2	3	4	5	
c) Breastfeeding increase mother infant bonding	1	2	3	4	5	
d) Breast milk is lacking in Iron	1	2	3	4	5	
e) Formula fed babies are more likely to be overfed than breastfed babies	1	2	3	4	5	
f) Formula feeding is the better choice if the mother plans to go back to work	1	2	3	4	5	
g) Mothers who formula feed miss one of the great joys of motherhood	1	2	3	4	5	
h) Women should not breastfeed in public places such as restaurants	1	2	3	4	5	
i) Breastfed babies are healthier than formula fed babies	1	2	3	4	5	
j) Breastfed babies are more likely to be overfed than formula fed babies	1	2	3	4	5	
k) Fathers feel left out if a mother breastfeeds	1	2	3	4	5	

l)	Breast milk is the ideal food for babies	1	2	3	4	5	
m)	Breast milk is more easily digested than formula	1	2	3	4	5	
n)	Formula is as health for an infant as breast milk	1	2	3	4	5	
o)	Breastfeeding is more convenient than formula	1	2	3	4	5	
p)	Breast milk is cheaper than formula	1	2	3	4	5	
q)	A mother who occasionally smoke should not breastfeed her baby	1	2	3	4	5	

If mother has terminated breastfeeding since last interview

89. How old (in weeks) was your baby when you stopped breastfeeding? _____(weeks)

90. Why did you decide to stop breastfeeding? (Probe for more than one reason)

_____

_____

_____

_____

91. Did you stop breastfeeding abruptly?

Yes	1
No	2

92. Did anyone advise you stop breastfeeding when you did? (may give more than one)

a)	No, own decision	1
b)	Husband	1
c)	Mother	1
d)	Mother-in-low	1
e)	Other family member or friend	1
f)	Local G P	1
g)	Paediatric	1
h)	Health workers	1
i)	Other health professionals	1

93. Did you plan to stop breastfeeding now (when you did)

Yes	1
No	2

94. Would you have liked to have breastfed your baby for longer

Yes	1
No	2

95. How long did you plan to breastfeed for? _____(weeks)

INFORMATION TO BE OBTAINED FROM HEALTH CENTERS

	1months	3months	4months	6months
96. Mother's weight (kg)?				
97. Mother's height (cm)?				
98. Mother's blood sugar?				
99. Baby's current weight? (kg)				
100. Baby's current length?(cm)				
101. Baby's head circumference?				

	1mo	3mo	4mo	6mo
Date of Interview (DD/MM/YY)				
Interviewer ID				

Appendix D

Baseline Questionnaire: Farsi Version

مطالعه کوهورت عفونت پستان ، فاکتورهای خطر مرتبط با آن و اقدام به شیر دهی در شیراز- ایران

کد **پرسشنامه مبدا**

1.امروز نوزا د تان را چگونه تغذیه میکنید؟

تغذیه انحصاری با شیر مادر-بدون استفاده از شیر خشک، مایعات و غذاهای جامد1 برو‌ید به سوال 5
تغذیه کامل با شیر مادر – بدون استفاده از شیر خشک اما آب میوه داده شده است 2 برو‌ید به سوال 5
ترکیبی از شیر مادر و شیر خشک 3 برو‌ید به سوال 5
شیر خشک به تنهایی 4 برو‌ید به سوال 2

2. آیا نوزاد شما تا بحال تغذیه با شیر مادر داشته است (حتی اگر یکبار زیر سینه مادر گذاشته شده است)
بلی1 برو‌ید به سوال 3
خیر2 برو‌ید به سوال 4
3. چرا تغذیه نوزاد خود را از شیر مادر به شیر خشک تغیر دادید؟

4.از ابتدا اگر تصمیم به تغذیه انحصاری با شیر خشک داشتید چه دلایلی برای این انتخاب بوده است ؟ (لطفا موارد زیر علامت بزنید شما میتوانید بیش از یک پاسخ داشته باشید) .
الف) شیر خشک برای نوزاد بهتر است 1.
ب) تغذیه با شیشه آسانتر است1.
پ) تغذیه با شیرمادر را دوست ندارم 1.
ت) بعداز زایمان باید فورا سر کاربرگردم1
ث) تغذیه با شیر مادر باعث شل شدن سینه میشود1.
ج) شوهرم تغذیه نوزادمان با شیر خشک را ترجیح میدهد1.
چ) شیر خشک مشابه شیر مادر است1.
ح) در تغذیه با شیر خشک پدر نوزاد میتواند کمکم کند1.
خ) دوست دارم مقدار شیری که به نوزاد میدهم را بدانم1.
د) مادرم تغذیه با شیر خشک پیشنهاد کرده است1.
ذ) دوستان و فامیل تغذیه با شیر خشک را توصیه کرده اند1.
ر) کارمندان بهداشتی(مثلا پزشکان ، ماما ها، پرستاران) تغذیه با شیر خشک پیشنهاد کرده اند1 .
ز) دلایل دیگر----------

5. اگر نوزاد تغذیه با شیر مادر میشود یا زمانی با شیرمادر تغذیه شده، چرا شیر مادر انتخاب کرده اید؟(بیش از یک پاسخ میتوانید داشته باشید).
الف)شوهرم تمایل دارد من با شیر خودم کودکم را تغذیه کنم1.
ب)اسلام تغذیه با شیر مادررا توصیه می کند1.
پ) شیر مادر برای نو زلد بهتراست1.
ت) تغذیه با شیر مادر آسانتر است1.
ث) نوزادانی که با شیر مادرتغذیه می شوند باهوشتر ند1.
ج) تغذیه با شیر ما در به کاهش وزنم کمک میکند1.
چ) تغذیه با شیر مادر پیشنهاد مادر و مادر شوهرم بوده است1.
ح)کارمندان بهداشتی تغذیه با شیر مادررا توصیه می کنند1.
خ) نوزادان تغذیه شده با شیر مادر کمتر دچار عفونت می شوند1.
د)تغذیه با شیر مادر طبیعی است1.
ذ) تغذیه باشیر مادر ارزانتر است1.
ر) تغذیه با شیر مادر ارتباط مادر و نوزاد را افزایش می دهد1.
ز) نوزادان تغذیه شده با شیر مادر سالم ترند1.
س) دلایل دیگر(لطفا توضیح دهید). _____

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6. بلافاصله بعد از زایمان در حالی که نوزادتان تماس پوست به پوست با شما داشت آیا او توانست بدون کمک سینه شما را پیدا کند.
1 بلی برو‌ید به سوال 7
2 خیر برو‌ید به سوال 8
3 یادم نمی اید برو‌ید به سوال 8.

7.چه مدت بعد زایمان نوزاد تان با شما تماس پو ست به پوست داشت؟
1 بلافاصله یا چند دقیقه بعد از تولد
2 بیشتراز چند دقیقه تا نیم ساعت
3بیشترلز نیم ساعت تا یک ساعت
4 بیشتراز یک ساعت تا دو ساعت
5 بیشتراز دو ساعت تا 24 ساعت
6 نمیدانم

8. چه مدت بعداز زایمان نوزاد زیر سینه شما قرار گرفت؟
1 بلافاصله بعد از تولد- بند ناف هنوز جدا نشده بود.
2 حدود 15 دقیقه
3 بین 15 تا 30 دقیقه
4 بین 30 دقیقه تا یکساعت
5 بین یکساعت تا دو ساعت
6 بین دو ساعت تا 24 ساعت
7 بیشتراز 24 ساعت بعد از زایمان

9.برای چه مدت زمان شما نوزاد تان را در اتاق خود نگه داشتید ؟
1 تمام مدت شب و روز
2 همه روزها و گاهی شبها
3 همه روزها اما نه شبها
4 گاهی روزها اما نه شبها
موارد دیگر(لطفا توضیح دهید)

10.چند بار نوزادتان را شیر می دهید؟
1 وقتی او گرسنه یا نا آرلم است.
2 طبق ساعت هر 2 ساعت
3 طبق ساعت هر 3 ساعت
4 طبق ساعت هر 4 ساعت
موارد دیکر(لطفا توضیح دهید)

11.چه مدت طول کشید تا شیروارد سینه شد(سینه شما پر شیر شد ، یا در اثر پر شیری متورم شد)؟
1 یکروز بعداز تولد
2 روز دوم بعد تولد
3 روز سوم بعد تولد
4 هنوز منتظرم
موا رد دیگر(لطفا توضیح دهید)

12.اگر بعد از شیردهی نوزادتان هنوز گرسنه است /بود آیا شما یا پرسنل درمان به او یک وعده شیر خشک جهت سیر شدن داده شده است ؟
1 بلی
2خیر

13. کدام موارد زیر هنگام تولد جهت نوزاد شما تشخیص داده شده است؟

2

1 بند زبان کوتاه
2 سقف دهان بلند
3 اختلال مکیدن
4 هیچ کدام

14.آیا نوزاد شما بعد از تولد در بخش مراقبتهای ویژه نوزادان بستری شد؟
1 بلی
2 خیر

15. اگر بلی چه مدت نوزاد شما در بخش بستری بود؟ _____(روز)

16. نوع زایمان شما چگونه بود؟
1 زایمان طبیعی بدون اپی زیاتومی
2 زایمان طبیعی با اپی زیاتومی
3 سزارین انتخابی
4 سزارین اورژانس

17.آیا شما اپیدورال (بی حسی موضعی در ناحیه کمر) داشته اید؟
1 بلی
2 خیر

18. اولین تغذیه نوزاد شما کدام موارد زیر بوده است؟
1 آغوز برو‌ید به سوال21
2 شیر خشک برو‌ید به سوال 19
3 آب قند برو‌ید به سوال 19
4 کره حیوانی بر ید به سوال 19
5 گیاهان دارویی برو‌ید به سوال 19

19.آیا به نوزادتان شیر زرد رنگ اولیه (آغوز) داده اید؟
1 بلی
2 خیر

20. اگر نه دلیل ندادن آغوز به نوزادتان چه بود؟
1 شیر اولیه شیر واقعی نیست
2 شیر اولیه مایع تمیزی نیست
3 شیر اولیه هضم مشکلی دارد
4 موارد دیگر(لطفا توضیح دهید

21 آیا نوزاد شما در بیمارستان با شیر خشک تغذیه شد؟
1 بلی
2 خیر

22 . آیا به نوزاد شما در بیمارستان پستا نک داده شد .
1 بلی
2 خیر

23. قبل از زایمان ، آیا در کلاسهای آمادگی تغذیه نوزاد با شیر مادر شرکت کرده اید؟
1 بلی
2 خیر

24.قبل و یا بعداز زایمان کدام موارد زیر در مورد چگونگی تغذیه نوزادتان دریافت کرده اید؟

3

	بعد زایمان	قبل زایمان
الف) پمفلتها یا کتابچه آموزشی در مورد تغذیه با شیر مادر	1	1
ب)نوارهای ویدیوئی در ارتباط با چگونگی تغذیه با شیر مادر	1	1
پ) مشاوره انفرادی در بیمارستان	1	1
ت) توصیه و پیشنهادات توسط دوستان و فامیل	1	1
ج) توصیه و پیشنهادات توسط ماما ها و پرستاران	1	1
چ) هیچکدام	1	1

ح) موارد دیگر(لطفا توضیح دهید) _____

25.هنگام اولین شیر دهی به نوزاد تان آیا پرسنل بیمارستان چگونگی گرفتن سینه توسط دهان نوزاد را چک کردند؟
1 بلی
2 خیر
3 نیازی به چک شدن نداشتم /تجربه قبلی شیر دهی دارم

26. آیا پرسنل بیمارستان چگونگی گرفتن نوزاد در بغل هنگام شیردهی چک کردند؟
1 بلی
2 خیر
3 نیازی به آموزش نداشتم/تجربه قبلی شیر دهی دارم

27. گاهی پرسنل دیمارستان عقاید و ایده های متناقضی در مورد شیر دهی دارند ،آیا شما این عقاید ضد ونقیض را دریافت کرده اید؟
1 بلی
2 خیر

28. اگر بلی لطفا توضیح دهید و مثال بزنید
.

_____

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29. در صورتیکه کودک /کودکان قبلی شما با شیر مادر تغذیه شده اند مدت زمان آن را ذکر نمایید
.

الف) اولین کودک _____ ماه

ب) دومین کودک _____ ماه

پ) سومین کودک _____ ماه

ت) چهارمین کودک _____ ماه

30. آیا بیمارستان شیر خشک در اختیار شما قرار داده که به منزل ببرید؟
بلی
خیر

31. اولین بارچه زمانی تصمیم به نحوه تغذیه نوزادتان گرفتید؟
1 قبل از حاملگی

4

2 در اوایل حاملگی
3 در انتهای حاملگی
4 در طول درد زایمان
5 بعد از زایمان

32. آیا همسر شما ایده ارجحی در مورد نوع تغذیه نوزادتان دارد؟
1 بلی- اوتغذیه با شیر مادر را ترجیح می دهد.
2 بلی- اوتغذیه با شیر خشک را ترجیح می دهد.
3 برای او تفاوتی نمی کند چگونه نوزادمان را تغذیه میکنم
4 تا کنون صحبتی در باره این موضوع با او نداشته ام

33. آیا مادر شما ایده ارجحی در مورد نوع تغذیه نوزادتان دارد؟
1 بلی- اوتغذیه با شیر مادر را ترجیح می دهد.
2 بلی- او تغذیه باشیر خشک را ترجیح می دهد.
3 برای او تفارتی نمی کند چگونه نوزادم را تغذیه می کنم.
4 تا کنون صحبتی در باره این موضوع با او نداشته ام.

34. آیا مادر شوهر شما ایده ارجحی در مورد نوع تغذیه نوزادتان دارد؟
1 بلی- اوتغذیه با شیر مادر را ترجیح می دهده
2.بلی- اوتغذیه با شیر خشک را ترجیح می دهد
3 برای او تفارتی نمی کند چگونه نوزادم را تغذیه می کنم
4 تا کنون صحبتی در باره این موضوع با او نداشته ام.

35. برای هر کدام از جملا ت زیر لطفا میزان موافقت و عدم موافقت ایده خود را مشخص نمایید. شماره 1 نشاند هنده این است که شما قویا مخالفید در حالیکه شماره 5 نشان میدهد شما قویا موافقید.

	قویا مخالف				قویا موافق
الف) مزایای تغذیه با شیر مادر فقط تا زمانی ادامه دارد که نوزاد با شیر مادر تغذیه میشود	1	2	3	4	5
ب) تغذیه باشیر خشک راحتتراز تغذیه با شیر مادر می باشد.	1	2	3	4	5
پ)تغذیه با شیر مادر رابطه عاطفی مادر و نوزاد را افزایش می دهد	1	2	3	4	5
ت) شیر مادرفاقد آهن می باشد.	1	2	3	4	5
ث) احتمال تغذیه بیش از حد درنوزادان تغذیه شده با شیر خشک بیشتر از نوزادان تغذیه شده با شیر است.	1	2	3	4	5
ج) تغذیه با شیر خشک انتخاب بهتری برای مادران شاغل است.	1	2	3	4	5
چ) مادرانی که کودک خود را با شیر خشک تغذیه می کنندازیکی ازلذت مادری بی بهره می باشند.	1	2	3	4	5
ح) مادران نباید در محل های عمومی مثل رستوران کودک را با شیرپستان تغذیه کند.	1	2	3	4	5
خ) نوزادان تغذیه شده با شیر مادر سالم تر از نوزادان تغذیه شده با شیر خشک می باشند	1	2	3	4	5
د)احتمال تغذیه بیش از حد در نوزادان تغذیه شده با شیر مادر بیشتراز نوزادان تغذیه شده با شیر خشک می باشد.	1	2	3	4	5
ذ) وقتی مادران تغذیه نوراد با شیر خود دارند پدران احساس می کنند که به آنها بی توجهی شده است.					
ر) شیر مادر یک غذای ایده ال برای نوزاد است.	1	2	3	4	5
ز) شیر مادر سهل الهضم تر از شیر خشک می باشد.	1	2	3	4	5
س) شیر خشک همانند شیر مادر یک غذای سا لم برای نوزاد می باشد.	1	2	3	4	5
ش) تغذیه با شیر مادر خیلی راحتتر از تغذیه با شیر خشک می باشد	1	2	3	4	5
ص) شیر مادر ارزانتر از شیر خشک می باشد.	1	2	3	4	5
ض) مادری که هر از گاهی سیگار می کشد نبایستی با شیر خود نوزاد را تغذیه کند.	1	2	3	4	5

5

36. چه مشکلاتی در رابطه با شیر دهی در **بیمارستان** تجربه کرده اید.(می توانید بیش از یک پاسخ داشته با شید)
الف) مشکل در گرفتن نوزاد 1

ب) مشکل در نحوه قرار دادن نوزا بر سینه1
پ) درد هنگام گرفتن سینه توسط نوزاد1
ت) درد پستان هنگام شیردهی1
ث) درد پستان هنگام عدم شیر دهی1
ج) درد پستان در همه زمان1
چ) شقاق و ترک خوردگی نوک سینه 1
ح) احتقان سینه 1
خ) نوک سینه فرو رفته1
د) شیر دهی دردناک است1
ذ) نوزاد در مکیدن مشکل دارد1.
ر) نوزاد سینه نمی گرفت1.
ز) نوزاد خیلی خسته بود(در طول شیر دهی به خواب می رفت)1.

اطلاعات دموگرافیک

37. سن شما چقدر است؟ _____

38. میزان تحصیلات شما چقدر است؟
1 ابتدایی
2 راهنمایی
3 دیپلم
4 لیسانس
5 فوق لیسانس
6 دکترا
موارد دیگر(لطفا توضیح دهید) _____

39. وضعیت تاهل شما چگونه است؟
1 متاهل می باشید.
2 طلاق گر فته اید.
3 جدا زندگی می کنید.
4 بیوه هستید.

40. وضعیت شغلی شما قبل از زایمان چگونه بود؟
1 استخدام در کادر دولتی
2 استخدام در کادر خصوصی
3 شغل آ زاد
4 خانه دار

41. آیا مرخصی زایمان جهت زایمان یا مراقبت ا ز نوزادتان استفا ده خواهید کرد؟
1 بلی
2 خیر

42. اگر بلی ، چند ماه مرخصی زایمان خواهید داشت؟
1 کمتر از 3 ماه
2 سه تا 6 ماه
3 شش تا 9 ماه
4 بین 9 تا 12 ماه

43. زمانی که سر کار برمیگر دید، آیا مر خصی ساعتی برای شیردهی خواهید داشت؟

6

1 بلی
2 خیر

44. آیا کار شما دارای شیفت شب می باشد؟
1 بلی
2 خیر

45. شغل همسر شما چیست ؟
1 استخدام در کا در دولتی
2 استخدام در کادر خصوصی
3 شغل آزاد
4 بدو.ن شغل

46. آیا شما
1 در منزلی مستقل زندگی می کنید
2 با خا نواده همسرتان زندگی می کنید.

47. چند فرزند دارید (این نوزاد نیز شامل می شود)
دختر _____ پسر _____

48. **قبل از** با ردار ی آیا سیگار می کشیدید؟
1 بلی
2 خیر(بروید به سوال 50)

49.قبل از بارداری روزانه چندعدد سیگار می کشیدید؟ _____

50. در حالیکه بلردار بودید آیا سیگار می کشیدید؟
1 بلی
2 خیر (بروید به سوال 52)

51. روزانه چند عدد سیگار میکشیدید _____

52. قبل از بارداری آیا قلیان مصرف می کردید؟
1 بلی
2 خیر(بروید به سوال 54)

53.قبل از بارداری چند باردر روز شما قلیان مصرف می کردید؟ _____

54.در طول بارداری آیا شما قلیان مصرف می کردید؟
1 بلی
2 خیر (بروید به سوال 56)

55.در طول بارداری چند بار در روز شما قلیان مضرف می کردید؟ _____

56.آیا پدر کودک سیگار میکشید زمانی که شما با ردار بودید؟
1 بلی
2 خیر

57. آیا چدر کودک قلیان مصرف می کرد زمانی که بار دار بودید؟
1 بلی
2 خیر

7

58. تاریخ تولد نوزاد _____/_____/_____

59.جنس نوزاد

1 دختر

2 پسر

اطلا عا ت گرفته شده از پرونده پزشکی

	قبل از بارداری	زمان تولد
60. وزن مادر (کیلو گرم)		
61. قد مادر (سانتی متر)		
62. قند خون مادر		
63. وزن نوزاد		
64. قد نوزاد		
65. دور سر نوزاد		

کد مصاحبه کننده: _____

نام بیمارستان : _____

تاریخ مصاحبه : ----------/----------/----------

نام کلینیک بهداشتی _____

با تشکر از همکاری شما

8

Appendix E

Follow-Up Questionnaire: Farsi Version

مطالعه کوهورت عفونت پستان عوامل خطر مرتبط با آن و اقدامات شیردهی در شیراز-ایران

پرسشنامه پیگیری بعد از زایمان

کد:

نام و نام خانوادگی مادر: _____

تلفن (منزل) :_____ موبایل _____

نام کودک : _____ جنس کو دک : دختر پسر

نام مرکز بهداشتی **:** _____

سوالات تکمیلی مربوط به نحوه تغذیه کودک شما

	الف یک ماهگی	ب 3 ماهگی	پ 4 ماهگی	ت 6ماهگی
1. امروز چگونه کودک خود را تغذیه می کنید ؟				
مایعات یا فرنی تغذیه انحصاری با شیر مادر - بدون استفاده از شیر خشک	1	1	1	1
تغذیه کامل با شیر مادر- بدون استفاده از شیر خشک اما آبمیوه یا آب داده شده است .	2	2	2	2
ترکیبی از شیر مادر و شیر خشک	3	3	3	3
شیر خشک به تنهایی	4	4	4	4

در صورتی که نیاز به ارائه توضیح بیشتری دارید, لطفا درقسمت زیر توضیحات خود را وارد نمایید.

الف _____

ب) _____

پ) _____

ت) _____

	الف یک ماهگی	ب 3 ماهگی	پ 4 ماهگی	ت 6 ماهگی
2. درصورتیکه نحوه تغذیه کودک خود را تغیر داده اید لطفا علت آن رابیان نمایید.	1	1	1	1
الف) شیر کافی نداشتم.	1	1	1	1
ب) میخواستم سر کار برگردم یا دانشگاه بروم.	1	1	1	1
پ) شوهرم مخالف بود.	1	1	1	1
ت) شیر خشک میزان رشد کودک را بیشتر میکند.	1	1	1	1
ث) دوستان و فامیل تغذیه با شیر خشک را پیشنهاد کرده اند.	1	1	1	1
ج) کارمندان بهداشتی و پزشکان تغذیه با شیر خشک را پیشنهاد کرده اند.	1	1	1	1
چ) مادر یا مادر شوهرتغذیه با شیر خشک را پیشنهاد کرده اند.	1	1	1	1
ح) تغذیه با شیر خشک آسانتر است.	1	1	1	1
خ) کودکم مدام گریه می کرد.	1	1	1	1
د) کودکم اضافه وزن کافی نداشت.	1	1	1	1
ذ) دلایل دیگر(لطفا توضیح دهید)	1	1	1	1

در صورتی که نیاز به ارائه توضیح بیشتری دارید.لطفا در قسمت زیر توضیحات خود را وارد نمایید.

الف _____

ب _____

پ _____

1

ت _____

	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
3.به طور متوسط چند بار در روز کودک خود را شیر می دهید؟				
4. چند بار ازوعده ها ی شیردهی توسط شیر مادر است؟ (اگر کودک با شیرمادر تغذیه نمیشود 00 استفاده کنید)				
5. چند بار از این وعده ها شیر خشک است؟ (اگر کودک با شیر خشک تغذیه نمیشود 00 استفاده کنید)				

6. چند وقت یکبار کودک خود را تغذیه می کنید؟	**الف یک ماهگی**	**ب 3 ماهگی**	**پ 4 ماهگی**	**ت 6 ماهگی**
هر وقت کودک گرسنه یا نا آرام است.	1	1	1	1
رامس ساعت - هر 2 ساعت یکبار.	2	2	2	2
رامس ساعت - هر 3 ساعت یکبار.	3	3	3	3
رامس ساعت - هر 4 ساعت یکبار.	4	4	4	4
موارد دیگر(لطفا توضیح دهید).				

در صورتی که نیاز به ارائه توضیح بیشتری دارید،لطفا در قسمت زیر توضیحات خود را وارد نمایید.

الف _____

ب _____

پ _____

ت _____

7.اگر کودک شما بعد از تغذیه با شیر مادر همچنان گرسنه بود/است آیا بلافاصله او را با شیر خشک تغذیه می کنید ؟	**یک ماهگی**	**3 ماهگی**	**4 ماهگی**	**6 ماهگی**
بلی	1	1	1	1
خیر	2	2	2	2

8. آیا تا بحال به کودکتان هر نوع غذای جامد یا نیمه جامد داده اید؟	**یک ماهگی**	**3 ماهگی**	**4 ماهگی**	**6 ماهگی**
بلی	1	1	1	1
خیر	2	2	2	2

9. در چه سنی به کودکتان برای اولین بار غذای جامد یا نیمه جامد داده اید؟ _____(هفتگی) **لطفا این قسمت را بعد از اینکه برای اولین بار به کودک غذای جامد دادید تکمیل نمایید.**

10.در چه سنی برای اولین بار غذاها و مایعات زیر داده اید؟ *سن را بنویسید . در صورتیکه کودک 6ماهه است وهمچنان هیچ کدام از موارد زیر را دریافت نکرده است* **خیر** *نوشته شود .*	
الف) شیر خشک	
ب) آب نوشیدنی	
پ) آبمیوه	
ت) شیر گاو	
ث) انواع دیگر شیرهای دامی مانند شیر بز یا بره	
ج) آب قند	
چ) فرنی	

2

ح) انواع غلات	
خ) تخم مرغ	
د) عدس و لوبیا	
ذ) سوپ گوشت و سبزیجات	
ر) ماست	
ز) میوه ها (مثل خرما و سایر میوه های تازه)	
س) غذای خانواده	
ش) گیاهان دارویی	
ص)غذاهای دیگر (توضیح دهید)	
ض) غذاهای دیگر (توضیح دهید)	
ط) غذاهای دیگر (توضیح دهید)	

(اگر بعد از آخرین مصاحبه تغذیه با شیر خشک را بصورت انحصاری یا ترکیبی شروع کرده اید)	الف یک ماهگی	ب 3 ماهگی	پ 4 ماهگی	ت 6 ماهگی
11 . زمانی که تغذیه با شیر خشک (مثلا روزانه) شروع کردید، سن کودک شما چقدر بود؟	_____	_____	_____	_____
12. آیا کودک شما از پستانک استفاده می کند؟				
بلی	**1**	**1**	**1**	**1**
خیر	**2**	**2**	**2**	**2**

.

13. زمانی که اولین بار به کودکتان پستا نک دادید او چند هفته بود؟ _____ (هفته)

14. چه زمانی کودکتان ازپستانک استفاده می کند؟

الف) در طول روز1

ب) درطول شب**2**

ج) در طول شب و روز **3**

15. به چه دلیل (دلایلی) برای کودکتان از پستانک استفاده کردید ؟ (می توانید بیش از یک دلیل ذکر کنید).

الف) برای اینکه کمک کند تا کودکم به خواب برود1.

ب)برای اینکه به هنگام دندان در آوردن او را آرام می کند1.

پ) برای اینکه از مکیدن انگشتانش جلوگیری می کند1.

ت)برای اینکه کودک را راحت وآرام نگه می دارد1.

ث) برای اینکه حواس کودک را پرت کند1 .

ج) برای اینکه استفاده از پستانک امری عادی است1.

چ) برای اینکه احتمال مرگ ناگهانی کودک را کم می کند1.

ح)برای اینکه مکیدن امر طبیعی برای کودکان است1.

خ)برای اینکه کمک می کند بعد از تغذیه با شیر مادر،پستان را رها کند1.

د)برای اینکه به طولانی شدن زمان بین تغذیه کمک میکند1.

ذ) نمی دانم1

16. آیا کسی جهت مراقبت از کو دکتان به شما کمک می کند؟	الف یک ماهگی	ب 3 ماهگی	پ 4 ماهگی	ت 6 ماهگی
الف) همسرم	1	1	1	1
ب) مادر بزرگ کودکم (مادرم)	1	1	1	1

3

پ) مادر بزرگ کودکم (مادر همسرم)	1	1	1	1
ت) اعضای دیگر خانواده	1	1	1	1
ث) پرستار کودک	1	1	1	1
ج) مهد کودک	1	1	1	1
چ) افراد دیگر(توضیح دهید)				

در صورتی که نیاز به ارائه توضیح بیشتری دارید،لطفا در قسمت زیر توضیحات خود را وارد نمایید.

الف _____

ب _____

پ _____

ت _____

17 آیا بعد از ترخیص از بیمارستان کسی از افراد زیر برای تغذیه کودکتان شما را راهنمایی و حمایت کرد؟

الف) پرستار یا ما ما ا

ب) پرسنل بهداشتی در در مانگا ها ا

پ) مشاور شیر دهی1

ت) مادرتان1

ث) مادر شوهرتان1

ج) پزشکتان1

چ) افراد دیگر (بیان کنید)1.

	الف یک ماهگی	**ب 3 ماهگی**	**پ 4 ماهگی**	**ت 6 ماهگی**
18. تعداد دفعاتی که بعد از آ خرین مصاحبه کودکتان به اسهال مبتلا شده است را بیان کنید. (3 بار در روز مدفوع آ بکی که برای 2 روز ادامه داشته باشد)	_____	_____	_____	_____

19. از آنجا که شما اخیرا صاحب کودکی شده اید، ما تمایل داریم احساس شما را بدانیم. لطفاگزینه ای راکه به بهترین نحو احساس شما را در **هفت روز گذشته** توصیف میکند مشخص کنید(نه فقط احساستان در امروز) .(این سوالات فقط در **1 و 6** ماهگی پرسیده شود)

	یک ماهگی	**6 ماهگی**
الف) موضوعات خنده دار توانسته اند باعث خنده من بشوند.		
درست به اندازه قبل	**1**	**1**
کمتر از قبل	**2**	**2**
خیلی کمتر از قبل	**3**	**3**
اصلا	**4**	**4**
ب) چیزهایی که برای من اتفاق افتاده اند خوشحال کننده و لذت بخش بوده اند.		
درست به اندازه قبل	**1**	**1**
کمتر ازآن حدی که معمولا پیش می آ مده.	**2**	**2**
خیلی کمتر ازآن حدی که معمولا پیش می آمده.	**3**	**3**
به سختی چنین چیزی بوده است.	**4**	**4**
پ) وقتی چیزی درست ازآب در نیامده من بی جهت خود را سرزنش کرده ام.		
اغلب	**1**	**1**
گاهی	**2**	**2**
به ندرت	**3**	**3**
هیچوقت	**4**	**4**
ت) من بدون دلیل مضطرب و نگران بوده ام.		
نه اصلا	**1**	**1**
به ندرت	**2**	**2**

4

گاهی	3	3
اغلب	4	4
ث) من بدون دلیل احساس ترس و هراس کرده ام.		
بله خیلی زیاد	1	1
بله گاهی اوقات	2	2
به ندرت	3	3
اصلا	4	4
ج) همه چیز برایم وارونه اتفاق افتاده است.		
بله اغلب اوقات من نتوانسته ام از پس آنها بر بیایم.	1	1
بله بعضی اوقات من نتوانسته ام از پس آنها بر بیایم.	2	2
نه اغلب من توانسته ام به خوبی همیشه از پس آنها بر بیایم.	3	3
نه من توانسته ام به خوبی همیشه از پس آنها بر بیایم.	4	4
چ) من به حدی ناراحت بوده ام که نتوانستم بخوابم.		
بله بیشتر اوقات	1	1
بله بعضی اوقات	2	2
بله به ندرت	3	3
نه اصلا	4	4
ح) من احساس غمگینی و بد بختی کرده ام.		
بله اغلب اوقات	1	1
بله خیلی اوقات	2	2
گاهگاهی	3	3
نه هیچوقت	4	4
خ) من به حدی ناراحت بوده ام که گریه کرده ام.		
بله اغلب اوقات	1	1
بله خیلی از اوقات	2	2
فقط گاهگاهی	3	3
نه هیچوقت	4	4
د) این فکر به سرم زده است که به خودم صدمه بزنم.		
بله خیلی زیاد	1	1
گاهگاهی	2	2
به ندرت	3	3
هیچوقت	4	4

مشکلات ضمن شیر دهی

	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
20. آیا از زمانی که بیمارستان را ترک کردید مشکلاتی در رابطه با پستان و یادر رابطه با شیر دادن به کودکتان داشته اید.				
بلی	1	1	1	1
خیر	2	2	2	2

21. چه مشکلاتی داشته اید.(می توانید بیشتر از یک پاسخ انتخا ب کنید).	**الف یک ماهگی**	**ب 3 ماهگی**	**پ 4 ماهگی**	**ت 6ماهگی**
الف) مشکلات درنحوه گرفتن نوزاد.	1	1	1	1
ب) مشکلات در گرفتن پستان توسط نوزاد.	1	1	1	1
پ) درد هنگام گرفتن پستان توسط نوزاد	1	1	1	1
ت) درد هنگام شیر دهی	1	1	1	1
ث) درد غیر از زمان شیر دهی	1	1	1	1
ج) درد در همه زمان ها	1	1	1	1
چ)تَرک نوک پستان و شقاق	1	1	1	1
ح) احتقان پستان (پرشیری پستان)	1	1	1	1
خ) عفونت پستان	1	1	1	1
د) فرورفتگی نوک پستان	1	1	1	1
ذ)کودک اضافه وزن مناسبی ندارد.	1	1	1	1
ر) کودک در مکیدن مشکل دارد.	1	1	1	1
ز) کودک مقدارزیادی یا با سرعت زیادی شیر دریافت می کند.	1	1	1	1
س) رگ کردن پستانم ضعیف است.	1	1	1	1
ش) کودک پستان را پس می زند.	1	1	1	1
ص) کودک هنگام شیر خوردن خیلی خسته است (زود به خواب میرود)	1	1	1	1

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ض) احساس می کنم به خوبی شیردهی نمیکنم.	1	1	1	1
ف) شیر کافی برای کودکم ندارم.	1	1	1	1
ق) مشکلات دیگر				
ط) مشکلات دیگر				

در صورتی که نیاز به ارائه توضیح بیشتری دارید،لطفا در قسمت زیر توضیحات خود را وارد نمایید.

الف _____

ب _____

پ _____

ت _____

	یک ماهگی	3 ماهگی	4 ماهگی	6ماهگی
22.آیا از زمان آ خرین مصاحبه شیر خودرا دوشید ه اید.				
بلی	1	1	1	1
خیر	2	2	2	2

23. هنگامی که اولین بار شیرتان دوشیدید نوزاد شما چند هفته بود؟ _____ (هفته)

24. عمدتا ازچه روشی برای دوشیدن شیر استفاده کرده/می کنید؟	یک ماهگی	3 ماهگی	4 ماهگی	6ماهگی
بوسیله دست	1	1	1	1
پمپ دستی	2	2	2	2
پمپ الکتریکی	3	3	3	3

25. چرا شما شیرتان را دوشیده اید؟ (می توانید بیش از یک دلیل داشته باشید)	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
الف) شیر اضافه را میخواستم (محض احتیاط)	1	1	1	1
ب) تغذیه توسط فرد دیگری انجام می شود (باید سر کار بروم)	1	1	1	1
پ) تغذیه توسط پرستار کودک انجام می شود.	1	1	1	1
ت) مقدار شیرم زیاد است /اذیت میشوم.	1	1	1	1
ث) عفونت پستان داشتم	1	1	1	1
ج) کودکم بیمار بود	1	1	1	1
چ) خودم بیمار بودم.	1	1	1	1

	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
26. ایا مشکلی با دوشیدن شیر داشته اید؟				
بلی	1	1	1	1
خیر برو ید به سوال 28	2	2	2	2

	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
27. کدام یک از مشکلات زیر را تجربه کرده اید؟(می توانید بیش از یک پاسخ داشته باشید)				
زمان زیادی طول میکشد.	1	1	1	1
درد ناک بود.	1	1	1	1
به سختی شیر کافی تولید می کردم	1	1	1	1
28. آیا قبل از شیر دهی دست خود را با آب گرم و صابون می شویید؟				
همیشه	1	1	1	1
معمولا	2	2	2	2
هر موقع بتوانم	3	3	3	3
گاهی	4	4	4	4
هرگز	5	5	5	5
29. آیا قبل از شیر دهی نوک پستان خود را میشویید؟				
همیشه	1	1	1	1
معمولا	2	2	2	2
هر موقع بتوانم	3	3	3	3

6

هر از گاهی هر گز	4 5	4 5	4 5	4 5
30. آیا از زمانی که از بیمارستان ترخیص شده اید پستان بند مخصوص شیر دهی پوشیده اید ؟				
بلی معمولا استفاده میکنم. بلی اما دیگر استفاده نکرده ام. نه	1 2 3	1 2 3	1 2 3	1 2 3
31. آیا از زمانی که از بیمارستان ترخیص شده اید کرم برای نوک پستان خود استفاده کرده اید؟				
بلی معمولااستفاده میکنم بلی اما دیگه استفاده نکرده ام. نه	1 2 3	1 2 3	1 2 3	1 2 3
32. آیا از زمانی که از بیما رستان ترخیص شده اید کرم ضد قارچ برای نوک پستان تان استفاده کرده اید؟(برای قارچ)				
بلی معمولا استفاده می کنم بلی اما دیگه استفاده نکرده ام نه	1 2 3	1 2 3	1 2 3	1 2 3
33. آیا از زمان ترخیص عفونت قارچی داشته اید؟ بلی خیر	1 2	1 2	1 2	1 2

سوالات مربوط به عفونت پستان

	یک ماهگی	3ماهگی	4ماهگی	6ماهگی
34. آیا از زمانی که از بیمارستان ترخیص شده اید عفونت پستان داشته اید؟ بلی خیر (بروید به سوال 75)	1 2	1 2	1 2	1 2
35.از زمانی که از بیمارستان ترخیص شده اید تاکنون چند بار عفونت پستان داشته اید؟	_____	_____	_____	_____
36. از زمان آخرین مصاحبه ،کودک شما چند هفته بود که به عفونت پستان مبتلاشدید؟ (اگر بیش از یک بار بوده اولین سن ابتلا را ذکر کنید).	_____ هفته	_____ هفته	_____ هفته	_____ هفته

لطفا وضعیت پستان خودرا در هنگام ابتلا به عفونت پستان بر اساس مقیاس 1 تا 5 بیان کنید.	یک ماهگی	3 ماهگی	4 ماهگی	6ماهگی
37. آن قسمت ازپستان مبتلا به عفونت ، دارای: 1 2 3 4 5 حساسیت نرمال غیر قابل تحمل در تماس				
38. آن قسمت از پستان مبتلا به عفونت ، دارای : 1 2 3 4 5 پوست طبیعی پوست خیلی داغ بود				
39.آن قسمت ازپستان مبتلا به عفونت،دارای: 1 2 3 4 5 رنگ پوست طبیعی پوست خیلی قرمز بود				

40 در زمان اوج شدت عفونت پستان ، میزان درجه حرارت شما چقدر بود؟	یک ماهگی	3ماهگی	4 ماهگی	6ماهگی
کمتر از 37.4 درجه سانتی گراد	1	1	1	1
38.1 تا 38.5 درجه سانتی گراد	2	2	2	2
38.6 تا 40 درجه سانتی گراد	3	3	3	3
بالا تر از 40 درجه سانتی گراد	4	4	4	4

41. اگر میزان درجه حرارت بدن خود نمی دانید کدام موارد زیر را حدس میزنید؟	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
1 2 3 4 5 نرمال حدودی بالا بود بالا خیلی بالا بشدت بالا بود	1 2	1 2	1 2	1 2

زیر 37.4	37.5 تا 38	38.1تا 38.5	38.6 تا 40	بالا تر از 40	3	3	3	3
					4	4	4	4
					5	5	5	5

42.اگر درجه حرارتتان در زمان عفونت پستان بالارفته بود ،چه مدت طول کشید که به میزان طبیعی برگردد؟	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
حدود 24 ساعت	1	1	1	1
24-48 ساعت	2	2	2	2
بیشتر از 48 ساعت	3	3	3	3

43.آیا در زمان ابتلا به عفونت پستان، لرز داشتید؟	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
1 2 3 4 5				
نه اصلا بشدت می لرزیدم				
44. ایا دردی مانند درد سرما خوردگی داشتید؟				
1 2 3 4 5				
نه اصلا بشدت سرماخوردگی درد داشتم				

	یک ماهگی	3 ماهگی	4 ماهگی	6ماهگی
45. آیا هنگام عفونت پستان آنقدراحساس بیماری داشتید که در رختخواب بستری شدید ؟	1	1	1	1
بلی	2	2	2	2
خیر				
46. اگر بلی طول مدت آن را علا مت زنید.				
کمتر از 24 ساعت	1	1	1	1
24-48 ساعت	2	2	2	2
بیش از 48 ساعت	3	3	3	3
47.آیا توسط یکی از افراد زیرتوصیه های درمانی دریافت کردید ؟				
الف) پزشک عمومی	1	1	1	1
ب) ماما	1	1	1	1
پ) پرسنل بهداشتی	1	1	1	1
ت) افراد دیگر(توضیح دهید)				

الف

ب _____

پ _____

ت _____

48. اگر شما توصیه درمانی از بیش از یک منبع دریافت کردید،آیا آن اطلاعات متناقض بود؟	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
1 2 3 4 5				
اصلا تناقض نداشت خیلی تناقض داشت				

لطفا پیشنهاداتی که از طرف افراد مختلف دریافت کرده اید علامت زنید.

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	پزشک عمومی	ماما	درمانگاه. پرستار	افراد دیگر
49. پیشنهاد درمان:				1
الف) توقف شیردهی از پستان مبتلا به عفونت	1	1	1	1
ب) توقف شیردهی به طور کامل (از شیر گرفتن کودک)	1	1	1	1
پ) شیردهی مکرر از پستان مبتلا	1	1	1	1
ت) شروع شیردهی از پستان مبتلا	1	1	1	1
ث) ماساژ پستان مبتلا قبل و در طول شیر دهی	1	1	1	1
ج) قطع مصرف کرم و محلولهای نوک پستان مبتلا	1	1	1	1
چ) گرم کردن پستان مبتلا قبل و در طول شیر دهی	1	1	1	1
ح) استفاده از کمپرس سرد بعد از شیر دهی	1	1	1	1
خ) درمان پستان مبتلا با سونوگرافی	1	1	1	1

50. افراد دیگر چه درمانی را توصیه کردند؟ ----------

	یک ماهگی	3ماهگی	4ماهگی	6 ماهگی
51. آیا جهت درمان، آنتی بیوتیک داخل وریدی دریافت کرده اید؟				
بلی	1	1	1	1
خیر	2	2	2	2
52. آیا آ جهت درمان ،عفونت پستان آنتی بیوتیک خوراکی دریافت کرده اید؟	1	1	1	1
بلی	2	2	2	2
خیر				

53. چه نوع آنتی بیوتیکی دریافت کرده اید ؟

الف _____

ب _____

پ _____

ت _____

54. چه چیزی راعلت عفونت پستان شما عنوان کرده اند؟

الف _____

ب _____

پ _____

ت _____

یک هفته قبل از ابتلا به عفونت پستان :

	یک ماهگی	3 ماهگی	4 ماهگی	6 ماهگی
55.آیا پستان شما حین تمرینات کششی آسیب دیده است؟				
1 2 3 4 5				
آسیب ندید ه امت بشدت آسیب دیده امت				
56. آیا پستان شما از ضربه آسیب دیده است؟				
1 2 3 4 5				
آسیب ندیده است بشدت آسیب دیده				
57. آیا پستان شمادر اثر ترک خوردگی یاخراشیدگی نوک پستان آسیب دیده است؟				
1 2 3 4 5				

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آسیب ندیده است بشدت آسیب دیده				
58. آیا در هنگام شیر دهی از محافظ نوک پستان استفاده کرده اید؟ 1 2 3 4 5 اصلا همیشه				
59. آیا بعد از شیر دهی نوک پستان خود را با پد پوشانده اید؟ 1 2 3 4 5 اصلا همیشه				
60. آیا کرم یا لوسیون برای نوک پستان خود استفاده کرده اید؟ 1 2 3 4 5 اصلا همیشه				

در **48** ساعت قبل از عفونت پستان :	یک ماهگی	3ماهگی	4ماهگی	6 ماهگی
61. آیا احتقان پستان داشته اید؟ 1 2 3 4 5 اصلا بشدت محتقن بود				
62.آیا مجرای شیر شما بسته بود؟ 1 2 3 4 5 اصلا بشدت بسته بود				
63. وضعیت شیر شما چگونه بود؟ 1 2 3 4 5 معمولی بود غلیظ تر از معمول				
64. تغذیه کودکتان چگونه بود؟ 1 2 3 4 5 کمتر از معمول معمولی بیشتر از معمول				
65. آیا برای تغذیه کودکتان ازشیر کمکی استفاده کردید؟ 1 2 3 4 5 هرگز معمولی بیشتر از معمول				
66.آیا کودک خود را طبق روتین ازپیش تعیین شده شیر داده اید؟ 1 2 3 4 5 هرگز اغلب				
67. آیا مجبور شدید شیردهی را باتاخیر شروع کنید؟ 1 2 3 4 5 هرگز اغلب				
آیا پستان خود را با یکی از موارد زیر محکم نگه داشته اید؟ **68. استفاده از یک پستان بند تنگ؟** 1 2 3 4 5 نه بشدت محدود				
69. پوشیدن لباس تنگ؟ 1 2 3 4 5 نه بشدت محدود				
70. آیا هنگام خواب پستان بند پوشیده اید؟ 1 2 3 4 5 هرگز معمولا				
71. آیا کودکتان برای گرفتن پستان مشکل داشت؟ 1 2 3 4 5 هرگز معمولا				
72. آیا نوک پستان شما در حین شیر دهی زخم شد؟ 1 2 3 4 5 هرگز معمولا				
73.بلا فاصله بعد از شیردهی شکل نوک پستان شما چگونه بود؟ 1 2 3 4 5 شکل طبیعی کاملا شکل غیرطبیعی				

یک **هفته قبل** از عفونت پستان:

74. کودک شما به کدام موارد زیر مبتلا بوده است؟	**یک ماهگی**	**3ماهگی**	**4 ماهگی**	**6 ماهگی**
الف) قارچ دهان	1	1	1	1
ب) قارچ در ناحیه مقعد و دستگاه تناسلی	1	1	1	1

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پ) هیچ کدام	1	1	1	1

پایان پرسش های عفونت پستان

75. آیا شما به کم خونی مبتلا بودید؟	**یک ماهگی**	**3 ماهگی**	**4ماهگی**	**6ماهگی**
بلی	1	1	1	1
خیر	2	2	2	2

کدام موارد زیر چگونگی احساس شما را در **هفته گذشته** نشان می دهد؟

		یکماهگی	3 ماهگی	4 ماهگی	6 ماهگی
چه درجه ای از : **76. خستگی تجربه کرده اید؟**	1 2 3 4 5 6 7 8 9 10 اصلا مقدار زیاد ا				
77.شدت خستگی چقدر بود؟	1 2 3 4 5 6 7 8 9 10 متوسط شدید				
78. خستگی باعث اضطراب شما شده است؟	1 2 3 4 5 6 7 8 9 10 بدون دیسترس بشدت دیسترس				

79. هفته گذشته چند بار خسته شده اید؟	**یک ماهگی**	**3 ماهگی**	**4**	**6 ماهگی**
هر روز	4	4	4	4
بیشتر روزها اما نه همه روزه	3	3	3	3
گاهگداری اما نه بیشتر روزها	2	2	2	2
تقریبا هیچ روزی	1	1	1	1
80. درجه خستگی شما در هفته گذشته چقدر تغیر کرده است؟				
افزایش یافته است	4	4	4	4
خستگی افزایش و کاهش یافته است	3	3	3	3
ثابت مانده	2	2	2	2
کاهش یا فته است	1	1	1	1

در **چهار هفته گذشته** موارد زیر را چند بار تجربه کرده اید؟

	تقریبا هیچ وقت 1	گاهی اوقات 2	اغلب 3	معمولا 4	یک ماهگی	3 ماهگی	4 ماهگی	ماهگی
81. احساس تنهاییو جدایی از دیگران داشته اید								
82. احساس آرامش داشته اید								
83. احساس نا امیدی داشته اید								
84. پر انرژی بوده اید								
85.از طرف مردم تحت فشار بوده اید								
86.ترس از آینده داشته اید								
87. برای تاریخ انجام کارها تخت فشار بوده اید								

88. برای هر کدام از جملات زیرلطفا میزان موافقت و عدم موافقت ایده خود را مشخص نمایید. عدد 1 نشاندهنده این است که شما قویا مخالفید در حالیکه عدد 5 نشان می دهد شما قویا موافقید (**فقط در 6 ماهگی**).

6 ماهگی		**قویا مخالف**				**قویا موافق**
	الف) مزایای تغذیه با شیر مادر فقط تازمانی ادامه دارد که نوزاد با شیر مادرتغذیه میشود.	1	2	3	4	5
	ب) تغذیه با شیر خشک راحت تر ازتغذیه با شیر مادر می باشد	1	2	3	4	5
	پ) تغذیه با شیر مادر رابطه عاطفی مادر و نوزاد را افزایش می دهد	1	2	3	4	5
	ت) شیر مادرفاقد آهن می باشد	1	2	3	4	5

11

	ث)احتمال تغذیه بیش از حد در نوزادان تغذیه شده با شیر خشک بیشتر از نوزادان تغذیه شده با شیر مادراست	1	2	3	4	5
	ج) تغذیه با شیر خشک انتخاب بهتری برای مادران شاغل است.	1	2	3	4	5
	چ) مادرانی که کودک را با شیر خشک تغذیه می کنند، از یکی از لذ ت مادری بی بهره هستند.	1	2	3	4	5
	ح) مادران نباید در محلهای عمومی مثل رستوران کودک را با شیر پستان تغذیه کند.	1	2	3	4	5
	خ) کودکان تغذیه شده با شیر مادر سالم تر از کودکان تغذیه شده با شیر خشک می باشند.	1	2	3	4	5
	د)احتمال تغذیه بیش از حد درکودکان تغذیه شده با شیر مادر بیشتر ازنوزادان تغذیه شده با شیر خشک است.	1	2	3	4	5
	ذ) وقتی مادران تغذیه کودک با شیر خود دارند پدران احساس می کنند که به آنها بی توجهی شده است.	1	2	3	4	5
	ر)شیر مادر یک غذای ایده آل برای کودک است	1	2	3	4	5
	ز) شیر مادر سهل الهضم تر از شیر خشک می باشد	1	2	3	4	5
	س) شیر خشک همانند شیر مادر یک غذای سالم برای کودک می باشد	1	2	3	4	5
	ش) تغذیه با شیر مادرخیلی راحتتر از تغذیه با شیر خشک می باشد	1	2	3	4	5
	ص) شیر مادر ارزانتراز شیر خشک می باشد	1	2	3	4	5
	ض) مادری که هر از گاهی سیگار می کشد نبایستی با شیر خود کودک را تغذیه کند	1	2	3	4	5

اگر مادربعد از آخرین مصاحبه تغذیه کودک با شیر خود را قطع کرد ه است

89. کودک شما چند هفته بود که تغذیه با شیرپستان را متوقف کردید؟ _____ (هفته)

90. چرا تصمیم به توقف شیر دهی گرفتید؟ (میتوانید بیش از یک دلیل ذکر نمایید)

.

---

91. آیا ناگهانی تغذیه با شیر پستان را قطع کردید؟

بلی 1

خیر 2

92. چه کسی پیشنهاد قطع شیر دهی را به شما داده است(پاسخ شما میتواند بیش از یکی باشد)

الف) این تصمیم خودم بود1

ب) همسرم1

پ) مادرم1

ت) مادر شوهرم1

ث) دیگر فامیل و یا دوستان1

ج) پزشک عمومی1

چ) پزشک متخصص اطفال1

ح) پرسنل بهداشتی1

خ) دیگر پرسنل درمانی1

93. آیا شما تصمیم گرفته بودید که الان شیر دهی را متوقف کنید ؟

بلی1

12

خیر2

94. آیا شما تمایل داشتید که برای مدت طولانی تری کودکتان را با شیر پستان تغذیه کنید؟

بلی1

خیر2

95. شما بر نامه ریزی کرده بودید که تا چه مدت شیر دهی را ادامه دهید؟ _____ (هفته)

اطلاعات گرفته شده از مراکز بهداشتی

	یک ماهگی	3 ماهگی	4ماهگی	6 ماهگی
96.وزن مادر (کیلو گرم)				
97. قد مادر(سانتی متر)				
98.میزان قند خون مادر				
99. وزن کودک (کیلو گرم)				
100.قد کودک (سانتی متر)				
101.دور سر کودک				

	ماه اول	ماه سوم	ماه چهارم	ماه ششم
تاریخ مصاحبه (----/------/-------)				
کد مصاحبه کننده				

Appendix

F

Appendix F

Approval: Ethics Committee of Curtin University

Curtin University

Memorandum

To	Prof Jane Scott, Public Health
From	Professor Peter O'Leary, Chair, Human Research Ethics Committee
Subject	Protocol Approval **HR 31/2014**
Date	13 March 2014
Copy	Mahnaz Zarshenas Public Health Dr Yun Zhao Public Health John Curtin Distinguished Professor Colin Binns 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 "*A cohort study of mastitis, related risk factors and breastfeeding practice in Shiraz, Southwest Iran.*". 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 31/2014.** *Please quote this number in any future correspondence*.
- Approval of this project is for a period of four years **13-03-2014** to **13-03-2018**.
- Your approval has the following conditions:
  i) Annual progress reports on the project must be submitted to the Ethics Office.
- **It is your responsibility, as the researcher, to meet the conditions outlined above and to retain the necessary records demonstrating that these have been completed.**

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 **Progress Report** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development annually.

Our website https://research.curtin.edu.au/guides/ethics/non_low_risk_hrec_forms.cfm contains all other relevant forms including:

- Completion Report (to be completed when a project has ceased)
- Amendment Request (to be completed at any time changes/amendments occur)
- Adverse Event Notification Form (If a serious or unexpected adverse event occurs)

Yours sincerely

Professor Peter O'Leary
Chair Human Research Ethics Committee

Appendix G

Approval:
Ethics Committee of
Shiraz University

Shiraz University of
Medical Sciences
(Vice-Chancellor for Research)

Date .....
No.:.....
2 Jun 2014
2014-209

TO WHOM IT MAY CONCERN

This is to certify that the research proposal entitled *"A Cohort Study of Mastitis, Related Risk Factors and Breastfeeding Practices in Shiraz, Southwest of Iran"*, submitted by Ms. **Mahnaz Zarshenas**, was approved by the "Local Research Ethics Committee" of this University. Please do not hesitate to contact us if you need any further information.

Sincerely yours,

Seyed Basir Hashemi, MD.
Vice-Chancellor for Research
Shiraz University of Medical Sciences
Shiraz, Iran

Shiraz University of Medical Sciences - Zand Blvd., Shiraz - Iran Post code: 71345-1978
E-mail: seeden@sums.ac.ir

Appendix H

Appendix H

Information Sheet: English Version

Curtin University

Information Sheet-Mothers

A cohort study of mastitis, related risk factors and breastfeeding practices in Shiraz, Southwest Iran

The School of Public Health at Curtin University is studying how babies are fed and what problems their mothers experience during breastfeeding. As part of this project, mothers of newborns in Shiraz, Iran are being asked about their infant feeding experiences and opinions. While you will not benefit directly from participating in this study, the information you provide will help us plan and deliver better health care services for you and other women like you in the future.

Initially you will be asked to complete an interview and provide us with information about how you are feeding your baby and your experiences while in hospital. We will ask you to help us with further interviews when your baby is 1, 3, 4 and 6 months old. These interviews will take just 15 minutes and will be conducted at your local Maternal and Child Health Clinic when you bring your baby for his or her regular check-ups at these times. During follow up, you will be asked about the types of foods you are feeding your baby and any problems you have had. In addition, we will obtain some information from your medical record about your pregnancy including your blood sugar levels and your weight during and after pregnancy, as well as measurements of your baby's growth such as weight, length and head circumference.

This study is completely voluntary and you have right to participate or not to participate. If you agree to participate you can withdraw from this study at any time, or choose not to respond to any question if you do not wish to answer it. The future health care that is offered to either you or your baby will not be affected in any way by whether or not you participate in this study.

Any information you provide will be stored securely and not revealed to anyone outside of the research team. Your name, baby's name or family's name will be not be used in any reports or publication for confidentiality. If you have any questions, the research person interviewing you, the researcher (Mahnaz Zarshenas) or the supervisor (Professor Scott) will be able provide you with more information. If you are able to help us with our research, please sign the consent form and provide us with your name, address and telephone number. This contact information is required so that we can schedule your follow-up clinic visits.

Thank you in anticipation of your assistance.

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 4641). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. 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.

Yours sincerely

Mahnaz Zarshenas
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Fax: +61 8 9250 2958
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Appendix

I

Appendix I

Information Sheet:
Farsi Version

فرم رضایت آگاهانه

شرکت در طرح تحقیقاتی

عنوان طرح پژوهشی	مطالعه کوهورت عفونت پستان ، فاکتورهای خطر مرتبط با آن و اقدامات شیر دهی در شیراز- ایران
شماره طرح پژوهشی	31 /2014HR
نام مجری یا مجریان	مهناز زرشناس ، پروفسور اسکات ، پروفسور بینز
دانشکده یا واحد مربوطه	بخش بهداشت دانشگاه کرتین (استرالیا)
معرفی پژوهش	این مطالعه بررسی وضعیت شیر دهی مادران در شیراز می باشد که چگونگی تغذیه کودکان و مشکلاتی که مادران در طول شیردهی تجربه می کنند را ارزیابی خواهد کرد.
مزایا	اطلاعاتی که توسط شما در این طرح ارائه می شود به اجرای یک مراقبت بهداشتی مناسب در آینده برای شما و دیگر مادران ،کمک خواهد کرد.
محرمانه بودن	هرگونه اطلاعاتی که شما در اختیار ما قرار می دهید به صورت محرمانه محفوظ خواهد ماند وهیچ کس به جزتیم مطالعه دسترسی به آن نخواهد داشت. نام شما وکودکتان برای هرنوع گزارش یا چاپ مقاله ذکر نخواهد شد.
پاسخگویی به پرسش ها	در صورت داشتن هر گونه سوالی محقق (مهناز زرشناس) و یا استاد راهنما (پروفسور اسکات) آماده جهت پاسخگویی به شما خواهند بود .09173171612
حق نپذیرفتن یا انصراف	شرکت شما در این مطالعه کاملا آزاد خواهد بود . اگر موافق به همکاری هستید در طول مطالعه هرزمان تمایل به همکاری نداشتید میتوانید به سوالات پاسخ ندهید.
رضایت	با توجه به اطلاعات موجود در این فرم و توضیحات حضوری مجری یا همکاران طرح موافقت خود را با شرکت در این مطالعه اعلان می نمایم.
اطلاع رسانی، پیشنهادات و پیگیری مشکلات	ضمن تشکر از همکاری شما در این تحقیق لطفا هر گونه نظرات ، پیشنهادات و یا مشکلاتی در پروسه تحقیق وجود داشته است با شماره 2122686 دفتر کمیته اخلاق دانشگاه علوم پزشکی شیرازبا ما در میان بگذارید.

نام و نام خانوادگی مادر: امضاء تاریخ

Appendix J

Consent Sheet: English Version

Curtin University

Subject ID

CONSENT FORM

A cohort study of mastitis, related risk factors and breastfeeding practices in Shiraz, Southwest Iran

I, _____ , have read the information sheet, and have been informed about the purpose of this research project.

I agree to participate in this research, but have the option to change my mind and withdraw at any time.

I agree to take part in interviews where my answers will be transcribed onto a questionnaire.

I agree to allow the research team to access my medical record and that of my child for the purposes of this study.

I understand that all information provided by me will be treated as confidential and that my identity will remain anonymous.

I understand that no individual data will be used except in aggregated form for subsequent reporting purposes.

Name of participant	Signature of participant	Date
_____	_____	_____
Name of witness	Signature of witness	Date
_____	_____	_____

Consent Form Version 1 21 January 2014

Appendix K

Consent Sheet:
Farsi Version

فرم موافقت

مطالعه کوهورت عفونت پستان فاکتورهای خطر مرتبط با آن و اقدامات شیر دهی در شیراز- ایران

اینجانب فرم اطلاعات مربوط به مادران را خوانده ام و در مورد اهداف این مطالعه اطلاع دارم.

من موافقم با شرکت در این مطالعه و می دانم هر زمان بخواهم می توانم همکاری نداشته باشم.

من موافقم که در مصاحبه شرکت کنم و به سوالات پرسشنامه پاسخ دهم.

من موافقم که تیم تحقیق دسترسی به اطلاعات پزشکی ثبت شده در پرونده کودکم برای اهداف مطا لعه داشته باشد.

من اطلاع دارم که همه اطلاعات مربوط به من محرمانه خواهد بود.

من می دانم اطلاعات فردی مثل نام من و کودکم در هیچ مقاله ای ذکر نخواهد شد.

نام شرکت کننده

امضا

تاریخ

نام شاهد

امضا

تاریخ

Appendix L

Poster Presentation

Presented at the18th International Society for Research in Human Milk and Lactation, 3-7 March 2016 Stellen bosch, South Africa

Curtin University

Association of maternity practices and in-hospital feeding practices in Iran

Mahnaz Zarshenas[1,2], Yun Zhao[1], Colin W. Binns[1], Jane A. Scott[1],

[1]School of Public Health, Curtin University, Perth, Australia [2]Fatemeh College of Nursing and Midwifery, Shiraz University of Medical Science, Iran

Introduction:

The "10 Steps to Successful Breastfeeding" summarise the evidence-based maternity practices necessary to support exclusive and continued breastfeeding[1]. Little is known however, of the extent to which these steps are practiced in Iranian maternity hospitals.

Methods:

A city-wide prospective cohort study of breastfeeding was conducted in Shiraz, Iran. A total of 700 mothers delivering in three public and two private maternity hospitals were recruited between June and August 2014. Within 48 hours of the birth, participants completed an interviewer administrated baseline questionnaire which collected information on maternal sociodemographic characteristics, biomedical factors, hospital practices and feeding methods. Multivariate logistic regression analysis was used to identify factors associated with the use of formula and traditional prelacteal foods in hospital.

Results:

The majority of mothers were ≤30 years old (59.3%), educated to high school or higher (79.7%), unemployed (82.1%) and delivered by Cesarean section (70%) (Table 1). The initiation of breastfeeding was near universal (98.6%). However, only 29.0% of infants were exclusively breastfed from birth with the majority of infants having received either a prelacteal feed (65%) and/or supplementary formula (34.9%) while in hospital (Figure 1).

More than one third of infants (38.8%) received a traditional herbal food as their first feed. These included purgative manna, fix weed, jujube tree, chicory and manne of hedyzaru that are traditionally used to prevent neonatal jaundice and/or diarrhoea.

Factors independently associated with in-hospital use of formula (Table 2) were delivering by Cesarean section, admission of neonate to NICU, and not experiencing skin-to-skin contact immediately following delivery. The independent predictors of receiving traditional prelacteal foods (Table 3) in hospital were low maternal education, not experiencing skin-to-skin contact and not being taught how to position and attach their infant. However, infants admitted to NICU or whose mother had undergone a Cesarean section were less likely to receive traditional prelacteal foods in hospital.

Table 1: Characteristics of sample

	n	%
Maternal age (years)		
<25	150	21.4
25 -30	265	37.9
>30	285	40.9
Maternal education		
Primary	142	20.3
High school	287	41.0
University	271	38.7

Figure 1: In-hospital infant feeding practices

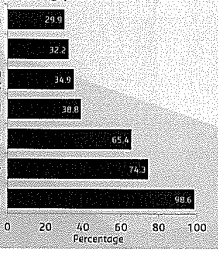

Table 2: Factors associated with the use of formula in hospital

	AOR	95% CI	P value
Method of delivery			
Vaginal	1.00		
Elective C/section	5.31	3.15, 8.94	<0.001
Emergency C/section	4.41	2.61,7.45	<0.001
Baby admitted to NICU			
No	0.013	.002, .111	<0.001
Skin to skin contact			
No	4.05	2.05, 8.00	<0.001

Discussion:

Skin to skin contact and the early initiation of breastfeeding were less likely to occur following a Cesarean section in this cohort of women (results not presented). The lack of practice of these recommended steps to successful breastfeeding, and the pain and the effect of analgesia or anesthesia post surgery, may interfere with the establishment of breastfeeding. Admission to NICU was a predictor of formula use in hospital, as the mother and neonate are typically separated in the immediate postpartum period and longer in some instances, making breastfeeding difficult. Conversely, newborn infants admitted to NICU were less likely to be offered traditional prelacteal feeds such as herbal foods. These foods are generally offered to the baby by family members (e.g. grandmothers) on the postpartum ward, however access to NICU by family members is limited, thereby protecting infants from this practice.

Table 3: Factors associated with the feeding of traditional prelacteal foods in hospital

	AOR	95% CI	P value
Mother's education			
Primary	2.17	1.36, 3.45	.001
High school	1.06	.734, 1.53	.747
University	1.00		
Method of delivery			
Vaginal	1.00		
Elective C/section	.529	.345, .811	.003
Emergency C/section	.686	.449, 1.048	.081
Baby admitted in NICU			
No	12.26	1.59, 94.02	.016
Taught how to attach			
Yes	1.00		
No	1.37	.886, 2.12	.156
Didn't need	2.66	1.56, 4.54	<0.001
Skin to skin contact			
No	2.19	1.35, 3.54	.001

Conclusions:

The findings of this survey suggest that several of the 10 Steps to Successful Breastfeeding are not routinely practiced in maternity hospitals in Shiraz. In particular, skin to skin contact and the initiation of breastfeeding within one hour of birth should be practiced and the use of prelacteal feeds and formula supplementation should be discouraged. Education of both mothers and professional staff is necessary.

[1] Division of Child Health and Development, *Evidence for the Ten Steps to Successful Breastfeeding*. 1998, World Health Organization: Geneva.

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Appendix

M

Appendix M

Oral Presentation

Presented at the 48th Asia-Pacific Academic Consortium for Public Health Conference, 16-19 September 2016, Tokyo, Japan

Title: Incidence and determinants of lactational mastitis among Iranian mothers

Mahnaz Zarshenas, Colin Binns, Yun Zhao, Jane Scott

School of Public Health, Curtin University, Perth, Australia

Objective: Studies from Western countries suggest that roughly one in 10 women will experience mastitis, with half of all cases occurring in the first month postpartum. If not managed appropriately it can result in the premature cessation of breastfeeding. In Iran, breastfeeding is universally practiced however, to date there have been no studies which have reported the incidence of mastitis among Iranian women and its impact on breastfeeding duration. The aim of this study was to identify the incidence of, and potential risk factors for, mastitis.

Method: A longitudinal infant feeding study was undertaken in Shiraz, a city in the South West of Iran. Between June and September 2014, 700 women were recruited from five maternity hospitals shortly after birth. They were then followed up at 1, 3, 4 and 6 months when they attended their local Mother and Child Health Clinic (MCHC) for routine postpartum visits. All data were collected by face-to-face interview and included symptoms and/or medical diagnosis of mastitis and potential risk factors identified in the literature including parity, method of delivery, breastfeeding problems (cracked nipples, engorged breast, and candida infection of the breast), the use of a pacifier and the expression of breastmilk. The association of mastitis with risk factors was explored using univariate and multivariate logistic regression.

Results: Of the 672 mothers who were followed-up in the MCHC, 130 mothers (18.6%, 95% CI: 16.4%, 22.3%) experienced at least one episode of mastitis in the six months postpartum period. More than half of the first episodes of mastitis (55.4%) occurred during the first four weeks postpartum and the incidence of new cases fell gradually thereafter. The results showed no difference in duration of breastfeeding with 88% of women who experienced mastitis and 87% of women without mastitis still breastfeeding at 26 weeks. Multivariate regression analysis showed that not having experienced the problems of cracked nipples candida infection of the nipples or breast engorgement were all associated with a reduced risk of mastitis. Similarly, women who had not expressed their breastmilk or given their infant a pacifier were also less likely to have experienced mastitis.

Conclusion: The risk factors identified in this study are all potentially modifiable with appropriate support and encouragement from health care workers in the early postpartum period. However, in Iran the average length of stay in hospital following delivery is 24–48 hours, where the provision of postnatal care is limited and can be ineffective. Therefore, alternative postnatal care needs to be offered in the early postpartum period to reduce complications of breastfeeding.

Appendix

N

Appendix N

Incidence and Risk Factors of Mastitis in Shiraz, Iran: Results of a Cohort Study

(Accepted for publication in *Breastfeeding Medicine Journal*, 17 March 2017)

Incidence and risk factors of mastitis in Shiraz, Iran: results of a cohort study

Mahnaz Zarshenas[1,2] BSc, MSc

Yun Zhao[1] BSc, P/Grad Dip Math, MSc, PhD

Shahnaz Poorarian[3] MD

Colin W Binns[1] MBBS, MPH, PhD

Jane A Scott[1] BSc, Grad Dip Diet, MPH, PhD

[1] School of Public Health, Curtin University, Perth, Australia

[2] Fatemeh College of Nursing and Midwifery, Shiraz University of Medical Science, Shiraz, Iran

[3] Neonatal Research Centre, Shiraz University of Medical Sciences, Shiraz, Iran

Corresponding author: Professor Jane Scott, School of Public Health, Curtin University, GPO Box U1987, Perth, Australia. Phone: +61892669050 Fax: +61892662958 Email: jane.scott@curtin.edu.au

Running title: Incidence and risk factors of mastitis

Key words: Mastitis, incidence, risk factors, breastfeeding duration

Abstract

Background: Approximately one in five Western women who breastfeed are likely to experience acute mastitis. This study investigated the incidence and risk factors of acute mastitis in a cohort of Iranian women.

Subjects and methods: Subjects were 672 participants of the Shiraz Infant Feeding Study conducted between June 2014 and March 2015. Mothers were recruited from the maternity ward and followed up at 1, 3, 4 and 6 months postpartum to obtain information on their breastfeeding practices and experiences. The occurrence of acute mastitis in the first 26 weeks postpartum was self-reported and the occurrence of acute mastitis in the first 4 weeks and between 5 and 12 weeks postpartum were treated as separate outcomes. The risk factors for acute mastitis were explored using multivariable logistic regression analysis.

Results: In total, 130 mothers (19.3%, 95% CI: 16.3%, 22.3%) experienced at least one episode of acute mastitis. Having expressed breast milk, and use of a pacifier were significantly associated with acute mastitis in both the first 4 weeks and between 5 and 12 weeks postpartum. Persistent problems with cracked or sore nipples, or engorged breasts, and a reduction in breastfeeding were associated with acute mastitis between 5 and 12 weeks.

***Conclusion*:** The incidence of acute mastitis experienced by this cohort of Iranian women is similar to that reported for women in Western countries. The risk factors of acute mastitis identified in this study are potentially modifiable and could be prevented or ameliorated with adequate support and anticipatory guidance provided in the early postpartum period.

Introduction

Lactation mastitis is an inflammation of breast tissue affecting breastfeeding women [1, 2].The condition has been categorised as infectious mastitis and non-infectious mastitis [1]. However, as breast milk samples are seldom collected for culturing of bacteria, diagnosis is typically made on the basis of a combination of acute, local breast symptoms and systemic symptoms [3]. Given that a third of women with mastitis will not have fever [1], subacute cases involving local symptoms only are underreported [4].

Studies of women in Western countries suggest that as many as one in five breastfeeding women will suffer at least one episode of acute mastitis in the first six months postpartum [5-8], with roughly half of all episodes occurring in the first 4 weeks [5, 7, 9]. Few studies have reported the incidence of mastitis in low and middle income countries. A study in China reported that 6.3% of women experienced at least one episode of mastitis in the first 6 months postpartum, with approximately half of the initial episodes occurring in the first 4 weeks postpartum [10]. A recent study from western Nepal reported that 8% of women experienced mastitis in the first month postpartum [11].

In Iran, breastfeeding is a near universal practice with most women continuing to breastfeed well into the first year and beyond [12, 13]. To our knowledge there have been no studies which have reported the incidence of mastitis among women in Iran or any other Middle Eastern country. The purpose of this study therefore is to report the incidence and risk factors of acute mastitis in a cohort of Iranian women and its impact on breastfeeding duration.

Subjects and Methods

The Shiraz Infant Feeding Study (SIFS) is a prospective cohort study conducted between June 2014 and March 2015. In addition to investigating acute mastitis, the focus of this

paper, SIFS was designed to investigate a variety of infant feeding practices including the introduction of prelacteal feeds, formula and solids and the duration since birth of exclusive breastfeeding. Mothers were recruited within 48 hrs of giving birth from the maternity wards of three government and two private hospitals in Shiraz, a city in the south west of Iran. Mothers were eligible for inclusion if they were older than 18 years and had delivered a healthy, singleton, full-term infant (≥ 37 weeks) weighing 2500g or more. Women were ineligible if they were considered by the nursing or medical staff to be too ill to participate in the study or resided outside of Shiraz.

Participants were followed up at 1, 3, 4 and 6 months postpartum when they attended scheduled appointments at their local Maternal and Child Health (MCH) clinic for routine postnatal maternal and infant care and monitoring. Mothers were interviewed at baseline and follow-up visits by trained research staff using questionnaires adapted from those used in the first and second Perth Infant Feeding studies [14, 15]. These questionnaires have been adapted and translated into local languages to study infant feeding practices in a number of Islamic countries [16, 17]. Additional questions related to mastitis were adapted from the Mastitis in Glasgow Study [5].

The study was approved by the Curtin University Human Research Ethics Committee (HR 31/2014) and the Local Research Ethics Committee of Shiraz University of Medical Sciences (209/2014). All mothers provided signed informed consent and were advised that their participation was voluntary and that they could decline to participate or withdraw from the study at any time without prejudice.

Case definition

Acute mastitis cases were identified initially by self-report at each follow-up interview when mothers were asked if they had experienced mastitis since their last interview. The age of

their infant at the time they experienced an episode of mastitis was recorded in weeks. Women were questioned further as to whether they had experienced symptoms typically associated with acute mastitis. While there is no standard definition of mastitis [7] these symptoms were used to verify the mother's self-report of mastitis. For statistical analysis, a woman was defined as an acute mastitis case if she reported having had a red, tender, hot, or swollen area on any part of her breast, accompanied by one or more of the following: i) an elevated temperature (either estimated or measured as being $\geq 38^0$ C) or ii) one or more of the constitutional symptoms of fever (body aches, headaches and chills).

As the majority of episodes of mastitis reportedly occur in the first 4 weeks postpartum [5, 7, 9, 10] and less frequently after 3 months postpartum, we chose to focus our analysis on cases occurring in the first 3 months. The occurrence of acute mastitis in the first 4 weeks postpartum and between 5 and 12 weeks postpartum were treated as separate outcomes to determine if the risk factors differed according to stage of lactation.

Explanatory variables

Variables examined in this study as potential determinants of acute mastitis were derived from the literature [6-8, 18] and included parity and method of delivery collected at baseline. Women were asked at the follow-up visits if in the intervening period they had experienced any of a list of common breastfeeding problems (including cracked nipples, attachment difficulties, pain on nursing and engorged breasts), and whether they had worn a nursing bra, given their infant a pacifier, expressed their milk or changed the level of breastfeeding (i.e. introduced complementary formula).

Sample size calculation

Assuming the 'any breastfeeding' rate at six months to be 60%, with a confidence precision % of 0.04, power of 0.8, a sample of 576 mothers would give a 95% confidence

interval (CI) of 56% to 64%. A target sample of 700 mothers allowed for an 18% drop-out rate and women were recruited consecutively until the target sample was achieved. Recent studies have reported mastitis incidences from as low as 6% in Chinese women [10] up to 18% in Scottish women [5]. To our knowledge, there is no information about the incidence rate of mastitis among Iranian women, and the mid-point of the range, 12%, was used as the rate for the sample size calculation. With a precision percentage of 0.04, power of 0.8, a sample of 254 mothers would give a 95% CI of 8% to 16%. Thus, this study which used 672 of the 700 participants recruited into SIFS was amply powered.

Statistical analysis

The acute mastitis incidence density was calculated by dividing the number of episodes of acute mastitis in four week blocks by the number of completed weeks of breastfeeding [7]. The potential risk factors associated with acute mastitis occurring in the first 4 weeks postpartum and between 5 and 12 weeks postpartum were explored as separate outcomes first using bivariate logistic regression. All explanatory variables were entered into a multivariable logistic regression model to identify those variables independently associated with the risk of acute mastitis during each time interval with a forward step-wise selection method. Results are presented as crude (COR) and adjusted odds ratios (AOR) with 95% CI. Kaplan-Meier survival analysis was used to investigate the association of acute mastitis and breastfeeding duration and the log-rank test was used to compare the difference between groups. A p value less than 0.05 was considered as statistically significant.

The small number of cases introduced a small cases bias [19] and caused a computational problem statistically with maximum likelihood estimation used in the logistic regression analysis, resulting in a wide 95% CI. The bias is stronger particularly when the number of cases in the less frequent category of a variable (for example, the occurrence of various

breastfeeding-related problems between 5 and 12 weeks) is small. In current literature related to statistical computation methodology, among others, the Firth method [20] provides a possible remedy for reducing the small cases bias, hence narrowing the corresponding 95% CI, and was used in this study in both univariate and multivariable logistic regression analyses.

Logistic regression analyses with the Firth method were conducted using Stata package version 14.1 (StataCorp LP, College Station, USA). The other analyses were conducted using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp. Released 2013. Armonk, NY: IBM Corp USA).

Results

In total, 1571 women were approached and of these 852 failed to meet one or more of the inclusion criteria and 19 declined to participate (Supplementary figure 1). Of the 700 women who agreed to participate in the SIFS, 672 attended the first month follow-up visit (96.0% retention). The majority of participants were 25 years or older (78.6%), primiparous (54.6%), had received a high school or university education (80.3%) and delivered by Caesarean section (70.8%) (Table 1). Overall, 130 mothers (19.3%, 95% CI 16.3%, 22.3%) had experienced at least one episode of acute mastitis in the first 26 weeks postpartum. A total of 136 episodes of acute mastitis were reported, with 124 mothers (95.4%) reporting a single episode and only six mothers (4.6%) reporting two episodes. In the first 4 weeks 72 women (10.7%) experienced acute mastitis, representing more than one half (55.4 %) of the first episodes, and the incidence fell sharply thereafter (Figure 1). The incidence density was highest in the first 4 weeks (27.3 episodes/number of women breastfeeding-weeks x 1000) and approximately half this (12.2 episodes/number of women breastfeeding-weeks x 1000) in the second 4 weeks postpartum (Table 2). All cases reported symptomology consistent with the case definition of acute mastitis used in this study including, moderate to severe breast

skin tenderness (100.0%), skin redness (83.1%), and/or warmth (91.4%), in combination with an elevated temperature (92.1%) and/or flu like symptoms (80.2%). All cases were prescribed antibiotics by a medical practitioner.

Acute mastitis and breastfeeding duration

In total, 579 (86.2%) of women were still breastfeeding at the 6 month follow-up visit, and there was no association between occurrence of acute mastitis and duration of breastfeeding with 87.0% of cases and 85.0% of non-cases still breastfeeding at 26 weeks (log-rank test χ^2 =0.289, df =1, p=0.591).

Factors associated with acute mastitis

Relatively few mothers reported mastitis at the four (n=18) and six months follow-up interviews (n=11) thus, potential risk factors were investigated only for mastitis reported at the one month (n=72) and three months (n=35) interviews. Based on the bivariate logistic regression analysis, the common risk factors associated with developing acute mastitis in both time intervals included experiencing cracked nipples, engorged breasts, wearing a nursing bra, expressing milk and giving their infant a pacifier. In addition, women who continued to experience pain with nursing and problems with positioning beyond 4 weeks, and those who had decreased their level of breastfeeding were at greater risk of experiencing acute mastitis between 5 and 12 weeks postpartum (Table 3).

The results of the multivariable analysis are shown in Table 4, and mothers who were multiparous, had engorged breasts, expressed their breast milk and given their infant a pacifier were at greater risk of acute mastitis in the first 4 weeks and between 5 and 12 weeks postpartum. However, experiencing pain during nursing, having damaged nipples, and wearing a nursing bra were found only to be independently associated with experiencing acute mastitis between 5 and 12 weeks. Mothers who had decreased the level breastfeeding

were at lower risk of acute mastitis in the first 4 weeks but at greater risk of acute mastitis between 5 and 12 weeks.

Discussion

This is the first study to report the incidence of acute mastitis in Iran or any other Middle Eastern country. Roughly one in five women experienced an episode of acute mastitis in the first 26 weeks postpartum. The overall incidence reported in this study is comparable to incidence rates over the same follow-up period reported for Western countries such as Scotland [5] and Australia [6, 7]. In a recent study conducted in Nepal, an 8% incidence of mastitis during the first month postpartum was reported [11], which is comparable to a first month incidence in this study of 10.7% (72/672) and 9.5% in Scotland [5]. This is one of few studies to report acute mastitis incidence density in 4 weekly blocks, which allows for direct comparison between studies. The incidence density in this study of 27.3 episodes/number of women breastfeeding-weeks x 1000 in the first 4 weeks postpartum was comparable to 35.0 episodes/number of women breastfeeding-weeks x 1000 reported for Australian women [7] but more than double that reported for Chinese women for the same period [10].

Lactation mastitis has been identified as a significant factor in weaning decisions [21-23]. However, while some women may give mastitis as their reason for discontinuing breastfeeding, most women who suffer the condition continue to breastfeed. We found no significant association between acute mastitis and duration of breastfeeding and this is consistent with the findings of an Australian study [7]. On the other hand studies conducted in Scotland [5] and New Zealand [8] reported that a history of mastitis was associated with longer overall duration of breastfeeding, and it has been postulated that mastitis is an indicator of an ample milk supply [8].

A number of potentially avoidable risk factors for mastitis associated with poor nursing technique were identified in this study. Cracked nipples have consistently been associated with mastitis in Western countries [6-9, 24] and nipple trauma related to inappropriate nursing technique [18, 24, 25] may provide an entry point for pathogens that lead to mastitis [7-9]. Cracked or sore nipples are common problems in the early postpartum period [26], and almost half (46.7%) of all women in this study had experienced cracked and/or sore nipples in the first 4 weeks following discharge from hospital. While nipple trauma and pain during nursing were not found in this study to be independently related to mastitis in the first 4 weeks, if these problems persisted beyond the first 4 weeks they were independently associated with mastitis between 5 and 12 weeks. This highlights the importance of the mastery of correct nursing technique in the early postpartum period. In Iran, the first routine MCH clinic visit is scheduled at one month postpartum and there is no community midwifery service to assist new mothers to successfully establish breastfeeding in the early post-discharge period. Thus, a greater emphasis on supporting mothers to correctly attach and position their infants whilst in hospital may minimise the risk of cracked nipples, and subsequently mastitis, post discharge.

While nursing technique is no doubt important recent studies suggest that pain on nursing and cracked nipples may be a clinical sign of mastitis [27] possibly caused by the highly virulent exfoliative toxins produced by *Staphylococcus aureus* [28], a bacterial species more commonly found in the breast milk of women with mastitis than that of healthy controls [29]. Further studies are warranted to determine if cracked nipples are a cause or consequence of mastitis.

Breast engorgement was significantly associated with acute mastitis between 5 and 12 weeks postpartum. Breast engorgement is a normal physiological process experienced by new mothers usually within 48 to 72 hours after delivery [30]. However, it may also occur due to

ineffective suckling and insufficient removal of milk from the breast, causing milk stasis or blockage of milk ducts. In an engorged breast, the nipple can be stretched flat and the baby may be unable to pull the nipple into their mouth, consequently the nipple may become cracked [1, 25]. Thus, breast engorgement and cracked nipples can occur in concert and predispose the mother to mastitis. In an effort to reduce the likelihood of engorgement and associated problems, mothers should receive anticipatory guidance on the risks associated with missing or delaying feeds and the advantages of demand feeding.

Expressing breast milk was significantly associated with acute mastitis both in the first 4 weeks and between 5 and 12 weeks which is consistent with the findings of a recent Spanish study that reported the use of breast pumps as a risk factor for mastitis [4]. The majority of women (95%) who expressed milk in the first 4 weeks used a manual pump and while we did not ask how frequently mothers expressed milk, a recent study reported that expressing several times a day was a risk factor for development of mastitis [9]. Milk expression may cause pain in the nipple from overstretching and inappropriate use of a breast pump may lead to nipple trauma [31, 32]. On the other hand, expressing breast milk provides an opportunity for mothers to exercise lifestyle choices while continuing to nurse, and has been associated with the success and duration of breastfeeding [33]. Furthermore, the association between breast milk expression and mastitis seen in this study may be an example of reverse causality. Expressing breast milk and using breast pumps is commonly recommended to minimise breast engorgement when mothers develop mastitis [2, 4]. As women were asked if they had expressed milk since their last clinic visit and not asked specifically if they had expressed milk before or after developing mastitis, it is unclear whether breast milk expression was the cause or consequence of mastitis in this study.

A decline in breastfeeding, whereby women changed from full or exclusive breastfeeding to combination feeding, was associated in this study with an increased risk of acute mastitis

between 5 and 12 weeks, but inexplicably with a decreased risk at 4 weeks. This latter finding is inconsistent with the literature as an increased risk of mastitis associated with supplementary feeding has been reported previously [6] and there is an increased risk of engorgement and blocked ducts if the level of breastfeeding declines suddenly, particularly in the early postpartum period when milk production is high [34].

The use of a pacifier was a significant risk factor for acute mastitis in the first 4 weeks and between 5 and 12 weeks. Pacifiers may contribute to the development of mastitis in a variety of interrelated ways. Firstly, the use of a pacifier may promote a non-nutritive, superficial sucking habit which does not effectively strip the breast of milk [35] leading to engorgement and blocked ducts [1]. The use of a pacifier also has been associated with increased risk of sore and damaged nipples in a number of studies [36, 37], while the pacifier itself may be a source of oral contamination and transmission of pathogens [38]. Finally, in countries where pacifiers are not routinely used mothers typically resort to other methods to soothe their infant which include carrying and rocking, as well as breastfeeding [39]. Given that infant crying and fussiness is a common and frequent occurrence, then these mothers are likely to breastfeed frequently, thus reducing the likelihood of breast milk stasis and engorgement, and consequently the risk of mastitis.

Of particular concern was the universal prescription in this study of antibiotics for women suffering from acute mastitis. Antibiotics are not routinely prescribed as first-line treatment for mastitis in other countries [5, 29], and many women with potential pathogens in their breast milk either recover spontaneously with conservative management (effective milk removal and supportive measures) [2]. Milk-culturing is not commonly practiced in Iran, or elsewhere, and hence antibiotics are prescribed without knowing the etiology or the antibiotic susceptibility of the microorganism involved. Delgado and colleagues [27] have warned against the indiscriminate use of broad spectrum antibiotics to treat mastitis as they "may lead to a

worsening of the symptoms since strains that cause mastitis may exhibit multi-resistance to drugs and/or form biofilms". Prior to discharge from hospital, breastfeeding mothers should be instructed how to recognise the early onset of symptoms of mastitis and to conservatively manage the condition. Antibiotics should only be prescribed if symptoms do not improve after 24 hours and preferably after breast milk culture and antibiotic susceptibility testing has been undertaken, although there is some debate over the value of breast milk culture [29].

The strength of this study is that a large, representative cohort of mothers was followed prospectively from birth to 6 months with four follow-up visits during this interval. A limitation of this study was that mastitis was self-reported by mothers. However, we verified self-diagnosis by applying a definition of acute mastitis based on reported symptomology which has been used by others [7, 9]. Nevertheless, cases of subacute mastitis will have been missed as not all women with local breast symptoms have systemic symptoms[1]. A further limitation is that we did not investigate a number of risk factors such as a prior or family history of mastitis and use of antibiotics, antifungal medication and nipple creams; all of which have been shown in a recent case-control study to be associated with an increased risk of mastitis [4]. The small number of cases identified in this study introduced a small cases bias [19] resulting in a wide 95% CI for a number of explanatory variables. The penalized maximum likelihood estimation proposed by Firth [20] was used to reduce this bias.

Conclusion

The incidence of acute mastitis in Shiraz, Iran is similar to that reported in Western countries. Most risk factors identified in this study are associated with poor nursing technique and potentially modifiable with appropriate support and anticipatory guidance in the early postpartum period. It is recommended that the breastfeeding support offered in the hospital setting be improved and supplemented with community-based midwifery services for at least

two weeks. These measures may go some way to help avoid the risk factors of mastitis which are commonly associated with poor breastfeeding technique.

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Table 1: Participant characteristics (n=672)

Characteristic	n	%
Age (years)		
<25	144	21.4
25 to 29	251	37.4
≥ 30	277	41.2
Highest level of education		
Primary or secondary	132	19.6
High School	277	41.2
University	263	39.1
Parity		
Primiparous	367	54.6
Multiparous	305	45.4
Delivery method		
Vaginal delivery	196	29.2
Caesarean section	476	70.8

Figure 1: Proportion (%) of first episodes of mastitis occurring in each time period (n=130)

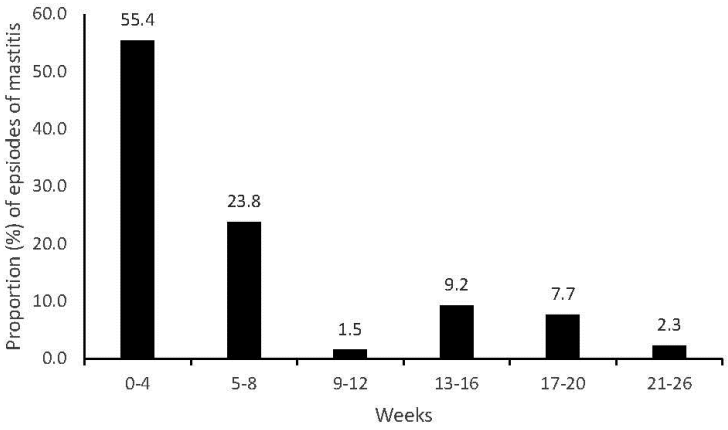

Table 2: Incidence density of mastitis in Iranian, Australian[1] and Chinese[2] mothers within 6 months postpartum

Interval	Number of episodes of mastitis	Number of women breastfeeding - weeks	Incidence density (x 1000) Iranian mothers	Incidence density (x 1000) Australian[1] mothers	Incidence density (x 1000) Chinese[2] mothers
0-4 weeks	72	2633	27.3	35.0	11.0
5-8 weeks	31	2545	12.2	16.6	6.5
9-12 weeks	4	2510	1.6	12.4	5.1
13-16 weeks	15	2472	6.1	9.4	2.9
17-20 weeks	10	2421	4.5	7.9	3.1
21-26 weeks	4	2321	1.3	1.7	1.8

[1]Amir et al., 2007 [2] Tang et al., 2014

Table 3: Bivariate analysis: Factors associated with acute mastitis by 4 weeks and between 5 and 12 weeks

	Acute mastitis by 4 weeks						Acute mastitis between 5 and 12 weeks					
	Yes (N=72)		No (N=600)				Yes (N=35)		No (N=627)			
Variables	n	%	n	%	COR*	95% CI	n	%	n	%	COR*	95% CI
Cracked nipples												
Yes	46	63.9	281	46.8	1.99	1.20, 3.29	10	28.5	10	1.6	24.22	9.43, 62.16
No	26	36.1	319	53.2	1		25	71.4	617	98.4	1	
Difficulty with attachment												
Yes	11	15.3	81	13.5	1.19	0.61, 2.33	3	8.6	2	0.3	26.94	5.12, 141.83
No	61	84.7	519	86.5	1		32	91.4	625	99.7	1	
Pain during nursing												
Yes	9	12.5	104	17.3	0.71	0.35, 1.45	3	8.6	8	0.3	7.85	2.15, 28.62
No	63	87.5	496	82.7	1		32	91.4	619	99.7	1	
Engorged breast												
Yes	43	58.7	262	43.7	1.90	1.16, 3.12	13	37.1	7	1.1	49.64	18.51, 133.16
No	29	40.3	338	56.3	1		22	62.9	620	98.9	1	
Expressed milk												
Yes	66	91.7	230	38.3	6.36	2.80, 14.48	23	65.7	88	14.0	11.46	5.57, 23.59
No	6	8.3	370	61.7	1		12	34.3	539	86.0	1	
Wearing a nursing bra												
Yes	30	41.7	155	26.0	2.04	1.24, 3.36	19	54.3	164	26.2	3.33	1.69, 6.57
No	42	58.3	441	74.0	1		16	45.7	463	73.8	1	
Using pacifier												
Yes	62	86.1	215	35.8	10.65	5.42, 22.90	32	91.4	286	45.6	11.07	3.63, 33.71
No	10	13.9	385	64.2			3	8.6	341	54.4	1	
Parity												
Primiparous	36	50.0	331	55.1	1.23	0.76, 2.00	20	57.1	342	54.5	0.91	0.46, 1.79
Multiparous	36	50.0	269	44.8	1		15	42.9	285	45.5	1	
Level of feeding												
Decreased level of breastfeeding	11	15.3	100	16.7	0.82	0.42, 1.60	15	42.9	126	20.1	2.90	1.41, 5.97
Increased level of breastfeeding	7	9.7	112	18.7	0.48	0.22, 1.05	4	11.4	111	17.7	0.96	0.33, 2.77
No change, fully breastfeeding	54	75.5	388	64.7	1		16	45.7	390	62.2	1	
Method of delivery												
Caesarean section	51	70.8	425	70.8	0.99	0.58, 1.68	26	74.3	445	71.0	1.14	0.53, 2.45
Vaginal delivery	21	29.2	175	29.2	1		9	25.7	182	29.0	1	

COR: Crude Odds Ratio CI: Confidence Interval, *Obtained by Penalized Maximum Likelihood Estimation as proposed by Firth [20]

Table 4: Multivariate analysis: Factors independently* associated with mastitis by 4 weeks and between 5 and 12 weeks postpartum

	By 4 weeks			Between 5 and 12 weeks		
Variable	AOR	95% CI	*P* value	AOR	95% CI	*P* value
Cracked nipples						
Yes			NS	18.31	4.29, 78.27	<0.001
No				1		
Pain during nursing						
Yes			NS	10.51	1.49, 74.16	0.018
No				1		
Engorged breast						
Yes	1.79	1.03, 3.09	0.036	115.31	25.59, 519.67	<0.001
No	1			1		
Expressed milk						
Yes	4.96	2.03, 12.12	<0.001	11.61	4.22, 31.97	<0.001
No	1			1		
Wearing a nursing bra						
Yes			NS	3.47	1.28, 9.43	0.015
No				1		
Using pacifier						
Yes	11.25	5.49, 23.06	<0.001	16.06	3.57, 72.35	<0.001
No	1			1		
Parity						
Multiparous	1.83	1.06, 3.17	0.031	3.59	1.26, 10.21	0.016
Primiparous	1			1		
Level of breastfeeding						
Decreased level of breastfeeding	0.38	0.18, 0.79	0.010			N/S
Increased level of breastfeeding	0.47	0.20, 1.14	0.093			
No change, fully breastfeeding	1					

AOR: Adjusted Odds Ratio, CI: Confidence Interval

* adjusted for all variables in the table in addition to difficulty with attachment, wearing a nursing bra and method of delivery.

Supplementary Figure 1: Participant flow diagram