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EFFECT OF MATERNAL SMOKING ON BREASTFEEDING INDICATORS IN JORDAN: RESULTS FROM 2007 DEMOGRAPHIC AND HEALTH SURVEY

by
ANGELA GEORGES SROURIAN

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ANGELA GEORGES SROURIAN

Approved by:

Dr. Monique Chaaya, Professor and Chair — Advisor
Department of Epidemiology and Population Health

Dr. Haya Hamadeh, Pediatrician — Member of Committee
Department of Pediatrics and Adolescent Medicine

Dr. Miran Jaffa, Assistant Professor — Member of Committee
Department of Epidemiology and Population Health

Dr. Mohannad Al-Nsour — Member of Committee
Executive Director EMPHNET, Amman Jordan

Date of thesis defense: May 16, 2013

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AN ABSTRACT OF THE THESIS OF

Angela Georges Srourian for Master of Science
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Title: Effect of Maternal Smoking on Breastfeeding Indicators in Jordan: Results from 2007 Demographic and Health Survey

Objective: To investigate the association between maternal smoking and breastfeeding indicators: initiation, duration, and exclusivity among children between the ages of 0 to 1 year old.

Methods: A secondary analysis based on the data from Jordan Demographic Health Survey (JDHS) conducted in 2007. The study was a cross-sectional survey of the Jordanian population at the national level. The sample included 2214 children between the ages of 0 to 1 year old and was obtained by using a stratified sampling method. For the survey to be executed, two questionnaires were prepared and pilot tested. These questionnaires were developed and validated in English and Arabic. The first is the Household Questionnaire and the second is the Individual Questionnaire (for eligible women).

Results: prevalence of smoking (cigarette or water-pipe) among women was 8.0%. Early initiation (<1 hour) was reported among 37.1% of the mothers. The mean± standard deviation of duration of breastfeeding was 5.14± 3.42 months. For exclusive breastfeeding, children ≤6 months were selected (1262 children). A small proportion of children, who were between 0-6 months, were exclusively breastfed (10.1%). In the bivariate analysis, smoking was significantly associated with early initiation and duration of breastfeeding. Among smokers, 25.2% initiated early compared to 38.1% in non-smokers and the mean of breastfeeding duration among smokers was 4.28±3.33 months compared to 5.21±3.42 months in non-smokers. As for exclusive breastfeeding, An equal proportion of children were exclusively breastfed (around 10%) among smoking and non-smoking mothers and these results were not significant. After controlling for potential confounders, results remained significant for initiation and duration of breastfeeding. The odds of early initiation in smoking mothers is 0.56 times the odds of non-smokers (95%CI= 0.37, 0.86). Regarding duration, for every 1 unit increase in smoking, breastfeeding duration decreases by 0.90 months (95%CI= -1.47, -0.34).

Conclusion: Although breastfeeding is generally high in Jordan; however, certain indicators of breastfeeding (initiation, exclusive and duration) are not optimal and thus require the attention of health authorities and professionals to improve these breastfeeding rates. Also, the rates of smoking need to be reduced especially during and post pregnancy.

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CHAPTER I

INTRODUCTION

The tobacco epidemic is a major public health concern around the world. Tobacco has killed approximately six million people, including ex-smokers and non-smokers who are exposed to second-hand smoking (WHO, 2012a). It is estimated that around 8 million people will die due to tobacco-related diseases by 2030 (Hitchman & Fong, 2011). In addition, approximately 80% of tobacco victims live in low-middle income countries (WHO, 2012a). Although the number of male smokers is higher than female smokers, the prevalence of female smoking is constantly increasing (Shafey & Elimam, 2010). Some of the highest female tobacco consumption rates in the Arab World are found in Yemen, Lebanon, and Jordan (WHO, 2012f). The highest male smoking rate (15 years +) in the Arab World is found in Jordan with a prevalence rate of 47% (WHO, 2012f). A recent study in Jordan indicated that smoking has increased from 27% to 29% in the general population between 2005 and 2007 (Dar-Odeh et al., 2010). Moreover, based on the Demographic and Health Survey (DHS), cigarette smoking among Jordanian women in 2007 was 11% and water-pipe was 5 %, compared to 10% and 4% respectively in 2002. Water-pipe smoking is the new trend in Middle Eastern countries. A study conducted by Dar-odeh et al. (2010) among university students between the ages of 16-26 years in three Jordanian universities (Jordan University of Science and Technology in Irbid, University of Jordan in Amman, and Mu'tah University in Karak) suggested that 42% of male smokers prefer cigarette and water-pipe, whereas 53% of female smokers prefer water-pipe only. Water-pipe smoking is frequent among women in Jordan. According to Azab et al. (2010), one third of women

who participated in the study were ever water-pipe smokers and approximately 20% were monthly water-pipe users. Several factors contribute to the increase in the use of water-pipe among women such as the availability of the water-pipe in public areas, affordable cost of water-pipe, presence of different flavors, and influence of the media (Nakkash, et al., 2011). Nonetheless, people tend to perceive water-pipe smoking as being healthier when compared to cigarette smoking. This may be due to the presence of flavored tobacco in water-pipe smoking and the fact that water-pipe contains water makes people believe that it purifies the toxic substances of the smoke before being inhaled by the user (Neergaard et al., 2007). Such misconceptions further encourage people to adopt this harmful habit. However, there is enough evidence that proves that water-pipe smoking is far more hazardous than cigarette smoking. Water-pipe smoking is associated with pulmonary illnesses with increased blood carboxyhemoglobin levels (Al-Fayez et al., 1988), cancer (El Hakim & Uthman, 1999), and coronary heart disease (Radwan, 1999). Above all, a greater concentration of nicotine is present in water-pipes compared to cigarettes (Shihadeh, 2003).

The increase in smoking among women increases the concern that women may continue this habit during pregnancy. Smoking during pregnancy is an important concern as it will not only harm the mother but the fetus as well. It may result in low birth weight, still births, and respiratory illnesses among infants (Neergaard et al., 2007). As recommended by WHO, exclusive breastfeeding should take place for six months and initiation of breastfeeding should start within an hour after birth (WHO, 2012b). Based on WHO global data bank on breastfeeding, 35% of infants (<12 months) are exclusively breastfed worldwide (WHO, 2012e) compared to 29 % in the Middle East and North Africa (MENA) region (UNICEF, 2010). Maternal smoking

affects the mother's decision to exclusive breastfeed and how soon she initiates breastfeeding (Letson et al., 2002). Although many researchers suggest that nicotine is responsible for decreased milk supply in the breast which results in short duration of breastfeeding, it has been noted that this might also be due to lower motivation to breastfeed among smoking mothers (Donath & Amir, 2004). Hence, this results in early weaning which prevents the child from receiving all the necessary nutrients which are important for his/her healthy development in general, as well as antibodies that protect him/her from childhood illnesses (WHO, 2012c). In addition, breastfeeding is advantageous to the mother as it reduces the risk of ovarian and breast cancer, decreases the rate of obesity and helps the mother regain her pre-pregnancy figure faster (Gartner et al., 2005). Also, breastfeeding acts as a contraceptive tool in the first six months of exclusive breastfeeding (WHO, 2012c).

Based on the Jordan Demographic and Health Survey (DHS), in 2007 93% of children were breastfed compared to 94% in 2002. Furthermore, in 2007 82% initiated breastfeeding within the first day out of which 39% initiated within an hour compared to 79% and 49% in 2002, respectively. In addition, 55% of children under the age of 2 months were exclusively breastfed in 2002 which decreased to 39% in 2007.Another key variable is smoking during pregnancy where 4% smoked cigarette and 3% smoked water-pipe during pregnancy in 2007. Although breastfeeding is generally high in Jordan, there are other important indicators of breastfeeding, such as exclusive breastfeeding for 6 months and initiation of breastfeeding within 1 hour after birth, that are not optimal. To our knowledge, the only study done in Jordan on maternal smoking and breastfeeding is by Najdawi and Faouri in 1999, where they reported that at 2 months postpartum 63% of smokers breastfed their infants compared to 90% in non-

smokers, while at 4 months postpartum, the prevalence of breastfeeding among smokers decreased to 43% whereas in non-smokers it was 88% which was not a significant decrease (Najdawi & Faouri, 1999). This study will assess to what extent prenatal smoking (cigarette or water-pipe) in Jordan disrupts optimal breastfeeding indicators: breastfeeding initiation, duration, and exclusivity.

The increase in smoking prevalence during and post pregnancy and the decrease in breastfeeding indicators may demonstrate the start of a trend that needs to be controlled by public health practitioners. Therefore, this issue should be addressed in order to intercept all forms of tobacco smoking during pregnancy. Since breastfeeding is more of a learned behavior than just a natural act, certain steps need to be established in order to support, encourage and educate mothers on proper breastfeeding practices (WHO, 2012d).

CHAPTER II

LITERATURE REVIEW

The purpose of the literature review was to help in the preparation of the study tools and to provide material that serves the study objectives. Literature review was carried out using AUB library, PubMed, Medline and MSH databases, searching for peer-reviewed publications regarding smoking and breastfeeding.

A. Benefits of Breastfeeding

Since the early 90's, many efforts have been done in order to encourage breastfeeding after it has been substituted with infant formula. Some of these efforts include informing pregnant women about the benefits and management of breastfeeding, training health care staff in assisting mothers with breastfeeding techniques, encouraging breastfeeding on demand, and fostering the establishment of breastfeeding support groups and referring mothers to them on discharge from the hospital (UNICEF, 1989). Not only does breast milk protect the infant from respiratory tract diseases and otitis media at a young age, but it also protects him/her later in life from diabetes mellitus, inflammatory bowel disease, and childhood cancer (Villalpando & Hamosh, 1998). Breastfeeding protects infants from having diarrhea and ear infection as well. The risk of developing diarrhea was 1.8 times and the risk of having ear infection was 1.6 times in non exclusively breastfed children compared to those who were exclusively breastfed in a longitudinal study conducted in the US (Scariati et al., 1997). Maternal colostrum, which is produced during the first days after delivery, is a

thick yellow/orange breast milk that is highly nutritious and contains maternal substances that act as a natural vaccine for the child (Hanson, 2004). Withholding of colostrum influences the introduction of prelacteal feeding which in turn is found to be associated with delayed milk arrival and delayed initiation of breastfeeding (Patel et al., 2013). As recommended by the WHO, breastfeeding should be initiated within 1 hour after birth and should be done exclusively for 6 months (WHO, 2012b). After this period, children should be introduced to complementary foods with continued breastfeeding for up to 2 years or more (WHO, 2012g). Early initiation and exclusive breastfeeding are both associated with good maternal and child outcomes. Early initiation of breastfeeding could reduce neonatal mortality by 22% which would contribute to the achievement of the Millennium Development Goals (Edmond et al., 2006). Also, it has been reported that exclusive breastfeeding for 6 months may prevent 13% of all deaths annually among children less than 5 years in developing countries (Jones et al., 2003). A study conducted in Ghana suggested that there is a dose response relationship between increase in neonatal mortality and decrease in early initiation of breastfeeding. Late initiation of breastfeeding increases the risk of neonatal mortality by 2.4 folds (Edmond et al., 2006). Furthermore, Mullany et al. (2008) reported that neonatal mortality was higher among late compared to early initiators (RR= 1.41, 95% CI=1.08-1.86) in southern Nepal. Additionally, newborns who were not exclusively breastfed had a significantly higher mortality risk (RR= 1.77) than those who were exclusively breastfed. Thus, there is enough supporting evidence on the benefits of breastfeeding among infants.

B. Global, Regional, and Local Patterns of Breastfeeding

The WHO Global Data Bank on breastfeeding currently covers 94 countries and 65% of the world's infant population (<12 months). Based on the latest data, 35% of these infants are exclusively breastfed between 0-4 months of age (WHO, 2012h). According to WHO World Health Statistics (2011), the European region has the lowest rate of exclusive breastfeeding (23%) compared to other regions across the globe. Large discrepancies are present across European countries where breastfeeding rates are slowly increasing in some such as France, Spain and the United Kingdom. Others have witnessed a fast increase such as Poland where exclusive breastfeeding under 4 months increased from 1.5% in 1988 to 17% in 1995 and for Sweden it increased from 55% in 1992 to 61% in 1993 (based on current available data) (WHO, 2012h).

Although breastfeeding rates are not high in Europe, in North America, where the advantages of breastfeeding have been widely publicized and where the Baby-Friendly Hospital Initiative has begun, breastfeeding rates have increased tremendously (WHO, 2012h). North American rates of breastfeeding initiation have increased from 24% during the 1960s (Myres, 1979) to 83% in the late 1990s (Barber et al., 1997). National surveys have found breastfeeding initiation rates in Canada to be approximately 79% (Health Canada, 1999), whereas rates in the United States have increased from 59.7% in 1995 (Ryan, 1997) to 64% in 1998 (U.S. Department of Health and Human Services, 2000). Unfortunately, breastfeeding rates decline rapidly in the first 4 to 8 weeks postpartum, with fewer than 35% of mothers exclusively breastfeeding at 4 months (Barber et al., 1997); only 30% to 40% of Canadian mothers (Bourgoin et al., 1997) and 29% of U.S. mothers (U.S. Department of Health and Human Services, 2000) continue any form of breastfeeding until 6 months postpartum.

In the African Region, the highest rates of exclusive breastfeeding for children under 6 months were found in Rwanda 88.4% (2005) followed by Ghana 62.84% (2008), Zambia 60.9% (2007), Malawi 56.7% (2006) and Madagascar 50.7% (2009) (WHO, 2012i). As for early initiation of breastfeeding, the highest rates were in Burundi 74% (2005) followed by Mozambique 63.1% (2008), Jamaica 62.3% (2005), Malawi 58.3% (2006), Niger 40.4% (2009) and Ghana 35.2% (2006) (WHO, 2012j).

In the Eastern Mediterranean Region, the exclusive breastfeeding rate for children under 6 months varies from one country to another. Egypt had the highest rate with 53.2% (2008) followed by Syrian Arab Republic 28.7% (2006), Iraq 25.1% (2006) Yemen 11.5% (2003) and Tunisia 6.2% (2006) (WHO, 2012i). As for early initiation of breastfeeding, Tunisia had the highest rate 87.4% (2006) followed by Oman 84.8% (2000), Syrian Arab Republic 32.4% (2006), Iraq 30.6% (2006), and Yemen 29.6% (2006) (WHO, 2012j). In addition, a study in Palestine indicated that among children younger than 5 years, early initiation of breastfeeding was 65% and exclusive breastfeeding has increased from 16.7% to 26.5% since 2000 (Abdul Rahim et al., 2009).

In 2003, a cross-sectional study was carried out on 344 Jordanian women with children aged between 6 months and 3 years who were residing in the north of Jordan to evaluate breastfeeding practice, knowledge and attitude. Full breastfeeding (i.e. breast milk only) was reported by 58.3%, mixed feeding was reported by 30.3% and infant formula feeding was reported by 11.4%. Out of the full breastfeeding group, 68% continued breastfeeding for more than one year. This study showed that a high proportion of Jordanian women did breastfeed for more than one year. (Khassawneh et al., 2006).

C. Tobacco and Breastfeeding

Several studies were conducted in different parts of the world to assess the association between smoking and breastfeeding indicators. In Missouri in the year 2005, 1789 women participated in a study where they were asked about their smoking status: non-smokers, light (≤10 cigarettes per day), and heavy smokers (>10 cigarettes per day) and breastfeeding practices (initiation and duration of breastfeeding). Approximately 31% of the respondents smoked during pregnancy. Light and heavy smokers were less likely to initiate breastfeeding early and more likely to wean earlier compared to non-smokers after controlling for sociodemographic characteristics: the presence of other smokers in the household, alcohol use, mode of delivery, and infant hospitalization (Weiser et al., 2009). In a longitudinal study, Giglia et al. (2006) examined the relationship between cigarette smoking and breastfeeding duration at 2 weeks, 6 months, and longer than 6 months in Western Australia. Subjects were eligible mothers of healthy newborn infants who were selected from two public maternity hospitals. The participants completed a self-administered baseline questionnaire while in hospital or shortly after discharge. The main measures of outcome were prevalence of breastfeeding at 2 weeks, 6 months and >6 months in women who smoked during pregnancy, and breastfeeding duration. The median duration of breastfeeding for non-smoking mothers was 28 weeks (95% CI 25.2-30.8) and for smoking mothers 11 weeks (95% CI 8.3-13.7). Women who smoked were significantly less likely to be breastfeeding between 2 weeks, 6 months, and longer than 6 months postpartum compared to non-smokers, even after adjustment for confounding covariates: age, education, income, father's smoking status, mother's country of birth, intended duration of breastfeeding >6 months and birthweight (RR= 1.59, 95% CI 1.22-2.08). Another

cross-sectional study which aimed to identify factors that are associated with exclusive breastfeeding in Malaysia indicated that out of 682 mothers with children up to 6 months, the prevalence of exclusive breastfeeding was 43.1%. The prevalence of exclusive breastfeeding when stratified by infant age from one to six months ranged between 32.4% and 63.3% with the highest among one month old infants and lowest among six month old infants. In addition, maternal smoking status was significantly associated with exclusive breastfeeding where non-smokers had 5 times (OR= 5.18 95% CI: 1.59, 45.05) higher odds of exclusive breastfeeding than smokers (Tan, 2011). Additionally, Liu et al. (2006) assessed the association between early weaning and maternal smoking before, during and after pregnancy in a population-based cohort study. Early weaning was described as not breastfeeding at 10 weeks postpartum. Of the 3047 women included in the study, 7.8% were quitters i.e., quit smoking during pregnancy and did not resume post delivery, 5.3% relapsed postpartum, and 7.8% persisted smoking throughout the prenatal period. At 10 weeks postpartum, the percentage of not breastfeeding among the quitters was 33.8%, among postpartum relapsers 38.2%, and 56.2% among persistent smokers compared to 21.1% in non-smokers. After controlling for confounders, early weaning was significantly higher among persistent smokers only compared to non-smokers with an adjusted RR=2.18 (95%CI=1.52, 2.97). The authors suggested that stopping smoking during pregnancy and decreasing the number of cigarettes smoked postpartum may increase breastfeeding duration. Bachir & Chaaya (2008) conducted a secondary analysis of data on 538 women who delivered in hospitals in two areas of Lebanon: Beirut and Bekaa, in order to assess the factors associated with smoking and the association of smoking with maternal and newborn health related factors. The first structured interview was carried

out in the hospitals where these women delivered and the second one took place at their homes after 2-3 months. Smoking during pregnancy was defined as smoking either cigarette or water-pipe. As for breastfeeding, two indicators were assessed which were duration and exclusive breastfeeding. Results indicated that approximately 26% of the women smoked during pregnancy. Among smokers, around 31% exclusively breastfed compared to 35% in non-smokers (p=0.008). On the other hand, breastfeeding duration showed varied results. At 2 months postpartum, 65.1% of smokers were breastfeeding compared to 46.6% in non-smokers. However, after 3-4 months, only 20.9% of smokers were breastfeeding compared to 45.2% in non-smokers (p=0.03).

In overwhelming studies, tobacco use is defined as cigarette smoking only, except in some studies such as Bachir & Chaaya (2008) who incorporated water-pipe smoking as part of tobacco use as well. In addition, a few studies on smoking and breastfeeding have been conducted in the EMR Region; therefore, further research is necessary to evaluate the relationship between maternal smoking (cigarette or water-pipe) and breastfeeding indicators: initiation, duration, and exclusive breastfeeding.

Other researchers believe that women who smoke are more likely to breastfeed for a shorter time than non-smokers because nicotine reduces prolactin which in turn suppresses milk supply in the breast (Horta et al., 1997; Vio et al., 1991). Hopkinson et al. (1992) found that the mothers in their study who smoked cigarettes expressed less milk for their non-suckling preterm infants than mothers who did not smoke even after adjusting for pumping frequency and duration, infant gestational age, and demographic differences including race, age, parity, gravidity, and maternal weight and height. The volume of milk produced by mothers who smoked cigarettes (n=11) and control subjects who did not smoke (n=29) was compared after the delivery of their preterm

infants (28 to 32 weeks gestation). Each mother was provided with an electric breast pump and a lactation consultant was present to explain basic concepts of mammary physiology and to demonstrate milk collection techniques. The mothers maintained their milk production using this electrical breast pump and without the stimulus of their infant suckling at the breast. Daily frequency and duration of breast pump usage were similar in the two groups. At 2 weeks postpartum, 24-hour milk volumes were 406 ± 262 ml for mothers who smoked and 514 ± 338 ml for control subjects. Between 2 to 4 weeks postpartum, the mean change in 24-hour milk volume (milliliters per 24 hours) of control subjects increased (+113 ± 179 ml), whereas milk volume of mothers who smoked cigarettes remained unchanged (-47 ± 122 ml). However, stepwise regression found that the change in frequency of expression and day of initiation of expression accounted for 56% of the variability in percent change in volume between 2 and 4 weeks postpartum, and smoking only accounted for an additional 8% of the variability. Furthermore, Vio et al. (1991) indicated that cigarette smoking had a negative influence on breast-milk volume. They found that non-smoking mothers had a significantly greater breast-milk volume than did smokers (961 ± 120 g/d vs 693 ± 110 g/d, $P < 0.0001$). On the other hand, further studies suggest that the relationship between smoking and breastfeeding rates is not a physiological one. Amir & Donath (2002) mentioned that women who smoke seem to have significantly less motivation to breastfeed. The social and behavioural differences among smoking women may contribute to the women's infant feeding decisions. Besides, if smoking had such an adverse effect on breastfeeding, then we would not expect to see such variations in breastfeeding rates among smokers. Thus, it is likely that psychosocial factors lead to lower rates of breastfeeding among smoking women compared to non-smokers. A study

in UK was carried out to investigate whether maternal smoking remains associated with decreased breastfeeding duration after adjustment for the mother's infant feeding intention. Pregnant women who were expected to give birth were recruited in a longitudinal cohort study. Maternal smoking was defined as any smoking reported at any time during pregnancy. After stratifying duration of breastfeeding among smokers and non-smokers by intention to breastfeed, it appeared that for each level of intention (<1 month, 1 month, 2-4 months, and ≥4 months), smokers had lower initiation and duration than non-smokers. The authors explained that although women who smoke are less likely to breastfeed their infants than non-smoking women, it appears that this is largely due to lower motivation to breastfeed rather than a physiological effect on their milk supply (Donath & Amir, 2004). Therefore, based on the literature, the association between breastfeeding and tobacco use could be psychosocial or physiological.

D. Potential Confounders

The potential confounders are known risk factors of breastfeeding and at same time could be associated with smoking. These confounders are divided into two categories: basic characteristics (such as age, education, work, wealth index, and type of place of residence) and health care related variables (such as delivery by cesarean section, place of delivery and wanted pregnancy).

Based on the literature, sociodemographic characteristics such as age, education, employment, income, and place of residence are highly associated with breastfeeding patterns. Results from a secondary analysis of the Tanzania 2010 Demographic and Health survey revealed that the risk of delayed initiation of

breastfeeding was significantly higher among young mothers aged <24 years and employed mothers (Victor et al., 2013). As for education exclusive breastfeeding for 4 months was more common among mothers with higher education level (>12years of education) than among the less educated (Mangrio et al., 2011). Moreover, low income mothers were nearly three times more likely to have stopped any breastfeeding at 4 weeks (OR = 2.76; 95% CI: 1.25, 6.06) (Dozier et al., 2012). In addition, breastfeeding practices have been compared between urban and rural areas. In Vietnam, it has been reported that out of 1145 urban and 1488 rural children, early initiation was more frequent in urban areas (44.1%) compared to rural (37.7%), whereas exclusive breastfeeding at 3 months of age was higher in rural (61.2%) compared to urban areas (49.2%) (Thu et al., 2012).

Other potential confounders are caesarean section, birth weight, unintended pregnancy, and place of delivery (public vs. private hospital). Women who had a caesarean section had a significant delay in initiating breastfeeding compared to those who had given birth vaginally (Rowe-Murray & Fisher, 2002). Nevertheless, a study in Bangladesh demonstrated the enhanced growth effects of exclusive breastfeeding on LBW babies in regard to weight and length gain. It was found that body weight of LBW babies after 2 months increased significantly (3620±229g, P<0.001) (Thakur et al., 2012). Unwanted or mistimed pregnancy has an effect on maternal behavior. It appears that mothers with unwanted pregnancies were less likely breastfeed for 8 weeks (OR= 0.74, 95% CI= 0.57, 0.97), compared to woman with wanted pregnancies (Cheng et al., 2009). In addition the secondary data analysis of the 2003 Philippine National Demographic and Health Survey showed that children born from mistimed pregnancies are more likely to have late breastfeeding initiation compared to those born from wanted

pregnancies (OR= 1.44, 90% CI= 1.17- 1.78) (Ulep & Borja, 2012). Nonetheless, breastfeeding patterns vary from public to private hospitals. Breastfeeding for 6 months was less likely in public hospitals where 74% of mothers in the public hospital were not breastfeeding compared to 11% in the private (Merewood et al., 2007).

Free infant formula packs are commonly given to new mothers at the time of hospital discharge. This is an effective and efficient marketing method that helps the manufacturers to get new mothers to try their company's formula milk (Merewood & Phillipp, 2000). Women who receive these packs are more likely to exclusively breastfeed for fewer than 10 weeks than women who do not receive these packs (AOR= 1.39 95%CI= 1.05-1.84) (Rosenberg et al., 2008).

The aim of this study is to investigate the association between maternal smoking and breastfeeding indicators: initiation, duration, and exclusivity among children between the ages of 0 to 1 year old. The data of this study is obtained from the Demographic and Health Survey (DHS) Jordan 2007, a national study that reported information on maternal and child health.

Hypothesis:

-Children whose mothers smoke are less likely to be exclusively breastfed compared to non-smokers, adjusting for other covariates.

- Children whose mothers smoke are less likely to have started early initiation of breastfeeding compared to non-smokers, adjusting for other covariates.

- Children whose mothers smoke are less likely to be breastfed for 6 months compared to non-smokers, adjusting for other covariates.

CHAPTER III

METHODOLOGY

A. Data Source

This study was a secondary analysis based on the data from Jordan Demographic Health Survey (JDHS) conducted in 2007 by Jordan's Department of Statistics in collaboration with Macro International (Department of Statistics Jordan, 2007). The study was a cross-sectional survey of the Jordanian population at the national level. The main objective of the DHS Jordan 2007 survey was to provide a comprehensive data on fertility, mortality, family planning, maternal and child health, and nutrition, to be used as tools to evaluate existing population and health policies and programs. The sample was designed using the 2004 DHS Census as the sampling frame. The frame excluded the population living in remote areas (most of whom are nomads), as well as those living in collective housing units, such as hotels, hospitals, work camps, prisons, and the like. The list was assessed in terms of completeness and recency as such: after identifying the locations of housing units/blocks, the numbers on the buildings and households were updated and documented, in addition to the name of the household head and the owner of the housing unit. The sample was obtained by using stratified sampling method by dividing Jordan into 12 governorates and separating each of these governorates into urban and rural areas. The rural areas of each governorate form a single stratum; the urban areas of each governorate form a single stratum only if the governorate does not have a city with a population more than 100,000, otherwise these cities with populations more than 100,000 form a single stratum in addition to the

urban stratum. In total, 30 sampling strata were obtained. Samples were selected from these strata in two stages. In the first stage, clusters/blocks were selected randomly as primary sampling units (PSUs) with a probability proportional to the size of the PSU. In total, 930 PSUs were selected at this stage. In the second stage, 16 households were selected from each PSU randomly, resulting in a sample size of 14,880 households. Out of these, 10,876 eligible women were interviewed, which has a high response rate of 98%. For this study, all children between 0-12 months (2214 children) were selected.

The field work started on 14 June 2007 and finished on 19 November 2007. Data processing operations (central editing of data, data entry, double-entry of all questionnaires, final editing, and verification of data accuracy and consistency) were completed at the end of December 2007. For the survey to be executed, two questionnaires were prepared and pilot tested. These questionnaires were developed and validated in English and Arabic. The first is the Household Questionnaire and the second is the Individual Questionnaire (for eligible women). The Household Questionnaire was used to list all members of the sampled households and to obtain information on each household member's age, sex, educational attainment, and relationship to the head of household. In addition, the Household Questionnaire was used to identify eligible women (ever-married between the ages 15-49) to proceed with the Individual Questionnaire. Interviewers for data collection were selected from the Department of Statistics and were all highly qualified females. Training of the interviewers lasted for four weeks and mainly focused on interviewing techniques as well as a detailed review on each item on the questionnaire. After this training, pilot testing was conducted in three urban areas and one rural area, upon which modifications and clarifications to the questionnaires were made.

B. Study Measurements and Covariates

Three measures were used to assess breastfeeding: exclusive breastfeeding assessed for children between 0-6 months, duration of breastfeeding (in months) for all children between 0-12 months, and initiation of breastfeeding which is the time at which breast milk was given to the child and is divided into two categories: early initiation (<1 hour) and late initiation (>1 hour).

The exclusive breastfeeding variable was created such that children were exclusively breastfed (Yes=1) if the mother did not give her child anything to eat or drink other than breast milk during the first 3 days after birth and the day before the interview and the child did not drink anything from a bottle. Breastfeeding duration is a continuous variable. Mother was asked to report in months how long has she breastfed her child. As for breastfeeding initiation, it was dichotomized, where 0 denoted early initiation (< 1 hour) and 1 late initiation (> 1 hour).

The main independent variable is smoking (cigarette or water-pipe). The mothers were asked whether they smoked cigarette (Yes=1/No=0) and water-pipe (Yes=1/No=0). The smoking variable was created by using these two covariates such that a mother is a smoker if she smokes cigarette or water-pipe.

Other covariates that could be related to smoking and breastfeeding are: mother's age (15-24, 25-29, 30-35, 35+), mother's education (no education/elementary, preparatory, secondary, university), mother is currently working (Yes, No), husband's age (19-29, 30-39, 40-49, 50+), husband's education (no education/elementary, preparatory, secondary, university), husband is currently working (Yes, No), wealth index (poorest, poorer, middle, richer, richest), type of place of residence (urban, rural),

sex of child (male, female), birth weight of child (<2.5 kg, ≥ 2.5 kg), place of delivery (public hospital, private hospital), wanted last child (wanted, mistimed, unwanted), last birth delivered by caesarian section (Yes, No), given free sample of infant formula when discharged from hospital after delivery (Yes, No).

Some of these covariates were recoded to account for small numbers in some of their categories.

C. Statistical Analysis

Data analysis was performed by using SPSS Version 16. The Individual SPSS data was merged with the Children SPSS data by using the mother's ID (CASEID) as a key variable to assess the association between the mothers' smoking status and breastfeeding indicators among their children. In addition, the data has been weighted so that the distribution of the selected variables is more representative. Univariate analysis was conducted to explore the distribution of all selected variables. For categorical variables (initiation and exclusive breastfeeding), frequencies and percentages were reported. For continuous variable (duration of breastfeeding) mean and standard deviation were reported. Bivariate analyses for initiation and exclusive breastfeeding was carried out using contingency tables and Chi square test of association. Independent sample t-test was used for the continuous outcome duration of breastfeeding to compare means of smokers vs. non-smokers. Variables with p value <0.2 in the bivariate analysis were entered to the multivariate regression. Binary logistic regression was used to perform the multivariate analysis for the categorical outcomes initiation and exclusive breastfeeding where adjusted ORs and 95% CI were reported. Linear regression was

used to perform the multivariate analysis for the continuous outcome breastfeeding duration. Adjusted β along with the 95% CI were calculated. The level of significance was set at $p< 0.05$ for the statistical analyses. Collinearity test was conducted to assess the correlation between the independent variables using the Variance Inflation Factors (VIFs). No collinearity was found between the independent variables since all VIFs were < 10 (belongs to result not in methodology). In addition, the assumptions of normality and homoscedasticity were met by conducting the diagnostics for multiple linear regression.

D. Ethical Considerations

The DHS Jordan 2007 data is a public data. There are no personal identifiers in this data. Before starting with the interview, a consent statement (which included a brief introduction of the survey, participation is voluntary, and all answers will remain confidential) was read to the interviewee upon which participation was either granted or refused.

CHAPTER IV

RESULTS

A. Description of Sample

1) Basic Characteristics

The study sample consisted of 2214 children who were between 0-12 months. Table 1 represents the percent distribution of these children by selected basic characteristics. The majority of the mothers (30.0%) were between 25-29 years, had a secondary education (48.0%), and were not working (89.3%). The husbands were mostly between the 30-39 age range (55.8%), had a secondary education as well (44.4%), and almost all husbands were working (93.1%). According to the wealth index, 27.8% were in the poorest category compared to 11.0% who were in the richest category. The highest proportion were living in urban areas (81.8%). As for the characteristics of the children, more than half were ≤6 months (57.0%) and were males (52.0%). Only 9.7% had a low birth weight.

2) Smoking and Health Care Related Variables

Table 2 represents the percent distribution of children by their mothers' smoking status and other health care related variables. A total of 178 mothers (8.0%) smoked either cigarette or water-pipe. The majority of the mothers had a vaginal delivery (77.8%) and delivered in a public hospital (65.7%). Approximately two-thirds

(71.5%) reported that their last pregnancy was wanted compared to 16.6% for mistimed and 12.0% for unwanted pregnancies.

3) Patterns of Breastfeeding

Table 3 shows the percent distribution of children by breastfeeding patterns. Early initiation (<1 hour) was reported among 37.1% of the mothers. The mean± standard deviation of duration of breastfeeding for children between 0-12 months was 5.14± 3.42 months. As for children who were being breastfed at the time of the interview, the mean± standard deviation of breastfeeding duration was 5.35±3.47. The highest proportion of children being currently breastfed were those between 0-2 months (94.0%). In addition, only 13.1% of women were given free sample of infant formula when discharged from hospital after delivery. For exclusive breastfeeding, children ≤6 months were selected (1262 children). Exclusive breastfeeding rate decreases with the increase in the age of children. A small proportion of children, who were between 0-6 months, were exclusively breastfed (10.1%).

B. Association of Smoking with Selected Covariates

Table 4 represents percent of mothers who smoke cigarette or water-pipe with selected covariates. Smoking was significantly associated with women's age, education, work, wealth index, type of place of residence, delivery by cesarean section, and place of delivery. Percent of smoking was highest among women who were ≥35 years, had an elementary or no education and among working women. The largest proportion of

smokers was in the richest category (24.2%) of the wealth index. Those who reside in urban areas are 3 times more likely to be smokers compared to rural residents.

C. Association of Smoking with Breastfeeding Indicators

1) Bivariate Analysis

Table 5 represents the percent who initiated early breastfeeding with smoking and selected covariates. Smoking was significantly associated with early initiation of breastfeeding. Among smokers, 25.2% initiated early compared to 38.1% in non-smokers. Other covariates significantly associated with early initiation of breastfeeding were women's age, education, work, wealth index, type of place of residence, delivery by cesarean section, and place of delivery. Women who initiated early breastfeeding were between 25-34 years, with no or elementary education, non working poorest and were residing in rural areas. Of those who delivered vaginally, 44.1% initiated early compared to 12.2% among those who delivered by cesarean section. In addition, early initiation was significantly higher among women who delivered in a public hospital (43.5%) compared to private (24.5%).

Table 6 represents percent who were exclusively breastfed with smoking and selected covariates for children between 0-6 months (1262 children). An equal proportion of children were exclusively breastfed (around 10%) among smoking and non-smoking mothers and these results were not significant. Younger mothers (15-24 years) had the highest rate of exclusive breastfeeding (16.1%). Women with secondary education (12.9%) and non working (11.2%) also had the highest proportions. As for wealth index and place of residence, women who belonged to the poorer category and

those living in urban areas had the highest proportion of exclusive breastfeeding (16.7% and 11.2%, respectively). Exclusive breastfeeding was also significant with sex of child, birth weight, delivery by cesarean section, and wanted pregnancy. Exclusive breastfeeding was highest in males (12.3%) and low birth weight children (16.3%), mothers who had a vaginal delivery (12.1%), and mistimed pregnancy (16.2%).

Table 7 shows the mean± standard deviation of breastfeeding duration with smoking and selected covariates. Smoking was significantly associated with duration of breastfeeding. The mean of breastfeeding duration among smokers was 4.28±3.33 months compared to 5.21±3.42 months in non-smokers. In addition, duration of breastfeeding was significantly associated with women's age and work, husband's age and education, wealth index, delivery by cesarean section and wanted pregnancy. The longest breastfeeding duration was among older mothers ≥35 with 5.64±3.48 months and non working mothers 5.22±3.42 months as well as those belonging to the middle class with 5.61±3.63 months. Women who had a cesarean section had a shorter duration (4.82±3.27 months) compared to vaginal delivery (5.23±3.46 months). Mothers who had an unwanted pregnancy had the longest duration of breastfeeding (5.58±3.69 months).

2) Multivariate Analysis

Tables 8, 9, and 10 show the unadjusted and adjusted ORs as well as the βs with 95% CI of breastfeeding initiation, exclusive breastfeeding, and duration of breastfeeding, respectively, with smoking and covariates that were significant at $p< 0.2$ in the bivariate analyses. The unadjusted OR for early initiation and smoking was 0.54

(95%CI= 0.37, 0.78). After adjustment, results remained significant; the odds of early initiation in smoking mothers is 0.56 times the odds of non-smokers (95%CI= 0.37, 0.86). For exclusive breastfeeding and smoking, results were not significant. The adjusted odds of exclusive breastfeeding among smokers is 1.60 times the odds of that in non-smokers (95%CI= 0.76, 3.39), after controlling for potential confounders. The unadjusted β for breastfeeding duration and smoking was -0.94 (95%CI= -1.49, -0.38) and these results remained significant (95%CI= -1.47, -0.34) after adjusting for potential confounders; for every 1 unit increase in smoking, breastfeeding duration decreases by 0.90 months.

CHAPTER V

DISCUSSION

This study was a secondary analysis of 2007 DHS data of Jordan. The aim of the study was to investigate the association between maternal smoking and breastfeeding indicators: initiation, duration, and exclusivity among children between the ages of 0 to 1 year old.

A. Overview and Discussion of Results

This study revealed that after adjustment for potential confounders, smoking was significantly associated with breastfeeding initiation and duration, where the larger proportion of women who initiated early and breastfed for a longer duration were non-smokers. These findings are similar to other studies where the authors suggest that maternal smoking causes early weaning (Horta et al., 2001; Giglia et al., 2006; Liu et al., 2006). A dose-effect relationship between smoking and breastfeeding duration was found; the higher the number of cigarettes a woman smokes, the shorter is her duration of breastfeeding (Horta et al., 1997). In addition, the odds of weaning before 3 months in smoking mothers was 1.93 times the odds of non-smoking mothers (95% CI = 1.55, 2.40) (Horta et al., 2001). This might be explained by the fact that smokers might be less conscious about their health and might have less knowledge about the harmful effects of smoking during and post pregnancy compared to non-smokers (Bogen et al., 2008). This negative association between maternal smoking and breastfeeding duration has been reported consistently in a range of countries (Nolan & Goel, 1995; Clements et

al., 1997; Ekstrom et al., 2003). In a cohort study on 587 Australian mothers, women who smoked during their pregnancy had a shorter duration of breastfeeding than non-smokers (OR=1.32, 95%CI= 1.02-1.71) (Scott et al., 2006). It has been proposed that nicotine has a negative effect on breast milk supply by suppressing prolactin levels (Jansson et al., 1992); on the other hand, Donath and Amir (2004) argued that if smoking had a negative physiologic effect on breastfeeding, then we would expect the effects of smoking to be seen universally. In a review of the epidemiologic evidence (Amir & Donath, 2002), the authors reported that women who smoked were less likely to intend to breastfeed and to initiate breastfeeding. They argued that psychosocial factors are largely responsible for the lower rates of breastfeeding found in women who smoke compared with those who do not smoke. They found that significantly fewer women who smoked intended to breastfeed for at least 4 months compared with non-smokers (33.7% vs 47.4%; $p<0$ .001). Similarly, Scott et al. (2006) reported that fewer smokers intended to breastfeed for 6 months or longer compared with non-smokers (47.2% vs 62.1; $p<0.001$). Not only do smoking mothers exhibit a shorter duration, but also they are more likely not to initiate breastfeeding early (Ratner et al., 1999; Hakansson & Carlsson, 1992). In a prospective cohort study in Hong Kong, the odds of late initiation among smokers was 4.21 times the odds of non-smokers (95%CI= 2.72, 6.50) (Leung et al., 2002). The definition of early initiation in this study is consistent with other studies (Edmond et al., 2005; Mullany et al., 2008; Victor et al., 2013) where initiation of breastfeeding within 1 hour after birth was denoted as early. Although several studies have found a negative relationship between smoking and breastfeeding duration, other studies have failed to find an association between the two (Vogel et al., 1999; Gilchrist et al., 2004). A study in Australia reported that there was no significant

association between maternal smoking and duration of breastfeeding; 58% of smokers were breastfeeding at 24 weeks postpartum, compared to 64% in non-smokers, but this difference was not significant (Gilchrist et al., 2004). Possible explanation for this might be the high rate of loss to follow up at 6 months postpartum (44%).

Although two of the hypotheses were confirmed in this study, no significant association was found between smoking and exclusive breastfeeding. This finding is inconsistent with the majority of studies in the literature. In most studies, smoking was significantly associated with exclusive breastfeeding (Al Sahab et al., 2010; Lande et al. 2003; Tan, 2011). Smoking during pregnancy was negatively associated with exclusive breastfeeding (OR= 2.11, 95% CI= 1.36-3.27) (Al-Sahab et al., 2010). Similarly, a study in UK showed that women who smoked during pregnancy had an odds of 2.5 (95% CI: 2.2–2.8) of not breastfeeding at 6 months compared to non-smokers (Donath & Amir, 2004). Possible reasons could be the inadequate knowledge among mothers regarding the benefits of exclusive breastfeeding for 6 months and also the belief that breast milk alone is not sufficient to fulfill the infant's hunger and therefore the need of formula milk after breastfeeding (Shirima et al., 2001) In addition, excessive crying has been observed in infants of smoking mothers (Reijneveld et al., 2005). This irritability may be interpreted as hunger, and a mother may cease breastfeeding prematurely and start formula feeding in response. Possible explanations for the non significant result between smoking and exclusive breastfeeding in this study might be the smaller sample that was chosen for the exclusive breastfeeding variable (children between 0-6 months) and consequently the low rate of exclusive breastfeeding. Also, recall bias could have occurred where some mothers might not have remembered if they had introduced their child to other liquids/foods. A more likely reason might be the way the exclusive

breastfeeding variable was measured. Since there was no specific question regarding exclusive breastfeeding in the original data, it was created by using 3 questions from the main study. Unfortunately these questions altogether do not clearly define exclusive breastfeeding because they focus on the administration of complementary foods/liquids to the child during the first 3 days after birth and the day before the interview. Therefore, the lack of accurate questions on feeding behavior for 6 months could have lead to insignificant results in this study. It's worth mentioning that the prevalence of exclusive breastfeeding in this study decreased with the increase in the age of child. This finding was consistent with other secondary analyses of Demographic and Health Surveys conducted in Nigeria (Agho et al., 2011), India (Patel et al., 2010), Bangladesh (Mihrshahi et al., 2010), Vietnam (Senarath et al., 2010b), and Malawi (Vaahtera et al., 2001).

B. Other Predictors of Breastfeeding

Although this study doesn't aim at assessing the predictors of breastfeeding; however, several factors in this study as well as in other studies are potential confounders of breastfeeding.

1. Breastfeeding Initiation

In the multivariate analysis, early initiation of breastfeeding was significantly associated with young maternal age, non working mothers, richer mothers, and women who delivered vaginally. Being employed and delivery by cesarean section are determinants of delayed initiation (Pandey et al., 2010; Senarath et al., 2010a, Patel et

al., 2010). The association between cesarean delivery and late initiation may be explained by the effect of anaesthesia that delays the onset of lactation (Mathews, 1989). Other covariates such as low maternal education and living in rural areas were significantly associated with early initiation in the bivariate analysis. These findings are not similar to other studies (Patel at al., 2010; Setegn et al., 2011; Victor et al., 2013) in which the authors reported that higher levels of education and residing in urban areas have a reduced risk of delayed initiation. These might be explained by the exposure of educated mothers to various sources of information and better knowledge about appropriate infant feeding practices (Patel et al., 2010). In addition, the difference in early initiation of breastfeeding between rural and urban mothers might be explained by the fact that majority of rural women give birth at home and are usually assisted by family members. These individuals may have inadequate knowledge of the benefits of breastfeeding and thus fail to support mothers in initiating breastfeeding early (Victor et al., 2013).

2. Duration of Breastfeeding

At the multivariate level, duration of breastfeeding was positively associated with maternal age and negatively associated with maternal education, work, and vaginal delivery. Many studies support the positive association between age and duration of breastfeeding (Dubois & Girard, 2003; Michaelsen et al., 1994; Nolan & Goel, 1995; Lande et al., 2003). Other studies suggest that higher maternal education and employment lead to shorter durations of breastfeeding (Ulep & Borja, 2012). Concerning vaginal delivery, results from a study in Australia were consistent with the results in this study, where the authors suggested that infants born to mothers who had

delivered by cesarean section have a shorter duration of breastfeeding compared to infants who were born to women who had delivered vaginally (Scott et al., 2006). At the bivariate level, additional covariates such as wealth index (middle class) and unwanted pregnancies were associated with longer duration of breastfeeding. These results were inconsistent with other studies where the authors mentioned that low SES households have the longest duration of breastfeeding since these families are unable to purchase infant formulas so they are left with the most economical approach which is breastfeeding (Ulep & Borja, 2012). Studies in the United States, Ghana and, Australia have indicated that children born from mistimed and unwanted pregnancies are more likely to breastfeed for a shorter duration (Taylor & Cabral, 2002; Scott et al., 2006; Chinebuah & Perez-Escamilla, 2001). Probable explanation to this might be that mothers with wanted pregnancies are more excited and emotionally ready; thus, they are more likely to provide the child with the necessary needs which they perceive to be "best" or "sufficient".

3. Exclusive Breastfeeding

Older maternal age, non working mothers, poorer mothers, residing in urban areas, having a male child, and vaginal delivery were significantly associated with exclusive breastfeeding in the multivariate analysis. A study in Nigeria reported that mothers who are forced to return to full time work are unable to exclusively breastfeeding their children (Salami, 2006). In addition, Sheehan et al. (2001) indicated that vaginal deliveries increased the odds of exclusive breastfeeding at 6 months. Pain and discomfort associated with caesarean section may prevent the mother from breastfeeding exclusively. As for the sex of the child, a study in Egypt reported that

infant's sex being male showed significant positive association with exclusive breastfeeding. Boys were found to be 1.8 times more exclusively breastfed than girls (Al Ghwass & Ahmed, 2011). Nonetheless, mothers in Tanzania residing in urban areas were at a greater risk of poor exclusive breastfeeding practices than mothers from rural areas, possibly because of the demand to return to work after maternity leave since most of these urban mothers were in paid employment. Also, most mothers in urban areas were from families with higher socioeconomic status compared with rural areas and that may have facilitated access to breast milk substitutes (Lakati et al., 2001).

C. Strengths of the Study

The main strengths of this study are the large and nationally representative sample and thus high power for statistical analysis. Moreover, response rate was high (98%) and non respondents were not different than respondents in the original study thus minimizing selection bias. In addition, the data was collected using pretested questionnaires by a well-trained staff. Furthermore, restricting the sample to only children less than 1 year (and $\leq$ 6 months only for exclusive breastfeeding) ensures greater accuracy of information regarding breastfeeding practices. In addition, the Jordan DHS data gives us the potential to compare present results with future Jordan DHS results. Also, the DHS includes several demographic and health related variables which are well measured and were used as potential confounders in this study. Additionally, thorough analysis was used in this study; collinearity test of the independent variables and diagnostics for multiple linear regression were conducted.

D. Limitations of the Study

Several limitations are present in this study; since the study is cross-sectional, causality could not be ascertained. Also recall bias might have occurred since most of the information in this study was collected retrospectively. Underreporting of smoking could have also occurred since smoking was self-reported by women which could underestimate the prevalence of smoking among women in this study and consequently underestimate the influence of smoking on breastfeeding indicators. Social desirability bias might have occurred regarding smoking- smoking women might be afraid of being stigmatized as smokers. Furthermore, we couldn't assess the impact of each type of smoking on the breastfeeding indicators since the prevalence of each type of smoking, especially water-pipe, was low, that is why we joined the two types of smoking into a one smoking variable. Moreover, the original Jordan DHS data lacks more specific questions on smoking such as the number of cigarettes smoked per day (to define women as heavy or light smokers), smoked during pregnancy (Yes/No), smoked during lactation (Yes/No), and questions regarding paternal smoking behaviour in order to know if the wife was being subject to second-hand smoking. Another limitation in this study is the validity of measure of the exclusive breastfeeding variable. Since no question on exclusive breastfeeding is present in the DHS data, this variable was created by using 3 questions found in the survey which mainly focus on introduction of supplementary foods or liquids other than breast milk during the first 3 days after birth and the day before the interview. Thus, these questions were not enough to have a good measure of exclusive breastfeeding in this study.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

The findings of this study show that smoking (cigarette or water-pipe) is significantly associated with initiation and duration of breastfeeding in Jordan. Even after controlling for several potential confounders, these results remained significant. However, there was no association found in this study between smoking and exclusive breastfeeding.

Although breastfeeding is generally high in Jordan; however, certain indicators of breastfeeding (initiation, exclusive and duration) are still not optimal and thus require the attention of health authorities and professionals to improve these breastfeeding rates. And even though the smoking rate in this study was not very high (8.0%); however, water-pipe smoking is gaining popularity now and more young women are attracted to this type of tobacco. Thus, interventions targeting these women are necessary and could be achieved through physicians such as OB/GYNs, pediatricians and even nurses who can inform these women about the importance of smoking cessation not only during pregnancy but in the long-run as well. Additionally, incorporating knowledge of the association between smoking and breastfeeding into existing smoking-cessation and breastfeeding programs could provide opportunities to reduce perinatal exposure to tobacco smoke and improve interest in breastfeeding. Moreover, strengthening smoking-cessation services that target pregnant women and women of childbearing age before they become pregnant is crucial to reduce the harmful effects of tobacco smoke in utero. Other interventions targeting breastfeeding promotion may also indirectly

support smoking cessation. In addition, interventions through media campaigns such as television commercials or billboard ads about breastfeeding and smoking cessation are very effective in improving attitudes towards breastfeeding and sending the message to a wider audience. Other interventions at the policy level may involve labels or warning messages about the harmful effects of smoking on breastfeeding on cigarette packs or on visible parts of the water-pipe such as the mouth tip. Furthermore, hospitals in Jordan must encourage the Baby Friendly Hospital Initiative by supporting breastfeeding and avoiding the distribution of free infant formulas. Finally, further research is needed in Jordan in order to assess the influence of smoking on the breastfeeding indicators and compare them with previous results. Therefore, more specific and accurate questions should be included in the DHS data such as the number of cigarettes smoked per day as well as smoking during pregnancy and lactation. As a result, the prevalence of smoking during these periods will be assessed and this is vital since pregnancy and breastfeeding are opportune times to intercept smoking among women in general.

TABLES

Table 1: Percent Distribution of Children between 0-12 months by selected Basic Characteristics; Jordan DHS data 2007

Woman's Age	**Frequency**	**Percentage**
15-24	599	27.1
25-29	665	30.0
30-35	475	21.5
35+	475	21.5
Woman's Education		
No Education/Elementary	151	6.8
Preparatory	359	16.2
Secondary	1062	48.0
University	641	28.9
Woman Currently Working		
Yes	237	10.7
No	1977	89.3
Husband's Age		
19-29	505	22.9
30-39	1229	55.8
40-49	402	18.2
50+	68	3.1
Husband's Education		
No Education/Elementary	272	12.3
Preparatory	416	18.8

Secondary	981	44.4
University	541	24.5
Husband works		
Yes	2061	93.1
No	153	6.9
Wealth Index		
Poorest	615	27.8
Poorer	571	25.8
Middle	481	21.7
Richer	303	13.7
Richest	244	11.0
Type of place of residence		
Urban	1811	81.8
Rural	403	18.2
Age of Child (months)		
≤6	1262	57.0
>6	952	43.0
Sex of Child		
Male	1150	52.0
Female	1064	48.0
Birth Weight of Child		
<2.5 kg	213	9.7
≥ 2.5 kg	1978	90.3

-Not all totals add up to 2214 because of missing data

Table 2: Percent Distribution of children between 0-12 months by smoking status of mothers and other health care related variables; Jordan DHS data 2007

Smokes Cigarette	**Frequency**	**Percentage**
Yes	140	6.3
No	2074	93.7
Smokes Water-pipe		
Yes	65	2.9
No	2149	97.1
Smokes (cigarette or water-pipe)		
Yes	178	8.0
No	2036	92.0
Last birth delivered by caesarian section		
Yes	491	22.2
No	1723	77.8
Place of Delivery		
Public Hospital	1438	65.7
Private Hospital	751	34.3
Wanted Last Child		
Wanted	1583	71.5
Mistimed	367	16.6
Unwanted	265	12.0

-Not all totals add up to 2214 because of missing data

Table 3: Percent Distribution of Children by selected patterns of Breastfeeding; Jordan DHS data 2007

a) Children between 0-12 months

Breastfeeding Initiation	**Frequency**	**Percentage**
Early (< 1 hr)	780	37.1
Late (> 1 hr)	1321	62.9
Breastfeeding Duration	**mean± standard deviation**	
Children 0-12 months (2,069 children)	5.14±3.42	
Children currently being breastfed (1,704 children)	5.35±3.47	
Introduction of liquids in the first 3 days after delivery:		
Infant Formula	2214	45.1
Plain water/ sugar water	2214	26.2
Tea/ infusions	2056	16.9
Child drank from a bottle		
Yes	1054	48.2
No	1132	51.8
Currently Breastfeeding		
Children 0-2 months	476	94.0
Children 3-4 months	414	85.9
Children 5-6 months	372	80.3
Children >6 months	1146	68.1
Given free sample of infant formula when discharged from hospital after delivery		

Yes	288	13.1
No	1908	86.9

-Not all totals add up to 2214 because of missing data

b) Children who are ≤6 months

Exclusive Breastfeeding for children between 0-2 months (N=476)	**Frequency**	**Percentage**
Yes	82	17.1
No	395	82.9
Exclusive Breastfeeding for children between 3-4 months (N=414)		
Yes	37	9.0
No	376	91.0
Exclusive Breastfeeding for children between 5-6 months (N=372)		
Yes	9	2.4
No	363	97.6
Exclusive Breastfeeding for children between 0-6 months (N=1262)		
Yes	128	10.1
No	1134	89.9

Table 4: Percent of mothers who smoke (cigarette or water-pipe) with selected covariates for children between 0-12 months

Covariates	**Frequency**	**% smoke**	**P value**

Woman's Age	15-24	599	6.3	0.004*
	25-29	665	8.7	
	30-34	475	5.9	
	35+	475	11.6	
Woman's Education	No Education/ Elementary	151	15.9	0.001*
	Preparatory	359	9.7	
	Secondary	1062	7.1	
	University	641	6.7	
Woman Currently Working	Yes	237	15.2	0.000*
	No	1977	7.2	
Husband's age	19-29	505	5.7	0.076
	30-39	1229	8.3	
	40-49	402	10.4	
	50+	68	7.4	
Husband`s education	No Education/ Elementary	252	22.4	0.111
	Preparatory	416	7.2	
	Secondary	981	7.3	
	University	541	7.8	
Husband works	Yes	2061	7.8	0.079
	No	153	11.8	
Wealth Index	Poorest	615	6.5	0.000*
	Poorer	571	6.3	

	Middle	481	5.8	
	Richer	303	5.3	
	Richest	244	24.2	
Type of place of residence	Urban	1811	9.2	0.000*
	Rural	403	3.0	
Age of Child (months)	≤6	1262	8.1	0.932
	>6	952	8.0	
Sex of Child	Male	1151	7.3	0.182
	Female	1063	8.8	
Birth Weight	< 2.5 kg	213	8.5	0.834
	≥ 2.5 kg	1978	8.0	
Last Birth delivered by caesarian section	Yes	491	10.6	0.021*
	No	1723	7.4	
Place of Delivery	Public Hospital	1439	6.4	0.000*
	Private Hospital	750	10.8	
Wanted Last Child	Wanted	1583	7.3	0.149
	Mistimed	367	9.8	
	Unwanted	264	9.8	
Currently Breastfeeding	Yes	1731	6.5	0.000*
	No	483	13.7	

Table 5: Percent initiated early breastfeeding with smoking and selected covariates for children between 0-12 months

Covariates	Frequency	% initiate early breastfeeding	P value

			(<1 hr)	
Smokes (cigarette or water-pipe)	Yes	159	25.2	0.001*
	No	1942	38.1	
Woman's Age	15-24	578	33.4	0.038*
	25-29	613	40.1	
	30-34	452	40.0	
	35+	458	34.9	
Woman's Education	No Education/ Elementary	137	49.6	0.004*
	Preparatory	339	38.9	
	Secondary	1018	37.2	
	University	607	33.3	
Woman Currently Working	Yes	220	22.7	0.000*
	No	1881	38.9	
Husband's age	19-29	486	39.7	0.400
	30-39	1161	37.0	
	40-49	379	34.0	
	50+	65	36.9	
Husband`s education	No Education/ Elementary	261	42.9	0.102
	Preparatory	395	35.7	
	Secondary	929	37.9	
	University	512	34.2	
Husband	Yes	1959	37.0	0.555

works	No	142	39.4	
Wealth Index	Poorest	568	46.0	0.000*
	Poorer	552	39.1	
	Middle	449	36.3	
	Richer	296	26.0	
	Richest	235	26.8	
Type of place of residence	Urban	1719	36.1	0.044*
	Rural	382	41.6	
Sex of Child	Male	1082	37.9	0.453
	Female	1019	36.3	
Birth Weight	< 2.5 kg	183	33.9	0.351
	≥ 2.5 kg	1900	37.4	
Last Birth delivered by caesarian section	Yes	458	12.2	0.000*
	No	1643	44.1	
Place of delivery	Public Hospital	1359	43.5	0.000*
	Private Hospital	718	24.5	
Wanted Last Child	Wanted	1507	37.4	0.443
	Mistimed	344	34.3	
	Unwanted	251	39.0	

Table 6: Percent who are exclusively breastfed with smoking and selected covariates for children between 0-6 months

Covariates		**Frequency**	**% exclusively breastfed**	**P value**
Smokes	Yes	102	10.8	0.823

(cigarette or water-pipe)				
	No	1160	10.1	
Woman's Age	15-24	372	16.1	0.000*
	25-29	367	9.5	
	30-34	287	9.8	
	35+	236	2.1	
Woman's Education	No Education/ Elementary	87	6.9	0.019*
	Preparatory	199	7.5	
	Secondary	613	12.9	
	University	363	7.7	
Woman Currently Working	Yes	136	1.5	0.000*
	No	1126	11.2	
Husband's age	19-29	321	14.3	0.010*
	30-39	702	9.0	
	40-49	189	7.9	
	50+	43	2.3	
Husband`s education	No Education/ Elementary	147	8.8	0.656
	Preparatory	249	8.4	
	Secondary	556	10.8	
	University	307	11.1	
Husband works	Yes	1167	10.4	0.352
	No	95	7.4	
Wealth Index	Poorest	364	9.3	0.000*

	Poorer	311	16.7	
	Middle	252	9.1	
	Richer	177	6.2	
	Richest	158	5.1	
Type of place of residence	Urban	1025	11.2	0.008*
	Rural	237	5.5	
Sex of Child	Male	690	12.3	0.005*
	Female	572	7.5	
Birth Weight	< 2.5 kg	123	16.3	0.016*
	≥ 2.5 kg	1130	9.4	
Last Birth delivered by caesarian section	Yes	307	3.9	0.000*
	No	955	12.1	
Place of delivery	Public Hospital	814	9.5	0.209
	Private Hospital	435	11.7	
Wanted Last Child	Wanted	918	9.2	0.007*
	Mistimed	204	16.2	
	Unwanted	141	7.8	

Table 7: Means and Standard deviations of Breastfeeding Duration with smoking and selected covariates for children between 0-12 months

Covariates		**Frequency**	**mean±sd**	**P value**
Smokes (cigarette or	Yes	156	4.28±3.33	0.001*

water-pipe)				
	No	1913	5.21±3.42	
Woman's Age	15-24	569	4.63±3.29	0.000*
	25-29	608	5.10±3.36	
	30-34	449	5.36±3.54	
	35+	443	5.64±3.48	
Woman's Education	No Education/ Elementary	137	5.46±3.57	0.159
	Preparatory	331	5.30±3.31	
	Secondary	1010	5.19±3.42	
	University	591	4.90±3.46	
Woman Currently Working	Yes	211	4.48±3.40	0.003*
	No	1859	5.22±3.42	
Husband's age	19-29	485	4.69±3.42	0.000*
	30-39	1140	5.14±3.40	
	40-49	371	5.74±3.40	
	50+	63	5.29±3.86	
Husband`s education	No Education/ Elementary	260	5.11±3.33	0.033*
	Preparatory	391	4.71±3.49	
	Secondary	921	5.24±3.37	
	University	494	5.34±3.50	
Husband works	Yes	1930	5.13±3.43	0.463
	No	139	5.35±3.41	
Wealth Index	Poorest	561	4.99±3.26	0.024* (based

	Poorer	547	5.15±3.48	on Kruskal Wallis Test because of unequal variances)
	Middle	436	5.61±3.63	
	Richer	291	5.09±3.48	
	Richest	235	4.68±3.15	
Type of place of residence	Urban	1691	5.16±3.46	0.579
	Rural	378	5.06±3.29	
Sex of Child	Male	1065	5.10±3.38	0.549
	Female	1004	5.19±3.48	
Birth Weight	< 2.5 kg	172	4.87±3.33	0.283
	≥ 2.5 kg	1880	5.16±3.43	
Last Birth delivered by caesarian section	Yes	444	4.82±3.27	0.023*
	No	1625	5.23±3.46	
Place of delivery	Public Hospital	1335	5.18±3.42	0.422
	Private Hospital	710	5.05±3.44	
Wanted Last Child	Wanted	1490	5.04±3.39	0.047*
	Mistimed	338	5.30±3.37	
	Unwanted	242	5.58±3.69	

Table 8: Unadjusted and Adjusted OR with 95% CI for Breastfeeding Initiation with smoking and other covariates

Covariates	Unadjusted OR	Adjusted OR	P-value of

		(95%CI)	(95%CI)	Adjusted OR
Smokes (cigarette or water-pipe)	No	1.00	1.00	
	Yes	0.54 (0.38, 0.79)	0.57 (0.37, 0.86)	0.008*
Women's Age	15-24	1.00	1.00	
	25-29	1.33 (1.05, 1.69)	1.62 (1.25, 2.09)	0.000*
	30-34	1.33 (1.03, 1.71)	1.69 (1.28, 2.24)	0.000*
	35+	1.07 (0.83, 1.38)	1.70 (1.26, 2.28)	0.000*
Woman's Education	No Education/ Elementary	1.00	1.00	
	Preparatory	0.65 (0.44, 0.97)	0.86 (0.55, 1.34)	0.498
	Secondary	0.61 (0.43, 0.88)	0.81 (0.53, 1.22)	0.309
	University	0.51 (0.35, 0.75)	0.80 (0.51, 1.26)	0.337
Woman Currently Working	No	1.00	1.00	
	Yes	0.46 (0.33, 0.64)	0.48 (0.33, 0.70)	0.000*
Husband`s education	No Education/ Elementary	1.00	1.00	
	Preparatory	0.74 (0.53, 1.01)	0.73 (0.51, 1.05)	0.087
	Secondary	0.81 (0.61, 1.06)	0.96 (0.69, 1.32)	0.779
	University	0.69 (0.51, 0.93)	1.14 (0.78, 1.69)	0.498
Wealth Index	Poorest	1.00	1.00	
	Poorer	0.76 (0.60, 0.96)	0.78 (0.60, 1.01)	0.057

	Middle	0.67 (0.52, 0.86)	0.87 (0.65, 1.16)	0.344
	Richer	0.41 (0.30, 0.56)	0.51 (0.35, 0.72)	0.000*
	Richest	0.43 (0.31, 0.60)	0.84 (0.55, 1.29)	0.426
Type of place of residence	Rural	1.00	1.00	
	Urban	0.79 (0.63, 0.99)	0.98 (0.77, 1.27)	0.904
Last Birth delivered by caesarian section	No	1.00	1.00	
	Yes	0.18 (0.13, 0.24)	0.16 (0.12, 0.22)	0.000*
Place of delivery	Public Hospital	1.00	1.00	
	Private Hospital	0.42 (0.34, 0.52)	0.48 (0.38, 0.61)	0.000*

Table 9: Unadjusted and Adjusted OR with 95% CI for Exclusive Breastfeeding with smoking and other covariates

Covariates		**Unadjusted OR (95%CI)**	**Adjusted OR (95%CI)**	**P-value of Adjusted OR**
Smokes (cigarette or water-pipe)	No	1.00	1.00	
	Yes	1.05 (0.54, 2.03)	1.60 (0.76, 3.39)	0.218
Woman's Age	15-24	1.00	1.00	
	25-29	0.54 (0.35, 0.85)	0.70 (0.42, 1.16)	0.164
	30-34	0.56 (0.35, 0.91)	0.77 (0.41, 1.42)	0.397
	35+	0.11 (0.04, 0.28)	0.14 (0.04, 0.45)	0.001*
Woman's Education	No Education/	1.00	1.00	

	Elementary			
	Preparatory	1.12 (0.42, 3.02)	1.15 (0.39, 3.43)	0.804
	Secondary	2.04 (0.86, 4.88)	2.08 (0.78, 5.57)	0.145
	University	1.15 (0.46, 2.90)	1.47 (0.51, 4.27)	0.481
Woman Currently Working	No	1.00	1.00	
	Yes	0.14 (0.04, 0.51)	0.22 (0.06, 0.85)	0.028*
Husband's age	19-29	1.00	1.00	
	30-39	0.59 (0.39, 0.89)	0.83 (0.51, 1.36)	0.454
	40-49	0.52 (0.28, 0.96)	1.59 (0.69, 3.68)	0.271
	50+	0.10 (0.01, 1.09)	0.60 (0.05, 7.19)	0.688
Wealth Index	Poorest	1.00	1.00	
	Poorer	1.94 (1.22, 3.68)	1.76 (1.06, 2.92)	0.029*
	Middle	0.96 (0.55, 1.67)	1.14 (0.62, 2.09)	0.672
	Richer	0.63 (0.31, 1.28)	0.94 (0.44, 2.01)	0.866
	Richest	0.49 (0.22, 1.09)	0.57 (0.23, 1.43)	0.229
Type of place of residence	Rural	1.00	1.00	
	Urban	2.26 (1.24, 4.11)	2.36 (1.25, 4.45)	0.008*
Sex of Child	Female	1.00	1.00	
	Male	1.70 (1.16, 2.49)	1.75 (1.15, 2.66)	0.009*
Birth Weight	≥ 2.5 kg	1.00	1.00	
	< 2.5 kg	1.90 (1.14, 3.18)	1.78 (0.95, 3.37)	0.074
Last Birth delivered by caesarian section	No	1.00	1.00	
	Yes	0.29 (0.16, 0.54)	0.40 (0.21, 0.77)	0.006*

Wanted Last Child	Wanted	1.00	1.00	
	Mistimed	1.91 (1.23, 2.95)	1.53 (0.94, 2.50)	0.090
	Unwanted	0.85 (0.44, 1.63)	1.37 (0.67, 2.80)	0.394

Table 10: Unadjusted and Adjusted β with 95% CI for Breastfeeding Duration with smoking and other covariates

Covariates	Unadjusted β (95%CI)	Adjusted β (95%CI)	P-value of Adjusted β
Smokes (cigarette or water-pipe)	-0.94 (-1.49, -0.38)	-0.90 (-1.47, -0.34)	0.002*
Woman's Age	0.33 (0.20, 0.47)	0.32 (0.13, 0.50)	0.001*
Woman's Education	-0.20 (-0.37, -0.02)	-0.29 (-0.50, -0.08)	0.006*
Woman Currently Working	-0.74 (-1.22, -0.25)	-0.75 (-1.27, -0.24)	0.004*
Husband's age	0.28 (0.14. 0.41)	0.11 (-0.07, 0.29)	0.238
Husband`s education	0.16 (0.001, 0.31)	0.35 (0.17, 0.53)	0.000*
Wealth Index	-0.02 (-0.13, 0.09)	-0.02 (-0.15, 0.10)	0.743
Last Birth delivered by caesarian section	-0.42 (-0.78, -0.06)	-0.51 (-0.88, -0.14)	0.007*
Wanted Last Child	0.27 (0.06, 0.49)	0.15 (-0.07, 0.37)	0.171

Table 11: Test of Collinearity

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	agewomen	.526	1.902
	educwomen	.702	1.424
	Respondent currently working	.876	1.142
	agepartner	.555	1.803
	partnereduc	.708	1.412
	husbandworks	.924	1.082
	Wealth index	.681	1.468
	Type of place of residence	.943	1.061
	Sex of child	.974	1.027
	bw	.949	1.054
	Last birth ceasarean section	.923	1.084
	Wanted last child	.937	1.067
	placeofdelivery	.769	1.300

a. Dependent Variable: smoking

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