

Initiation and Sustainability of Breast Feeding During the First Six Post-Partum Months among Mothers with Diabetes Mellitus

Omnia Galal Waziry¹, Nehad Sabry Bassiuony¹, Samar Kamal Hafez²,
Isis Emile Gohar³

¹Assistant professor, Pediatric Nursing Department, Faculty of Nursing, Alexandria University

²Assistant professor, Obstetric and gynecological Nursing Department, Faculty of Nursing, Alexandria University

³Lecturer, Obstetric and gynecological Nursing Department, Faculty of Nursing, Alexandria University

Corresponding Author: Omnia Galal Waziry

Abstract It is now widely acknowledged that breast feeding is the optimal feeding method for infants. Breast milk is the ideal food for infants' health and development. The protective effects of breast feeding are abundantly clear in developing countries. Mothers with diabetes are less likely to partly or exclusively breast feed their infants than mothers without diabetes. Diabetes bring many challenges for those mothers so pediatric and obstetric nurses have a crucial role in providing information to support diabetic mothers in early initiation and continuation of breast feeding. **Aim:** The aim of this study was to identify patterns of breast feeding initiation and assess sustainability of infant breast feeding during the first six post-partum months among mothers with Diabetes Mellitus. **Tools:** One tool was used to collect the necessary data, namely Initiation and patterns of breast feeding among diabetic mothers structured interview schedule. **Setting:** The study was conducted at six family health centers affiliated to Ministry of Health from different health zones in Alexandria Governorate. The subject included a convenient sample of 115 diabetic mothers who had infants from 1-6 months attended the previously mentioned settings. **Results:** The study findings revealed that less than fifth only of the mothers gave exclusive breast feeding, and more than half of them gave mixed feeding (complementary or supplementary breast feeding) for their infants. On the other hand, nearly one quarter of the mothers stopped breast feeding at all and gave artificial milk. **Conclusion:** Mothers with diabetes were less likely to initiate breast feeding early or continue exclusive breast feeding. Moreover, they had more tendencies either to provide complementary or supplementary breast feeding or stop breast feeding and give artificial milk. **Recommendation:** Mothers with diabetes need extra support and encouragement during and after pregnancy to achieve optimal breast feeding outcomes. There is a need for providing continuing support and guidance in addressing breast feeding challenges during the first post-partum period for those mothers. Providing practical assistance and education delivered by trained health care providers for women with diabetes in early post-partum period to facilitate successful transition from breast feeding initiation to continuation.

Keywords: Diabetic Mothers; Initiation of breast feeding; Exclusive breast feeding.

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I. Introduction

Breast feeding is the natural and biological method of providing infants and young children with nutrients required for healthy growth and development⁽¹⁾. World Health Organization (WHO) and United Nations Children's Fund (UNICEF) recommend early initiation of breastfeeding within 1 hour after birth with exclusive breastfeeding (EXBF) for the first 6 months of life⁽²⁾. Exclusive Breast Feeding means that the infant receives only breast milk and no other liquids or solids are given not even water in the first six months of life with the exception of vitamins, minerals supplements or medicines. In addition, the infant is fed on demand, day and night with no restrictions on the length or frequency of breast feed⁽³⁾. The practice of exclusive breast feeding is still low despite the associated benefits. WHO estimate that worldwide only 35% of children between birth and their fifth month are breastfed exclusively. Increasing the rates of breastfeeding worldwide is a fundamental driver in achieving the Sustainable Development Goals by 2030⁽⁴⁾.

Breast milk contains all the nutrients which are needed for optimum and proper growth and development in the first six months of infant age. It contains protective bacterial and viral antibodies (immunoglobulin A) and nonspecific immune factors which limit infections⁽⁶⁾. In addition, infants who exclusively breast fed for the optimal duration of six months are protected against the major childhood diseases such as diarrhea, GIT infections and allergic diseases as well as leukemia⁽⁷⁾ Moreover, breast milk contains vitamins, minerals, electrolytes and water which are necessary for the maturation of the intestinal tract⁽⁸⁾. In

addition, breast feeding has long term beneficial effects on minimizing childhood obesity and the risk of developing type 1 and 2 diabetes^(7, 8). Breast feeding is also essential for brain growth of the infant⁽⁷⁾. It also enhances better cognitive development and improvement of intelligence^(8, 9). Additionally, breast feeding promotes close physical and emotional bonding with the mother by frequent skin to skin contact, attention, interaction between mother and infant^(7,9).

Breast feeding reduces the chance of postpartum hemorrhage and helps in better uterine involution⁽¹⁰⁾. Furthermore, it reduces the risk of breast and ovarian cancer of the mother⁽¹¹⁾. Mothers who breast feed also reported lower levels of stress and higher levels of maternal attachment and self-esteem⁽¹²⁾. Additionally, breast milk is more convenient and time saving for mothers. They can provide fresh, pure, ready-made, clean uncontaminated milk to their infant at right temperature without any preparation^(10,12). Breast feeding also provides advantages to society as it reduces health care costs by lowering incidence of illnesses in breast-fed infants. It is also economical in terms of saving money, time and energy. The family spends less on milk, health care and illnesses. In addition, community expenditure on health care and contraception are reduced^(13, 14).

Breastfeeding initiation and duration rates are variable and influenced by the circumstances of the mother and her infant. There are circumstances under which breast feeding can be problematic. Some breast problems may encounter and interfere with breast feeding such as breast engorgement, sore nipple, candidiasis, mastitis, breast abscess, inverted nipple and breast surgery^(15, 16). Women with chronic illnesses may be empowered by their abilities to breast feed. Chronic disorder like Diabetes Mellitus may hinder mothers' ability for lactation. Women with diabetes may be more likely not to breastfeed their children and may have reduced duration of breastfeeding^(17, 18). This is due to increased occurrence of complicated pregnancy and labor, instrumented vaginal deliveries or caesarean section and neonatal morbidity including growth deviations, prematurity and respiratory distress⁽⁵⁾. Neonatal hypoglycemia may also complicate the postpartum feeding regimen. This is related to fetal intrauterine hyperglycemia and hyperinsulinism as a response to maternal hyperglycemia. The lactation process is shown to be delayed in mothers with diabetes, and their infants have a more immature sucking pattern^(19, 20). In addition, women with diabetes may have lower prolactin levels. This may delay the milk's 'coming in' to the seventh day postpartum. Stress, anxiety and poorly-controlled diabetes are also known to affect the mother's ability to produce and 'let down' (the process of milk ejection) her milk^(21,22). so, diabetes may bring many challenges of breast feeding for those mothers.

Early initiation of breast feeding, by placing the neonate immediately postpartum skin-to-skin, allows the first feeding to be led by the neonate with maternal support. This often results in a better initial latch, the mother gain confidence in herself and her neonate. Studies have confirmed that early contact is associated with improved thermal regulation, improved blood glucose level and increased duration of exclusive breast feeding^(22,23). Pediatric nurses and midwives can play a vital role in promoting and supporting breast feeding. Informing pregnant women about the benefits and practices of breast feeding is one of the nursing responsibilities. Nurses should also encourage the mothers to initiate breast feeding as soon as possible after birth (within one hour)^(24, 25). Nurses can also guide mothers how to breast feed and maintain latching even if they are separated from their infants. Furthermore, nurses should encourage the mothers to practice rooming in where mothers and infants are allowed to remain together 24 hours a day. Breast feeding on-demand should also be encouraged. Nurses could also educate the mothers about the appropriate positions for breast feeding, principles for enabling the infant to latch on effectively and the appropriate technique of breast feeding⁽²⁴⁾. Nurses can also provide anticipatory guidance for problems and common difficulties encountered during breast feeding and lactation and provide information for diabetic mothers about how to manage these problems. They should also encourage mothers to receive good balanced diet, adequate amount of fluid and get considerable periods of rest and avoid psychological tension as possible. They can also foster the establishment of breast feeding support groups and refer mothers to them on discharge from the hospital or birth center^(24, 26). Providing information on how to manage different breast feeding problem and providing access to confident support help the mothers to exclusively breast feed their infants successfully for the first six months of life and even longer if they wish.

Aim of the study

The aim of this study was to identify patterns of breast feeding initiation and assess sustainability of infant breast feeding during the first six post-partum months among mothers with Diabetes Mellitus.

Research Questions

- 1- What are the patterns of Breast Feeding initiation among mothers of Diabetes Mellitus?
- 2- To what extent the sustainability of providing breast feeding during the first six post-partum months among mothers with Diabetes Mellitus?

II. Materials and Method

Materials

Research Design:

A descriptive research design was utilized in this study.

Setting:

The study was conducted at six family health care centers affiliated to Ministry of Health and randomly selected from each health zone in Alexandria Governorate. These centers are:

- 1- Al- Gomerk Family health center.
- 2- Al Amria Family health center.
- 3- Al- Hanoveel Family health center.
- 4- Al- Kabbary Family health center.
- 5- Moharam Beck Maternal and Child Health center.
- 6- Abes Family health center

Subjects:

A convenient sample of 115 mothers who were attending to the well baby clinics for vaccinating their infants at the previously mentioned settings throughout the period of six months (from November 2016 till April 2017) was included in the study.

Inclusion criteria:

- 1- Mothers who had diabetes mellitus during their last pregnancy (type 1, type 2 and gestational).
- 2- They haven't any other associated medical conditions.
- 3- They had infants up to 6 months old.

Tools:

One tool was used to collect the data namely "Initiation and patterns of breast feeding among diabetic mothers structured interview schedule".

This tool was developed by the researchers to collect data about initiation and patterns of breast feeding among diabetic mothers during the first six post-partum months after delivery. It consisted of three parts:

Part I: Socio-demographic and health-related characteristics of diabetic mothers and their infants characteristics such as: mothers' age, education, occupation, residence, family income (Self-assessed as satisfactory or unsatisfactory), parity, type of diabetes, type of last delivery (spontaneous vaginal delivery or caesarean section / instrumental) and infant's age, sex and birth order.

Part II: Included data related to initiation of breast feeding such as: time of breast feeding initiation after delivery (early or delayed initiation), current infant feeding (exclusive breast feeding, mixed (supplementary or complementary) or substitutive (artificial or formula feeding).

Part III: Included mothers knowledge about breast feeding such as: benefits for both mothers and infants, meaning of exclusive breast feeding, technique, proper positioning, duration and rooming-in.

Method:

- An official permission was obtained from responsible authorities of the study settings to conduct the study after explaining the aim of the study.
- The tool was developed by the researcher after review of literature.
- The tool was tested for content validity by a jury of five experts in the field of pediatric and obstetric nursing. Based on their comments, necessary modifications were done. The validity was 85%.
- Reliability of the tool was done using Cronbach's alpha test ($r=0.89$).
- A pilot study was carried out on 10 diabetic mothers attending the previously mentioned settings to test the feasibility and applicability of the tool (those mothers were excluded from the study subjects).
- Every mother was interviewed individually to collect the necessary data at the waiting area in MCH centers either between or after the child's receiving for the immunization. The duration of each interview lasted from 30-45 minutes.

Scoring System:

A scoring system was done regarding diabetic mothers' knowledge about breast feeding. Mothers responses concerning each item were scored as follow: two for correct and complete answer / one for correct incomplete answer / zero for incorrect answer or didn't know. Total score was obtained, then the obtained score was converted to total percent score. The percent score was transformed into qualitative manner as follow:
Good => 65% / Fair = 50-65% / Poor =< 50%

Ethical considerations:

- Written informed consents were obtained from the mothers after explaining the aim of the study.
- They have the right to refuse to participate in the study.
- They were assured regarding the confidentiality of the collected data.
- Anonymity and privacy were also considered.

Statistical Analysis:

After collection of data it was revised, coded and fed to statistical software SpSS version 16. The given graphs were constructed using Microsoft excel software. All statistical analyses were done using two tailed tests and alpha error of 0.05. The P value less than or equal to 0.05 was considered to be statistically significant. The following statistical measures were used:

Descriptive statistics:

- Number and percentage: They were used for describing and summarizing qualitative data.
- Mean (x) was used to measure central tendency in statistical tests of significance.
- Standard deviation (SD) is the average of the deviation from the mean. It was used for measuring the degree of variability in a set of scores.

Analytical statistics:

- **Pearson's chi square test:** it is a non-parametric statistic that is used to test for the association (or relationship) between the categories

III. Result

Table 1 presents socio-demographic and health-related characteristics of diabetic mothers. Almost two thirds of the mothers (66.1%) aged from 20-30 years. It was also found that 24.3% of them were above 30 years, while only 9.6% of the mothers were less than 20 years of age with a mean age of 26.5 ± 4.65 years. Regarding to mothers' education, the same table clarifies that 47.0% of mothers completed their elementary education, while 21.7% of them had university education. Concerning mothers' occupation, it is obvious that 65.2% of the mothers were housewives, while 34.8% of them were working mothers. Concerning residence, it is clear that 60.9% of mothers lived in rural areas, while the rest of them (39.1%) lived in urban areas. Regarding the family income, 58.3% of the mothers reported that they had unsatisfactory income, while 41.7% of them had satisfactory income. Concerning the type of diabetes mellitus, the same table clarified that 44.3% of the mothers had diabetes mellitus type I, while 34.8% of them had diabetes mellitus type II. Moreover, nearly two thirds of the mothers (60.9%) reported that they had normal spontaneous delivery, while 39.1% of them delivered by cesarean section. Regarding the current use of contraceptive methods, the same table illustrates that more than one third of the mothers (36.3%) did not use any contraceptive methods, while 31.3% of them depended on lactation amenorrhea as contraceptive method. In addition, only 19.1% of mothers reported that they used oral contraceptive pills and 13% of them used intrauterine devices.

Table 2 presents characteristics of infants of diabetic mothers. It was found that the age of 52.2% of infants was less than 3 months, while only 20% of them were 6 months and more with a mean age of 3.22 ± 1.98 months. Concerning infants' sex, the same table revealed that 51.3% infants were males and 48.7% of them were females. It is also clear from the table that 39.1% of infants were the second in their birth order.

Table 3 illustrates distribution of diabetic mothers regarding their initiation patterns of breast feeding. It is clearly shown that more than half of diabetic mothers (54.8%) delayed the initiation of breast feeding more than one hour after delivery, while the rest of them (45.2%) initiated breast feeding within the first hour after delivery. Cesarean section was the most reported maternal cause for delaying initiation of breast feeding which mentioned by 66.7% of the mothers followed by feeling tired which reported by 50.8% of the mothers. Regarding infant causes, nearly one third of the mothers (30.2%) referred delayed initiation due to infant's poor sucking.

Table 4 presents distribution of diabetic mothers regarding their current infant feeding patterns. It is clearly shown that less than fifth only of the mothers (19.1%) reported that they gave exclusive breast feeding, and more than half of them (57.4%) gave mixed feeding (complementary or supplementary breast

feeding) for their infants. On the other hand, nearly one quarter of the mothers (23.5%) stopped breast feeding at all and gave artificial milk.

Table 5 shows distribution of diabetic mothers regarding their total scores of knowledge about breast feeding. The table revealed that 43.5% of the mothers had good total scores of knowledge, while 26.1% of them had fair scores and 30.4% had poor scores of knowledge with a total mean score of 70.9 ± 18.9 .

Table 6 illustrates the relationship between socio-demographic and health related characteristics of diabetic mothers and their patterns of breast feeding initiation. As shown in the table, 40.4% of mothers aged above 30 years initiated breast feeding early and only 11.1% of them delayed the initiation of breast feeding. On contrast, the majority of mothers who delayed initiation of breast feeding (81 %) were in the age group of 20-30 year compared to 48 % among those who initiated breast feeding early. Statistical significant difference was found where $P=0.01123$. The table also revealed that the majority of diabetic mothers who initiated breastfeeding early (92.3%) received either elementary or secondary education compared to only 7.7% of those who had university education. Statistical significant difference was shown where $P=0.00001$. Highly statistical difference was also found regarding family income and initiation of breast feeding where the majority of diabetic mothers who had satisfactory income (80.8%) reported that they initiated breastfeeding early compared to only 9.5% who delayed the initiation of breast feeding. On the other hand, 90.5% of mothers who had unsatisfactory income delayed initiation of breast feeding compared to 19.2% who started breast feeding early. $P=0.00001$. Multiparas mothers also had tendencies to early initiation of breastfeeding where 71.2% of them initiated breast feeding early compared to 52.4% who delayed initiation of breast feeding. Statistical significant difference was found where $P=0.04094$. The same table also revealed that almost all of diabetic mothers who initiated breast feeding early (96.2 %) had normal spontaneous delivery. On the contrary, more than two thirds of mothers who delivered by cesarean section (68.3%) delayed initiation of breast feeding compared to a small percent (3.8%) who initiated breast feeding early and the difference was highly statistically significant $P=0.00001$. Concerning the type of diabetes mellitus, the findings also showed that nearly three quarters of mothers who had diabetes mellitus type 1 (73.0%) reported that they delayed initiation of breast feeding compared to only 9.6% who initiated breast feeding early. On contrast, 71.2% of diabetic mothers who had diabetes mellitus type 2 initiated breast feeding early compared to 4.8% who reported that they delayed initiation of breast feeding and the difference was also highly statistically significant where $P=0.00001$.

Table 7 illustrates the relationship between Socio-demographic and health-related characteristics of diabetic mothers and the patterns of their infant feeding. The table clarified that nearly half of the mothers whose age above 30 years (45.5%) gave exclusive breast feeding compared to 7.6% of them who gave mixed feeding. On the other hand, the majority of mothers who gave mixed feeding (83.3%) aged between 20-30 years compared to 40.9% of them who gave exclusive breast feeding. Statistical significant difference was shown where $P=0.0001$. Concerning educational level of mothers, it is clearly shown that the majority of mothers who gave mixed feeding (84.8%) and those who stopped breastfeeding and substitute it by artificial milk (92.6%) had either elementary or secondary education. On the other hand, more than half of mothers who gave exclusive breastfeeding (59.1%) had university education while only 15.2 % and 7.4% respectively of them gave either mixed or substitutive feeding. Statistical significant difference was shown where $P=0.0001$. Regarding mothers occupation, the table also clarified that more than two thirds of mothers who gave mixed feeding (68.2%) and the majority of those who stopped breast feeding and gave artificial feeding (81.5%) were house wives. On the contrary, nearly two thirds of working mothers (63.6%) gave exclusive breastfeeding while 31.8 % and 18.5% respectively of them gave either mixed or artificial feeding. The difference was statistically significant with $P=0.0032$. The table also revealed that 68.2% of mothers who had satisfactory income gave exclusive breastfeeding compared to 69.7% of those who had unsatisfactory income who gave mixed feeding. The difference was statistically significant where $P=0.0057$. The majority of mothers who gave exclusive breastfeeding (77.3%) were multiparas. The same was observed regarding mothers who stopped breastfeeding and gave artificial feeding where 85.2% of them were also multiparas. Statistical significant difference was found where $P=0.004$. Concerning type of diabetes, it is clearly shown that the majority of mothers who gave exclusive breastfeeding (81.8%) had gestational diabetes while mothers who had diabetes mellitus type 2 had more tendencies to stop breastfeeding where 59.3% of them reported that they gave artificial feeding. Mixed feeding was practiced more by mothers who had diabetes mellitus type 1 where 57.6% of them reported that they gave mixed feeding. Statistical significant difference was shown where $P=0.0001$. The table also revealed that all mothers who gave exclusive breastfeeding (100%) had normal spontaneous delivery. While, 51.5% and 40.7% respectively of mothers who delivered by cesarean section gave their infants either mixed or artificial feeding. The difference was statistically significant where $P=0.0001$.

Table 8 portrays the relationship between socio-demographic and health-related characteristics of diabetic mothers and their total scores of knowledge about breastfeeding. It is clear from the table that the majority of mothers who obtained either good or fair scores of knowledge (76% and 86.7% respectively) their age ranged between 20-30 years. On the other hand, almost two thirds of mothers who had poor total scores of

knowledge (65.7%) were above 30 years old and statistical significant difference was shown where $P=0.0001$. The table also showed that all the mothers who had university education had good total scores of knowledge while all the mothers who obtained either fair or poor scores of knowledge (100%) received only elementary or secondary education. The difference was statistically significant where $P=0.0001$. The table also illustrated that the majority of mothers who obtained either good or fair scores of knowledge (80% and 70% respectively) were house wives. On the other hand, 60% of mothers who obtained poor total scores of knowledge were working mothers and statistical significant difference was found where $P=0.0006$. It is also obvious that the majority of mothers who had good total scores of knowledge (80%) lived in urban areas. On the contrary, the majority of mothers who obtained fair scores (90%) and poor scores (94.3%) lived in rural areas. The difference was statistically significant where $P=0.0001$. Concerning family income, the table showed that the majority of mothers who had good total scores of knowledge (80%) reported that they had satisfactory income. On contrast, the majority of mothers who obtained either fair scores (80 %) or poor scores (94.3%) had unsatisfactory incomes. The difference was statistically significant where $P=0.0001$. Among the mothers who had good total scores of knowledge, 80% were multiparas. On the other hand, 50% and 57.1% respectively of mothers who obtained fair and poor scores were primiparas and the difference was statistically significant $P=0.0009$. The table also showed that 40% of mothers who had good total scores of knowledge and 60% of those who had fair total scores had diabetes mellitus type 1. On the other hand, 57.1% of mothers who obtained poor scores had diabetes mellitus type 2. Statistical significant difference was found where $P=0.0004$. As regard the type of last delivery, it is clearly shown that more than two thirds of mothers who had good total scores of knowledge (68%) and nearly three quarters of those who obtained fair total scores (73.3%) had normal spontaneous delivery while 60% of mothers who had poor total scores reported that they delivered by cesarean section. The difference was statistically significant where $P=0.0090$.

Table 9 presents the relationship between diabetic mothers' total scores of knowledge about breastfeeding and their patterns of breastfeeding initiation. It is clearly shown that the majority of mothers who had good total scores of knowledge about breastfeeding (88.5%) reported that they initiated breastfeeding early. On the contrary, more than half of mothers who obtained poor total scores of knowledge (54%) delayed the initiation of breastfeeding. Statistical significant difference was shown where $P=0.00001$.

Table 10 shows the relationship between diabetic mothers' total scores of knowledge about breastfeeding and the patterns of their infants' feeding. It is obvious that the vast majority of mothers who had good total scores of knowledge (90.9%) gave their infants exclusive breastfeeding. On the other hand, more than half of mothers who had poor total scores of knowledge (55.6%) reported that they stopped breastfeeding and gave artificial feeding. Statistical significant difference was found where $P=0.0001$

IV. Discussion

Exclusive breast feeding for the first six months of life has been recommended by numerous health and professional medical organizations including World Health Organization and the American Academy of Pediatrics for all infants. Breast feeding has many benefits for mothers and children. Exclusive breast feeding has been associated with greater reductions in infants' risks for specific negative health outcomes. Although it is recommended for the first six months of life, early introduction of supplementary feeding is common globally^(1,2).

The current study findings revealed that only less than fifth of the mothers reported that they gave exclusive breast feeding, and more than half of them gave mixed feeding (complementary or supplementary breast feeding) for their infants. On the other hand, nearly one quarter of the mothers stopped breast feeding at all and gave artificial milk. These findings could be interpreted in the light of the fact that many mothers are convinced that artificial feeding is more nutrient for their infants compared with breast milk so, they tended to give it beside or as substitutive for breast milk. Moreover, some mothers perceive that breast milk alone is insufficient for their infants probably because their infants continue to cry after feeding, not lasting calm enough between feeds, not sleeping well or not growing as they wish.

Besides, mothers are not able to measure the amount of breast milk secreted to their infants. So, they tend to introduce artificial feeding to satisfy their infants needs. In addition, they think that early supplementation of artificial milk will help their infants to grow faster and sleep well at night. Furthermore, bottle feeding could be provided by any family member such as grandmother, husband or sibling if the mother is not available to breastfeed her infant.

The findings of Motee et al (2013)⁽²⁷⁾, Alina et al (2013)⁽²⁸⁾ and Fauzi et al (2018)⁽²⁹⁾ are congruent with the present study findings where they reported that many mothers are promoted to resort to the supplementation of infant formula before 3 months and the majority of mothers stopped breast feeding within the first six months. On the contrary, the present study findings are inconsistent with the findings of Mahmoud et al (2014)⁽³⁰⁾ and Wolde et al (2015)⁽³¹⁾ who cited that most of mothers never introduce solid food & fluids for their infants before six months.

Lack of comprehensive anti-natal care given by health care providers in health care settings which is expected especially in rural areas could also be considered as another contributing factor for discontinuing of exclusive breast feeding among the mothers in the present study (the present study findings revealed that sixty percent of mothers lived in rural areas). The majority of health care providers (either obstetrician, pediatrician, pediatric or obstetric nurses) usually focus on certain issues as performing general assessment for pregnant and lactating women and infants' immunization. Usually they are not concerned with instructing mothers about the importance of providing exclusive breast feeding.

Lactating mothers usually are suffering from feeling hunger. Diabetes mellitus as a chronic disorder is associated with many complications especially the hypoglycemic episodes. These episodes are associated with feeling hunger and tiredness especially for those who receive high doses of insulin. So those mothers do not prefer to give breast feeding exclusively and tend to provide additional types of feeding for their infants. This issue was confirmed in the present study findings where more than half of the mothers who have type 1DM who is mainly dependent on insulin in their treatment gave mixed feeding and one third of them stopped breast feeding at all.

Moreover, many diabetic mothers believe that their medical condition could hinder their abilities for lactation. In addition, the difficult responsibility for caring of young infants may lead most of diabetic mothers to discontinue exclusive breast feeding or even stop breast feeding at all. The study findings revealed that nearly three quarter of mothers had the burden of caring of other children beside their infant.

Tendency of diabetic mothers in the present study to give either complementary or supplementary feeding rather than exclusive breast feeding could also be justified by their desire to gain adequate periods of rest and sleep. In addition, some diabetic mothers were lacking the confidence in their abilities to provide breast feeding successfully. These women either believe they cannot produce adequate quantities of breast milk to sustain the needs of their infants or that their milk is not nutrient compared to healthy women. Similar findings were reported by Brawn et al (2014)⁽³²⁾, Hunegnaw et al (2017)⁽³³⁾ and Adugana et al (2017)⁽³⁴⁾.

The present study findings revealed that more than half of the mothers reported that they delayed initiation of breast feeding. As shown, in the study findings, cesarean section and feeling of tiredness were the most reported causes of delayed initiation of breast feeding. These findings could be attributed to the convention of many mothers that breast milk is not secreted during the first hours or even the first day after delivery. Meanwhile, some mothers think that the secreted milk (colostrum) at these hours is unuseful milk therefore; they delay initiation until the mature milk starts flowing. Probably those mothers are lacking the awareness about its benefits. So, many diabetic mothers prefer getting rest and sleep immediately after delivery rather than starting lactation. Neonatal hypoglycemia is a common problem that affects infants of diabetic mothers. Such problem interferes with neonate's ability to suck and should be managed immediately by giving I.V glucose. So, the occurrence of such problem for those neonates could also be a possible reason for delaying initiation of breast feeding among infants in the present study. The findings of the study revealed that nearly one third of the mothers who delayed initiation of breast feeding attributed that to poor sucking among their infants. The findings of Reena et al (2014)⁽³⁵⁾ and De Bortoli et al (2015)⁽³⁶⁾ are consistent with the present study findings.

Lacking of previous experience of pregnancy and lactation, (primipara mothers), feeling of tiredness associated with insulin dependent diabetes mellitus. As well as, lacking of receiving information about the importance of early initiation of breast feeding could explain the present study findings. Where, early initiation of breast feeding was significantly demonstrated more by older age group of mothers and multiparas mothers who have previous lactation experiences, those who had spontaneous delivery, mothers with diabetes mellitus type II and those who had good scores of knowledge.

The findings of the present study revealed that exclusive breast feeding was significantly practiced by older age group of mothers, highly educated ones, those who had good scores of knowledge and those who had gestational diabetes. Highly educated and older age group mothers are expected to have previous experiences of lactation and providing breast feeding. They are also expected to have awareness about the benefits of exclusive breast feeding. Those mothers also are more likely to have an access to health care facilities that provide them with information regarding the most suitable type of feeding for their infants. Furthermore, gestational diabetes is a temporal health problem that is usually relieved by mothers' delivery so, such problem could not interfere with mother's ability for lactation as expected in mothers with type 1 or 2 diabetes mellitus.

The findings of Mascarenhas et al (2006)⁽³⁷⁾ are consistent with the present study findings where they reported that mothers' educational level was significantly associated with providing exclusive breast feeding. On the contrary, Taleb et al (2012)⁽³⁸⁾ reported that mixed and formula feeding increase as educational level increase. The findings of Jones et al (2011)⁽³⁹⁾ and Ukegbu et al (2011)⁽⁴⁰⁾ are congruent with the study findings where they reported high rates of exclusive breast feeding among older mothers. On contrast, the findings of Perera et al (2012)⁽⁴¹⁾ mentioned that younger mothers are more likely to practice exclusive breast feeding than older ones.

Parity is a significant predictor of providing exclusive breast feeding. The multiparous mothers are expected to have previous experiences in breast feeding and may be better able to manage such pattern of breast feeding beside their household tasks. Although, the results of the current study revealed that the majority of mothers were more likely to discontinue exclusive breast feeding, the majority of mothers who gave it were multiparous. These results are consistent with the findings of Tank et al (2011)⁽⁴²⁾ and Vieira et al (2010)⁽⁴³⁾ where they reported that mothers with previous child rearing were more likely to breast feed their infants exclusively for 6 months than those who have the 1st born infant.

Providing supplementary feeding and early introduction of other food is perceived as necessity for working mothers where they are anxious because they would have to start it when they go out for work. Unexpectedly, the present study findings revealed that more than two thirds of mothers who gave mixed feeding and the majority of those who discontinued breast feeding and substitute it with artificial feeding were house wives.

Stressful life events facing those mothers including obligations, exhaustion, domestic adventures at home and infant care in addition to the stress of chronic disease like diabetes make it difficult for many of them to continue breast feeding. So, providing supplementary or complementary feeding is viewed as a way to solve practical challenges.

Similar findings were reported by Seifuelal (2014)⁽⁴⁴⁾ who also reported low practice of exclusive breast feeding among housewives. Perera et al (2012)⁽⁴¹⁾ also reported that increased household work in addition to presence of other children are associated with lower rate of exclusive BF. On the contrary, the findings of El-Gilany et al (2011)⁽⁴⁵⁾ and Feldens et al (2012)⁽⁴⁶⁾ were contradicting with the present study findings where they reported more practices of exclusive breast feeding by mothers stayed at home more than the working ones.

The present study also revealed that no significant association was found between practices of exclusive breast feeding and mothers' residence. Nearly two thirds of mothers who gave mixed feeding and more than half of those who gave artificial feeding lived in rural areas. These findings could be attributed to false believe and traditions that exclusive breast feeding is not enough and early supplementation of other types of food is a necessity. Similar findings were reported by Tank (2011)⁽⁴²⁾. On the contrary, the findings of Yenealal et al (2014)⁽⁴⁷⁾ were contradicting for the present study findings where they cited that the risk of early cessation of breast feeding was higher in urban residents compared to rural ones.

The present study findings revealed that mothers who had university education, those whose age ranged between 20-30 years, house wives mothers, those who lived in urban areas, those who had satisfactory income and multiparas mothers were found to have the highest scores of knowledge about breast feeding. Highly educated mothers are expected to be more knowledgeable and updated regarding the benefits of breast feeding for their infants. They are also expected to understand information more easily than those with elementary education. The findings of Karimi et al (2014)⁽⁴⁸⁾ and Simon et al (2014)⁽⁴⁹⁾ supported these findings. Mothers with sufficient income and those who lived in urban areas may have access to health care facilities that help them in gaining information concerning nutritional needs of their infants. Similar findings were reported by Zenginl and Ataly (2013)⁽⁵⁰⁾. Mothers in the age group of 20-30 years (age of reproductively) and multiparas mothers are also expected to be knowledgeable and skillful due to their previous experiences of breast feeding. Similar findings were reported by Mbada et al (2013)⁽⁵¹⁾.

The present study findings highlighted the particular challenges of mothers with Diabetes Mellitus and areas for future research on how best to support optimal breast feeding in this group of mothers.

V. Conclusion

Mothers with diabetes were less likely to initiate breast feeding early or continue exclusive breast feeding. Moreover, they had more tendencies either to provide complementary or supplementary breast feeding or stop breast feeding and give artificial milk.

Early initiation of breast feeding was significantly demonstrated more by mothers above 30 years, those who had elementary and secondary education, multiparas, those who had normal spontaneous delivery, mothers with Diabetes Mellitus type 2 and those who had good scores of knowledge about breast feeding.

Exclusive breast feeding was significantly provided by mothers above 30 years, those who had university education, working mothers, multiparas, mothers who had gestational diabetes, those who had normal spontaneous delivery and those who obtained good scores of knowledge about breast feeding.

VI. Recommendations

Based on the previous findings, the following recommendations are suggested:

- 1- Educational sessions should be provided for pregnant and lactating diabetic mothers especially primi-paras mothers in maternity hospitals. Such educational sessions should emphasize benefits of breastfeeding for mothers and infants, importance of early initiation of breastfeeding, proper techniques of breastfeeding, maintenance of exclusive breastfeeding and criteria of successful breastfeeding.

- 2- Mass media should raise the awareness of diabetic mothers regarding breastfeeding through emphasizing the benefits of breastfeeding, the early initiation of breastfeeding (within the first hour after birth) and how to maintain exclusive breastfeeding six months for infants. Mothers' misconception and wrong believes concerning inadequate breast milk that may interfere with maintaining and continuation of breastfeeding should be corrected.
- 3- Diabetic mothers need early postpartum breastfeeding support including encouragement of early and frequent milk expression as well as reducing maternal-infant separation, thereby minimizing delayed lactogenesis to enhance breast milk production and facilitate successful transition from breastfeeding initiation to continuation.
- 4- A breastfeeding consultation service through trained health care providers should be available at maternity and children hospitals to provide information and assistance for pregnant and lactating diabetic mothers concerning breastfeeding to help them achieve the optimal breastfeeding outcomes.

Table (1): Socio-demographic and Health-related Characteristics of Diabetic Mothers

Mothers' characteristics	No	%
Age	n=115	
<20 years	11	9.6
20-30 years	76	66.1
>30 years	28	24.3
Range	18-35	
Mean±SD	26.5±4.65	
Education		
Elementary education	54	47.0
Secondary	36	31.3
University	25	21.7
Occupation		
Housewives	75	65.2
Working mother	40	34.8
Residence		
Urban	45	39.1
Rural	70	60.9
Family income		
Satisfactory	48	41.7
Unsatisfactory	67	58.3
Parity		
Primipara	45	39.1
Multipara	70	60.9
Type of diabetes mellitus		
Gestational diabetes	24	20.9
Diabetes mellitus type 1	51	44.3
Diabetes mellitus type 2	40	34.8
Type of last delivery		
Normal spontaneous	70	60.9
Cesarean section	45	39.1
Current use of contraception		
Non	42	36.5
Lactational amenorrhea	36	31.3
Oral contraceptive pills	22	19.1
Intrauterine device	15	13.0

Table (2): Characteristics of Infants of Diabetic Mothers

Infants' characteristics	No	%
Age	n=115	
<3 month	60	52.2
3-6 months	32	27.8
6+	23	20.0
Range	2-12	
Mean ± S.D.	3.22 ± 1.98	
Sex		
Male	59	51.3
Female	56	48.7
Birth order		
1 st	32	27.8
2 nd	45	39.2
3 rd +	38	33.0

Table (3): Distribution of Diabetic Mothers Regarding their Initiation Patterns of Breast Feeding

Breast feeding initiation and patterns	No	%
Initiation Pattern of Breast Feeding		
n=115		
Time of BF initiation after delivery		
Early initiation (Immediately ≤ 1 hour)	52	45.2
Delayed initiation (> 1 hour)	63	54.8
Causes of delayed breast feeding initiation *		
Maternal Causes		
n=63		
Cesarean section	42	66.7
Feeling tired	32	50.8
Sedation or drug	16	25.4
Presence of episiotomy	15	23.8
No or low breast milk	12	19.0
Infant Causes		
Infant poor sucking	19	30.2
Physiological Jaundice	8	12.7
Congenital anomalies	3	4.8
Low birth weight	2	3.2
Respiratory distress	2	3.2

* More than one response

Table (4): Distribution of Diabetic Mothers Regarding their Current Infant Feeding Patterns

Current Infant Feeding patterns	No	%
n=115		
Exclusive Breast Feeding	22	19.1
Mixed Feeding (Complementary / supplementary)	66	57.4
Substitutive (Artificial Feeding)	27	23.5

Exclusive breastfeeding (expresses as the proportion of infants below 6 months who fed only on breast milk).

Table (5): Distribution of Diabetic Mothers Regarding Their Total Scores of Knowledge about Breast Feeding

Total score of knowledge	No	%
Good	50	43.5
Fair	30	26.1
Poor	35	30.4
Range	36-85	
Mean±S.D.	70.9±18.9	

Table (6): Relationship between Socio-demographic and Health-related Characteristics of Diabetic Mothers and Breast Feeding Initiation Patterns

Characteristics of Diabetic Mothers	Initiation patterns of Breast Feeding					Chi square test X ²	p-value
	Early initiated BF "n=52"		Delayed initiated BF "63"		Total		
Age							
<20 years	6	11.5	5	7.9	11	4.11	0.01123*
20-30 years	25	48.1	51	81.0	76		
>30 years	21	40.4	7	11.1	28		
Education						30.52	0.00001**
Elementary & Secondary	48	92.3	42	66.7	90		
University	4	7.7	21	33.3	25		
Occupation						0.842	0.45369
Housewife	32	61.5	43	68.3	75		
Working mother	20	38.5	20	31.7	40		
Residence						1.85	0.09654
Urban	16	30.8	29	46.0	45		
Rural	36	69.2	34	54.0	70		
Family income						30.42	0.00001**
Satisfactory	42	80.8	6	9.5	48		
Unsatisfactory	10	19.2	57	90.5	67		
Parity						3.01	0.04094*
Primipara	15	28.8	30	47.6	45		
Multipara	37	71.2	33	52.4	70		

Type of last Delivery							
Normal spontaneous	50	96.2	20	31.7	70	38.5	0.00001**
Cesarean section	2	3.8	43	68.3	45		
Type of diabetes mellitus							
Gestational diabetes	10	19.2	14	22.2	24	34.5	0.00001**
Diabetes mellitus type 1	5	9.6	46	73.0	51		
Diabetes mellitus type 2	37	71.2	3	4.8	40		

Early initiation of breast feeding(expressed as the proportion of infants who first suckled within 1 hour after birth).

Table (7): Relationship between Socio-demographic and Health-related Characteristics of Diabetic Mothers and Patterns of their Infant Feeding

Characteristics of Diabetic Mothers	Patterns of Infant Feeding						Total	Chi square test X ²	p-value
	Exclusive Breast feeding		Mixed feeding		Substitutive (Artificial)				
	"n=22"		"n=66"		"n=27"				
Age									
<20 years	3	13.6	6	9.1	2	7.4	11	25.4	0.0001*
20-30 years	9	40.9	55	83.3	12	44.4	76		
>30 years	10	45.5	5	7.6	13	48.1	28		
Education								22.98	0.0001*
Elementary & secondary	9	40.9	56	84.8	25	92.6	90		
University	13	59.1	10	15.2	2	7.4	25		
Occupation								11.47	0.0032*
Housewife	8	36.4	45	68.2	22	81.5	75		
Working mother	14	63.6	21	31.8	5	18.5	40		
Residence								0.611	0.7368
Urban	10	45.5	24	36.4	11	40.7	45		
Rural	12	54.5	42	63.6	16	59.3	70		
Family income								10.33	0.0057*
Satisfactory	15	68.2	20	30.3	13	48.1	48		
Unsatisfactory	7	31.8	46	69.7	14	51.9	67		
Parity								15.772	0.004*
Primipara	5	22.7	36	54.5	4	14.8	45		
Multipara	17	77.3	30	45.5	23	85.2	70		
Type of diabetes mellitus								67.529	0.0001*
Gestational diabetes	18	81.8	4	6.1	2	7.4	24		
Diabetes mellitus type 1	4	18.2	38	57.6	9	33.3	51		
Diabetes mellitus type 2	0	0.0	24	36.4	16	59.3	40		
Type of last Delivery								18.422	0.0001*
Normal spontaneous	22	100.0	32	48.5	16	59.3	70		
Cesarean section	0	0.0	34	51.5	11	40.7	45		

Table (8): Relationship between Socio-demographic and Health-related Characteristics of Diabetic Mothers and their Total Scores of knowledge about Breast Feeding

Characteristics of Diabetic Mothers	Total Scores of Knowledge about Breast Feeding						Total	Chi square test X ²	p-value
	Good		Fair		Poor				
	"n=50"		"n=30"		"n=35"				
Age								53.917	0.0001*
<20 years	10	20.0	1	3.3	0	0.0	11		
20-30 years	38	76.0	26	86.7	12	34.3	76		
>30 years	2	4.0	3	10.0	23	65.7	28		
Education								41.528	0.0001*
Elementary & secondary	25	50.0	30	100.0	35	100.0	90		
University	25	50.0	0	0.0	0	0.0	25		
Occupation								14.931	0.0006*
Housewife	40	80.0	21	70.0	14	40.0	75		
Working mother	10	20.0	9	30.0	21	60.0	40		
Residence								62.160	0.0001*
Urban	40	80.0	3	10.0	2	5.7	45		
Rural	10	20.0	27	90.0	33	94.3	70		
Family income								54.609	0.0001*
Satisfactory	40	80.0	6	20.0	2	5.7	48		
Unsatisfactory	10	20.0	24	80.0	33	94.3	67		

Parity									
Primipara	10	20.0	15	50.0	20	57.1	45	13.938	0.0009*
Multipara	40	80.0	15	50.0	15	42.9	70		
Type of diabetes mellitus									
Gestational diabetes	12	24.0	10	33.3	2	5.7	24	20.470	0.0004*
Diabetes mellitus type 1	20	40.0	18	60.0	13	37.1	51		
Diabetes mellitus type 2	18	36.0	2	6.7	20	57.1	40		
Type of last Delivery									
Normal spontaneous	34	68.0	22	73.3	14	40.0	70	9.424	0.0090*
Cesarean section	16	32.0	8	26.7	21	60.0	45		

Table (9): Relationship between Diabetic Mothers' Total Scores of knowledge about Breast Feeding and their Breast Feeding Initiation Patterns

Total Scores of Knowledge about breast feeding	Breast Feeding Initiation Patterns					Chi square test X ²	p-value
	Early initiated BF "n=52"		Delayed initiated BF "63"		Total		
Good	46	88.5	4	6.3	50	36.9	0.00001**
Fair	5	9.6	25	39.7	30		
Poor	1	1.9	34	54.0	35		

Early initiation of breast feeding(expressed as the proportion of infants who first suckled within 1 hour after birth).

Table (10): Relationship between Diabetic Mothers' Total Scores of Knowledge about Breast Feeding and the Patterns of their Infant Feeding

Total Scores of Knowledge about breast feeding	Patterns of Infant Feeding						Chi square test X ²	p-value	
	Exclusive Breast feeding "n=22"		Mixed feeding "n=66"		Substitutive (Artificial) "n=27"				Total
Good	20	90.9	26	39.4	4	14.8	50	32.049	0.0001*
Fair	2	9.1	20	30.3	8	29.6	30		
Poor	0	0.0	20	30.3	15	55.6	35		

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