Predicting infant feeding intention and intensity in Oman using a path analysis approach

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Abstract

Background: Low breastfeeding rates are a global concern, and few studies have examined breastfeeding in Oman.

Aims: We examined the associations of mothers' sociodemographic characteristics, breastfeeding knowledge, attitudes, subjective norms, perceived control, previous breastfeeding experience, and early breastfeeding support with infant feeding intention at birth and breastfeeding intensity at 8 weeks postpartum.

Methods: We used a descriptive, prospective cohort design. Data collection was in 2016. We administered a structured questionnaire to mothers at postpartum discharge from 2 hospitals in Oman and followed up once via a 24-hour dietary recall at 8 weeks. We used a path analysis model (n = 427) using *SPSS*, version 24.0, and *Amos*, version 22.

Results: During the postpartum hospitalization, 33.3% of mothers reported that their babies received formula milk. At the 8-week follow-up, 27.3% of mothers were exclusively breastfeeding. Subjective norms (measured by social and professional support) were the strongest predictors. Infant feeding intention significantly predicted breastfeeding intensity. Returning to work/school was the only sociodemographic variable to significantly correlate with breastfeeding intensity ($r = -0.17$; $P < 0.001$); mothers who planned to return to work/school had significantly lower intensity. Knowledge significantly predicted positive and negative attitudes, subjective norms and perceived control. Early breastfeeding support negatively correlated with breastfeeding intensity ($r = -0.15$; $P < 0.001$).

Conclusion: Infant feeding intention positively predicted breastfeeding intensity with subjective norms or social and professional support and had the strongest correlation with mothers' intentions.

Keywords: breastfeeding, intensity, theory of planned behaviour, beliefs, intention

Introduction

Optimal breastfeeding practices directly influence the nutritional status, development and survival of children (1). Optimal breastfeeding practices include exclusive breastfeeding (EBF) for the first 6 months of life, meaning that infants receive milk directly from their mother's breast or expressed mother's milk and no other liquids or solids, including water, except for oral rehydration solutions, drops, syrups, vitamins, minerals or medicines (2). The prevalence of EBF in infants for the first 6 months of life has increased across low- and middle-income countries from 27% in 2000 to 39% in 2018. With the current trend, EBF rates are anticipated to rise to 43% by 2025, and to 45% by 2030. Despite this progress, the rates are still much lower than the global goal of 50% by 2025 and at least 70% by 2030 (3). In Oman, the Ministry of Health reported that in 2015 93.4% and in 2018 90.8% of mothers exclusively breastfed at birth; however, only 11.8% of mothers in 2015 and 8.7% in 2018 were still exclusively breastfeeding at 6 months. The rates of EBF during the first 6 months have also declined

over time, with a more than 3.5-fold decrease between 2005 and 2018 (4).

In 2019, the World Health Organization (WHO) reported that 5.2 million under-5 children worldwide died from preventable and treatable causes. Almost 45% of these deaths were attributed to nutrition-related factors (5). Oman, a developing country in the Arabian Gulf Peninsula, saw its mortality rate for under-5 children drop dramatically over 25 years, from 35 per 1000 live births in 1990 to 11.4 per 1000 in 2015 (4). The improvement was attributed to the country's development in the healthcare sector. Despite this, Oman still has a noticeable prevalence of conditions related to childhood malnutrition. In 2020, the prevalence of stunting (height-for-age < −2 SD) among under-5 children was 12.2% (6).

Researchers have associated maternal breastfeeding outcomes with maternal beliefs and infant feeding intentions (7–9). This association aligns with the Theory of Planned Behaviour (TPB), which indicates that mothers' attitudes, subjective norms and perceived control will positively or negatively contribute to their intention to breastfeed (10,11). This intention will subsequently

influence mothers' infant feeding outcomes. Although many researchers have considered the maternal variables that influence breastfeeding outcomes, no published studies to date have focused on examining maternal beliefs among Omani mothers.

According to the TPB, target (or desired) behaviours are directly predicted by attitudes towards the desired behaviours, subjective norms (e.g. the assumption that individuals care about how others view their behaviours), perceived control over desired behaviours and perceived ease or difficulty in performing desired behaviours (11). Maternal beliefs predict infant feeding intention and, subsequently, breastfeeding outcome (12).

In addition to the TPB concepts, we assessed how the early breastfeeding support mothers received during hospitalization predicted breastfeeding intensity. In the Baby-Friendly Hospital Initiative (BFHI), the WHO listed "Ten Steps for Successful Breastfeeding" in its standardization of support for hospitalized mothers (13). Pérez-Escamilla et al. reported evidence of the positive effects of the BFHI in randomized control trials, quasi-experimental studies and comparison group studies; the implementation of some or all of the elements of BFHI led to improvements in breastfeeding initiation and EBF at discharge (14). Government hospitals in Oman were BFHI-certified in the 1990s (12), and although these hospitals are no longer BFHI-certified, elements of the 10 steps are still in practice.

We examined the effects of mothers working or attending school on maternal infant feeding intentions and breastfeeding intensity to predict infant feeding intention. Returning to work has been a commonly reported barrier to breastfeeding and in previous studies has been given as a reason mothers introduced formula feeding and early weaning (15,16). We explored maternal breastfeeding knowledge and previous breastfeeding experience as contributors to explaining maternal TPB variables measured in this study and breastfeeding intensity; these factors were reported in the literature to influence breastfeeding practice (17,18). We explored the influences of the most commonly reported sociodemographic variables (e.g. maternal age, family income and education level) on breastfeeding (19).

In this study, we aimed to examine the associations of mothers' sociodemographic characteristics, breastfeeding

Table 2 Descriptive statistics for categorical variables among Omani mothers (n = 427) at hospital discharge, 2016

Variable	No.	%
Hospital		
A	231	50.0
B	231	50.0
Monthly income (2 parents) (OR)		
< 800	217	47.0
≥ 800	205	44.4
Education		
High school diploma or below	253	54.8
2-year college degree or above	209	45.2
Type of delivery		
Vaginal	396	85.7
C-section	64	13.9
Sex of baby		
Male	245	53.0
Female	217	47.0
Returned to work or school		
Yes	193	45.2
No	224	52.5
Marital status		
Married	460	99.6
No. previous children, not including current delivery		
0	135	29.2
≥ 1	320	69.3
Presence of ≥ 1 servants at home		
Yes	230	49.8
No	217	47.0
Previous breastfeeding experience		
Yes	328	71.0
No	132	28.6
Did hospital give formula milk?		
No	285	61.7
Yes	154	33.3
Did mother give formula milk?[a]		
Yes	308	66.7
No	151	32.7

OR = Omani rial (1 OR ≈ 2.59 US$).

[a]Data collected at 8 weeks follow-up.

knowledge, attitudes, subjective norms (or social and professional support), perceived control, previous breastfeeding experiences and early breastfeeding support with their infant feeding intentions at birth and their breastfeeding intensity at 8 weeks postpartum.

Methods

Design

This was a descriptive study with a prospective cohort. We designed the study to collect data from participants

Table 1 Descriptive statistics for continuous variables among Omani mothers (n = 427) at hospital discharge, 2016

Variable	Mean (SD)	Range
Length of hospital stay (days)	2.3 (1.4)	0–9
Hours away from child	3.3 (3.5)	0–12
Early breastfeeding support score	4.7 (1.8)	0–9
Breastfeeding knowledge score	9.3 (1.5)	4–12
Intention to breastfeeding score	10.2 (3.5)	2–16
Time mother spent away from infant for all mothers (hours)	3.3 (3.5)	0–12

SD = standard deviation.

during postpartum hospitalization and follow-up at 8 weeks postpartum. We collected data between May and December 2016.

Study sample

We recruited Omani women who were ≥ 18 years old; had given birth to healthy, full-term singleton infants; initiated breastfeeding during hospitalization; could read Arabic; and had phones with texting capabilities. We excluded women whose infants had physical conditions that may interfere with breastfeeding, e.g. acute or chronic illness, medical complications (including prematurity), underweight or congenital anomalies such as cleft palate or cleft lips.

We calculated the sample size based on the recommended ratio of 20 cases per variable (20). The recommended sample size was 400 (20 variables × 20 cases). We over-recruited for a total of 691, thereby allowing up to 42% follow-up failure and incomplete cases.

A total of 691 mothers agreed to participate at hospital discharge. Among these, 54 returned incomplete data, we lost 175 at follow-up, and 35 participants did not provide sufficient data to score the early breastfeeding support scale, the revised Breastfeeding Attrition Prediction Tool (revised-BAPT), or infant feeding intentions, yielding 427 cases for analysis (Figure 1).

Measurements

Maternal theory of planned behaviour variables

Maternal attitudes, subjective norms, and perceived control directed towards feeding infants were measured using the revised-BAPT (21). We defined attitudes, similar to the original BAPT concepts and definitions, as maternal sentiments about infant feeding, which included the advantages and disadvantages of breastfeeding and formula feeding. Attitudes were represented by positive and negative breastfeeding sentiment items. Subjective norms, measured by the social and professional support subscale, were defined as the participant's perception of whether key people in her life (the baby's father, the mother's mother, the mother-in-law, a sister, a close friend, a nurse, or a doctor) thought the mother should breastfeed or formula-feed. Perceived control, which we measured with the Breastfeeding Control subscale, was operationalized as the maternal beliefs about the ease or difficulty associated with breastfeeding and formula feeding (22)

The BAPT has been tested in various studies, supporting medium-to-high reliability in various populations, including non-Hispanic White, African American, Asian, and Spanish-speaking Hispanic mothers. Cronbach's alpha for the subscales ranged from 0.76 to 0.86 (21–23). The BAPT validity was assessed by the developer and subsequently in various studies (24). The

Figure 1 Flow diagram for enrolment of participants at postpartum hospital discharge and follow-up at 8 weeks postpartum
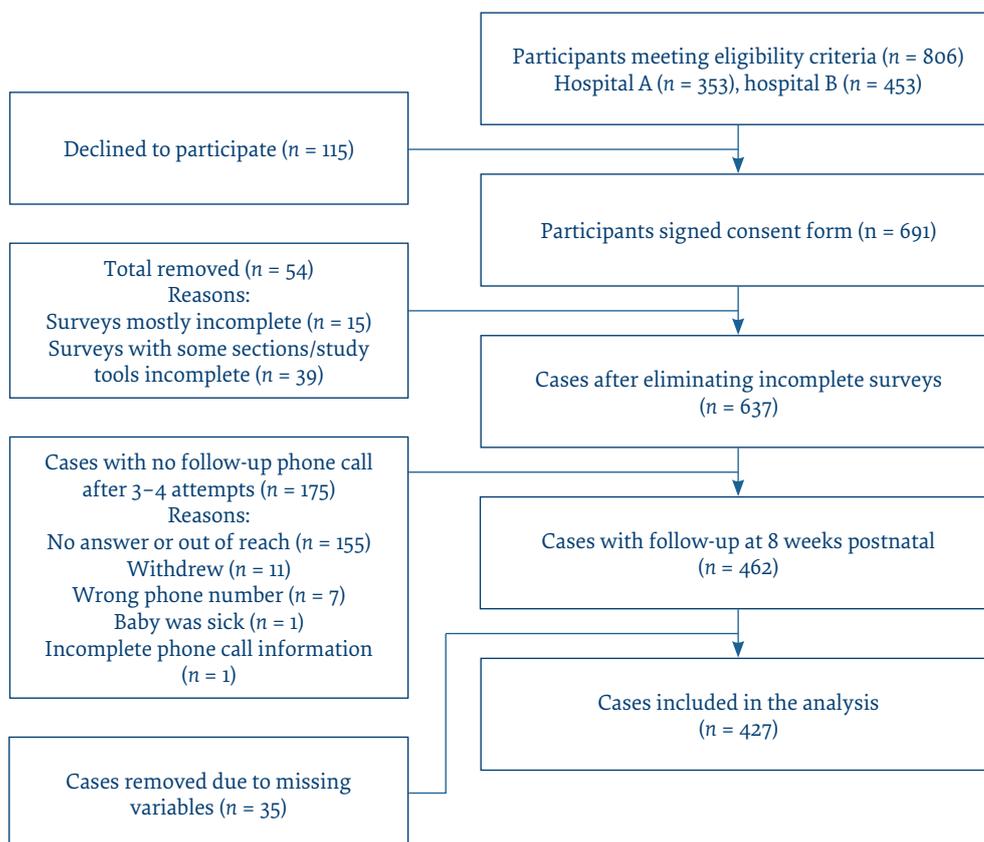
revised-BAPT contains 32 items on a 3-point Likert scale and assesses the TPB-based variables for mothers (*25*). We altered the tool to a 4-point Likert scale to increase the variability of the scores. We added 2 items to the social and professional support subscale to include the perceptions of the mother's close friends and the nurses, yielding 34 items. We systematically translated and back-translated the revised-BAPT into Arabic (*26*). The reliabilities of the subscales in this study were positive breastfeeding sentiment = 0.74; negative breastfeeding sentiment = 0.81; social and professional support = 0.88; and breastfeeding control subscale = 0.89.

We calculated the subscales scores for the study as the averages of the positive breastfeeding sentiment, negative breastfeeding sentiment, and breastfeeding control subscales, which ranged from 1 to 4; the range with social and professional support was 1–3. Higher negative breastfeeding sentiment scores indicate more negative attitudes towards breastfeeding, while higher positive breastfeeding sentiment scores indicate greater positive attitudes towards breastfeeding. Higher social and professional support scores indicate greater breastfeeding support, and higher breastfeeding control subscale scores indicate the mother's greater control over her breastfeeding abilities (*22*).

Maternal infant feeding intention

Collected at baseline, the infant feeding intention scale measures the mother's intentions to initiate and sustain breastfeeding as the only source of feeding for the first 6 months of the infant's life (*27*). The scale consists of 5 questions on a 5-point Likert scale to determine the mother's infant feeding intentions at 1, 3 and 6 months. The original developers of the scale determined the Cronbach's alpha to be 0.70 and 0.90 in 2 studies (*27,28*). The total infant feeding intentions score ranges from zero (no intention to breastfeed) to 16 (very strong intention to EBF for 6 months). A team of researchers translated the scale into Arabic and determined Cronbach's alpha for the Arabic version to be 0.90 and 0.82 in 2 studies (*29,30*). We calculated Cronbach's alpha for this study to be 0.63.

Maternal breastfeeding knowledge

We developed the breastfeeding knowledge scale to assess mothers' awareness of the WHO-recommended breastfeeding practices (*31*). Using the WHO breastfeeding recommendations contributed to establishing the content validity of the developed scale. The questions include practice recommendations focused on exclusive breastfeeding for 6 months and the benefits of breastfeeding. The scale consists of 12 true or false questions. We made minor revisions based on the results of a pilot study on 30 mothers to establish the readability and adaptability of the scale. We scored the scale by counting the number of correct responses, yielding a range of 0–12, with a higher score indicating better awareness of the WHO recommendations. The Kuder–Richardson formula 20 (KR-20) was used to estimate internal consistency, which was 0.39. This low reliability may be attributed to the scale measuring multiple aspects of breastfeeding knowledge that were not necessarily closely related.

Early breastfeeding support

We adapted a scale developed by a lactation expert which assesses hospital practices of breastfeeding support to measure maternal perceptions of early breastfeeding support (Labbok MH; personal communication, 29 October 2015). The items included in the early breastfeeding support scale represent elements of BFHI (*13*):

- the teaching of hand expressions,
- breastfeeding assistance,
- baby receiving formula milk,
- baby being given water,
- baby being bottle-fed,
- implementation of skin-to-skin contact within an hour post-vaginal or caesarean delivery,
- baby being separated from the mother more than one hour in a day,
- receiving specific education about feeding the infant on-demand/cue,
- receiving breastfeeding education.

We did not assess breastfeeding support groups or pacifier use on the scale because these groups are not established, and pacifiers are not used in Omani government hospitals. Also, rooming-in was not included because the 2 hospitals implemented rooming-in as a standard protocol. One point was awarded for each item on the scale to which the mother responded "yes", yielding scores ranging from 0–9, with higher scores indicating favourable hospital breastfeeding practices. We established the content validity of the items on the early breastfeeding support scale by ensuring that the scale reflected elements of the WHO's BFHI standards of practice for successful breastfeeding (*13*) and that the scale was adapted from a scale on breastfeeding support developed by an expert (Labbok MH. Personal communication, 29 October 2015). Before data collection, we administered the scale to 5 maternal–child nurses to determine its readability and adaptability to Omani culture. The internal consistency of this scale using KR-20 was 0.45. Since scales are assumed to be an assembly of interrelated items (*32*), the low reliability could be because the elements of BFHI were not expected to be strongly interrelated.

Breastfeeding intensity

Using the WHO's definition of EBF as the standard, we defined breastfeeding intensity as the percentage of feedings consisting of mothers' milk, ranging from 0% (no mothers' milk) to 100% (*33*). The higher percentage of breastfeeding intensity indicates greater infant intake of mother's milk in 24 hours. We collected the infants' dietary intake through phone interviews, collecting data for all 1-hour intervals over the preceding 24-hours (6 am to 6 am). We revised the dietary recall survey from the

child dietary recall questionnaire used by the Nutrition Obesity Research Center (*20*). We operationalized breastfeeding intensity as the number of feedings of mother's milk (breastfeeding + expressed mother's milk) divided by the total number of feedings during the 24-hr period (breastfeeding + expressed mother's milk + formula or any type of milk + water + juice + tea + solid food).

Previous breastfeeding experience

A dichotomous variable (yes/no) indicated which mothers had prior breastfeeding experience. Those who answered "yes" for prior breastfeeding experience rated the success of this experience on a scale of 1–4 (not at all successful, slightly successful, moderately successful, or very successful) and reported the duration of breastfeeding in months for their last child.

Data collection

We recruited mothers and collected data from them at postpartum hospital discharge. The self-report tools administered at this point were: sociodemographic variables, the revised-BAPT, Infant Feeding Intentions Scale, and the Breastfeeding Knowledge Scale. The data collectors approached mothers who met the recruitment criteria to obtain written consent, administered the study's baseline survey, and provided the 24-hour infant dietary recall sheet to take home. We conducted the follow-up interview at 8 weeks postpartum. To minimize recall bias, we asked the mothers to take notes of the infant's intake using a recall sheet. We used the mobile application *WhatsApp* to send reminders.

Statistical analysis

We conducted the analyses using *SPSS*, version 24.0 and *Amos*, version 22. We conducted Little's missing completely at random test on the dataset to determine whether data were missing at random (*34*). We used mean substitution in *SPSS* to replace missing items from the early breastfeeding support, revised-BAPT, and the infant feeding intention scale. We used stochastic regression imputation in *Amos* to input missing values for demographic variables. We removed cases from analyses if ≥1 subscales had more than 50% of item responses missing.

We used the acceptable standard of a comparative fit index > 0.90 and root mean square error approximation < 0.08 to assess the fit of our final model (*35*). We constructed an initial path analysis model that included all observed study and sociodemographic variables with paths drawn according to the proposed study framework. We revised the initial model by removing the nonsignificant sociodemographic variables to obtain the final model. We reported model modifications, path correlation coefficients (*r*), standardized regression coefficients (*β*) and *P* values from the final model using a significance level of 0.05.

Ethical approval

We obtained ethical approval from the University of North Carolina-Chapel Hill, Office of Human Research Ethics (IRB: 16-0780). The study was also approved by the Director-General of Planning and Studies, Ministry of Health, Muscat, Oman (STUDY: M.H./DGP/R&S/ Proposal Approved/8/2016).

Results

Introduction of formula milk

Descriptive statistics are presented in Tables 1 and 2. The average duration of participants' hospital stay was 2.48 [standard deviation (SD) 2.87] days, and the average age of the mothers was 30.74 (SD 4.99) years. For about 45% (*n* = 209) of the participants, education level was 2 years of college or higher. Approximately half of the participants worked or attended school during pregnancy (*n* = 232). The average length of participants' maternity leave was 53.58 (SD 16.12) days.

Regarding the infant feeding method, one-third (*n* = 154, 33.3%) of mothers reported that their babies had received formula milk during postpartum hospitalization. Formula consumption varied by hospital, with 24.2% (*n* = 54) receiving it at Hospital A and 46.3% (*n* = 100) at Hospital B. The majority of mothers had introduced formula by 8 weeks postpartum (*n* = 308, 66.7%). About one-quarter of these (*n* = 76, 24.7%) reported formula introduction by the first week postpartum. Mean breastfeeding intensity at 8 weeks postpartum was 84.74 (SD 17.94); these scores ranged from 0.00 to 100.00. At 8 weeks postpartum, some mothers reported more than one reason for formula introduction. The most common reasons were: "perception of insufficient breast milk supply" (*n* = 133, 43.1%) and "breast milk alone does not satisfy the baby" (*n* = 113, 36.7%).

The path model fit and modification

We constructed the initial model to include all observed study variables with paths drawn according to the proposed research model. Covariances were drawn between the error terms for positive attitude, negative attitude, subjective norms and perceived control. The continuous variables and previous breastfeeding experience variables were also allowed to covary. The initial model had a less-than-acceptable fit (comparative fit index = 0.42, root mean square error approximation = 0.15). We examined the path coefficients to simplify the model and removed the sociodemographic variables that were not significantly associated with intensity. Maternal work or school status had a statistically significant negative direct path to intensity (*P* = 0.001), thus, it was retained, but all others were dropped. The final model (Figure 2) had an excellent fit (comparative fit index = 0.98, root mean square error approximation = 0.05).

Maternal theory of planned behaviour predictor variables and infant feeding intention

The final model supports the hypothesized direct links between the TPB predictor variables, work or school status, breastfeeding knowledge scale and breastfeeding intensity. The model also supports a direct link between early breastfeeding support, intention and breastfeeding intensity. The estimates of the correlation coefficients (r) and standardized regression coefficients (β) are presented in Figure 2 and Table 3.

Participants with greater breastfeeding knowledge had significantly higher scores on positive attitude ($P = 0.02$), subjective norms ($P = 0.001$) and perceived control ($P = 0.03$), and significantly lower scores on negative attitude ($P < 0.001$). Work or school status was significantly associated with higher scores on positive attitude ($P = 0.04$) and higher scores on negative attitude ($P = 0.003$), and lower scores on subjective norms or social and professional support ($P < 0.001$). Higher positive attitude ($P = 0.007$), subjective norms or social and professional support ($P < 0.001$), perceived control ($P = 0.005$) and lower negative attitude ($P < 0.001$) were associated with significantly greater intention to breastfeed.

Breastfeeding intensity

Participants with greater intention to breastfeed had significantly higher breastfeeding intensity ($P < 0.006$). Mothers who worked or attended school had lower breastfeeding intensity ($P < 0.001$), as did mothers who

had higher scores on the early breastfeeding support scale ($P < 0.001$).

Discussion

The strength of this study is in using path analysis to examine the relationship among the variables. For this study, since it was a criterion for inclusion, all the participants initiated breastfeeding at birth. From the early breastfeeding support scale we calculated about a third of the mothers reported that their babies were given formula by hospital staff at least once during postpartum hospitalization. The current high rates of in-hospital formula supplementation are alarming. Identifying the reason for the variation in formula feeding rates in Hospital A and Hospital B was beyond the scope of our study, however, we suspect this is due to the visible role of lactation consultants in providing breastfeeding support to mothers. More studies are needed to explain the variations.

Formula supplementation during maternity stay is linked to shorter durations of EBF. Multiple researchers have documented that formula supplements during maternity stay are associated with shortened duration of both exclusive and "any" breastfeeding (36,37). In our study, the proportion of mothers reporting formula consumption at 8 weeks postpartum (66.7%) doubled from postpartum hospitalization. Although more than half of the mothers introduced formula, only 3 reported stopping breastfeeding. Almost one-quarter of the mothers introduced formula by one week postpartum.

Figure 2 Final model of factors in the pathway for breastfeeding intentions at postpartum hospital discharge and breastfeeding intensity at 8-week postpartum in Omani mothers (n = 427) [only significant coefficients (r) are shown]
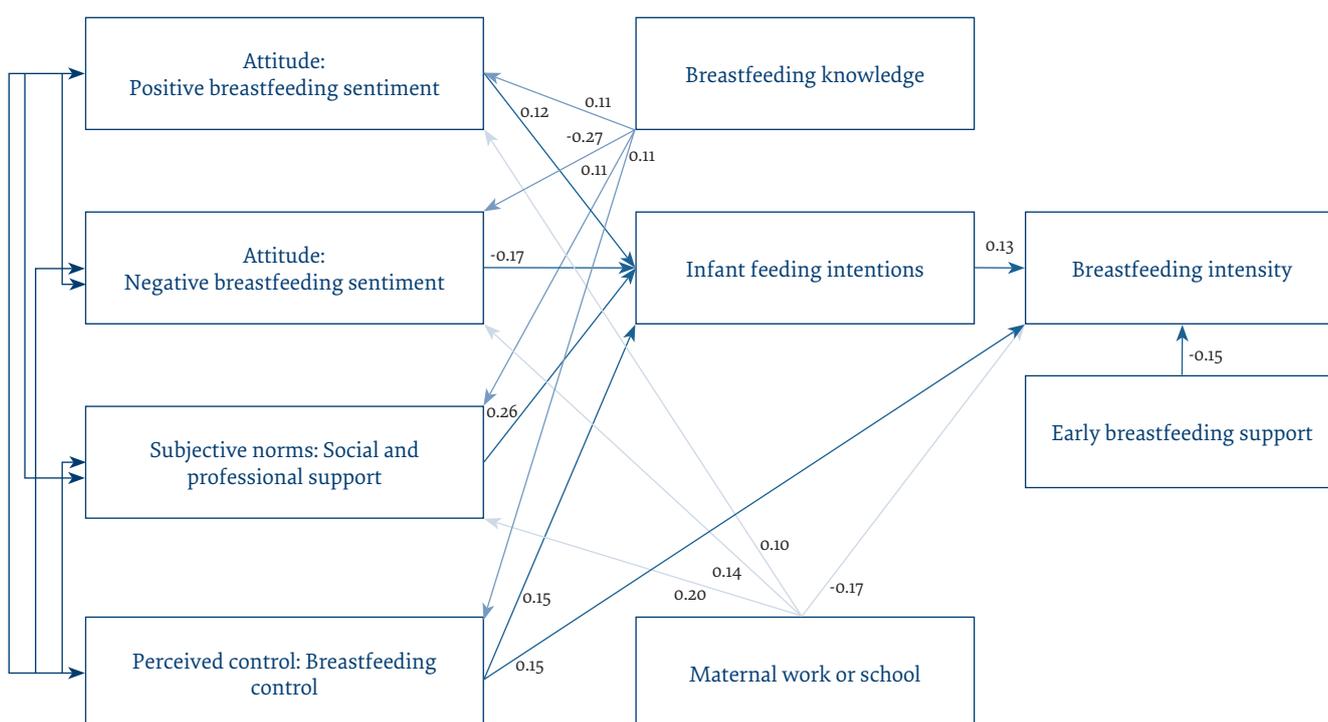
Table 3 Final model, path coefficients for final path analysis of maternal breastfeeding intention and breastfeeding intensity among Omani mothers (*n* = 427) 2016

Path from	Path to	Estimate	SE	*P*
Early breastfeeding support	Breastfeeding control	−0.02	0.01	0.118
Early breastfeeding support	Social and professional support	−0.01	0.01	0.246
Early breastfeeding support	Negative breastfeeding sentiment	0.02	0.01	0.051
Early breastfeeding support	Positive breastfeeding sentiment	−0.01	0.01	0.308
Breastfeeding knowledge	Breastfeeding control	0.04	0.02	0.025
Breastfeeding knowledge	Social and professional support	0.04	0.01	0.001
Breastfeeding knowledge	Negative breastfeeding sentiment	−0.08	0.01	< 0.001
Breastfeeding knowledge	Positive breastfeeding sentiment	0.03	0.01	0.020
Maternal work or school	Positive breastfeeding sentiment	0.08	0.04	0.044
Maternal work or school	Negative breastfeeding sentiment	0.13	0.04	0.003
Maternal work or school	Social and professional support	−0.15	0.03	< 0.001
Maternal work or school	Breastfeeding control	−0.07	0.05	0.127
Positive breastfeeding sentiment	Infant feeding intention	10.12	0.41	0.007
Negative breastfeeding sentiment	Infant feeding intention	−10.18	0.35	< 0.001
Social professional support	Infant feeding intention	20.73	0.42	< 0.001
Breastfeeding control	Infant feeding intention	0.99	0.35	0.005
Breastfeeding control	Breastfeeding intensity	50.43	10.74	0.002
Early breastfeeding support	Breastfeeding intensity	−10.59	0.47	< 0.001
Breastfeeding knowledge	Breastfeeding intensity	10.08	0.55	0.052
Work or school during pregnancy	Breastfeeding intensity	−60.01	0.65	< 0.001
Infant feeding intention	Breastfeeding intensity	0.69	0.25	0.006

SE = standard error.

The first few weeks of breastfeeding are essential for the long-term success of breastfeeding because early supplementation with formula is associated with shorter duration of breastfeeding (*38*). At this rate, Omani mothers are falling behind the goal of achieving an EBF rate of at least 50% for the first 6 months, set by the WHO with a target date of 2025 (*39*).

Maternal work or school status was the only sociodemographic variable that was significant in our model. Returning to work or school is perceived as a barrier to breastfeeding (*15*). We noted that mothers who worked or attended school had higher scores on the negative attitudes scale. These mothers were inclined to agree with specific negative aspects of breastfeeding, such as "breastfeeding makes returning to work more difficult". These mothers were also more likely to agree with positive statements about the benefits of breastfeeding, such as "breastfeeding is better than formula milk". Mothers who worked or attended school and had both negative and positive attitudes about breastfeeding expressed somewhat conflicting beliefs about ideal breastfeeding and the reality of returning to work while breastfeeding. Higher scores in positive attitudes about breastfeeding may indicate greater awareness of the benefits of breastfeeding, while higher scores in negative attitudes may indicate the conflicts mothers have related to common breastfeeding difficulties associated with returning to work or school. This suggests that mothers' attitudes are not merely a reflection of a

spectrum of positive or negative attitudes; rather, they are a mixture of both negative and positive attitudes, with both attitudes strongly exhibited.

Mothers who worked or attended school also had lower scores on subjective norms, indicating that they perceived less support from family members, friends, nurses, and doctors. This indicates the importance of involving family members and health care providers in breastfeeding support, especially for mothers who work or attend school. The mandated paid maternity leave in Oman is 7 weeks (*40*). Although paid maternity leave has been associated with enhanced breastfeeding duration, the length of this leave in Oman is shorter than in some Western countries e.g. Canada (17 weeks) and Ireland (26 weeks) (*41,42*). To promote breastfeeding in mothers who work, it is imperative to find ways to minimize barriers and adopt achievable goals that fit the needs of mothers who work; issues to consider are baby-friendly work and school environments (e.g. pumping rooms and availability of daycare).

Mothers with higher scores on the early breastfeeding support scale during their postpartum hospital stays had significantly lower breastfeeding intensity at 8 weeks, a negative association. The amount of need-based support could explain this counterintuitive result elicited during hospitalization. The breastfeeding support scale included such questions as: "Did you ever receive assistance with breastfeeding your baby?" and "Did you receive breastfeeding education?"; thus, mothers who

report more breastfeeding problems often receive more support. These mothers are more likely to have negative attitudes about breastfeeding (e.g. the perception that breastfeeding is more difficult than formula feeding) and are at higher risk for formula supplementation because of these attitudes and breastfeeding problems. Hence, the early breastfeeding support scale measure may reflect more about the mother's risk than the availability of support by the hospital. The fact that women who receive more support in the hospital have lower intensity later underscores the importance of follow-up breastfeeding support at home, especially for those mothers who struggled with breastfeeding during postpartum hospitalization. The support mothers receive during the first weeks of postpartum care is documented in the literature as a contributor to successful breastfeeding (*43,44*). More research is required to understand specific ways for the healthcare system and the family to support breastfeeding mothers in Oman.

Although breastfeeding knowledge was not directly associated with breastfeeding intensity, mothers with better knowledge about WHO breastfeeding recommendations had fewer negative and more positive attitudes about breastfeeding. These mothers also perceived a greater degree of control over their ability to breastfeed and perceived more social and professional support for breastfeeding. Saied et al. also reported that knowledge about WHO recommendations regarding the benefits of breastfeeding influenced attitudes in general (*45*).

The results of this study support the use of the TPB to explain infant feeding intention among Omani mothers. Our findings are in agreement with other studies that used TPB constructs to predict intention (*8*). In a meta-analysis, Guo et al. reported a moderate relationship between intention and TPB variables (*8*). Maternal attitude was the best predictor of intention, followed by PBC and subjective norms or social and professional support. In our study, infant feeding intention was significantly predicted by all of the TPB variables in the model. However, the strongest predictor of infant feeding intention was the subjective norms ($r^2 = 0.07$). This suggests that a mother who perceived that key people in her life (the mother's mother, the mother-in-law, the baby's father, a sister, a close friend, the nurse, the doctor) supported breastfeeding had a stronger intention to breastfeed. Similar results were reported previously where intention was positively associated with support from family, peers and partner (*46*). It is important to point out that the studies included in the meta-analysis of Guo et al. were mostly from western countries, only 2 were from Asia, and none were from the Arab countries (*8*).

In the TPB, the influence of culture on breastfeeding is primarily visible through social norms. Mothers live in the context of their community and the people they interact with. The relationship between subjective norms and social and professional support, especially between maternal and paternal grandmothers, is important in the Arab culture. The relationship involves a great degree of involvement in the upbringing of children. As part of the culture, grandmothers usually invest in care of grandchildren. It is common to observe the presence of grandmothers in labour rooms and during the postnatal period, e.g. it is customary for new mothers to spend the first 40 days following the birth at their mothers' (maternal grandmothers) homes for assistance with child care. The traditional 40-day period is where the grandmothers' influence on infant feeding is most apparent (*47*). They are a source of advice and greatly influence infant feeding practices (*48*). In traditional societies such as in the Middle East, grandmothers often help with tasks related to breastfeeding, such as assisting the daughter in breastfeeding positions and emotional encouragement and providing advice with the management of problems arising from childrearing.

Our findings confirm the applicability of intention to predicting breastfeeding intensity. The results suggest a positive association between intention at birth and breastfeeding intensity at 8 weeks. De Jager et al. reported that intention predicted breastfeeding intensity and duration (*19*). Perceived control also directly influenced breastfeeding intensity, indicating that a mother with a greater sense of control over her breastfeeding abilities is more likely to have greater breastfeeding intensity.

The limitations of this study were lack of follow-up beyond 8 weeks postpartum and low alpha reliability of the early breastfeeding support scale and the breastfeeding knowledge scale.

Conclusion

This study provides evidence for the use of the TPB to predict infant feeding intention and intensity among Omani mothers. A stronger intention suggests that mothers will have a better breastfeeding outcome. Maternal work or school status is an important predictor of breastfeeding outcomes; thus, it should be considered in planning interventions. Future studies in Oman and the Eastern Mediterranean Region should address the predictive breastfeeding factors beyond 8 weeks postpartum and interventions for breastfeeding promotion.

Prédiction de l'intention en matière d'alimentation des nourrissons et de son intensité à Oman à l'aide de l'approche d'analyse causale

Résumé

Contexte : Les faibles taux d'allaitement sont un sujet de préoccupation à l'échelle mondiale et peu d'études ont porté sur la question de l'allaitement à Oman.

Objectifs : Nous avons examiné les associations entre les caractéristiques socio-démographiques, les connaissances sur l'allaitement, les attitudes, les normes subjectives, le contrôle perçu et l'expérience antérieure des mères en matière d'allaitement, l'intention d'alimenter le nourrisson au moment de la naissance, ainsi que l'intensité de l'allaitement à huit semaines postpartum.

Méthodes : La présente étude s'est appuyée sur un modèle de cohorte descriptif et prospectif. La collecte des données a été réalisée en 2016 à l'aide d'un questionnaire structuré administré aux mères à la sortie des deux hôpitaux à Oman après l'accouchement et nous avons effectué un suivi une fois par un rappel alimentaire de 24 heures à huit semaines postpartum. Nous avons utilisé un modèle d'analyse causale (*n* = 427) à l'aide des logiciels SPSS version 24.0 et Amos version 22.

Résultats : Pendant l'hospitalisation postpartum, 33,3 % des mères ont déclaré que leur bébé avait reçu du lait maternisé et, lors du suivi à huit semaines, 27,3 % d'entre elles pratiquaient l'allaitement au sein de manière exclusive. Les normes subjectives (mesurées par le soutien social et professionnel) constituaient les facteurs prédictifs les plus importants. L'intention en matière d'alimentation du nourrisson a permis de prédire de manière significative l'intensité de l'allaitement. Le retour au travail ou à l'école était la seule variable socio-démographique à présenter une corrélation significative avec l'intensité de l'allaitement (*r* = −0,17 ; *p* < 0,001) ; les mères qui avaient prévu de retourner au travail ou à l'école avaient une intensité de l'allaitement considérablement plus faible. Les connaissances ont permis de prédire de manière significative les attitudes positives et négatives, les normes subjectives et le contrôle perçu. Le soutien précoce à l'allaitement est négativement corrélé avec l'intensité de l'allaitement (*r*= −0,15 ; *p* < 0,001).

Conclusion : L'intention en matière d'alimentation du nourrisson a permis de prédire positivement l'intensité de l'allaitement maternel avec des normes subjectives ou un soutien social ainsi que professionnel et était le plus en corrélation avec les intentions des mères.

التنبؤ بِنِيةِ وكثافة تغذية الرُضَّع في عُمان باستخدام نهج تحليل المسار

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الخلاصة

الخلفية: يمثل انخفاض معدلات الرضاعة الطبيعية مصدر قلق، سواء على الصعيد العالمي أو في عُمان، وثمة القليل من الدراسات التي تناولت الرضاعة الطبيعية في إقليم شرق المتوسط.

الأهداف: هدفت هذه الدراسة إلى بحث أوجه الارتباط بين الخصائص الاجتماعية والسكانية، والمعرفة بالرضاعة الطبيعية، والمواقف، والمعايير الشخصية، والتحكم المتصوَّر، والتجارب السابقة للأمهات بشأن الرضاعة الطبيعية، ونية الرضاعة عند الولادة، وكثافة الرضاعة بعد 8 أسابيع من الولادة.

طرق البحث: استندت هذه الدراسة إلى تصميم أترابي وصفي استباقي، إذ جمعت الدراسة بيانات من مستشفيين في عام 2016 عن طريق إجراء استبيان مُنظَّم للأمهات في مدة النفاس، وتلاه استبيان واحد آخر أجريَ بعد 8 أسابيع من الولادة خلال أحد تقييمات النظام الغذائي على مدار 24 ساعة. واتبعنا نموذج تحليل المسار (العدد = 427) باستخدام الإصدار 24.0 من برنامج SPSS والإصدار 22 من برنامج Amos.

النتائج: خلالِ مدة رعاية ما بعد الولادة في المستشفى، أفاد ما نسبته 33.3٪ من الأمهات بأن أطفالهن يتغذَّون على بدائل لبن الأم، وفي استبيان المتابعة الذي أجريَ بعد 8 أسابيع، كان ما نسبته 27.3٪ من الأمهات يرضعن أطفالهن رضاعة طبيعية حصرية. وكانت المعايير الشخصية (المقيسة

بالدعم الاجتماعي والمهني) أقوى العوامل المنبِّئة. وكانت نية تغذية الرضع تُنبئ بدرجة كبيرة بكثافة الرضاعة الطبيعية. وكانت العودة إلى العمل أو المدرسة المتغير الاجتماعي السكاني الوحيد الذي يرتبط ارتباطًا وثيقًا بكثافة الرضاعة الطبيعية (معامل الارتباط = −0.17؛ القيمة الاحتمالية > 0.001)؛ فكانت كثافة الرضاعة الطبيعية لدى الأمهات اللاتي خططن للعودة إلى العمل أو المدرسة أقل بشكل ملحوظ. وكانت المعرفة تُنبئ بدرجة كبيرة بالمواقف الإيجابية والسلبية والمعايير الشخصية والتحكم المتصوَّر. وتبيَّن أن دعم الرضاعة الطبيعية المبكرة يرتبط ارتباطًا سلبيًا بكثافة الرضاعة الطبيعية (معامل الارتباط= −0.15؛ القيمة الاحتمالية > 0.001).

الاستنتاج: إن نيَّة تغذية الرضع تُنبئ بشكل إيجابي بكثافة الرضاعة الطبيعية إلى جانب المعايير الشخصية أو الدعم الاجتماعي والمهني، وكان الارتباط الأقوى مع نيَّات الأمهات.

References

1. Committing to child survival: a promise renewed progress report. New York: UNICEF Division of Data, Research and Policy; 2015.

2. Indicators for assessing infant and young child feeding practices: part 1: definitions: conclusions of a consensus meeting held 6–8 November 2007 in Washington DC, USA. Geneva: World Health Organization; 2008.

3. Bhattacharjee NV, Schaeffer LE, Hay SI. Mapping inequalities in exclusive breastfeeding in low-and middle-income countries, 2000–2018. Nat Hum Behav. 2021 Aug;5(8):1027–45. doi:10.1038/s41562-021-01108-6

4. Annual health report. Muscat: Ministry of Health, Department of Health Information & Statistics; 2018.

5. Children: improving survival and well-being. Geneva: World Health Organization; 2019 (https://www.who.int/news-room/fact-sheets/detail/children-reducing-mortality, accessed 19 December 2020).

6. Monitoring the situation of children and women: UNICEF data, country profile, Oman. New York: UNICEF; 2020 (https://data.unicef.org/country/omn/#/, accessed 12 January 2022).

7. Lau CY, Lok KY, Tarrant M. Breastfeeding duration and the theory of planned behavior and breastfeeding self-efficacy framework: a systematic review of observational studies. Matern Child Health J. 2018 Mar;22(3):327–42. doi:10.1007/s10995-018-2453-x

8. Guo J, Wang T, Liao J, Huang C. Efficacy of the theory of planned behavior in predicting breastfeeding: Meta-analysis and structural equation modeling. Appl Nurs Res. 2016 Feb;29:37–42. doi:10.1016/j.apnr.2015.03.016

9. Bajoulvand R, González-Jiménez E, Imani-Nasab M, Ebrahimzadeh F. Predicting exclusive breastfeeding among Iranian mothers: application of the theory of planned behavior using structural equation modeling. Iran J Nurs Midwifery Res. 2019 Sep-Oct;24(5):323–9. doi:10.4103/ijnmr.IJNMR_164_18

10. Ajzen I. Theory of planned behavior, FAQ answers. Amherst: University of Massachusetts; 2016, (accessed 19 March 2023).

11. Ajzen I. The theory of planned behavior. Organ Behav Hum Decis Process 1991;50(2):179–211.

12. Al-Asfoor D. The second national PEM survey, Oman. Muscat: Ministry of Health; 2008 (http://www.cdscoman.org/uploads/cdEscoman/Newsletter%2017-9.pdf, accessed 4 November 2014).

13. Baby-friendly hospital initiative: revised, updated and expanded for integrated care. Geneva: World Health Organization; 2009.

14. Pérez-Escamilla R, Martinez JL, Segura-Pérez S. Impact of the Baby-friendly Hospital Initiative on breastfeeding and child health outcomes: a systematic review. Matern Child Nutr. 2016 Jul;12(3):402–17. doi:10.1111/mcn.12294

15. Wu Q, Farley T, Cui M. Breastfeeding, maternal psychopathological symptoms, and infant problem behaviors among low-income mothers returning to work. Soc Sci Med. 2021 Sep;285:114288. doi:10.1016/j.socscimed.2021.114288

16. Lewallen LP, Dick MJ, Flowers J, Powell W, Zickefoose KT, Wall YG, et al. Breastfeeding support and early cessation. J Obstet Gynecol Neonatal Nurs 2006 April 01;35(2):166-72. doi:10.1111/j.1552-6909.2006.00031.x

17. Bai DL, Fong DYT, Tarrant M. Previous breastfeeding experience and duration of any and exclusive breastfeeding among multiparous mothers. Birth. 2015 Mar;42(1):70–7. doi:10.1111/birt.12152

18. Khoury AJ, Moazzem SW, Jarjoura CM, Carothers C, Hinton A. Breast-feeding initiation in low-income women: role of attitudes, support, and perceived control. Womens Health Issues. 2005 Mar-Apr;15(2):64–72. doi:10.1016/j.whi.2004.09.003

19. de Jager E, Skouteris H, Broadbent J, Amir L, Mellor K. Psychosocial correlates of exclusive breastfeeding: a systematic review. Midwifery. 2013 May;29(5):506–18. doi:10.1016/j.midw.2012.04.009

20. Jackson DL. Revisiting sample size and number of parameter estimates: some support for the N:q hypothesis. Structural equation modeling 2003;10(1):128–41. doi:10.1207/S15328007SEM1001_6

21. Gill SL. Breastfeeding by Hispanic women. J Obstet Gynecol Neonatal Nurs. 2009 Mar–Apr;38(2):244–52. doi:10.1111/j.1552-6909.2009.01013.x

22. Janke JR. Prediction of breast-feeding attrition: instrument development. Appl Nurs Res. 1992 Feb;5(1):4–53. doi:10.1016/s0897-1897(05)80086-2

23. Dick MJ, Evans ML, Arthurs JB, Barnes JK, Caldwell RS, Hutchins SS, et al. Predicting early breastfeeding attrition. J Hum Lact. 2002 Feb;18(1):21–8. doi:10.1177/089033440201800104

24. Rajabi Gharaii N, Hesarinejad Z, Nasibi M, Ghazanfarpour M, Ghorbani F, Kargarfard L. Psychometric properties of Breastfeeding Attrition Prediction Tool (BAPT): a systematic review. Int J Pediatrics. 2019;7(2):8993–9001. doi:10.22038/IJP.2018.34001.2996

25. Gill SL, Reifsnider E, Lucke JF, Mann AR. Predicting breast-feeding attrition: adapting the breast-feeding attrition prediction tool. J Perinat Neonatal Nurs. 2007 Jul–Sep;21(3):216–24. doi:10.1097/01.JPN.0000285811.21151.3

26. Al Barwani S, Hodges EA, Thoyre SM, Knafl KA, Crandell JL, Sullivan C. Cross-cultural adaptation and linguistic validation of the translated Arabic revised breastfeeding attrition prediction tool. J Nurs Meas. 2023 Mar 1;31(1):5–18. doi:10.1891/JNM-D-21-00036

27. Nommsen-Rivers L, Dewey KG. Development and validation of the Infant Feeding Intentions Scale. Matern Child Health J. 2009 May;13(3):334–42. doi:10.1007/s10995-008-0356-y

28. Nommsen-Rivers L, Cohen RJ, Chantry CJ, Dewey KG. The Infant Feeding Intentions scale demonstrates construct validity and comparability in quantifying maternal breastfeeding intentions across multiple ethnic groups. Matern Child Nutr. 2010 Jul 1;6(3):220–7. doi:10.1111/j.1740-8709.2009.00213.x

29. Al-Ali N, Hatamleh R, Khader Y. Intention and attitudes towards breastfeeding among undergraduate female students at a public Jordanian university. Evidence Based Midwifery-Royal College of Midwives Library. 2012;10(4):119.

30. Yehya N, Tamim H, Shamsedine L, Ayash S, Abdel Khalek L, Abou Ezzi A, et al. Validation of the Arabic version of the infant feeding intentions scale among Lebanese women. J Hum Lact. 2017 May;33(2):383–9. doi:10.1177/0890334416680790

31. Nutrition, exclusive breastfeeding. Geneva: World Health Organization; 2015 (http://www.who.int/nutrition/topics/exclusive_breastfeeding/en/, accessed 2 November 2015).

32. Reynold J, Santos A. Cronbach's alpha: a tool for assessing the reliability of scales. J Extension. 1999;37(7):35–6.

33. Piper S, Parks PL. Use of an intensity ratio to describe breastfeeding exclusivity in a national sample. J Hum Lact. 2001 Aug;17(3):227–32. doi:10.1177/089033440101700306

34. Schlomer GL, Bauman S, Card NA. Best practices for missing data management in counseling psychology. J Couns Psychol. 2010 Jan;57(1):1–10. doi:10.1037/a0018082

35. Hooper D, Coughlan JP, Mullen MR. Evaluating model fit: a synthesis of the structural equation modelling literature. 7th European Conference on Research Methodology for Business and Management Studies, Regent's College, London, United Kingdom. Dublin: Technologcal University Dublin; 2008. doi:10.21427/D79B73

36. Chantry CJ, Dewey KG, Peerson JM, Wagner EA, Nommsen-Rivers LA. In-hospital formula use increases early breastfeeding cessation among first-time mothers intending to exclusively breastfeed. J Pediatr. 2014 Jun;164(6):1339–45.e5. doi:10.1016/j.jpeds.2013.12.035

37. Forster DA, Johns HM, McLachlan HL, Moorhead AM, McEgan KM, Amir LH. Feeding infants directly at the breast during the postpartum hospital stay is associated with increased breastfeeding at 6 months postpartum: a prospective cohort study. BMJ Open. 2015 May 7;5(5):e007512. doi:10.1136/bmjopen-2014-007512

38. Eilers MA, Hendrick CE, Pérez-Escamilla R, Powers DA, Potter JE. Breastfeeding initiation, duration, and supplementation among Mexican-origin women in Texas. Pediatrics. 2020 Apr;145(4):e20192742. doi:10.1542/peds.2019-2742

39. Global nutrition targets 2025: Breastfeeding policy brief. Geneva: World Health Organization and United Nations Children's Fund; 2014.

40. Sultanate of Oman labour law. Muscat: Ministry of Manpower, Legal Department; 2012 (Article 83).

41. Maternity leave. Dublin: Government of Ireland Citizens Information Board; 2017.

42. Maternity-related reassignment and leave, maternity leave, and parental leave. Ottawa: Employment and Social Development Canada; 2017 (LT-173-12-17E).

43. McKeever P, Stevens B, Miller K, Macdonnell J, Gibbins S, Guerriere D, et al. Home versus hospital breastfeeding support for newborns. Birth. 2002;29(4):258–65.

44. Hamade H, Naja F, Keyrouz S, Hwalla N, Karam J, Al-Rustom L, et al. Breastfeeding knowledge, attitude, perceived behavior, and intention among female undergraduate university students in the Middle East: the case of Lebanon and Syria. Food Nutr Bull. 2014 Jun;35(2):179–90. doi:10.1177/156482651403500204

45. Saied H, Mohamed A, Suliman A, Al Anazi W. Breastfeeding knowledge, attitude and barriers among Saudi Women in Riyadh. J Nat Sci Res. 2013;3(12):6–13.

46. Persad MD, Mensinger JL. Maternal breastfeeding attitudes: association with breastfeeding intent and socio-demographics among urban primiparas. J Community Health. 2008 Apr;33(2):53–60. doi:10.1007/s10900-007-9068-2

47. Chehab RF, Nasreddine L, Zgheib R, Forman MR. Exclusive breastfeeding during the 40-day rest period and at six months in Lebanon: a cross-sectional study. Int Breastfeed J. 2020 May 19;15(1):45. doi:10.1186/s13006-020-00289-6

48. Reid J, Schmied V, Beale B. 'I only give advice if I am asked': examining the grandmother's potential to influence infant feeding decisions and parenting practices of new mothers. Women Birth. 2010 Jun;23(2):74–80. doi:10.1016/j.wombi.2009.12.001