

EMPLOYING THE THEORY OF PLANNED BEHAVIOR TO PREDICT BREASTFEEDING  
INTENTION AND INTENSITY IN OMAN

Saada Al-Barwani

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Approved by:

Eric A. Hodges

Suzanne Thoyre

Kathleen Knafl

Jamie Crandell

Catherine Sullivan

Miriam Labbok

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## **ABSTRACT**

Saada Al-Barwani: Employing the Theory of Planned Behavior to Predict Breastfeeding Intention and Intensity in Oman  
(Under the direction of Eric A. Hodges)

Low breastfeeding initiation, duration and intensity are a global concern. Oman, located in the Arabian Peninsula, is no exception. As per the World Health Organization, the definition of exclusive breastfeeding (EBF) is infant receiving only breast milk or expressed breast milk, and no other liquids or solids for the first 6-month of life except for drops or syrups or medicines. EBF influence child development and survival. Currently, in Oman, about one in 10 infants are EBF for the first 6-month, although more than nine in 10 were EBF at birth. Factors that contribute to breastfeeding outcomes are not well researched in Oman. Thus, this dissertation aimed to examine maternal belief variables (attitudes, subjective norms and perceived behavior control), as well as the relationship of maternal intention, sociodemographic variables, knowledge, early breastfeeding support, and previous breastfeeding experience with breastfeeding intensity measured as the percent of feeding per 24-hour period that were from breastfeeding or breast milk.

The theory of planned behavior (TPB) was employed in a structural equation modeling analysis. Three manuscripts were produced to accomplish the purpose of the overall study. The first manuscript was a systematic review of literature on the relationship between belief variables and intention and breastfeeding initiation and duration. The second manuscript was a systematic translation and back-translation of the revised-breastfeeding attrition prediction tool using content validity indexing, cognitive interviews, and pilot testing, which was later used to study

Omani mothers. The third manuscript reports on the findings of a study conducted in Omani mothers that examined the theorized variables.

The main findings of the three manuscripts were: all of the TPB beliefs variables were significantly associated with breastfeeding intention. Maternal intention significantly predicted breastfeeding outcome. Return to work or school was the only sociodemographic variable that had a significant influence (negative) on breastfeeding intensity. Breastfeeding knowledge influenced belief variables and early postpartum breastfeeding support was negatively associated intensity. Results of this dissertation indicate that maternal belief variables, returning to work or school, knowledge, and early breastfeeding support all should be considered by clinicians, researchers and policy makers in optimizing breastfeeding outcomes in Omani mothers.

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## **LIST OF ABBREVIATIONS**

BAPT	Breastfeeding Attrition Prediction Tool
BFKS	Breastfeeding Knowledge Scale
CI	Cognitive Interviews
CVI	Content Validity Index
EBF	Exclusive Breastfeeding
EBFS	Early Breastfeeding Support
MOH	Ministry of Health
NBS	Negative Breastfeeding Statement
PBC	Perceived Behavior Control
PBS	Positive Breastfeeding Statement
SE	Self-efficacy
SEM	Structural Equation Model
SPS	Social and Professional Support
TPB	Theory of Planned Behavior
WHO	World Health Organization

## INTRODUCTION

This dissertation is presented as five chapters; it concerns maternal breastfeeding beliefs. My objectives for this dissertation are to present a study on maternal breastfeeding beliefs among Omani mothers (Chapter 1), to provide three manuscripts related to maternal breastfeeding beliefs (Chapter 2 through 4), and to synthesize these manuscripts (Chapter 5).

Chapter 1 is a study proposal regarding Omani mothers' beliefs about breastfeeding and their infant-feeding intentions; in the study, I examine how these factors contribute to variations in breastfeeding patterns in Oman. The study uses a descriptive, prospective design with follow-up to achieve the following aims:

1. Assess the reliability and validity of the Arabic translation of the revised- Breastfeeding Attrition Prediction Tool (revised-BAPT).
2. Examine the associations of mothers' sociodemographic characteristics, their breastfeeding knowledge, the variables pertaining to their beliefs (attitudes, subjective norms, and perceived controls), and early breastfeeding support with their breastfeeding intentions at birth and their breastfeeding patterns at 8 weeks postpartum.
3. Examine the effects that sociodemographic variables, breastfeeding experiences, breastfeeding knowledge, and breastfeeding support have on the relationship between maternal belief variables intention and breastfeeding patterns.

Chapter 2 presents the first manuscript. The manuscript is a systematic review using the theory of planned behavior (TPB) as the framework for identifying empirical studies that

examine the impact of, beliefs on women's intentions and decisions about breastfeeding. In the manuscript, I use TPB concepts to answer the following questions:

1. What is the relationship between maternal intention attitudes, subjective norms, and perceived control and 1) initiation of breastfeeding at birth and 2) duration for the first 6 months of the infant's life?
2. How is breastfeeding conceptualized in the reviewed studies?
3. What theoretical frameworks, if any, were used in the reports included in the review?
4. What methodologies were used in the reports included in the review?

Chapter 3 presents the results of the Arabic translation of the revised-BAPT regarding translation, linguistic validation, and content validation, all using the content validity index (see aim 3 of the study proposal).

Chapter 4 focuses on maternal belief variables, breastfeeding knowledge, and breastfeeding support. This part of the dissertation presents the results of the other aims 2 and 3 of the study. It focuses on the results of the structural equation model (SEM) regarding sociodemographic and maternal breastfeeding knowledge, belief variables (attitudes, subjective norms, and perceived controls), and maternal perceptions of breastfeeding support in terms of these factors' associations with the mothers' breastfeeding intentions at birth and with their breastfeeding patterns at 8 weeks postpartum.

Chapter 5 is a synthesis of the three manuscripts' results, with a focus on the implications for practical implementations and future research.

## CHAPTER 1: STUDY PROPOSAL

This chapter presents the study's specific aims; significance and innovations; methods and rationale; instruments; the threats to its internal and external validity; data analysis, data management, and missing data; the translations of study tools; timeline; the risks to subjects; potential limitations; and the solutions to those limitations.

### Specific Aims

Breastfeeding practices directly influence children's nutritional status, development, and survival (UNICEF, 2012). Patterns of breastfeeding practice can be measured through concepts such as exclusivity of breastfeeding (EBF), predominant breastfeeding, and complementary breastfeeding. The World Health Organization (WHO, 2008) has defined these patterns of breastfeeding practice as follows:

**EBF.** Infant receives only breast milk from his/her mother or a wet nurse, or expressed breast milk, and no other liquids or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines for the first 6 months of life.

**Predominant breastfeeding.** In addition to breast milk—including expressed breast and medicines—the infant may receive water or water-based drinks, tea, or fruit juices but no formula or non-human milk.

**Complementary breastfeeding.** In addition to breast milk, including expressed milk, the infant receives solid or semi-solid food. This may include any food or liquid, including infant formula milk and non-human milk (WHO, 2008, p. 4).

For this study, I added a fourth category, *no breastfeeding*, to describe infants who receive

formula or any other form of drink or food in place of human breast milk. *In addition, breastfeeding duration* also includes the possibility that breastfeeding continues for two years or longer (WHO, 2010). The Academy of Breastfeeding Medicine defined “breastfeeding” as:

The mother/child act of milk transference; “exclusive breastfeeding” means that no other liquid or solid food is fed to the infant, with the exception of medicines. “Breastmilk feeding” or “mother’s milk feeding” is the provision of the mother’s milk to the infant, and “human milk feeding” is the feeding of milk from any other mother or pooled human milk (Chantry, Eglish and Labbok, 2015, p. 407).

According to the WHO (2015), “If every child was breastfed within an hour of birth, given only breast milk for their first six months of life, and continued breastfeeding up to the age of two years, 800,000 children’s lives would be saved annually” (para. 1). In developing countries, the prevalence of EBF in the first 6 months of life has increased from 33% in 1995 to 39% in 2010 (Cai, Wardlaw, & Brown, 2012). This increase in EBF rates has occurred for developing countries in most regions. Despite this, the EBF rates in developing regions are still lower than the WHO’s 90% widely agreed target reported by Jones et al. (2003; Cai et al., 2012). Globally, the Middle East and North Africa region has the second-lowest percentage of infants (0–5 months) who are exclusively breastfed, with an average of 26% between 2000 and 2007 (Childinfo, 2009). Regarding Oman, Al-Asfoor (2008) indicated that relatively few EBF statistics are available from recent decades; for instance, the 1999 and 2005 EBF rates at 3 months were 31% and 33%, respectively. Breastfeeding rates at 4 months have also been reported for the combined category of EBF and predominant breastfeeding: 17.5% in 1992, 78% in 1995, 71.5% in 1999, and 56% in 2000 (Al-Asfoor, 2008; Sinani, 2008). The reasons behind these rate fluctuations have not been studied. However, Al-Asfoor (2008) suggested that the initial success was due to the Baby-Friendly Hospital Initiative (BFHI), which was established in the early 1990s; that success was maintained for only a few years. This program was designed



for hospitals and was not intended to provide support through primary health services. Al-Asfoor added that the later decline could be attributed to a lack of interventions that address breastfeeding at the community level. The EBF rate for infants at 6 months was 16.9% in 2011 (Department of Health Information & Statistics, 2013). Presently, fewer than 10% of mothers breastfeed exclusively for the first 6 months of their infants' lives, even though more than 90% initiate EBF at birth (Department of Health Information & Statistics, 2013). This decrease in EBF rates has been accompanied by a significant increase in formula feeding at 6 months, from 60.7% in 2005 to 81.6% in 2011 and 85.2% in 2013 (Department of Health Information & Statistics, 2013). Rigorous studies focusing on Omani mothers are not available, so the explanation for the country's declining rates of breastfeeding and increasing rates of formula feeding is not known.

In recent decades, studies have associated maternal breastfeeding outcomes with mothers' beliefs and intentions about infant feeding (Avery, Duckett, Dodgson, Savik, & Henly, 1998; Bai, Middlestadt, Peng, & Fly, 2010). This association is in line with the TPB, which indicates that a mother's attitudes, subjective norms, and perceived control contribute to her intention to breastfeed. This intention subsequently influences the mother's infant-feeding behavior. For this study, I used the TPB to understand the discrepancy in EBF rates at birth and 8 weeks. The findings from the literature—which primarily comprise Western studies on maternal belief variables (attitudes, perceived norms, and perceived control, all of which are variables that predict intentions to perform a desired action)—support the associations among maternal attitudes, subjective norms, perceived control, intentions, and maternal infant-feeding behavior.

The literature on breastfeeding supports the following applications of the TPB concept.

First, a positive maternal attitude toward breastfeeding is associated with the intention to breastfeed and with the continuation of breastfeeding (Avery et al., 1998; Hoddinott, Kroll, Raja, & Lee, 2010; Yen-Ju Ho & McGrath, 2011). Second, subjective norms and perceptions regarding key people (e.g., partners, parents, and friends) are strongly associated with breastfeeding intention; likewise, breastfeeding intention is positively associated with the presence of family, peer, and partner support (McMillan et al., 2008; Persad & Mensinger, 2008). Subjective norms are also predictors of choices regarding infant-feeding methods (Avery et al., 1998; Swanson & Power, 2005). Additionally, perceived control or confidence when coping with breastfeeding-related issues is associated with the continuation of breastfeeding (Avery et al., 1998; Bai et al., 2010; Lawson & Tulloch, 1995). Higher levels of perceived control predict intention to breastfeed for longer durations (Lawson & Tulloch, 1995; Nommsen-Rivers, Chantry, Cohen, & Dewey, 2010). Finally, maternal intentions are associated with longer durations of EBF (Avery et al., 1998; Bai et al., 2010).

Culture's influence on breastfeeding is most visible in the TPB through the concept of perceived social norms. Mothers live within the context of the community and of the individuals who surround them. In Omani culture, this concept is based on the domestic unit, which often includes not just the nuclear family but also extended generations in one household (Koermer, 2013). For example, grandmothers in Arabian culture are often highly involved in their grandchildren's upbringings; the grandmothers referred to here can be the mother's biological mother or her mother-in-law. In addition, grandmothers are not only a source of advice, but also a great source of influence on infant feeding practices (Andrew & Harvey, 2011; Ingram et al., 2003; Reid et al., 2010; Sharma & Kanani, 2006).

Although many authors have conducted studies on the maternal belief variables that

influence breastfeeding outcomes (Avery, Zimmermann, Underwood, & Magnus, 2009; Bai et al., 2010; Barona-Vilar, Escribá-Agüir, & Ferrero-Gandía, 2009; Jessri, Farmer, & Olson, 2013; Moore & Coty, 2006), only a few studies have focused on the Arabian Gulf. In an effort to develop a child growth chart for six countries (Brazil, Ghana, India, Norway, Oman, and the United States), Onis (2006) reported that, compared to those in the other countries, the highly educated mothers in Oman had significantly lower compliance with breastfeeding recommendations. Moreover, Onis (2006) highlighted the cultural differences that influence breastfeeding practices, thus suggesting an area of research that requires further exploration. Improving understanding of maternal knowledge and beliefs in Oman could lead to a better understanding of the variables that contribute to such variations in breastfeeding patterns.

Various researchers have reported that returning to work is a commonly reported breastfeeding barrier and a main factor in why mothers introduce formula feeding and early weaning (Chen & Chi, 2003; Lewallen et al., 2006; Schwartz et al., 2002). Hamlyn, B., Brooker, S., Oleinikova, K. & Wands, S. (2002) reported that 87% of mothers who discontinued breastfeeding in the first 6 weeks wanted to breastfeed for a longer duration. Going back to work is associated with a shorter duration of EBF (Mora, Russell, Dungy, Losch, & Dusdieker, 1999). Sloan, Sneddon, Stewart, and Iwaniec (2006) reported that 88% of mothers who initiated breastfeeding at birth were still breastfeeding in the first week; this number decreased to 67% at 6 weeks, with the need to return to work listed as the most common reason for discontinuing breastfeeding.

The first few weeks of breastfeeding are important for the process's long-term success. Hill, Humenick, Brennan, and Woolley (1997) stated that the duration of breastfeeding is associated with early supplementation (e.g., formula feeding). Hill et al. (1997) reported that,

even though there was no significant difference in breastfeeding intention between mothers who exclusively breastfed and those who supplemented breastfeeding with formula milk, mothers who breastfed exclusively at 2 weeks postpartum had significantly greater durations of breastfeeding at 20 weeks than did mothers who supplemented at 2 weeks. Among working mothers in Oman, the period of 7 to 8 weeks postpartum is especially critical for sustaining EBF, as this is the time when women return to paid work. According to Article 83 of Oman's labor laws, women have the right to 50 days of fully paid maternity leave (Labour Law, 2012). Statistics from the Oman Ministry of Health (MOH) indicate that breastfeeding drops off dramatically at 8 weeks postpartum. In 2010, EBF rates in Muscat, the capital of Oman, dropped from 92.05% at birth to 61.44% at 8 weeks postpartum (Department of Nutrition, 2010).

In addition to the belief variables and returning to work, sociodemographic variables influence both the patterns of breastfeeding practice and the maternal belief variables. The sociodemographic variables that are most commonly found to have associations with patterns and duration are maternal age, marital status, family income, and education level (Avery et al., 1998; de Jager, Skouteris, Broadbent, Amir, & Mellor, 2013; Dennis, 2002).

Maternal age is consistently associated with breastfeeding outcomes; older mothers breastfeed for longer durations than younger ones. Avery et al. (1998) reported that maternal age was correlated with duration of breastfeeding. Mothers who stopped breastfeeding early were younger than those who breastfed for a longer duration. Chye, Zain, Lim and Lim (1997) reported that mothers older than 27 were significantly more likely to engage in EBF than younger mothers. Kornides and Kitsantas (2013) reported that mothers older than 25 were significantly more likely to initiate and continue breastfeeding at 2 months than younger mothers.

Marital status is also associated with breastfeeding outcomes. Researchers have reported that married mothers have significantly longer durations of breastfeeding than single mothers do (Callen & Pinelli, 2004; Li, Fein, Chen, & Grummer-Strawn, 2008). This variable was not a concern because all Omani mothers were expected to be married due to Islamic religious requirements. In addition, education level is correlated with breastfeeding outcomes. Researchers have reported that more highly educated mothers tend to breastfeed for longer durations than do less educated mothers. However, this variable is inconsistent in its association with breastfeeding duration. On one hand, Simard et al. (2005) reported a significant positive association between longer duration of breastfeeding and maternal education level. Kornides and Kitsantas (2013) reported that mothers with more education are significantly more likely to initiate breastfeeding and continue it at 2 months. Kehler, Chaput, and Tough (2009) reported that lower maternal education significantly increased the likelihood of early breastfeeding cessation. On the other hand, various authors (who conducted studies mostly in developing countries) have found that breastfeeding duration decreases significantly as education level increases (Amin, Hablas, & Al Qader, 2011; Humphreys, Thompson, & Miner, 1998; O'Brien, Buikstra, & Hegney, 2008).

Family income is associated with mothers' breastfeeding outcomes. Flower, Willoughby, Cadigan, Perrin and Randolph (2008) reported that mothers who received financial assistance were less likely to both initiate and continue breastfeeding. Hawkins, Griffiths, Dezateux, Law, and Millennium Cohort Study Child Health Group (2007) reported that mothers who had full-time employment were less likely to initiate breastfeeding than mothers who were not employed. Camurdan et al. (2008) reported that the duration of maternity leave was positively correlated with the duration of both overall breastfeeding and EBF.

This study explores the effect that previous breastfeeding experience has on both beliefs and patterns. Previous breastfeeding experience is associated with increased breastfeeding duration. Becerra and Smith (1990) reported that mothers who breastfed their first child were 7.3 times more likely to breastfeed their second child than were mothers who never breastfed their first child. In a sample of multiparous mothers after a follow-up at 12 months postpartum, (Bai, Fong & Tarrant, 2015) reported that mothers who had previously breastfed for more than 3 months had a lower risk of weaning compared to mothers who had never breastfed or who had breastfed for no more than 3 months. In addition, mothers who used EBF for more than 2 months were less likely to stop EBF than were mothers who never engaged in EBF and those who had done so for no more than 2 months. Phillips, Brett and Mendola (2011) also reported that mothers who used EBF for their first child for at least 4 months had higher odds of doing so for their second child for at least 4 months, when compared to mothers who used EBF for less than 4 months and to those who had no breastfeeding experience.

Breastfeeding knowledge also contributes to explanations of maternal breastfeeding behavior. Knowledge of the benefits of breastfeeding is associated with significantly higher odds of breastfeeding (Khoury, Moazzem, Jarjoura, Carothers, & Hinton, 2005). Ertem, Votto and Leventhal (2001) reported a lack of breastfeeding knowledge in their longitudinal observational study, which they conducted on U.S. ethnic-minority mothers (56.3% African American, 34.3% Puerto Rican and 9.4% White), 91% of whom were enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children. Even though these mothers received education about breastfeeding and were able to name the benefits of breastfeeding, only 30% knew the recommended period for EBF, and only 4.7% were able to identify that frequent breastfeeding is essential to increasing breast milk production.

In a cross-sectional study of Saudi mothers—of whom 6.7% had less than a high school education, 63.3% were high school graduates, and 30% had received at least some higher education—Mosalli et al. (2012) reported that a lack of breastfeeding knowledge was the most common barrier to breastfeeding. During the immediate postpartum period, 30% of the Saudi women in the Mosalli et al. study believed that breastfeeding did not provide adequate nutrition for the infant, and 4% believed that formula milk was superior in nutritional value to breast milk. Furthermore, 23% of the mothers had little knowledge about colostrum's benefits to the infant (Mosalli et al., 2012). In a study on maternal breastfeeding knowledge and attitudes, Saudi mothers who had more breastfeeding knowledge had longer breastfeeding durations and fewer perceived barriers to breastfeeding. Breastfeeding knowledge assessed included knowledge of the benefits of breastfeeding for the mother and baby. The authors suggested that maternal breastfeeding knowledge is positively correlated with maternal breastfeeding attitudes. Mothers who had higher scores on the breastfeeding knowledge scale had more positive attitudes toward breastfeeding (Saied, Mohamed, Suliman, & Al Anazi, 2013).

The proposed study is meant to explore knowledge of breastfeeding in light of the WHO's breastfeeding recommendations. These recommendations include providing knowledge about

1. breastfeeding's benefits to the mother and baby (including the prevention of infectious disease) as well as the harms of not breastfeeding;
2. the benefits of colostrum;
3. insufficient milk supply, the most commonly reported barrier to breastfeeding;
4. the most common misconceptions related to breastfeeding, such as that bigger babies are healthier and more desirable, which may contribute to supplementation with formula and

the early introduction of formula feeding (Heinig et al., 2006), as parents of overweight or obese children often incorrectly perceive their children as being the right weight (Duncan, Hansen, Wang, Yan, & Zhang, 2015); and

5. the WHO's and UNICEF's recommendations to establish breastfeeding within the first hour of life, sustain EBF for 6 months, make breastfeeding available on demand both day and night, and use spoons or cups instead of bottles, teats, or pacifiers.

For this study, I use the WHO's definition of the patterns of breastfeeding—which focuses on infants' diet intake—to describe the infants' feeding patterns as well as the WHO's recommendations for successful breastfeeding to evaluate maternal breastfeeding knowledge (WHO, 2010; WHO, 2015a).

The objectives of this study are to explore maternal beliefs about breastfeeding behavior and the cultural factors that explicitly contribute to variations in the patterns of breastfeeding practices in Oman. The rationale is to provide a foundation for effective breastfeeding interventions that are tailored to Omani mothers. The study has the following specific aims:

1. Assess the reliability and validity of the Arabic translation of the revised-Breastfeeding Attrition Prediction Tool (revised-BAPT).
2. Examine the associations of mothers' sociodemographic characteristics, their breastfeeding knowledge, the variables pertaining to their beliefs (attitudes, subjective norms, and perceived controls), and early breastfeeding support with their breastfeeding intentions at birth and their breastfeeding patterns at 8 weeks postpartum.



3. Examine the effects that sociodemographic variables, breastfeeding experiences, breastfeeding knowledge, and breastfeeding support have on the relationship between maternal belief variables intention and breastfeeding patterns.

The knowledge gained from this study fills a gap in the literature on the maternal belief variables that contribute to Oman's relatively low EBF rate. The findings from the study contribute to identifying potential areas for culturally specific interventions, promoting EBF in Oman, and further concentrating on areas of the country where the breastfeeding rates are lowest. This supports my long-term goal of developing a culturally specific intervention aimed at improving EBF rates in Oman.

### **Significance**

Optimal infant feeding practices are an important determinant of health outcomes and nutrition trends in developing countries. Insufficient nutritional intake leads to mortality and morbidity from common childhood illnesses. The rate of child mortality (age 0–5) in Oman dropped dramatically from 48 per 1,000 live births in 1990 to 11.5 in 2013. The 2013 rate was much lower than the global rate of 46 per 1,000 live births (UNICEF, 2014). The drop was attributed to the country's development in the health care sector, especially in primary care. Some of these areas of development include better access to clean drinking water and the eradication of communicable diseases such as polio and measles thanks to the country's high vaccination rate, which reached 99% in 2011 (UNICEF, 2012). Despite its drop in mortality rate, Oman still has a high prevalence of childhood malnutrition conditions such as protein energy malnutrition, the prevalence of which, among was 4.3 per 1,000 children under 5 years old in 2013. This rate improved from 128 per 1,000 children in 1995 (Department of Health Information & Statistics, 2013). In a national survey on child nutrition that the MOH conducted

in 2008 and 2009, ElSayed and Al Shammkhi (2009) reported the following results among children 5 years old and younger: 8.6% were underweight,<sup>1</sup> 7.1% had wasting,<sup>2</sup> 9.8% were stunted,<sup>3</sup> and 60.6% had anemia. The prevalence of these conditions was especially high in children younger than 6 months old, as 6.1% were underweight, 9.6% had wasting, 8.4% were stunted, and 65.6% had anemia (ElSayed, M. & Al Shammkhi, S., 2009).

In 2012, undernutrition caused more than one third of global deaths among children 5 years old and younger (UNICEF, 2012). According to the WHO and UNICEF, a key contributor to optimal infant nutrition is breastfeeding, which not only promotes child's growth and development but also reduces the disease burden and prevent excess nutrition (WHO & UNICEF, 2014). Oman's EBF rates are in decline and no researchers have explained the declining rates of breastfeeding and increasing rates of formula feeding in Oman. Moreover, the lack of validated Arabic instruments that could help explain mothers' breastfeeding beliefs adds to the need for conducting this study.

The aim of the proposed study is to increase understanding of the maternal belief variables (attitude, subjective norms, and perceived behavioral control) and breastfeeding intentions that influence patterns of breastfeeding practices in Oman. Researchers have suggested that these maternal belief variables are associated with breastfeeding intentions and with EBF duration (Avery et al., 2009; Bai, Middlestadt, Joanne Peng, & Fly, 2009; Bai et al., 2010; Barona-Vilar et al., 2009; Jessri et al., 2013; Moore & Coty, 2006). However, few

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<sup>1</sup> *Underweight* is "more than two standard deviations below the median weight (based on age) for the reference population" (UNICEF Definitions, n.d.)

<sup>2</sup> *Wasting* is "more than two standard deviations below the median weight (based on height) for the reference population" (UNICEF Definitions, n.d.)

<sup>3</sup> *Stunting* is "below minus two standard deviations from median height and for age of reference population" (UNICEF Definitions, n.d.)

researchers have focused on understanding the belief variables and breastfeeding intentions in the culture of Oman or the Arabian Gulf as a whole. The findings of this study identify a critical gap in the literature related to the maternal belief variables that explicitly influence breastfeeding in Oman. A better understanding of these maternal belief variables is imperative when designing culturally specific interventions that focus on increasing EBF rates. Furthermore, Aim 1 helps determine the reliability and validity of the translated version of the revised-BAPT for the Arabic population. This helps refine the instrument through statistically reliable methods and provides further evidence of its global application.

### **Innovations**

The proposed study addresses Omani mothers' specific perspectives on breastfeeding, an area of research that has a limited focus. The study provides an opportunity to gain a more comprehensive understanding of these mothers' knowledge and early breastfeeding support—variables that are associated with breastfeeding in that population (Axinn & Pearce, 2006). According to past researchers, maternal belief variables influence behavior, and this study contributes to knowledge regarding the association between the identified variables and breastfeeding behavior. This study is also important because it highlights how sociodemographic variables such as maternal education and family can influence maternal belief variables and perceptions. Studies conducted in Western countries have found that higher educational levels are positively associated with increased levels of breastfeeding intention, initiation, and duration (Dennis, 2002). However, there are indications that this association between the level of education and breastfeeding duration is inverted in Oman and in other developing countries that have relatively low breastfeeding rates among highly educated mothers (Amin, Hablas, & Al Qader, 2011; Humphreys, Thompson, & Miner, 1998; O'Brien, Buikstra,

& Hegney, 2008; O'Brien, Buikstra, Fallon, & Hegney, 2009; Onis, 2006; Persad & Mensinger, 2008). The results of this study increase knowledge of Omani mothers' breastfeeding intentions, perspectives, and beliefs contribute to Oman's relatively low rates of breastfeeding.

### **Methods and Rationale**

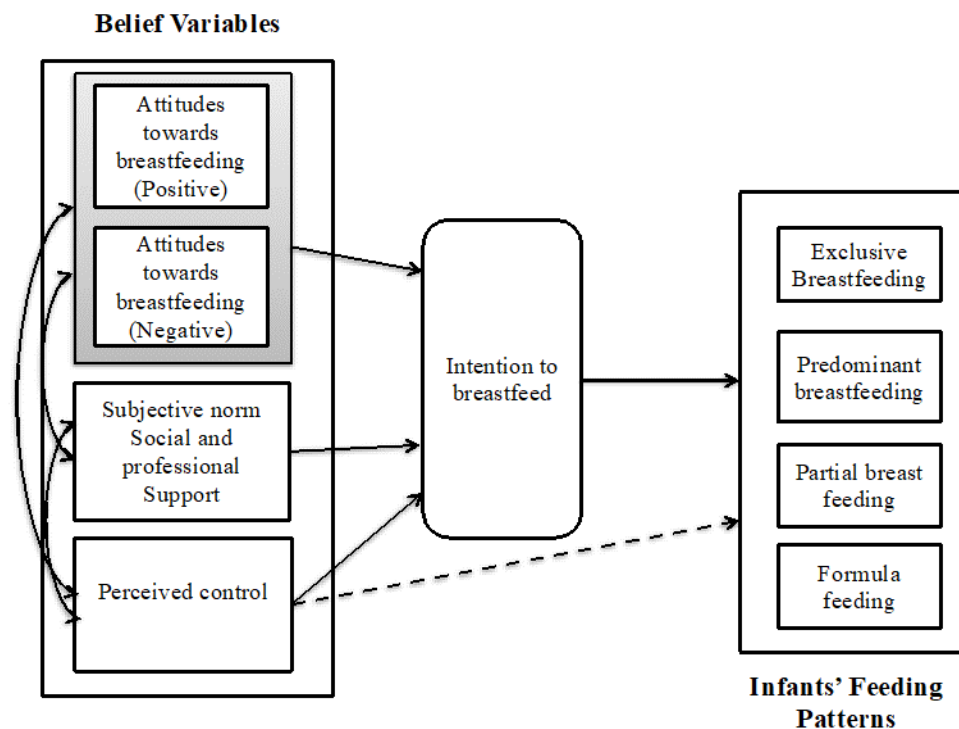
My intent in this study is to examine the maternal sociodemographic and belief variables (e.g., attitudes, subjective norms, and perceived control) that, in Oman, are associated with breastfeeding intentions at birth and with patterns of breastfeeding practices at 8 weeks postpartum. Among Omani mothers, the maternal belief variables are predicted to have associations with intention and with patterns of breastfeeding practices. My primary purpose in this study is to explore the sociodemographic variables, maternal breastfeeding knowledge, early breastfeeding support, and belief variables that contribute to maternal feeding intentions and breastfeeding patterns in Oman. I examine the breastfeeding patterns in this study based on infants' diets, as recorded using 24-hr dietary recall. Because this method is open-ended, it is a comprehensive technique for estimating intake, as it allows the mothers to report all types of food (and combinations thereof) when recording the intake of their infants and toddlers (Briefel et al., 1992). I conducted this study in three phases. In the pretest phase, I assessed the practicality of the study's tools with a sample of five Omani mothers, redrafting the tools as needed after examining the participants' responses. In Phases I and II, I implemented an exploratory study of breastfeeding Omani mothers at birth and at 8 weeks postpartum.

This study's theoretical framework is Ajzen's (1991) TPB, which includes the hypothesis that individual behavior is largely determined by that person's attitudes toward the desired behavior, along with subjective norms, individuals' beliefs about how others view their behaviors, and individuals' perceived control over the desired behavior and perceived ease or

difficulty when performing the desired behavior (Figure 1.1; Table 1.1). The assumption for attitude, the first part of the theory, is that individuals adjudicate their actions. The second part of the theory focuses on the social antecedents of a behavior (e.g., the desire to be like others). This part, which considers the importance of assessing subjective norms, includes the individual's perceptions of whether key people (e.g., partners, parents, and friends) approve of the behavior; the individual's motivation to comply or otherwise behave in a way that gains the key people's approval; and the individual's normative belief regarding whether the key people approve of the behavior. The third component of the TPB is perceived behavioral control, which is a measure of an individual's perceived ease or difficulty in performing the desired behavior. Perceived behavioral control directly influences individuals' intentions and behaviors (Figure 1.1; Table 1.1). The concept of perceived behavioral control assumes that the predictive behavior is influenced either by the individual's perception of control over the behavior or by the extent to which the individual believes that he or she has control over the facilitating or constraining conditions. This influence is demonstrated in the extent that the individual feels able to enact the desired behavior. This concept includes factors that can interfere with the desired behavior, thus explaining why intentions do not always predict behavior (Ajzen, 1991; Armitage & Conner, 2001; Glanz, Rimer, & Viswanath, 2008).

In this study, the TPB is used to predict maternal breastfeeding patterns. Mothers who have more positive attitudes about breastfeeding, higher levels of subjective norms, higher perceived control, and higher levels of breastfeeding intentions are expected to be more likely to still be using EBF for their infants at 8 weeks postpartum. Mothers who have lower measurements for attitude, subjective norms, perceived control, and breastfeeding intentions are expected to have moved on to formula feeding. Researchers have used the TPB in breastfeeding

studies to predict breastfeeding intention and behavior using various operational measurements. The results reported from the studies on maternal intentions strongly predict EBF duration (De Jager et al., 2013). In addition, Teich, Barnett, & Bonuck (2014) reported significant relationships between the concepts of the TPB (attitudes, perceived norms, and perceived social support) and both maternal infant-feeding intentions and the continuation of breastfeeding.



*Figure 1.1.* Ajzen's (1991) theory of planned behavior as applied to breastfeeding

In addition to the concepts of the TPB, I modeled sociodemographic variables to determine how they influence both the patterns of breastfeeding practice and the maternal belief variables (Figure 1.2). The sociodemographic variables used in the current study are maternal education level, family income, maternal employment status, maternal age, number of children, previous maternal breastfeeding experience, and method of delivery (Avery et al., 1998; De Jager et al., 2013; Dennis, 2002). Although I have collected data on marital status for the study,

this factor is not expected to vary because all of the participants are expected to be married in Oman's all-Muslim culture; therefore, it is not included as a potential variable, as it would confound the patterns of breastfeeding practices for the population.

Regarding the direct effects on breastfeeding patterns through the intention model (Figure 1.1), I examined the belief variables, maternal breastfeeding knowledge, and early breastfeeding support (Figure 1.2). I also examined the moderation effects of sociodemographic variables, breastfeeding experience, breastfeeding knowledge, and early breastfeeding support on the relationships that the maternal belief variables and intentions have with breastfeeding patterns.

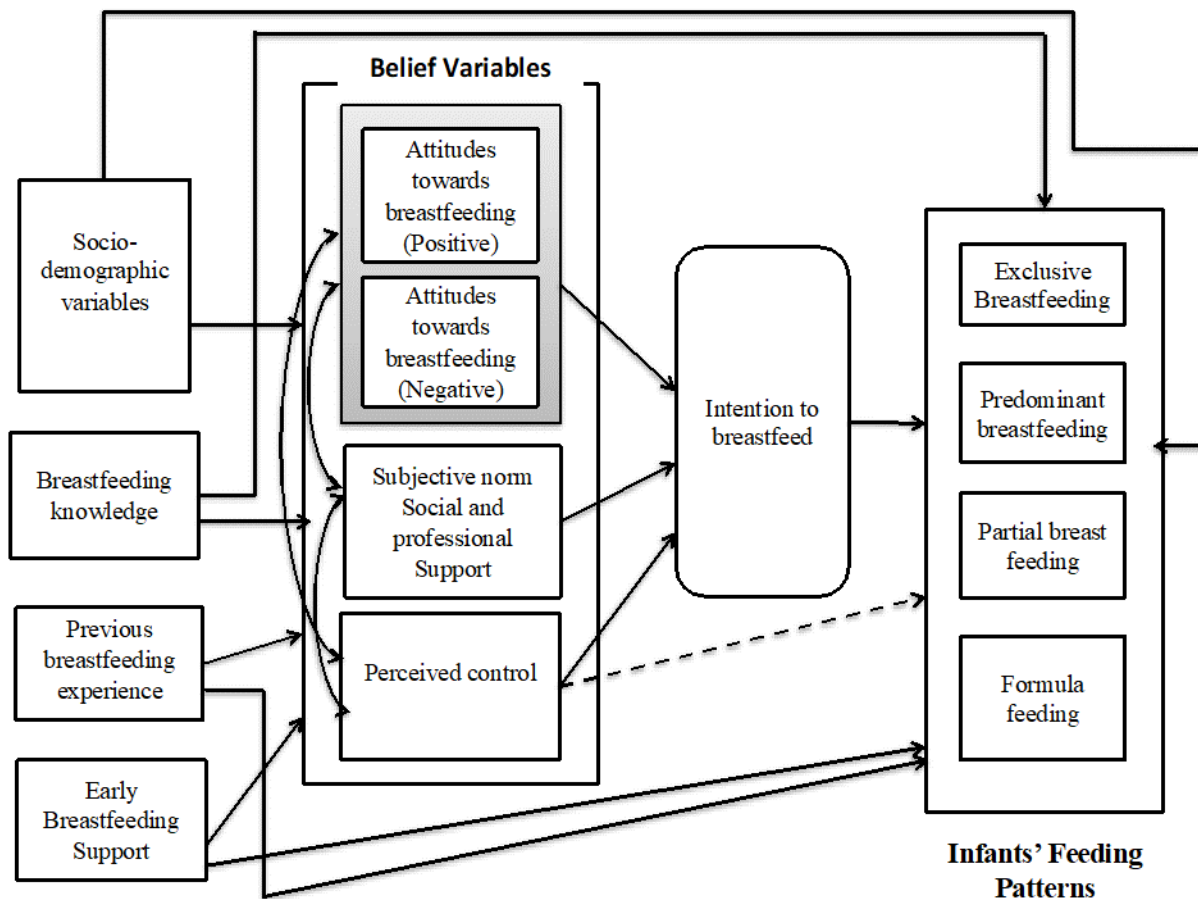


Figure 1.2. Adapting the theory of planned behavior to determine breastfeeding intention and breastfeeding patterns

Table 1.1. *Operational definitions of the study variables: attitude, perceived control, subjective norms, intention, maternal breastfeeding knowledge, previous breastfeeding experience, and early breastfeeding support*

Variable	Operational Definition
Attitude <sup>a</sup>	The woman's beliefs regarding the consequences of breastfeeding and formula feeding. This includes beliefs about the advantages and disadvantages of both breastfeeding and formula feeding.
Perceived control <sup>a</sup>	The woman's beliefs about the ease and difficulties regarding breastfeeding and formula feeding.
Subjective norms <sup>a</sup>	The woman's perceptions of the key people around her, including the woman's mother, husband, sister, and primary care provider, as well as the infant's father, and whether they think that she should or should not breastfeed or formula feed.
Intention <sup>b</sup>	The woman's plan and likelihood of following up with the plan about infant feeding at one, three, and six months of infant's age, collected within the first 48 hr after delivery.
Maternal breastfeeding knowledge	Maternal knowledge of World Health Organization recommendations, focused exclusively on breastfeeding for the first six months and the benefits of breastfeeding.
Previous breastfeeding experience	The success of the mother's past breastfeeding experience
Early breastfeeding support	The mother's perception of the breastfeeding support experience she receives during hospitalization, in accordance with the Steps to Successful Breastfeeding (BFHI) practice guidelines

<sup>a</sup> Janke (1992) and <sup>b</sup> Nommsen-Rivers et al. (2009).



## **Methods**

### **Design**

For this study, I used a descriptive, prospective design with a follow-up to examine breastfeeding beliefs, intentions, and behaviors among Omani mothers. I performed the study as follows: pretest phase, Phase I, and Phase II. The pretest, which was a pilot test for the study tools, consisted of a cross-sectional study that allowed me to assess the feasibility of the study tools (the BAPT, the Infant Feeding Intention [IFI] tool, and the sociodemographic survey) for the targeted sample. The purpose was to detect any issues that the participants might experience when responding to the study tools.

Along with two research assistants, I collected data from the participants in two phases: Phase I, at postpartum hospital discharge, and Phase II, at the 8-week postpartum follow-up. The rationale for this implementation is to establish the direction of the relationships between, first, the maternal belief variables (attitude, subjective norms, and perceived control) and the intentions and, second, the patterns of breastfeeding practices. This design allowed for the interactions between these variables to be examined simultaneously to determine which ones vary together (P. J. Brink & Wood, 1997). This design is also useful for understanding the sociodemographic influences within Oman, thus allowing for the development of culturally sensitive interventions to promote EBF. The sociodemographic variables that influence behavior, according to the available literature, contributed to explaining the correlations between the identified variables and breastfeeding behavior. This understanding of the data helped to disentangle the complexity of breastfeeding behavior in Oman, where breastfeeding has not been comprehensively studied.

## Setting

I carried out this study in Muscat Governorate, which is located in the northeast region of Oman and which had a population of 734,697 people in 2010 (National Statistics, 2012). Since the ascension of the modern Omani government in 1970, Muscat has gone through rapid infrastructural and economic development. According to Oman MOH statistics, in 2010, the mean rate of breastfeeding was below 52% in all regions of the country; Muscat had the lowest rate of any region, with only 32.74% of children being breastfed (Department of Health Information & Statistics, 2013). Moreover, in 2012, Muscat had the lowest rate in the country for EBF in the first 6 months: 1.8%, compared to 9.1% nationally (Department of Health Information & Statistics, 2013).

The MOH is the primary health care provider in Oman, and its care is free to Omanis. Muscat, the country's capital region, has the highest population density; nearly 50% of the country's population resided there in 2017 (World Population Review, 2017). Muscat is a coastal area situated in the northern part of the country, which is located in the southeastern part of the Arabian Peninsula. Because of the country's location and history, Oman's societal composition is unlike that of any other country in the Arabian Gulf—a heterogeneous population comprising several ethnic groups. The major ethnic categories include Arabs; Arabs who immigrated into Oman from East Africa; and non-Arab settlers, including Persians, Baluchis, and Gujaratis. In addition to Arabic, Urdu, Swahili, and English are commonly spoken in Oman (Peterson, 2004). Social factors might influence EBF in Oman. As a result, conclusions that apply to other countries cannot be generalized to Oman. I understand that this study must account for these social factors; nevertheless, due to political and social limitations, inquiries about individuals' ethnic and racial backgrounds is neither acceptable nor tolerable, limiting this

area of inquiry.

Like other Arabian Gulf countries, Oman is experiencing a population transition toward urbanization.<sup>4</sup> According to the U.S. Central Intelligence Agency, in 2010–2015, Oman had an estimated urbanization rate equivalent to 8.54%, with 77.6% of the population living in urban areas by 2015; the global figures for the same time period are a 2.05% urbanization rate and 54% living in urban areas (Central Intelligence Agency, 2015). This urbanization, in addition to the country's economic growth, has given women the chance to receive higher levels of education and to become more involved in work outside the home. Similarly, the illiteracy rate among Omani women is declining; the 2010 National Census documented a drop in illiteracy among Omani women from 23.7% in 2003 to 16.7% in 2010 (Human Development Report, 2012). Consequently, the percentage of female employment is rising, with a considerable increase from 10.8% in 2003 to 25.2% in 2010 (Human Development Report, 2012).

For the study, I recruited participants from Royal Hospital and Khawlah Hospital, which are the country's main hospitals and which are both located in Muscat. According to MOH annual statistics report, Royal Hospital has 624 beds, and Khawlah Hospital has 490 beds. The average live births are 7,694 for Royal Hospital and 5,080 for Khawlah Hospital (Department of Health Information & Statistics, 2013). This results in approximately 641 potential participants per month from Royal Hospital and 423 from Khawlah Hospital (Table 1.2). Royal Hospital has two postpartum wards, with the capacity to accommodate 68 patients total. Khawlah Hospital has one postpartum ward that can accommodate 50 patients. Each hospital has a principal nursing officer—a nurse concerned with the administration of the entire hospital—and a nurse

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<sup>4</sup> The urbanization rate and the urban population rate are “two measures of the degree of urbanization of a population. The first, urban population, describes the percentage of the total population living in urban areas, as defined by the country. The second, rate of urbanization, describes the projected average rate of change of the size of the urban population over the given period of time” (Central Intelligence Agency, 2015).

who is in charge of each ward. The patient turnover for the postpartum wards is high. With no medical complications, the infant—mother dyad stays for an estimated two days if the baby is a girl or three days if it is a boy. The discrepancy in length of hospital stay is caused by male newborns being circumcised during their postpartum hospital stay. These hospitals serve the Muscat area and receive referrals from other regions of the country. Because these hospitals receive patients from all of Muscat, recruiting from them provided variation in the sample characteristics.

Table 1.2. *Total deliveries and potential recruitment pool, Royal and Khawlah Hospitals, 2013*

Hospital	Annual births (live and still)	Annual live births	Monthly live births
Royal	8709	7694	641
Khawlah	5673	5080	423

*Note.* From *The Ministry of Health annual statistics*, by Ministry of Health, 2013

## Sample

The subjects—Omani mothers in the postpartum wards of Royal and Khawlah Hospitals in Muscat, Oman—were recruited upon their discharge from postpartum hospitalization. The participants were selected according to the following inclusion criteria: (a) mothers of Omani nationality who are at least 18 years old and who have healthy, singleton, full-term infants (at least 37 weeks' gestation); (b) those who initiated breastfeeding during hospitalization; (c) those are able to read and write in Arabic or English, have no hearing or speech difficulties, and are able to verbalize their comprehension of the survey questions and instructions; and (d) those who have phones with texting services. The exclusion criteria include (a) mothers with high-risk infants such as those with acute or chronic illnesses, medical complications such as anemia or being underweight, or congenital anomalies such as cleft palate or cleft lips; (b) those with previous diagnosis of mental illness such as psychosis or depression, including during

pregnancy; and (c) those with physical conditions that might interfere with breastfeeding, such as breast reduction. In addition, mothers and infants who had any other conditions that could interfere with the breastfeeding process were excluded from the study (T Qeenan, 2004).

The sample for Phase I was 30 participants. Five participants completed the cognitive interview. The sample size for Phase II was calculated using the recommended ratio of 10 cases per variable (Bentler & Chou, 1987; Jackson, 2003). As this study contains about 23 variables, and a latent variable, and as there were 5 observations in the model, the recommended sample size is 280 ( $28 \times 10$ ). For this study, given the estimated 20% attrition rate for the follow-up interview, the estimate for the final sample size was 337.

### **Measures**

The study explored (a) maternal belief variables, (b) maternal infant feeding intentions, (c) maternal breastfeeding knowledge, (d) sociodemographic variables, (e) previous breastfeeding experience, (f) patterns of breastfeeding practices, and (g) maternal early breastfeeding support. Table 1.3 represents the instruments used for the study, along with their validity and reliability. (Permissions for using study instruments are presented on Appendix 1 and 2).

#### **Maternal Belief Variables**

Maternal belief variables include maternal attitudes, subjective norms, and perceived behavior control directed toward infant feeding, which were measured using the revised-BAPT. For this measurement, maternal attitudes were defined as maternal beliefs about infant feeding. Subjective norms refer to the perception of whether key people in the woman's life (the baby's father, the mother's mother, the mother-in-law, a sister, a close friend, a nurse, or a doctor) approve or disapprove of the behavior; the motivation to comply or to behave in a way that gains

their approval; the normative belief or beliefs that the referent approves or disapproves; and the descriptive norms, or the belief that most people perform the behavior, such as the desire to be like others (Glanz et al., 2008; Table 1.1).

The BAPT is a self-report instrument that was originally developed to identify women who have the tendency to wean their babies early (Janke, 1992; Janke, 1994). The instrument contains 52 items on a 6-point Likert-type scale (Janke, 1994). The instrument's subscales measure positive breastfeeding statements, negative breastfeeding statements, social and professional support, and perceived behavioral control. Gill et al. (2007) revised the tool and used it to predict breastfeeding intention in Hispanic mothers; this revision reduced the tool to 32 items on a 3-point Likert scale. The revised-BAPT is first scored by reverse-scoring the NSB items so that *disagree* becomes *agree* and vice versa. The *disagree* responses are scored with a 0, and the *agree* responses are scored with a 0, 1, or 2 based on the item's weight in the analysis. The items' weights change based on factor analysis, which is implemented for the population of interest. Finally, the score for each item is added to obtain the total score. The total scores range from 0 to 38; a score below 20 indicates a below-average belief score and a low intention to breastfeed (Gill et al., 2007).

The BAPT was subsequently tested in various studies, and the results supported medium-to-high reliability in various populations, including low-income, Caucasian, African American, Asian, and Spanish-speaking Hispanic mothers. The Cronbach's  $\alpha$  reliability of the instrument has been measured as .08 -.086 (Gill, 2009; Janke, 1992; Janke, 1994). The Cronbach's  $\alpha$  of each of the instrument subscales is presented in Table 1.3, as are the construct validity and predictive validity of the instrument.

In this study, I used the revised-BAPT. After a consultation with Mary Lynn (personal communication, 30 October, 2015)—an expert in tool development at the University of North Carolina, Chapel Hill—I altered the items to use a 4-point Likert scale (*strongly disagree*, *disagree*, *agree*, and *strongly agree*). I did this to avoid the lack of variation in the scoring that can occur when using fewer points on a scale, especially when using a tool in a culture for which there are no documented reviews of adoptability or scale usage (Mary Lynn, personal communication, 30 October, 2015). In addition, the original revised-BAPT did not include labels for each point on the scale; therefore, I modified this scale and labeled each item so that it matched the Likert scale's criteria. I conducted confirmatory factor analysis (CFA) on the tool to test the structure of the newly translated tool before analyzing the results with the SEM. Using CFA, I was able to determine whether the measured constructs in the self-reported tool had equivalent meanings in Omani culture. Using CFA also allowed me to determine the items' feedback construct validity by judging whether a particular set of items indirectly measured the hypothesized latent variables (Gregorich, 2006) and therefore determined whether the tool had subscales.

### **Maternal Infant Feeding Intentions**

I operationalized this variable as the mother's breastfeeding plan and the likelihood of following up with the desired infant feeding plan. I collected the mother's intention within the first 48 hr after delivery, during the postpartum hospitalization period, using the IFI scale. This scale measures the mother's intention to initiate breastfeeding and sustain EBF. The scale consists of five questions to determine the mother's breastfeeding intentions at 1, 3, and 6 months (Nommsen-Rivers & Dewey, 2009; Nommsen-Rivers, Cohen, Chantry, & Dewey, 2010). The total summative score is a continuous variable that ranges from 0 (no intention of

EBF) to 16 (high intention of EBF). The scale's original developers determined its Cronbach's  $\alpha$  to be .70 and .90 (Nommsen-Rivers & Dewey, 2009; Nommsen-Rivers et al., 2010). The scale has been translated from English to Spanish and other languages, including Arabic. The original developer assessed the construct validity with multiethnic cohorts of postpartum mothers, including Caucasian, African American, English-speaking Hispanic, Spanish-speaking Hispanic, and Asian mothers. The tool's predicative validity was confirmed by predicting the association between intention and EBF initiated at birth at 23.4% and at 1 month at 13.7% ( $p < .0001$ ; (Nommsen-Rivers & Dewey, 2009; Nommsen-Rivers et al., 2010). For this study, I obtained the translated version of the IFI scale with permission from the original developers; the Arabic team of researchers that translated the scale determined the Cronbach's  $\alpha$  for the Arabic-translated version to be .80 (Nabulsi, 2015). The tool's reliability and validity are presented in Table 1.3.



Table 1.3. *Reliability and validity of the variables and instruments*

Construct	Instrument	Cronbach's $\alpha$	Validity
Maternal belief variables: attitude, subjective norms, and perceived control	BAPT	Overall $\alpha$ .80 <sup>f</sup> & .86 <sup>c</sup>	For a sample of 201 postpartum mothers, 88% Caucasian, the BAPT explained 35.1% of the variance. The NBS ( $p = .003$ ), PBS ( $p = .17$ ), and SPS ( $p = .20$ ) subscales were significantly related to infant feeding at 8 weeks. The predictive validity for each of the NBS, SPS, and BFC subscales was significant in determining the method of infant feeding at 8 weeks.
Attitude	BAPT: PBS subscale	.78, <sup>a</sup> .81, <sup>b</sup> & .83 <sup>c</sup>	
	BAPT: NBS subscale	.77, <sup>a</sup> .78, <sup>b</sup> & .78 <sup>c</sup>	
Subjective norms	BAPT: SPS subscale	.83, <sup>a</sup> .83, <sup>b</sup> & .80 <sup>c</sup>	
Perceived control	BAPT: PBC subscale	.86, <sup>a</sup> .86, <sup>b</sup> & .82 <sup>c</sup>	Discrimination analysis indicated that 73% of women weaned before 8 weeks. <sup>f</sup> For a sample of 291 mothers, of whom 88% were Caucasian, 7% were African American, 2% were Asian, and 3% were Hispanic, the tool accounted for 39% of the variance. At 8 weeks, the tool predicted that 78% of the women would stop breastfeeding and that 68% of the women would continue breastfeeding ( $p < .005$ ). <sup>b</sup>
Intention	Infant Feeding Intention tool	.70 <sup>d</sup> & .90 <sup>e</sup>	The construct validity was assessed in multiethnic (Caucasian, African American, English-speaking Hispanic, Spanish-speaking Hispanic, and Asian) cohorts of postpartum mothers. The tool predicted that EBF would be 23.4% at birth and 13.7% at 1 month ( $p < .001$ ). <sup>e</sup>

Construct	Instrument	Cronbach's $\alpha$	Validity
Maternal breastfeeding knowledge	Breastfeeding Knowledge Scale	Developed for the purpose of this study	
Sociodemographic variables	Survey	Developed for the purpose of this study	
Present and success of previous breastfeeding experience and duration	Two items Part of socio-demographic variables	Developed for the purpose of this study	
Patterns of breastfeeding practice	24-hr dietary recall	Modified by the PI from the "child" portion of the 24-hr dietary recall measure in the Nutrition Obesity Research Centers study tool	
Maternal early breastfeeding support	Maternal breastfeeding support tool	Developed for the purpose of this study	

*Note.* BAPT = Breastfeeding Attrition Prediction Tool; PBS = Positive Behavior Statement; NBS = Negative Behavior Statement; SPS = Social and Professional Support; PBC = Perceived Behavioral Control; PI = Primary Investigator.

<sup>a</sup> Janke (1992).

<sup>b</sup> Dick et al. (2002).

<sup>c</sup> Gill (2007).

<sup>d</sup> Nommsen-Rivers et al. (2010).

<sup>e</sup> Nommsen-Rivers et al. (2009).

<sup>f</sup> Janke (1994).

<sup>g</sup> Dick et al. (2004).

## **Maternal Breastfeeding Knowledge Measured Using the Breastfeeding Knowledge Scale**

I developed the Breastfeeding Knowledge Scale to assess mothers' knowledge of WHO-recommended breastfeeding practice. I developed the questions from those guidelines. The questions include practice recommendations focused exclusively on breastfeeding for the first 6 months and the benefits of breastfeeding. Content pertaining to breastfeeding practice in relation to HIV infection is beyond the scope of the study and is not included. The knowledge tool consists of 12 true or false questions to assess mothers' knowledge. The use of WHO breastfeeding recommendations contributes to establishing the content validity of the tool (WHO, 2015b). I pilot-tested the tool with five nurses who work in maternal child units to assess its readability and adaptability. The mothers attained 1 point for every question answered correctly on a cumulative scale of 0 to 12. I scored the tool as a continuous variable, with a higher score indicating better breastfeeding knowledge. After conducting the factor analysis, I loaded the tool into the SEM for analysis.

## **Sociodemographic Variables**

I designed the sociodemographic variables based on a review of the literature. The sociodemographic variables in the study are as follows:

1. Mother's age in years, collected as a continuous variable
2. Monthly household income of the parents, collected as a categorical variable based on the household monthly income distribution for Omani households, with a mean of 953.6 Omani rials (Kotagama, Al Jabri, Salwa Abdullah Nasser, Boughanmi, & Guizani, 2014). I collected the income as six categories in increments of 100 Omani rials (1 rial  $\approx$  US\$2.59) at each income level, starting from an income level of less than 100 rials;

3. Mother's educational level, categorized as *some type of formal school* (between 1 and 5 years), *primary* (6 years), *preparatory* (7–9 years), *secondary* (10–12 years), *college or university*, and *graduate or above*;
4. Mother's employment outside the house, which also includes school attendance. I collected this information using an open-ended question; it represents a continuous variable of the number of hours the mother is away from home for work or school.
5. Parity or number of living children the mother gave birth to, excluding the current delivery, collected as a continuous variable
6. Method of delivery: *vaginal delivery* or *cesarean section*
7. Baby's sex: *female* or *male*
8. Living conditions, represented by two continuous variables: *number of family members* and *number of servants*. I collected the number of family members living in a single household because the domestic unit in Oman may include extended generations of family members residing in a single household (Koermer, 2013). I included the number of servants because, in (Mohamed et al., 2004) study, 39% of families had at least one servant in the household.

### **Previous Breastfeeding Experience**

Each mother was asked to assess the success of her past breastfeeding experience by selecting among the following: *very successful*, *moderately successful*, *slightly successful*, *not at all successful*, and *this is my first baby*. The mother was also asked about the duration of breastfeeding for her last child and about any problems she had during her most recent breastfeeding experience (Janke, 1992).

## **Patterns of Breastfeeding Practices**

I estimated patterns of breastfeeding practices based on 24-hr dietary recall. I modified the 24-hr dietary recall survey used in this study, with the guidance of Mangan (2015), from the child 24-hr dietary recall of the Nutrition Obesity Research Centers Diet and Physical Activity Core, NIH grant number DK56350, at the University of North Carolina, Chapel Hill. The 24-hr recall survey questions are mostly open-ended, and I also used them to generate the infant's intake for the day. I obtained the information via telephone interviews and inquired about the type of feeding, the food given, and the frequency of feeding (time from one feeding to the next). I asked the subject to report the infant's intake (using 2-hr intervals) over the 24-hr period (from 6 a.m. to 6 a.m.) for the day preceding the interview. I used dietary recall to estimate the patterns of breastfeeding practices. I used the recall to generate patterns of breastfeeding practices by categorizing the feeding patterns to match the WHO's patterns.

## **Maternal Early Breastfeeding Support**

I assessed maternal early breastfeeding support using a maternal breastfeeding support tool. The tool measures maternal perceptions of the hospital breastfeeding practices. This tool was adapted from Miriam Labbok's (personal communication, October 29, 2015) assessment of hospital practices of breastfeeding support. I modified the assessment to collect maternal perceptions of hospital breastfeeding practices. The questions represent the elements of the BFHI: maternal breastfeeding support, implementation of skin-to-skin contact immediately post-delivery, teaching of hand expressions, assistance of breastfeeding, practice of rooming in, feeding on cue, avoiding the use of pacifiers and artificial nipples, providing information on early breastfeeding support at discharge, and prenatal education. I did not include content on breastfeeding support groups in the tool because breastfeeding support groups are not established

in Oman. I expected item 5—*was your baby ever given a pacifier?* — to be eliminated from the analysis because pacifiers are neither available nor used in Oman government hospitals, and I did not expect the results of this item to vary among the mothers.

I established the content validity of the items on the early breastfeeding support tool by ensuring that (a) the tool reflected the WHO's BFHI standards of practice for successful breastfeeding (WHO, 2009) and (b) the tool was adopted from breastfeeding expert Mariam Labbok (personal communication, October 29, 2015). I administered the tool to five nurses who had worked in a maternal child unit for at least five years to determine the tool's readability and adaptability. I scored the tool as a continuous variable (0–10) and gave each item on the tool 1 point if the mother answered *yes* and 0 if she answered *no*, with higher scores indicating more favorable hospital breastfeeding practices.

### **Tool Translations**

Before conducting the study, I subjected the BAPT tool to a process of translation and validation. I used the back translation method for the translation process. This method involves multiple steps and provides higher quality than a mere direct translation (Thicke, 2011). Improving translation quality through back translation also allows for more efficient use of the research data by capturing not only the variability in language but also the way the language is spoken and the cultural concepts (Thicke, 2011). A paid translation agency conducted the back translation of the BAPT (<http://www.worldtranslationcenter.com>). These steps were carried out for the translation process: forward translation, back translation, and expert evaluation using content validity indexing, cognitive interviewing, and pilot testing in mothers. The following details the translation process steps.

In the forward translation process, two independent professional translators conducted the forward translation of the instrument. I directed the translators to capture the meaning of the translation, rather than the word-for-word or literal translation, of the items in the instrument. I also instructed the translators to use simple language that would be comprehensible to patients with a lower reading level. During this phase, both translated versions were transferred to a table as a word processor document, with all items side by side. A third independent bilingual translator was then able to look at the two translated versions and reconcile them as one, which I called Version 1.

For the back translation, a professional bilingual native Arabic speaker who lives in the United States back-translated Version 1 of the Arabic BAPT into English. The translator was neither involved in the forward translation nor saw the original English version. Because I am bilingual, I was able to compare the English back translation and the original English tool; the project manager at the translation center, who is also bilingual, did the same. We detected no mistranslations or inaccuracies in the comparison of the back translation and the original comparison. The back-translation process provides higher quality than a direct translation. This means that back translation minimizes the bias that may result from the two forward translations (Hilton & Skrutkowski, 2002; Streiner, Norman, & Cairney, 2014; Thicke, 2011). This process yielded Version 2 (Figure 1.3).

For the expert evaluation of the translation accuracy using the content validity index, I presented Version 2 of the translated BAPT to 10 expert health care professionals: three nurses, four nursing instructors, one physician, and two clinical pharmacists.

I then carried out cognitive interviews with a sample of three Omani women with the purpose of assessing the clarity of the translated tool and identifying problematic items that might lead to biased answers.

Finally, for the pilot testing of the translated, revised-BAPT, I administered the tool to five Omani mothers. The purposes of this testing were to attain feedback from the participants, to revise the tool, and to identify problems. I used the participants' comments to produce the final version of the translated, revised-BAPT.

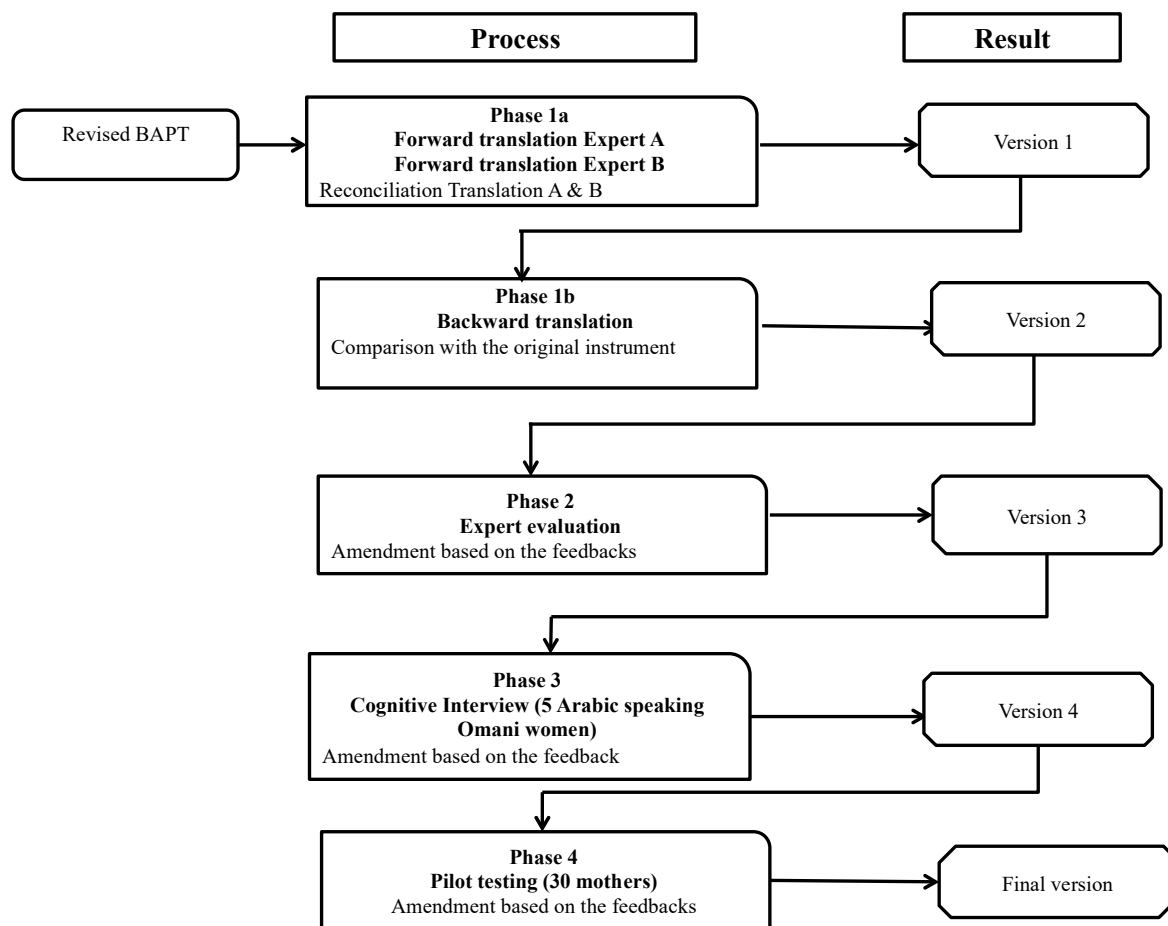


Figure 1.3. Validation process of the translation of the revised-Breastfeeding Attrition Prediction Tool. Adapted from *Linguistic Validation of the OedsQL*, by Mapi Research Institute (Mapi, 2002)



## **Procedure**

Following the approval of the University of North Carolina-Chapel Hill Institutional Review Board (IRB), I applied for access to the study sites, which were granted by the MOH in Muscat, Oman. I also obtained approval from the MOH's IRB. I have a pre-established relationship with the MOH facilities as a result of nursing student training, community involvement activities, and staff education development conducted within the MOH facilities. (IRB from Oman Ministry of Health and UNC-Chapel Hill and Oman are presented in Appendix 3 and 4).

Once I obtained IRB approval from the MOH, I acquired a letter of support from the MOH and forwarded this letter to the principal nurse officers at Royal Hospital and Khawlah Hospital. I also verbally informed the nurse in charge of the postpartum ward about the study. In the pretest phase—the pilot testing of the tools—I enrolled mothers (two from Khawlah and three from Royal). I explained the study to them and obtained a consent form from the participants. Once the consent form was obtained, I administered the survey to the participants. After completing the pretest phase, the two data collectors and I commenced Phase I, which included the recruitment of and data collection from mothers at postpartum hospital discharge, followed by Phase II, which was the follow-up at 8 weeks postpartum. The study tools administered to the mothers in Phase I included the sociodemographic tool, IFI tool, the Breastfeeding Knowledge Scale, and the revised-BAPT. The study measurements administered to the mothers in Phase II were the Early Breastfeeding Support Tool and the Breastfeeding Follow-Up Form (24-hr food recall). Table 1.4 presents the tools administered at each point in the process.

In Phase I, the recruitment and data collection stage, one member of the research team

screened the mother–infant dyads to determine a list of eligible participants for the study. The member of the research team then approached the eligible mothers and asked if they would be interested in participating in the study and being contacted by telephone for a follow-up survey. A member of the research team explained the study to the mothers and obtained a written consent form. Written informed consent was obtained once for data collection, telephone interviews, and recording telephone conversations. The data collector instructed the participants that they were free to withdraw from the study at any point and would suffer no consequences. The mothers were left to complete the study and were informed that a member of the research team would come back to collect the forms.

Table 1.4. *Time frame of the data collection*

Measure	Time	
	Phase I: at discharge	Phase II: Week 8
Sociodemographic Variables	√	
Infant Feeding Intentions Scale	√	
Breastfeeding Knowledge Scale	√	
Revised-Breastfeeding Attrition Prediction Tool	√	
Early Breastfeeding Support Tool <sup>a</sup>		√
Breastfeeding Follow-Up Form (24-hr food recall) <sup>a</sup>		√

<sup>a</sup> This tool was provided to the mothers during Phase I.

As part of the preparation for Phase II, I gave the mothers a 24-hr food recall and maternal early breastfeeding support sheet during Phase I of the data collection. The two sheets were color-coded for convenience. Because the early breastfeeding support tool requires evaluation of the breastfeeding support mothers received during their hospitalization, I ensured that the mothers only completed this tool after discharge. Collection of the tool at this point in time reduced bias that might have occurred due to differences in the mothers' lengths of stay in the hospital. The nurses reminded the mothers to complete the breastfeeding support form upon

discharge. In order to maximize the participants' completion of the tool within a few days and to reduce recall bias, I also reminded all the mothers to complete the form; this was done via text message. I also collected information by phone during Phase II of the data collection.

In Phase II, once the participants were 8 weeks postpartum, I sent a text message to remind the mothers that their interview was approaching and that they needed to complete the 24-hr dietary recall before the day of the interview. In the case of working mothers, I asked them to give the recall sheet to the primary caretaker so that the latter could take her place when she was away from the baby. A member of the research team called the mothers to conduct one recall interview via a telephone survey. The data collector obtained oral consent when the data were collected during the telephone interview and for recording the interviews and reminded the participants of the voluntary nature of the study. During the telephone survey, the data collector recorded the infant's dietary intake using 24-hr recall. The data collector elicited the mother to recall, in detail, the infant's dietary intake for each 2-hr period during the 24 hr (from 6 a.m. to 6 a.m.) preceding the interview.

I anticipated that the retention plan for the follow-up phone interviews would be an issue. Follow-up refusal was one potential threat for this study. I focused the team's efforts on building rapport with the participants. This was achieved by the research team members presenting themselves in a professional and friendly manner and accommodating the participants' time. In addition, during the recruitment stage, I obtained the mothers' contact numbers and the contact numbers of other family members with the participants' consent. This allowed for the opportunity to connect with the mothers via another family member.

## **Data Analysis**

For Aims 2 and 3, I computed descriptive statistics for the data. I used SEM analyses to test the proposed model of sociodemographic variables and maternal belief variables (maternal attitudes, social norms, perceived control), intention and patterns of breastfeeding practices as outcome outcomes. I also added maternal knowledge and breastfeeding support and previous breastfeeding experience to estimate the model. This process allowed me to test the framework model presented in Figure 1.2 using the observed data set. Using SEM allows researchers to combine factor analysis and path analysis when analyzing data (Markus, 2012). This is the approach we chose because it allows for a more “causal” explanation of the findings. This allowed us to test the complementary and full mediation of the breastfeeding intention variable. It also allowed for the inclusion of the measurements’ error variance (Markus, 2012). For my analysis, I carried out the following steps. First, I ran the basic model, which includes the main theoretical variables, to estimate the parameters that would be used in the theoretical model. Second, I used the appropriate model fit technique, which has the maximum likelihood. Next, I tested the fit of the model against the data. Finally, I modified the model based on the theoretical framework with justifications. I modified the model by adding the relationships between the main variables, e.g. the patterns of breastfeeding practices and maternal attitude (Brown, and Cudeck, 1993; F. F. Chen, 2007; Markus, 2012). To compare the fit of our final model, I used the standard acceptable values: standard of a comparative fit index (CFI) comparative fit  $> .90$  and a mean square error of approximation (RMSEA)  $< .08$  (Brown, and Cudeck, 1993; Chen, 2007). I used  $\chi^2$  tests as an index of the significance of our results. I conducted all analyses using SPSS-24.0 and Amos-22 IBM for descriptive statistics and structural equations modeling. For Aim 1, I analyzed the content validity result for the purpose of editing the revised-BAPT.

This provided the content validity of the measurement in Omani culture. I also tested the revised-BAPT for reliability using the Cronbach's  $\alpha$  test.

### **Missing Data Management**

The extent and the nature of the missing variables determined the way missing data were handled in this study. Descriptive statistics for the continuous variables and the frequency distribution of the categorical variables determined the percentage of the missing data. If the missing variables were less than 5%, it meant the missing data could be ignored and that action did not need to be taken for the imputation of the missing variables (Schlomer, Bauman, & Card, 2010). However, if the missing variables were more than 5%, I used Little's Missing Completely at Random (MCAR) test to evaluate the null hypothesis and to consider the missing data as missing completely at random. A significant result on the MCAR test indicates that variables are not missing completely at random. A non-significant MCAR test indicates that the missing values are missing at random. Missing data of the variable do not depend on the variable itself, although they may depend on other variables in the data or may be MCAR (Schlomer et al., 2010). For both missing at random and MCAR, I used the stochastic regression imputation in SPSS Amos to handle the missing variables in this study.

### **Project Timeline**

Table 1.5 presents the study activities. Table 1.6 presents the methods of dissemination for these activities (e.g., through publication and presentation).

### **Data Management**

I was the primary person responsible for data management. Two people—one of the paid data collectors and myself—collected and entered the data. We copied the names of the participants and the subjects' unique numbers onto the consent forms. The data-collection forms

only featured the subjects' unique numbers. During the data collection period, I placed the data collected from the paper surveys and the telephone interview information, without identifiers, in a folder box, and I placed the participants' identifier information in a different folder box. After each data collection day, I stored the identifier information in a locked cabinet at the administration office of my workplace in Muscat, Oman. I also stored the folder box with the paper surveys and the telephone interview information with unique identifier variables in a locked cabinet at my office in Muscat.

I carried out the data entry using Microsoft Excel on a secured computer. I checked all of the data entry for accuracy. My academic advisor, Eric Hodges, conducted random checks on 10% of the data to assure further accuracy of the data entry. I used SPSS to analyze the data. The data entered into the software did not contain any personal identifiers. I classified the participant responses using the unique identifier variables described above. I only used personal information to contact the potential respondents for the follow-up telephone interview. I did not store this information electronically and only retrieved it from the secured cabinet when needed. I only shared the data set created from this study via encrypted data files

Table 1.5. *Timeline*

Activity	Month	2016										2017						
		4	5	6	7	8	9	10	11	12		1	2	3	4	5	6	7
Database preparation and IRB approval		X	X															
Pilot testing and adjustment of the instrument based on the pilot results				X														
Recruitment and data collection					X	X	X	X	X	X								
Data entry, cleaning, and analysis					X	X	X	X	X	X		X	X	X				
Dissemination (analysis of results, write-ups of the papers, and defense of the dissertation)															X	X	X	X

Table 1.6. *Dissemination of results*

Date	Activity
May 2017	Sending a copy of the research results to a policy maker: the MOH's undersecretary of planning
May 2017	Placing a copy of the study results in the Sultan Qaboos University Library and sending copies to all parties who requested the results
December 2017	Submitting the manuscript to a peer-reviewed journal
January–May 2018	Presenting the findings at international conferences such as the Implementation Science Conference and the Sigma Theta Tau International Honor Society of Nursing

## **Limitations and Solutions**

The limitations of this study include the use of only two points in time for data collection. Because this study was an academic project, I only followed the mothers for up to 8 weeks postpartum, mainly due to limitations in funding and the time that was available to me. In addition, even though I included a number of concepts to be tested, I did not examine other concepts that might help address the variation of patterns of breastfeeding practices in Oman, such as early breastfeeding support at home and in the workplace. I conducted the proposed study at two sites via self-administered tools; I instructed the people selected to administer the tools on topics such as the literacy level of the participants and ethical considerations. In addition, I considered interactions with participants, the behavioral influence of the data collectors, and the fact that participants may want to compare notes as possible threats to the study's internal validity during data collection. Another limitation was the test arrangements, including the fact that the participants knew that they were being examined or watched, which could give rise to the Hawthorne effect. I managed this threat during sampling by allowing the participants to use the tool at their bed site without the constant supervision of the data collector and without interruptions. I also managed this threat statistically by increasing the sample size, which diluted the threat's effect on the outcomes.

Instrument validity was a threat to the study's internal validity (Brink & Wood, 1998). The study used tools that were validated in English. The revised-BAPT had not been studied in Arabic populations. This was the first study in which researchers translated the tool into Arabic and validated it in Arabic. The IFI tool has been translated and adopted for use in different languages, including Arabic. I managed this threat by means of a detailed discussion of validity and reliability, which is presented in the instrument section of this proposal. Because the tools



had not been used in Omani populations before, I pilot tested them to assess the understanding of the content. I translated the BAPT, as mentioned earlier, using a systematic method of back translation. Before using it, during the pretest phase, I subjected the Arabic version of the BAPT to validation for Omani mothers through (a) presenting the tool to a professional Arabic-English translator to decide if the concepts were translated accurately across cultures; (b) the use of the content validity index to examine the tool's content validity by presenting the tool for expert evaluation; and (c) conducting cognitive interviews with five Omani women to determine the validity and use of the BAPT.

Another threat to external validity for the design was the interaction effect that could occur while administering the study tool (Grove, Burns, & Gray, 2012). This means that the person administering a tool might inadvertently suggest clues to the participants about how to answer the tool or may project thoughts onto the participants. The answers would not reflect the experience of the selected sample and, therefore, would not be reflective of the population studied. To create a quality control system to minimize errors and to deal with this threat, I trained individuals in proper sampling procedures when administering a paper-pencil tool.

Another threat to the study's internal validity was the use of dietary recall. Poor recall of information is an issue with any type of recall question (Al Dhawi & West, 2002; Streiner et al., 2014). I managed this threat by limiting the recall to 24-hr, which reduced recall bias. Data that required number and specific event recall of infant feeding were collected using 24-hr recall. This included, for example, the number of times per day the mother breastfed her baby and what type of supplement the mother used to feed her baby.

In order to control for the fidelity of the study procedures and to ensure reliable data collection, I trained the research assistants on how to collect data and how to recruit participants

using exclusion criteria a week before data collection commenced. One week before beginning the Phase II data collection, I provided a training session to the assistants on conducting telephone interviews using the study procedure. I emphasized the concept of confidentiality and explained the informed consent form. I also explained the importance of avoiding educating the mothers about breastfeeding and of concentrating on their role as data collectors.

To evaluate the fidelity of the implementation of the procedures during the recruitment phase and during the data collection phase at points one and two, I evaluated how well the assistants adhered to the study procedure. To fit the needs of the current study, I used the concept of *adherence* specified by (Carroll et al., 2007) in the framework of implementing fidelity in intervention programs to assess whether the research assistants adhered to the study procedure, and I identified any elements that needed to be improved. I also observed the first three interactions between the data collectors and the participants. Furthermore, each week, I conducted two random observations for each of the data collectors. I was also present in the hospitals throughout the data collection period. A week before implementing Phase II, I trained the research assistants in conducting the recall interviews. I followed up with the research assistants for feedback and observed the first two interviews that each of them conducted. As part of a quality check, using a digital recording device with a telephone condenser microphone, I recorded each of the research assistants' first 10 interviews and every 10th telephone interview they conducted afterward. I also checked all the documentation associated with the research assistants' interviews.

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## **CHAPTER 2: MATERNAL BELIEFS ABOUT BREASTFEEDING INTENTIONS, INITIATION AND DURATION: A SYSTEMATIC LITERATURE REVIEW**

Research continues to add to the list of advantages of human-milk for the growing infant (Horta & Victora, 2013; Kramer et al., 2008). Yet, only about 45% newborns are breastfed within one hour of birth and about 43% of infants under the age of 0-5 months were exclusively breastfed in 2015 (UNICEF, 2016) Exclusive breastfeeding (EBF) means that the “infant receives only breast-milk, or expressed breast-milk, and no other liquids or solids, with the exception of drops or syrups or medicines for the first 6 months of life” (WHO, 2008, p. 4).

According to the WHO (2015), “If every child was breastfed within an hour of birth, given only breast-milk for their first 6 months of life, and continued breastfeeding up to the age of two years,” 800,000 children’s lives would be saved annually (para. 1). A key contributor to adequate optimal feeding among infants is breastfeeding, which not only provides optimal nutrition for the infant but also reduces disease burden and excess intake of nutritional requirements that may contribute to obesity (WHO, 2015). The impact of inadequate breastfeeding on health is not constrained to developing countries. In the United States, it is estimated that \$13 billion annually could be saved if 90% of families breastfeed exclusively for 6 months. This would prevent more than 911 deaths in childhood every year, of which 95% are infants (Bartick & Reinhold, 2010).

To better address mothers’ breastfeeding needs, it is essential to understand maternal beliefs about breastfeeding and what factors predict the initiation and duration of breastfeeding. According to the Theory of Planned Behavior (TPB; Ajzen, 1991) belief variables include

attitudes, perception of how people in her life see infants feeding, and perceived control over her abilities to feed her baby. Prior research supports the association of these belief variables with maternal breastfeeding intention and outcome (Avery, Duckett, Dodgson, Savik, & Henly, 1998; Dick et al., 2002). These belief variables provide a rationale for understanding outcomes because individuals' beliefs can be construed as determinants of behaviors (Taylor et al., 2006).

The purpose of this systematic literature review was to explore the relationship of women's beliefs and intentions with breastfeeding initiation and duration. We also examined research methods, theoretical frameworks, and how breastfeeding was conceptualized. The review identifies studies focused on maternal perceptions and intentions and how they influence the decision to breastfeed, formula feed, or combine these two methods. While we understand the importance of EBF in child health outcome, focusing the review on EBF would eliminate studies that examine variation in breastfeeding patterns. Thus, this review focuses on initiation and duration of breastfeeding without limiting the amount of breastfeeding the infant receives. As described further in the methods section, the concepts of the TPB (Ajzen, 1991) were used to guide the extraction and analysis of data from research reports and to answer the following specific questions:

1. What is the relationship between maternal intention attitudes, subjective norms, and perceived control and 1) initiation of breastfeeding at birth and 2) duration for the first 6 months of the infant's life?
2. How is breastfeeding conceptualized in the reviewed studies?
3. What theoretical frameworks, if any, were used in the reports included in the review?
4. What methodologies were used in the reports included in the review?

## **Methodology**

We utilized Systematic Reviews and Meta-Analyses PRISMA guidelines for conducting systematic reviews (Moher, Liberati, Tetzlaff, & Altman, 2009). The search included PubMed, CINAHL, and PsycInfo databases. We modified the search terms to fit the requirement for each database (Table 2.1). Eligible studies met the following criteria: English language, human subjects, and recent publications between January 2004 and March 2017 to address current breastfeeding practices. To maximize study yield, there were no limitations on geographical location, type of beliefs, or breastfeeding outcomes.

We excluded papers in which researchers focused on neonatal or maternal conditions that might interfere with breastfeeding such as premature birth, gestational diabetes, or congenital anomalies. We also exclude studies focused on health care professionals, other family members' points of view, scale development, and literature reviews or dissertations. In addition, we excluded articles about breastfeeding beyond 6 months of age or weaning practices, as well as those that did not include maternal beliefs about infant feeding as a primary outcome or did not have specific measures to address maternal beliefs about infant feeding. In order to enhance generalizability of findings, we excluded articles stating a focus on mothers of extremely high or low socioeconomic status. No limits were placed on research methodology. Once the papers were retrieved, they were imported into Refworks data management software (ProQuest LLC, Ann Arbor, Michigan) to detect duplicates. After removing duplicates, the titles and abstracts of the remaining articles were reviewed for relevance. The full-length versions of relevant articles were examined to determine eligibility according to the exclusion criteria. The PRISMA search strategy is presented in Figure 2.1.

Table 2.1. *Search terms and databases used*

Database	Search terms
PubMed	((“breast feeding”[MeSH Terms] OR (breastfeed* OR “infant* feeding” OR breastfed OR “formula feeding” OR “bottle feeding” OR “feeding method”)) AND ((“choice behavior”[MeSH Terms] OR “intention”[MeSH Terms] OR “decision making”[MeSH Terms]) OR (choic* OR choos* OR intent OR intend* OR decid* OR decis*)) AND (attitud* or perception or perceiv* or belief* or believ*) AND “Mothers”[MeSH Terms])
CINAHL	((MH “Attitude to Breast Feeding”) OR (MH “Breast Feeding+”)) OR (breastfeed* OR “infant* feeding” OR breastfed OR “formula feeding” OR “bottle feeding” OR “feeding method”)) AND ((MH “Decision Making+”) OR (MH “Intention”)) OR (choic* OR choos* OR intent OR intend* OR decid* OR decis*)) AND (attitud* or perception or perceiv* or belief* or believ*) AND (MH “Mothers”)
PsycInfo	((DE “Breast Feeding”) OR (breastfeed* OR “infant* feeding” OR breastfed OR “formula feeding” OR “bottle feeding” OR “feeding method”)) AND ((DE “Decision Making”) OR (DE “Intention”) OR (DE “Choice Behavior”)) OR (choic* OR choos* OR intent OR intend* OR decid* OR decis*)) AND (attitud* or perception or perceiv* or belief* or believ*) AND DE “Mothers”

## Data Extraction

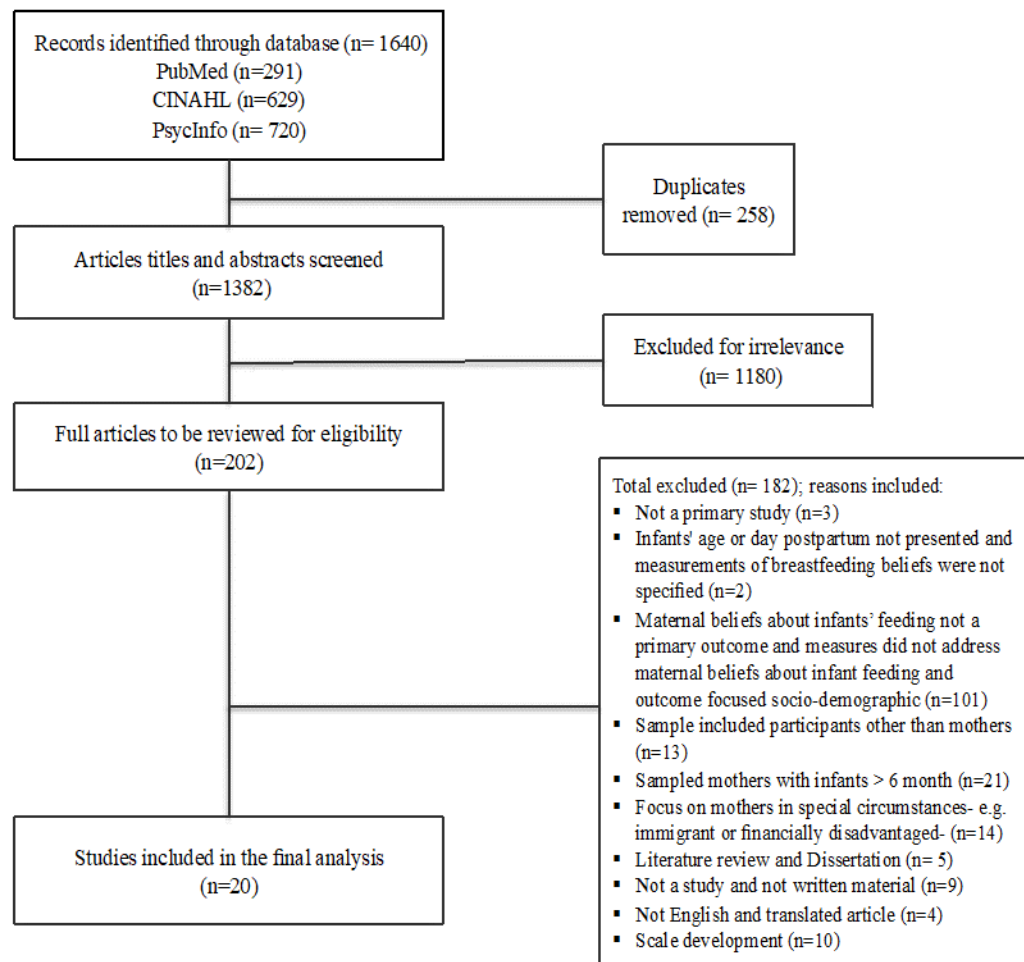
TPB was used to guide the extraction of information from the retrieved literature. We also extracted conceptual underpinning of the studies, study method, measure used and sample characteristics. TPB was used because it focuses on individuals’ intentions or likelihood to perform a behavior as well as belief variables in determining behavior. According to TPB, there are three belief variables influencing breastfeeding intentions, initiation, and duration. The first variable is attitude, which is the individual’s overall evaluation of the importance of the behavior (e.g., positive, negative, or neutral). The second is subjective norms or the individual’s perception of whether key people approve or disapprove of the behavior. The third is perceived behavior control (PBC), which measures the individual’s perceived ease or difficulty of performing the desired behavior. PBC is held to directly influence both the individual’s intention and behavior (Ajzen, 1991).

We included self-efficacy (SE) together with PBC as one concept (PBC/SE) in the extraction of data. SE is a concept in Bandura's social learning theory; SE refers to individual beliefs about the ability to perform a behavior (Bandura, 1997). SE is added because even though PBC and SE are distinct, they are conceptually similar. Both concepts "refer to people's beliefs that they are capable of performing a given behavior" (Ajzen, 2016, para. 20).

Operationally, these two concepts are assessed differently. PBC assesses the extent to which individuals perceive that behavior is under their control. On the other hand, SE assesses the obstacles and how likely it is that an individual will overcome those obstacles (Ajzen, 2016). Because our review did not focus on how concepts are operationalized, we defined PBC/SE to include factors that influence an individual's perception of the ease and difficulty of carrying out the behavior, the facilitators, impediments, and controls over the behavior, and the likelihood of overcoming obstacles.

The major headings of our data extraction table included: first author, year of publication, location, study design/methods, sample characteristics, research aims/questions, framework, measures used, outcome measures (initiation and duration), and the findings (attitudes, subjective norms, perceived control, intentions, and breastfeeding definition). We did not exclude any relevant study on the basis of quality; nevertheless we discussed methodological issues of the reviewed studies. We examined the completeness of sampling methods, the used of framework to guide the study and type of analysis. We focused examining the strength of evidence of each study that met the criteria for inclusion. We used the Centre for Evidence-Based Medicine (CEBM)'s Levels of Evidence scale (2009) to determine the strength of evidence for the articles. Each reviewed article was assigned a level from among five levels ranging from systematic review of randomized control trials (RCTs) as the strongest to anecdotal evidence as the weakest.

The studies were then graded as A, B, C, or D, with A being the highest possible level of evidence and D being a very low level of evidence (CEBM, 2009).



*Figure 2.1.* PRISMA flow diagram of the selection process of the studies

### **Description of Studies Included**

Twenty studies were included in the review. The samples represented the following countries: USA, UK, Spain, Australia, Taiwan, China, Northern Ireland, Malaysia, the Netherlands, Bangladesh, India and American Samoa. All studies used self-reported measures to examine maternal belief variables and infant feeding intentions, initiation, or duration. Data



collection instruments included: structured questionnaires that were developed for the purpose of the study (n= 9), scales that were validated in previous studies (n= 4), semi-structured questionnaires using interviews (n= 5), and mixed methods including both structured questionnaires/scales and semi-structured questions (n= 2). Researchers used either one-time assessment (n= 10) or included follow-ups (n= 10). A description of the studies included in this review including theoretical framework used is presented in Table 2.2.

Breastfeeding was examined at different points in time, ranging from birth to 6 months of age for infants. The results of this systematic review are presented according to the TPB concepts used in the data extraction: intention, attitude, belief, subjective norms, and perceived control. Infant feeding was conceptualized differently in the studies. The WHO Global-Data-Bank definition, or some element of it, was used in ten studies to define breastfeeding; Table 2.3 provides the definition used in each study.

The methodological assessment of the studies' level of evidence, according to the CEBM's Levels of Evidence scale, revealed that the studies were between level 2-b (n=5) and 2-c (n=15), meaning that the studies reviewed received grade B, with grade A being the highest level that could be achieved. This suggests that clinicians should follow the recommendations, however, they should be aware of any new information that arises (ASPS, 2017; Table 2.3).

Table 2.2. *Characteristics of the studies included in the review*

Authors and Year	Location	Time of data collected	Sample size (n) and population	Sample characteristics: Maternal mean age in years (M) and range (R) Parity Marital status	Theoretical Framework used	TPB Concepts measured	1. Study method 2. Analysis type 3. Sampling method	Measurement Used
Andrew and Harvey (2011)	Reading, UK	Postnatal 7–18 weeks	n=12	Primiparous and Multiparous	Non-specific	Attitudes SN PBC	1. Qualitative interviews 2. Content analysis 3. Random sample	Semi-structured questionnaire
Bai et al. (2010)	Indiana, USA	Postnatal ≤12 weeks. Follow-up 24 weeks postpartum	n=78 Asian (1.3%); African-American (16.6%); Hispanic (7.7%); White (70.5%); Other (1.3%); Unreported (2.6%)	M= 27.4 Married (57.7%); Unmarried (41.05%); Unreported (1.3%)	TPB	Intention SN PBC	1. Quantitative 2. Regression analysis 3. Convenience sample	Structured questionnaire
Bai et al. (2009)	Indiana, USA	Postnatal	n=25 White (80%)	M=31.8 Married (84%)	TPB	Attitudes SN PBC	1. Qualitative interviews 2. Content analysis 3. Purposive sample	Semi-structured questionnaire

Barona-Vilar et al. (2009)	Valencia, Spain	Antenatal 1st or 3rd trimester of pregnancy	n=31	Primiparous and Multiparous	Non-specific	SN PBC	1. Qualitative, focus groups 2. Content analysis 3. Purposive sample	Semi-structured questionnaire
Barodribb et al. (2007)	Southern Queensland, Australia	≤ 2 weeks Postpartum	n=562	M= 29.4 Primiparous and Multiparous Married (83.5%); Divorced (6.1%); Unmarried (10.4%)	Non-specific	Attitudes SN	1. Quantitative 2. Factor analysis and regression analysis 3. Convenience sample	Structured questionnaire
Bartick and Reyes (2012)	Massachusetts, USA	Antenatal 3rd trimester or early postpartum Follow-up after 28 weeks	n=17 Dominican (65%); Puerto Rican (18%); Mexican (6%); Ecuadoran (6%); Hispanic (6%)	Primiparous and Multiparous	Non-specific	Attitudes SN PBC	1. Qualitative face-to-face interviews and phone interviews 2. Content analysis 3. Convenience sample	Semi-structured questionnaire
Behera and Kumar, 2015	Odisha, India	During antenatal	n=218	Primiparous and Multiparous M=23.6	TPB	Intention Attitude SN PBC	1. Quantitative 2. Logistic regression 3. Random sample	Interviews using structured questionnaire

Cabieses et al. (2014)	Bradford, UK	28 weeks gestation <sup>[11]</sup>	n=476 White British (46%); Pakistani (32.9%); Other (21%)	Primiparous and Multiparous M=28 Married (81.39%); Single (18.61%)	TPB	Intention Attitudes SE	1. Mixed methods 2. Multinomial regression; qualitative interviews thematic analysis 3. Convenience sample	Structured questionnaire; Open-ended written responses
Hawley <sup>[12]</sup> et al., (2015)	Pago and Tafuna, American Samoa	Around 37 weeks antenatal Followed after at 3 and 8 weeks postpartum	n=12 Samoan (100%)	M=28.6 Primiparous and Multiparous Married/partnered (83.3%); Single (16.7%)	Non-specific	Intention Attitudes	1. Qualitative interviews 2. Thematic analysis 3. Purposive sample	Semi-structured questioners
Hoddinott et al. (2010)	North East Scotland, UK	Antenatal Follow-up 8 weeks postpartum	n=418	Primiparous and Multiparous	Non-specific	Intention Attitudes	1. Quantitative, 2. Regression analysis 3. Convenience sample	Seeing Breast-feeding Scale and Maternal Breast-feeding Evaluation Scale
Ismail et al. (2014)	Kelantan, Malaysia	Antenatal $\geq 32$ weeks	n=210	M= 29.4	TPB	Intention Attitude SN PBC	1. Quantitative 2. Bivariate correlational; multiple-regression 3. Random sample	Interviews using structured questionnaire

Nommsen-Rivers et al. (2010)	Sacramento, CA, USA	Antenatal 32-40 weeks. Follow-up 6-10 weeks postpartum	n=532 White (41%); Hispanic (27%); African-American (14%); Asian (12%); Other (6%)	Primiparous R=16 to 41	Mediation analysis model	Intention Attitudes	1. Quantitative 2. Regression analysis 3. Convenience sample	Structured questionnaire
Persad and Mensinger (2008)	Inner city, USA	Antenatal $\geq 12$ weeks	n=100 African-American (32%); African-Caribbean (54%); White (1%); Mixed (13%)	M= 22 Primiparous	TRA	Intention Attitudes SN	1. Quantitative 2. Odd ratios 3. Convenience sample	Iowa Infant Feeding Attitude Scale
Kools et al. (2005)	Limburg, the Netherlands	Recruited during pregnancy and at follow-up at birth	n=373	M= 31 Primiparous and Multiparous	Attitude-social influence-efficacy model	Intention Attitude SN SE	1. Quantitative 2. Multivariate logistic regression 3. Convenience sample	Structured questionnaire
Lawton et al. (2012)	Bradford, UK	3rd trimester of pregnancy Follow-up at 24 weeks postpartum	n=184 South-Asian (61.41%); White British (38.56%)	M= 27.5 Primiparous and Multiparous	TPB	Intention Attitude SN SE	1. Quantitative 2. Logistic regression 3. Convenience sample	Telephone interview using Structured questionnaire

Shi et al. (2008)	Laishui County, China.	8–16 weeks postpartum	n=599 Han (96.3%); Minority (3.7%)	M=26.9	Non-specific	Intention Attitudes SE	1. Quantitative 2. Logistic regression 3. Convenience sample	Interviews using structured questionnaire, infant diet recall
Sittlington et al. (2007)	Belfast Northern Ireland	8–12 weeks antenatal Followed up after birth	n=192	R=16 to 35 Primiparous and Multiparous Married/partnered (77.1%); Single (22.9%)	TRA	Intention Attitudes	1. Quantitative 2. ANOVA and Mann–Whitney U-test 3. Convenience sample	Iowa Infant feeding attitude scale
Swanson and Power (2005)	Scotland, UK	Antenatal and follow-up at 6 weeks postpartum	n=118	Primiparous and Multiparous	TPB	Intention Attitudes SN	1. Quantitative 2. Multiple regression 3. Convenience sample	Structured questionnaire
Thomas et al. (2015)	Karimganj and Katiadi, Bangladesh	26–32 weeks antenatal	n=2400	M=24.7 Primiparous and Multiparous	TPB	Intention Attitudes SE	1. Quantitative 2. Logistic regression 3. Convenience sample	Structured questioner adopted from Breastfeeding Attrition-Prediction Tool

Yen-Ju Ho and McGrath (2011)	Taiwan	Postpartum after birth. Follow-up 3 and 6 weeks postpartum	n=140	M= 30.04 Primiparous and Multiparous Married (93.6%); Divorced (1.4%); Single (5%)	Non-specific	Attitude SN PBC	1. Mixed methods 2. Regression analysis using Cox proportional hazards model; qualitative, focus group, content analysis 3. Convenience sample	Iowa Infant feeding attitude scale and Semi-structured questionnaire
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*Note:* Theory of planned behavior (TPB); theory of reasoned actions (TRA); perceived behavior control (PBC); self-efficacy (SE); Subjective norms (SN)

Table 2.3. *Conceptualizations of in infant feeding review articles and level of evidence according to the Oxford Center for Evidence-Based Medicine; levels and grading of clinical, 2009*

Authors/Pub year	Conceptualization of infant feeding	Level of evidence*	Grade of recommendation for practice**
Andrew and Harvey (2011)	Non-specific***	2-c	B
Bai et al. (2010)	Exclusive breastfeeding: Use only breast milk, either by direct nursing or using bottles; breastfeed for 6 months from birth; and no solids, no formula, no animal milk, no juice, and no water.	2-b	B
Bai et al. (2009)	Exclusive breastfeeding: Use only breast milk either by direct nursing or using bottles; breastfeed for 6 months from birth; and no solids, no formula, no animal milk, no juice, and no water.	2-c	B
Barona-Vilar et al. (2009)	Non-specific	2-c	B
Bartick and Reyes (2012)	Non-specific	2-c	B
Behera and Kumar (2015)	Exclusive breastfeeding for 6 month included (no pre-lacteal feeding, no feeding of water or any food given to baby before breastfeeding initiation)	2-c	B
Brodribb et al. (2007)	Non-specific	2-c	B
Cabieses et al. (2014)	Non-specific	2-c	B
Hawley <sup>[11]</sup> <sub>[SEP]</sub> et al. (2015)	Non-specific	2-c	B
Hoddinott et al. (2010)	Seeing breastfeeding: directly seeing other women with a baby on their breast; and indirectly seeing women with a baby on their breast on television or video within the preceding 12 months.	2-c	B
Ismail et al. (2014)	Exclusive breastfeeding: giving infant breast milk only, without additional food or drink, for the first 6 months of life.	2-c	B



Kools et al. (2005)	Breastfeeding at birth: all feeding practices combined with breast milk (exclusive breastfeeding, feeding of expressed mother's milk, or breastfeeding with complementary liquids or complementary formula feeding). Formula feeding at birth includes feeding with formula without any breastfeeding.	2-c	B
Lawton et al. (2012)	Non-specific	2-b	B
Nommsen-Rivers et al. (2010)	Fully breastfeeding: breast milk without the use of other milks or infant formula at 1, 3, or 6 months.	2-b	B
Persad and Mensinger (2008)	Non-specific	2-c	B
Shi et al. (2008)	Feeding patterns: the WHO's definition. Full breastfeeding includes exclusive breastfeeding and predominant breastfeeding. Exclusive breastfeeding is milk with no other food or liquid, with the exception of drops consisting of vitamins, supplements, and medicine. Predominant breastfeeding is breast milk with water, fruit juice, drops of supplements, and medicines.	2-c	B
Sittlington et al. (2007)	Exclusively artificial feeding and exclusively breastfeeding; non-specific.	2-c	B
Swanson and Power (2005)	Feeding patterns: the World Health Organization (WHO) Global Data Bank on Breastfeeding after birth and at 6 weeks postpartum "infant receives only breast-milk with expressed milk"; combined feeding as "infant receives breast-milk and regular bottle-feeding with baby formula milk"; and bottle feeding as "infant receives formula milk from a bottle."	2-b	B
Thomas et al. (2015)	Exclusive breastfeeding: the WHO's description. This includes giving breast milk for the first 6 months of life with nothing else.	2-c	B

Yen-Ju Ho and McGrath (2011)	Feeding patterns: According to the WHO Global Data Bank on Breastfeeding. Data collected after birth and at 3 and 6 weeks postpartum, “breastfeeding means the infant only receives breast-milk, including expressed milk; combined feeding means the infant receives breast-milk and regular bottle feeding with baby formula milk; and bottle feeding means the infant receives formula milk from a bottle.”	2-b	B
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*Note.* \*Levels of evidence used in review: 2-b: individual cohort studies; 1-b: individual randomized control trails; and 2-c: outcome research and ecological studies.

\*\*\*No specific definition of breastfeeding is provided.

\*\*Grade descriptions are from the American Society of Plastic Surgeons scale for grading evidence-based clinical practice (Recommendations. Guidelines). A: Clinicians should follow a strong recommendation; B: Clinicians should follow a recommendation but should remain alert to new information; C: Clinicians should be flexible in their decision making regarding appropriate practice; and D: Clinicians should consider all options in their decision making and be aware of new evidence (ASPS, 2017).

### **Maternal Infant Feeding Intentions with Initiation and Duration**

The association between intention to breastfeed and initiation and duration of breastfeeding was examined in seven studies; six of these studies were quantitative and one was qualitative (Table 2.4). Bai et al. (2010) documented that the intention to breastfeed was strongly associated with longer breastfeeding duration at 24 weeks. Likewise, Shi et al. (2008) reported that mothers who intended to breastfeed were significantly more likely to be breastfeeding their infant at 8 to 16 weeks. Mothers who intended to breastfeed were significantly more likely to initiate breastfeeding at birth (Kools, Thijs, & de Vries, 2005; Lawton, Ashley, Dawson, Waiblinger, & Conner, 2012; Swanson & Power, 2005). However, intentions were not identified to be predictors of breastfeeding at 24 weeks (Lawton et al., 2012). Sittlington, Stewart-Knox, Wright, Bradbury, & Scott (2007) reported that 95.2% of mothers who intended to formula feed prenatally did so at birth, and 91.5% of mothers who intended to breastfeed prenatally attempted breastfeeding after birth. Hawley et al., (2015) reported that

maternal intention did not predict continuation of exclusive breastfeeding at 3 and 8 weeks. All study findings are presented in (Table 2.4).

Table 2.4. *Maternal intention, attitudes, perceived behavior control (PBC), subjective norms and primary breastfeeding outcomes reported by the studies.*

Concept	Author/Year	Outcomes	Results
Intentions with initiation	Kools et al. (2005)	Breastfeeding intenders were more likely to initiate breastfeeding.	$p < .001$
	Lawton et al. (2012)	Mothers who intended to breastfeed were significantly more likely to initiate breastfeeding.	$p < .01$
	Shi et al. (2008)	Breastfeeding intenders were more likely to be breastfeeding their infant at 8 to 16 weeks.	$p < .01$
	Sittlington et al. (2007)	Intentions were associated with initiation.	Mothers who intended to formula feed did so at birth (95.2%). Mothers who intended to breastfeed, attempted breastfeeding at birth (91.5%).
	Swanson and Power (2005)	Breastfeeding intenders were more likely to initiate breastfeeding.	$p < .001$
Intentions with duration	Bai et al. (2010)	Breastfeeding intentions were strongly associated with breastfeeding at 24 weeks.	$p < .01$ .
	Hawley <sup>[11]</sup> et al., (2015)	Intention to exclusively breastfeed did not predict continuation of exclusive breastfeeding at 3 and 8 weeks.	Qa and $\Phi$
	Lawton et al. (2012)	Intentions do not predict breastfeeding at 24 weeks.	$\Phi$
Attitudes and intentions	Behera and Kumar (2015)	Mothers with more positive attitude towards breastfeeding, have higher intentions to breastfeed without use formula, water or any food given to baby before breastfeeding initiation for the first 6 months of life.	OR 3.18, 95% CI 1.46-6.62

Brodrigg (2007)	Positive attitudes about breastfeeding were associated with intentions to breastfeed.	Breast-milk was better for the baby (95.5%) and Breastfeeding was convenient (84.3%).
Cabieres et al. (2014)	Formula feeding intenders were more likely to report negative attitudes towards breastfeeding.	PRR 0.04; 95% CI 0.005-0.18
Cabieres et al. (2014)	Formula feeding intenders were more likely to report more positive attitudes toward formula feed.	PRR 52.70; 95% CI 12.44-92.22
Cabieres (2014)	Positive attitudes about breastfeeding (healthy, promote bonding, and convenient) were associated with intentions to breastfeed.	Qa
Cabieres (2014)	Positive attitudes about formula feeding (formula was convenient, formula feeding, knowing baby was full) were associated with intention for formula feeding.	Qa
Hoddinott et al. (2010)	Mothers with the perception that seeing others breastfeed was “lovely” were six times more likely to intend to breastfeed compared with women who do not perceive seeing others breastfeed as lovely.	OR 6.72, 95%, CI 2.85–15.82
Ismail et al. (2014)	Maternal attitudes were associated with intention to breastfeed.	$p < .001$
Nommsen-Rivers et al. (2010)	The level at which the mothers perceive formula feeding to be comfortable negatively predicts breastfeeding intentions.	$p < .0001$
Nommsen-Rivers et al. (2010)	The level at which the mothers perceive breastfeeding to be comfortable positively predicts their breastfeeding intentions.	$p < .0001$
Persad and Mesinger (2008)	Breastfeeding intentions were associated with favorable attitudes toward breastfeeding attitude.	$P < .001$
Swanson and Power (2005)	Mothers’ favorable attitudes about formula feeding were negatively associated with their intentions to breastfeed.	$p < .001$

	Swanson and Power (2005)	Favorable attitudes about breastfeeding positively predict breastfeeding intention.	$p < .05$
	Thomas et al. (2015)	Attitudes toward breastfeeding were associated with intention (positive association).	OR 1.68; 95% CI 1.31-2.16
Attitudes associated with duration	Andrew and Harvey (2011)	Perception that breastfeeding decreased independence was reported to influence duration.	Qa
	Bai et al. (2009)	Positive attitudes toward breastfeeding were associated with breastfeeding at 24 weeks.	Breastfeeding makes baby healthier (60%) and helps bond with baby (68%).
	Bartick and Reyes (2012)	Positive attitudes toward breastfeeding were associated with continuation of breastfeeding.	Breastfeeding promotes bonding (41%) and helps with weight loss (41%).
	Bartick and Reyes (2012)	Positive attitudes toward formula feeding were associated with breastfeeding discontinuation.	Formula or breast milk was not harmful to the infant (59%) and formula was more convenient (41%).
	Hawley <sup>[11]</sup> et al., (2015)	The perception that formula-milk as a back-up option in situations where breastfeeding was not possible or when breast milk was sufficient was association with formula feeding at 3 and 8 weeks.	Qa
	Lawton et al. (2012)	Do you mean “Mothers’ emotional reactions to breastfeeding and perceptions of breastfeeding as enjoyable, convenient, and pleasant were positively associated with breastfeeding at 24 weeks	$p < .01$
	Shi et al. (2008)	Mothers with favorable attitudes toward breastfeeding were significantly more likely to be breastfeeding at 8–16 weeks.	$p < .01$
	Swanson and Power (2005)	Belief that formula was acceptable was negatively associated with breastfeeding at 6 weeks.	$p < .001$

	Yen-Ju Ho and McGrath (2011)	Positive attitudes toward breastfeeding were less likely to discontinue breastfeeding at 6 weeks.	$p = .03$
Attitudes and breastfeeding initiations	Andrew and Harvey (2011)	The perception that breastfeeding was difficult causes reluctance to initiate breastfeeding.	Qa
	Andrew and Harvey (2011)	Belief in the health benefits was positively associated with initiation to breastfeed.	Qa
	Kools et al. (2005)	Mothers with favorable attitudes toward breastfeeding were more likely to initiate breastfeeding.	$p < .001$
	Lawton et al. (2012)	Mothers' emotional reactions to breastfeeding and perceptions of breastfeeding as enjoyable, convenient, and pleasant were predictive of breastfeeding initiation.	$p < .05$
	Stillington et al. (2007)	Mothers who attempt to breastfeed have more favorable attitudes toward breastfeeding.	$p < .001$
	Swanson and Power (2005)	Mothers with negative attitudes about formula feeding were more likely to breastfeed at birth.	$p < .001$
	Swanson and Power (2005)	Mothers with positive attitudes about breastfeeding were more likely to breastfeed at birth.	$p < .05$
Subjective norms and infant feeding intentions	Bai et al. (2010)	Subjective norms were significant in predicting breastfeeding intentions. (Positive association).	$p < .01$ .
	Behera and Kumar (2015)	Mothers with higher levels of support from family members with breastfeeding have higher intentions to breastfeed without use formula, water or any food given to baby before breastfeeding initiation for the first 6-months of life.	OR 2.61; 95% CI 1.54-4.77
	Cabieses et al. (2014)	Mothers who reported that friends and relatives fed with formula feeding for the first weeks of their infants' lives were more likely to intend to mixed feed.	PRR 10.68; 95% CI 2.19-32.05

	Cabieses et al. (2014)	Mothers who reported that friends and relatives mixed feed for the first weeks of their infants' lives were more likely to intend to mixed feed.	PRR 13.77; 95% CI 3.38-45.57
	Ismail et al. (2014)	Subjective norms do not significantly influence intentions.	$\Phi$
	Persad and Mesinger (2008)	Breastfeeding intention was positively associated with mothers' perceptions of perceiving partner support.	$p < .001$
	Swanson and Power (2005)	The perception of how others view breastfeeding was not a significant predictor of intentions.	$\Phi$
Subjective norms and initiation	Brodribb et al. (2007)	Advice from others was associated with breastfeeding intentions.	Women's mothers (17.5%), nurses (23.2%), and doctors (11.4%) were sources of advice.
	Hawley <sup>[SEP]</sup> et al., (2015)	Health care providers were sources of support during the time of breastfeeding initiation at the hospital.	Qa
	Kools et al. (2005)	The perception that partners favored breastfeeding was positively associated with mothers' initiation of breastfeeding at birth.	$p < .01$
	Kools et al. (2005)	The perception of colleagues or employer was not significant on initiation.	$\Phi$
	Lawton et al. (2012)	Subjective norms do not predict breastfeeding initiation.	$\Phi$
Subjective norms and duration of breastfeeding	Andrew and Harvey (2011)	Women's mothers were a source of support and advice for continuation.	Qa
	Bai et al. (2010)	Subjective norms do not predict continuation of breastfeeding at 24 weeks.	$\Phi$
	Bai et al. (2009)	Sources of infant feeding advice were family and friends.	Qa
	Barona-Vilar et al. (2009)	Fathers' support of breastfeeding was essential for continuation.	Qa
	Bartick and Reyes (2012)	The perception that breastfeeding around others was embracing contribute to mothers' breastfeeding decisions.	18%

	Hawley et al., (2015)	Women's maternal mother and older sisters were source of advice for infants' feeding decisions during postpartum period.	Qa
	Shi et al. (2008)	Perceived social support in breastfeeding was positively associated with breastfeeding at 8–16 weeks.	$p < .01$
	Swanson and Power (2005)	The perception that (partner, women, maternal mother, friends and midwives/nurses, and people in general) she should formula feed was negatively associated with breastfeeding at 6 weeks.	$p < .005$
	Swanson and Power (2005)	The perceptions that (partner, women, maternal mother, friends and midwives and nurses, and people in general) she should breastfeed were positively associated with breastfeeding at 6 weeks.	$p < .001$
	Lawton et al. (2012)	Subjective norms did not predict breastfeeding at 24 weeks.	$\Phi$
	Yen-Ju Ho and McGrath (2011)	Husbands and partners were a source of support.	47.4%
PBC and SE and infant feeding intentions	Bai et al. (2010)	Sources of infant feeding advice were family and friends.	$p < .0001$
	Bai et al. (2010)	PBC did not predict intentions.	$\Phi$
	Behera and Kumar (2015)	Mothers who perceived greater independence in making decisions about infants; perceived more confidence and adequacy in the ability to breastfeed had higher intentions to breastfeed without use formula, water or any food given to baby before breastfeeding initiation for the first 6-months of life.	OR 5.37; 95% CI 1.22-16.61
	Cabieses et al. (2014)	Mothers intended to formula feeding were more likely to have lower self-efficacy for breastfeeding (mothers reporting breastfeeding as difficult).	PRR: 0.10; 95% CI 0.02-0.50



	Cabieses et al. (2014)	Mothers intended to formula feed were more likely reported higher self-efficacy towards mixed-feeding	PRR: 5.55; 95% CI: 1.41-12.53
	Ismail et al. (2014)	PBC was not a significant predictor of breastfeeding intentions.	$\Phi$
	Lawton et al. (2012)	Perceived confidence over breastfeeding was positively associated with intention to breastfeed.	$p < .001$
	Nommsen-Rivers et al. (2010)	Confidence with breastfeeding techniques positively predicted breastfeeding intention.	$p < .0001$
	Thomas et al (2015)	Maternal confidence with the breastfeeding process was associated with breastfeeding intention.	OR 1.72; 95% CI 1.23-2.40
PBC and SE and infant feeding initiation	Kools et al. (2005)	Mothers who perceive breastfeeding being easy or less stressful in public places, at night, at the workplace, when they were tired, and during infant illness were more likely to initiate breastfeeding.	$p < .0001$
	Kools et al. (2005)	Mothers who perceive formula feeding as easy or less stressful in public places, at night, at the workplace, when they were tired, and during infant illness were more likely to initiate formula feeding.	$p < .0001$ □
	Lawton et al. (2012)	Perception of confidence in ability to breastfeed and perceptions of ease or difficulty and potential barriers to breastfeeding did not directly influence breastfeeding initiation.	$\Phi$
PBC and SE and infant feeding duration	Andrew (2009)	Breastfeeding skills were important for continuation.	Qa
	Bai et al. (2010)	Perceptions of control over breastfeeding did not predict breastfeeding at 24 weeks	$\Phi$
	Bai et al. (2009)	Breastfeeding facilitators were associated with continuation of breastfeeding.	Able to stay home (40%) and flexible work schedule (20%)
	Bai et al. (2009)	Perceived barriers were associated with discontinuation of breastfeeding.	Return to work (80%) and poor breastfeeding knowledge (48%)

Barona-Vilar (2007)	Returning to work was a barrier to breastfeeding.	Qa
Bartick and Reyes (2012)	Barriers to the continuation of breastfeeding include: pain during breastfeeding; lack of knowledge about benefits of breastfeeding; and lack of awareness about breastfeeding recommendations.	Qa
Hawley <sup>[1]</sup> <sub>SEP</sub> et al., (2015)	The perception of insufficient breast milk supply and pain during breastfeeding was associated with formula feeding at 3 and 8 weeks.	Qa
Lawton et al. (2012)	Perceptions of confidence, ability to breastfeed and perceptions of ease or difficulty of and potential barriers to breastfeeding did not directly influence breastfeeding at 24 weeks	Φ
Shi et al. (2008)	Mothers who were able to control breastfeeding practices, even when family and community members disapproved, were significantly more likely to breastfeed at 8 to 16 weeks.	$p < .01$
Yen-Ju Ho and McGrath (2011)	Perceived barriers were associated with discontinuation of breastfeeding.	Insufficient milk supply breastfeeding (52.9%) and return to work (35.3%)

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Note. Perceived behavior control (PBC); self-efficacy (SE); qualitative results (Qa); non-significant association (Φ); odds ratio (OR); proportional reporting ratio (PRR); and  $p$ -value ( $p$ )

### Maternal Attitudes and Intention, Initiation and Duration

A significant association between attitudes toward breastfeeding and breastfeeding intentions was quantitatively reported in nine studies (Table 2.4). Maternal attitudes about breastfeeding (e.g., saving money, healthier infant, bonding with infant, spacing between births, time consuming, infant was hungry, and difficulty leaving infant) were associated with intention (Ismail, Muda, & Bakar, 2014), and favorable attitudes toward breastfeeding were associated with breastfeeding intention (Persad & Mensinger, 2008). Positive maternal attitudes toward breastfeeding (e.g. nutritional benefits of breastfeeding) were associated with higher intention to

breastfeed without the use of formula (Thomas et al., 2015). Also, mothers with more positive attitude about breastfeeding were more likely to intend to breastfeeding (Behera & Anil Kumar, 2015). Lawton et al. (2012) reported that mothers' perceptions about whether breastfeeding was right/wrong, pleasant, enjoyable, and convenient were the strongest predictor of breastfeeding intentions. Nommsen-Rivers et al. (2010) reported that formula feeding comfort (the level at which the mother perceived formula feeding to be comfortable) and breastfeeding comfort (the level at which the mother perceived breastfeeding to be comfortable) both independently predicted breastfeeding intentions. Mothers' perception that formula feeding was comfortable was the strongest predictor (negative direction) of breastfeeding intentions. Likewise, Swanson and Power (2005) reported that favorable attitudes about formula feeding were negatively associated with intentions to breastfeed. Cabieses et al. (2014) reported that compared to mothers who intended to formula feed and those with no clear intention about method of feeding, mothers who had high intentions toward mixed feeding were more likely to have negative attitudes toward breastfeeding and positive attitudes toward mixed feeding. Cabieses et al. also reported that mothers with no clear intentions were significantly more likely to report positive attitudes toward mixed feeding and formula feeding. Mothers who intended to formula feed were more likely to report negative attitudes toward breastfeeding and mixed feeding and more positive attitudes formula feeding. In addition, Hoddinott et al. (2010) reported that women who perceived seeing others breastfeed as "lovely" were six times more likely to intend to breastfeed compared to women who did not.

The researchers in four studies explored maternal attitude and breastfeeding duration using quantitative methods (Table 2.4). Shi et al. (2008) and Yen-Ju Ho and McGrath (2011) reported that mothers with favorable attitudes toward breastfeeding were significantly more

likely to be breastfeeding at 6 weeks. The maternal belief that formula was acceptable was reported to be negatively associated with breastfeeding at 6 weeks (Swanson & Power, 2005). Lawton et al. (2012) reported that the mothers' emotional reactions to breastfeeding and perceptions of breastfeeding as enjoyable, convenient, and pleasant were positively associated with breastfeeding at 24 weeks.

The association between maternal attitudes and breastfeeding initiation was reported in four studies (Table 2.4). Kools et al. (2005) reported that mothers with more favorable attitudes toward breastfeeding were more likely to initiate breastfeeding. Swanson and Power (2005) and Sittlington et al. (2007) reported that mothers with favorable attitudes about breastfeeding and negative attitudes about formula feeding were more likely to breastfeed at birth. In addition, compared to mothers who had not attempted to breastfeed, mothers who attempted to breastfeed had more favorable attitudes toward breastfeeding (Sittlington et al., 2007). Lawton et al. (2012) reported that mothers' emotional reaction to breastfeeding (perceiving breastfeeding as enjoyable, convenient, and pleasant) predicted breastfeeding initiation.

Qualitative methods and frequencies of occurring themes were used to explore attitudes in relation to intentions, duration and initiation of breastfeeding in five studies; Brodribb et al. (2007) listed the most frequently occurring themes (Table 2.4). The themes or maternal perceptions of the reasons to initiate and continue breastfeeding, were supportive attitudes toward breastfeeding such as: 1) breastfeeding was healthier and more natural than formula, and colostrum was good for the baby (Andrew & Harvey, 2011; Bai, Middlestadt, Joanne Peng, & Fly, 2009; Bartick & Reyes, 2012); 2) breastfeeding was enjoyable and promotes bonding with the baby (Andrew & Harvey, 2011; Bai et al., 2009; Bartick & Reyes, 2012); 3) breastfeeding was more convenient and cheaper (Andrew & Harvey, 2011; Bai et al., 2009; Brodribb, Fallon,

Hegney, & O'Brien, 2007); and 4) breastfeeding was thought to help with weight loss (Bartick & Reyes, 2012; Brodribb et al., 2007). The themes typifying mothers who formula feed are: 1) formula was not harmful to the infant, or breast-milk and formula were equally nourishing and beneficial (Andrew & Harvey, 2011; Bartick & Reyes, 2012); 2) formula feeding was useful as a backup when there was a perceived low breast milk supply, keeping the baby fuller and in situations where breastfeeding is not possible (Bartick & Reyes, 2012; Hawley et al., 2015); and 3) formula feeding was more convenient (Bartick & Reyes, 2012).

### **Maternal Subjective Norms and Infant Feeding**

The researchers in six studies examined the association between subjective norms and intentions quantitatively (Table 2.4). Subjective norms were significant in predicting breastfeeding intentions (Bai, Middlestadt, Peng, & Fly, 2010), and breastfeeding intentions were positively associated with mothers' perception of partners' support (Persad & Mensinger, 2008). Mothers with family support were more likely to intend to breastfeed without using formula, water or prelacteal feeding—or food given to baby before breastfeeding initiation—for the first 6 months of life (Behera & Anil Kumar, 2015). Also, mothers who reported that friends and relatives fed with formula or mixed feeding for the first weeks of their infants' lives were more likely to intend to formula or mixed feed (Cabieses, Waiblinger, Santorelli, & McEachan, 2014). In other studies, subjective norms did not significantly influence intentions (Ismail et al., 2014), and mothers' perception of how others view breastfeeding was not a significant predictor of intention (Swanson & Power, 2005)

The association between maternal perceived subjective norms and initiation and duration of breastfeeding was assessed quantitatively in five studies (Table 2.4). Kools et al. (2005) reported that the perception that partners favored breastfeeding was positively associated with

mothers' initiation of breastfeeding at birth. Perceived social support was also positively associated with breastfeeding (Shi, Zhang, Wang, & Guyer, 2008). In addition to the partner's influences, the mothers' perception that social referents (partner, women, maternal mother, friends and midwives/nurses, and people in general) thought that she should formula feed was negatively associated with breastfeeding at 6 weeks. Likewise, the mothers' perception that social referents thought that she should breastfeed was positively associated with breastfeeding at 6 weeks (Swanson & Power, 2005). Even though subjective norms were reported to significantly predict intentions, they did not predict continuation of breastfeeding at 24 weeks (Bai et al., 2010). Conversely, Lawton et al. (2012) reported that subjective norms neither predicted breastfeeding initiation nor breastfeeding at 24 weeks. Similarly, Kools et al. (2005) reported that the perception of colleagues or employers was not significantly associated with initiation.

The subjective norms and breastfeeding initiation and duration were explored qualitatively in eight studies; Brodribb et al. (2007); Bartick and Reyes (2012) and Yen-Ju Ho and McGrath (2011) used percentages to summarize findings (Table 2. 4). The researchers of the examined studies explored subjective norms in terms of others who had a direct relationship with the breastfeeding mothers, including, the infants' maternal grandmothers, partners, friends, and health care professionals. The researchers of two studies also examined maternal perceptions of breastfeeding as the norm and maternal perceptions of breastfeeding in public places (Andrew & Harvey, 2011; Bartick & Reyes, 2012). The following themes were identified in these studies: 1) The infant's maternal grandmother and older sister were a source of advice and support for the infant's feeding, the partner or infant's father was a source of influence on the infant's feeding (Andrew & Harvey, 2011; Brodribb et al., 2007; Hawley et al.,

2015; Yen-Ju Ho & McGrath, 2011), and sources of infant feeding advice and support were family and friends (Bai et al., 2009) and health care professionals (Brodribb et al., 2007; Hawley et al., 2015) ; 2) women in the family, including sisters, mothers, and mothers-in-law, influenced breastfeeding choices (Barona-Vilar, Escribá-Agüir, & Ferrero-Gandía, 2009); 3) what the mother considers the norm for infant feeding influences her feeding practice, and formula feeding mothers were concerned about judgments (Andrew & Harvey, 2011); and 4) breastfeeding in public was embarrassing, uncomfortable, and disapproved of by people (Andrew & Harvey, 2011; Barona-Vilar et al., 2009; Bartick & Reyes, 2012).

### **Maternal PBC/SE and Infant Feeding**

The association between PBC/SE and intentions using quantitative methods was explored in seven studies (Table 2.4). PBC, along with attitudes and subjective perceived behavioral control, significantly explained 50.2% variance in mothers' breastfeeding intentions. However, PBC did not predict intentions independently (Bai et al., 2010). Nommsen-Rivers et al. (2010) reported that breastfeeding SE or confidence in breastfeeding techniques strongly positively predicted breastfeeding intention. Also, Cabieses et al. (2014) reported that formula feeding intender were more likely to have lower SE for breastfeeding—mothers reporting breastfeeding as difficult—and higher SE for mixed feeding or mothers reporting mixed feeding as easier. Maternal confidence with the breastfeeding process was significantly associated with breastfeeding intention (Lawton et al., 2012; Thomas et al., 2015). Also, mothers who perceived a greater independence in decision making, confidence and adequacy in their ability to breastfeed were more likely to intend to breastfeed without use formula, water or prelacteal feeds— or foods given to baby before breastfeeding initiation— for the first 6 months of life (Behera & Anil Kumar, 2015). Conversely, Ismail et al. (2014) reported that perceived control was not a

significant predictor of breastfeeding intentions.

The researchers of four studies examined the relationship between PBC/SE and initiation and duration of breastfeeding using quantitative methods (Table 2.4). Mothers who reported the ability to control breastfeeding practices, even when family and community members rebuffed breastfeeding were more likely to breastfeed at 8 to 12 weeks (Shi et al., 2008). Kools et al. (2005) also reported that mothers who perceived breastfeeding as being easy or less stressful in public places, at night, at the workplace, when they were tired, and during infant illness were more likely to initiate breastfeeding. Mothers who perceived formula feeding as easier or less stressful in the same situations were more likely to initiate formula feeding. Conversely, mothers' perceptions of confidence in their ability to breastfeed and perceptions of ease or difficulty of and potential barriers to breastfeeding did not directly influence their breastfeeding initiation and duration (Lawton et al., 2012). Also, mothers' perceptions of control over breastfeeding did not predict breastfeeding behavior at 24 weeks (Bai et al., 2010).

Researchers from six studies explored PBC/SE and breastfeeding initiation and duration qualitatively; one study used mixed method (Table 2.4). The themes that emerged from these studies include the barriers to and facilitators of breastfeeding. The barriers to breastfeeding include: 1) return to work or school being perceived as a barrier to breastfeeding (Andrew & Harvey, 2011; Bai et al., 2009; Barona-Vilar et al., 2009; Bartick & Reyes, 2012); 2) perceived insufficient milk supply (Bai et al., 2009; Bartick & Reyes, 2012; Yen-Ju Ho & McGrath, 2011); 3) physical difficulties during breastfeeding, such as engorgement, nipple pain, fatigue, or illness (Andrew & Harvey, 2011; Bai et al., 2009; Bartick & Reyes, 2012; Yen-Ju Ho & McGrath, 2011); 4) having to look for a place to breastfeed in public (Bai et al., 2009); and 5) lack of knowledge and support from hospitals (Bai et al., 2009; Bartick & Reyes, 2012).



Breastfeeding facilitators include: 1) having breastfeeding skills (Andrew & Harvey, 2011; Bai et al., 2009) and 2) being able to stay home (Bai et al., 2009).

## **Discussion**

In this systematic literature review, we focused on maternal beliefs influencing breastfeeding initiation and duration without restricting outcomes to EBF to attain a broader perspective of factors influencing variation in breastfeeding beliefs. Another recent systematic review has examined the association of intention and duration to EBF (de Jager, Skouteris, Broadbent, Amir, & Mellor, 2013). Our review reveals that maternal intention was associated with initiation of breastfeeding. This finding was consistent with other systematic literature reviews reporting that maternal intentions strongly predict intention (de Jager et al., 2013). Unlike the other systematic reviews, in our review, intention only predicted duration in one of the three studies (de Jager et al., 2013; Guo, Wang, Liao, & Huang, 2016).

Though we categorized findings using attitude, subjective norms, and PBC/SE into determinants of breastfeeding intentions, initiation, and duration we recognize that most of the studies included a combination of outcome measures and belief variables. Thus, maternal breastfeeding behavior is probably shaped by a combination of these variables. Similarly, although this review only covered maternal beliefs, the review does not discount the effect of other variables (e.g., socioeconomic levels, maternal age, education levels, returning to work and knowledge) on breastfeeding behavior reported by various breastfeeding studies (Bosnjak, Grguric, Stanojevic, & Sonicki, 2009; Mathews, Leerkes, Lovelady, & Labban, 2014). We also assessed how infant feeding was conceptualized. In instances where infant feeding was conceptualized by the reviewed studies, the most common definition used was from the WHO Global-Data-Bank on Breastfeeding (WHO, 2008).

The majority of the studies examining breastfeeding attitudes reported a strong association between attitude and intention, initiation, and duration (Cabieses et al., 2014; Ismail et al., 2014; Lawton et al., 2012; Nommsen-Rivers, Cohen, Chantry, & Dewey, 2010; Persad & Mensinger, 2008; Swanson & Power, 2005). An association between attitudes and desired behavior was also present with formula feeding, where mothers who perceived formula feeding as favorable were more likely to formula feed (Swanson & Power, 2005), and formula-feeding mothers at birth had significantly more negative attitudes toward breastfeeding (Sittlington et al., 2007). Additionally, our findings indicate that, in many instances, while mothers believe in the health benefits of breastfeeding, they do not perceive formula feeding as unhealthy (Bartick & Reyes, 2012). Comfort with the idea of formula feeding as an acceptable way of feeding natively predicted breastfeeding intentions (Nommsen-Rivers et al., 2010).

Findings related to PBC/SE varied in the studies. Some studies reported a significant association between maternal PBC/SE and initiation and duration of breastfeeding (Shi et al., 2008) and others reported no direct association (Bai et al., 2010; Lawton et al., 2012). This concept was often referred to as having confidence or control in coping with breastfeeding-related issues. In general, themes that emerged from our qualitative review of the studies perceived control mostly included barriers such as returning to work or school, perceived insufficient breast milk supply, and physical difficulties related to breastfeeding, such as engorgement or sore nipples. These themes were consistent with literature on breastfeeding (Daly, Pollard, Phillips, & Binns, 2014; Dunn, Kalich, Henning, & Fedrizzi, 2015).

Overall, the role of subjective norms can be concluded to be important in breastfeeding intentions, initiation, and duration, with most researchers who examined this concept reporting a positive association (Bai et al., 2010; Cabieses et al., 2014; Kools et al., 2005; Persad &

Mensing, 2008; Swanson & Power, 2005). The major themes that emerged from the literature show the importance of people surrounding the mother in the decision to breastfeed and the continuation of breastfeeding. This is explained well by social support as a form of social capital that can be directed toward promotion of health for the community (Putnam, 1993; Raj & Plichta, 1998). The shared values among society members direct their behaviors and interactions (Putnam, 1993). The concept of social capital for the promotion of social involvement is helpful in justifying the importance of utilizing the strong relationships and trust that exist within the members who were in close relationships with breastfeeding mothers.

### **Limitations**

As with other systematic reviews, this review is limited by selection bias that occurs by setting criteria such as the inclusion of only English studies. We limited bias for the articles included by following the PRISMA guidelines. The following five limitations were recognized as part of reviewing the literature on maternal perceptions and breastfeeding. First, the use of various methodological approaches with various outcome measures and multiple time points creates a challenge to the synthesis of findings. The studies in the review assessed outcomes during pregnancy as well as different infant ages from birth to 6 months. In addition to the main study outcomes, most of the studies examined multiple outcomes concepts of TPB. In this review we examined the main study outcomes and did not limit study extraction to specific research methods. Second, a lack of follow-up to determine if beliefs and intentions were related to breastfeeding outcomes in some of the reviewed studies was a major methodological limitation. Nine of these studies included a follow-up outcome evaluation. Third, a major limitation in some studies was the lack of a theoretical framework. Seven studies did not have a specific framework. Fourth, all the studies included self-reported measurements as the only

source of outcome evaluation. This finding was consistent with another systematic review (de Jager et al., 2013). This limitation was anticipated because outcome measures included an evaluation of feeding behavior, which was difficult to measure in ways other than self-reporting. Lastly, the studies in this review used various data collection instruments and the validity and reliability of some of these instruments were not established.

### **Implications for Future Research and Clinical Practice**

Because maternal feeding behavior is complex, maternal intentions and beliefs must be considered in planning for breastfeeding interventions. The review highlights the lack of consistent measurements of breastfeeding beliefs. While some studies included measurements, the development of these measurements was not specifically addressed, and no research indicated further refinement of the measurements. More consideration should be given to utilizing the measurements that are already available in literature and refining what is available through rigorous reliability and validity assessment. Given that the reviewed studies were from highly disparate countries, findings might vary due to the influence of societal norms and expectations that were embedded within a culture, in addition to the behavior determinants expressed by TPB.

Clinically, health care providers should be aware of the influence of mothers' beliefs and intentions on breastfeeding outcomes. Assessing mothers' intentions, especially during pregnancy is important because intentions determine breastfeeding choices after birth. This gives health care providers a window of opportunity to intervene in breastfeeding promotion before delivery, particularly to recognize that perceptions were modifiable (Blyth et al., 2004). It is especially important to address mothers' PBC/SE related to continuation of breastfeeding, particularly the perception of barriers, and to determine the possible contributions to overcome

these malleable barriers through health education (e.g., teaching about breast milk pumping and storage for preparation to return to work).

### **Conclusion**

This review suggests that maternal breastfeeding behavior is shaped by various belief variables in addition to other variables. In our review, attitudes about breastfeeding most often were associated with breastfeeding initiation and duration. The association of attitudes with outcomes was also present for attitudes in favor of formula feeding, as the mothers who had relatively positive attitudes about formula feeding were more likely to formula feed. The majority of the studies reported positive associations between PBC/SE and breastfeeding initiation and duration; nevertheless, the associations between intention and initiation and duration were not always present. Emerging themes included barriers to and facilitators of breastfeeding. Future studies need to examine the associations of the maternal belief variables with more validated measurements, across various cultures, and with follow-up measures of breastfeeding outcomes.

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### **CHAPTER 3: CROSS-CULTURAL ADAPTATION AND LINGUISTIC VALIDATION OF THE TRANSLATED ARABIC REVISED-BREASTFEEDING ATTRITION PREDICTION TOOL**

The World Health Organization (WHO) recognizes exclusive breastfeeding (EBF) as the best standard of practice, in which an infant receives only breast-milk from his or her mother or a wet nurse, or expressed breast-milk, and no other liquids or solids, and no water with the exception to oral rehydration solution, drops or syrups such as vitamins, minerals, or medicines for the first six months of life (WHO, 2008, p. 4). According to the WHO (2015), “If every child was breastfed within an hour of birth, given only breast milk for their first six months of life, and continued breastfeeding up to the age of two years, about 800,000 children’s lives would be saved every year” (para. 1). The Middle East and North Africa have one of the lowest percentages of infants (0–5 months) who are exclusively breastfed in the world, with an average of 26% breastfeeding exclusively between 2000 and 2007 (Childinfo, 2009). In Oman, an Arabian Gulf country, the rate of EBF for infants at six months was 16.9% in 2011 and 11.8% in 2015 (Department of Health Information & Statistics, 2015). Presently in Oman, about one in 10 mothers breastfeed exclusively for the first six months of their infants’ lives, although more than nine in 10 initiate EBF at birth (Department of Health Information & Statistics, 2015). The decrease in EBF rates has been accompanied by a significant increase in the amount of formula feeding at six months from 60.7% in 2005 to 81.6% in 2011 and 87.8% in 2015 (Department of Health Information & Statistics, 2015).

The theory of planned behavior (TPB) provides a framework for explaining and predicting variables influencing behavior (Ajzen, 1991) and has been adapted as a framework to

explain maternal feeding behavior for the first six months of an infant's life (Avery, Duckett, Dodgson, Savik, & Henly, 1998; Bai, Middlestadt, Peng, & Fly, 2010). Employing valid and reliable tools to measure any research concept is imperative in research. Despite the availability of valid and reliable tools in the English language, it remains challenging to use these tools among non-English-speaking individuals. The challenges are due not only to language comprehension but also to the cultural adaptations required for some of the measurement components, which subsequently impact reliability and validity.

To date, there is no known published valid and reliable tool focused on TPB related to maternal beliefs that has been translated into the Arabic language. The process of cross-cultural adaptation aims to achieve equivalency between the translated and original measures. This article presents the results of a study to cross-culturally adapt the Revised Breastfeeding Attrition Prediction Tool (Revised-BAPT), including translation, linguistic validation, and the testing of the tool's psychometric properties for use in Oman, an Arabic speaking culture.

The Breastfeeding Attrition Prediction Tool (BAPT) uses the TPB framework. The tool is chosen because its development and application suggested accumulated evidence to support content, construct, and predictive validity across various languages, socioeconomic levels, and cultures (Dick et al., 2002; Evans, Dick, Lewallen, & Jeffrey, 2004; Gill, Reifsnider, Lucke, & Mann, 2007; Karayağız Muslu, Basbakkal, & Janke, 2011; Mortazavi, Mousavi, Chaman, Khosravi, & Janke, 2015; Thomas et al., 2015; Wan, Tiansawad, Yimyan, & Sriaporn, 2015). Since the task of constructing new reliable and valid measurement is costly and time consuming, it is logical to adapt an existing tool to different cultures.

## The Tool

The Revised-BAPT is a self-report tool that was originally developed to identify women who were likely to wean their babies early (Janke, 1992; Janke, 1994). The original BAPT contains 52 items on a 6-point Likert-type scale (Janke, 1994). The tool was revised by Gill et al. (2007) to predict breastfeeding intentions among Hispanic mothers. The revised version of the tool contains 32 items on a 3-point Likert scale.

The BAPT contains the following subscales: positive breastfeeding statement (PBS), negative breastfeeding statement (NBS), social and professional support (SPS), and perceived behavior control (PBC). The PBS and the NBS subscales assess maternal beliefs about the consequences of breast- and formula feeding; this includes the advantages and disadvantages of both. An example PBC item is *Mother's milk is healthy for the baby* and an example NBS item is *Formula milk feeding is easier than breastfeeding*. SPS items assess maternal subjective norms as the perception of whether key people in the woman's life (e.g., the baby's father, mother's mother, mother-in-law, sister, or doctor) approve or disapprove of the behavior and motivation to comply or to behave in a way that gains their approval. An example SPS item is *the baby's father thinks I should breastfeed*. PBC items assess maternal perceptions of the ease or difficulty associated with breastfeeding and formula feeding. These factors include having the knowledge, skill, and confidence to breastfeed an infant; the need for help in breastfeeding; and the perception of the ease of breastfeeding; an example item from this subscale is *I have the necessary skills to breastfeed* (Ajzen, 1991; Janke, 1992).

The original BAPT was tested in various studies, and the results supported moderate to high reliability in various populations, including low-income non-Hispanic White, African American, Asian, and Spanish-speaking Hispanic mothers. The Cronbach's  $\alpha$  reliability of the

tool ranged from .70–.90 (Gill, 2009; Janke, 1992; Janke, 1994). The Cronbach's  $\alpha$  ranges for each of the tool's subscales were as follows: PBS = .76–.83; NBS = .77–.78; SPS = .80–.83; and PBC = .82–.86 (Dick et al., 2002; Gill, 2009; Janke, 1992). These studies' findings support the tool's construct and predictive validity (Dick et al., 2002; Janke, 1992; Ryser, 2004). The tool's content validity was established in its development process. The developer, Dr. Janke, derived the tool items from the literature, interviews with postpartum women, and feedback from a panel of lactation experts. The developer enhanced the construct validity by subjecting the tool to exploratory factor analysis with deletion of items that failed to load to a particular factor. In addition, discrimination analysis identified 73% of mothers who weaned before the time they planned to breastfeed for at least eight weeks (Janke, 1994).

Regarding predictive validity, among women who stopped breastfeeding, the tool predicted 78% of mothers who weaned before eight weeks ( $p < .005$ ; Dick et al., 2002). Similarly, among women who continued breastfeeding, the tool was able to predict 68% of women who continued breastfeeding ( $p < .005$ ; Dick et al., 2002). The Revised-BAPT was used to predict breastfeeding intentions among Hispanic mothers. The psychometric results of the Revised-BAPT support the utilization of the measurement in predicting breastfeeding intention. The reliability of the entire tool was .86. The Cronbach's  $\alpha$  of the subscales was as follows: PBS = .83, NBS = .78, SPS = .80, and PBC = .82 (Gill, 2009).

The developer granted permission to use and modify the BAPT for Omani women. After consultation with a psychometrics expert, the first author altered the items in the Likert scale from a 3- to 4-point scale. This alteration was performed to provide more possible answers and hence avoid a potential lack of variation in scoring that could occur when using fewer points on a scale (Carifio & Perla, 2007). Furthermore, based on suggestions by reviewers with expertise in Omani culture,

two items were added to the SPS subscale to include the perception of the mother's close friends and nurse.

## **Method**

The method for the tool's cross-cultural adaptation included both translation and linguistic validation. Our method was adapted from the Mapi Research Institute's translation and linguistic validation method (Mapi, 2002) Figure 3. 1). The steps of the cross-cultural adaptation process included the following: (1) forward and back translation (2) expert evaluation using content validity indexing; (3) cognitive interviewing (CI); and (4) pilot testing among Omani mothers. The UNC-Chapel Hill Institutional Review Board and the Oman Ministry of Health Institutional Review Board approved the study.

### **Phase 1: Translation**

The process of the translation of the Revised-BAPT tool, including forward and back translations, was conducted by a paid translation agency.

**Phase 1a: Forward-translation process.** Two separate professional translators conducted the forward translation of the tool. The first author directed the translators to capture the items' essential meaning rather than create a word-for-word or literal translation. The first author also instructed the translators to use simple language that would be comprehensible to individuals with a lower reading level and avoided the use of complicated phrases. During this phase, both translated versions were transferred to a table as a word document, with all items side by side. The first author reconciled the two translations into a single version (version 1).

**Phase 1b: Back translation.** Validation through back-translation provides a higher level of quality than a mere direct translation (Thicke, 2011). Improving the quality of a translation through back translation allowed for more efficient use of the research data by capturing not only

the variability in the language but also the way the language is spoken and how cultural concepts are expressed (Thicke, 2011). A professional bilingual native Arabic speaker who lives in the United States back translated version 1 of the Arabic BAPT into English. The back translator was not involved in the forward translation and did not see the original English version.

#### Phase 2: Expert Evaluation of Translation's Accuracy Using the Content Validity Index.

After the forward- and back-translation processes were completed, we conducted an expert evaluation of the 32-item translated Revised-BAPT tool. Experts were health care professionals who had practiced in a maternity or pediatric unit or health center as a physician, nurse, clinical pharmacist, or nurse educator for at least five years and were proficient in both English and Arabic. Ten healthcare professionals agreed to participate: three nurses, four nursing instructors, one physician, and two clinical pharmacists.

We assessed content validity using the content validity index (CVI; Squires et al., 2013), assessing each item's cultural relevance as well as semantic equivalency between the English and the Arabic versions. Content validity is the degree to which a tool has appropriate items to represent a particular construct (Polit, Beck, & Owen, 2007). In this study, we adapt CVI to evaluate the adequacy of the revised-BAPT content to use in Oman culture. The experts rated each item's content on its relevance to breastfeeding in Omani culture using a 4-point Likert-type scale: 1 (*not relevant*), 2 (*somewhat relevant*), 3 (*quite relevant*), and 4 (*highly relevant*; (Davis, 1992). The question of relevancy to Omani culture is important to ask because the tool has items about breasts, and tools that mention breasts might be misinterpreted as being embarrassing. An example of such a statement is item 8: *Breastfeeding makes your breasts sag*. A second CVI was computed to examine the semantic equivalency of the Arabic BAPT with the original English version. In this context, semantic equivalency refers to each item's sameness in content and

meaning in a culture after translation (Beck, Bernal, & Froman, 2003). The purpose of examining semantic equivalency is to obtain additional confirmation of the translation's appropriateness (Beck et al., 2003; Sousa & Rojjanasrirat, 2011). The experts were asked to rate each item's translation equivalence in terms of both content and meaning by marking *yes* if the translations are accurate in semantic equivalency and *no* if they are inaccurate. Additional space for comments is provided next to each item for alternatives to the translation.

In August 2015, the first author met with each expert individually to discuss the tool. The first author aimed for a minimum of six participants. Based on Lynn's (1986) recommendations, if there are five or fewer experts, all experts must agree that the content of an item is valid for the rating to be reasonable. Having six or more experts allows for one expert to disagree and a CVI of .83 to still be achieved (Lynn, 1986). For this analysis, since we included 10 experts, having more than two experts disagree (a CVI score lower than .80) for an item is interpreted as an indicator that the item needed to be revised to make the content of the item more acceptable in the Omani culture. Lower CVI items will be modified using experts' suggestions. Once the experts evaluated the tool, two CVIs were computed for each item: (a) item relevancy to Omani culture and (b) examination of semantic equivalency.

### **Phase 3: Cognitive Interviews**

We conducted cognitive interviews (CIs) in this study with five Omani women to assess the clarity of the translated tool and identify problematic items that might lead to biased answers (e.g., items that are confusing to participants). The CI of the BAPT involved steps adapted from Tourangeau's (1984) CI process. The original steps are as follows: comprehension of the question, ability to recall relevant information and match the individual answer to the provided response categories, and motivation to answer truthfully (Tourangeau, 1984; Willis, 2015).



For this study, participants were asked to think aloud while completing the Revised-BAPT, and the following steps were applied. The interviewer took notes on participants' thoughts, such as "I do not understand the question," "The answer I want is not provided," and "The next section is not provided" (Bullen & Brack, 2015). The participants were asked to rephrase each question, providing the opportunity to determine the participants' comprehension of each item, their ability to answer the questions with the responses available, and the thought process they used to answer the questions, such as counting or recalling. Questions were asked to trigger the participants' thinking: "Why do you think the question is not clear, and what other options should be included?" In addition, it is important that the interviewer notes how the participants complete the survey, e.g., changing answers or crossing out the first selection they made (Bullen & Brack, 2015). Once the CIs were conducted, the interview notes were used to further refine survey questions and answers; this produced version 4 of the BAPT (Figure 3. 1).

For the survey to be pertinent to the representative participants, all of the mothers had to have breastfed before. All of the participants were married and spoke Arabic; their ages ranged from 26–34 years, with a mean of 29.8 years. The respondents had completed different levels of education; four participants had a bachelor degree, and one participant had completed secondary education (10–12 years of schooling). A total of five CIs were conducted. Interviews were conducted in a private conference room. The participants completed the survey in 5 to 15 minutes using a paper and pencil. The survey was immediately followed by the cognitive interview, which took 20–30 minutes per participant.

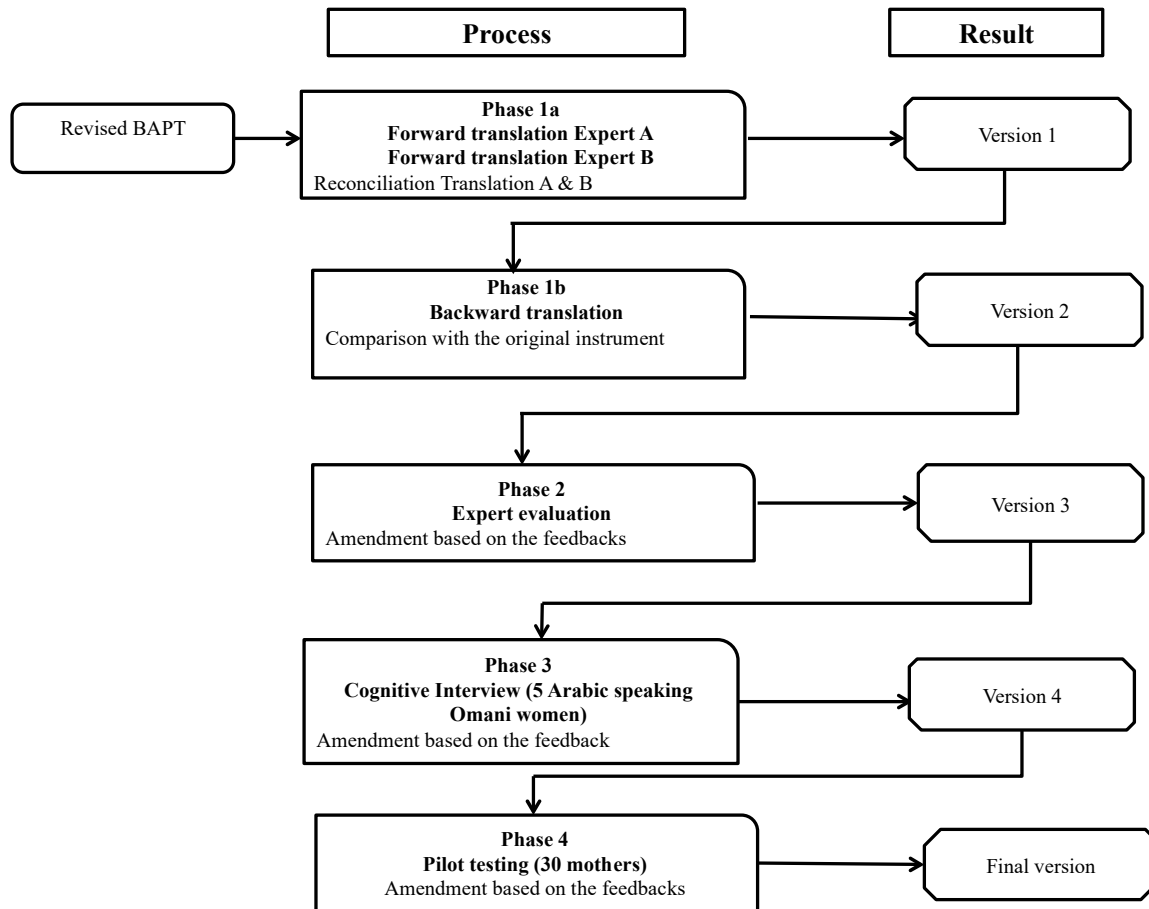
The analysis process adapted the use of the text-summary model, which Willis (2015) described as a summary of the dominant conclusions and problems apparent in the aggregated interview notes. The process included the first author reading through the notes of the interviews

and sorting the items into two categories. The decision about how to sort the items was made with regard to the purpose of the CIs to determine the readability and comprehension of the survey items. Therefore, the analysis focused on categorizing these items into two areas as follows: those requiring modification and no modification.

#### **Phase 4: Pilot Testing of the Translated Revised-BAPT**

We finally conducted a pilot test of the translated Revised-BAPT. This allowed us to assess the feasibility of administering the survey and potential issues in the data-collection protocol that would require refinement before implementing the actual study survey (Bullen & Brack, 2015). The results of this step were used to make final revisions to the questionnaires and data collection procedure.

A convenience sample of 30 Omani women who had breastfed before were selected from two major hospitals in Muscat, Oman in June 2016 for the pilot test. Postnatal mothers were invited to participate if they met the following inclusion criteria: (a) Omani nationality, older than 18 years of age, and had given birth to a healthy, single, full-term infant ( $\geq 36$  weeks and  $\geq 2,500$  g); (b) had initiated breastfeeding as a method of infant feeding during hospitalization; and (c) were able to read and write in Arabic and able to verbalize comprehension of the survey questions and instructions. In addition to completing the paper and pencil questionnaire, participants were requested to provide written or oral feedback if concerns arose about the meaning or readability of the questions. Thirty-three mothers were approached for the pilot test, and 30 agreed to participate. Participants ranged in age between 23 and 39 years, with a mean of 29.8 years. Participants had completed levels of education ranging from secondary education to postgraduate studies; Table 3.1 presents the demographic data of the study participants.



*Figure 3.1.* Validation process of the translation of the Revised-Breastfeeding Attrition Prediction Tool (Revised-BAPT), adapted from the Mapi Research Institute's (2002) linguistic validation methodology.

Table 3.1. *Characteristics of mothers and infants (n = 30) in a pilot test study to assess the Arabic Revised BAPT*

Variables	N	Mean	%	SD
<i>Hospital variables</i>				
Participants from Royal Hospital	18		60%	
Participants from Khaula Hospital	12		40%	
<i>Infant variables</i>				
Birth weight in kg		3.14		0.38
Male	15		50%	
Female	15		50%	
Gestational age in weeks		38.87		1.22
<i>Maternal variables</i>				
Age		29.83		3.85
Marital status				
Married	30		100%	
<i>Education</i>				
Secondary (10–12 years)	14		46.7%	
Collage Diploma, all types (1-2 years after secondary school)	8		26.7%	
Bachelor's degree	7		23.3%	
Master's or above	1		3.3%	
Number of children		1.47		1.50
<i>Employment status</i>				
Employed	17		56.7%	
Unemployed	13		43.3%	
<i>Family income in Omani Rials (1 Rial ≈ 2.59 US Dollars)</i>				
199	2		6.7%	
200–399	2		6.7%	
400–599	9		30.0%	
600–799	4		13.3%	
800–999	4		13.3%	
1000–1499	5		16.7%	
1500–1999	3		10.0%	
2000 and above	1		3.3%	
<i>Presence of servant(s) at house</i>				
Yes	12		55.6%	
No	15		44.4%	
Missing data	3		10%	

## Results

### Forward and Back Translation

There were no major differences between the two forward translations. In the few situations in which the two translations used different words to describe the same item, the translation that used simpler terms with words more appropriate for Omani culture was selected. For example, in item 23, one of the forward translations used the word *hamate*, which means “mother-in-law” in standard Arabic, and the other used the word *um-zuji*, a phrase describing a mother-in-law that is selected because it not only describes the actual relation, “my husband’s mother,” but also because *hamate* is not commonly used in Omani Arabic.

The term “breastfeeding” does not have a one-word equivalent in Arabic; instead, it translates as a process that either the mother or baby conducts. To be equivalent to the original English word, the BAPT tool used a translation that indicates a process that moves from mother to child (*irdha iltabiee*) rather than from child to mother (*ridha’ah iltabiea*). The reason the professional translators and the first author made this decision was because the BAPT tool primarily refers to breastfeeding as a process that the mother conducts.

The third, independent translator detected no mistranslations or inaccuracies in the comparison of the back translation and the original. The back-translation was very similar to the original version, with some items that were slightly different in wording but generally reflected the item’s original meaning. The result of this process was version 2 of the translated Revised-BAPT. Table 3.2 presents the two Arabic translations of selected Revised-BAPT items, the reconciled Arabic version, and the back translation of the items.

Table 3.2. *Two Arabic translations with the reconciled Arabic version and back translation of the Revised BAPT (selected items)\**

Item	Original English item	Arabic Translation 1	Arabic Translation 2	Reconciled Arabic version	Back Translation
Item 3	Formula feeding allows the mother more freedom. <sup>[17]<sub>SEP</sub></sup>	الإرضاع بالحليب - المُستحضَر يسمح للأم بحريّة أكبر.	الإرضاع بالحليب المُستحضَر يسمح للأم بحريّة أكبر.	الإرضاع بالحليب المُستحضَر يسمح للأم بحريّة أكبر.	Feeding infants with formula milk allows the mother more freedom.
Item 11	Breastfeeding makes returning to work more difficult. <sup>[17]<sub>SEP</sub></sup>	الإرضاع الطبيعي يجعل العودة إلى العمل أكثر صعوبة.	الإرضاع الطبيعي يجعل العودة إلى العمل أصعب.	الإرضاع الطبيعي يجعل العودة إلى العمل أكثر صعوبة.	Breastfeeding makes returning to work more difficult.
Item 16	Formula feeding lets the father become close to the baby.	الإرضاع بالحليب المُستحضَر يقرب الأب إلى طفله.	الإرضاع بالحليب المُستحضَر يجعل الأب أقرب إلى طفله.	الإرضاع بالحليب المُستحضَر يقرب الأب إلى طفله.	Formula milk feeding brings the father closer to his baby.
Item 18	Breastfeeding ties you down.	الإرضاع الطبيعي يقيد حركتك.	الإرضاع الطبيعي يقيد حركتك.	الإرضاع الطبيعي يقيد حركتك.	Breastfeeding ties up your movement.
Item 23	My mother-in-law thinks I should:...	تعتقد أم زوجي أنّ عليّ الإرضاع:	تعتقد حماتي أنّ عليّ الإرضاع:	تعتقد أم زوجي أنّ عليّ الإرضاع:	My mother-in-law thinks I should use: ...
Item 32	I won't need help breastfeeding.	لن أحتاج إلى مساعدة في الإرضاع بالرضاعة الطبيعية.	لن أحتاج إلى مساعدة في الإرضاع بالرضاعة الطبيعية.	لن أحتاج إلى مساعدة في الإرضاع بالرضاعة الطبيعية.	I will not need help breastfeeding.

Note. \*Six of 34 translated and validated items.

## Expert Evaluation

**Item relevance to Omani culture.** The relevance of the Revised-BAPT content to Omani culture was supported by the CVI's results. The results of the I-CVI calculations are presented in Table 3.3. The I-CVI values for all the items are within acceptable limits, ranging from .8 to 1.00. The result of the S-CVI/average across the 32 I-CVIs was .95. In addition, the

experts also commented on the overall content of the tool, and two experts suggested adding two items to the SPS subscale: the mother's close friends' and nurses' perceptions of breastfeeding.

Table 3.3. *Ratings on a 32-Item Scale by 10 Experts: Items Rated 3 or 4 on 4-Point represent an agreement and items rated 1 or 2 represent disagreement and not included in scoring. Scale of Relevance to Omani*

Item	Experts in Agreement	Item CVI
1	10	1.00
2	8	0.80
3	9	0.90
4	10	1.00
5	9	0.90
6	10	1.00
7	10	1.00
8	9	0.90
9	8	0.80
10	10	1.00
11	10	1.00
12	10	1.00
13	8	0.80
14	10	1.00
15	9	0.90
16	8	0.80
17	9	0.90
18	10	1.00
19	10	1.00
20	9	0.90
21	10	1.00
22	10	1.00
23	9	0.90
24	9	0.90
25	10	1.00
26	9	0.90
27	10	1.00
28	10	1.00
29	10	1.00
30	10	1.00
31	10	1.00
32	10	1.00
<i>Average I- CVI=</i>		<i>0.95</i>

*Note.* \* After Polit, Beck & Owen (2007).

Item-level content validity index (I-CVI); Scale-level content validity index averaging method (I-CVI/Average) = 0.95.

**Semantic equivalency.** The results of the evaluation of semantic equivalency for the translation of the BAPT are presented as issues one or more expert reviewers reported, suggestions expert reviewers offered, and the decisions we made based on the revision of the BAPT in version 3 (Figure 3. 1).

The term breastfeeding was translated by professional translators as *irdha iltabee*, which back translates as “natural nursing” in English and not as “breastfeeding.” However, according to the professional translator, the phrase was the most appropriate. The professional translation of the phrase breastfeeding *irdha iltabee*, however, was a phrase that was not commonly used in Oman, and expert reviewers suggested the phrase *ridha’ah iltabee*, which has a similar meaning. Moreover, the phrase “formula feeding,” translated into Arabic by professional translators as *halib mustahdhar*, back translated to “prepared milk.” This translation was the most appropriate Arabic translation, based on the comments the professional translators gave. However, the Arabic translation for “formula feeding” was a concern for two reviewers because it was not a common phrase used in Oman, and the use of the phrase *irdha’ estina’i* was suggested, which back translates to English as “synthetic nursing.” In this case, the first author used the term the experts suggested to describe formula feeding in Oman.

The translation of idioms, defined here as figurative expressions that cannot be interpreted literally (Al-Shawi & Mahadi, 2012), was based on the more natural Arabic expression for the phrases (Al-Shawi & Mahadi, 2012). In item 1 (*Breastfeeding is more convenient*), the concept of the convenience of performing a behavior translates to *mulaem*, which back translates as “appropriate.” The Arabic phrase *murih akthar* was a more natural Arabic expression for the English word “convenience,” and it back translates to “comfortable.” One expert suggested changing the phrase *murih akthar*; however, the expert could not come up



with a suitable word or phrase as a substitution, so the phrase was not revised. Another example of an idiomatic translation was the word “messy” in item 17 (*breastfeeding is messy*), which also does not translate well to Arabic. The phrase *fadhawi alhal*, or “messy situation,” was used to describe the process of breastfeeding. The use of the phrase “messy situation” to describe the idiom “messy” in item 17 was a concern for one reviewer. That reviewer suggested that the phrase *ghair nadheef* be used, which literally means “dirty” or “unclean.” The first author decided to use the original translation, as the words “dirty” and “unclean” did not describe the original intention of the BAPT. Item 18 (*Breastfeeding ties you down*) was another idiom, which was translated as *yuqiyed harakatak*. This idiom back translates to “breastfeeding restricts your movements,” which reflects the difficulty of understanding the idiom “ties down” in Arabic. However, the experts did not consider the translation of this phrase to be an issue.

### **Cognitive Interview**

When the participants were asked about the instructions for the scale, they commented that the instructions were clear and easy to understand. Nevertheless, one participant commented on the order of the choices on the Likert scale and suggested that the ranges should be from *strongly agree* to *strongly disagree* instead of from *strongly disagree* to *strongly agree* based on her familiarity with other forced choice questionnaires. The participants provided no other comments regarding the scale’s instructions. In general, the participants had no issues matching their desired answers to the response categories of the scale. The survey items were sorted into two categories: items requiring no modification or requiring modification.

**Items without modification.** In general, respondents were able to paraphrase the survey items to provide similar meanings to the original survey questions. In several cases, such as for questions 4, 10, and 20, when the participants were requested to paraphrase the questions and

asked if the questions were clear, three responded that the meaning was obvious and commented with responses such as *very easily understood*, *very clear*, and *it's obvious what the question asks*. No problems with comprehension or readability were reported except for items 5, 6, 13, 17, and 33. The decision was made to leave all of the survey items unmodified except for questions 5, 6, 13, 17, and 33.

**Items requiring modification.** Participants indicated concerns regarding the clarity of items 5, 6, 13, 17, and 33 and suggested minor wording or grammatical alterations (see Table 3.4). The first author made changes to these five items after conferring with two colleagues who are Omani nurses with Ph.D. and worked on previous tools translations. Table 3.4 provides a summary of the comprehension problem for the items before and after modifications and the resolutions.

Table 3.4. *The Resolution of Participants' comprehension issues arise during the cognitive interviews.* \*

Original English item	Arabic translation (version 3)	Comprehension problem	Number of participants identifying problems	Participants' suggested corrections	Arabic translation (version 4)
Item 5: No one else can help feed the baby when you breastfeed him or her.	لا أحد آخر يستطيع أن يساعد في إطعام الرضيع حين ترضعينه طبيعياً.	“Clear but requiring minor changes” “Sentence flow needs improvement” “Edit the grammar”	3	“Change the phrase <i>la ahad akhar yastateea</i> , which translates to ‘no one else can,’ to <i>la yastatia shakh akhar</i> , (the two are equivalent in meaning).” “Replace <i>tardhaeenahu tabeeyan</i> , which literally translates to ‘when you feed him/her naturally,’ to <i>tardhaeenahu bilredhaa altabeiya</i> , which literally means ‘when you feed this child with natural feeding’.”	لايستطيع شخص آخر مساعدتك في اطعام الرضيع حين ترضعينه بالرضاعه الطبيعية
Item 6: It is difficult to breastfeed the baby in public.	يصعب إرضاع الطفل بالرضاعة الطبيعية علناً.	“The word <i>alanan</i> , or ‘in public’ is high-level.” “The word <i>alanan</i> is too fancy for all mother to know.”	2	“Provide a description to rephrase <i>alanan</i> , which means ‘in public’.” “Add the phrase <i>amam elnase</i> , which means ‘in front of others’.”	يصعب إرضاع الطفل بالرضاعة الطبيعية علناً أو أمام الناس.

Item 13: When you breastfeed your baby, you can never know if s/he has enough milk.	- حين تُرضعين طفلك طبيعياً لا تعرفين أبداً إن كان يتناول ما يكفي من الحليب.	“The sentence is grammatically accurate, but the flow is not good.” “The sentence’s flow and ease of reading needs improvement.”	2	“Add an adverb to the item from <i>la taarifeen</i> , which means ‘you will never know,’ to <i>la tastateen an taarifin</i> , which translates to ‘you will not be able to know’.”	- حين تُرضعين طفلك طبيعياً لا تعرفين إن كان يتناول ما يكفي من الحليب.
Item 17: Breastfeeding is messy.	الرضاعة الطبيعية فوضوية الحال.	“Is this what this means...” “Do you mean...” “Not clear.” “Not sure what the item meant.”	4	“Edit the item to <i>elridha eltabieya tajal alum fi halat fawdh</i> , which translates to ‘breastfeeding places the mother in a messy situation’; this way, the sentence makes more sense.”	الرضاعة الطبيعية تجعل الأم في حالة فوضوي.
Item 33: Breastfeeding is easy.	الإرضاعة الطبيعية سهلة.	A typo	4	Participants pointed out the typo.	الرضاعة الطبيعية سهلة.

Note. \*Five of 34 translated and validated items.

## **Pilot Test**

During the pilot test, there were no readability or comprehension issues reported by the participants. There were eight reports of a typo in item 30; which was corrected. The overall reliability coefficient (Cronbach's  $\alpha$ ) for the Revised-BAPT for the current study is .83. The subscales were *attitude* (PBS and NBS, combined), SPS, and BFC. The Cronbach's  $\alpha$  coefficients were .78, .89, and .93, respectively. The negative items for *attitude* were reversed before running the reliability test. When the Cronbach's  $\alpha$  for the positive and negative items on the *attitude* subscale were assessed separately, the results were PBS = .31 and NBS = .83.

## **Discussion**

Well-translated and validated measurements are essential to enable the cross-cultural comparison of research results (Collins et al., 2001; Hilton & Skrutkowski, 2002). This paper focused on the translation of the Revised-BAPT from English to Arabic in four phases: (1) translation process, (2) expert evaluation using CVI, (3) CI, and (4) pilot testing. The phases included in this paper were specifically targeted to achieve a more comprehensive cross-culturally appropriate adaptation (including translation and linguistic validation) of the translated Revised-BAPT. The back-translation process was used because it provided higher quality than a direct translation; it minimizes bias that may have resulted from the two forward translations (Hilton & Skrutkowski, 2002; Streiner, Norman, & Cairney, 2014; Thicke, 2011). The CVI provided feedback on the appropriateness of the content of the Revised-BAPT for Omani culture. The results suggest that the contents of the scale are highly acceptable in relation to cultural relevance (Polit et al., 2007). Based on the results of the I-CVI and S-CVI, the Revised-BAPT items were not altered for content. The overall reliability results were comparable to what other researchers have reported, with ranges from .77 to .86 (Dick et al., 2002; Gill et al., 2007; Janke,

1992). In this study, when the *attitude* subscale combined both the negative and positive items into one subscale, the Cronbach's  $\alpha$  of the subscale was .78. However, when the positive and negative items were run as separate *attitude* subscales, the Cronbach's  $\alpha$  for the positive items decreased dramatically to .31, and the negative items were at .83. A factor analysis will be conducted in the future to determine latent variables or the presence of common variances among items in a subscale of a larger sample size (Yong & Pearce, 2013).

The experts' evaluations also provided information on the overall relevance of the tool's content for Omani culture. Experts in this study contributed to better understanding of the intended meaning of words in Arabic culture, subsequently adding to the cross-cultural validation of the translations. The experts' comments about adding two items to the SPS subscale to include perceptions of the mother's close friends and nurses of breastfeeding contributed to the decision to add the items to the tool for a total of 34 items. Others who are close to the mothers, including friends and nurses, impact mothers' decisions about infant care (Bai, Middlestadt, Joanne Peng, & Fly, 2009; Swanson & Power, 2005). These two items were included in the original version of the BAPT but were deleted in the Revised-BAPT. The people who are most influential over mothers' breastfeeding decisions vary by ethnicity (Janke, 1992). The decision to include the mothers' close friends and nurses was also to explore the significance of these individuals in Omani culture in future studies.

The cultural appropriateness of words used in the translated tool was recognized during the forward and back translation of the BAPT. For example, the professional translators reported that the word "mother-in-law" should be translated into standard Arabic as *hamati*, but because in Gulf countries this might be confused with a local colloquialism (they call mothers-in-law "aunts"), the translators and the first author agreed to use the literal expression "my husband's

mother” to describe the mother-in-law. Moreover, the above examples illustrate that words are culturally bound. In this situation, the equivalent word that was most appropriate for the culture was used over the more common dictionary meaning (Hassan, 2014). This adds to the importance of understanding a particular culture to recognize the intended meaning of words (Al-Shawi & Mahadi, 2012) subsequently adding to the cross-cultural validation of the translation.

The translation process was directed to attain semantic equivalency of content and meaning between the translation and original tool and to emphasize the cultural appropriateness of the translation rather than provide a mere word-by-word translation (Hassan, 2014). This aim was visible throughout the translation process. Translation of idioms or figurative expressions was an issue that arose in attempts to establish the semantic equivalency of the translated tool. Translating idioms from English into Arabic requires an understanding of the culture of the target language, as idioms often cannot be translated directly because the conceptual meaning in the translation is not equivalent (Al-Shawi & Mahadi, 2012). The concept of “messy” required particular attention throughout the translation process and expert evaluations because it encompassed a concept that was not familiar in Omani culture. Concerns about the concept of “messy” were taken into account during the earlier phase of the translation process, yet it was still an issue during the CIs. We also benefited by seeking additional confirmation from colleagues during the decision-making process regarding items’ clarity. Even though this step was not planned during the translation process, it was beneficial for decision-making, as the first author was the only member who was bilingual in Arabic and English among the investigators.

The process of CI aimed to assess the appropriateness of the tool for Omani culture by selected a sample of Omani mothers to for feedback. The CI also provided with an opportunity to

assess the clarity of the translated tool before the pilot test and modify problematic items. During the CIs respondents reported that most items were clear and easily understood. In some situations participants were unable to provide further interpretation of an item because they thought the meaning was apparent.

### **Strengths and Limitations**

This study is the first Arabic translation of the Revised-BAPT. The study strength is the use of a systematic process of translation and validation of the Revised-BAPT. We executed various validation steps to produce Arabic version conceptually equivalent to the original English version. These steps were set not only to verify the accuracy of translation of the tool but also assess the cultural adaptability of the tool.

The issue of cultural appropriateness of words used in translation was recognized much earlier, during the translation and back translation of the Revised-BAPT. Moreover, words are culturally bound. In various circumstances, the most suitable equivalent word appropriate for the culture was used over the more common dictionary meaning. This study had several limitations. First, phase 4 was a pilot test and thus included a limited number of participants to validate the translation and assess the readability of the BAPT. Second, due to cultural reasons, the mothers included in the translation process and the pilot test were all married. Marital status as a variable was not expected to vary among Omani mothers and could potentially confound the data on breastfeeding practices in the population because all mothers were expected to be married in this all-Muslim culture. Therefore, the translated tool might need further testing if applied to a different Arabic-speaking culture that does not meet this criterion. Finally, the participants included in the translation process and pilot test were well educated. Testing the tool among



individuals of other social and educational levels is necessary to determine the general applicability of the translated Revised-BAPT.

### **Conclusion**

This study was a systematic evaluation of the translation of the Revised-BAPT tool into Arabic and should not be understood as validating any predictions about the instrument's performance in Arabic. The systematic translation process and cross-cultural adaptation used in this paper minimizes threats to validity that might occur due to a translation. The results of examining the semantic equivalence of the translated tool provided an opportunity to identify and resolve potential comprehension issues of the translated instrument. Overall, this was the first translation of the tool and results point toward readiness of the Revised-BAPT to be used in Arabic. More studies with larger sample sizes and different Arabic cultures are needed to fully validate the tool's functionality.

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## **CHAPTER 4: PREDICTING BREASTFEEDING INTENTION AND INTENSITY IN OMAN USING THE THEORY OF PLANNED BEHAVIOR: A STRUCTURAL EQUATION MODELING APPROACH**

Optimal breastfeeding practices directly influence the nutritional status, the development, and the survival of children (United Nations Children's Fund [UNICEF], 2012). 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, with the exception of oral rehydration solutions, drops, syrups, vitamins, minerals, or medicines during that time (World Health Organization [WHO], 2008). The UNICEF data suggested an increase in the rates of EBF in infants younger than 6 months in most developing countries, with the rate increasing from 33% in 1995 to 39% in 2010 (Cai, Wardlaw, & Brown, 2012). Nevertheless, this percentage was still much lower than both the broadly accepted "universal coverage" target of 90% suggested by Jones et al., (2003) and WHO's 2025 desired goal of 50% (Cai et al., 2012; WHO & UNICEF, 2014). In Oman, the MOH reported that in 2015, 93.4% of mothers exclusively breastfed after the birth; however only 11.8% of mothers were still exclusively breastfeeding when the infants were 6 months old; this is lower than the average in developing countries (Department of Health Information & Statistics, 2015). Rates of EBF during the first 6 months have declined over time: 31.3% in 2005, 16.2% in 2010, and 11.8% in 2015. The decrease is accompanied by a noticeable upsurge in the use of formula feeding: 60.7% in 2005, 81.6% in 2011, and 87.8% in 2015 (Department of Health Information & Statistics, 2015).

UNICEF (2015) reported that almost half of the deaths of children under 5 years old worldwide were attributed to undernutrition. Oman, a developing country in the Arabian Gulf Peninsula, saw its mortality rate for children under 5 years of age drop dramatically over the past decade from 39 per 1,000 live births in 1990 to 12 per 1,000 in 2015 (UNICEF, 2015). This rate was much lower than the global rate of 43 per 1,000 in 2015 (UNICEF, 2015). The improvement has been attributed to the country's development in the health-care sector, especially in primary care (UNICEF, 2012).

Despite this, Oman still has a noticeable prevalence of conditions related to childhood malnutrition. The Oman Ministry of Health (MOH) reported that wasting— or -2 below the standard deviations from median weight for height of reference population (UNICEF Definitions, n.d.)— among infants at two months is 3.4% and 53.9% of infant at nine months are have anemia— or hemoglobin > 11.0 grams/decilitre (Department of Health Information & Statistics, 2015).

Studies have associated maternal breastfeeding outcomes with mothers' beliefs and intentions about infant feeding (Avery, Duckett, Dodgson, Savik, & Henly, 1998; Bai, Middlestadt, Peng, & Fly, 2010). This association aligns with the theory of planned behavior (TPB), which indicates that mothers' attitudes, subjective norms, and perceived control will positively or negatively contribute to their intention to breastfeed (Ajzen, 1991). This intention will subsequently influence mothers' infant-feeding outcomes. Although many studies have considered the maternal belief variables that influence breastfeeding outcomes, no published studies to date have focused on examining breastfeeding beliefs among Omani mothers.

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% (EBF; Piper & Parks, 2001). In this study, we used the TPB to examine the effects of sociodemographic factors, maternal breastfeeding knowledge, belief variables (attitudes, subjective norms, and perceived control), and maternal perceptions of early breastfeeding support on breastfeeding intentions at birth and breastfeeding intensity at 8 weeks postpartum.

### **Framework**

According to the TPB, individual behaviors are largely determined by belief variables, including attitudes toward desired behaviors, subjective norms, assumptions that individuals care about how their behaviors are viewed by others, perceived control over desired behaviors, and perceived ease or difficulty in performing desired behaviors (Ajzen, 1991). These belief variables influence breastfeeding intention and, subsequently, breastfeeding intensity (Figure 4. 1).

In addition to the TPB's concepts, we also assessed how the early breastfeeding support (EBFS) mothers received during hospitalizations affected 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 (WHO, 2009). Pérez-Escamilla, Martinez, and Segura-Pérez (2016) 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. Oman's governmental hospitals were BFHI-certified in the 1990s (Al-Asfoor, 2008), and although these hospitals are no longer BFHI-certified, elements of the ten steps are still in practice.

We also examined the effects of mothers returning to work or to school on both the intensity of breastfeeding practice and on maternal belief variables. Returning to work was a

commonly reported breastfeeding barrier and a reason why mothers introduced formula feeding and early weaning (Chen & Chi, 2003; Lewallen et al., 2006; Sloan, Sneddon, Stewart, & Iwaniec, 2006). Women in Oman are entitled to 50 days of paid maternity leave (Labour Law, 2012); in 2010, the EBF rates in Muscat, the capital of Oman, dropped from 92% at birth to 61% at 8 weeks postpartum (Department of Nutrition, 2010).

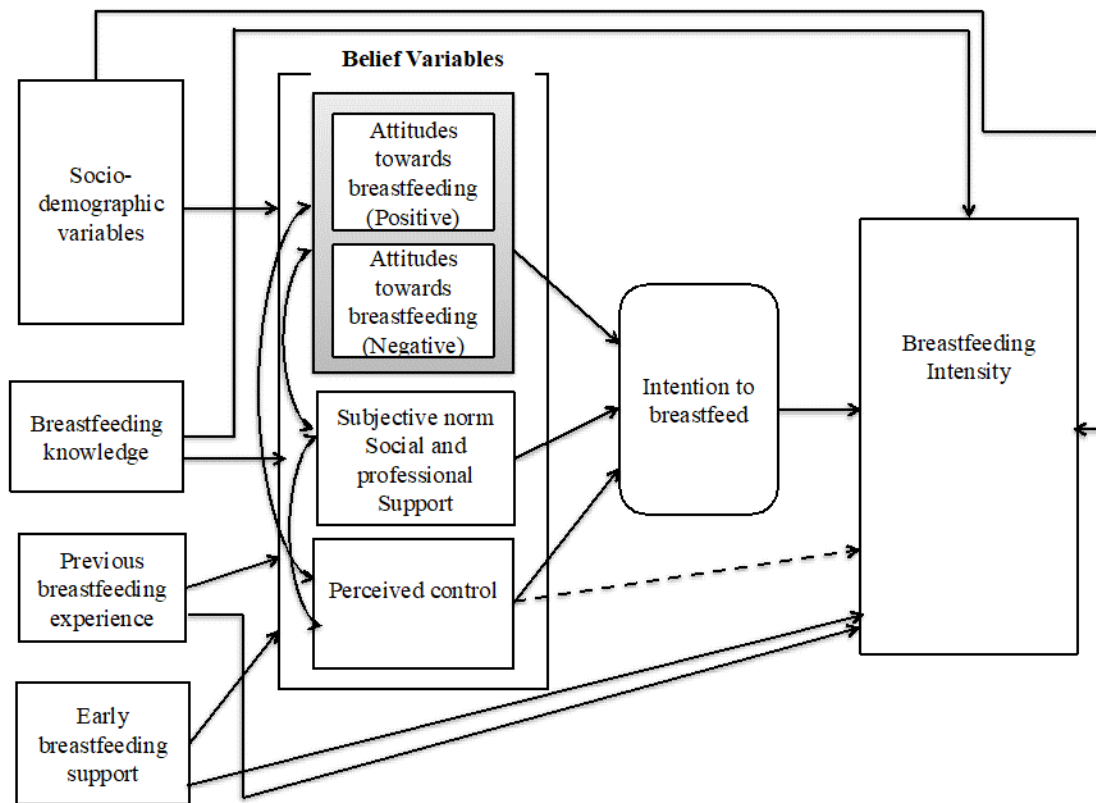
We explored maternal breastfeeding knowledge and previous breastfeeding experience (PBFE) as contributors to explaining maternal belief variables and breastfeeding intensity. Knowledge of the benefits of breastfeeding is associated with significantly higher rates of breastfeeding infants (Khoury, Moazzem, Jarjoura, Carothers, & Hinton, 2005). Mothers who had previously breastfed were more likely to practice EBF with their second children for longer periods (Bai, Fong, & Tarrant, 2015; Phillips, Brett, & Mendola, 2011).

Finally, we explored the influences of the most commonly reported sociodemographic variables (e.g., maternal age, family income, and education level) on maternal belief variables and breastfeeding outcomes (de Jager, Skouteris, Broadbent, Amir, & Mellor, 2013; Dennis, 2002). We expected the results of our study to increase the understanding of mothers' breastfeeding intentions and belief variables that contributed to the lower rates of breastfeeding in Oman.

## **Method**

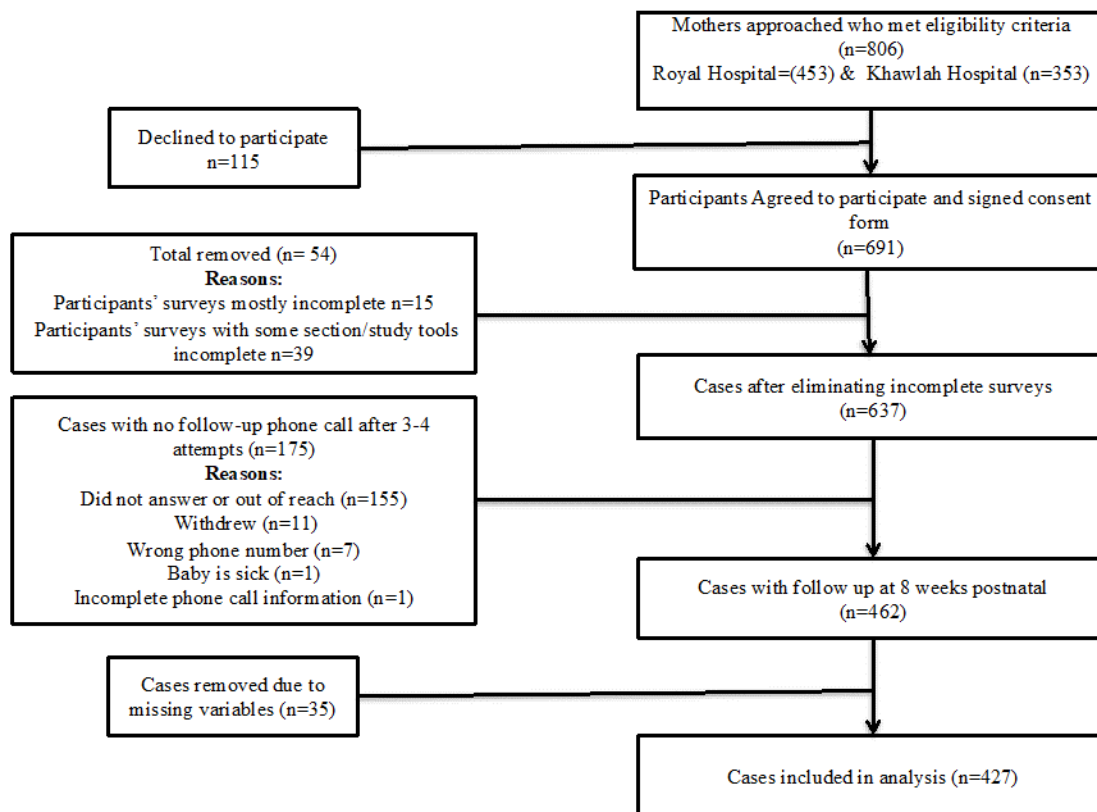
This descriptive, prospective cohort study was designed to collect data from participants during postpartum hospitalization and at 8 weeks postpartum. We used purposive sampling to recruit from the postnatal wards of Royal and Khawlah, which are the main hospitals in Oman's capital, Muscat. We collected data between May and December 2016. We used structural equation modeling (SEM) to examine the relationship among the study's variables.





*Note:* Observed sociodemographic variables included were: mother's age, hours spent away from child, children in the home, adults in the home, servants in the home, gestational age, birth weight, monthly income, maternal educational level, type of delivery, sex of the baby, and whether the mother returned to work or school after delivery and hospital (Khawlah vs. Royal), Previous breastfeeding experience represented by: breastfeeding experience in months and a binary variable indicating whether the mother had previous breastfeeding experience or not, and a continuous variable where higher values indicate more successful previous experience.

*Figure 4.1.* The initial structural equation model. Adapting the theory of planned behavior to determine breastfeeding intensity in Omani mothers.



*Figure 4.2.* Flow diagram of participants enrollment at postpartum hospital discharge and follow-up at 8 weeks postpartum

Mothers were recruited on their day of discharge from the hospital if they met the following criteria: they were Omani; were over the age of 18; had given birth to healthy, full-term singleton infants; initiated breastfeeding during hospitalization; were able to read Arabic; and had phones with texting capabilities. Participants were excluded if they or their infants had physical conditions that might have interfered with breastfeeding.

The sample size was based on the ideal recommended ratio of 20 cases per variable in a structural equation model (Jackson, 2003). The recommended sample size was  $n = 400$  (20 variables times 20 cases). We over-recruited for a total of 691, thereby allowing up to 42% follow-up failure and incomplete cases. We obtained ethical approval from the Institutional

Review Board at the University of North Carolina at Chapel Hill and from the MOH in Oman prior to initiating the study.

## **Measures**

### **Maternal Belief Variables**

Maternal attitudes, subjective norms, and perceived behavior control directed toward feeding infants were measured using the revised Breastfeeding Attrition Prediction Tool (revised-BAPT; Gill, Reifsnider, Lucke, & Mann, 2007). This self-report Likert scale-type tool was originally developed to identify women likely to wean their babies early (Janke, 1992). We defined attitudes as maternal beliefs about infant feeding, which included the advantages and disadvantages of both breastfeeding and formula feeding. Attitudes were represented by subscales for positive breastfeeding sentiment (PBS) and negative breastfeeding sentiment (NBS). Subjective norms, represented by the social and professional support (SPS) 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 behavior control, which we measured with the breastfeeding control subscale (BFC), was operationalized as the mother's beliefs about the ease or difficulty associated with breastfeeding and formula feeding (Janke, 1992).

The BAPT has been tested in various studies, with the results 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 .76 to .86 (Dick et al., 2002; Gill, 2009; Janke, 1992). The results of these studies also support the tool's construct and predictive validity (Dick et al., 2002; Ryser, 2004). The revised-BAPT contains 32 items on a 3-point Likert scale and was used to assess mothers' belief variables. We altered the

tool to a 4-point Likert scale in order to attain more variability in the scores. We also added two items to the SPS subscale to include the perceptions of the mother's close friends and the nurses, yielding a total of 34 items. We systematically translated the revised-BAPT to Arabic. The reliabilities of the subscales in this study were  $PBS = .74$ ;  $NBS = .81$ ;  $SPS = .89$ ; and  $BFC = .89$ . The scores for subscales, which were calculated as the averages of the items within the PBS, NBS and BFC subscales, ranged 1–4 and the range with SPS was 1–3. The higher NBS scores indicate more negative attitudes toward breastfeeding, and higher PBS scores indicate greater positive attitudes toward breastfeeding. Higher SPS scores indicate greater support for breastfeeding, and higher BFC scores indicate a mother's greater sense of control over her breastfeeding abilities (Janke, 1992).

### **Maternal Infant Feeding Intentions**

Collected at baseline, the maternal infant feeding intentions (IFI) 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 (Nommsen-Rivers & Dewey, 2009). The tool consists of five 5-point Likert scale questions to determine the mother's breastfeeding intentions at 1, 3, and 6 months. The scale's original developers determined its Cronbach's alpha in two studies to be .70 and .90 (Nommsen-Rivers & Dewey, 2009; Nommsen-Rivers, Cohen, Chantry, & Dewey, 2010). The total IFI score ranges from zero (no intention to breastfeed at all) to 16 (very strong intention to EBF for 6 months). A team of Arabic researchers translated the scale and determined Cronbach's alpha for the Arabic version in two studies to be .90 and .82 (Al-Ali, Hatamleh, & Khader, 2012; Yehya et al., 2017).

## **Maternal Breastfeeding Knowledge**

We developed the breastfeeding knowledge scale (BFKS) to assess mothers' awareness of the WHO-recommended breastfeeding practices (WHO, 2015). The questions include practice recommendations focused exclusively on breastfeeding for 6 six months and the benefits of breastfeeding. The tool consists of 12 true or false questions. We used the results of a pilot study on 30 mothers to establish the tool's readability and adaptability. We scored the tool 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-20 (K-20) was used to estimate internal consistency, which was 0.39. This low reliability was contributed to the items measure multiple aspects of breastfeeding knowledge that were not necessarily closely related.

## **Early Breastfeeding Support**

We adapted a tool developed by a lactation expert who assesses hospital practices of breastfeeding support to measure maternal perceptions of EBFS (Labbok, personal communication, October 29, 2015). The items included in this tool represent eight elements of BFHI: maternal breastfeeding support; implementation of skin-to-skin contact with an hour post-vaginal or cesarean delivery; teaching of hand expression; assistance with breastfeeding; practice of rooming-in; feeding on cue; providing information on EBFS at discharge; and prenatal education (WHO, 2009). We did not assess breastfeeding support groups or pacifier use in the tool because these groups are not established and use of pacifiers are not available in the Omani government hospitals. One point was awarded for each BFHI element to which the mother responded “yes,” yielding scores ranging from 0–9, with higher scores indicating favorable

breastfeeding hospital practices. The internal consistency using K-20 was .45, which could be because the elements of BFHI were not expected to be strongly interrelated.

### **Breastfeeding Intensity**

We collected infants' dietary intake through phone interviews, collecting data for all 1-hr intervals over the preceding 24 hr. We revised the dietary recall survey from the child dietary recall of the Nutrition Obesity-Research Centers Diet and Physical-Activity-Core NIH grant at the University of North Carolina at Chapel Hill. We operationalized breastfeeding intensity as the percentage of feeding from 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 mothers who answered "yes" to prior breastfeeding experience rated the success of this experience on a scale from 1 to 4 ("not at all successful," "slightly successful," "moderately successful," or "very successful") and reported the duration of breastfeeding, in months, of their last child.

### **Sociodemographic Variables**

The sociodemographic variables included the mother's age, number of living children, daily hours spent away from the infant during the postpartum period, gestational age (weeks) at the time of delivery, infant's birth weight (kilograms), length of hospital stay in days, number of children under 18, and number of adults living at home. Categorical variables included the monthly household income of the parents, mother's educational level, mother's employment or

school status, type of delivery, infant's sex, and presence of servants at home. We added the two hospitals (Khawlah vs. Royal) to assess variations in breastfeeding outcomes.

The data collectors obtained a list of mothers who met the recruitment criteria from the charge nurses of the postpartum units. The data collectors then approached mothers who met the recruitment criteria and asked whether they would be interested in participating. After obtaining the participants' consent, the data collectors administered the study's baseline survey and provided the 24-hr infant dietary recall sheet to take home. At 8 weeks postpartum, we sent participants text messages to remind them about the follow-up interviews and to ask them to take notes on the 24-hr infant dietary recall sheet on the day of their phone interviews. On the day of the interview, the data collectors recorded the infant's dietary intake using the 24-hr recall sheet.

### **Analysis**

We conducted the analyses in SPSS-24.0 and Amos-22 IBM®. We performed a confirmatory factor analysis (CFA) on the revised-BAPT to ensure that it was appropriate for this population. We used the acceptable standard of a comparative fit index (CFI)  $> 0.90$  and root mean square error approximation (RMSEA)  $< .08$  to assess the fit of our final model (Hooper, Coughlan, & Mullen, 2008). We constructed an initial SEM that included all observed study and sociodemographic variables with paths drawn according to the proposed study framework (Figure 4.1). The fit of the SEM was evaluated with the CFI and the RMSEA, as in the CFA described above. We revised the initial model by removing the nonsignificant sociodemographic variables to attain the final model. We reported model modifications as well as path coefficients and  $p$  values from the final model using a significance level of 0.05.

## Results

A total of 691 mothers agreed to participate at hospital discharge. Among these mothers, 54 mothers returned incomplete forms. We lost 175 at follow-up, and 35 participants did not provide sufficient data to score the EBFS, revised-BAPT, or IFI, yielding 427 cases for analysis (Figure 4.2).

The descriptive statistics are given in Table 4.1. The mean maternal age was 30.7 years (standard deviation [ $SD$ ] = 5.0), and 45.2% ( $n = 209$ ) reported having a 2-year college degree or above. The mean length of hospital stay was 2.3 days ( $SD = 1.4$ ). The majority of the mothers ( $n = 396$ ; 85.7%) had vaginal deliveries. The mean infant birth weight was 3.09 kg ( $SD = 0.36$ ), and the mean gestational age at the time of delivery was 38.9 weeks ( $SD = 1.1$ ). A total of 135 mothers (29.2%) reported this was their first pregnancy. Nearly half the mothers ( $n = 193$ , 45.2%) reported returning to work or school. The length of maternity leaving for working mother was 54.7 days ( $SD = 14.9$ ) and the length of time away from school was 104 days ( $SD = 144.9$ ).

During postpartum hospitalization, one-third ( $n = 154$ , 33.3%) of mothers reported that their babies had received formula milk. Formula consumption varied by hospital, with 46.3% ( $n = 100$ ) receiving it at Royal compared to 24.2% ( $n = 54$ ) at Khawlah. The majority of mothers introduced formula by 8 weeks postpartum ( $n = 308$ , 66.7%). Among the mothers who introduced formula, one-quarter ( $n = 76$ , 24.7%) reported formula introduction by the first week postpartum. Some mothers reported more than a single reason for formula introduction; the most common reasons were: perception of insufficient breast milk supply ( $n = 133$ , 43.1%); breast milk alone does not satisfy the baby ( $n = 113$ , 36.7%); being away from the baby for long periods of time ( $n = 87$ , 28.3%); and to get the baby used to formula milk before the mother resumes work or away for long periods of time ( $n = 41$ , 13.3%). At the time of the 8-week interview,



slightly more than one-quarter ( $n = 126$ , 27.3%) of mothers practiced EBF; some ( $n= 69$ , 14.9%) gave water, juices, or herbs in addition to breastfeeding and breast milk. Most mothers ( $n= 264$ , 57.1%) gave formula milk and/or solids in addition to breastfeeding, breast milk, water, juices, or herbs. Only three mothers (0.6%) completely stopped breastfeeding their babies, while 41 mothers (8.9%) reported giving food/juices (e.g., biscuits, orange juice and honey) during the first 8 weeks. Also, 19.1% ( $n=88$ ) mothers reported giving herbs (e.g., aniseed and fennel).

Table 4.1. *Descriptive statistics for categorical variables*

Variable	N	Percent	Mean (SD)*	Range
Length of hospital stay in 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			9.3 (1.5)	4-12
Intention to breastfeeding score			10.2 (3.46)	2-16
Number of hours per day mother spent away from infant for all mothers			3.3 (3.5)	0-12
Hospital				
Khaula	231	50.0		
Royal	231	50.0		
Monthly income (two parents)				
Under OR 800**	217	47.0		
OR 800 and above	205	44.4		
Missing/No response	40	8.7		
Education				
High school diploma or bellow	253	54.8		
Two year college degree or above	209	45.2		
Type of delivery				
Vaginal	396	85.7		
Section	64	13.9		
Missing/No response	2	0.4		
Sex of baby				
Boy	245	53.0		
Girl	217	47.0		
Return to works or attends school				
Yes	193	45.2		
No	224	52.5		

Missing/No response	10	2.3
Marital status		
Married	460	99.6
Missing/No response	2	0.4
Number of previous children not including current delivery		
0	135	29.2
≥1	320	69.3
Missing	7	1.5
Did hospital give formula milk?		
No	285	61.7
Yes	154	33.3
Missing/No response	23	5.0
Did mother give formula milk? <sup>b</sup>		
Yes	308	66.7
No	151	32.7
Missing/No response	3	0.6
Presence of one or more servants at home		
Yes	230	49.8
No	217	47.0
Missing/No response	15	3.2
Previous breastfeeding experience		
Yes	328	71.0
No	132	28.6
Missing/No response	2	0.4

*Note.* \*SD: standard deviation; \*\*OR: Omani Rial (1OR=2.59 US dollars); <sup>a</sup> Data presented in table was collected during postnatal discharge; <sup>b</sup> Data collected at 8-weeks follow-up

The results of CFA on the 588 baseline cases with complete data confirmed the validity of the revised-BAPT in our sample. All latent variables in the CFA were allowed to covary. The initial model had low fit based on the CFI (.83) but acceptable fit based on the RMSEA (.06). The modification indices revealed that three pairs of error terms for items pertaining to subjective norms could be covaried to improve model fit. The revised model applying the modification indices demonstrated good fit ( $CFI = .90$ ,  $RMSEA = .05$ ).

## Structural Equation Modeling Model Fit and Modification

In the main model, positive attitude (seven indicators), negative attitude (13 indicators), subjective norms (seven indicators), and perceived control (seven indicators) were latent variables. An initial model was constructed that included all observed study variables with paths drawn according to the proposed research model (Figure 4.1). Covariances were drawn between the error terms for positive attitude, negative attitude, subjective norms, and perceived control. The continuous and PBF variables were also allowed to covary. The initial model had less-than-acceptable fit ( $CFI = .42$ ,  $RMSEA = .15$ ). We examined the path coefficients to simplify the model and removed the sociodemographic variables that were not significantly associated with intensity. Returning to work or school had a significant negative direct path to intensity ( $p = .001$ ), thus it was retained, but all others were dropped. The final model (Figure 4.3) had excellent fit ( $CFI = .98$ ,  $RMSEA = .05$ ).

## Maternal Belief Variables and Breastfeeding Intentions

The final model supports the hypothesized direct links between the belief variables, returning to work or school, BFKS, and breastfeeding intensity. The model also supports a direct link between EBFS, intention, and breastfeeding intensity. The estimates of the correlation coefficients ( $r$ ) and standardized regression coefficients ( $\beta$ ) are presented in Figure 4.3 and Table 4.2.

Participants with higher breastfeeding knowledge had significantly higher scores on positive attitude ( $p = .02$ ), subjective norms ( $p = .001$ ), and perceived control ( $p = .03$ ), and significantly lower scores on negative attitude ( $p < .001$ ). Returning to work or school was significantly associated with higher scores on positive attitude ( $p = .04$ ) and higher score on negative attitude ( $p = .003$ ), and lower scores on subjective norms ( $p < .001$ ).

Higher positive attitude ( $p = .007$ ), subjective norms ( $p < .001$ ), and perceived control ( $p = .005$ ) and lower negative attitude ( $p < .001$ ) were associated with significantly greater intention to breastfeed.

Table 4.2. *Standardized estimates ( $\beta$ ) for the final structural equation model*

Variable	Positive attitude	Negative attitude	Subjective norms	Perceived control	Intention to breastfeed	Breastfeeding intensity
Positive attitude	-	-	-	-	1.12**	-
Negative attitude	-	-	-	-	-1.18***	-
Subjective norms	-	-	-	-	2.73***	-
Perceived control	-	-	-	-	.99**	5.43**
Intention	-	-	-	-	-	0.69**
EBFS	-0.01	0.02 <sup>#</sup>	-0.01	-0.02	-	-1.59***
BFKS	0.03*	-0.08***	0.04***	0.04*	-	1.08 <sup>##</sup>
Returning to work or school	0.08*	0.13**	-0.15***	-0.07	-	-6.01***

Note. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; <sup>#</sup> $p = .051$ ; <sup>##</sup> $p = .052$

BFKS: breastfeeding knowledge scale; EBFS: early breastfeeding support

### Breastfeeding Intensity

Participants with greater intention to breastfeed had significantly higher breastfeeding intensity ( $p < .006$ ). Mothers who returned to work or school had lower breastfeeding intensity ( $p < .001$ ), as did mothers who received higher EBFS ( $p < .001$ ).

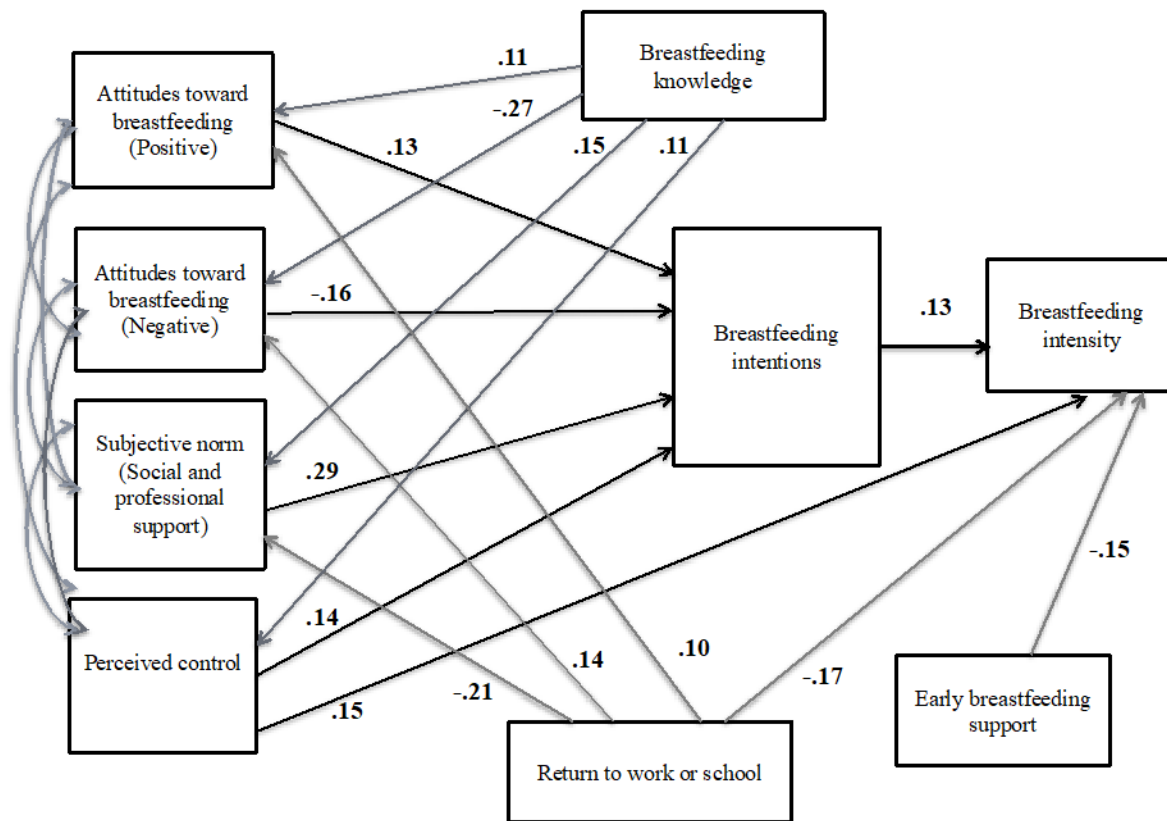


Figure 4.3. Final model of factors in the pathway for breastfeeding intention at postpartum hospital discharge and breastfeeding intensity at 8 weeks postpartum in Omani mothers (N=427). Only significant coefficients ( $r$ ) are shown.

## Discussion

In this study, although all mothers initiated breastfeeding at the time of birth, about a quarter of the mothers reported that their babies were given formula by hospital staff at least once during postpartum hospitalization. The MOH statistics confirm a high rate of breastfeeding initiation with 93.4% of mothers initiating breastfeeding (Department of Health Information & Statistics, 2015). This rate of initiation, however, only indicates breastfeeding at the time of birth and is not a sufficient indicator of the breastfeeding rate during the period of hospitalization. The rate of early breastfeeding initiation is higher in Oman than the global average of 45% (UNICEF, 2016). This is probably due to the implementation of some BFHI

policies of early initiation and rooming-in for all low-risk infant-mother dyads, as the implementation of BFHI has demonstrated its effectiveness in improving initiation rates in the U.S. hospital setting (Philipp et al., 2001).

The share of mothers reporting formula consumption at 8 weeks postpartum (66.7%) doubled from the percentage who reported it during postpartum hospitalization. Almost one-quarter of these mothers introduced formula by one week postpartum. Even though more than half of the mothers introduced formula, only three mothers reported that they stopped breastfeeding. The first few weeks of breastfeeding are important for the long-term success of breastfeeding because early supplementation with formula is associated with early breastfeeding weaning (Hill, Humenick, Brennan, & Woolley, 1997). Our results indicate that only 27.3% of mothers were exclusively breastfeeding at 8 weeks postpartum. At this rate, Omani mothers are falling behind the goal of achieving an EBF rate of at least 50% at 6 months set by the WHO with a target date of 2025 (WHO & UNICEF, 2014).

Mothers in this study reported various reasons for the introduction of formula. The majority of them reported “insufficient breast milk” and “breast milk did not satisfy the infant,” and other studies have reported similar reasons for formula introduction (Bai, Middlestadt, Joanne Peng, & Fly, 2009; Bartick & Reyes, 2012). Other mothers reported “being away from infant for long period of time,” “returning to work,” and “preparing the baby so he/she was accustomed to formula for future separations.”

Returning to work or school was the only sociodemographic variable that was significant in our model. The non-significant statistical contribution of the other sociodemographic variables on our model could be explained by lack of disparities on health might not be visible in Oman, where health care and basic education are available for free to Omani citizens and the

provision of welfare benefits people in need. In addition, public higher education is free for Omani citizens, and private higher education is highly subsidized by the government (Baporikar & Shah, 2011).

The negative association between maternal employment status and breastfeeding outcomes has been identified in multiple studies (Lewallen et al., 2006; Schwartz et al., 2002). Returning to work or school is perceived as a barrier to breastfeeding (Andrew & Harvey, 2011; Bartick & Reyes, 2012). In our model, we saw that mothers who planned to return to work or 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 planned to return to work or 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 might indicate greater awareness of the benefits of breastfeeding, while higher scores in negative attitudes might indicate the conflicts mothers have related to common breastfeeding difficulties associated with returning to work or school. This indicates that mothers’ attitudes are not merely a reflection of a spectrum of positive or negative attitudes, but rather, they are a mixture of both negative and positive attitudes, with both attitudes strongly exhibited. Dietrich-Leurer and Misskey (2015) also discussed the importance of assessing the social and emotional needs of women and overcoming breastfeeding barriers by discussing realistic goals for balancing ideal breastfeeding and the social demands placed on mothers.

Mothers who planned to return to work or 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. While paid maternity leave has been associated with enhanced breastfeeding duration (Skafida, 2012), the length of this leave in Oman is shorter than in some Western countries (e.g., Canada [17 weeks] and Ireland [26 weeks]; Citizens Information Board, 2016; Government of Canada, 2016). Because mothers are expected to rejoin the workforce and continue breastfeeding, it is imperative to find ways to minimize barriers and adapt achievable goals that fit the needs of working mothers; issues to consider include baby-friendly work and school environments (e.g., pumping rooms and availability of day care). In addition, fathers, family members, and health care professionals who provide breastfeeding support should be educated regarding the decline in breastfeeding associated with returning to work or school.

Mothers who reported receiving higher EBFS during their postpartum hospital stays had significantly lower breastfeeding intensity at 8 weeks. This counterintuitive result could be explained by the amount of need-based support elicited during hospitalization. Mothers who report more breastfeeding problems often receive more support. These mothers are more likely to have negative attitudes about breastfeeding (e.g., perception that breastfeeding is more difficult than formula feeding) and, because of these attitudes and their breastfeeding problems, are at higher risk for formula supplementation. Hence, the EBFS measure may reflect more about the risk of the mother 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 these mothers who struggled with



breastfeeding during postpartum hospitalization. The support that mothers receive during the first weeks of postpartum care is documented in the literature as a contributor to successful breastfeeding (Hamade, Chaaya, Saliba, Chaaban, & Osman, 2013; McKeever et al., 2002). More research is required to understand specific ways for the health care system and the family to support breastfeeding mothers in Oman.

Although breastfeeding knowledge was not directly associated with breastfeeding intensity, mothers with higher knowledge about WHO breastfeeding recommendations had less negative attitudes 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. (2013) also reported that knowledge about WHO recommendations regarding the benefits of breastfeeding influenced attitudes in general.

This study is novel in that it attempted to investigate factors related to breastfeeding in Oman. The results of this study support the use of TPB to explain breastfeeding intention in Omani mothers. Our findings are in agreement with others who used TPB constructs to predict intention (Bai et al., 2010; Cabieses, Waiblinger, Santorelli, & McEachan, 2014). Breastfeeding intention was significantly predicted by all of the maternal belief variables in the model. The strongest predictor of breastfeeding intention was the subjective norm ( $r^2 = .07$ ). This suggests that a mother who perceived that key people in her life (the baby's father, the mother's mother, the mother-in-law, a sister, a close friend, the nurse, and the doctor) supported breastfeeding had a stronger intention to breastfeed. Similar results were reported in prior studies in which breastfeeding intention was positively associated with having family, peer, and partner support (Khoury et al., 2005; Persad & Mensinger, 2008). Negative attitude, positive attitude, and perceived control each independently predicted infant feeding intention. This suggests that these

variables all play important parts in intention.

A negative or unfavorable attitude toward breastfeeding contributed to a lower intention to breastfeed. On the other hand, a positive or more favorable attitude toward breastfeeding indicated a stronger intention to breastfeed. In this study, a negative attitude was a stronger predictor of intention ( $r^2 = .03$ ) compared to a positive attitude ( $r^2 = .02$ , Figure 4.3). Thus, negative attitudes (e.g., thinking that breastfeeding is painful, that breastfeeding makes your breasts sag, or that formula feeding is easier than breastfeeding) are to be considered by clinicians and scientists as barriers to breastfeeding. Research examining mothers' attitudes toward breastfeeding in the Arabian Peninsula is sparse. In a study conducted in Saudi Arabia (Saied, Mohamed, Suliman, & Al Anazi, 2013), the researchers helped explain attitudes toward breastfeeding in this region. Even though intention was not examined in the study, the results add to the importance of positive attitude toward breastfeeding as a determinant of breastfeeding duration. Another breastfeeding study in Arabic-speaking countries also reported that attitudes were significantly related to mothers' intention to breastfeed (Al-Akour, Khassawneh, Khader, Ababneh, & Haddad, 2010).

The findings of this study confirm the applicability of intention in predicting breastfeeding intensity. The significant results suggest a positive association with breastfeeding intention at birth and breastfeeding intensity at 8 weeks. De Jager et al. (2013) also reported that intention predicted breastfeeding intensity and duration. In addition, perceived behavior 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 higher breastfeeding intensity. Shi, Zhang, Wang, and Guyer (2008) reported similar results, finding that mothers who perceived

greater control over breastfeeding practices, even when family and community members disapproved, breastfed for a longer duration.

To our knowledge, this is the first study that involved a structured methodological framework to address maternal feeding behavior in Oman. This study's strength is in the use of SEM, which involves the combination of factor and path analysis to analyze the data. This approach allows a more "causal" explanation of the findings in the data analysis (Pearl, 2012). The major limitation of this study was participants' lack of follow-up beyond 8 weeks postpartum. Later follow-up would have provided the opportunity to examine infants' feeding behaviors that might not have been visible in the early postpartum period. Another limitation was the low alpha reliability of the EBFS and the BFKS. The low internal consistency could be attributed to the low number of items and low agreement within participants' responses due to the multidimensionality of scales. Future studies should both refine those scales by including more items and conduct further psychometric tests. Furthermore, we used a convenience sample selected from hospitals in the capital, which might limit the generalizability of the sample to the Omani population.

Understanding the factors influencing breastfeeding can offers important insights to health care providers and researchers in order to improve breastfeeding outcomes. This study can support the development of a more targeted intervention to address breastfeeding needs in Oman. The findings of this study indicate the need to improve health care support—especially for mothers who work or attend school and those who are at higher risk for formula supplementation during postpartum hospitalization—and to promote child-care services and breastfeeding-friendly working environments. It is also important to improve follow-up support during the early postpartum period due to the role of knowledge in maternal beliefs and breastfeeding

outcome. Interventions focused on increasing breastfeeding rates should also include training health care professionals to provide lactation support service counseling and management. Future studies are needed to (a) modify research tools for Omanis and the Arabic-speaking population, and (b) expand this study to other areas of Oman and include longitudinal methods to examine breastfeeding outcomes beyond 8 weeks postpartum.

### **Conclusion**

This study provides further confirmation of the low breastfeeding rates and the extensive use of formula milk in Oman during the first 8 weeks of infants' lives. This study provides evidence for the use of the TPB to predict breastfeeding intention and intensity among Omani mothers. A stronger breastfeeding intention suggests that mothers will have a better breastfeeding outcome. Returning to work or school is an important predictor of breastfeeding outcomes; thus, it should be considered in planning interventions. Future studies in Oman should address the predictive breastfeeding factors beyond 8 weeks postpartum and interventions for the promotion of breastfeeding.

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## **CHAPTER 5: DISCUSSION**

In this chapter, I present a comprehensive discussion of the systematic literature review, the translation and validation of the revised Breastfeeding Attrition Prediction Tool (revised-BAPT), the results of the original research on breastfeeding intensity, and the implications for clinical practice and health care research. I also present the implementation issues of the pretest's data collection approach and recruitment process. I present further discussion about the reasons for the recruitment plan's success and the ways in which I resolved emerging issues.

### **Manuscript 1**

The first manuscript of this dissertation was a systematic literature review of the factors influencing breastfeeding outcomes (initiation and duration). I did not include exclusive breastfeeding (EBF) practices in the review because including only EBF would have limited the inclusion of studies that explored the variation of other breastfeeding outcomes. In addition, maternal factors solely influencing EBF were recently examined in a systematic review by De Jager, Skouteris, Broadbent, Amir, and Mellor (2013).

Our systematic review followed PRISMA guidelines—a systematic process that maximizes transparency, minimizes subjectivity, and provides highly reliable evidence on a particular topic (Moher et al., 2009). This review relied on reproducible and explicit methods as I searched for literature, critically appraised it, and synthesized results from multiple primary studies while minimizing random errors and biases. Considering that systematic reviews follow a strict method, they provide reliable estimates of the effects of an outcome to formulate logical conclusions. These reviews also assist in identifying gaps in the current knowledge, which, in

turn, helps to guide future research. The systematic literature review is important to the entire dissertation, as it provides high-level evidence of the relationship between maternal-belief variables and maternal breastfeeding intentions, initiation, and duration.

In the systematic review, infant-feeding intentions were associated with initiation but not always with the duration of breastfeeding. Other systematic reviews (De Jager et al., 2013; Guo, Wang, Liao, & Huang, 2016) reported significant associations between intention and breastfeeding initiation and duration. The maternal attitudes from the literature review can be grouped into two categories: positive attitudes about breastfeeding that might promote breastfeeding, and negative attitudes that might hinder breastfeeding. Attitudes that might be considered positive toward breastfeeding included the beliefs that breastfeeding is healthier, enhances immunity, is more natural than formula is, promotes bonding, and is enjoyable. Attitudes that might hinder breastfeeding included the ideas that formula is not harmful to the infant, breast milk and formula are equally nourishing and share the same benefits, formula feeding is useful when a perceived low milk supply exists, formula feeding keeps the baby fuller, breast milk eventually dries up, and breastfeeding may cause excess attachment. These themes were similar to what was often presented in the literature regarding the barriers to and promoters of breastfeeding (Lawrence, 2014; Teich, Barnett, & Bonuck, 2014).

In relation to perceived control, maternal confidence in the breastfeeding process was reported to be significantly associated with breastfeeding intention (Lawton, Ashley, Dawson, Waiblinger, & Conner, 2012; Thomas et al., 2015). In addition, mothers who reported having more control over their breastfeeding practices were more likely to breastfeed (Shi, Zhang, Wang, & Guyer, 2008). In the qualitative part of the review, I also identified major barriers to breastfeeding, which included returning to work or school and insufficient breast milk supply.

These barriers were similar to those reported in other breastfeeding studies (Daly, Pollard, Phillips, & Binns, 2014; Dunn, Kalich, Henning, & Fedrizzi, 2015). Finally, the subjective norms (e.g., women's perceptions of how key people—such as their husbands, mothers, friends, nurses, and doctors—view breastfeeding) were significant in most studies of breastfeeding intention, initiation, and duration. It is evident that individuals who surround a mother influence her decision to breastfeed the infant and sustain the breastfeeding process.

Most of the commonly reported qualitative themes included the influence of the father or partner and the maternal grandmother on infant-feeding decisions (Andrew & Harvey, 2011; Brodribb, Fallon, Hegney, & O'Brien, 2007; Hawley et al., 2015; Yen-Ju Ho & McGrath, 2011). The roles of health care professionals have also been recognized as important in maternal infant-feeding decisions (Brodribb et al., 2007; Hawley et al., 2015).

Although the systematic literature review revealed valuable information about the factors and associations of breastfeeding intentions, initiation, and duration, several gaps were apparent. First, Middle Eastern studies were not reviewed. Most of the studies were from the Western world. Thus, the participants in these studies were not from the Arab culture. Culture affects how mothers perceive and embrace breastfeeding. These gaps justified conducting a study in Oman as described in manuscript 3.

Another limitation was that not all of the reviewed studies identified breastfeeding outcomes or included follow-up assessments to relate infant-feeding intentions to feeding behaviors. Researchers either used a one-time assessment ( $n = 10$ ) or included follow-ups ( $n = 10$ ). Half of the reviewed studies did not examine how the intention subsequently influenced feeding behavior. This is especially important because intention does not always result in the desired outcome (Armitage & Conner, 2001). Moreover, the studies included in the systematic

review lacked the comprehensive models required for examining the relationships between the variables. Thus, the study I conducted in the Omani population addressed these gaps in the literature. Moreover, I also examined sociodemographic characteristics, maternal knowledge, breastfeeding experience, and postpartum breastfeeding support to further the understanding of how these factors influence breastfeeding in Oman.

## **Manuscript 2**

The revised-BAPT was initially presented in English. Thus, it had to be translated to fit the Arab culture and the Omani context in particular. The purpose of the second manuscript was to describe the cross-cultural adaptation of the instrument through translation followed by a linguistic validation of the tool and an assessment of the content validity results of the newly translated tool. I used a content validity index (CVI) to evaluate the relevance of the survey questions. The CVI process allowed for assessments of the cross-cultural relevance and the translation accuracy of the revised-BAPT. The translation also aimed to discuss the adaptability and semantic equivalency of the BAPT tool to Omani culture. I used the most efficient method of translation. I used forward and backward translations to evaluate the accuracy of the translation, which was also followed by expert evaluation and cognitive interviews (CIs). Finally, I pilot tested the translated tool with a sample of Omani mothers to assess its readability before using it. The translated tool's total results showed the reliability Cronbach's alpha  $\alpha$  for the pilot-test to be as follows: [the Positive Breastfeeding Statement (PBS) subscale = .31; the Negative Breastfeeding Statement (NBS) subscale = .83; the Social and Professional Support (SPS) = .89; and the Perceived Behavior Control (PBC) subscale = .93]. The PBS had the lowest subscale reliability, which indicated that it needed to be re-examined in the main study. The main study, presented in manuscript 3, revealed good results for all of the tool's subscales (PBS

= .74; NBS = .81; SPS = .89; and PBC = .89). The process of translating and pilot testing the tool provided confirmation of the appropriateness of the tool in Omani culture. Additional information regarding the appropriateness of the tool for use in Oman was also supported with the results of semantic equivalency and the CVI of the items, which ranged from 0.8 to 1.0 with the total CVI of the scale at 0.95.

### **Manuscript 3**

The study I conducted among Omani mothers was aimed at increasing the understanding of the maternal behavioral factors or the maternal perceptions of factors that influence breastfeeding practices in Oman. Maternal behavioral factors include attitudes toward norms, subjective norms, and perceived behavioral control. In other studies (Avery, Zimmermann, Underwood, & Magnus, 2009; Bai, Middlestadt, Joanne Peng, & Fly, 2009; Bai, Middlestadt, Peng, & Fly, 2010; Barona-Vilar, Escribá-Agüir, & Ferrero-Gandía, 2009; Bartick & Reyes, 2012), these factors were associated with the intention and duration of EBF. However, few studies have focused on understanding behavioral factors in the mothers' perspectives in the Omani and Gulf cultures. The findings of the study I conducted will help with identifying the critical gap in literature related to maternal behavioral factors that explicitly influence breastfeeding in Oman. A better understanding of the relevant maternal behavioral factors is imperative for designing culturally specific interventions that focus on increasing EBF rates.

I adopted the theory of planned behavior (TPB; Ajzen, 1991) as the conceptual model for the systematic literature review and the study of Omani mothers. The TPB explains the behavior of individuals as being a function of belief variables (subjective norms, attitudes, and perceived control). The theory aids in providing a key contribution of intention and outcome behavior. In the study, I added maternal sociodemographic variables, previous breastfeeding experience,

postpartum breastfeeding support, and breastfeeding knowledge to provide a more comprehensive model of the breastfeeding intentions and outcomes in Omani mothers. The use of SEM in the analysis was beneficial in accounting for the relationship between these variables. The final model that was significant in the analysis included the TPB belief variable, intention, breastfeeding knowledge, breastfeeding support, and the mother's return to work.

I made two changes to the study's proposal: I (a) used intensity to conceptualize the breastfeeding outcome instead of patterns and (b) increased the sample size. I planned to estimate breastfeeding outcomes using the WHO definition of breastfeeding. This would allow the outcome variable to be modeled as a categorical variable. However, during the analysis phase of the study, using AMOS to model a categorical outcome was not feasible. Thus, after receiving approval from the committee statistician and the academic advisor, I changed the breastfeeding-outcome variable to a continuous variable using the percentage of breast milk consumed during the 24-hour period. Moreover, the use of intensity to describe breastfeeding outcomes is beneficial over using the WHO definition because it accounts for the amount of breast milk consumption. The breastfeeding-intensity ratio can be used to calculate the amount of breast-milk meals in relation to other non-breast-milk meals (Li, Fein, & Grummer-Strawn, 2008). When using the WHO categories, one considers an infant-feeding outcome as either predominant breastfeeding or complementary breastfeeding, irrespective of the amount of breast milk in the meals. Therefore, monitoring the dosage of milk consumption in relation to the benefits of breastfeeding is difficult. Defining breastfeeding as a function of intensity, however, determines the ratios of breast milk to other feeds and thus makes comparing infant outcomes easier. In addition, I planned to recruit ( $n = 337$ ) participants during phase II of the study. Because the recruitment process was highly successful and exceeded my original goals, I was

able to include a larger sample size ( $n = 691$ ), which was beneficial, as it allowed me to use SEM for analysis.

The study is important because it addresses the specific belief variables of Omani mothers and because few studies have addressed this perspective. Second, this study is important for understanding how cultural contact shaped demographic variables, such as maternal educational and socioeconomic levels. Literature findings have positively associated higher educational levels with increased intentions, initiations, and durations of breastfeeding. However, there were indications that this association is inverted in Oman and other developing countries, with lower breastfeeding rates for more highly educated mothers (Amin et al., 2011; Humphreys, 1998; O'Brien et al., 2008; O'Brien et al., 2009; Onis, 2006; Persad, 2008).

The study did not identify a significant association between maternal education and breastfeeding outcome (intensity). However, a significant association was found among the maternal-belief variables, breastfeeding intensity, and the mother's return to work or school. In this study, mothers who reported returning to work or school had significantly lower breastfeeding intensities compared with mothers who planned to stay home. This variable was the only sociodemographic variable that significantly influenced outcomes in the SEM. This indicates the importance of considering the mother's return to work or school as an important variable when planning breastfeeding interventions and education. About 41.6 % of mothers who introduced formula did so to return to work or school or to get the infant accustomed to formula mostly in anticipation of the mother's returning to work or school. Aspects of the mothers' breastfeeding education should include information on barriers and the management of barriers. The education should include the consequences of returning to work or school, such as decreased milk supply due to long hours of not breastfeeding or pumping, and the lack of the



storage of breast milk. Even though the BFHI 10-step guidelines require that health care facilities educate mothers about the hand expression of breast milk and breastfeeding support (WHO, 2009), they do not provide specific information on using breast pumps or on returning to work or school. Health care facilities' interpretation of the BFHI guidelines might not include the mother's return to work in breastfeeding support. More than half of Omani mothers plan to return to work or school after giving birth. In many instances, mothers may find hand expression to be time consuming and inappropriate in work, school, or public places. Therefore, including the mother's return to work as part of the postpartum discharge plan is important.

An important element of BFHI in Oman that was not covered is item 10, or breastfeeding support groups (WHO, 2009). The establishment of breastfeeding support groups as an important element of continuous support for breastfeeding mothers (WHO, 2009). Mothers especially in Oman received support during postpartum from the health care system during the postpartum hospitalization period; however, there are no indications that this support continued throughout the six-month period during which mothers are required to engage in EBF.

Breastfeeding support groups are not yet established in Oman. These support groups may help mothers to develop breastfeeding skills and decrease anxiety associated with breastfeeding (McCarter-Spaulding & Kearney, 2001). Thus, policymakers should consider facilitating the inclusion of community-based support groups as part of the promotion of breastfeeding.

### **Implementation Issues and Resolutions**

One of the key implementation issues was the change in the pretest data collection approach. Our aim for the pretest data collection was to evaluate the tools that would later be used to collect data for the study. Our initial plan was to carry out a panel discussion with experts to evaluate the study's tools. However, the experts' inability to attend resulted in the

alteration of the plan. The tools that were set for evaluation included the Infant Feeding Intentions scale, the breastfeeding knowledge scale, the revised BAPT, and the sociodemographic tool. The other assessed measurement tools included the breastfeeding follow-up form and the early breastfeeding support tool. An expert panel can provide input for assessing the extent to which a tool measures desired concepts (Yaghmel, 2003). Thus, the experts' failure to attend the discussion was an issue. Discussions would have provided valuable insights into the soundness of the data collection tools and recommendations for making the tools more valid and unbiased. In addition, the experts' discussion would have provided further feedback regarding the overall adaptability of the study design to Oman.

The failure to hold the expert discussion meant I then needed to revise the plan to attain expert feedback by meeting with each expert individually to discuss the tool and then collect an evaluation of the study's tools. I attained feedback from 10 experts who agreed to participate. The plan's change meant additional travel to the experts' locations, and more effort and time were required to explain the recruitment to the individual experts. However, I collected feedback to revise the study tools. In the future, it will be important to provide incentives to ensure commitment to the study. Doing so will help to prevent unnecessary changes and will ensure that the study proceeds as planned.

Another implementation consideration is the recruitment of the participants. Even though the initial recruitment plan was not altered, attaining a sufficient number of participants to meet the sample-size requirement was a concern for me. The Oman Ministry of Health's (MOH's) 2013 statistics reported a large population pool at the recruitment sites; nevertheless, no reports were available on participant recruitment issues in Oman's postnatal wards. In 2013, the MOH reported a total of 12,774 live births at the designated recruitment sites, the Royal Hospital and

Khawlah Hospital. At the Royal Hospital, the annual number of live births is 7,694; this means a birth rate of 160 live births/week. Similarly, Khawlah Hospital has an annual live-birth rate of 5,080, with 105 live births/week. As the study started, it was clear that subject recruitment was not a concern. This was evident from our ability to recruit around 80 participants by the second week of the data collection process.

Cultural considerations were yet another important issue in the data collection process, especially in qualitative studies requiring interaction with people. The Omanis have a friendly culture (Sobh, Belk, & Wilson, 2013). Omanis are accommodative toward people and like to share their food with others as a sign of hospitality. In fact, declining food may be construed as impolite. In addition, in general, Arabs stand when a person enters a room, to show respect. Furthermore, men are not allowed to shake hands with Arab women unless the women offer their hands first (Sobh et al., 2013).

Cultural issues did not emerge because I was from the same culture as the participants, which made it easy to obtain information. Although my data collection process proceeded well, this would not be the same for a researcher who is unfamiliar with Arabic culture. For instance, female researchers may find it challenging to interview Arab men, as many Arab men have traditional beliefs in which they consider women's roles to be confined to the domestic sphere. Thus, they may not accept instructions or directions from women. Similarly, Western researchers may decline to accept an offer of food, which the participants from the Arab culture may consider to be disrespectful. Some may misunderstand the Arabs' friendliness, which may strain the relationship between the researcher and the participants (Marshall, 2008).

Because Omani mothers are accommodating, I was specific in expressing to the participant that she had the freedom to refuse study participation. This was particularly

important; I did not want the mothers to feel obligated to participate because they were in nonpaying government hospitals. Mothers were asked to participate in the study only after the study was clearly explained to them. The data collectors were advised to take great care not to pressure the mothers in any way. In addition, the research team required all of the data collectors to have received training in the study protocol from me. The research team also required the data collectors to successfully pass the Collaborative Institutional Training Initiative Program.

The follow-up interview was a major issue in the data collection for two reasons. One of the studies ran through Ramadhan, Eid Al-Fitr, and Eid Al Ahdha. Eid Al-Fitr is a religious holiday that the Muslims celebrate, marking the end of the 28–30 days of fasting during the Ramadhan month (New York City [NYC] Department of Education, 2016). Eid Al Ahdha is also known as the Sacrifice Feast. It is one of the two Muslim holidays celebrated worldwide. During this holy time when the country is fasting, working hours are considerably shorter for government employees. This means the data collectors returned home one hour early, which consequently led to a reduction in the amount of time spent collecting data during that month. Some of the follow-up telephone interviews were assigned during Eid Al-Fitr, when families celebrate or travel to other states to be with their extended family members. Eid Al-Fitr and Eid Al Ahdha are about two months apart, and both continue for about one week—including the weekends—with the exact dates varying each year. This made it difficult to contact the mothers who were scheduled for their postnatal follow-up interviews at week 8.

Despite the recruitment process's success, the holidays had an impact on the progress of the data collection. The study coincided with two of the major holidays in the Islamic world. During this time, all Muslims were committed to praying, fasting, attending sermons, and celebrating with their friends and families. In addition, the working hours for government

employees are significantly reduced, as employees need time off to attend Ramadan. This meant that the timeframe for data collection was greatly limited. The researcher resolved the issue by conducting all phone interviews within one day after the holidays. Text reminders were sent to 18 mothers in a single day, and these reminders were followed by phone interviews with these parents the following day. On average, a phone interview took between 15 and 40 minutes. In the future, I will have to plan data collection around the expected holidays.

Another major issue was how the limited budget compelled me to devise creative ways of collecting data. Inadequate funding limited the number of certain research activities that increased the research costs. I had planned to give mothers gifts in appreciation of their participation, but this was cut as a direct result of the limited funding. I also wanted to explore the maternal breastfeeding outcomes at week 24 of the infants' lives to longitudinally assess infant-feeding patterns. However, due to limited time and a limited budget, the subjects were assessed only up to eight weeks postpartum. I thought of creative ways of staying within the budget. The interviews were conducted via telephone. In telephone interviews, all the researcher requires is a phone, the respondents' contact information, and convenient times for conducting the interviews; however, face-to-face interviews require time, physical places, transport arrangements, and safety considerations (Gibbs, Friese, & Mangabeira, 2002).

The limited budget compelled me to adopt creative ways of collecting data. As the study unfolded, I learned that smartphone applications are accessible in Omani culture. However, the literature on texting and smartphone use in research, particularly among those of childbearing age, was not available before I commenced with data collection. Therefore, the research team was careful not to employ smartphones in the study initially. I instead focused on recruiting mothers who had texting services. I learned that data collectors could rely on WhatsApp to send

texts to mothers scheduled for phone interviews. This texting application was feasible considering that 100% of the mothers whom I approached and who later enrolled in the study had mobile phones. Nearly 97% of them had smartphones featuring WhatsApp. The smartphone application's use also allowed us to send a picture of the data collection form to the mothers. Although I gave this form to the mothers at the hospital during the first data collection phase, I anticipated the mothers' misplacing the form due to the hectic early postpartum period. The mobile application allowed the data collectors to send text reminders without incurring the costs associated with sending messages. The choice of text messages and interviews arose from the fact that Omanis and those in the Arabian Gulf culture, in general, are highly technologically savvy. According to Crabtree (2009), cell phones have outpaced Internet penetration in the Middle East. Even in the most impoverished areas—Palestine and Yemen—almost all residents have cellular phones. Additionally, home-based Internet access is available among people from the oil-rich nations. Most cities also have public Internet cafés—which shows that, in many countries, more urban dwellers than rural residents have access to the Internet (Benfield & Szlemko, 2006). Although variations exist in Internet access, it became clear that the spread of new information technologies among my sample was nearly universal.

In any study involving human subjects, the data collectors were required to obtain the consent of the respondents. Thus, the research team informed the respondents about the plan to acquire contact information from their friends and families. I made sure to include this as part of the data collection survey to the IRB. This additional mobile phone numbers proved fruitful during the phone interviews. The additional phone numbers also provided an opportunity to connect with the mothers through other family members, in case they could not be reached. This ensured that the research team had access to the subjects at all times.

## **Recruitment Success**

A confluence of factors played a leading role in ensuring the recruitment process's success. One of the key aspects was the requirement that the staff and the administration of the hospitals know where the participants were to be drawn from for research purposes. As the study progressed, I learned the importance of having a pre-established relationship with the two hospitals—as a result of training as a nursing student, being involved in community activities, and conducting staff education development within the MOH's facilities. Approval letters from the MOH and the IRB aided in the research process. They were presented to the principal nurse officers at Khawlah Hospital and the Royal Hospital, which allowed the officers to grant us permission to recruit mothers who had delivered in the two hospitals.

Updating the nurse in charge of the postpartum unit in the study further contributed to recruitment success. The health personnel in the respective wards were furnished with gifts—such as chocolate, donations, and office supplies—to show our appreciation for their aid in the recruitment process. The researchers also made verbal comments of appreciation for being granted permission to collect data. These actions helped with building relationships with the nurses at the recruitment sites. I also took time to explain the study, upon request, to staff members throughout the data collection period. Positive relationships provided a sense of ease during the data collection process.

In practice, none of the issues identified earlier impeded the study's successful implementation. The recruitment and data collection process progressed smoothly. The success was partly due to our adherence to the pre-established study protocol, which was identified in Chapter 1. Initially, the research team obtained approval from the MOH and the IRB, both of which approved the study. The positive interaction and involvement of the nurses and other staff

members working in the two hospitals further contributed to the process's success. Another important aspect was that the researcher was Omani as well. Culturally, this made it easier to contact the patients, obtain their consent, and build strong relationships that contributed to the participants' desire to participate in the study.

The budget limitations constrained some activities I wanted to carry out during data collection. Thus, I introduced creative ways of contacting and interviewing the participants by using mobile applications and telephone surveys. Overall, the methodology's soundness made it possible to collect credible data sets.

### **Implications for Practice, Research, and Policy**

This research study is in the category of health promotion and is thus a research priority. Breastfeeding affects the short-term and long-term health of newborn babies. Breastfeeding lowers the risk of childhood infections and diarrhea (aim 6: health promotion; aim 7: communicable disease in children; and aim 10: women and child health [from the MOH health research priority list]). Breastfed babies are also at reduced risks of obesity later in life (Harder, Bergmann, Kallischnigg, & Plagemann, 2005; Owen, Martin, Whincup, Smith, & Cook, 2005). Therefore, this study also supports aim 1 of the MOH health-research priority list, which is concerned with the prevention of chronic non-communicable diseases.

The study aimed at identifying factors relevant to Oman that could be used to improve breastfeeding outcomes in the country. The findings of the study were expected to identify a critical gap in the literature related to maternal-behavioral factors that explicitly influence breastfeeding in Oman. A better understanding of the relevant maternal behavioral factors is imperative when designing culturally specific interventions that focus on increasing EBF rates. The benefits of the study at the community level include (a) providing information to improve



interventions for infants and support optimal nutrition with appropriate complementary feeding (Taveras et al., 2004; WHO, 2001) and (b) providing information to policymakers who develop culturally specific national breastfeeding campaigns that focus on infant feeding in Oman.

Implementing an effective breastfeeding program and increasing breastfeeding in the country will provide the children in the community with long-term health benefits—including a reduction in incidences of malnutrition, diarrhea, and early respiratory disorders (Oddy et al., 2003; Weinberg, 2000); fewer incidences of cancer in infants and women (Van Den Hazel et al., 2006); a decrease in incidences of cardiovascular diseases (Martin, Gunnell, & Smith, 2005); and a decline in incidence of obesity (Arenz, Ruckerl, Koletzko, & Von Kries, 2004).

The significance of the current study is based on its ability to provide information that will help health care leaders to implement necessary changes in the health care system. This will be especially visible in the breastfeeding-related recommendations that arise from the study and in the identification of areas of breastfeeding support in which the health care system needs to improve. The study may be used to support the revision policies that protect and support exclusive breastfeeding for six months. These policies include paid maternity leave for working mothers, the provision of a friendly environment for breastfeeding mothers (e.g. breastfeeding rooms), and enforcing the international code of the marketing of breast-milk substitutes, whose aim is to protect breastfeeding by ensuring the proper marketing and distribution of breast-milk substitutes (WHO & UNICEF, 2014).

The study may also be beneficial to health care workers in the promotion of breastfeeding education. The findings of the study offer guidance in the areas of breastfeeding education that need improvement based on the outcomes of the maternal breastfeeding-knowledge instrument. In this study, the mothers reported various factors that hinder the achievement of EBF in addition

to the belief variables that were found to be significant. A major factor was maternal employment. Health care systems and policymakers may use the variables identified in this study to implement interventions that address mothers', particularly working mothers', breastfeeding needs, such as the availability of childcare and breastfeeding-friendly working environments.

In addition to benefitting the community and policymakers, the study contributes to the body of knowledge related to breastfeeding. The study adds to the Oman-specific literature on maternal beliefs. The study also contributes to the development and validation of study instruments in Arabic that contribute to the understanding of mothers' breastfeeding behaviors.

### **Future Directions**

It is possible to analyze important additional questions that affect breastfeeding outcomes in Oman from this data set. The study's data set contains information on mother-infant dyed e.g. herbs used during breastfeeding, which were not examined during the study. A potential area of analysis includes examining the prevalence of herbal supplements in Omani infants. Another inquiry could examine the gap between hospital practices and breastfeeding outcomes. The question could be assessed by analyzing the Early Breastfeeding Support Tool as a latent variable. The tool's purpose was to examine the breastfeeding care that the mothers received during the postnatal hospital stay by using the BFHI 10 steps of practice. Examining the question in this manner will allow for the identification of the specific hospital practice that has the most influence on breastfeeding outcomes. Moreover, this will help with identifying the elements in the BFHI practice that the hospitals lack. The identification of these elements of hospital practices is useful for subsequently deriving appropriate intervention programs for the hospitals. Furthermore, I am planning to further develop the Breastfeeding Knowledge Scale

and the Early Breastfeeding Support Tool. These two tools were developed for the purpose of the study with the guidance of a breastfeeding expert, Dr. Labbok. The use of the WHO's breastfeeding recommendation and the BFHI guidelines during development supported both tools' content validity. I will further refine the tools by examining the results of a factor analysis as well use the study's data to explain the predictive validity of the tools.

The next step of this study will include the dissemination of the study's data to policymakers. This step is critical due to the roles policymakers have as gatekeepers in the health care system. The policymakers' roles include funding and allowing access to the health care facilities. During the upcoming months after graduation, I will focus on presenting the study's results to the policymakers. Additionally, I will present literature on the short-term and long-term benefits of breastfeeding to society. The EBF rate in Oman is declining. The MOH is excellent in addressing issues that directly impact childhood, as evidenced by the immunization coverage of more than 99% (UNICEF, 2012). A clear message should be given to policymakers about the link between low breastfeeding rates and the overall health of the child and the nation—including infant malnutrition, childhood obesity, and the general risk for childhood infectious disease. Therefore, improving breastfeeding initiation and duration should save the government money.

### **Conclusions**

To conclude, low exclusive breastfeeding rates remains a global concerns. In this dissertation, I examined maternal beliefs, breastfeeding knowledge, previous breastfeeding experience, and the perceptions of breastfeeding support associated and sociodemographic variables with breastfeeding intentions and breastfeeding intensity in Oman. I translated and validated the revised BAPT to Arabic that was used for data collection. The dissertation

provided an opportunity to gain a more comprehensive understanding of issues in breastfeeding that are specific to Oman, an area of research that has had a limited research focus. The findings of this dissertation support the application of the TPB in examining the maternal-beliefs variable and intention in Omani mothers. The findings of this dissertation also support the importance of understanding maternal breastfeeding knowledge, early breastfeeding support in influencing breastfeeding outcome. The findings also support the reliability and validity of the revised BAPT provided further evidence of the global application tool. The dissertation provides useful information to clinicians, researchers, and stakeholders that can be used in interventions and future research to promote breastfeeding in Oman.

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## APPENDIX 1: APPROVAL TO USE THE BREASTFEEDING ATTRITION PREDICTION TOOL

---

**From:** Jill R Janke [jrjanke@uaa.alaska.edu]  
**Sent:** Wednesday, February 04, 2015 1:52 PM  
**To:** Al-barwani, Saada Sallim  
**Subject:** RE: Tool

Sorry for the delay. Here they are ... the survey and scoring instructions. I do encourage you to look at the subjective norm scale because that is the one that gets modified the most ... related to cultural variability (e.g. one done with the Eskimo population had to add 'elders' and delete things like childbirth educator). Because I am sending the survey as MS Word the margins may be messed up and you will need to fix them. You have my permission to use the BAPT and modify as needed in your research as long as you send me a copy of any paper you write.

Let me know if you have questions. Jill

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**From:** Al-barwani, Saada Sallim [mailto:sbarwani@email.unc.edu]  
**Sent:** Monday, February 02, 2015 1:58 PM  
**To:** Jill R Janke

---

**Subject:** RE: Tool

Hi Dr. Janke,

Hope you are well. Were you able to find the tool I need?

Thank you,

Saada

---

**From:** Al-barwani, Saada Sallim  
**Sent:** Thursday, January 29, 2015 11:27 PM  
**To:** Jill R Janke  
**Subject:** RE: Tool

Hi Dr. Janke,

I was referencing to two articles to the original Tool that you have developed and published in the following article: Janke, J. R. (1994). Development of the breast-feeding attrition prediction tool. *Nursing Research*, 43(2), 100-104. I would like a copy of this to compare with the new versions of the tool.

The new version of the tool I would like to use for my study is published by "Gill, S. L., Reifsnider, E., Lucke, J. F., & Mann, A. R. (2007). Predicting Breast-feeding Attrition: Adapting the Breast-feeding Attrition Prediction Tool. *The Journal of perinatal & neonatal nursing*, 21(3), 216-224.". I have contacted Gill for the tool, I have not received a feedback as of today. However, I know the original tool is developed by you, therefore, I feel its appropriate to acquire the permission to use the tool from you. I would like to get a copy of both the tool.

Thank you,



## APPENDIX 2: APPROVAL TO USE THE INFANT FEEDING INTENTION TOOL

Dear Saada,

How wonderful that you are researching breastfeeding practices in Oman. I have attached papers on the validation of the scale, and I have attached a more current, slightly revised version of the scale. As described in the validity papers, we detected some misinterpretation of item 2, so we slightly modified the wording from "I will at least try to breastfeed" to: "2. I am planning to breastfeed my baby or at least try."

You are correct that the tool has been translated into Arabic! Below are the contacts for the Lebanese and Jordanian professors involved in this translation.

Nahla M. Al Ali, <[nmali@just.edu.jo](mailto:nmali@just.edu.jo)>  
Assistant Professor  
Jordan University of Science & Technology  
Community and Mental Health Department  
Faculty of Nursing  
P.O.Box 3030  
Irbid-Jordan

"Lara Nasreddine" <[ln10@aub.edu.lb](mailto:ln10@aub.edu.lb)>  
department of Nutrition and Food  
Science, American University of Beirut in Lebanon.

Mona Nabulsi, MD, MS, [mn04@aub.edu.lb](mailto:mn04@aub.edu.lb)  
Head, Division of General Pediatrics  
Department of Pediatrics and Adolescent Medicine  
Vice-Chair, Biomedical IRB  
Director, Research Education Unit  
American University of Beirut  
P.O.Box: 113-6044C3  
Beirut-Lebanon

Best wishes with your research.

Sincerely,  
Laurie

Laurie A. Nommsen-Rivers, PhD, RD, IBCLC  
Assistant Professor of Pediatrics  
Division of Neonatology/Center for Interdisciplinary Research in Human Milk and Lactation

Cincinnati Children's Hospital Medical Center  
3333 Burnet Avenue, MLC 7009  
Cincinnati, OH 45229-3039  
Office Phone: 513-636-7208 Cell Phone: 513-335-3256  
FAX: 513-803-0969

---

**From:** Kathryn Dewey [<mailto:kgdewey@ucdavis.edu>]  
**Sent:** Wednesday, January 28, 2015 5:24 AM  
**To:** Al-barwani, Saada Sallim



Mona Nabulsi <mn04@aub.edu.lb>

Fri 9/4/2015, 7:55 AM



Download   Save to OneDrive - University of North Carolina at Chapel Hill

Hi Saada. We just finished data collection and did not complete our analysis yet. The preliminary analysis shows that it MAY be reliable with Cronbach alpha of 0.8. I am attaching the Arabic IFI for your study only. Please use with caution as we cannot state for sure that it is valid in our context before finishing all analysis. We are testing it on a large sample of women to see its predictive validity.

Hope it works with you

Best

mona

Mona Nabulsi, MD, MS  
Professor of Clinical Pediatrics  
Head, General Pediatrics Division  
Department of Pediatrics and Adolescent Medicine  
Director, Research Education Unit  
Vice Chair, Biomedical IRB  
American University of Beirut Medical Center  
Beirut-Lebanon

\*\*\*



Al-barwani, Saada Sallim

Hi again Dr. Nabulsi, Sorry I was talking about the results of Infant feeding intension scale. Can you also send me the official tr...

Thu 9/3/2015, 2:4



Al-barwani, Saada Sallim

Hi Dr, Nabulsi, Hope you are well. I wanted to follow up with you on the psychometrics of the translated lowan infant feeding s...

Thu 9/3/2015, 2:2

### APPENDIX 3: IRB MINISTRY OF HEALTH OMAN

*Sultanate of Oman*  
*Ministry of Health*  
*Directorate General of Planning*  
*and Studies*



سلطنة عمان  
وزارة الصحة  
المركز العام للتخطيط  
والدراسات

Ref: MH/DGP/R&S/PROPOSAL\_ APPROVED/ 8 /2016

Date : 16.2.2016

الرجاء  
التاريخ  
الموافق

Saada Al-Barwani  
Principal Investigator

Study Title: "Maternal Beliefs Contributing to Variations of Breastfeeding Patterns in Oman, Structural Equation Modeling".

After compliments

We are pleased to inform you that your research proposal "Maternal Beliefs Contributing to Variations of Breastfeeding Patterns in Oman, Structural Equation Modeling". has been approved by Research and Ethical Review & Approve Committee, Ministry of Health.

Regards,

Dr. Ahmed Mohamed Al Qasmi  
Director General of Planning and Studies  
Chairman, Research and Ethical Review and Approve Committee  
Ministry of Health, Sultanate of Oman.



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Day file

## APPENDIX 4: IRB, UNC CHAPEL HILL



THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

OFFICE OF HUMAN RESEARCH ETHICS  
720 Martin Luther King, Jr. Blvd.  
Bldg. 385, 2nd Floor  
CB #7097  
Chapel Hill, NC 27599-7097  
(919) 966-3113  
Web site: [ohre.unc.edu](http://ohre.unc.edu)  
Federalwide Assurance (FWA) #4801

**TO:** Saada Al-barwani  
School of Nursing

**FROM:** Non-Biomedical IRB

**DATE:** 4/25/2017

**EXPIRATION DATE OF APPROVAL:** 5/25/2017

**RE:** Reminder of Impending Expiration of IRB Approval  
**STUDY #:** 16-0780

**STUDY TITLE:** Maternal Beliefs Contributing to Exclusive Breastfeeding in Muscat, Oman

IRB approval for the above-referenced study will expire on the date listed above. Unless the approval is renewed before this date, all research-related procedures must halt, except where doing so would jeopardize the welfare of the human subjects. Continuing research activities in the absence of IRB approval is a violation of federal regulations and University policy.

If you intend to continue the study beyond the current expiration date, please apply for renewal of IRB approval following the link above. **PLEASE NOTE: IRB applications are now online. Therefore, you should submit your renewal online using the [IRBIS system](#). This will require that you enter all the information from your most recently approved paper application into the online application. The online application contains new questions and processes. YOU SHOULD ALLOW YOURSELF AND THE IRB MORE TIME THAN YOU HAVE IN THE PAST TO COMPLETE THE RENEWAL PROCESS.**

Failure to renew in time may result in grant funding attached to this approval being frozen; you should be in contact with the Office of Sponsored Research (OSR) if you anticipate that IRB approval will not be renewed in time.

Please disregard this notice if you have already submitted your renewal materials.

CC:  
Eric Hodges, School of Nursing



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**TO:** Saada Al-barwani  
School of Nursing

**FROM:** Non-Biomedical IRB

**DATE:** 3/26/2017

**EXPIRATION DATE OF APPROVAL:** 5/25/2017

**RE:** Reminder of Impending Expiration of IRB Approval  
**STUDY #:** 16-0780

**STUDY TITLE:** Maternal Beliefs Contributing to Exclusive Breastfeeding in Muscat, Oman

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