

Predicting Exclusive Breastfeeding among Iranian Mothers: Application of the Theory of Planned Behavior Using Structural Equation Modeling

Abstract

Background: Identifying the factors that lead to the beginning, continuing, or stopping the Exclusive Breastfeeding (EBF) by mothers can be of great assistance in the design of interventions to strengthen this behavior. The aim of this study was to predict EBF among mothers with Infants Less than Six Months of Age (ILSMA) according to the Theory of Planned Behavior (TPB). **Materials and Methods:** The study was a cross-sectional one that conducted among 304 mothers with ILSMA in Khorramabad-Iran in 2017 using Structural Equation Modeling (SEM). The sampling method was a combination of census, stratified random, and systematic random sampling. The data collection tool was a contextualized, valid, and reliable questionnaire according to the TPB. Data were collected by a trained interviewer. Data were analyzed using SPSS-16 and AMOS-20 software programs and SEM. **Results:** Perceived Behavioral Control (PBC) could explain 65% of mothers' EBF intention. Intention and PBC were able to predict 79% of the variance in EBF together. The fitness indices of EBF model in the current study were acceptable (RMSEA = 0.07, CMIN/DF = 2.58, NFI = 0.81, CFI = 0.87, and GFI = 0.83). **Conclusions:** TPB is an appropriate model for predicting the intention and behavior of EBF. Policy makers and health system managers are recommended for taking some measures to add a standardized questionnaire in the electronic health record to predict EBF according to TPB of pregnant women and mothers with ILSMA. In this way, they can empower primary healthcare providers to design and implement a theory-based interventional plan.

Keywords: Behavior, breastfeeding, intention latent class analysis, Iran

Introduction

Exclusive Breastfeeding (EBF) refers to feeding an infant with breast milk from his or her mother or a wet nurse, or expressed breast milk without any additional solid or liquid, except for oral rehydration therapy, drops, syrups of vitamins, and minerals or medicines.^[1] The World Health Organization recommends that infants should be exclusively breastfed until the end of the sixth month of age.^[2] Health benefits of EBF are well-known for both mother and infant. EBF can annually prevent 1.4 million deaths of children less than 5 years old in the world.^[3] Children who have been exclusively breastfed for 6 months have a higher intelligence quotient, lower risk of childhood obesity, morbidity of leukemia, allergies, diabetes, and lower psychological problems when entering to adulthood.^[4,5] EBF has also been associated with a reduced risk of the sudden infant death syndrome and, in preterm infants,

necrotizing enterocolitis.^[6] Breastfeeding helps to lose pregnancy weight faster and reduces the risk of breast, endometrial, and ovarian cancer, osteoporosis, and iron deficiency anemia in mothers and improves their mental health.^[5-11] In this regard, 10% of 44 million disability-adjusted life years and 1.4 million deaths of infants are due to non-exclusive breastfeeding.^[12,13] Since the early 20th century, breastfeeding rate has declined dramatically in developed countries;^[14] for example, only 17% of Canadian women and 24.72% Spanish women breastfeed their children until the end of the sixth month.^[15,16] The same trend takes place with a time lag about developing countries; with only 37% of Infants Less than Six Months of Age (ILSMA) are exclusively breastfed;^[17] for example, the rate of EBF in Iran has been reported to be 28%.^[18]

Identifying the factors that cause to start, continue, or stop EBF by mothers can be of

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great assistance to design interventions to strengthen this behavior.^[19] Some studies have been conducted to predict the factors affecting EBF according to Theory of Planned Behavior (TPB). For example, in a cohort study (2009) among American lactating mothers, Attitude toward Behavior (AB), Subjective Norm (SN), and Perceived Behavioral Control (PBC), totally could explain 50.2% of the variance of the mother's intention to continue EBF.^[20] In another cross-sectional study (2011) among American lactating mothers, AB, SN, and PBC were identified as the best predictor of intention in white, African-American, and Latin-type ethnics, respectively.^[21]

Although a recent systematic review and meta-analysis were conducted on EBF in 2016, the number of included studies was few. Thus, it recommended for conducting more study to prove the application of TPB for predicting breastfeeding.^[19] Several studies have shown the effect of ethnicity on EBF.^[22-24] Breastfeeding behavior seems to be affected by its cultural context. The number of studies published on EBF according to TPB is limited in the Middle East region. In these studies, the direct approach is used to measure the constructs of TPB and SPSS software to analyze the data.^[25,26] The aim of this study was to predict EBF among mothers with ILSMA according to the TPB using Structural Equation Modeling (SEM).

Materials and Methods

The present work was a cross-sectional using an SEM to test TPB among mothers with ILSMA in Khorramabad city of Iran in 2017. There are various recommendations on sample size in SEM studies. Some statisticians know enough at least 200 samples.^[27-29] Others recommend the minimum sample size 5 times the free parameters.^[30-32] Given that the number of free parameters in the present study was 30 and the minimum sample size was 150 samples. Considering the probability of outlier data, 6 times the number of free parameters was estimated (180 samples) that by multiplying it in the effect size (1.5 times), the sample size reached 270. Considering the probable loss data (12%), the final sample size was 304. The sampling method was a combination of census, stratified random, and systematic random sampling. All of the healthcare centers of Khorramabad were included in the study. Further, stratified random sampling proportional to the sample size was used. In this way, first, the estimated sample size was distributed among the healthcare centers of Khorramabad in proportion to the number of mothers with ILSMA. Then, the list of mothers covered by each center was divided into six strata according to the age of their children. Finally, systematic random sampling was applied to select mothers from different strata.

Using the contact number in the health record, the mothers were invited to the healthcare center over the phone for conscious and willing participation in the study. In this case, the willingness and accuracy of the participant to answer the

questions are greater than the available sampling in which the selected person refers to receive health care such as vaccination. In case of non-response to the call after three attempts at 1-h intervals or reluctance to participate in the study, the next person was replaced from the stratified list. The exclusion criteria were the prohibition of breastfeeding depending on a medical recommendation (reflection, prematurity, mastitis, using drugs by mothers, cleft palate, and cheiloschisis). Data were collected by a trained interviewer. Answering the questionnaire through interview facilitated understanding the questions by interviewees.

The data-gathering tool was a two-part questionnaire. The first section includes demographic characteristics and the second part comprised a standard questionnaire about measuring EBF according to the TPB constructs. Validity and reliability of the second part were assessed and approved by Alami *et al.*^[33] To identify the benefits, harms, stakeholders, facilitators, and barriers to EBF, three focus group discussions were conducted on 20 mothers. The identified factors were converted to 25 closed questions according to the manual of constructing TPB questionnaire, including 11 questions of AB (for example, in my opinion, breastfeeding creates emotional relationship between mother and child), 7 SN questions (for example, the most important people to me agree to breastfeed), 4 questions of PBC (for example, breastfeeding is impossible for me), 3 intention questions (for example, I intend to breastfeed exclusively for 6 months), and 4 behavioral questions (for example, I feed my baby only by breast milk). The answers were measured using a 5-point Likert scale. The draft questionnaire was given to 12 professionals of health education, maternal and child health, and epidemiology to measure its content and face validity. The range of questions' content validity was 0.65–0.99 and the content validity index (CVI) of the questionnaire was 0.80, which is acceptable. The face validity of questions was assessed by 10 mothers and improved in two quantitative and qualitative methods. The reliability of the questionnaire was assessed through internal consistency and test-retest methods by recruiting 220 and 20 mothers, respectively. Cronbach's alpha coefficient and intra-class correlation (ICC) were 0.79 and 0.81, respectively.^[33]

Data were analyzed using SPSS-16 (produced by IBM Corporation) and AMOS-20 software programs and SEM. The relationships between mean scores of EBF intention and behavior with dichotomous and polychotomous demographic variables were tested by the Mann-Whitney and Kruskal-Wallis, respectively. The significance level of all tests was 0.05.

Ethical considerations

Objectives of the study were explained for invited mothers and their informed and voluntary consent to participate in the study was sought. Mothers who agreed to participate signed informed consent document. The questionnaire was

unnamed, and the participating mothers were free to refuse to answer the questions while completing the questionnaire.

Results

The result of the study showed that the response rate was 64%. The mean (SD) age of mothers was 29.93 (5.38) years, and the mean (SD) age of infants was 3.50 (1.68) months. The total prevalence of EBF among studied mothers was 65.11%. The EBF prevalence among mothers according to their status was employed mothers: 47.52%; housewives: 67.80%; cesarean section: 71.51%; and normal delivery: 61.24%. The prevalence of EBF in terms of infant's monthly age was as follows: 71.71%, 65.28%, 73.82%, 62.50%, 74.39%, and 43.42%. Other demographic characteristics of the participants are presented in Table 1.

Figure 1 shows the SEM of EBF according to TPB. The predictive constructs of intention could explain 50% of its variance. The constructs of intention and PBC predicted 79% the variance of behavior. In SEM, the Chi-square statistic was 932.41 and statistically significant ($p < 0.001$).

The standardized effects of EBF model in total, direct, and indirect states are reported in Table 2. Indices of modal fitness are presented in Table 3.

Discussion

The aim of the current study was predicting the EBF among mothers with ILSMA according to TPB. PBC was a good predictor for intention and behavior of EBF. PBC and intention considerably predicted the behavior of EBF. There was a significant relationship between infant's gender, infant's grade, and type of delivery with intention and behavior of EBF. The mother's occupational status was significantly correlated with the behavior of EBF. The fitness indices of the EBF model in the current study were acceptable.

In the current study, PBC could explain the variance of EBF intention considerably. In a cross-sectional study (2017), PBC was the strongest predictor of EBF intention among lactating mothers of Bushehr city of Iran. In the mentioned study, PBC and the intention

Table 1: Demographic Characteristics and their Relationships with Intention and Behavior of EBF^a

Variable	Category	Frequency	Percent	<i>p</i> I ^b	<i>p</i> B ^c
Mother's age	<25	47	15.50	0.31	0.49
	25-34	190	62.50		
	≥35	66	21.70		
Mother's education	Illiterate	6	2	0.14	0.05
	Elementary	39	12.80		
	High school-Diploma	143	47		
	Academic	116	38.20		
Mother's employment	Employed	40	13.20	0.23	0.002*
	Unemployed	264	86.80		
Father's education	Illiterate	6	2	0.89	0.93
	Elementary	56	18.40		
	High school-Diploma	121	39.80		
	Academic	121	39.80		
Household income \$	<100	88	28.90	0.64	0.81
	100-200	164	53.90		
	>200	52	17.10		
Infant's sex	Male	158	52	0.004*	0.001*
	Female	146	48		
Infant's age	<1 month	46	15.10	0.12	0.15
	1-2 month	49	16.10		
	2-3 month	65	21.40		
	3-4 month	48	15.80		
	4-5 month	43	14.10		
	5-6 month	53	17.40		
Type of delivery	Vaginal	116	38.20	0.031*	0.02*
	Cesarean section	188	61.80		
Infant's grade	First	129	42.40	0.004*	<0.001*
	Second	119	39.10		
	Third and more	56	18.40		

^aThe relationships between EBF intention and behavior with dichotomous and polychotomous variables were tested by the Mann-Whitney and Kruskal-Wallis, respectively. ^bSignificance test of mother's EBF intention and demographic variables. ^cSignificance test of mother's EBF behavior and demographic variables

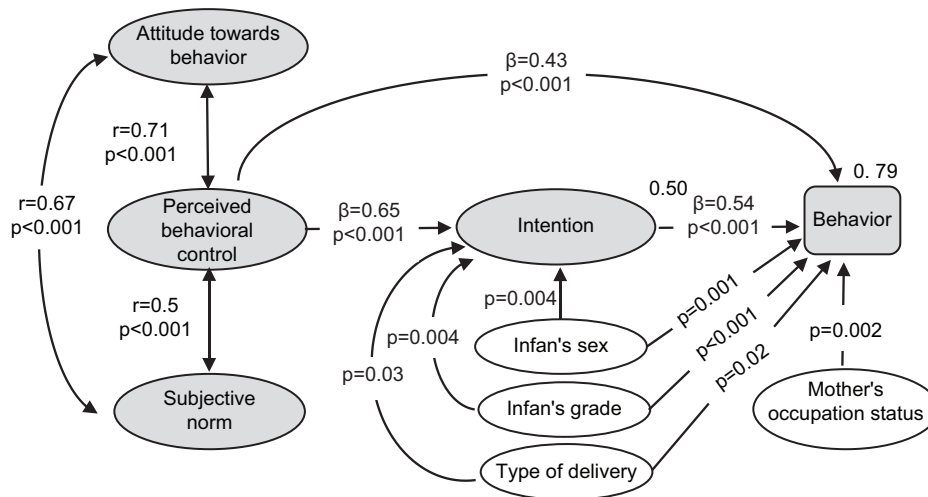


Figure 1: Structural Equation Model of EBF based on TPB

Table 2: The standardized effects of EBF model

Variable	AB ¹	SN ²	PBC ³	Intention
Direct				
Intention	0.17	-0.14	0.65	0
Behavior	0	0	0.43	0.54
Indirect				
Intention	0	0	0	0
Behavior	0.09	-0.07	0.35	0
Total				
Intention	0.17	-0.14	0.65	0
Behavior	0.09	-0.07	0.78	0.54

¹Attitude toward Behavior, ²Subjective Norm, ³Perceived Behavioral Control

Table 3: Fitness indices of EBF model according to TPB

Indicator	RMSEA ¹	NFI ²	RFI ³	CFI ⁴	PNFI ⁵	PCFI ⁶
Value	0.07	0.81	0.79	0.87	0.72	0.78
Indicator	CMIN/DF ⁷	RMR ⁸	GFI ⁹	AGFI ¹⁰	PGFI ¹¹	AIC ¹²
Value	2.58	0.05	0.83	0.79	0.69	1080.43

¹Root Mean Square Error of Approximation, ²Normed Fit Index, ³Relative Fit Index, ⁴Comparative Fit Index, ⁵Parsimonious Normed Fit Index, ⁶Parsimonious Comparative Fit Index, ⁷Normed Chi-Square, ⁸Root Mean Square Residual, ⁹Goodness of Fit Index, ¹⁰Adjusted Goodness of Fit Index, ¹¹Parsimonious Goodness of Fit Index, ¹²Akaike Information Criterion

constructs were good predictors of EBF behavior.^[26] The predictive value of intention by PBC construct was close in the current study and the one conducted in Bushehr (0.65 and 0.63, respectively); however, the predictive value of behavior by intention and PBC constructs in the current study was more than that of the Bushehr's study (0.53 vs. 0.22 and 0.43 vs. 0.19, respectively). This difference may be attributed to the entrance time of mothers to the study (pregnancy or lactation),^[20] but in both studies, mothers were included in the lactation period. Moreover,

the multiplicity of reliability measurement methods and participant groups in assessing the content validity of the current study resulted in its better indicators (CVI: 0.80 vs. 0.51 and ICC: 0.81 vs. 0.72);^[26,33] therefore, different results of the two mentioned studies can be related to their tools. In a longitudinal study (2003), PBC was the strongest construct for predicting the intention among Hongkonger mothers.^[34] However, the predictive value of intention and behavior by this construct in the present study was notably higher than Hong Kong's study (0.63 vs. 0.38 and 0.43 vs. 0.18, respectively). The predictive value of behavior by the intention construct in the current study was remarkably higher than the Hong Kong's study (0.53 vs. 0.37). The investigation of two important fitness indices in the current and Hong Kong's study revealed that the Goodness of Fit Index (GFI) values were close together (GFI = 0.83 and 0.85, respectively). However, the other index value in the current study was far better than that of the Hong Kong's study (CMIN/DF: 2.58 and 4.43, respectively). Therefore, it can be stated that the data of the current study are better fitted with the TPB model.

The fitness indices of EBF model were acceptable in the current study. Among the few studies that reported common fitness indices, one of the indices (CMIN/DF) in the current study and a meta-analysis (2016) were in an acceptable range but was not acceptable in the longitudinal study (2003) (2.58, 1.83, and 4.43, respectively) (19, 34). The other index (i.e., Adjusted Goodness of Fit Index (AGFI)) in the current study and the meta-analysis study (2016), it was better than the current study (0.95 and 0.79, respectively). The recent index may be influenced by the difference in sample size of the present study and the meta-analysis (304 vs. 2694).

In general, the results of previous studies on the predictive value of EBF intention by its explanatory constructs were

different; so that in some studies such as the present one, PBC was the best predictor of EBF intention,^[26,34] while in others, AB and SN were better able to predict EBF intention.^[19,20] Considering numerous previous studies conducted in this regard, it can be stated that the relative importance of predictive constructs of EBF intention depends on the characteristics of the studied population.^[20,21] Therefore, it is recommended focusing on the total prediction of constructs and the amount of the model fitness in different societies rather than trying to identify the best predictive construct of EBF internationally.

In the present study, the intention and behavior of EBF in terms of the type of delivery, infant's grade, and infant's gender and EBF behavior in term of mother's occupation status were significantly different. The intention and behavior of EBF in cesarean mothers were higher than those who had a vaginal delivery. In most of the previous studies, EBF was significantly higher in mothers with vaginal delivery.^[35-38] However, in a systematic review and meta-analysis (2012), cesarean did not have a significant correlation with EBF of infants whose mothers had begun breastfeeding immediately after delivery.^[39] Other demographic variables may have had an effect on the relationship between EBF and type of delivery. Demographic variables such as mother's education, household income, and infant's and mothers' age did not have a significant relationship with intention and behavior of EBF, but the relationship between EBF and type of delivery may be influenced by infant's gender and grade or mother's occupation status. Recent hypotheses were tested and rejected. The proportion of elective cesarean section to an emergency is high in Middle Eastern countries, including Iran.^[40,41] It seems that the demand for cesarean section and EBF are influenced by mediators such as fear of labor pain and adherence to medical advice, respectively. To explore these mediators, it is recommended studying the relationship between the demand for cesarean section and EBF in societies with a high proportion of elective cesarean section to an emergency.

In the present study, the prevalence of EBF was higher in the second child. In a study that the prevalence of EBF was higher in primiparous mothers, authors mainly attributed this higher value to their greater motivation to achieve knowledge and skills about breastfeeding.^[42] Furthermore, the high prevalence of EBF in multiparous women is attributed to the previous experience of lactation.^[43-45] However, the reasons given in previous studies cannot explain the results of the current study. This finding may be random or influenced by other unknown factors such as the interval between births. Thus, it is suggested conducting an independent and robust study to examine the relationship between infant's grade and EBF. Healthcare providers are advised to support primiparous women through lactation training.

A limited number of published articles have tested the relationship between infant's sex and EBF.^[35,36,46-48] Although some studies attributed this relationship to the cultural differences of the societies,^[26,49] the existing evidence from Iran does not confirm the above hypothesis. In spite the relative cultural harmony in Iran, in Tehran's study (the capital), the relationship between infant's sex and EBF was not significant. In Bushehr's study (a city in the south of Iran), this relationship was in favor of girls, and in the current study (Khorramabad), it was in favor of boys.^[26,47] The interest to boys in Iranian culture may lead to different reactions so that in mothers from Bushehr results to early initiating of complementary food and in mothers from Khorramabad to continuing of EBF until the end of 6 months. Thus, it suggested considering the role of mediators of the interest in boys in similar cultures. It is advised that lactating mothers refrain from gender discrimination in the EBF.

In the present study, EBF among unemployed mothers was higher than the employed ones. This finding was similar to most previous studies.^[35,45,48,50] It can be related to time limitation of employed women or lack of facilities for keeping and breastfeeding of infants; therefore, the adoption and implementation of laws such as increasing the length of postpartum leave for at least 6 months, as well as assignment places at the mothers' workplace to maintain and breastfeed, can be recommended to policymakers and managers. Healthcare providers are recommended training employed mothers on how to maintain breast milk in the refrigerator and how to use a cup or spoon to feed their infants by recruiting an assistant.

Considering that longitudinal studies can provide a better understanding of the factors affecting EBF, it is suggested that in future studies, mothers from the third trimester of pregnancy be included in the study and followed up every month from the birth for 6 months.

In the current study, TPB was used to predict affecting factors on EBF, which is one of the most valid theories for the study of health-related behaviors; but there may be other factors specifically affecting EBF that are not included in the theory; SEM was used to analyze the data, which has the ability to determine the direct, indirect, and total effects of predictive variables; the only inclusion criterion was having an ILSMA, and the only exclusion criterion was prohibition of breastfeeding on the advice of a physician; the response rate of the study decrease generalizability of findings to the research community and causes of unwillingness to participate in study (necessity to attend in the healthcare centers to participate in the study or other work priorities) may be related to EBF intent and behavior; social desirability bias that may have been strengthened through the interview; demographic variables were measured and their relationship with EBF intent and behavior was tested and discussed; a standard native

questionnaire and sufficient sample size were used; using probabilistic sampling methods increases the ability for generalizability of the results to the target community; so it can be said that the current study has a relatively acceptable internal and external validity.

Conclusion

Considering the previous TPB-based studies, it can be stated that TPB is an appropriate theory for predicting the intention and behavior of EBF in different societies. It is recommended that instead of trying to identify the best predictive construct of EBF intention internationally, it is better to focus on the total predictive value of its constructs and the amount of model fitness in different societies. Accordingly, policymakers and health systems managers are recommended taking some measures to add a standardized questionnaire in the electronic health record to predict EBF according to TPB of pregnant women and mothers with ILSMA. In this way, they can empower primary healthcare providers to design and implement a TPB-based interventional plan, if their intention and behavior are low.

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Conflicts of interest

Nothing to declare.

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