Psychometric Properties (Validity and Reliability) of the Arabic Version of the Preterm Infant Feeding Survey (PIFS) Instrument

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Abstract

The current study examines the validity and

reliability of the Arabic version of the Preterm Infant Feeding Survey (PIFS) instrument. The original instrument was developed based on the Breastfeeding Attrition Scale and demonstrated adequate reliability and validity. Cross- culture validation was performed in three phases: Forward-Backward translation, pilot testing, and estimation of reliability and validity. A sample of 200 mothers and their preterm newborn infants were recruited from NICU at a tertiary level teaching hospital. Cronbach's α coefficient was calculated (Reliability). Factor analysis was used for the construct validity, and Principal Component Analysisand Varimax Rotation method were used for analyzing the factor structures. The final translated instrument included 70 items. Reliability for the Arabic PIFS instrument Cronbach's alpha was 0.895, with the Individual subscale's Cronbach alpha values ranged from 0.857 to 0.945. Factor analysis demonstrated 55 items in the 5-factor solution; these factors explained 54.85% of the variance. In conclusion, the Arabic-translated PIFS instrument showed satisfactory internal consistency and proved to be a valid and reliable tool that can be used to assess the factors contributing to maternal decision to breastfeed or not amongmothers of preterm infants in Arabic-speaking populations.

Keywords: *Infant Feeding Survey, Instrument, Validity, Reliability.*

I. INTRODUCTION

Research studies had proven that breast milk has all the needed nutrition for infants' needs. It provides adequate calories, immunological and psychological benefits to support infants' growth and development. It also benefits mothers' health and offers an important opportunity for the infant and mother to bond (1-3). Benefits are even more for preterm infants. Breast milk has been shown to decrease the rates of sepsis and necrotizing enterocolitis, which are both costly and potentially fatal health issues (4). Therefore, the World Health Organization (WHO) and the United Nations International Emergency Children's Fund (UNICEF), in recognition of the importance of breast milk for all children, have sponsored initiatives to increase the initiation and duration of breastfeeding and the provision of breast milk (5).

Moreover, calls for increasing the proportion of infants who are breastfed aimed at increasing initiation of Breastfeeding to 81.9%, Breastfeeding at 6 months to 60.6%, Breastfeeding at 1 year to 34%, Exclusive Breastfeeding at 3 months to 46.2%, and Breastfeeding at 6 months to 25% (6). Despite the many calls and recommendations for encouraging breastfeeding, its rate is still beyond the recommendations, especially in developing countries (7), which need further effort to examine why mothers do not breastfeed. Mothers whose infants are admitted to the Newborn Intensive Care Unit (NICU) have unique experiences providing breast milk for their infants from mothers who remain with their infants. Mothers with infants in the NICU require dedication and perseverance to provide milk through artificial expression. Breastfeeding in the preterm infant was studied (9), multiple factors were found to be associated with nonexclusive breastfeeding that needs the health care provider's attention and directed interventions.

The provision of breast milk for preterm newborn infants in the NICU is very challenging (10). Understanding of the mother's beliefs and attitude toward the provision of breast milk to preterm hospitalized newborn as well as the factors that make the mother decide to breastfeed or not will enable NICU infants to meet the goals provided by Healthy People 2020, UNICEF and WHO, and ultimately help to improve the health of preterm infants.

Finding a reliable instrument to assess the mothers' beliefs and attitudes toward the provision of breast milk to a preterm hospitalized newborn was a challenge. Moreover, the challenge to assess the mothers' decision to provide her

preterm hospitalized infant is coupled with the unavailability of a valid and reliable instrument that is directed to the Arabic-speaking population. Therefore, the current study aimed to translate and test the psychometric properties of the PIFS instrument in a sample of Arabic-speaking mothers of preterm infants hospitalized in the NICU. The Preterm Infant Feeding Survey (PIFS) was developed to be used in research aimed at improving the initiation and duration of provision of mothers' milk for hospitalized preterm infants. The instrument showed adequate validity and reliability (11).

II. METHODS

The study uses a descriptive cross-sectional survey design. Descriptive design occurs in a "natural" setting and answers questions about the incidence, prevalence, or frequency of occurrence of a phenomenon and its characteristics (12). After IRB approval and official permission from the administrative personnel in the selected setting, a convenience sample of 200 mothers who were above 18 years old and who gave birth to a stable single live preterm newborn between 28 to 37 weeks gestation was recruited from level IV neonatal intensive care unit (NICU)at a tertiary level teaching hospital. The researchers explained the aim of the study to the mothers and informed them information obtained would be confidential, and their participation is on a voluntary basis. Written consent was taken from mothers to obtain their acceptance to participate in the study. Mothers were interviewed by the researcher at the first few days of NICU admission to assess their experience of expressing breast milk to their preterm infants and to assess the factors contributing to their decision to provide their infants with breast milk or not. All mothers were given the standard breastfeeding information.

A. Instrument: Preterm Infant Feeding Survey (PIFS) instrument developed to examine factors contributing to feeding decisions of mothers of high-risk preterm infants(11). The PIFS development was guided by the Breastfeeding Attrition Prediction Scale (13) and consisted of 78 items divided into four main subscales, including (14 items positive breastfeeding sentiment, 13 items positive formula-feeding sentiment, 8 items subjective norms, andperceived behavioral control; 12 items). The remaining items (31items) are another subscale that measures the value the mother places on the opinions of important people concerning her infant feeding decisions and the importance of beliefs concerning various aspects of infant feeding. Reliability for the entire instrument was .80 (Cronbach's alpha), and individual subscale reliabilities ranged from .79 to .85. (11).

B. Procedures for PIFS Instrument Translation: Translation of the original PIFS instrument into Arabic was carried out after obtaining permission from the original instrument author. Forward and backward translation of the instrument was carried out by two bilingual individuals with

medical backgrounds. They independently translated the original English instrument into Arabic and then combined the translations into a single Arabic translation. A further two bilingual translators then carried out a backward translation into English. A final English translation of each measure was sent to the original author to obtain full authorization and comments. The back-translated questionnaire was reduced to 70 items after deleting culturally inappropriate items such as breastfeeding in public or if items were related to different practices such presence of lactation consultants in the study setting. The original and final translated PIFS subscales are summarized in Table 1. Demographic data were collected using a questionnaire that was developed by the researchers. It consisted of two parts. Part I: maternal characteristics; included questions related to mother's age, level of education, occupation, parity, history of mother's pregnancy, methods of delivery, and types of feeding for siblings. Part II: infant's characteristics; included questions related to the infant's postnatal age, gestational age, type of feeding after delivery, and infant's anthropometric measurements.

C. Pilot study: The final Arabic translations were tested on 20 subjects as a pilot to test for clarity and comprehensiveness of the Questionnaires. The results of the pilot study revealed that both questionnaires were clear and understandable to participants. Data from pilot subjects were included in the final study sample.

D. Data collection procedure: after official approval of the study. The research assistant met eligible subjects to explain the research purpose and obtain their consent to participate. The research assistant interviewed the mothers and filled in the study questionnaires. The interview lasted for about 20- 30 minutes for each mother.

Table1. Comparison of the original and final translated PIFS Subscales items

Subscale	Original PIFS Items	Arabic Translated PIFS Items
Positive breastfeeding sentiment	14	14
Positive formula-feeding sentiment	13	13
Subjective norms	8	6
Perceived behavioral control	12	10
Importance of feeding method	23	21
Total items	70	64

E. Data Analysis: Data was analyzed using IBM SPSS advanced statistics version 20 (14). Numerical data were expressed as mean and standard deviation as appropriate.

Qualitative data were expressed as frequency and percentage. The reliability of the PIFS was determined using Cronbach's alpha. Exploratory factor analysis was conducted using Principal Component Analysis factoring and varimax rotation with Kaiser Normalization. Two criteria were used to select the number of factors to extract: (a) eigenvalues of 1.0 or higher and (b) examine scree plots of eigenvalues. Items were included in a factor if their loadings were at least .40 (**15**). Items were checked for cross-loadings (>.30) on other factors. The original measurement model was then tested, forcing the five-factor solution.

III. RESULTS

A total of 200 mothers with a mean age of 27.7 years (SD = 5.7 years; range = 18–48 years) participated. Most of the mothers had children (96%) and previously breastfed their children for a mean of 5.3 months (SD = 6 .7 months), planned the current pregnancy (84%); however, only 34% were intended to breastfeed this preterm infant. Other characteristics are presented in Table 2. Most infants were male (64%), born at 33.7 Wks (S.D. =3.6). Mean birth weight was 2.2kg (SD = 0.9 kg), and about 44.5% of the infants receive either expressed breastmilk or are directly breastfed.

A. Initial Reliability Assessment: Table 3 illustrates the individual and total subscales reliability of the Arabic version of the PIFS. The reliability results were satisfactory as Cronbach's Alpha was above 0.8. Inter-item correlations, item-total correlations, and alpha-if-item deleted were evaluated.

Table2. Maternal Characteristics (N=200)

Characteristic	(n) %
Education:	
No Education	(44) 22.0%
Elementary	(33)16.5%
Secondary	(60) 30.0%
University	(63) 31.5%
Job:	
Housewife	(108) 54.0%
Working	(92) 46.0%
Gravidity:	
Primigravida	(85) 42.5%
Multigravida	(115) 57.5%
Mode of delivery:	
Normal	(56) 28%
Cesarean	(144) 72%
Previously breastfed preterm baby	(11) 5.5%

For the Breastfeeding and Bottle, Feeding Sentiments Subscale (27 items), the correlation was 0.859. Four items item-total correlations were below .30; "*Breastfeeding is easy to do in public*," "*Formula feeding helps the father to feel close to the baby*," "*It is hard to tell when a breastfed baby is getting enough*," and "*Breastfeeding tires the mother.*" Alpha Coefficient results minimally improved whenthese three items were removed (0.897).

For the Perceived Control subscale (10 Items), the Alpha Coefficient result was 0.897. Item-total correlations were below .30 for four items; "*I have the necessary skills to express my milk 8 times a day*", "*Bringing my milk to the NICU is easy," "I can fit pumping milk into my schedule,*" and "*I am ready to breastfeed when the baby is ready*." Alpha Coefficient results improved when these three items were removed (0.920). For Feeding Method Subscale (21 items) Alpha Coefficient result was 0.885. Item-total correlations were below .30 for two items; "lets me have some freedom" and is easy to do in public." Alpha Coefficient results improved when these two items were removed (0.905). For the Subjective Norm Subscale (6 items), the Alpha Coefficient result was 0.913, and all item- total correlations were above 0.40.

TABLE 3
Individual Subscale Cronbach's Alpha Reliabilities for Original Subscales

Subscale	N of Items	Cronbach's Alpha
Domain I: (Feeding sentiments)		
Original	27	0.859
Items with "item-total" r <0.3 (2, 4, 5, 7)	*23*	*0.897*
Domain II: (Perceived behavioral control)		
Original	10	0.835
Items with "item-total" r <0.3(1,2,3)	*7*	*0.920*
Domain III (Subjective norms)	6	0.913
Domain IV (importance of Feeding Method)	21	0.885
Items with "item-total" r <0.3((2,,5)	*19*	0.905
Total scale	64	0.895

B. Construct Validity Assessment

Factor analysis was conducted using principal axis factoring with Oblimin rotation. Two criteria were used to select the number of factors to extract: (a) eigenvalues that were 1.0 or higher and (b) examination of scree plots of eigenvalues. Using the criteria described by (15), items were included in a factor if their loadings were at least .40. In addition, items were checked for cross-loadings (>.30) on other factors. The original measurement model was then tested, forcing a six-factor solution. Forcing fewer numbers of factors further developed this model. Items that failed to load or that had loadings <.40 were removed one at a time, and the analysis was rerun after each item was removed until a clean solution was obtained; all items had a primary factor

loading of >.40, and no items cross-loaded. A comparison of items and their factor loadings for the five factors are presented in Tables 4a, 4b, 4c, 4d, and 4e.

The result was a five-factor solution. The five factors included: positive breastfeeding sentiments (13 items), positive bottle-feeding sentiments (10 items); negatively worded items in relation to a feeding method were considered to be positive in relation to the other feeding method, perceived control / Confidence/perceived behavior control (6 items), social support (6 items), and important aspects of the feeding method (19 items).

TABLE 4a
Factor Analysis Results Component1
Rotated Component Matrix [a]

Positive Breastfeeding	
Breastfeeding is natural	.567
Breastfeeding is satisfying	.497
Breastfeeding helps a mother feel close to her baby	.796
Breastfeeding is easy	.431
Breast milk is healthy	.605
Breast milk is best for the baby	.851
Breastfeeding is less expensive	.846
Formula-fed babies tend to get sick	.490
Formula-fed babies tend to be overweight	.658
Harder for me to be close to a formula-fed baby	.765
Formula-fed babies are fussy	.536
Formula-fed babies may develop allergies	.465
Formula-fed babies can get constipated	.844

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Cumulative Eigen (percent of variance explained: 54.853%)

TABLE 4b
Factor Analysis Results Component2

Negative Breastfeeding	
Formula feeding is easy	.575
Formula-fed babies are easily satisfied	.596
Breastfeeding is time-consuming	.634
Breastfeeding makes it hard to return to work	.629
Pumping milk for my baby hurts	.575
Breastfed babies are fussy	.679
Breastfed babies tend to get sick	.786
Breastfed babies tend to be overweight	.771
Breastfeeding hurts	.699
Formula feeding allows more freedom	.829

TABLE 4c
Factor Analysis Results Component3

Perceived Control / Confidence	
Giving my baby my milk makes me feel good	.582
I know I will have enough milk for my baby	.877
I am confident I can provide breast milk for my baby	.895
I am determined to provide breast milk for my baby	.914
I won't need help to provide breast milk for my baby	.925
I will be emotionally ready to breastfeed my baby when she/he is ready	.910

TABLE 4d
Factor Analysis Results Component4

Social Support	
My baby's father thinks I should	.652
My mother thinks I should	.638
My closest female friend thinks I should	.644
My doctor thinks I should	.657
My baby's doctor thinks I should	.657
My baby's nurse thinks I should	.657

TABLE 4e
Factor Analysis Results Component5

Feeding Method	
Doesn't make me hurt	.716
It won't cause allergies	.761
Is healthy for my baby	.725
Protects my baby from getting sick	.798
Is best for my baby	.770
Keeps my baby from getting constipated bu8	.805
Is easy	.582
Keeps my baby from getting fussy	.726
Let's me be close to my baby	.683
Makes it easy for me to return to work	.519
Let's other people be close to my baby	.662
Keeps my baby from being overweight	.688
Is less expensive	.433
Let's me get lots of rest	.625
Is natural	.711
Is satisfying	.689
Satisfies my baby	.724
Isn't time-consuming	.489
Let's me know my baby is getting enough	.703

C.   Post-Exploratory   Factor   Analysis   Reliability
Assessment: A reliability assessment was conducted for the five factors derived from the Exploratory Factor Analysis. Cronbach's alpha coefficients were above 0.85 for all factors demonstrating adequate reliability. Item-total correlations and alpha-if-item deleted were assessed for the five factors and illustrated in Table 5.

TABLE 5
Reliability data (after 5-component factor analysis)

	N of Items	Cronbach's Alpha
Component I (Positive breastfeeding)	13	0.929
Component II (Positive bottle feeding)	10	0.907
Component III (Confidence/Perceived Behavior control)	6	0.870
Component IV (Social influence)	6	0.945
Component V (Feeding Method)	19	0.857
Total Scale	54	0.9016

IV. DISCUSSION

Additional research is still needed to understand the best interventions to support breastfeeding and the provision of maternal breast milk for preterm infants. The provision of maternal breast milk for a preterm hospitalized infant is challenging, yet it is very beneficial for infant health. Breast milk was proven to be the best feeding method not only for the infant's health during childhood but also during adulthood. A beneficial association was found between breast consumption for preterm infants and cardiac morphology and function in adult life (16).

Assessment of maternal willingness to provide breast milk for a preterm infant is vital. Finding a valid and reliable instrument to do so is a priority. Development and testing, and confirmation of the validity and reliability of a tool is a fundamental step for conducting a rigorous research study and assuring the integrity of study findings (17). The purpose of the current study was to produce a linguistically equivalent and culturally accepted Preterm Infant Feeding Survey Instrument of the original one (11) and to assess its reliability and validity for future use in research assessing factors affecting preterm infant mothers' choice of feeding method.

The instrument was translated to standard Arabic with no specific Arabic dialect used, which will allow using the instrument in all Arabic-speaking countries. The translation process resulted in 64 items; 6 items were deleted from the original instrument because they were either culturally unaccepted or inapplicable in the current study setting or sounds redundant when translated to Arabic. Pilot testing revealed that it was clear and understandable to the participants. The results of the reliability testing of the Arabic translated PIFS instrument showed adequate internal consistency. Cronbach's alpha coefficients were above 0.85 for all factors demonstrating adequate reliability, according to Nunnally & Bernstein's 1994 criterion in the development of a new instrument (**18**). It reflects the improved reliability of the Arabic version of the PIFS instrument compared to the original instrument (Cronbach's alpha ranged from .78 to .82) (11). The final version of the instrument includes a total of 54 items into five components (scales).

The first two scales of the instrument related to the mother's attitude toward breast and bottle feeding (Positive breastfeeding and Positive bottle feeding). Mother's attitude toward breastfeeding preterm infants was studied and revealed that mothers with a positive attitude toward breastfeeding of their premature infants tend to successfully initiate and continue to breastfeed longer than others (19). Husebye and associates evaluated the effect of programs targeted to encourage mothers of LBW infants to provide MM in NICU at the time of achieving full enteral feeding, at discharge, and at six months corrected age. The report concluded that these programs improving mothers' attitudes toward maternal milk (MM) and consequently improved rates of providing breastfeeding at both early and long term (20). Understanding the mother's beliefs and attitude toward the provision of breast milk to a preterm hospitalized newborn will enable the NICU health care team to help to improve the health of preterm infants.

The third scale is of the instrument is the Confidence/Perceived Behavior control) scale, consist of 6 items. It examines the mother's perceived ability to provide breast milk for the infant. Tengku Ismail and associates found that maternal perceived behavioral control was a significant predictor of the initiate and continue exclusive breastfeeding duration at 6 months after delivery (21). On the other hand, inadequate perceived behavior control or breastfeeding confidence was reported as a barrier to breastfeeding promotion (22). The association between type of infant feeding and maternal breastfeeding self-efficacy was tested among Arabic speaking population (23). The type of feeding at four weeks postpartum was significantly associated with high prenatal breastfeeding self-efficacy (r=0.061, p<0.05). Therefore, the mother's intention or decision to provide exclusive breastfeeding can be improved by improving the maternal breastfeeding perceived behavioral control and her self-efficacy related to breastfeeding.

The fourth scale (Social influence) included items related to mothers' beliefs about how others are important in their feeding decision. The support system in the mother's life is important, and it can encourage the mother to provide breastfeeding. Family members were found o play an important role in supporting breastfeeding (22) concluded that "family's support to was important to the provision of breastfeeding. Moreover, Mothers who received adequate support during their infant's hospitalization reported satisfaction with breastfeeding (24). Therefore, the healthcare system and the health care members' role in encouraging and supporting the mother during infant hospitalization is very important.

The fifth and last scale (Feeding Method) includes items related to factors that make the mother choose the feeding method for her infant, such as if the feeding method

is natural, easy, satisfying, etc. Feeding a preterm infant his mother's breast milk was proven to benefit the preterm infant growth and development when compared to any other type of feeding. Premature infants fed exclusively human milk achieved catch-up growth without metabolic consequences and achieve catch-up growth without metabolic consequences at 2 years of age (25). A multicenter retrospective cohort study (4) emphasizes the many benefits of exclusive human milk feeding for preterm infants. The study showed that preterm infants who received exclusive human milk had a significantly lower incidence of NEC and mortality and had a reduction in late-onset sepsis, BPD, and ROP. Given the many benefits of breastfeeding and the provision of breast milk to the preterm infant, the health care provider is required to provide more support, guidance, and further breastfeeding research. Therefore, there is a need to have valid and reliable research instruments to assess the mothers of preterm infant breastfeeding and breast milk provision readiness and ability. The current research showed that the Arabic translations of the PIFS instrument have satisfactory internal consistency and proved to be a valid and reliable tool that can be used to assess the factors that contributed to maternal decision to breastfeed or not among mothers of preterm infants in Arabic speaking populations. Additionally, further multicenter, multinational studies are planned to assure generalizability of the current results as well as to assess factors that contribute to preterm infant' mother's decision to breastfeed or not and to guide interventions that promote breastfeeding practices in preterm infants.

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