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Preterm Infant Breastfeeding Behavior Scale: A study for Assessing the Validity and Feasibility

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ABSTRACT

Background: Breastfeeding is known as a normative means of infant feeding, and human milk is considered the optimal nutrition source for infants. Although there are several tools for assessing infants' feeding behavior, currently, only the Preterm Infant Breastfeeding Behavior Scale (PIBBS) is specifically developed to measure the feeding behavior of preterm infants. The present study aimed to evaluate the validity and feasibility of PIBBS.

Methods: The Preterm Infant Breastfeeding Behavior Scale was translated using forward/backward methods. Cohen's kappa coefficient was used to evaluate the inter-rater reliability of the questionnaire. To this end, the feeding behaviors of 70 neonates born at 32-35 weeks of gestation were assessed on two consecutive days, once by the researcher and again in the evening shift of the same day by one of the nurses, and then, PIBBS questionnaire was completed. The internal consistency of the instrument was measured by calculating Cronbach's alpha coefficient.

Results: The total Cohen's kappa of the instrument was estimated to be 0.72 on the first day of observation and 0.79 on the second day, which was considered substantial. The Cronbach's alpha coefficient of the instrument was 0.791, which was acceptable.

Conclusion: The PIBBS was a valid and reliable instrument for the evaluation of preterm newborns' feeding behavior.

Keywords: Feasibility, Inter-rater reliability, Preterm infant breastfeeding score, Preterm newborn's nutrition, Validity

Introduction

Breastfeeding is the interaction between mother and newborn. Term and preterm newborns begin life outside the uterus with different experiences of sucking and swallowing. In a healthy term newborn, the coordination between sucking, swallowing, and breathing is optimized during the first 48 h after birth. Qualitative changes in the sucking pattern may result from sensory feedback, learning, and nutritional experience. Experience and practice increase the oral mobility capacity and suck-swallow-breathe (SSwB) coordination (1).

Generally, if term newborns are placed on their mother's breast during the first hour after birth, they begin to search and find the nipple and start sucking. However, there is still no comprehensive definition of the evolution of sucking in preterm newborns (2).

Nutrition skills in infants require complicated functions, guided by the central nervous system. Preterm neonates often have difficulty coordinating SSwB for at least 32 weeks of gestational age at birth and postnatal age. The lack of SSwB coordination is associated with a longer

transition time to complete oral feeding in preterm neonates. In addition, muscular strength and insufficient power can exacerbate the inability to keep sucking among preterm neonates (3).

Preterm newborns born with a gestational age of 29-30 weeks can swallow during the first week after birth; nevertheless, they have no detectable sucking pattern until 2-3 weeks later. The evidence of organized sucking rhythm is observed among preterm neonates up to 33-36 weeks. However, the number of consecutive sucking is low and the sucking rhythm is irregular among these newborns (4). As the preterm neonates grow up, sucking becomes more prominent, and the capacity, function, and total amount of milk sucked by them improve. This seems to be due to various factors, such as development, exercise, coordination, strength enhancement, fatigue reduction, or a combination of these factors (1).

Preterm neonates are 2-3 times more likely to be re-hospitalized compared to term neonates since about 16% of hospitalizations are attributed to nutritional problems. Independent oral nutrition requires SSwB coordination, including several sensory-motor systems (2). Although other tools exist for evaluating an infant's feeding

behavior, currently, only the Preterm Infant Breastfeeding Behavior Scale (PIBBS) is specifically developed by Nyqvist et al. (1999) to assess the feeding behavior of preterm infants (5). This scale measures the issues related to the lack of feeding maturation, length of consecutive sucking, and evidence of swallowing among preterm newborns.

The Preterm Infant Breastfeeding Behavior Scale has been developed for the use of mothers and healthcare providers to assess the feeding behavior of preterm neonates born at ≤ 35 weeks of gestation receiving care inside a neonatal intensive care unit (NICU). Parents can accurately assess their newborn's feeding behavior at each feeding time. This tool measures six components, including rooting, areola grasp, latching and maintaining latch, sucking, longest sucking burst, and swallowing (Nyqvist et al., 1999) (Table 1).

Although many studies have been conducted on preterm newborns' feeding behavior using the PIBBS tool, the validity of this tool is not investigated in Iran. Given the high incidence (near 10%) of preterm birth in Iran (6), the present study aimed to evaluate the validity and feasibility of the PIBBS questionnaire.

Table 1. Scores of the Preterm Infant Breastfeeding Behavior Scale

Scale items	Maturational steps	Score
Rooting	Did not root	0
	Showed some rooting behavior	1
	Showed obvious rooting behavior	2
Areolar grasp	None, the mouth only touched the nipple	0
(how much of the	Part of the nipple	1
breast was inside	The whole nipple, not the areola	2
the baby's mouth)	The nipple and some of the areola	3
Latched on and	Did not latch on at all so the mother felt it	0
fixed to the breast	Latched on for ≤5 min	1
	Latched on for 6–10 min	2
	Latched on for ≥11–15 min	3
Sucking	No sucking or licking	0
	Licking and tasting, but no sucking	1
	Single sucks, occasional short sucking bursts (2–9 sucks)	2
	Repeated short sucking bursts, occasional long bursts (≥10 sucks)	3
	Repeated (≥2) long sucking bursts	4
	1–5 consecutive sucks	1
	6–10 consecutive sucks	2
	11–15 consecutive sucks	3
Longest sucking burst	16–20 consecutive sucks	4
	21–25 consecutive sucks	5
	≥26–30 consecutive sucks	6
	Swallowing was not noticed	0
Swallowing	Occasional swallowing was noticed	1
	Repeated swallowing was noticed	2

Note. Adapted from: Nyqvist, K.H., Sjödén, P., & Ewald, U. (1999). The development of preterm infants' breastfeeding behavior. Early Human Development, 55, 247-264

Methods

The sampling was initiated after obtaining permission from the Ethics Committee of Tabriz University of Medical Sciences, Tabriz, Iran (IR.TBZMED.REC. 1398.1213). The current study was performed on 70 preterm newborns (29 girls and 41 boys) from August 2020 to January 2021. The newborns aged 32-35 weeks of gestation were admitted to the NICU of Persian Gulf Hospital in Bandar Abbas City, Iran. The exclusion criteria were the attachment to a continuous positive airway pressure ventilator, suffering from neonatal sepsis, intraventricular hemorrhage, periventricular leukomalacia, and cleft lip and palate. The samples were selected using a purposeful sampling method.

The researcher sampled eligible newborns of parents willing to participate in the study and explained the study objectives and methods to the parents. Participation in the study was voluntary, and the participants were assured of the confidentiality of their information. The informed consent form was obtained from the parents and a demographic/obstetric and neonatal characteristic form was completed.

The feeding behavior score (PIBBS) is obtained in the range of 0-20 with low scores representing immature breastfeeding behaviors. Mature breastfeeding behavior is indicated if the newborn achieves the highest scores on all six items (7). The neonate in the best feeding condition gets a score of 20 (5). The PIBBS questionnaire was translated using the forward/backward method after obtaining permission from the designer of the original scale. The original English version was translated into Persian by two translators who were proficient in translating medical texts and had previous expertise in translating questionnaires. Afterward, the translations were compared and the items were matched in terms of semantic, conceptual, and technical equivalence. Finally, a Persian version of this tool was prepared by selecting the best options. To make sure of the congruency of Persian translation with the original text and the fluency of the Persian text sentences, the original translated version was translated into the original language by two other experienced English translators who had not previously seen the original questionnaire. At this stage, the English version was compared with the original version and, after conducting the required review and reform, the English version of the questionnaire was obtained. Then, the final version of the English tool was prepared in Persian (8).

Cohen's kappa coefficient was applied to assess the inter-rater reliability of the questionnaire. For this purpose, the neonate was placed under the mother's breast in the morning shift about 2 h after the last feeding time, and the researcher carefully monitored the neonate's feeding behavior and completed the PIBBS questionnaire. Subsequently, in the evening shift of the same day, the neonate was placed under the mother's breast again about 2 h after the last feeding time, and this time, one of the nurses examined the feeding behavior of the neonate and completed the questionnaire. The Kendall's Tau correlation coefficient was calculated each day to assess intra-rater reliability. The internal consistency of the instrument was measured by calculating Cronbach's alpha coefficient.

Data analysis

The data were analyzed using SPSS software version 15. Cohen's kappa coefficient was calculated to evaluate the agreement between observers. The kappa values of ≤ 0.2 are classified as slight, 0.4-0.59 as fair, 0.660-0.79 as moderate, 0.8-0.9 as strong, and > 0.9 as perfect agreement (9).

The internal consistency of the instrument was measured by calculating Cronbach's alpha coefficient. An alpha value of > 0.8 is preferred, 0.6-0.8 is acceptable, and < 0.5 is rejected (10). Kendall's Tau correlation coefficient of > 0.3 is considered strong (9).

Results

Table 2 presents the socio-demographic characteristics of the newborns. The mean scores of neonates' age at birth and weight were estimated at 31.5±2.5 weeks and 1508.1±326 g, respectively. The feeding behavior of 70 preterm neonates was measured by 2 individuals (each once) on two consecutive days. The total Cohen's kappa coefficients of the instrument among observers were obtained at 0.72 for the first time of investigation and 0.79 for the second time, which were considered substantial. The Cronbach's alpha of the instrument was 0.791, which was acceptable. Table 3 summarizes the values of Kendall's Tau, Cohen's kappa, and Cronbach's alpha in terms of the time of measurement and sub-scales of PIBBS. Table 4 tabulates the PIBBS score by age groups.

Table 2. Socio-demographic characteristics of newborns

Characteristic	n (%)
Gestational age	
31-33 weeks	50 (35)
34-35 weeks	50 (35)
Gender (male)	41 (58.6)
Mode of delivery (cesarean)	54 (77.1)
Type of nutrition (exclusive breastfeeding)	30 (42.8)

Table 3. Inter-rater reliability and internal consistency of PIBBS

Scale items	Kendall's Tau	Cohen's kappa	Cronbach's alpha
Rooting			
Day 1	0.499	0.700	0.701
Day 2	0.675	0.721	
Areolar grasp			
Day 1	0.683	0.783	0.671
Day 2	0.497	0.717	
Latched			
Day 1	0.714	0.743	0.761
Day 2	0.630	0.761	
Sucking			
Day 1	0.846	0.703	0.791
Day 2	0.697	0.899	
Longest sucking burst			
Day 1	0.615	0.659	0.681
Day 2	0.725	0.697	
Swallowing			
Day 1	0.793	0.799	0.801
Day 2	0.802	0.797	

Table 4. PIBBS scores according to the age groups

PIBBS score	31-33 weeks (n=35) mean±SD	34-35 weeks (n=35) mean±SD	P-value
Day1	13.5±4.4	14.6±3.9	0.254
Day2	13.9±3.6	15.4±3.4	0.048

Discussion

The present study aimed to evaluate the validity and feasibility of PIBBS among Iranian preterm newborns. Overall, an acceptable agreement was obtained between the two evaluators at each time of assessing the feeding behavior of the newborns. The results of the present study demonstrated that the agreement of the observers on the first and second day of the investigation was moderate for all PIBBS sub-scales as well as the whole instrument. Acceptable intra-rater reliability was found in utilizing PIBBS.

Nyqvist et al. (1999) estimated the kappa values for the PIBBS tool between the two observers at 0.68-0.84. In their study, the kappa value between mother and observer was calculated at 0.77-0.94 (11). The results of the present study indicated that Cronbach's alpha coefficient of this instrument was 0.791, which was acceptable. The Cronbach's alpha coefficient has been widely used to measure the internal consistency of the questionnaire. Internal consistency refers to the degree of homogeneity among the items of an instrument and a lower variation in repeated measurements indicates higher reliability of the tool (10).

In the present research, the lowest and highest kappa values were obtained in the longest sucking burst and in sucking and swallowing, respectively. In the same vein, the results of a study conducted by Lober et al. (2020) on 23 neonates with 34-36 weeks of gestation showed that maternal fatigue could change the position, lead to the early termination of breastfeeding, and alter the observation results of the two observers (7).

In the present study, due to the fatigue of the second observer, who was a staff nurse, because of the workload, as well as the mother's probable unwillingness to cooperate, a decrease was observed in the accuracy and the score of the Cohen's kappa of PIBBS.

Nyqvist et al. (1999) reported a good or excellent agreement between the two evaluators for the subscales of rooting, areolar grasp, sucking, and swallowing (11). In another study, Lober et al. (2018) investigated the reliability of PIBBS for late preterm infants, as well as the inter-rater agreement in the first 24 and 48 h after the birth and obtained good kappa values between observers (5).

In addition, Lober et al. (2020) examined the use of PIBBS among late preterm infants and determined its validity between mothers and health professionals. The six components of the tool were independently rated and the agreement range for all components was obtained at 81.8-100% (7). The findings of a study carried out by Pike et al. (2017) on 73 late preterm infants demonstrated a lower Cohen's kappa value in examining the validity of PIBBS (12). Phalen et al. (2003) measured the correlation between PIBBS score and weight gain of 50 preterm infants hospitalized in the NICU. The agreement coefficient between the researcher and two lactation consultants demonstrated a significant agreement (kappa=0.73, P=0.01); however, there was little agreement between the researcher and mother (kappa=0.14). They concluded that when PIBBS was used by trained professionals, it was a reliable tool for assessing preterm infants' breastfeeding behavior (13).

Based on the results of the present study, neonates with 34-35 weeks of gestation obtained high scores in PIBBS, compared to neonates with 31-33 weeks of gestation, and the difference on the second day was significant, which was consistent with the results of the study by Nyqvist et al. (1999) (14). Naturally, as neonates grow up, their nutrition from breast milk will become more effective and better.

Furthermore, Nyqvist et al. (1999) generalized the validation of PIBBS to late preterm infants, not to those hospitalized in NICU. The inter-rater

reliability was tested at two different time points. In the first interval (in the first 24 h after the birth), each component of the PIBBS tool had a strong to almost complete agreement. In the second interval (between 24-48 h after the birth), the level of agreement was still reported acceptable.

Lober concluded that the breastfeeding behavior of late preterm neonates could be changed day by day and week by week. Unlike other preterm neonates, late preterm neonates can be kept rooming-in with their mothers due to being relatively small and becoming sustainable after birth. However, every sub-category of preterm birth can be considered an obstacle to effective and fast feeding. The Preterm Infant Breastfeeding Behavior Scale is regarded as a reliable tool for evaluating late preterm neonates' feeding as well as an objective tool for assessing their feeding by mothers. The inclusion of PIBBS in breastfeeding training can lead to the achievement of an important goal of having infants fed with breast milk. The use of PIBBS in the framework of programs, which are purposefully designed to feed late preterm neonates, starting from birth to the predicted time, may be highly useful for promoting and supporting breastfeeding (5).

Limitations

The relatively low sample size was one of the limitations of the current study. Another limitation was the failure to review the Cohen's kappa between the mother and researcher. Due to the fatigue of mothers, they could not be encouraged to score the PIBBS tool. Although breastfeeding is not affected by ethnicity, since this study was conducted in the south of Iran, the generalization of the results to other regions and ethnicities of Iran should be performed with caution.

Conclusion

The results of the present study demonstrated that PIBBS had good internal reliability and consistency. Given that preterm newborns' feeding requires a precise evaluation, based on the results of this study, PIBBS can be used to examine preterm newborns' feeding among the Iranian population.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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