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Effect of Instructional Program on Nurses' Performance Regarding Expressed Breast Milk used in Trophic Feeding for Preterm Infant

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ABSTRACT

Background: Trophic feeding is a strategy used to encourage the development of preterm neonates' underdeveloped gastrointestinal tracts by giving them small volumes of enteral feedings. **Objectives:** The study aimed to evaluate the effect of an instructional program on nurses' performance regarding expressed breast milk used in trophic feeding for preterm neonates. **Methods:** *Design:* A quasi-experimental research design was utilized. *Settings:* The research was conducted at the Neonatal Intensive Care Units of Fayoum General Hospital and Mostafa Hassan Pediatric Hospital. *Sample:* A purposive sample of 100 nurses using expressed breast milk in trophic feeding and preterm neonates. *Tools:* Three tools were used. The first was a structured interview questionnaire that collected required information regarding the attributes of the subjects and the nurses' knowledge regarding expressed breast milk used in trophic feeding for preterm neonates. 2nd *Tool:* An observational checklist designed to assess nurses' practices with regard to expressed breast milk used in trophic feeding for preterm neonates. 3rd *Tool:* Attitude Type-Rating Scale. **Results:** There was a highly significant difference (p=0.001) between the total level of the nurses' knowledge, practices, and attitude pre/post intervention. Additionally, there was a positive correlation ($p \leq 0.05$) between the nurses' total knowledge, practices, and attitude pre- and post-intervention. **Conclusion:** The health education intervention significantly enhanced nurses' understanding, practices, and attitudes regarding the use of expressed breast milk in trophic feeding for preterm neonates. **Recommendation:** Continuous health education program for nurses to raise awareness about expressing breast milk used in trophic feeding for preterm neonates.

Keywords: Breast Milk; Nurses' Performance; Preterm Infants; Trophic Feeding

INTRODUCTION

Preterm birth is defined as delivery occurring before 37 completed weeks of gestation. In 2020, about 13.4 million babies were born too early around the world, which is more than one in ten births. Preterm birth represents a major public health concern because it is associated with an increased risk of various health complications (Muppa *et al*., 2024). Preterm neonates are particularly vulnerable to nutrient deficiencies due to gastrointestinal immaturity, underdeveloped sucking ability, low breast milk supply, and challenges in achieving adequate nutritional intake to support growth and neurodevelopment. Therefore, ensuring optimal nutrition is crucial for promoting proper growth, supporting neurodevelopment, and reducing the risk of metabolic disorders later in life (Hu & Zhu, 2024). Optimal early nutrition is essential for the growth and development of preterm neonates. Breast milk is the ideal nutrition for preterm neonates. When direct breastfeeding is not possible, Expressed Breast Milk (EBM) is used (Chen *et al*., 2025). Expressed breast milk improves immunity, digestion, neurodevelopment, and weight gain, and increases exclusive breastfeeding rates (Li *et al*., 2024).

Preterm neonates often cannot tolerate full enteral feeding in the early days of life. Therefore, trophic (minimal) enteral feeding is used in small amounts to stimulate the intestine (de Paula *et al.*, 2025). This approach supports gut maturation and reduces the risk of sepsis and necrotizing enterocolitis (Socarras *et al*., 2025).Trophic

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feeding offers multiple benefits for preterm neonates, including enhanced caloric intake, improved feeding tolerance, increased weight gain, and better physical development. It also contributes to reducing the risk of infection, improving mineral balance, and increasing serum calcium activity. Additionally, trophic feeding is associated with a significant reduction in the duration of oxygen therapy and parenteral nutrition, as well as earlier hospital discharge (Prasad *et al*., 2025).

Neonatal nurses play a critical role in promoting the optimal development of preterm neonates by implementing structured protocols and care practices. These include providing oral care, facilitating skin-to-skin contact, supporting mothers to express breast milk, appropriately fortifying expressed breast milk, and creating opportunities for nurturing interactions between preterm neonates and their parents. Such practices contribute to the overall physical, psychological, and emotional development of preterm neonates (Dilantika *et al.*, 2024).

Significance of the Study

Approximately 15 million (11.1%) of the 130 million infants who are born annually before their due date. Preterm still contributes significantly to long-term poor health outcomes, newborn and infant death, and morbidity (Khasawneh & Khriesat, 2020). About 23.13% of preterm births in Egypt are reported to take place between 32 and less than 37 weeks of gestation (Algameel *et al.*, 2020). Preterm newborns require more nutrients than term infants. Because of the gastrointestinal tracts' immaturity, feeding preterm neonates presents a special problem. Early trophic feeding is essential for preterm neonates to obtain adequate earlier enteral intake of expressed breast milk, reduce morbidities, and improve optimal growth and long-term outcomes (Grigorov & Mladenov, 2025).

Aim of the Study

The study aimed to evaluate the effect of an instructional program on nurses' performance regarding expressed breast milk used in trophic feeding for preterm neonates.

Research Hypothesis

The implementation of the instructional program will have a positive effect on nurses' performance regarding expressed breast milk used in trophic feeding for preterm neonates.

METHODOLOGY

Design: A quasi-experimental design was used.

Setting

The study was conducted in the Neonatal Intensive Care Unit (NICU) at Mostafa Hassan Pediatric Hospital, affiliated with Fayoum University Hospitals. It is situated on the third floor of the hospital building and consists of 4 rooms. The first room is for routine care and equipped with 8 incubators; the second room is for isolation and equipped with 2 incubators. While the third room is for medication preparation, and the fourth one is for intensive care and equipped with 10 incubators. In addition, the neonatal intensive care unit at Fayoum General Hospital is affiliated with the Egyptian Ministry of Health. It is situated on the third floor of the hospital building and consists of 4 rooms. The first and the second rooms are for routine care and equipped with 20 incubators. Meanwhile, the third room is for isolation and equipped with 12 incubators, and the fourth room is for intensive care and equipped with 12 incubators.

Sampling

A purposive sampling involved 100 nurses and preterm neonates who attended the previously mentioned settings during the study period. Participants were chosen based on specific inclusion and exclusion criteria. Inclusion criteria required that nurses be registered, working in the NICU, willing to participate, provide informed consent, and have at least six months of neonatal care experience. Nurses were excluded if they were on leave during data collection, had less than six months of experience, declined to participate, or were student nurses/trainees not fully responsible for preterm care. This approach ensured that the sample included nurses who were knowledgeable and actively engaged in the relevant clinical practices, thereby supporting the study's objectives.

Preterm neonates were eligible to participate if they were underweight newborns (less than 2.5 kg) and early

born (less than 37 weeks gestation), did not receive enteral feeding during the first week of life, and were in a steady state of health (heart rate, breathing rate, and oxygen saturation). Preterm neonates with severe hemodynamic instability, necrotizing enterocolitis, and intestinal obstruction/perforation or paralysis were excluded from participation.

Data Collection: *Data was collected using three tools*

Tool I: A structured interview questionnaire was developed and adapted by the researcher based on a thorough review of relevant literature (Elhusein *et al*., 2015; Sinha *et al.*, 2017). The questionnaire was used to comprehensively assess sociodemographic characteristics and nurses' knowledge regarding expressed breast milk used in trophic feeding. It consisted of three main sections. The first section gathered information on sociodemographic characteristics of the nurse, including age, educational qualification, and years of experience. The second section focused on preterm neonates, including gestational age, gender, and birth weight. The third section assessed nurses' knowledge regarding expressed breast milk used in trophic feeding for preterm neonates. It included information on trophic feeding, breast milk expression, gastric tube feeding, and preterm neonates' infection.

Nurses' knowledge was evaluated by the model key answers sheet that was prepared by the researcher. Each question was scored 0–2, where a complete and correct answer had 2 grades, incomplete correct answers had 1 grade, and a zero score was for an incorrect or unknown answer, and the total score was converted to a percentage and classified as good (≥75%), average (60–74%), or poor (<60%) knowledge.

Tool II: The observational checklist was adapted from Seyedhejazi *et al*. (2017); the Center for Disease Control and Prevention guidelines; and Foote *et al*. (2020) to evaluate nurses' practices regarding preterm neonates care, including anthropometric measurements, nasogastric tube insertion, breast milk expression, cleaning, storage, and freezing. It included 125 items. Each item was scored as 0 for not done or 1 for correctly done. The total score is converted to a percentage and categorized as competent (≥85%) or incompetent (<85%).

Tool III: The attitude rating scale was developed by Elezz *et al.* (2021) to assess nurses' attitude toward expressed breast milk used in trophic feeding. It included 15 statements scored 1–2, with the total score converted to a percentage and classified as a positive (≥70%) or negative (<70%) attitude.

The Instructional Program

The instructional program was conducted in three phases: assessment, implementation, and evaluation. In the assessment phase, nurses' baseline knowledge, attitude, and practices regarding expressed breast milk used in trophic feeding were evaluated using a questionnaire, attitude rating scale, and observational checklist. Relevant preterm neonates data were obtained from medical records. Upon completion of data collection, the eligible participants were provided with an instructional program (the implementation phase). The program was created to meet the requirements and expectations of nurses with different educational backgrounds. The lecture-based sessions' content was created based on relevant literature (Buloze, 2021; Shattnawi, 2017) and was presented in the Arabic Egyptian dialect to enhance comprehension. To ensure the clarity, relevance, and effectiveness of the program, a panel of neonatal health experts was invited to evaluate the session content and handout. Based on their feedback, necessary modifications were made before delivering the program.

The implementation phase included nine sessions—six theoretical and three practical. Each educational session included 5–7 nurses, a number chosen to optimize the delivery of the material, allow for sufficient interaction, and fit within the available educational space. The educational content was provided through a data show using different activities such as role-playing, brainstorming, and group discussion. Each nurse participated in two face-to-face sessions, each lasting 60 min, during which expressed breast milk used in trophic feeding was thoroughly explained. At the end of each session, the researcher addressed any questions raised by participants.

The first session commenced with a warm welcome from the researcher, followed by an overview of preterm neonates characteristics. The second and third sessions began with a review of the key points from the previous session. The researcher then elaborated on trophic feeding. The fourth and fifth sessions involved breast milk expression and storage. The sixth session included gastric tube feeding and neonatal infection. While the practical sessions demonstrated breast milk handling, nasogastric tube insertion, and anthropometric measurements for preterm neonates. Knowledge was reinforced at the start of each session through review, and

comprehension was ensured at the end. In the evaluation phase, a posttest for nurses' knowledge, attitude, and practices was performed immediately after completing the program sessions using the same tools.

Content Validity

To assess the content validity, five pediatric nursing specialists evaluated the tools' application, relevance, clarity, and content coverage. The tools were somewhat altered in response to the experts' feedback regarding the items' order, content appropriateness, and language clarity.

Table 1: Experts' Judgment Regarding General Evaluation of Content Validity of the Data Collection Tools (n=5)

Tools Characteristics		Agree		Disagree	
		N	%	N	%
1	Accurate	5	100.0	0	
2	Comprehensive	5	100.0	0	
3	Clear	5	100.0	0	
4	Appropriate	5	100.0	0	
5	Logical sequence	5	100.0	0	
6	Related to objectives	5	100.0	0	
7	Representative	5	100.0	0	

Table 1 presents the evaluation of content validity for the data collection tools based on expert judgments. The table shows the characteristics of the tools, including their accuracy, comprehensiveness, clarity, appropriateness, logical sequencing, relevance to objectives, and representativeness. For each characteristic, the evaluation is reported with the number (N) and percentage (%) of experts who agreed, showing that all experts (100%) agreed on the content validity of the tools.

Reliability

The internal consistency and overall tools' dependability were evaluated, making use of Cronbach's Alpha of knowledge 0.85, attitude 0.91, and practices 0.85.

Field Work

Each nurse was interviewed separately based on their level of mental and physical preparedness as well as the work's mitigating circumstances. The researcher began by introducing herself and providing a concise overview of the study's purpose and expectations to each nurse. Based on an evaluation of the nurses' actual needs under study, researchers reviewed relevant works of literature before planning, designing, and implementing the Arabic-language instructional program. For the nurses under study, the researchers preferred an educational program. Both theoretical knowledge and practical processes were explained. Each nurse was evaluated twice before and after the instructional program was put into place.

Statistical Analysis

The data was analyzed and tabulated using SPSS version 27. Mean and Standard Deviation (SD) were used to represent quantitative data, whereas frequency and percentage were used to represent qualitative data. Results were considered statistically significant when the *p*-value was less than 0.05. McNemar's test was used to evaluate the statistically significant change in proportions that occurred on a paired, dichotomous trait at two time points.

The difference between non-parametric paired qualitative data when variables had more than two categories was evaluated through the Marginal Homogeneity test. The chi-square (x^2) independency test was used to evaluate the relationship between the independent categorical variables. The Spearman correlation coefficient evaluates the strength and direction of correlation between two ranked variables. The significance level was set as a P-value ≤ 0.05.

Ethical Consideration

The ethical approval was obtained from the Scientific Research Ethics Committee, Faculty of Nursing, Helwan University, Egypt with reference number 38 on 2nd January 2024.

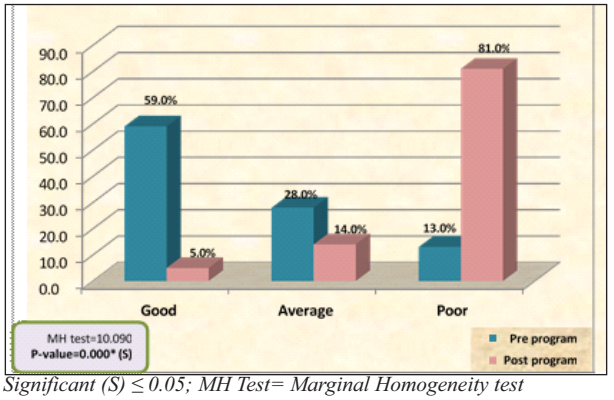
Before gathering data for the actual study, the researcher got in touch with the study participants to solicit their cooperation and give them a brief description. The researchers promised to protect the subjects' data's confidentiality and anonymity and to utilize it exclusively for the study.

RESULTS

Table 2: Distribution of Nurses According to Selected Demographic Characteristics (n = 100)

Attributes of the Studied Nurses	No	%
Age /years		
20 : < 25	28	28.0
25 : <30	57	57.0
30 : < 35	11	11.0
≥35	4	4.0
Mean ± SD	**27.11±3.86**	
Sex		
Male	0	0.0
Female	100	100.0
Educational Qualification		
Diploma of Nursing	6	6.0
Technical Nursing institute	83	83.0
Bachelor of nursing	9	9.0
Other	2	2.0
Experience in Years		
> 5	26	26.0
5 <10	62	62.0
10 <15	9	9.0
≥15	3	3.0
Mean ± SD	**7.39±2.27**	
Pervious Participation in Training Program about Trophic Feeding for Premature Infant		
Yes	29	29.0
No	71	71.0
In Case of Yes, how Many Courses (n=29)		
One	23	79.4
Two	5	17.2
Other	1	3.4

Table 2 Indicates that most nurses were female and aged 25<30 years (mean±SD:7.39±2.27). The predominance of females in this age group may reflect staffing patterns in the NICU. Most nurses held a degree from the technical nursing institute, and nearly two-thirds had five to ten years of clinical experience, suggesting a moderate level of professional expertise. However, less than three-quarters had received formal training on trophic feeding for preterm neonates, which may indicate a gap in continuing education that could affect the quality of care provided in NICUs.



Significant (S) ≤ 0.05; MH Test= Marginal Homogeneity test

Figure 1: Nurses' Overall Knowledge of Expressed Breast Milk Use in Trophic Feeding for Preterm Infants in NICUs (n = 100)

The figure 1 demonstrates that before program, only a minority of nurses possessed a good level of overall knowledge regarding expressed breast milk used in trophic feeding for preterm neonates in NICUs. Following the instructional program, the majority of nurses achieved a good level of knowledge, indicating a substantial improvement. This change was statistically significant (P = 0.000), highlighting the effectiveness of the program in enhancing nurses' understanding and preparedness to provide optimal care for preterm neonates.

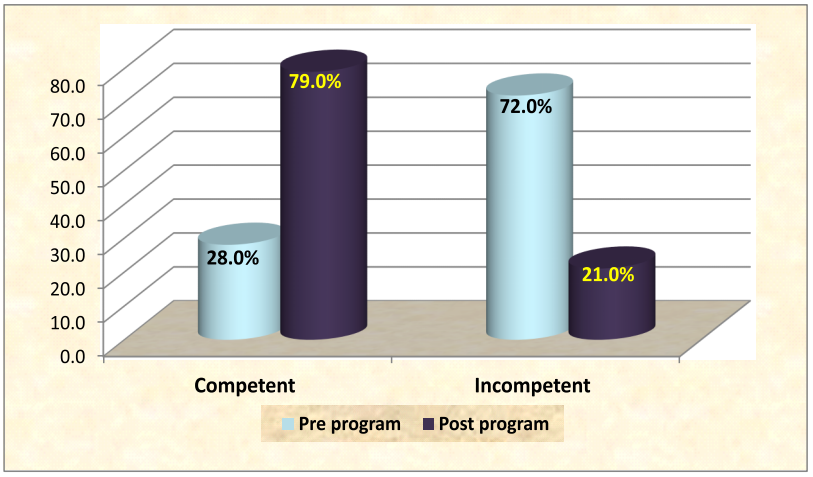
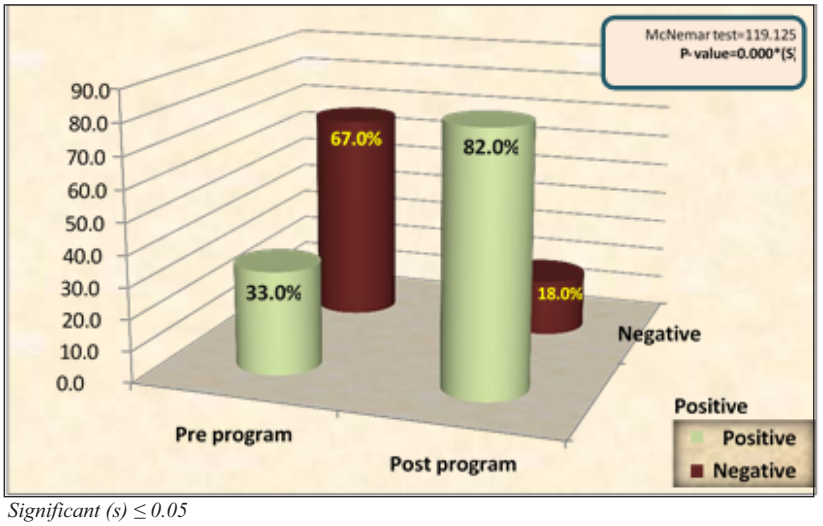


Figure 2: Nurses' Practice Levels Regarding Expressed Breast Milk for Trophic Feeding in NICUs (n = 100)

Figure 2 presents the intervention effect on nurses practices at pre and post intervention. At post program, the results showed a significant improvement in nurses practices included increase competent practices to most on nurses (P = 0.000).



Significant (s) ≤ 0.05

Figure 3: Nurses' Overall Attitude toward Expressed Breast Milk for Trophic Feeding in NICUs (n =100)

Figure 3 demonstrates a statistically significant improvement in nurses' overall attitude toward expressed breast milk used in trophic feeding for preterm neonates in NICUs (P = 0.000). Before the intervention, only one-third of the nurses exhibited a positive attitude, whereas following the instructional program, the majority demonstrated a favorable attitude. This finding indicates that the intervention effectively enhanced nurses' perspectives, which is likely to contribute to improved care practices and support for preterm neonates.

Table 3: Correlation between Total Level of Studied Nurses Knowledge, Attitude and Practices Pre and Post Intervention (n=100)

Items	Pre /post	Total Level of Knowledge		Practices	
		R	***P*-value**	***R***	***P*-value**
Practices	Pre intervention	0.551	0.030* (S)	-	-
	Post intervention	0.692	0.034*(S)	-	-
Total level of attitude	Pre intervention	0.461	0.038* (S)	0.418	0.045* (S)
	Post intervention	0.621	0.025*(S)	0.835	0.031*(S)

**P-value ≤0.05 = Significant (S) R=Correlation Coefficient; P-value ≤ 0.05 indicates statistical significance (S); R = Pearson correlation coefficient. Confidence level: 95%*

Table 3 demonstrates a statistically significant positive association between nurses' overall knowledge, attitude, and practices both before and after the intervention ($P \leq 0.05$). This finding indicates that higher levels of knowledge are associated with more positive attitude, and better practices emphasizing the interconnected nature of these domains. The results suggest that interventions aimed at improving knowledge are likely to positively influence both attitude and practical skills, thereby enhancing the overall quality of care provided to preterm neonates in NICUs.

DISCUSSION

Expressed breast milk is commonly used in trophic feeding for preterm neonates to support their nutritional needs (Tewari *et al.*, 2020). The study aimed to examine the effect of an instructional program on improving nurses' performance regarding the use of expressed breast milk in trophic feeding for premature infants. The current study finding showed that most nurses were aged 25<30 years, with a mean ± SD of 7.39 ± 2.27. This finding is consistent with the study by Ebrah and Yousif (2020) conducted in Sudan with 50 participants, which also reported that a large proportion of nurses fell within this age range. The researcher suggests that this may be attributed to the high demands of NICU work, which often requires young, qualified nurses capable of meeting the physical and professional challenges of providing high-quality neonatal care.

Based on the results of the current study, every nurse under investigation was a female. This outcome was in line with El-Morsy *et al*. (2020) findings, which found that all evaluated nurses were female. According to the study, the higher proportion of female nurses could be a result of the majority of nursing school students in Egyptian society are female. The results of the current study revealed that the majority of the nurses who were the subject of the inquiry had degrees from technical nursing institutes. In contrast to this outcome, a study conducted in Pakistan among 36 nurses by Naz *et al.* (2024), and revealed that over one-third of the nurses was a diploma nursing graduate.

In terms of training sessions on trophic feeding for preterm neonates, over three-quarters of the nurses did not attend these sessions. This finding is consistent with Ebrah and Yousif (2020), who reported that a substantial proportion of nurses had not participated in training sessions on therapeutic feeding. The researchers suggested that this could be due to factors such as limited time, high workload in neonatal units, and restricted access to hospital-based training programs. In the present study, the overall level of nurses' knowledge regarding trophic feeding using expressed breast milk for preterm neonates in NICUs showed a significant improvement after the intervention. This improvement highlighted the effectiveness of structured educational program in enhancing nurses' theoretical understanding and supporting evidence-based neonatal care.

On the same hand, El-Morsy *et al*. (2020) reported that the majority of nurses lacked adequate knowledge regarding the nutritional needs of low birth weight neonates prior to the implementation of guideline-based training. This is consistent with the current study's findings, which also indicated limited baseline knowledge among nurses. However, following the instructional program, all participating nurses demonstrated sufficient expertise, highlighting the effectiveness of structured educational intervention. Similarly, Buloze (2021) found that nurses had adequate knowledge of trophic feeding, supporting the current results. In contrast, Aisa and Abbas (2019) reported gaps in nurses' knowledge despite similar educational efforts. These discrepancies may reflect variations in program content, delivery methods, or institutional support for continuing education.

The current study demonstrated a statistically significant improvement in nurses' overall attitude toward the use of expressed breast milk in trophic feeding for preterm neonates in NICUs after the intervention (P = 0.000). This finding is consistent with Buloze (2021), who reported initially negative attitude among the study participants. On the other context, the results differ from Shattnawi (2017) study, which highlighted discrepancies between staff members' perceptions and their actual practices regarding breastfeeding support. From the perspective of the present study, the improvement in attitude may be attributed to the provision of accurate information, structured training, and practical demonstrations, which addressed prior gaps in knowledge and practices. Thereby, positively influencing nurses' perceptions and readiness to implement best practices in NICU settings.

A statistically significant improvement in nurses' overall practices regarding the use of expressed breast milk in trophic feeding for preterm neonates in NICUs was observed following the instructional program. This finding aligns with Hendy *et al*. (2025), who reported that more than half of the nurses in their study demonstrated inadequate procedures for transitioning preterm neonates to oral feeding. According to the researcher, these results underscore the importance of structured training initiatives aimed at enhancing the protocols and practical skills for trophic feeding with expressed breast milk, thereby improving the quality and supporting evidence of neonatal care in critical care settings.

The findings were in contrast to those of Kayiza (2022) study, which found no statistically significant impact of the training provided to healthcare professionals on food intake in newborns with extremely low birth weights. A cross-sectional by Shrestha *et al.* (2023) found that nurses had adequate practices of nutritional care for preterm neonates. Additionally, Buloze (2021) revealed that nurses in the study had a very high level of practices when it came to feeding infants with low and extremely low birth weights, which was consistent with research.

Regarding the correlation between overall knowledge, attitude, and practices of the nurses, the current study revealed a statistically significant positive correlation among these domains both before and after the intervention. Nurses with higher knowledge scores tended to be more positive attitude, and demonstrate better practices toward the use of expressed breast milk in trophic feeding for preterm neonates. These findings are consistent with Hamdan *et al*. (2022), who reported a correlation between nurses' knowledge and their attitude, and highlighted that improvements in knowledge are likely enhancing practical skills and perceptions. This underscores the importance of comprehensive educational programs that simultaneously target theoretical understanding, attitudinal change, and practical competence to optimize neonatal care in NICUs.

Additionally, this finding is supported by Ebrah and Yousif (2020), who reported a positive Pearson correlation between nurses' knowledge scores and their practical skills. From the researchers' perspective, this correlation can be explained by the fact that nurses' attitude and practices improve concurrently with increased knowledge. When nurses possess sufficient knowledge, they are better able to perform clinical procedures effectively, which demonstrates the effectiveness of structured educational program in enhancing both competence and confidence in providing trophic feeding using expressed breast milk for preterm neonates.

These findings reinforce the value of structured educational interventions in strengthening nurses' competencies and supporting evidence-based neonatal care.

Limitations

This study has numerous limitations that should be considered when interpreting the results. First, because the study was conducted in only two neonatal intensive care units in Egypt, the results may not be applicable to all nurses in different health settings. Second, the outcomes were measured immediately after the intervention, so the long-term sustainability of the improvements is unknown. The study also excluded neonates with severe hemodynamic instability, and intestinal obstruction, which limits the relevance of the results to the general preterm neonates.

CONCLUSION

The study highlights the vital role of nurses in providing optimal care and nutrition for preterm neonates through the use of expressed breast milk in trophic feeding. Enhancing nurses' knowledge, attitude, and skills

positively affects clinical outcomes, including improving growth, immunity, and neurodevelopment. These findings emphasize the importance of structured instructional programs to support professional competence and promote evidence-based practices in neonatal intensive care units. Continuous training and evaluation are recommended to sustain high standards of care and achieve better outcomes for preterm neonates. Future research with larger, multi-center samples and long-term evaluation is recommended to further validate the effectiveness and sustainability of such training programs.

Recommendations

Raising awareness of nurses about importance of trophic feeding for preterm neonates using expressed breast milk rather than artifiacl feeding. Offering ongoing training courses for the purpose of teaching neonatal critical care unit nurses about trophic feeding for premature infants.

This study is unique because it focuses on improving NICU nurses' knowledge and performance specifically in the use of expressed breast milk for trophic feeding in preterm neonates—an area with limited previous research. The instructional program developed in this study provides targeted, evidence-based training on safe handling, preparation, and administration of EBM, and addressing practical gaps not widely covered in earlier studies. By measuring changes in both knowledge and performance, the study offers new insights into how structured education can enhance the quality of trophic feeding practices and neonatal outcomes.

Conflict of Interest

The authors declare that they have no competing interests.

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