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ASSESSMENT OF NURSES' KNOWLEDGE AND SKILLS REGARDING ENTERAL NUTRITION FOR PRETERM INFANTS

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Abstract

Background: Enteral nutrition is the prioritized method of administrating nutrients in preterm infants. **Aim**: To assess nurses' knowledge and skills regarding enteral nutrition for preterm infants in neonatal intensive care units. **Methods**: A descriptive research design was conducted at El Manial University Hospital and Cairo University Children's Hospita to meet the aim of this study. A convenience sample of 50 bedside nurses was assessed using a structured questionnaire and an observational checklist. **Results**: The study found that less than half of the studied nurses had a satisfactory total knowledge level regarding prematurity and enteral nutrition. None of the studied nurses achieved the satisfactory skill level iregarding enteral tube insertion or administration I'd enteral nutrition. **Conclusion**: The study concluded that the level of nurses' knowledge and skills regarding enteral nutrition for preterm infants was unsatisfactory. Their is no relationship between nurses' Knowledge or skills and their personal characteristics. **Recommendations**: Implement mandatory, competency-based training programs specifically tailored to evidence-based enteral nutrition protocols.

Keywords: Assessment, Nurses' Knowledge, Nurses' Skills , Enteral Nutrition , Preterm Infants.

1. INTRODUCTION

Enteral nutrition (EN) is the prioritized method of administrating nutrients in preterm infants (PIs) [1]. Enteral nutrition is a safe and effective method that allows food to be delivered directly to the stomach via the orogastric (OG) or nasogastric (NG) catheter to meet PIs' daily energy and nutritional needs [2]. This method is also preferred in order to prevent complications that can occur with prolonged parenteral nutrition [3], to support intestinal development, and to allow the enteral administration of pharmacological agents [4,5].

Neonatal nurses have a critical role in the safe and effective provision of EN [6].This role includes responsibilities such as inserting OG/NG catheters in line with evidence-based guidelines, checking their placement, administering food ordered by the neonatologist using correct feeding techniques, ensuring aseptic care, monitoring the physiologic stability of the PIs during feeding, providing oral motor stimulation to support feeding, and informing the physician in a timely manner in the event of complications [5,6,7]. Studies have indicated that outdated skills, such as the auscultatory method for checking tube position, are still prevalent among nurses despite being discouraged by modern safety standards [8].

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Preterm infants are more susceptible to potential complications from EN due to their underdeveloped anatomy and physiology. In addition to this susceptibility, failure of neonatal nurses to fulfill any of their critical responsibilities related to EN may increase PIs' risk of serious complications such as aspiration pneumonia [6], feeding intolerance (FI)[9], necrotizing enterocolitis (NEC), regurgitation, and sepsis [10]. The literature includes previous studies examining the knowledge levels and skills related to EN among nurses working in adult [11,12, 13] and pediatric populations [14]. However, very few studies have investigated neonatal nurses' knowledge and skills regarding EN for PIs [1,15].

In Egypt, the challenges in neonatal nursing are compounded by high patient to nurse ratios and varying levels of specialized education. Previous assessments have suggested that nursing performance is often influenced by years of experience and the availability of institutional protocols [16] Understanding the current level of nursing knowledge and the reality of bedside skills is crucial for identifying clinical gaps and enhancing the quality of neonatal care.

2. METHODS

2.1 Aim of the Study

The aim of this study was to assess nurses' knowledge and skills regarding enteral nutrition for preterm infants.

The study sought to answer the following research questions:

1) What are the level of nurses' 'knowledge and skills regarding enteral nutrition for preterm infants?
2) Is there a relationship between nurses' personal characteristics and their knowledge or skills ?

2.2 Research Design

A descriptive research design was utalized to achieve the aim of this study .

2.3 Setting

The study was conducted at two neonatal intensive care units (NICUs) in Cairo, Egypt: El Manial University Hospital (Kaser Al-Ainy) and Cairo University Children's Hospital (El Monira). Both facilities equipped with a 64-incubator capacity each, serving a high volume of high-risk neonates and following unified medical protocols.

2.4 Participants

A convenience sample of 50 bedside nurses was included in the study. The inclusion criteria comprised all nurses providing direct care to PIs, regardless of their age, gender, or years of experience. To ensure the reliability of the professional assessment, undergraduate nursing students were excluded from the sample.

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2.5 Data Collection Tools

Two tools were used:

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Data were collected using two tools developed and adapted based on an extensive review of recent literature.

Tool I: Structured Assessment Questionnaire

An Arabic language questionnaire was developed by the researchers following a comprehensive review of relevant literature. This tool was structured into two sections:

Part 1: Socio-demographic Characteristics: Collected data on age, gender, educational qualifications, years of experience in pediatric and NICUs nursing, and previous attendance at EN training programs.

Part 2: Knowledge Assessment: Consisted of 29 items (multiple-choice and true/false) designed to measure the nurses' understanding of prematurity and EN including 7 about definition of prematurity, causes, complications and nursing care, and 22 about definition of EN, indications, advantages, types, methods, contraindications, complications, role of nurse before, during and after EN and symptoms of feeding intolerance.

Scoring System for Knowledge:

Nurses received a score of (1) for each correct answer and (0) for incorrect ones. The total score was 29, and the knowledge level was categorized as follows:

- Satisfactory knowledge level: ≥ 60% = ≥17.4 scores.
- Unsatisfactory knowledge level: <60 % =<17.4 scoees.

Tool II: Clinical Skills Observational Checklist

A standardized checklist was utilized to assess the nurses' actual skills during the insertion and administration of EN. The checklist comprised 26 procedural steps (11 for tube insertion and 15 for feeding administration).

Scoring System for skills :

Each correctly performed step was awarded (1) point, while incorrectly performed or omitted steps were awarded (0). The total score was 26, and the skills level was categorized as follows:

- Satisfactory skill level: ≥ 70% = ≥18.2 scores.
- Unsatisfactory skill level: <70% = <18.2scores.

Validity and reliability

The revision of the tools for clarity, relevance, comprehensiveness, understanding, and applicability was done by a panel of three experts in the fields of high-risk neonates and pediatric nursing to assess the internal consistency and reliability of the tools, Reliability

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coefficients were calculated for the study tools , it were 94.3% and 97.1% for knowledge and skills respectively.

2.7 Procedure

The study was carried out through a structured assessment process conducted from December 2024 to May 2025. The procedure followed these steps:

Preparatory Step: An extensive literature review of recent medical textbooks and global nursing guidelines was conducted to design the study tools. Official administrative approvals were obtained from the directors of the participating hospitals.

Knowledge Assessment: Nurses completed the self-administered questionnaire (Tool I) in the units' educational or nursing rooms. It took approximately 20–30 minutes.

Skills Assessment: The researchers utilized the observational checklist (Tool II) to evaluate each nurse’s Skills during actual clinical shifts. Each observation took approximately 10 minutes per nurse. To ensure a comprehensive assessment, data collection was conducted during day shifts, four days per week, over the six-month study period.

2.8 Statistical Analysis

The data analyzed with the statistical package for social sciences (SPSS) version 20. Descriptive statistics used to present data as frequencies and percentages for qualitative variables, and means, standard deviations, and medians for quantitative ones. The internal consistency approach used to assess the reliability of the tools, with the estimation of Guttman split-half coefficient.

Analytic statistics included chi-square tests for comparing categorical variables. Quantitative continuous data were compared using the non-parametric Kruskal-Wallis (H) or ANOVA (F) tests. Spearman’s rank correlation used to assess the relations among quantitative and ranked variables.

Multiple regression analysis is used to identify independent predictors of the scores of knowledge and skills. The level of statistical significance was set at p-value <0.05.

3. RESULTS

The results of the current study showed that 60% of the studied nurses were female, their mean age was 27.8±1.0 years old. 74% of them held a bachelor’s and higher degree in nursing, 70% had less than five years’ experience in pediatric nursing, 44% had experience in the NICUs and only 8% attended one course regarding EN.

Table (1) indicated that more than half of the studied nurses had satisfactory knowledge level regarding prematurity (64.0%). Less than half of the studied nurses (32.0%) had satisfactory knowledge level regarding enteral nutrition. Less than half of the studied nurses (44.0%) had satisfactory total knowledge level regarding prematurity and enteral nutrition.

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Table (2) and table (3) demonstrated that none of the studied nurses achieved a satisfactory skill level regarding enteral tube insertion or the administration of enteral nutrition.

Table (4) revealed no statistical significant relationship between nurses' personal characteristics and their knowledge or skill scores (p>0. 05).

Table (1): Distribution of nurses' satisfactory knowledge level of prematurity and enteral nutrition (n=50)

Knowledge domains	Satisfactory Level (≥ 60%)
Prematurity	64. 0%
Enteral nutrition	32.0%
Total Knowledge	44.0%

Table (2): Distribution of nurses' correct skills regarding enteral tube insertion (n=50)

Correct skills of tube insertion	Satisfactory Level (≥ 70%)	
	No.	%
• Hand hygiene	6	12.0
• Prepare equipment	2	4.0
• Put infant in supine position	35	70.0
• Don gloves	0	0.0
• Measure the tube	23	46.0
• Lubricate the tube	4	8.0
• Insert the tube	49	98.0
• Check tube placement	10	20.0
• Re-feed unless abnormality are present	49	98.0
• Stabilize the tube	49	98.0
• Open Ryle before feeding.	2	4.0
Total:	0	0.0

Table (3) Distribution of nurses' correct skills regarding administration of enteral nutrition (n=50)

Correct skills of enteral nutrition administration:	Satisfactory Level (≥ 70%)	
	No.	%
• Check formula temperature	0	0.0
• Check formula amount	0	0.0
• Place towel below the chin	4	8.0
• Pinch the tube	22	44.0
• Pour formula into the syringe	45	90.0
• Allow feeding to flow slowly	40	80.0
• Pinch the tube before the syringe is empty	18	36.0
• Flush tube and catheter tip with distal water from 1-2 ml	2	4.0
• Place the infant on the right side	2	4.0

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• Clamp tube	50	100.0
• Provide mouth care	0	0.0
• Recording	10	20.0
• Report any abnormalities	35	70.0
• Return the equipment	42	84.0
• Wash hands	15	30.0
• Total :	0	0.0

Table (4): Relations between Nurses' Personal Characteristics and their Knowledge and Skills Scores (n=50)

Nurses' personal characteristics	Knowledge		Skills	
	Mean± SD	P	Mean± SD	P
Gender: Female Male	 53.4±14.4 57.9±13.4	0.27	 37.3±9.3 36.7±5.8	0.77
Age: <25 25+	 58.1±15.0 54.8±13.1	0.42	 38.3±6.7 26.0±7.7	0.29
Nursing qualification: Diploma Bachelor/ higher	 50.1±13.2 58.3±13.6	0.07	 37.3±8.2 36.8±7.1	0.85
Experience years in pediatric nursing: <5 5+	 58.5±2.3 50.6±3.6	0.06	 37.8±1.2 34.9±1.9	0.19
Experience years in NICU: <1 1+	 58.2±2.3 54.6±3.0	0.37	 7.1±1.5 7.6±1.4	0.79
Training courses in enteral feeding No Yes	 56.9±13.3 51.2±17.1	0.32	 7.1±1.1 8.4±3.2	0.43

4. DISCUSSION

The present study showed that less than half of nurses achieved a satisfactory total knowledge level. While more than half demonstrated satisfactory knowledge regarding prematurity, only 32% achieved satisfactory knowledge regarding EN, revealing a significant knowledge gap between general neonatal concepts and specialized nutritional management. The relatively better knowledge regarding prematurity aligns with findings by [17] who reported adequate theoretical understanding of prematurity among NICUs nurses but identified deficiencies in specific clinical management areas. Similarly, a study by [18] in Egypt found that nurses scored higher in general neonatal knowledge than in enteral feeding protocols.

In contrast, the low knowledge level regarding EN contradicts findings by [19], who reported that more than 60% of NICU nurses had satisfactory knowledge of enteral

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feeding guidelines after structured training implementation. This difference may be attributed to variations in continuing education programs and institutional protocols.

The observed knowledge gap is concerning because evidence-based EN practices are essential for preventing complications such as NEC, aspiration, and FI. According to [20]), standardized enteral feeding protocols significantly reduce feeding related complications in PIs. Therefore, insufficient knowledge may directly affect neonatal morbidity and mortality.

The present study found that none of the nurses achieved a satisfactory total skill level in either tube insertion or EN administration. Although technical steps such as tube insertion and stabilization were performed correctly by most nurses, critical infection control and safety measures were largely neglected. Only 12% performed hand hygiene, 0% donned gloves, and 20% verified tube placement. These findings are alarming and consistent with a study by [21], which found poor adherence to infection control measures during enteral feeding procedures in neonatal units. Similarly, a systematic review by [22] emphasized that improper verification of tube placement significantly increases the risk of aspiration and adverse events.

However, the results contradict findings by [23], who reported high compliance rates with tube placement verification following implementation of standardized checklists in NICUs. The discrepancy may be explained by the absence of structured protocols and monitoring systems in the current study setting.

Regarding EN administration, none of the nurses checked formula temperature or amount, and extremely low adherence was observed for mouth care, tube flushing and positioning the infant post-feeding. These omissions are clinically significant, as improper formula temperature may cause gastric discomfort, and failure to flush tubes may lead to blockage and microbial growth. According to [24], strict adherence to hand hygiene and equipment handling protocols is fundamental to preventing healthcare-associated infections in NICUs. The observed gaps in infection prevention practices suggest potential risks for neonatal sepsis and feeding-related complications.

The discrepancy between high performance of mechanical steps (e.g., pouring formula, inserting tube) and low adherence to safety steps suggests a task-oriented rather than safety-oriented practice culture. This pattern has been described by [23,] who noted that nurses may prioritize visible technical tasks while overlooking less observable safety procedures unless reinforced by supervision and training.

The present study found no statistically significant differences between nurses' knowledge or skills scores and their gender, age, years of experience, or previous training. Although bachelor-prepared nurses and those with less than five years of pediatric experience had slightly higher knowledge scores, these differences were not significant. However, the absence of significant improvement among nurses who attended EN training contradicts findings by [19] who demonstrated that structured training significantly improved both knowledge and practical skills. Moreover, Benner's theory of skill acquisition suggests that experience alone does not guarantee competence without

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reflective practice and guided learning. The current findings support this perspective, as years of experience did not significantly correlate with improved EN performance.

5.1 CONCLUSION

The study concluded that the level of nurses' knowledge and skills regarding enteral nutrition for preterm infants was unsatisfactory. Their is no relationship between nurses' Knowledge or skills and their personal characteristics. The total absence of satisfactory skills highlights a theory practice gap that persists regardless of the nurses' age, experience, or previous training. These findings underscore an urgent safety concern in NICUs, as relying on traditional, non-evidence-based methods increases the risk of life-threatening neonatal complications.

5.2 Recommendation: Based on these findings, it is recommended that NICUs implement mandatory, competency-based training programs specifically tailored to evidence-based EN protocols. Shifting from theoretical lectures toward high-fidelity simulation and hands-on clinical examinations to bridge the gap between knowledge and skill. Establishing a system of continuous bedside supervision and periodic audits to maintain adherence to international safety standards.

6. LIMITATIONS

There were no limitations in the current study.

7. ABBREVIATIONS

EN	Enteral Nutrition
FI	Feeding Intolerance
NEC	Necrotizing Enterocolitis
NG	Nasogastric
NICUs	Neonatal Intensive Care Units
OG	Orogastric
PIs	Peterm Infants
SPSS	Statistical Package for the Social Science

8. DECLARATIONS

8.1 Ethical Considerations

Ethical approval for this study was obtained from the Research Ethics Committee of the Faculty of Nursing at Cairo University as an integral part of a Master’s thesis. Before data collection, the researchers provided a detailed explanation of the study's aim and nature to all potential participants, ensuring that written informed consent was secured. Participation was strictly voluntary, and all nurses were explicitly informed of their right to withdraw from the study at any point without providing justification or facing any professional repercussions. Furthermore, strict measures were implemented to maintain the confidentiality and anonymity of the participants, with all collected data being utilized exclusively for scientific research purposes.

8.2 Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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8.3 Competing Interests

The authors declare that they have no competing interests.

8.4 Funding

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