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Necrotising Enterocolitis Knowledge and Questionnaire Responses among Neonatal Nurses in Sarawak

Wati Dadi@Bisop[1], Joemmaicca Augustta Joggery[1,*], Sarina Jamalluddin[1], Manjit Kaur Khaira[2], Kala Raani Chandra Guindan[3]

[1] Faculty of Technology & Applied Sciences, Nursing, Open University Malaysia, Malaysia
[2] Faculty of Health, School of Nursing, University of Cyberjaya, Malaysia
[3] Faculty of Medical & Life Sciences, School of Nursing, Sunway University, Malaysia

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ABSTRACT

This cross-sectional survey examined necrotising enterocolitis knowledge and responses to two assessment questions among 80 neonatal nurses at a referral hospital in Sarawak. Under the study key, the mean knowledge score was 4.06 out of 6 (SD 1.16). Seventy-five nurses (93.8%) selected the keyed general risk factors, compared with 38 (47.5%) for the item about feeding during packed red blood cell transfusion. Fifty-seven (71.3%) selected the keyed group of signs, and 23 (28.8%) selected the symptom-triggered gastric residual response. The latter item asked about routine behaviour and did not specify infant stability or unit protocol. The knowledge and two-item assessment scores showed little association (Spearman ρ = .030, p = .791). Sparse subgroups and a three-level assessment score limited inference. The responses identify topics for education and instrument refinement. Bedside assessment performance was not observed.

1. Introduction

Necrotising enterocolitis (NEC) is a serious gastrointestinal disorder in neonatal care. Prematurity and low birth weight are important risk factors, and infant characteristics and feeding exposures contribute to risk [1-4]. Early signs can be nonspecific, making a change in an infant's feeding tolerance, abdominal findings or cardiorespiratory status relevant to assessment and escalation [5,6].

Neonatal nurses monitor changes over time and communicate them to the clinical team. Evidence and practice guidance on human milk, feed initiation and monitoring continue to inform neonatal feeding protocols [7-10]. Some bedside questions, including gastric residual assessment and feeding around red cell transfusion, require consideration of infant condition and the unit protocol.

Malaysian neonatal research has documented NEC risk in very low birth weight infants [11]. This study assessed responses to six NEC knowledge items and two assessment items among nurses in a Sarawak referral hospital. It explored the association between those scores and whether assessment scores varied by demographic or professional group.

* *Corresponding author.*
E-mail address: joemmaicca@oum.edu.my

2. Methodology

2.1 Design and Setting

A quantitative cross-sectional correlational design was used. The study was conducted in the Neonatal Intensive Care Unit (NICU) and Special Care Nursery (SCN) of a referral hospital in Sarawak, a major referral centre providing care for premature, low birth weight and critically ill neonates. The design enabled measurement of current knowledge and assessment performance at a single point in time and examination of associations without manipulating study variables.

The submitted study describes an eligible workforce of approximately 100 NICU and special care nursery nurses, a target sample of 80 and stratified random sampling. Eligible nurses provided direct neonatal care and had at least three months of experience in the setting. Students, nurses on prolonged leave, staff without bedside responsibilities and those who declined consent were excluded. The submitted analysis included 80 nurses.

2.2 Questionnaire and Scoring

The questionnaire was adapted from Van Hoose [12] and included six knowledge items and two assessment items in the final analysis. Each response matching the study key received one point. The summed ranges were 0–6 and 0–2. The study defined knowledge scores of 0–49%, 50–74% and 75–100% as poor, moderate and good, respectively. Those categories were study-defined and no external validation was reported. The assessment items measured recognition of a group of NEC-associated signs and the respondent's stated approach to gastric residual checks. Neither involved observation of bedside behaviour.

The submission reports expert review, an eight-nurse pilot and a pooled Cronbach's alpha of .762. The pooled coefficient does not establish validity or separate reliability for either domain. We reviewed the residual item against the precise survey wording and published guidance.

2.3 Statistical Analysis

The analysis used Spearman correlation for the knowledge and assessment scores and Kruskal–Wallis tests for subgroup comparisons. This revision reports the original statistics and nominal p-values for the 80-nurse cohort. Confidence intervals were not available from the submitted analysis.

3. Results

3.1 Participant Characteristics

All 80 nurses in the submitted cohort were women. Most were aged 31–40 years (65.0%) and were staff nurses (93.8%). Table 1 describes the sample. The youngest age group contained one nur

Table 1
Participant characteristics (N = 80)

Characteristic	Category	n	%
Age, years	21 to 30	1	1.3
	31 to 40	52	65.0
	41 to 50	20	25.0
	>=50	7	8.8
Gender	Female	80	100.0
Education	Diploma in Nursing	50	62.5
	Bachelor's Degree in Nursing	5	6.3
	Post Basic or Advanced Diploma	25	31.3
Work experience	5 to 10 years	13	16.3
	11 to 15 years	37	46.3
	>15 years	30	37.5
Position	Staff Nurse	75	93.8
	Senior Nurse	2	2.5
	Nursing Sister	3	3.8

3.2 Knowledge and Assessment Item Responses

The mean knowledge score was 4.06 (SD 1.16) out of 6, or 67.7% of the available points under the study key. This lies in the study-defined moderate range. Item performance varied, from 75 nurses (93.8%) selecting the keyed general risk factors to 38 (47.5%) selecting the keyed response that continuing feeds during a packed red blood cell transfusion increases NEC risk. Table 2 reports agreement with the study key. The transfusion item identifies uncertainty about a specific practice question and cannot establish whether respondents would act appropriately under local policy.

Table 2
Responses matching the study key

Domain	Item	Keyed n	Keyed %
Knowledge	Feeding type that decreases NEC risk	60	75.0
	Major NEC risk factors	75	93.8
	Medications associated with increased NEC risk	42	52.5
	Timing of enteral feeds in stable premature infants	58	72.5
	Enteral feeding during PRBC transfusion	38	47.5
	Corrected gestational age of highest NEC risk	52	65.0
Assessment	Study keyed NEC signs and symptoms	57	71.3
	Study keyed gastric residual response	23	28.8

The mean assessment score was 1.00 (SD 0.62) out of 2. Fifty-seven nurses (71.3%) selected the keyed group of NEC-associated signs. The exact gastric residual question asked whether respondents checked residuals during their shift. Twenty-three nurses (28.8%) selected the keyed option to check only if the infant showed feeding intolerance. Other options included routine checking before feeds, checking only if a provider ordered it, and no checking.

3.3 Association between Knowledge and Assessment

The correlation was small (ρ = .030, p = .791). The analysis detected little evidence of an association between the scores. The two-item assessment measure and restricted score range limit what this comparison can establish.

Table 3
Exploratory comparisons of assessment scores

Factor	Statistic	Nominal p
Knowledge score	Spearman ρ = .030	.791
Age	Kruskal–Wallis H = 1.764	.623
Education	Kruskal–Wallis H = 1.685	.431
Work experience	Kruskal–Wallis H = 0.636	.728
Position	Kruskal–Wallis H = 2.335	.311

The subgroup tests did not detect differences. The assessment score had only three possible values and some groups had very few nurses. The all-female sample did not permit a gender comparison.

4. Discussion

4.1 What the Assessment Items Measure

The residual question was phrased as reported shift practice and did not specify whether the infant was clinically stable, had signs concerning for NEC or was being managed under a particular protocol. ESPGHAN guidance advises against routine residual monitoring in clinically stable preterm infants and supports selective assessment when other signs of feeding intolerance or NEC are present [8]. The study-keyed option is closer to a selective approach, but it does not capture all clinical indications or how provider orders and local protocols affect practice. Other neonatal studies also illustrate variation in routine aspiration practice [13,14]. The 28.8% response rate should therefore be read as agreement with one questionnaire option.

4.2 Interpretation of Knowledge Findings

The difference between general risk recognition and the transfusion response is more informative than the overall category. Published neonatal network guidance describes insufficient evidence to recommend withholding feeds during red cell transfusion [15]. The low agreement with the study key is therefore a reason to discuss uncertainty and local policy with staff, rather than to treat a single answer as a universal clinical rule. Education could pair protocol review with cases that distinguish general NEC risk, feeding intolerance and signs that warrant escalation.

4.3 What the Association Tests Can Establish

Knowledge and assessment scores covered different content and the assessment score was coarse. The correlation between questionnaire scores cannot establish whether knowledge translates into observed assessment behaviour. The small age and position groups also limit what the subgroup tests can detect. The findings support examining recognition and escalation using case scenarios, simulation or supervised observation.

4.4 Implications for Nursing Practice

Neonatal teams could review how feeding, transfusion and gastric residual questions are taught alongside their local protocols. Case discussions could ask nurses to explain which changes would prompt reassessment or escalation, and simulation could assess how they communicate those changes. Related neonatal nursing work has highlighted the importance of context and practice support [16].

4.5 Limitations

This single-centre cross-sectional study used a brief self-administered questionnaire and did not measure bedside performance or neonatal outcomes. The knowledge thresholds were study-defined and the two assessment items have limited content coverage. The questionnaire key for context-dependent items cannot resolve differences in local policy. Some subgroups were sparse and comparisons were exploratory. The pooled reliability coefficient does not establish reliability for the two domains separately. The submitted analysis did not provide confidence intervals.

5. Conclusion

Most nurses selected the keyed general risk factors, while responses varied on transfusion-related feeding and gastric residual monitoring. The two assessment responses identify topics for discussion, item refinement and further assessment using clinical scenarios. The correlation and subgroup tests provide limited evidence about relationships with the brief questionnaire score.

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Author Contribution Statement
Wati Dadi@Bisop contributed to the investigation, data collection, data analysis, interpretation of findings, and preparation of the original manuscript. Joemmaicca Augustta Joggery contributed to

the conceptualization, methodology, supervision, interpretation of findings, and critical revision of the manuscript. Sarina Jamalluddin contributed to the methodology, interpretation of findings, and critical review of the manuscript. Manjit Kaur Khaira and Kala Raani Chandra Guidan contributed to the scholarly review, interpretation of findings, and critical revision of the manuscript.

Declaration on the Use of Artificial Intelligence

ChatGPT (OpenAI) assisted with language editing, manuscript restructuring, source checking and review of the reported statistical results. The authors should review and verify the revised content and analyses before submission.

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