

Preparedness of nurses to work in neonatal intensive care unit in a selected tertiary care facility: An observational study

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ABSTRACT

Background: Neonates admitted in neonatal intensive care units (NICUs) require specialized neonatal nursing care. **Objective:** The objective of this study was to generate evidence on quality of neonatal nursing by assessing the preparedness of nurses in terms of knowledge and skills in neonatal nursing at pre-service level with respect to specific neonatal procedures and to further explore their self-perception about performing these procedures. **Materials and Methods:** In this cross-sectional observational study, 36 out of 600 newly joined nurses were randomly recruited. A pre-validated tool consisting of structured knowledge questionnaire, observation checklists for objectively structured clinical examination stations, and self-preparedness scale was used. The knowledge and skill scores were graded as excellent (>80%), average (60–80%), and poor (<60%). **Results:** A total of 36 nurses (age median, interquartile range; 24 [23–29]) participated in the study. The basic qualification of majority of subjects (30, 83.4%) was BSc nursing. The median duration of didactic classroom learning (h) and clinical posting (weeks) in neonatology was 15 (3–45) and 1.5 (0.3–4), respectively. One-third of the subjects (12, 33.3%) did not have any clinical posting in NICU at pre-service level. The mean knowledge, skill, and self-preparedness scores of nurses along with the range were 11.8 ± 2.1 (8–16), 56.9 ± 7.2 (42–72), and 60.0 ± 13.4 (26–80), respectively. More than 60% of nurses had excellent knowledge scores (>80%); similar number had poor overall skills (<60%). Skills of the more than half of nursing personnel were average in hand hygiene (58.3%), temperature recording (52.8%), and prevention of hypothermia (52.8%) while poor in weight recording (75%), bag and mask ventilation (69.4%), intravenous drug administration (63.9%), and orogastric feeding (58.3%). No correlation was found among knowledge, skill, and preparedness scores ($p > 0.05$). The median self-preparedness scores of the nurses suggested their overestimation regarding performing the neonatal procedures. **Conclusion:** Preparedness of the nurses to work in NICU in terms of skills to perform various neonatal procedures was inadequate and hence requires attention.

Key words: Preparedness, Neonatal Nursing, Pre-service Level, Nurses

Neonatal nurses are globally considered to be the backbone of neonatal intensive care units (NICUs). They are the key components in delivering maternal and newborn health care, including the intensive care of “at-risk” or sick neonates admitted in NICU [1]. Participation of nurses in neonatal care is very essential to improve the outcome in neonates [2]. The efficiency and effectiveness of neonatal services rely on adequate numbers of well-prepared neonatal nurses working in the NICU.

Nurses in India are trained in neonatology nursing at pre-service level, to attend to the physical needs of the neonates as well as to meet the educational and psychological needs of their caregivers, mainly mothers. The main objective of teaching neonatal nursing during general nursing midwifery and graduate program is to prepare qualified nurses to influence the outcomes of neonates during hospitalization in terms of neonatal care, prevention of complications, and early recovery [2]. The nursing regulatory bodies such as Indian Nursing Council (INC) and

State Nursing Councils in India exercise control over various government and private nursing educational institutions to ensure quality nursing education [3]. Neonatal nursing curriculum at the pre-service level is scanty and theoretical [3]. The nursing programs offered by various schools and colleges, all over India are not able to provide uniformly standardized classroom and clinical teaching in neonatal nursing due to lack of trained nurse educators in neonatal nursing and inadequate infrastructure. Varying content on neonatal nursing with or without adequate clinical experience in NICU is being used to prepare the nurses at pre-service level.

It has been estimated that about 70% of neonatal deaths could be prevented if simple interventions such as preventing hypothermia by maintaining warm chain, using skin-to-skin contact, kangaroo mother care for low birth weight babies, and promoting breastfeeding are implemented effectively by the nursing personnel [3]. These interventions can be easily taught to

the mothers in NICU and at the time of discharge from the hospital. In addition, care of baby at birth, practicing neonatal resuscitation at the time of delivery in labor room and subsequently in NICU can reduce the episodes of birth asphyxia and neonatal morbidity and mortality. Thus, timely neonatal nursing care has a significant potential in improving the survival of neonates in India [3]. The existing nursing workforce in NICU in India is facing serious challenges due to lack of uniform opportunities to learn, and build their skills in neonatal nursing during their foundational days primarily due to poor preparation at pre-service education level [2]. These nurses after the completion of training may lack adequate preparedness (knowledge and skills) needed to ensure optimal neonatal care. To date, there has been paucity of research work focusing on preparedness of nurses in neonatal nursing in India. Therefore, the present study was planned to examine and generate evidence on quality of neonatal nursing by assessing their preparedness in terms of knowledge and skills of nurses in neonatal nursing at pre-service level. It also further explored their self-perception about the preparedness to work in NICU.

MATERIALS AND METHODS

In this cross-sectional observational study, 36 out of 600 newly appointed nurses, during their initial 1 week of orientation period, posted in various medical-surgical wards, ICUs, and operation theater were randomly recruited by drawing lots. These nurses during their orientation period were not given any assignment in the form of patient care but oriented with the general and specific aspects of the hospital functioning, rules and regulations, infection control, and biomedical waste management, etc. Our institute is a tertiary care facility having bed strength of more than 2000, rendering healthcare services to the patients coming from different parts of the country. Nurses who joined the institute within 2 years of the completion of their training in nursing, willing to participate and placed for providing direct patient care in different medical and surgical wards and ICUs other than pediatric or neonatology wards/ICU were included.

Ethical clearance was taken from the institute ethics committee. Confidentiality and anonymity of the subjects were assured. Informed written consent was taken from all the subjects before their enrolment for the study. The sample size calculation was based on the obtained mean knowledge score of 10 newly recruited nurses (5.17 ± 2.47 [2–9.5, max score 10]) in an initial pilot study. With 90% power and 0.5% level of significance, the expected sample size was 31. Considering 10–20% drop out rate; we recruited 36 nursing personnel.

Outcome Assessment

The primary outcome was the knowledge (as assessed by multiple choice questions [MCQ]) and skill scores (as assessed by objective structured clinical examination [OSCE]). The secondary outcome of the study included the assessment of the self-preparedness from the perspective of the subjects through the Likert's scale.

Data were collected in 4-month time from January 2017 to April 2017 using structured sociodemographic profile, and pre-validated preparedness tool consisting of knowledge questionnaire and observation checklists. The tool was administered in small groups (2–3 nursing personnel). The knowledge questionnaire had 20 MCQ items. A score of 1 was given for correct and 0 for incorrect response, with the maximum possible score of 20. Seven OSCE skill stations [4] were (i) hand washing, (ii) temperature recording, (iii) prevention of hypothermia, (iv) weight recording, (v) orogastric (OG) feeding, (vi) intravenous (IV) administration of medication, and (vii) use of bag and mask ventilation (BMV). Each OSCE station was manned by experienced neonatal nurse as an assessor, who explained the process of assessment to each subject. A case scenario was provided and the subject was asked to complete the task on a mannequin in 5–10 min time. The marking for each OSCE station was structured and marks were given for each step of correct skill demonstration. The knowledge and skill scores were graded as excellent (>80%), average (60–80%), and poor (<60%). Self-perception about the preparedness in neonatal nursing was assessed using a structured self-perception questionnaire having 20 items measured on 4-point Likert scale (1=not at all, 2=some extent, 3=great extent, and 4=very much) to find out how equipped they feel to perform various tasks related to neonatal care such as hand hygiene, preparing a neonatal unit, receiving a newborn from labor room, etc.

Data were coded and entered into Excel sheet. SPSS version 23.00 was used for statistical analysis. Descriptive statistics (frequency, percentage, mean, and standard deviation) for knowledge, skill, and self-perception scores and inferential statistics (Chi-square test) for finding out association with select variables were computed. The preparedness of the nurses was expressed as median (range), collected on Likert's scale. Pearson coefficient of correlation was used to find correlation among knowledge, skills, and self-preparedness. The level of significance was considered as $p < 0.05$.

RESULTS

A total of 36 nurses (age median, interquartile range; 24 [23–29] of which 52.8% were female, and 77.8% were unmarried) participated in the study. The basic qualification of majority of subjects (30, 83.4%) was BSc nursing. More than half of the nurses studied in government institution (19, 52.8%) and were posted in medicine ward (20, 55.6%) at the time of study. Majority of nurses (29, 80.6%) had completed their nursing course in 2014 and had received 15 (3–45) median hours of didactic classroom learning and 1.5 (0.3–4) weeks of clinical posting in neonatology. One-third of the subjects (12, 33.3%) did not have any clinical posting in NICU at pre-service level.

The mean knowledge and skill and self-preparedness scores of nurses along with range were 11.8 ± 2.1 , (8–16) 56.9 ± 7.2 (42–72), and 60.0 ± 13.4 (26–80), respectively (Table 1). More than 60% of nurses had excellent knowledge scores (>80%); similar number had poor overall skills (<60%). Skills of the more than half of nursing personnel were average in hand hygiene (58.3%),

temperature recording (52.8%), and prevention of hypothermia (52.8%) while poor in weight recording (75%), BMV (69.4%), IV drug administration (63.9%), and OG feeding (58.3%) (Table 2 and Fig. 1). Positive correlation was found between the knowledge and skill scores ($r=0.68$, $p<0.05$), however, self-preparedness did not show any correlation with knowledge and skill scores ($p>0.05$) (Table 1).

No correlation was found among knowledge, skill, and preparedness scores ($p>0.05$) (Table 1). The median self-preparedness scores of the nurses suggested their overestimation to perform the neonatal procedures (Table 3). No association in terms of knowledge, skills, and preparedness of nurses with select variables such as gender, type of nursing program and institution, professional qualification, year of passing, and posting in NICU could be observed ($p>0.05$).

DISCUSSION

Findings of the present study reveal that nearly one-third of nursing personnel were not posted in NICU and the median hours of didactic classroom learning were less as compared to INC recommendations. Most of the nurses had excellent knowledge scores in neonatal nursing; however, their overall skills were poor or average. Skills of the nurses in areas of hand hygiene, temperature recording, and prevention of hypothermia were average, while poor skills were observed in weight recording, BMV, IV drug administration, and OG feeding. A positive correlation was observed between the knowledge and the skill scores of the nurses. Most of the nurses had overestimated their ability to perform neonatal procedures, which did not match with their knowledge and skill scores.

Table 1: Knowledge and skill scores of nurses related to neonatal nursing (n=36)

Variable	Variable categories (%)	(mean±SD) range	r value	p value
Knowledge	Excellent (>80)	22 (61.1)	11.8±2.1 (8–16)	0.06
	Average(60–78)	11 (30.6)		
	Poor (<60)	3 (8.3)		
Overall skills	Excellent (>80)	0	56.9±7.2 (42–72)	
	Average(60–78)	15 (41.6)		
	Poor (<60)	21 (58.3)		
Self-perception score	-	60±13.4 (26–80)	0.09 [^] , 0.04 ^{^^}	0.6, 0.9

[^]Correlation between knowledge and preparedness, ^{^^}correlation between skills and preparedness. SD: Standard deviation

Table 2: Skill OSCE scores of nurses in neonatal procedures (n=36)

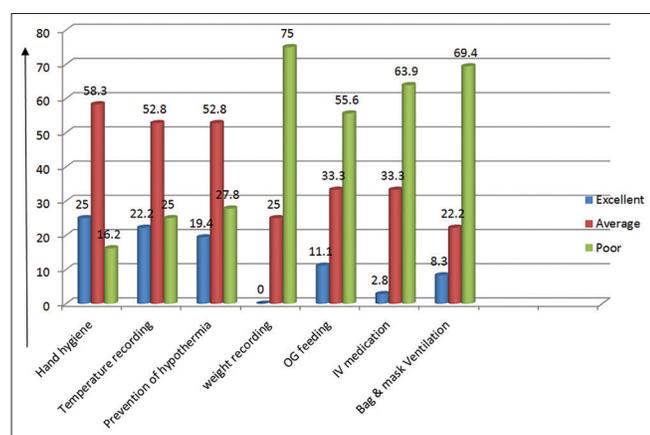
Skills	Maximum possible score	Skill scores		
		(mean±SD), range	Categories	f (%)
Hand hygiene	8	5.39±1.4 (3–7)	Excellent	9 (25)
			Average	21 (58.3)
			Poor	6 (16.7)
Temperature recording	9	5.89±1.65 (3–9)	Excellent	8 (22.2)
			Average	19 (52.8)
			Poor	9 (25)
Prevention of hypothermia	6	3.17±1.5 (0–6)	Excellent	7 (19.4)
			Average	19 (52.8)
			Poor	10 (27.8)
Weight recording	13	5.69±3.4 (0–10)	Excellent	0
			Average	9 (25)
			Poor	27 (75)
OG feeding	19	10.56±4.17 (0–19)	Excellent	4 (11.1)
			Average	12 (33.3)
			Poor	20 (55.6)
IV medication	27	14.47±3.9 (6–22)	Excellent	1 (2.8)
			Average	12 (33.3)
			Poor	23 (63.9)
BMV	16	6.72±4.1 (0–15)	Excellent	3 (8.3)
			Average	8 (22.2)
			Poor	25 (69.5)

OSCE: Objective structured clinical examination, SD: Standard deviation, OG: Orogastric, IV: Intravenous, BMV: Bag and mask ventilation

Table 3: Self-perception related to preparedness to work in NICU (n=36)

Statement	Median (range)
Can perform hand hygiene	4 (2–4)
Can prepare neonatal unit for receiving a newborn	3 (1–4)
Can receive newborn from labor room as new admission	3 (0–4)
Can perform newborn assessment	3 (2–4)
Can perform weight recording using electronic scale	4 (1–4)
Can monitor vital signs of the newborn	4 (1–4)
Can provide warmth to newborn using incubator/radiant warmer	3 (2–4)
Can provide KMC to sick newborn	4 (1–4)
Can assist mother in breastfeeding	4 (1–4)
Can feed newborn using OG, pallid/katori spoon	3 (1–4)
Can administer medication correctly to newborn	3 (1–4)
Can administer IV fluids to newborn	3 (1–4)
Can assist in laboratory investigations required for newborn	3 (1–4)
Can assist in neonatal procedures	3 (1–4)
Can counsel mother related to baby care	3 (1–4)
Can perform disinfection and sterilization of equipment	3 (1–4)
Can follow biomedical waste management	4 (1–4)
Can participate in newborn resuscitation	2 (1–4)
Can transport sick baby for investigations	2 (1–4)
Can discharge newborn from NICU	2.5 (1–4)

NICUs: Neonatal intensive care units, KMC: Kangaroo mother care, OG: Orogastric, IV: Intravenous

**Figure 1: Performance of nurses at each objective structured clinical examination station**

The present study sought to find out the preparedness of the nurses to work in NICU at pre-service level by assessing their knowledge and skills with respect to specific neonatal procedures. Hand hygiene, temperature recording, OG feeding, and IV drug administration are the basic neonatal procedures, but very crucial as far as neonatal care is involved. We found

that the majority of nurses despite having excellent knowledge in neonatal nursing could demonstrate average skills. This suggests poor translation of knowledge into practice. Maintaining a normal body temperature is one of the critical functions for newborn survival [5]. In sick and low birth weight neonates; an impaired thermoregulatory mechanism becomes overwhelmed, leading to metabolic deterioration and direct death from hypothermia [6]. Similarly, weight recording and BMV are other two important neonatal procedures carried out regularly in the NICU. Weight recording is also very vital to drug and fluid calculation and to assess the growth pattern in neonates. The most important aspect of neonatal resuscitation is BMV [7], which is required to effectively resuscitate a sick neonate either in the labor room or NICU. In the present study, skills of the majority of nurses related to weight recording, OG feeding, IV medication administration, and BMV were poor, hence unsatisfactory. These findings raise important concerns regarding the quality of neonatal nursing education provided at pre-service level. Our findings are similar to few published studies [8-10] assessing the competencies of newly qualified nurses in various fields.

The INC recommends total of 20 h of classroom learning and 2 weeks posting in NICU at pre-service level. In our study, nursing personnel had both classroom and clinical learning less than what is recommended by INC. Nurses working as part of NICU team can improve the neonatal outcome. The effectiveness of the neonatal nurses in the care of high risk and sick neonates depends on the quality of neonatal nursing education provided to them at pre-service level. Neonatal nursing cannot be learned alone in the classroom. Clinical posting is required to help them translate the gained knowledge into skills. In our study, one-third of the subjects did not have any exposure to NICU as they did not get opportunity to work there at pre-service level, which warrants action on the part of educational institutions and the regulatory bodies. At the same time, we have to realize that preparedness is an ongoing process that continues to change on the basis of learned experience and evidence. Therefore, there is a need for an intensive training of nurses before they are posted in NICU. Nursing personnel working in NICU should also undergo ongoing in-service education program related to newborn care so that they can upgrade their knowledge and skills and practice research-based evidence in the unit.

In our study, we used OSCE approach as a reliable tool for measuring the skills of the nurses and tried to triangulate the results with their self-preparedness perception. At the same time, we have to accept the fact that skills in simulated setting may not be same as the skills observed in real clinical setting. We tried to take care of the recall bias by recruiting subjects who had finished their course in past 2 years, however, their working status and the place of work in that period was not considered, which might have influenced their knowledge and skills. Small sample size, though statistically calculated limits the generalizability of the findings.

Good neonatal services are crucial to the achievement of national and international goals in newborn and child health. In

our study, most of the nurses had excellent knowledge but poor skills, the same can be attributed to the preparation at coaching centers, they undergo for entrance test to get selection in any government facility. Hence, there is a need to review the quality of neonatal nursing education provided at pre-service level.

CONCLUSION

Nurses are the key members in providing neonatal care to the neonates admitted in NICU. Preparedness of the nurses to work in NICU in terms of skills to perform various neonatal procedures such as hand washing, temperature recording, prevention of hypothermia, weight recording, OG feeding, IV administration of medications, and BMV was inadequate and hence required attention at pre-service level.

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