

Gaps in Knowledge and Awareness Related to Equipment Safety Among Nursing Personnel Working in Pediatric and Neonatal Medical-Surgical Icus at Tertiary Care Hospital

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Abstract Equipments are the essential part of any pediatric or neonatal ICU required for monitoring and care to children and neonates during the ICU stay. The present study was conducted to identify gaps in knowledge and awareness related to equipment safety among nursing personnel working in pediatric and neonatal medical-surgical ICUs in a tertiary care hospital. Sixty one nursing personnel working in pediatric and neonatal ICUs were enrolled using universal sampling technique. A structured pretested and validated tool containing knowledge and awareness questionnaire was used to collect the data ($\alpha = 0.82$).

More than half of the nursing personnel were between the age group of 26-35 years with the mean age of 30.24 ± 6.56 (22–46). Majority nursing personnel were female (93.4%), working as sister grade II (77%, working as bedside nurses) in PICU ((42.6%), with most having BSc Nursing as their professional qualification, Majority of nursing personnel (83.6%) had not attended in-service education programme and half of them did not have any bedside demonstration of the equipments prior to its installation in the unit. Majority nursing personnel were having medium knowledge (68.9%) and awareness scores (65.6%) related to equipment safety with mean knowledge and awareness scores of 11.5 ± 1.7 (6-16) and 32.9 ± 3.4 (20–40) respectively. No correlation was observed between knowledge and awareness scores of the nursing personnel ($p > 0.05$).

Keywords: Knowledge, awareness, equipment safety, nursing personnel

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1. INTRODUCTION

Pediatric and neonatal medical-surgical intensive-care units (ICU) are specialized units that take care of sick children including premature neonates. Some of them could be requiring care and intensive monitoring after life saving surgeries. The physiological vulnerability of children including premature neonates and the complexity of the ICU may increase the risk of morbidity and mortality among the sick children and pose financial and psycho-social burden on the families and the hospital. [1]

The Joint Commission on Accreditation of Health Care Organizations (JCAHO) in 2002 reported of delayed or no response to the alarm by the health care professionals (HCP) in relation to patient safety. The alarm is either put off or set incorrectly; no alarms are set for different types of ventilator disconnections; or the alarm is not audible in all areas of patient care. As a result of which patient safety goals were framed by JCAHO and being followed in every health care setup. [2]

In everyday practice in PICU/NICU, the goal for any HCP is to provide safe care, do no harm and maximize the benefits of treatments for the sick child and the family. Nursing personnel are considered to be the back bone of any ICU, playing very crucial role in care of sick children. They are expected to be providing care and monitoring admitted children intensively round the clock. For providing quality care to sick neonates, nursing personnel have to be highly knowledgeable and aware both in managing the sophisticated equipments as well as in providing care to the sick children.

Safety of the child is of utmost importance in any PICU/NICU. All the critical children including neonates are cared and monitored using sophisticated medical equipments such as ventilator, pulse oximeter, radiant warmer and incubators. Children in general have underdeveloped body systems. Their abilities to metabolize, absorb, distribute and excrete drugs are limited. They require more vigilant nursing care. It is, therefore essential for the HCP in general and nursing personnel in specific to know about the medical equipments and their safety features [4] to avoid any kind of unintended ill effects. Few research studies are available that have explored the knowledge nursing personnel related to the equipment safety in terms of alarms recognition. The present study aimed to explore the existing knowledge and awareness among the nursing personnel related to equipment safety in terms of alarms recognition, regular maintenance, electrical safety, sterilization and disinfection of the equipments before and after each use. So that the strategies for improving safe practices related to equipments could be developed.

2. METHODOLOGY

In a non-experimental descriptive cross-sectional study, using quantitative approach, 61 out of total 80 available nursing personnel involved in direct patient care, working in pediatric and neonatal medical-surgical ICUs were enrolled using universal sampling technique. All the three ICUs were comparable in terms of manpower and resources. Ethical clearance was obtained from the institute ethics committee. Written informed consent was obtained from the participants prior to their enrolment for the study. They were assured about the confidentiality of the information provided by them during data collection. A pretested validated self developed semi-structured tool including knowledge and awareness questionnaire ($\alpha = 0.82$) was used for data collection along with subject data sheet. The knowledge and awareness questionnaire focused on functioning of alarms, regular annual maintenance of equipments, disinfection and sterilization of equipments namely pulse oximeter, ventilator, and radiant warmer etc. Knowledge questionnaire had total 17 items consisting of MCQs and True/false and fill in the blanks type questions. A score of one was given for every correct response with a minimum and maximum possible score of 0–17. The awareness questionnaire had total 8 positively framed items on five point likert scale (strongly agree 5, agree 4, uncertain 3, disagree 2, strongly disagree 1). Collected data was coded and entered in excel sheet and analyzed using appropriate descriptive and inferential statistics. The set level of significance was 0.05.

3. RESULTS

More than half of the nursing personnel were between the age group of 26–35 years with the mean age of 30.24 ± 6.56 (22–46). Majority nursing personnel were female (93.4%), working as sister grade II (77%, bedside nurses) with most having BSc Nursing as their professional qualification. Most of the nursing personnel were working in PICU (42.6%) followed by neonatal medical- surgical ICU. Majority (83.6%) of nursing personnel had not attended in-service education programme and half of the interviewed nurses did not have any bedside demonstration of equipment (Table 1). Mean knowledge and awareness scores of nursing personnel related to equipment safety were 11.5 ± 1.7 (6–16) and 32.9 ± 3.4 (20–40) respectively. Majority of nursing personnel were having medium knowledge (68.9%) and awareness scores (65.6%). No correlation was observed between knowledge and awareness scores of the nursing personnel ($p > 0.05$) (Table 2). Awareness scores (median, range) of the nursing personnel related to equipment safety is described in table 3.

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Table 1: Demographic profile of nursing personnel working in pediatric and neonatal medical and surgical ICUs.

Variable	f(%)
Age*(years)	30.24±6.56 (22–46)
	21–25
	13 (21.3)
	26–35
	34 (55.7)
	>35
	14 (23.0)
Gender	Male
	4 (6.6)
	Female
	57 (93.4)
Basic qualification	10+2
	36 (59)
	BA/BSc
	23 (37.7)
	MA/MSc
	2 (3.3)
Professional qualification	GNM
	22 (36.1)
	BSc Nursing
	36 (59)
	MSc Nursing
	2 (3.3)
	Any other
	1 (1.6)
Designation	Grade-II
	47 (77)
	Grade-I
	14 (23)
Total work experience (years)**	5 (0.9 – 24)
Present experience in NICU/NSICU/PICU)**	3 (0.1– 18)
Attended in-service education programme**	Yes
	10 (16.4)
	No
	51 (83.6)
Attended bedside demonstration on equipments	Yes
	29 (39.7)
	No
	32 (52.5)
Area of work	NICU
	17 (27.9)
	NSICU
	18 (29.5)
	PICU
	26 (42.6)

*mean± SD, ** median scores

Table 2: Correlation between knowledge and awareness scores related to equipment safety.

Knowledge Scores (mean± SD)		Awareness scores (mean ±SD)		r value	p value		
Good	3(4.9)	11.5± 1.7	Good	20(32.8)	32.9±3.4	0.10	0.42
Medium	42 (68.9)	(6-16)	Medium	40(65.6)	(20-40)		
Poor	16(26.2)		Poor	1(1.6)			

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Table 3: Awareness of nursing personnel related to equipment safety.

SNo.	Statement	Median scores(range)
1	Purpose of the alarm is to alert the nurse about the deteriorating condition of the patient	5(1–5)
2	Proper alarm setting in equipment help in reducing adverse events in neonates	5(3–5)
3	False alarms disrupt neonatal care	4(1–5)
6	False alarms occur very frequently in unit	3(1–5)
7	False alarms reduce the trust on alarms	4(1–5)
8	Frequent false alarm can be seen with the inappropriate setting of the lower and upper limit	4(1–5)
7	Proper disinfection of the equipment before use for the neonate reduces the risk of health care associated infections (HCAI)	5(3–5)
8	Proper maintenance and earthing of the equipment is required for the safety of the neonate and nurses	5(3–5)

Majority of nursing personnel (93.4%) claimed to be aware of different types of audio, visual and audio-visual alarms in their units and preferred audio-visual alarms (86.9%) generally. Majority nursing personnel (70%) knew about the setting of alarm limits on the monitors and more than half of the nursing personnel set the alarm limits in their units, as stated by them. Majority nursing personnel (81.9%) first disabled alarm temporarily and then looked for the cause. The possible reasons stated for the activation of alarms were multiple (one or more) mainly change in child's condition, technical error, detachment from patient and excessive movements of the child. Most of the nursing personnel (69.3%) felt that under preventive maintenance,

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equipments should be checked daily. Nearly 50% of nursing personnel knew that the equipments of their units were under annual maintenance check, and being managed by technicians (49.2%). Most of the nursing personnel (63.9%) stated to be responsible for disinfection and sterilization of equipments before use in their units.

DISCUSSION

Findings of the study reveal that majority of nursing personnel had medium knowledge and awareness scores related to equipment safety and that did not match with their self claim of setting the alarm limits in the unit. Majority of nursing personnel did not attend in-service education on equipment safety and only half of the nurses had the opportunity to witness bedside demonstration of equipments,

All the equipments have alarms as safety features to safeguard the sick children. Use of these medical equipment and associated technology, to monitor the sick children is a kind of human-system interaction at the point of care level.[3] Medical equipments are becoming more and more sophisticated technologically and hence presenting increasing challenges to the nursing personnel. The equipments used in pediatric and neonatal medical-surgical ICUs are many like pulse oximeter, mechanical ventilator, cardiac monitors, infusion pumps, incubators and radiant warmers, that are indispensable part of the unit and very vital to the patient care. Therefore nurses working in pediatric and neonatal medical –surgical ICUs should possess technical skills to provide quality care to the admitted children. Lack of knowledge and awareness among nursing personnel about the equipment could have the disastrous effect on the child. In our study nursing personnel working in pediatric and neonatal medical-surgical ICUs had medium knowledge and awareness, with that majority of nursing personnel claimed to set the alarm limits in their units. These findings are contradictory to the findings by Essani R R and Ali TS (2011)[5], in which nursing personnel felt uncomfortable using or manipulating the devices. There is need to arrange more frequently in-service education programmes on equipment safety. Bedside demonstrations can be equally effective in making the nursing personnel confident and aware of equipments, therefore should be made integral part of daily routine of ICU.

All the equipments should ideally be periodically checked in terms of electrical safety, regular maintenance, [5] sterilization and disinfection of equipments especially prior to their use. In our study, most of the nursing personnel felt that as part of preventive maintenance, equipments should be checked daily, but only half of nursing personnel knew that the equipments

were under annual maintenance. In our study majority nursing personnel have stated that they first disabled the alarm temporarily and then looked for the cause to rectify it. According to them the possible reasons for the activation of alarms were multiple (one or more) mainly change in child's condition, technical error, detachment from patient and excessive movements of the child, similar findings were also reported by Garg R et. al., [5] The equipments were disinfected and sterilized either by the technical staff or nursing personnel before use. In view of the above findings there is need to periodically conduct refresher course on equipment safety and the equipments should be made user friendly by organizing bedside demonstrations of the newly installed equipments in the unit particularly in relation to alarms.

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Our study has few limitations. Use of self reported tool limits the findings of the study and its generalizability, however structured knowledge questionnaire further validated the self reports. Ideal would have been to observe the practices of nursing personnel related to equipment safety. Another study can be conducted in the PICU/NICU using observation tools.

CONCLUSION

There exists a gap in knowledge and awareness related to equipment safety among the nursing personnel working in pediatric and neonatal medical-surgical ICUs at tertiary care hospital, which needs to be addressed to.

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