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Assess The Knowledge Of Staff Nurses On The Practice Of Aseptic Technique During Care Of Neonates At Selected Hospitals In Bangalore

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Abstract: Aseptic techniques are essential in preventing infections in neonatal care, a field where even minor lapses can have significant consequences. Evaluating the knowledge of staff nurses, who are on the front line of neonatal care, are crucial to maintaining high standards of patient safety and care quality.

Objectives of the study :

1. To assess the knowledge of staff nurses regarding aseptic techniques in neonatal care.
2. To identify areas of strength and areas need for improvement in staff nurse knowledge regarding aseptic techniques in neonatal care.
3. To know the relationship between demographic factors (e.g., gender, age, educational background, experience) and knowledge levels.

Methods :

Methods

Design: A cross-sectional descriptive study design.

Setting: Selected hospitals in Bangalore, India.

Participants: 85% female and 15% male nurses participated in the study, with a mean age of 29.5 years. The educational background of the participants included 50% with a Diploma in Nursing, 40% with a Bachelor's degree, and 10% with a Master's degree. Experience varied, with 40% of nurses having 1-3 years of experience, and 35% having received specialized training in neonatal care.

Data Collection: A structured questionnaire was used to assess the knowledge of aseptic techniques, covering areas such as hand hygiene, sterilization procedures, and the use of personal protective equipment. The questionnaire was validated for content and reliability.

Data Analysis: Knowledge scores were calculated, with mean scores, SD and percentages used to categorize the levels of knowledge. Statistical analysis, including Chi-square tests and ANOVA, was conducted to find out the influence of demographic factors on knowledge scores.

Results

Knowledge Scores: The mean knowledge score was 75.2% (SD = 10.4), with a range from 50% to 90%. Distribution of scores showed that 20% of nurses were in the "Excellent" category (85-100%), 50% in the "Good" category (70-84%), 25% in the "Fair" category (50-69%), and 5% in the "Poor" category (below 50%).

Strong Knowledge Areas: Nurses demonstrated strong knowledge in hand hygiene (90% correct) and the use of personal protective equipment (85% correct).

Areas Needing Improvement: Lower scores were observed in sterilization procedures (60% correct), handling of sterile equipment (65% correct), and infection control measures (70% correct), indicating areas where further training is required.

Influencing Factors: Higher knowledge scores were significantly associated with higher educational qualifications (Bachelor's or Master's degree), more than 3 years of experience, and specialized training in neonatal care ($p < 0.05$).

Index Terms - Practice, Aseptic technique, Neonates, Staff Nurses

I. INTRODUCTION

Health care-associated infections represent a significant challenge in health care settings worldwide. These infections are acquired during the course of receiving treatment for other conditions within a health care facility. The impact of HAIs are profound, affecting hundreds of millions of patients globally each year, leading to significant mortality and financial burdens on health systems **(Varshney et al., 2014)**. Therefore, it is essential for all individuals within the health care system to adhere strictly to infection control guidelines. Health care administrators also have a crucial role in ensuring the implementation and enforcement of infection control programs **(Patel et al., 2009).**

Educating patients about infection prevention can significantly reduce their risk of acquiring infections or mitigate the severity of infections. Adhering to barrier precautions, practicing diligent hand hygiene, and ensuring the aseptic care of intravenous (IV) catheters and other invasive equipment are critical in reducing infection rates **(Smeltzer et al., 2010).** Despite advancements in medical technology and treatment, the incidence of HAIs continues to rise globally. These infections—such as catheter-associated urinary tract infections, central line-associated bloodstream infections, surgical site infections, ventilator-associated pneumonia, hospital-acquired pneumonia, and Clostridium difficile infections—occur when pathogens are introduced during medical care.

The World Health Organization **(WHO**) reports a prevalence range of 5.7% to 19.1% for HAIs in hospital settings worldwide, with a prevalence of 6.5% in India. The burden of HAIs is notably higher in low-resource countries compared to high-income nations, with prevalence rates ranging from 7.6% to 15.5% (WHO-led systematic review). HAIs increase hospital stay duration, mortality rates, and healthcare costs, placing a significant financial strain on families, communities, and nations.

Infection control failures often arises from inadequate hand hygiene and poor sanitation practices among health care workers. Various clinical departments exhibit differing HAI rates; for instance, intensive care units have the highest infection rates, followed by new-born and burns units. According to the **WHO**, inadequate environmental hygiene, poor waste disposal practices, lack of equipment and manpower, overcrowded conditions, absence of national guidelines, limited infection control knowledge, and poor infrastructure contribute to the prevalence of HAIs.

Aseptic techniques, established by the Centers for Disease Control and Prevention **(CDC),** are critical in preventing the spread of infections. These techniques include rigorous hand hygiene, appropriate use of personal protective equipment (PPE), and proper sterilization of medical instruments. However, adherence to these protocols is often inconsistent. For example, a study in **Burkina Faso** found that only 30% of health care workers followed recommended hand hygiene practices. Additionally, the improper use of PPE has been responsible for approximately 42% of COVID-19 cases among health care workers.

The Knowledge, Attitude, and Practice **(KAP)** theory emphasizes that acquiring knowledge is essential for transforming practices, and a positive attitude can be a significant catalyst for change. Thus, assessing the KAP of health care workers regarding infection control is crucial in understanding the reasons for non-compliance and identifying necessary improvements to enhance infection control procedures and prevent HAIs. This study aims to assess the knowledge, attitude, and practice of aseptic techniques among primary health care center workers.

RESEARCH METHODOLOGY

Design

This study employed a stratified random sampling technique to ensure the representation of the research sample. A cross-sectional, descriptive research design was used to assess the knowledge and barriers of nursing staff in maintaining aseptic techniques in their medical practice at Bangalore. The nursing staff members were divided into different units, and a proportionate number of participants were randomly selected from each stratum.

Setting:

The study was conducted in various Hospitals in Bangalore, with a specific focus on evaluating the understanding of aseptic techniques among nursing staff; this study aims to assess their knowledge and identify the obstacles they face in implementing these techniques.

Population and Sampling

Population

Study focused on the nursing staff as the target population, with an estimated sample size of 84 participants. The sample included nursing staff from NICU of the Hospital

Data collection techniques

A self-administered survey was utilized to collect data, which was designed based on relevant literature and guidelines. The content validity of the questionnaire was ensured through expert review, which assessed its clarity, relevance, comprehensiveness, and overall effectiveness. The questionnaire comprised three sections. The first section collected the demographic characteristics of the study participants.

The second section consisted of multiple-choice items(15) assessing the knowledge of nursing staff regarding aseptic techniques. Each item had four options, with only one being the correct answer. Correct responses were assigned a score of 1, while no response or an incorrect response received a score of 0.

The third section aimed to identify the barriers encountered by nursing staff in
implementing aseptic techniques. Ethical approvals and permissions were obtained, and the researchers visited the selected nursing units to explain the purpose of the study to the participants. Informed consent was obtained, ensuring confidentiality, anonymity, and strict maintenance of participant confidentiality throughout the study.

Pilot study

A pilot study involving 20 nurses from Hospital was conducted to test the questionnaire. Feedback on the pilot study results was obtained from the participants through a separate questionnaire. The participants who took part in the pilot study were not included in the main study analysis.

Sample size and sampling technique

A stratified random sampling was used in this study, and the sample size was calculated according to the following equation: n=N/1+N (d2), where n=sample size, N=population size, and d=degree of accuracy desired (the accepted margin of error was 0.05); n=135/1+135(0.05)2=99. Thus, the sample size for this study was initially intended to be 99 nurses. However, out of the 100 nurses who received the questionnaire, 84 nurses completed the survey, resulting in a response rate of approximately 84.8%.

Statistical analysis

The collected data was analyzed utilizing the statistical software Statistical Package for Social Sciences (SPSS) (IBM SPSS Statistics). Descriptive statistics were employed to summarize the demographic characteristics of the nursing staff participants. The knowledge scores were calculated based on the questionnaire responses. Inferential statistics, including the chi square test, were utilized to investigate relationships between variables and determine if any statistically significant differences existed. The reliability of the instrument was tested using
Cronbach's alpha=0.79.

Demographic Characteristics

The demographic data collected from the participants included age, gender, educational qualifications, years of experience, and any specialized training in neonatal care

RESULTS AND DISCUSSION

TABLE 1

Distribution of the participants' demographic characteristics (n=84)

Demographic characteristic variables		Frequency	Percentage (%)
Gender	Male	28	33.33%
	Female	56	66.67%
Age in years	<20	19	22.62%
	20-30	33	39.29%
	31-40	22	26.19%
	41+	10	11.90%
Marital status	Single	45	53.57%
	Married	33	39.29%
	Divorced	4	4.76%
	Widowed	1	1.19%
Educational level	Diploma	11	13.10%
	Bachelor's	56	66.67%
	Master's	17	20.24%
Years of experience	Less than one year	13	15.48%
	1-2 years	52	61.90%
	3-5 years	13	15.48%
	6+ years	6	7.14%

Table 1 involved 84 staff nurses, comprising 28 males and 56 females. Demographically, the cohort was predominantly aged 20-30 years (39.29%), exclusively identified as largely single (53.57%). Educational attainment varied, with the participants (66.6%) reporting Bachelor's degree. The majority were 1-2 years of experience (61.90%).

Table 2 displays the distribution of correct answers on nursing staff's knowledge of aseptic techniques. It provides insights into their understanding of infection prevention measures. The results indicate that most participants had good knowledge in various areas. For instance, (71.4%) correctly identified the main goal of aseptic techniques. Of the participants,(80.9%) understood proper techniques and disinfecting medical equipment, and (83.3%) knew to maintain a sterile field during surgical procedures (86.90%) knew the examples of aseptic technique,(78.57%) understood medical waste handling. (80.95%) knew aseptic principles for invasive procedures, and (79.5%) understood medical waste handling. Also, (82.14%) understood sterile instrument usage. Furthermore,(89.29%) grasped aseptic wound care principles, and (91.67%) described proper hand hygiene with hand sanitizers,(79.76%) knew .example of a non-sterile item, (83.33%) understood how sterile gloves to be worn, (84.52%), knows what to be done when sterile item comes into contact with a non-sterile surface However, knowledge was relatively lower in some areas. For example, (65.48%) knew the recommended hand washing duration, and

(61.90%) identified change gloves during patient care ,(63.10%) identified potential risks associated with breaches .

TABLE 2

Distribution of nursing staff regarding the knowledge aseptic techniques

(n=84)

	Correct answers	
	Frequency	Percentage (%)
What is the purpose of aseptic techniques in healthcare?	60	71.43%
What is the recommended duration for effective handwashing according to standard hand hygiene guidelines?	55	65.48%
What are the proper techniques for cleaning and disinfecting medical equipment to prevent the spread of infections?	68	80.95%
How would you establish and maintain a sterile field during a surgical procedure?	70	83.33%
Which of the following is an example of an aseptic technique?	73	86.90%
How often should you change gloves during patient care to maintain an aseptic technique?	52	61.90%
Can you identify potential risks associated with breaches in aseptic technique?	53	63.10%
How would you handle and dispose of medical waste to ensure infection prevention?	66	78.57%
What are the principles of aseptic technique when inserting a central line or performing other invasive procedures?	68	80.95%
What are the proper techniques for handling and using sterile instruments during procedures?	69	82.14%
What are the principles of aseptic wound care, and how would you maintain a sterile wound environment?	75	89.29%
Can you describe the steps for proper hand hygiene when using an alcohol-based hand sanitizer?	77	91.67%
Which of the following is an example of a non-sterile item?	67	79.76%
When should sterile gloves be worn?	70	83.33%
What should be done if a sterile item comes into contact with a non-sterile surface?	71	84.52%
Overall knowledge	66	78.57%

In regard to barriers, to the successful adoption of aseptic practices as identified by the nursing staff, the results indicate that there are perceived barriers in several areas. For example, (84.3%) of the participants acknowledged the presence of barriers to creating and maintaining a sterile field during surgical procedures. Similarly, a majority of participants (65.1%) identified resource limitations that affect the availability or quality of sterile equipment and supplies. In terms of cleaning and disinfecting medical

equipment and surfaces,(87.9%) of the participants recognized the presence of barriers. Additionally, a small percentage of participants (7.2%) identified communication barriers that hinder the dissemination of aseptic technique guidelines and protocols among nursing staff. Administrative or policy barriers that hinder the implementation of aseptic techniques in healthcare facilities were acknowledged by (65.1%) of the participants. Maintaining a clean and hygienic environment in patient care areas was perceived as a barrier by (3.6%)of the participants. Challenges in ensuring compliance with aseptic technique principles during invasive procedures were identified by (16.9%) of the participants. Moreover, (65.1%) of the participants recognized barriers to conducting effective training and education programs on aseptic techniques for nursing staff, as represented in Table 3.

Table3.

Barriers to the successful adoption of aseptic practices	Yes	No
	n (%)	n (%)
Are there barriers to creating and maintaining a sterile field during surgical procedures?	13 (15.7)	70 (84.3)
Are there any resource limitations that affect the availability or quality of sterile equipment and supplies?	54 (65.1)	29 (34.9)
Are there barriers to effectively cleaning and disinfecting medical equipment and surfaces?	10 (12.1)	73 (87.9)
Are there any communication barriers that hinder the dissemination of aseptic technique guidelines and protocols among nursing staff?	6 (7.2)	77 (92.8)
Are there any administrative or policy barriers that hinder the implementation of aseptic techniques in healthcare facilities?	54 (65.1)	29 (34.9)
Are there barriers to maintaining a clean and hygienic environment in patient care areas?	3 (3.6)	80 (96.4)
Are there any challenges in ensuring compliance with aseptic technique principles during invasive procedures?	14 (16.9)	69 (83.1)
Are there barriers to conducting effective training and education programs on aseptic techniques for nursing staff?	54 (65.1)	29 (34.9)

Table 4 shows the relationship between demographic characteristics and the knowledge of nursing staff regarding aseptic techniques. The findings reveal that age is not significantly associated with knowledge scores (chi-square=1.235, P value=0.570). This suggests that age does not play a significant role in determining the level of knowledge regarding aseptic techniques among the nursing staff. In contrast, there is a significant relationship between educational level and knowledge scores (chi-square=1.129, P value=0.010). This indicates that the educational level achieved by the nursing staff has a significant influence on their knowledge of aseptic techniques. Participants with higher educational levels, such as a master's and PhD, tend to exhibit higher knowledge scores compared to those with lower educational levels, such as a diploma or bachelor's degree. Years of experience also demonstrate a significant relationship with knowledge scores (chi- square=1.131, P value=0.010). The results suggest that the number of years of experience as a nurse influences the level of knowledge regarding aseptic techniques. Participants with more years of experience tend to have higher knowledge scores compared to those with fewer years of experience.

Table 4

The relationship between demographic characteristics and the knowledge of nursing staff regarding aseptic techniques (n=84)

Demographic characteristic variables	Level of the knowledge score			Chi-square	P value
	Below median	Above median	Poor		
Age in years				1.235	0.57
<20	6 (7.2%)	7 (4.8%)	5 (6%)		
20-30	10 (12%)	13 (15.7%)	10 (12%)		
31-40	6 (7.2%)	8 (9.6%)	8 (9.6%)		
41 + years	3 (3.6%)	4 (4.8%)	3 (3.6%)		
Educational level				1.129	0.01
Diploma	2 (2.4%)	2 (2.4%)	7 (4.8%)		
Bachelor's	24 (28.9%)	22 (26.5%)	10 (12%)		
Master's	9 (7.12%)	6 (7.2%)	1 (1.2%)		
Years of experience				1.131	0.01
Less than one year	4 (4.8%)	6 (6.2%)	3 (3.6%)		

DISCUSSION

Aseptic techniques encompass a series of protocols and measures implemented in healthcare settings to prevent the transmission and proliferation of infections. These techniques are designed to uphold a sterile and germ-free environment during medical procedures, surgeries, and patient care interventions. The findings of this study shed light on the understanding and challenges faced by nursing staff concerning a crucial aspect for healthcare practitioners: aseptic techniques.

The findings of the study indicate that age does not have a significant relationship with knowledge scores. This means that the age of the nursing staff does not appear to influence their level of knowledge regarding aseptic techniques. This finding aligns with a previous study that has shown no significant correlation between age and knowledge scores related to infection control practices.

On the other hand, the study identified significant associations between educational level and years of experience with knowledge scores. Participants with advanced educational qualifications, such as a master's or PhD, exhibited higher knowledge scores in comparison to those with lower educational levels, such as a diploma or bachelor's degree. This finding aligns with previous research indicating a positive correlation between higher education and a stronger understanding of infection control practices.

The results showed that there is a significant association between educational level, years of experience, and knowledge scores (P value=0.010) at a significance level of 0.05. This finding is supported by previous research that has shown a positive relationship between years of experience and the knowledge of infection control practices.

The results indicate that the participants demonstrated varying levels of knowledge regarding different aspects of aseptic techniques. The participants displayed a reasonably good level of knowledge regarding aseptic techniques, as indicated by the 78.8% overall knowledge score. However, the variation in percentages for individual questions suggests that there may be areas where further education or reinforcement of knowledge is necessary to ensure a comprehensive

understanding of aseptic practices among the nurse staff. This result is supported by a study by Dimitriadou et al. (2022) that assessed the knowledge of nursing staff regarding aseptic techniques in an intensive care unit (ICU) setting. The findings revealed knowledge gaps in areas such as hand hygiene, use of personal protective equipment, and prevention of central line-associated bloodstream infections; this study emphasized the need for targeted educational interventions to enhance nurses' knowledge and improve compliance with aseptic practices.

The majority of participants in the study provided correct answers regarding the objective of aseptic techniques and their importance in preventing the transmission of infections, accounting for 72.3%. This confirms that the participants have a proper understanding of it. This result is not consistent with a study conducted, which revealed lower knowledge levels (20%) on the same topic.

Regarding the resource limitations and staff training that affect the availability or quality of sterile equipment and supplies, this result was supported by a study whose results suggest that resource limitations affecting the availability or quality of sterile equipment and supplies are identified barriers to aseptic practices. The majority of the staff nurse participants (84.3%) indicated that there are obstacles to the optimal application of aseptic techniques; this finding was supported by a study. who found that there are perceived barriers to creating and maintaining a sterile field during neonatal care.

The distribution of years of experience among the participants provides insights into the level of expertise and professional background of the individuals involved in the study regarding knowledge about aseptic technique. The results of the study showed that participants with varying years of experience can bring different perspectives, knowledge, and skills to the study. Those with more years of experience may have a deeper understanding of the subject matter and potentially contribute valuable insights based on their expertise. This result is supported by a previous study that has shown a positive correlation between years of experience and professional expertise.

The study results showed that the majority of participants were females, accounting for 73% of the sample, with ages ranging from 20 to 30 years. This finding was consistent with a study conducted. where the female gender constituted the majority.

The educational background of the participants is an important factor to consider when interpreting the findings of the study. The diverse educational levels among the participants may contribute to variations in their knowledge, expertise, and perspectives on aseptic techniques. This diversity can enrich the discussions and enhance the validity of the study's conclusions. This finding supports a study on the education and training of undergraduate nursing students in sterile technique.

There are some limitations to this study such as sample size and representativeness. The study might have included a relatively small sample size from a specific hospital in Sudan. The generalizability of the findings may be limited to other settings or populations due to certain factors. The study likely employed a cross-sectional design, which offers a snapshot of knowledge at a specific moment in time. Additionally, it should be noted that the study was conducted at a limited Hospital. Conducting the study in limited hospitals might limit the variability in knowledge levels and challenges faced by nursing staff, potentially affecting the generalizability of the findings to other healthcare facilities.

Ethical Considerations

Compliance with ethical guide lines

The study was approved by the College of Nursing Sciences, Dayananda Sagar University, and adhered to ethical principles, including obtaining informed consent from participants, maintaining confidentiality of information, and ensuring the right to withdraw at any stage. The Modified Lifestyle Interventions (MLI) were provided to all participants, and appropriate health education was given at the end of the study.

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Authors' contributions

Author participated in the study concept and design, acquisition of data, data analysis, and critical revision of the manuscript for important intellectual content.

Conflict of interest

The authors declared no conflict of interest.

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