

Nurses' Knowledge and Performance Regarding Infection Control Measures in Processing of Laryngoscope of Neonatal Intensive Care Unit



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1.ABSTRACT

Background: The neonatal intensive care unit is one of the most infection-prone areas in the hospital. The laryngoscope is identified as a potential vector for cross-infection. So, assessing knowledge and performance of NICU nurses is baseline to improve well-being of patients. **Aim:** This study aimed to assess the nurses' knowledge and performance regarding infection control measures in processing of laryngoscope of neonatal intensive care unit. **Method:** A descriptive cross-sectional study design was utilized in this study. **Setting:** study was conducted at Mansoura Specialized Hospital at Mansoura city on a convenient sample of (35) nurses working in the NICU. **Tools:** Three tools were used to collect data as the following: nurses' demographic and occupational characteristics questionnaire sheet, nurse's knowledge about infection control measures toward laryngoscope processing and observational checklist. **Results:** The overall total knowledge score revealed that (60%) of nurses showed a poor score level of knowledge with a mean of 14.4(4.33). A few percentages of nurses had competent perform hand hygiene, wear personal protective equipment, sharp and waste disposal (2.9%, 0% and 0% respectively). Moreover, there was significant relation between nurses' educational level and total knowledge score. While there was no relation between nurses' occupational characteristics and total performance score related infection control measure in laryngoscopy. **Conclusion:** Nurses had a poor score level of knowledge in addition, inadequate performance regarding infection control measures in processing of laryngoscope. **Recommendation:** Continuous educational programs to keep nurses in neonatal intensive care units updated with the evidence based practices and carry interventions for reducing infection among children.

Keywords: Infection control, Laryngoscope, Neonatal intensive care unit, Nurses' knowledge, Nurses' performance.

2.Introduction:

Neonatal infection continues to be a major source of long-term morbidity and mortality. The incidence of sepsis in newborn infants is higher than at any other time in life, and it varies by location (Molloy et al., 2020). Early-onset sepsis (EOS) and late-onset sepsis (LOS) are two types of neonatal sepsis. EOS occurs within 72 hours of delivery, but LOS occurs after 72 hours in infants who have been exposed to germs from the postnatal environment (Giannoni et al., 2018).

Subclinical infection to severe focal or systemic illness are all possible clinical presentations. The infectious agent could come from intrauterine or maternal flora, but it could also come from the hospital or the community. According to the period of development of the symptoms, it is characterised as early-onset, late-onset, or very late-onset neonatal sepsis (Chen & Shi, 2019). While early-onset

neonatal sepsis refers to cases in which clinical signs appear within the first 72 hours of birth, some studies consider the first seven days to be the limit. Late-onset neonatal sepsis is defined as cases diagnosed between the 4th and 30th days of life, or instances diagnosed beyond the first seven days. Very late-onset neonatal sepsis, on the other hand, refers to sepsis cases detected in new-borns who spend the first 30 days of their lives in the neonatal intensive care unit before being discharged (Braye et al., 2019).

For new-borns with insufficient breathing after birth, endotracheal intubation can be a lifesaving procedure (Qureshi & Kumar, 2018). Moreover, endotracheal intubation of a new-born is a critical skill that is difficult to learn but improves with practise. Intubation attempts should be limited to 20 seconds, according to the Neonatal

Resuscitation Program. Junior doctors' intubation attempts are typically not serious, and many new-borns are intubated for 20 to 30 seconds without obvious harm (Rocha et al., 2018). Little is known regarding the expertise of more senior medical personnel, the time it takes to determine the position of an endotracheal tube (ETT), or the consequences of attempted intubation on the heart rate (HR) and oxygen saturation (SpO₂) of infants in the delivery room. Routine intubation of infants born through meconium-stained liquor is no longer suggested, and intubation of new-borns who have died is no longer acceptable (O'Shea, 2019).

The laryngoscope is a common piece of anaesthetic equipment for general anaesthesia and endotracheal intubation. Because of the blood and bacterial contamination, is one of the sources of cross infection. A diverse variety of microorganisms has been found to grow on laryngoscope blades. According to the Centers for Disease Control's (CDC) Healthcare Infection Control Practices Advisory Committee (HICPAC), laryngoscopes are classified as semicritical items that only require high-level cleaning using chemical disinfectants. (Loboda & Tarasova, 2018).

The laryngoscope is composed of two parts: a handle and an illuminated blade that is usually powered by batteries or a battery pack built into the grip. The health care professional puts a straight or curved blade into the patient's mouth to inspect the larynx, epiglottis, and vocal cords, as well as an endotracheal tube (Van Wicklin, 2019). it is important that laryngoscopes are processed correctly and that they are safe for use (Starck et al., 2020).

After use, health care providers should process laryngoscopes according to the manufacturer's instructions for use (IFU), which may include the following steps (pre-cleaning at the point of use, transporting to the decontamination area in a closed container or cart, manual cleaning, rinsing, inspecting, and preparing for high-level disinfection (HLD), packaging for sterilisation, transporting to the point of use or storage area, and storing) (Sherman, Raibley IV, & Eckelman, 2018).

2.1 Aim of the Study

The study aimed to assess the nurses' knowledge and performance regarding infection control measures in Processing of Laryngoscope of Neonatal Intensive Care Unit.

2.2 Research questions:

1. What is the nurses' knowledge resregarding infection control measu in processing of laryngoscope of NICU.
2. What is the nurses' performance regarding infection control measures in processing of laryngoscope of NICU.

3 Method:

3.1 Design

A descriptive cross-sectional study design was utilized in this study.

3.2 Setting:

The study was carried out at neonatal intensive care unit (NICU) of specialized Mansoura hospital. Which contain three-separated room:

- Level I (well new-born nursery) which contain 6 incubators which can be increased with a maximum of eight incubators. a nurse can be assigned up to four babies to care for them
- Level II (special care nursery) which contain 6 incubators, in which a nurse was assigned to two babies.
- Level III (neonatal intensive-care unit) which contain 4 incubators, where nurses to babies ratio is one-to-one, or sometimes even one-to-two.

3.3 Sample:

A convenient sample composed of all available (35) nurses working in the NICU in Mansoura Specialized Hospital.

3.4 Tools of Data Collection

The necessary data was collected through the use of the following tools:

Tool 1: Nurses' Demographic and Occupational Characteristics Questionnaire sheet:

It was developed by researcher to assess demographic and occupational characteristics

of the nurses including data such as age, educational level, years of experience and training courses.

Tool 2: Nurses' Knowledge about Infection Control Measures toward Laryngoscope Processing.

This tool was adapted from **Tash, Wegdan, Amer, Bassyouni, and Botros (2018); Chaskar, Dave, Dias, and Karnik (2017); Labrague, Rosales, and Tizon (2012); and Challenge (2009)**, to assess the nurse's knowledge in relation to infection prevention measures in NICU. It includes questions in the form of multiple-choice questions Such as disinfection process and its level, endotracheal suctioning, PPE and waste disposal.

Scoring system:

Each correct answer scored one point and each incorrect answer scored a zero. A higher score indicated a greater nurse's knowledge. The score obtained for each question summed up get the total score for the nurse's knowledge. (**Mohamed & Ramadan, 2015**). The nurse's knowledge was considered good if the percent score was $\geq 75\%$ and more, average knowledge from $50\% - < 75\%$ was considered fair and poor if the percent score was $< 50\%$ (**Jemal et al., 2019**).

Tool 3: Observational Checklists of performance of Infection Control Measures to Evaluate Skills.

It was used to assess nurses' performance regarding infection control measures in laryngoscope processing. An observation checklist was adapted from **Caston-Gaa and Ruparelia (2018); Pereira, Lam, Chan, Malaguti-Toffano, and Gir (2015); and Commission (2013)**, composed of two categories (checklist of nurses' compliance with infection control measures and checklist of nurses' performance of infection control measures in laryngoscopy).

Scoring system:

Two points were marked for the choice 'Done Correctly', for the choice 'done incorrectly', one point was marked and zero was marked for the choice 'Not Done' . As regards to their performance core components of infection control in NICU was competent if

the percent score was ($\geq 85\%$) and incompetent if ($< 85\%$) (**Ahmed, Mohammed, & Elwasefy) & (Abou Zed & Mohammed, 2019)**).

3.5 Method

- An approval had been obtained from the research ethics committee of the faculty of nursing, Mansoura University to carry out the study.
- An official letter had been submitted from the dean of faculty of nursing to the head of the neonatal intensive care unit (NICU) MSH to obtain an approval to carry out the study
- Data collection extended a period of (6) months start from first of July 2021 to the end of December 2021. The researcher attended during morning or afternoon shift (2-3 times/week)

3.6 Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee of Faculty of Nursing, Mansoura University. Informed consent was obtained from each nurse for her participation after the explanation of the purpose, benefits, risks and process of the study. privacy and confidentiality of data was assured that it used only for research purposes. The results was used as a component of the necessary research, as well as for future publications and education. Participants was informed that participation in the study is voluntary and they have the right to withdraw at any time freely without any responsibilities.

3.7 Statistical analysis:

The collected data were sorted, coded, organized, categorized, and transferred into especially design formats to be suitable for computer feeding. Statistical analyses were performed using the statistical software SPSS (Stands for Statistical Product and Service Solutions) version 21. It was analysed by the same program for presenting frequency tables with percentages. Qualitative data was presented as number and percent. Besides, quantitative data were described as mean \pm standard deviation as appropriate. The results considered significant when the probability of error is less than 5% ($p \leq 0.05$).

4. Results:

Concerning characteristics of the studied nurses. **Table (1)** illustrates that, more than half (57.1 %) of nurses' age is less than 30 years. Their main age is 29.29 14089years. Concerning the educational level of the nurses, most of them had nursing Bachelor's degree (65.7%), while the diploma (Secondary nursing school) (8.6%) was less frequency between nurses. Regarding years of experience of the nurses, (37.1%) of them had 1 to less than 5 years of experience, while (17.1%) of them had more than 10 years. regarding Last training courses or seminar on infection control (82.9%) of them attended training courses about infection control, while, only (17.1%) of them had no training courses.

Table (2) clarified that, percentages of nurses showed a fair score level of knowledge about disinfection process and laryngoscope disinfection (25%, 21% respectively), while percentages of nurses showed a poor score level of knowledge about wear PPE and endotracheal suctioning (24%. 18% respectively). The overall total knowledge score revealed that (60%) of nurses showed a poor score level of knowledge with a mean of 14.4(4.33).

In relation to nurse's knowledge regarding infection control measures toward

Laryngoscope Processing.

Table (3): represents that, only few percentages of nurses competently perform hand hygiene, wear PPE, apply sharp & waste disposal and prevent cross infection (2.9%, 0%, 0%, and 0% respectively). While highly percentage of nurses showed an incompetent score level of the same items (97.1%, 100%, 100%, 100%).

Table (4): indicates that, there was a zero percentage of nurses competent perform laryngoscope preparation, open sterile package, transfer sterile items to the sterile field before the procedure while, 100% of nurses incompetent with the same items. In addition, highly percentage of nurses incompetent perform cleaning and high-level disinfection blades, cleaning and intermediate level disinfection for handles and testing after the procedure.

Table (5): indicates that, there was significant relation between nurses' educational level and total knowledge score ($P = 0.035^*$).

Table (6): shows that, there was no relation between nurses' occupational characteristics and total performance score related infection control measure in laryngoscopy at ($p < 0.05$).

Table (1): Demographic and occupational characteristics of the studied nurses

Items	N=35	%
Age		
<30 years	20	57.1
≥ 30 years	15	42.9
• (S.D)	29.29 (.)	
Educational level		
Secondary nursing school	3	8.6
Technical diploma	9	25.7
Bachelor	23	65.7
Years of experience		
<1 year	8	22.9
1 to less than 5 years	13	37.1
5 to less than 10 years	8	22.9
10years and more	6	17.1
Training course or seminar on infection control policies, procedures and practices		
Yes	29	82.9
No	6	17.1

Table (2): Nurses' knowledge about infection control measures related laryngoscope processing.

Knowledge level	Test time N = 98	
	N	%
Disinfection process and its level (6marks)		
Good	0	·
Fair	25	71.4
Poor	10	28.6
□(SD)	2.86(0.88)	
Laryngoscope and its disinfection (8marks)		
Good	5	14.3
Fair	21	60
Poor	9	25.7
□(SD)	4.63(1.5)	
PPE and waste disposal (11marks)		
Good	6	17.1
Fair	5	14.3
Poor	24	68.6
□(SD)	5.46(2.51)	
Endotracheal suctioning (4marks)		
Good	0	0
Fair	17	48.6
Poor	18	51.4
□(SD)	1.46(0.95)	
Total Knowledge level (29 marks)		
Good	3	8.6
Fair	11	31.4
Poor	21	60
□(SD)	14.4(4.33)	

Table (3): Nurses' daily performance regarding general infection control measures.

	N	%
Hand hygiene		
Competent	1	2.9
Incompetent	34	97.1
□(SD)	2.69(1.25)	
Personal protective equipment		
Competent	0	0
Incompetent	35	100
□(SD)	2.03(0.92)	
Sharp and waste disposal		
Competent	0	0
Incompetent	35	100
□(SD)	2.51(0.82)	
Prevention of cross infection		
Competent	0	0
Incompetent	35	100
□(SD)	3.57(1.20)	
Respiratory hygiene and cough etiquette		
Competent	0	0
Incompetent	35	100
□(SD)	1.91(0.70)	

Table (4): Relationships between nurses' occupational characteristics and total knowledge score related infection control measure in laryngoscopy.

Occupational characteristics	Mean (SD)	F	P
Age			
<30 years	15.3(4.78)	2.077	0.159
≥ 30 years	13.2(3.45)		
Educational level			
Secondary nursing school	12(1)	3.179	0.035*
Technical diploma	11.78(3.76)		
Bachelor	15.74(4.28)		
Years of experience			
<1 year	17(3.53)	1.457	0.245
1 to less than 5 years	14(3.94)		
5 to less than 10 years	1 2.75(2.82)		
10years and more	14(4.56)		
Training courses about infection control measures			
Yes	14.72(4.64)	0.945	0.338
No	12.83(1.83)		

Table (5): Relationships between nurses' occupational characteristics and total performance score related infection control measure in laryngoscopy.

Occupational characteristics	Mean (SD)	F	P
Age			
<30 years	9.85(5.61)	0.174	0.680
≥ 30 years	9.13(4.12)		
Qualification			
Secondary nursing school	7.33(2.08)	0.823	0.448
Technical diploma	8.33(4.36)		
Bachelor	10.3(5.39)		
Years of experience			
<1 year	9.88(5.06)	0.052	0.984
1 to less than 5 years	9.77(5.92)		
5 to less than 10 years	9(5.01)		
10years and more	9.33(3.5)		
Training courses about infection control measures			
Yes	10.17(5.16)	2.86	0.1
No	6.5(2.43)		

5. Discussion

Laryngoscopy is an invasive procedure involving contact of the laryngoscope with the mucous membrane, saliva, and at times even blood, making it a source of hospital-acquired infections (de Miguel Garcia & Cooley, 2018). CDC published that equipment which are in direct or indirect contact with mucus membrane or respiratory tract mucosa are classified as semi critical and need a high level of disinfection which destroys all forms of microorganisms except bacterial spores. They suggested hot water pasteurisation (80°C–100°C, for 30 min) or exposure to

Environmental Protection Agency-registered sterilant chemical for short exposure time (10–45 min). These methods have been universally accepted and supported by various organisations (Rubaiat, Lateef, Quader, & Khurshid, 2020).

In relation to educational level of the studied nurses, the present study showed that, about two-third of studied nurses had bachelor's degree (Table 1). This result was in the same line with Ahmed et al. who studied effect of preventive bundle guidelines on nurses' knowledge and practice towards healthcare-associated infections in NICU and reported that, the majority of nurses had a

bachelor degree. Also, congruent with **Tahiru (2021)** who found that the majority (76.9%) of them had the highest education limited to a college education. This was in disagreement with **Shauq et al. (2014)** who found that the minority of them had college in nursing, more than half had < 5 years of experience in NICU and majority of them did not participate in training courses in NICU.

According to the result, a few number of the nurses have good knowledge regarding laryngoscope processing (**Table 2**). This result was in the same line with **Geberemariam (2018)** who conducted a study about instrument processing knowledge and practice amongst healthcare workers in Addis Ababa, Ethiopia and found that, less than half (46.3%) of HCWs knowledgeable on instrument processing which imply that a significant number of HCWs lack adequate knowledge. similarly **Thapa and Kaphle (2021)** who conducted a study about knowledge and factors associated with compliance of standard precautions in clinical exposure among proficiency certificate level nursing students of Pokhara, Nepal and reported in their study that, only 2.9% nursing students had a good knowledge on infection control precautions.

In the present study, there was no one of studied nurses competent with sharp and waste disposal (**table 3**) These findings are in disagreement with a study conducted by **Ibrahim Abdeen Mhana, Ahmed Abd El-Aziz, and Mohamed Hassan (2022)**, in a study about nurses' performance regarding infection control precautions in primary health care centers. who reported that more than half (62.5%) of the studied nurses were competent perform hand hygiene while more than one third (37.5%) incompetent, regarding Safe disposal of waste found that, more than half of studied nurses (58.3%) were competent with waste disposal.

In the present study, there was no significant relation between years of experience and the total knowledge score. While there was significant relation between nurses' educational level and their total knowledge score **Table (4)**. This was in

agreement with **Iliyasu et al. (2016)** in the study about knowledge and practices of infection control among healthcare workers in a tertiary referral center in North-Western Nigeria who showed that there was no significant association between age and knowledge. While **Faith et al. (2019)** who conducted a study about knowledge, attitude and infection prevention and control practices regarding lassa fever among healthcare workers in Edo State, Nigeria, portrayed that, There was no statistically significant difference in the knowledge of HCWs based on the number of years they have worked for. In this regards **Ayed (2015)**, who conducted a study about knowledge and practice of nursing staff towards infection control measures in the Palestinian hospitals, indicated that, no relationship between knowledge regarding infection control and age, years of experience, and training course of the studied group. In addition, congruent with our study that highly significant relation between knowledge regarding infection control measures and level of education.

The results of our study showed that no relationship between performance regarding infection control and age, years of experience, training course of the studied group and nursing qualification **Table (5)**. In this regards **Ayed (2015)**, who conducted a study about knowledge and Practice of nursing staff towards infection control measures in the Palestinian hospitals, indicated that, factors such as age, years of experience and training course did not contribute to acquisition of performance regarding infection control Concerning the relationship between performance and nursing qualification. Which emphasis the need for continuous training courses about infection control to facilitate adherence to infection control measures. This was contraindicated with **AbdElgilil, Talaat, and Mahmoud (2020)**, who conducted a study about nurses performance regarding care of patients undergoing laparoscopic cholecystectomy, It revealed that, there was a high statistically significant difference between nurses' demographic characteristics (educational level and years of experience) and their total practice.

6. Conclusion

Based on the findings of this study, it can be concluded that nurses had low score level of knowledge, In addition to incompetent performance regarding infection control measures in laryngoscope processing. While observed a significant relation between nurses' educational level and total knowledge score.

7. Recommendations

In line with the findings drawn from the study, the researcher recommended that- :

- Conducting more periodical educational training program for nurses in neonatal intensive care unit to keep them updated with the evidence based practices and carry interventions for reducing infection among patients and health care workers.
- Replication of this study with a larger sample size at different neonatal intensive care units and with longitudinal follow-up so that the results could be generalized and compared for differences between Egypt and other countries.
- Empowered neonatal nurses to practice safe reprocessing methods with confidence based on current evidence using a consensual evidence-based guideline.

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