

Nurses' Knowledge and Practice Regarding Infection Control Measures in Endotracheal Intubated Children



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1.ABSTRACT

Background: Endotracheal intubated children have a greater risk of acquiring infection however, this problem is greatest in critical care units. So, assessing knowledge and practice of ICU nurses is baseline to improve well-being of intubated patients. **Aim:** This study aimed to assess the nurses' knowledge and practice regarding infection control measures in endotracheal intubated children. **Method:** A descriptive cross-sectional study design was utilized in this study. **Setting:** This study was conducted at Mansoura University Children's Hospital (MUCH) on convenience sample of nurses (N= 98) 38 nurses in Pediatric Cardiac Intensive Care Unit and 60 nurses in Pediatric Intensive Care Unit. **Tools:** Two tools were used to collect data as the following : Nurse's knowledge structured interview questionnaire sheet and Observational checklist. **Results:** The overall total knowledge score revealed that (62.2%) of nurses showed a good score level of knowledge with a mean of 26.5(4.5). A few percentages of nurses had proper perform hand hygiene, oral care, patient monitoring and suctioning (12.2%, 4.1%, 1%, and 2% respectively). Moreover there was significant relation between nurses' years of experience and total knowledge score. While there was no significant relation between total nurses' knowledge and practice **Conclusion:** Although nurses had good score level of knowledge, they had inadequate practice regarding infection control measures in endotracheal intubated children. **Recommendation:** Continuous educational programs to keep nurses in intensive care units updated with the evidence based practices and carry interventions for reducing infection among endotracheal intubated children.

Keywords: Endotracheal Intubated Children ,Infection Control ,Nurses' knowledge, Nurses' practices.

2.Introduction:

Endotracheal tubes are ventilation tubes that entering the trachea through the mouth or nose of the patient. Children may need mechanical ventilation through the placement of endotracheal and other ventilation tubes for a multitude of reasons . For example, children undergoing anaesthetics, may require ventilation to temporarily replace their natural breathing process. Mechanical ventilation is only required for a specific period of time in this case. Children in intensive care who have respiratory failure, alternatively, may be intubated and ventilated for days, weeks, or even months and that increase incidence of respiratory infections, such as community-acquired pneumonia, healthcare-associated pneumonia, hospital-acquired pneumonia and ventilator-associated pneumonia (VAP) . (Suijs, 2017).

So The American Thoracic Society(ATS) recommended numerous preventive measures and this recommendation include: education and training of healthcare worker, high compliance with alcohol-based hand rubbing as main measure for hand hygiene, keeping teeth and mouth clean, limiting the use of continuous sedation and paralytic agent that decrease cough, avoiding of unnecessary or repeated intubation and use Non-invasive Positive Ventilation(NIPPV), and maintain cuff pressure to prevent leakage of contaminated secretion (Landelle, Pittet & Bearman, 2018)

Studies have confirmed that sufficient hand hygiene has been linked with a major decrease in nosocomial infection .The principal deficiency was in hand disinfection performs prior to and post endotracheal

suction (ETS) events. As well as infection-control practices, significant treatment-related discrepancies were observed in preserving an optimum cuff pressure prior to and post ETS events, which is important for the prevention of micro aspiration of colonized oropharyngeal secretions (Ahmed, 2019). additionally suctioning from the mouth to eradicate plaque and pharmacological interferences such as the usage of chlorhexidine, gentamicin, colistin, and vancomycin mouthwashes decrease the rate of infection by declining colonization. Keeping sterility after intubation is necessary during the endotracheal suction procedure. Appropriate oral care lessens the risk of bacterial spread.(Osti, Wosti, Pandey & Zhao, 2017).

Infection control and prevention strategies is the best factor that limitation hospital stay and reduce mortality rate in those children admitted to Pediatric Intensive Care Unit (PICU). Several strategies and guidelines are established to confirm infection control when dealing with intubated children. Nurses are the most healthcare provider who in direct connection with those children, and without following these measures and guidelines they make children more susceptible to infection beside tube that placed into children trachea itself which make him at risk to infection (Abdallh, 2018). Therefore, this study aimed to assess nurses' knowledge and practice regarding infection control measures in endotracheal intubated children.

2.1 Aim of the Study

This study aimed to assess nurses' knowledge and practice regarding infection control measures in endotracheal intubated children.

2.2 Research questions:

1. What is the nurses' knowledge regarding infection control measures in endotracheal intubated children?
2. What is the nurses' practice regarding infection control measures in endotracheal intubated children?

3. Method:

3.1 Design

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

3.2 Setting:

This study was conducted at Pediatric Cardiac Intensive Care Unit (PCICU) and Pediatric Intensive Care Unit (PICU) affiliated to Mansoura University Children's Hospital (MUCH).

- Pediatric Cardiac Intensive Care Unit (PCICU) consists of two rooms. There are 5 beds, 5 mechanical ventilators and 19 nurses in each room.
- Pediatric Intensive Care Unit (PICU) consists of one big room. There are 14 beds, 15 mechanical ventilators and 60 nurses.

3.3 Sample:

A convenient sample composed of all nurses who are responsible for providing care for endotracheal intubated children in the previously mentioned setting .

3.4 Tools for Data Collection

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

Tool 1: A structured interview questionnaire sheet:

This tool was developed by the researcher after reviewing of relevant literatures with the guidance of (Esayas, 2017). It include two parts as the following:

Part I: It includes demographic data of the studied nurses such as (age, qualification, work place, years of experience and **previous** attendance of training courses regarding infection control measures for children with endotracheal tube.

Part II: Nurses' knowledge regarding infection control measures in endotracheal intubated children. It includes questions in the form of multiple choice questions (definition and indications of mechanical ventilation, risk **factors** of pneumonia in mechanically ventilated children and its prevention, definition, types adverse effects, position, suction pressure of endotracheal suctioning,

endotracheal tube size ,frequency, contraindication of endotracheal suctioning, care of endotracheal tube, preventive measures of infection control in intubated children).

Scoring system

Each correct answer was given (1) score, while incorrect or missed answer given (0) score. Total scoring was classified **according** to the answer of the studied nurses. The nurse's knowledge was considered good if the percent score was $\geq 70\%$ and more, average knowledge from $65\% - < 70\%$ was considered fair and poor if the percent score was $< 65\%$ (Elbilgahy, Ouda, Hashem & Ellassmy, 2015)

Tool II: Observational checklist:

It was used to assess nurses' practice regarding infection control measures in endotracheal intubated children (hand washing - hand rub with alcohol-Patient monitoring - suctioning- mouth care). This tool was developed by the researcher after reviewing the related literature (Abdallh, 2018).

Scoring system

Each correct step of the procedure scored on the basis of "complete correctly done" scored (2), "incomplete correctly done" scored (1) and "incorrect done", scored (0). The level of nurses' practice was considered proper practice if the percent score was $\geq 70\%$ and more, improper practice if the percent score was < 70 (Dipanjali, Shivananda & Yashoda, 2021)

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 Pediatric Cardiac Intensive Care Unit (PCICU) and Pediatric Intensive Care Unit (PICU) of MUCH to obtain an approval to carry out the study.
- Data collection extended over a period of 4 months period from first of September 2021 to the end of December 2021. The researcher attended two days per week from 9.00 am to 3.00 pm.

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 explaining the aim, benefits, risks and procedure of the study. Anonymity 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 coded and entered to the statistical package of social sciences (SPSS) version 20. After complete entry, data were explored for detecting any error, then, it was analyzed 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 / SD as appropriate. The result considered significant when the probability of error is less than 5% ($p < 0.05$).

4. Results:

Concerning characteristics of the studied nurses. **Table (1)** illustrates that, most of the studied nurses (65.3%) aged from 30 to less than 40, their educational level revealed that most of them had nursing bachelor's degree and were married (69.4%, 85.7% respectively). As regards nurses' years of experience, it was noticed that (38.8%) had 1 to less than 5 years of experience, whereas (36.7%) had 10 years and more of experience. Most of them (64.3%) had no training courses about infection control measures, while, only (35.7%) of them attended training sessions courses about infection control measures.

Figure (1): illustrates that, (35.7%) of the studied nurses attended training courses about infection control measures in endotracheal intubated children. While majority of them (64.3%) wasn't attend training courses.

Table (2) clarified that, percentages of nurses showed a good score level of knowledge about mechanical ventilation and its indication, endotracheal tube and standard precaution related endotracheal tube (77.6%, 31.6%, and 64.3% respectively). The overall total knowledge score revealed that (62.2%) of nurses showed a good score level of knowledge with a mean of 26.5(4.5).

In relation to nurse's knowledge regarding infection control measures in endotracheal intubated children. Table (3): represents that, only few percentages of nurses properly perform hand hygiene, oral care,

patient monitoring and suctioning (12.2%, 4.1%, 1%, and 2% respectively). The overall total practices score revealed that (100%) of nurses showed a improper score level of perform with a mean of 45.8 (7.1) marks.

Table (4): indicates that, there was significant relation between nurses' years of experience and total knowledge score. ($P = 0.023^*$).

Table (5): indicates that, there was no significant relation between nurses' characteristics and total practice score ($P > 0.05$)

Table (1): Socio-demographic characteristics of the studied nurses.

Items	N = (98)	(%)
Age		
20 -< 30 years	29	29.6
30 -< 40 years	64	65.3
40 ≥ years	5	5.1
X(SD)32.4(4.6)		
Marital status		
Single	14	14.3
Married	84	85.7
Department		
Pediatric intensive care unit (PICU)	60	61.2
Pediatric cardiac intensive care unit (PCICU)	38	38.8
Qualification		
Diploma (nursing school)	7	7.1
Technical nursing institute	22	22.5
Bachelor's degree (BSc)	68	69.4
Postgraduate degree (MSc)	1	1
Years of experience		
1 - < 5 years	38	38.8
5 - < 10 years	24	24.5
≥10 years	36	36.7
Training courses about infection control measures		
No	63	64.3
yes	35	35.7

Figure (1): Percentage distribution of the previous attendance of training programs about infection control measures in endotracheal intubated children

attended training courses regarding infection control measures for children with endotracheal tub

no
yes

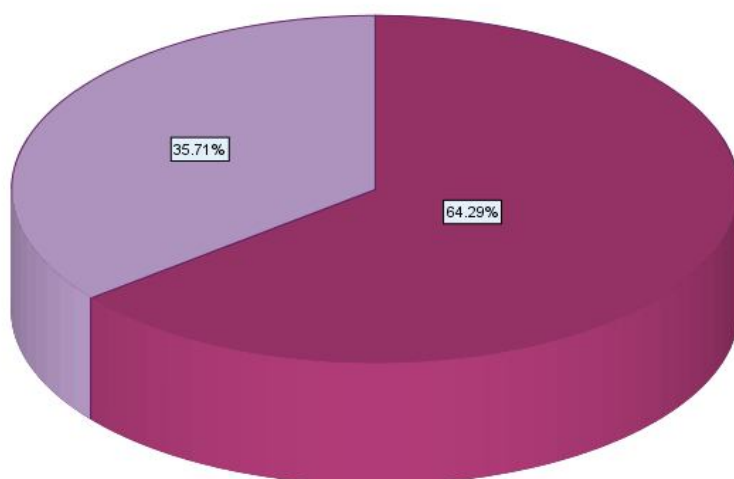


Table (2): Nurses' knowledge regarding infection control measures in endotracheal intubated children

Knowledge level	N = 98	
	N	%
Mechanical ventilation and its indication (9marks)		
Good	76	77.6
Fair	4	4.1
Poor	18	18.4
X(SD)	7(1.86)	
Endotracheal tube (16marks)		
Good	31	31.6
Fair	10	10.2
Poor	57	58.2
X(SD)	10.3(2.1)	
Standard precaution related endotracheal tube (12marks)		
Good	63	64.3
Fair	8	8.2
Poor	27	27.6
X(SD)	9.2(1.9)	
Total Knowledge level(37marks)		
Good	61	62.2
Fair	2	2
Poor	35	35.7
X(SD)	26.5(4.5)	

Good= scores 70% and more of total scores.

Fair= scores from 65% to less than 70% of total scores.

Poor= scores less than 65% of total scores.

Table (3): Nurses' level of daily practices regarding endotracheal tube

practices		N = 98	
		N	%
Hand hygiene (18 marks)			
Proper		12	12.2
Improper		86	87.8
X(SD)		10.6(1.78)	
Oral care (24 marks)			
Proper		4	4.1
Improper		94	95.9
X(SD)		10.1(3.3)	
Patient monitoring (18 marks)			
Proper		1	1
Improper		97	99
X(SD)		8.1(1.6)	
Suctioning (36 marks)			
Proper		2	2
Improper		96	98
X(SD)		19.97(4)	
Total practice level (96 marks)			
Proper		0	0
Improper		98	100
X(SD)		45.8 (7.1)	

proper = scores 70% of total scores and more than **Improper** = scores less than 70% of total scores

Table (4): Relationships between nurses' characteristics and total knowledge score .

Occupational characteristics	Mean (SD)	F	P
Age			
20 - < 30 years	6.69 (2.17)		
30 - < 40 years	7.1 (1.76)	0.624	0.538
≥40 years	7.4 (1.14)		
Qualification			
Diploma	24 (4.12)		
Technical nursing institute	25.68 (4.78)	1.294	0.281
Bachelor's degree (BSc)	26.99 (4.36)		
Postgraduate degree (MSc)	28 (-)		
Years of experience			
1 - < 5 years	26.24 (4.78)		
5 - < 10 years	28.54 (3.78)	3.909	0.023*
≥10 years	25.39 (4.31)		
Training courses about infection control measures			
No	26.11 (4.61)	1.272	0.262
Yes	27.17 (4.16)		

Table (5): Relationships between nurses' characteristics and total practice score

Occupational characteristics	Mean (SD)	F	P
Age			
20 - > 30 Years	45.84 (7.69)	0.001	0.999
30 - > 40 Years	45.83 (7.73)		
≥ 40 Years	45.78 (6.05)		
Qualification			
Diploma	46 (3.61)	0.008	0.999
Technical nursing institute	45.91 (7.35)		
Bachelor's degree (BSc)	45.78 (7.36)		
Postgraduate degree (MSc)	45 (-)		
Years of experience			
1 - > 5 years	45.84 (7.69)	0.001	0.999
5 - > 10 years	45.83 (7.73)		
≥10 years	45.78 (6.05)		
Training courses about infection control measures			
No	45.48 (7.24)	0.406	0.525
Yes	46.43 (6.79)		

5. Discussion

Infection prevention is one of the most important challenges in the health institutions. Despite the continuing concern of hospital managers and all attempts at improvement,

many healthcare institutions were unable to achieve adequate levels of prevention, particularly in developing countries (Xu et al., 2015). So assessing the nurses' knowledge and practice regarding infection control measures

is very important to improve levels of prevention and reduce infection.

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 **Eskander, Morsy & Elfeky, (2013)** who studied intensive care nurses' knowledge & practices regarding infection control standard precautions at a selected Egyptian cancer hospital and reported that, frequency of the nurses had bachelor's degree was 66.2%. While, **Abou Zed & Mohammed, (2019)** who conducted a study about impact of nursing guidelines on nurses' knowledge and performance regarding to prevention of ventilator associated pneumonia in neonates stated that, 62.7% of the nurses had diploma in nursing.

Regarding nurses' years of experience, the current study clarified that, about one-third of the studied nurses had less than 5 years of working experience and the majority of the studied nurses did not receive training program about infection control measures (**Table1**). This result was in agreement with **Abou Zed & Mohammed, (2019)**, who found that the peak percent (46.5 %) were employed in ICU for less than 5 years of experience and the majority of nurses did not attended any training program. This result could be due to workload on nurses and shortage in staff may kept them had no more time to attend any training program.

According to the result of our study, most of nurses have good knowledge regarding mechanical ventilation and its indication (**Table 2**). This result was in accordance with **Kiyoko Hayashi et al., (2020)** who conducted a study about impact of a respiratory ICU rotation on resident knowledge and confidence in managing mechanical ventilation and found that, 54% of nurses had an adequate knowledge about indications for mechanical ventilation.

The findings of the current study showed that, there is strong relation between years of experiences and knowledge (**Table 4**). This finding was in the same line with **Ahmed & Abosamra, (2015)** who conducted a study about knowledge of Pediatric Critical Care Nurses Regarding Evidence Based Guidelines for Prevention of Ventilator Associated Pneumonia (VAP) and stated that, there is strong relation between years of experiences and total knowledge score of nurses on the evidence based guidelines for

prevention of Ventilator Associated Pneumonia .

While **Alamin Ahmed, Mohammed yousif & Awad, (2019)** who conducted a study about effect of teaching program on ICU nurse's knowledge and practice of endotracheal suctioning procedure at omdurman military hospital 2019 portrayed that, there is no significant relationship between working experience & levels of knowledge. That finding might be due to nurses who had more years of experiences receive more in-service training program about infection control measures which increase their level of information.

In the present study, there was no significant relation between years of experience practice score. **Table (5)** . This might be due to years of experience not affected on nurses' practice. This was in agreement with **Hassan, (2018)** in the study about effect of educational program on nurses' practice regarding care of adult patients with endotracheal tube. who showed that there was no significant relation between years of experience and nurses' practice .

6. Conclusion

Based on the findings of this study, it can be concluded that although nurses had good score level of knowledge, they had inadequate practice regarding infection control measures in endotracheal intubated children. While observed no significant relation between total nurses' knowledge score and total practice score.

7. Recommendations

Based on the findings and conclusions drawn from the study, the researcher recommended that- :

- Critical nurses in ICUs should be formally trained before positioning them in these units
- The hospital administrators should put plan for mandatory in-services education regarding infection control measures in endotracheal intubated children.
- Manuals, information booklets and self-instruction module regarding infection control measures should be present in every intensive care unit.
- Regular educational programs to keep nurses in intensive care units updated with the evidence based practices and carry interventions for reducing infection among endotracheal intubated children.

8. Acknowledgments

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