

Nurses' knowledge, Practice and Attitude regarding Endotracheal Tube Fixation: An Assessment Study

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Abstract

Background: A tube is inserted into the trachea through the mouth or nose during a medical procedure called endotracheal intubation. After that, the tube can be attached to a mechanical ventilator to help breathing and keep patent airway. **Aim of the study:** Was to assess nurses' knowledge, practice and attitude regarding endotracheal tube fixation. **Design:** A descriptive, assessment research design was utilized to carry out this study. **Settings:** This study was carried out at Pediatric Intensive Care Units of Specialized Pediatric Hospital in Benha City which affiliated to ministry of health and population and Benha University Hospital. **Subjects:** A convenient sample of (100) nurses who were responsible for care of infants with endotracheal tube and a purposive sample of (100) infants who are undergoing endotracheal intubation in the previously mentioned settings. **Tools of data collection:** Three tools were utilized to collect data for the study: **Tool (I):** A structured interviewing questionnaire sheet. **Tool (II):** An observational checklist to assess nurses' practices regarding endotracheal tube fixation. **Tool (III):** Nurses' attitude regarding endotracheal tube fixation. **Results:** More than two fifths of studied nurses had an average level of knowledge, more than half of them had incompetent level of practice and more than two thirds of them had positive attitude regarding endotracheal tube fixation. **Conclusion:** There was a positive correlation between total nurses' knowledge, total practice and total attitude regarding endotracheal tube fixation. **Recommendation:** Developing training programs regarding endotracheal tube fixation are recommended for the nurses working in pediatric intensive care units to improve their knowledge, practice and attitude.

Keywords: Attitude. Endotracheal tube. Fixation. Knowledge, Nurses, and Practice

Introduction

The process of performing maneuvers and utilizing technologies to allow safe and appropriate ventilation for newborns in need of such care is known as airway management. For many critically unwell newborns, mechanical ventilation (MV) and endotracheal intubation (ETI) are necessary life-saving procedures. ETT entails positioning it correctly, comforting the child, and making it easier for caregivers to use in order to maximize ventilation, prevent displacement, and prevent unintentional

extubation (Colombage & Goonewardena, 2020).

Infants requiring mechanical ventilation should have continuous attention and observation on heart rate, blood pressure, oxygen saturation, mechanical ventilation mode, arterial blood gas findings, and auscultate chest sound. This is because early detection of alterations may prevent a significant deterioration. In order to provide care for infants in a safe and effective manner, nurses are involved in the ventilation and

weaning process from mechanical ventilators, thus they should have good level of knowledge (El-Garhy et al., 2020).

Successful treatment for infants who are intubated requires nurses to be confident and at ease with their understanding of endotracheal tubes, fixation procedures, and factors that affect ETT fixation. To minimize difficulties and avoid unintentional extubation, they must carry out the necessary procedures. To spot extubation symptoms including cyanosis and uneven chest movement, nurses should observe the newborn (Bauman & Hyzy, 2016).

The ETT fixation's fundamentals and workings must be understood by the nurse. The best stabilizing requirements include using glue, various taping techniques, cotton, gauze, regular saline for cleaning, and commercial tube holders. To guarantee improved ETT fixation, nurses should practice at a competent level and make use of more recent evidence-based practices (Tiernan & Clerkin, 2019).

Nurses' knowledge and attitude toward ETT fixation are influenced by qualification of nurses, staff training, source of learning, the presence of ETT securing protocol, years of experience, level of education and enough nursing staff. Positive nurses' attitude regarding ETT fixation is very crucial to avoid stress in the work environment and introduce quality improvement initiatives to minimize the frequency of unscheduled extubations (Loganathan et al., 2017).

Significance of Study:

Presence of an obstructed airway or when the clinician is unable to ventilate a severely unwell infant sufficiently with ambu bag or a supraglottic airway device, endotracheal intubation is the gold standard for securing patent airway. Complications

from unsuccessful intubation attempts increase the risk of morbidity and death (Van-Sambeek et al., 2019).

The rate of admission at pediatric intensive care unit (PICU) from 2019 to 2020 was 1100 children (600 in Specialized Pediatric Hospital and 500 in Benha University hospital), according to the statistical departments of both hospitals. However, there is no data available regarding the rate of infants who were intubated. A conducted study of mechanical ventilation practice in Egyptian pediatric intensive care units. This study reported that (32.8%) of admitted children were mechanically ventilated (Meligy, Kamal & El Sherbini, 2017). According to a study done to investigate the variables influencing endotracheal tube connection in pediatric patients at intensive care unit, almost half of them (52.5%) are aged from one month to less than one year and the rate of unplanned extubation from improper fixation of ETT was (13.0%) of intubated children and all had been orally intubated (Gebril et al., 2020). This study assessed nurses' knowledge, practice and attitude regarding ETT fixation to prevent the occurrence of serious problem in pediatric intensive care units.

Aim of the Study

This study aimed to assess nurses' knowledge, practice and attitude regarding endotracheal tube fixation.

Research questions:

1. Do nurses have good level of knowledge regarding endotracheal tube fixation?
2. Do nurses have competent level of practice regarding endotracheal tube fixation?
3. Do nurses have positive attitude regarding endotracheal tube fixation?

Nurses' knowledge, Practice and Attitude regarding Endotracheal Tube Fixation: An Assessment Study

4. Is there a relation between the nurses' knowledge, practice, and attitude regarding endotracheal tube fixation?

Subjects and method.

a) Research design:

Descriptive, assessment research design was utilized to conduct the study.

b) Settings:

The study was carried out at pediatric intensive care units of Specialized Pediatric Hospital in Benha city which affiliated to Ministry of Health and Population (3rd floor) which contain 20 beds and 10 ventilators and Benha University Hospital (4th floor) which contain 15 beds and 11 ventilators.

c) Subjects:

- A convenient sample of 100 nurses who were caring for infants with ETT (50 nurses from Specialized Pediatric Hospital in Benha city and 50 nurses from Benha University Hospital) were included in the study regardless their personal characteristics (age, gender, educational level, years of experience and attending of training courses) and willing to participate in the study.
- A purposive sample of 100 infants (50 infants from Benha University Hospital and 50 infants from Specialized Pediatric Hospital at Benha city) who are undergoing endotracheal intubation in the previously mentioned settings. They were selected after fulfilled the following criteria:
- **Inclusion criteria:**
 - 1) Infants from 1 month to 1 year of age from both gender.
 - 2) All infants connected to ventilators.

3) Tools of data collection:

Three tools were utilized to collect data for the study:

Tool (I): A structured interviewing questionnaire sheet

It was consisted of three parts as the following:

Part 1: Characteristics of the studied nurses such as; age, gender, level of education, years of experience and attendance of training courses in the field of pediatric nursing.

Part 2: Characteristics of the studied infants and medical data such as; age, gender, current weight, medical diagnosis and duration of endotracheal intubation.

Part 3: Nurses' knowledge regarding ETT fixation:

It was concerned with assessing nurses' knowledge regarding ETT fixation. It was developed by the researcher in an Arabic language and reviewed by the supervisors after reviewing of a recent literature (Santhosh, et al., 2017). It included (19) questions and divided under three categories:

- a) **Nurses' knowledge regarding endotracheal tube fixation:** It included (9) questions (multiple choice).
- b) **Nurses' knowledge regarding infant factors affecting fixation of ETT:** It included (7) questions (yes or no).
- c) **Nurses' knowledge regarding tube factors affecting fixation of ETT:** It included (3) questions (yes or no).

Scoring system for nurses' knowledge:

- Total degree of questions (0 - 38) degrees.
- The complete correct answer of nurses' knowledge was scored (2).
- Incomplete correct answer was scored (1).
- Wrong answer or don't know was scored (0) according to nurses' responses.

Total scoring of nurses' knowledge:

- Good level of knowledge if nurses scored >75% (above 28.5 degrees).
- Average level of knowledge if nurses scored 50% -<75 (from 19 degrees to less than 28.5 degrees).
- Poor level of knowledge if nurses scored <50% (below 19 degrees).

Tool (II): An observational checklist

It was concerned with evaluating nurses' practices regarding ETT fixation. It was adopted from **Lynn & Lebon., (2011)**. It consisted of (18) items and included bring necessary equipment to the bedside the infant, identify infant ETT depth and size.

Scoring system for nurses' practice:

- Total degree of steps (0 – 18) degrees.
- Score (1) for each step if correctly done.
- Score (0) for each step not done.

Total scoring for nurses' practice:

- Competent level of practice if nurses scored $\geq 85\%$ (above or equal 15.3 degrees).
- Incompetent level of practice if nurses scored < 85% (below 15.3 degrees).

Tool (III): Nurses' attitude regarding ETT fixation

This tool was used to assess nurses' attitude regarding ETT fixation. It was adapted from **(Andargie & Kassahun., 2019)**. It consisted of (13) items such as; in your point of view, are all infants at potential risk of endotracheal extubation, do you believe that ETT fixation is a very dangerous procedure need great care and do you believe that ETT extubation can be prevented before its' occurrence.

Scoring system for nurses' attitude:

- Total degree of items (0 - 26) degrees.
- Agree items were scored (2).
- Uncertain items were scored (1).
- Disagree items were scored (0).

Total scoring for nurses' attitude:

- Positive attitude: $\geq 75\%$ (above or equal 19.5 degrees).
- Negative attitude: < 75% (below 19.5 degrees).

Content validity and reliability:

To assess the tools' content validity, a panel of three pediatric nursing specialists from Benha University's Faculty of Nursing evaluated the revisions. Clarity, relevance, comprehensiveness, simplicity, and applicability were all evaluated by the experts on the tools. Every comment they made on the structure, design, paragraphing, accuracy, and consistency of the tools was taken into account. The completed form was then utilized to gather data. Reliability of tool was tested to ensure that an assessment tool produces stable and consistent results over times. Reliability was assessed by using cronbach's alpha coefficient test and it was ($r=0.761$) for knowledge, ($r= 0.814$) for practice and ($r=0.732$) for attitude. These indicate a high degree of reliability for the study tools.

Ethical considerations:

Written research approval was obtained from scientific research ethical committee of Faculty of Nursing, Benha University before starting the study, which clarify the purpose of the study. The nurses assured that the collected data would be treated confidentially and that it would be used for the purpose of the study only. An oral consent was taken from every nurse before data collection to participate in the current study and assured them that they have the right to withdraw from the study at any time. The study's nature & aim were fully explained, and the nurses were given the assurance that their information would be kept confidential.

Nurses' knowledge, Practice and Attitude regarding Endotracheal Tube Fixation: An Assessment Study

Pilot study:

A pilot study was carried out on 10% (10 nurses) and (10 infants) of total sample size to test the research feasibility, clarity, objectivity, applicability of the study tools and to estimate the time needed for the data collection. There are no vital modifications were carried out on the tools so, the pilot sample was included in the current study sample.

Field work:

Field work was conducted to achieve the aim of the study. This phase took four months from June 2021 till the end of September 2021. Through this period, the researcher attended the settings two days per week (Sunday in Benha University Hospital and Wednesday in pediatric intensive care units of Specialized Pediatric Hospital at Benha city) from 9 A.M. to 2 P.M. with a range of (6-7) nurses per week. The researcher began with introducing herself to the nurses and gave a brief explanation about the aim & nature of the study prior data collection. Each nurse was interviewed individually to gather the necessary data of the study. The nurses were asked to give their responses according to the study tools. The data of studied infants were collected by the researcher from the medical record and it took 10-15minutes. The researcher gave the studied nurses questionnaire for filling to assess their knowledge and it took 20-25 minutes. Also, the researcher assessed their actual practices by using observational checklist. The average time needed for the completion of each observation was between 20-30 minutes. The researcher gave the studied nurses questionnaire for filling to assess their attitude and it took 10-15 minutes.

Statistical analysis:

The collected data from the studied sample was organized, categorized, analyzed and tabulated then revised, coded and entered using computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 20. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (X^2) was used for comparisons between qualitative variables and correlation coefficient (Spearman's rank test) was used to test correlations between variables. Statistically significant was considered at p-value <0.05 while high significant statistically at p-value <0.001 .

Results:

Table (1): Shows that, less than half of studied nurses (43.0%) were aged 30 years and more with mean age of 28.42 ± 3.93 years, also most studied nurses (86.0%) are female. In relation to nurses educational level, less than two thirds of them (65.0%) have bachelor nursing sciences. This table also illustrates that, two fifths (40.0%) of studied nurses have 5 < 10 years of experience and (39.0%) of them have 10 years and more of experience with mean 7.21 ± 3.49 years.

Table (2): Clarifies that, more than half of studied infants (56.0%) are aged from $8 \leq 12$ months with mean age of 6.96 ± 3.34 months. More than half of studied infants (53.0%) are females. Moreover, this table also illustrates that, more than one third (38.0%) of infants' weight are from $3.5 < 5$ Kg with mean age of 5.97 ± 1.96 kg.

Table (3): Illustrates that, less than three quarters (71.0%) of studied infants stayed from $1 < 5$ days on endotracheal intubation,

mean of duration of endotracheal intubation 3.19±2.09 days.

Figure (1): Illustrates that, slightly more than two fifths (42.0%) of the studied nurses have an average level of knowledge. More than one third of them (35.0%) have a good level of knowledge. While, less than one quarter of studied nurses (23.0%) have a poor level of knowledge about endotracheal tube fixation.

Figure (2): Clarifies that, more than one half (51.0%) of studied nurses have incompetent level of practice. While, less than one half (49.0%) of them have competent level of practice regarding endotracheal tube fixation.

Figure (3): Shows that, more than two thirds (67.0%) of studied nurses have positive attitude about endotracheal tube fixation. While, one third (33.0%) of them have negative attitude about endotracheal tube fixation.

Table (4): Demonstrates the presence of a positive correlation and statistically significant difference ($p < 0.05$) between studied nurses' total knowledge, total practice and total attitude regarding endotracheal tube fixation.

Table (1): Distribution of the studied nurses according to their personal characteristics (n=100).

Items	No	%
Age in years		
20 < 25	18	18.0
25 < 30	39	39.0
30 and more	43	43.0
Min-Max	19-37	
Mean ±SD	28.42±3.93 years	
Gender		
Male	14	14.0
Female	86	86.0
Educational level		
Diploma of nursing	7	7.0
Technical institute of nursing	28	28.0
Bachelor in nursing sciences	65	65.0
Years of experience		
1 < 5	21	21.0
5 <10	40	40.0
10 and more	39	39.0
Min-Max	1-15	
Mean ±SD	7.21±3.49 years	

Nurses' knowledge, Practice and Attitude regarding Endotracheal Tube Fixation: An Assessment Study

Table (2): Distribution of studied infants regarding their personal characteristics (n=100).

Items	No	%
Age / months		
1 < 4	23	23.0
4 < 8	21	21.0
8 ≤ 12	56	56.0
Min-Max	1-11	
Mean ±SD	6.96±3.34 months	
Gender		
Male	47	47.0
Female	53	53.0
Weight / kg		
3.5 < 5	38	38.0
5 < 7	20	20.0
7 < 9	35	35.0
9 and more	7	7.0
Min-Max	3.5-12	
Mean ±SD	5.97±1.96 kg	

Table (3): Distribution of studied infants regarding to duration of endotracheal intubation (n=100).

Items	No	%
Duration of endotracheal intubation / day		
Less than 1 day	12	12.0
1 < 5	71	71.0
5 < 10	13	13.0
10 and more	4	4.0
Min-Max	1-9	
Mean ±SD	3.19±2.09 days	

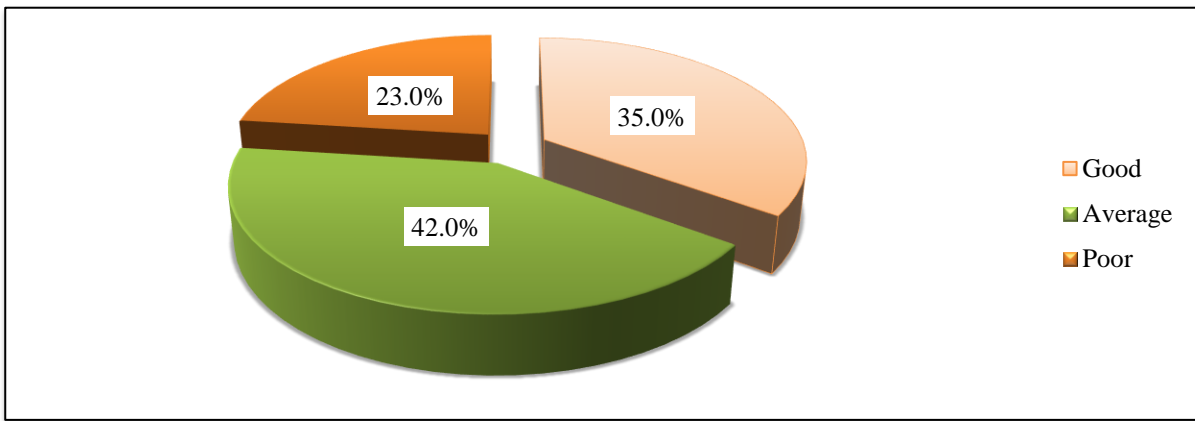


Figure (1): Distribution of studied nurses regarding their total level of knowledge about endotracheal tube fixation (n=100).

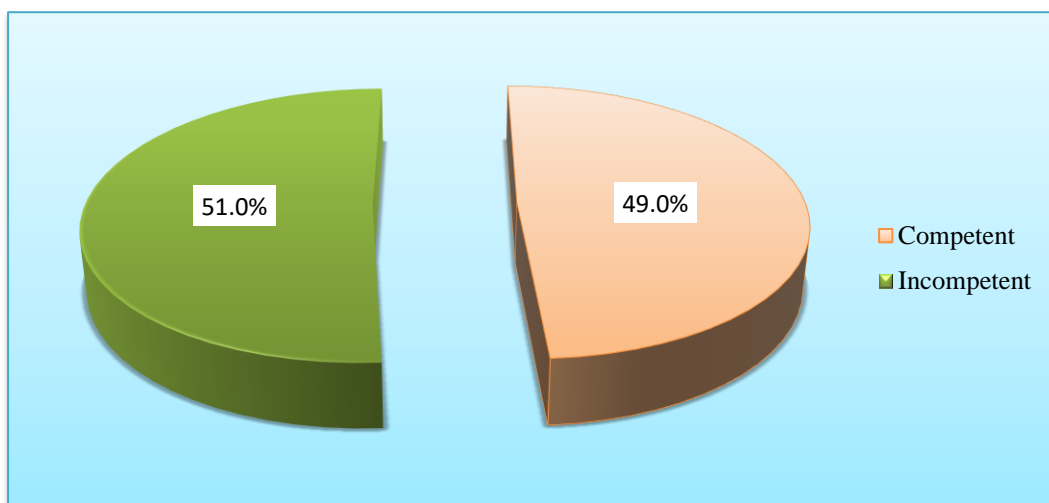


Figure (2): Distribution of studied nurses regarding their total level of practices about endotracheal tube fixation. (n=100).

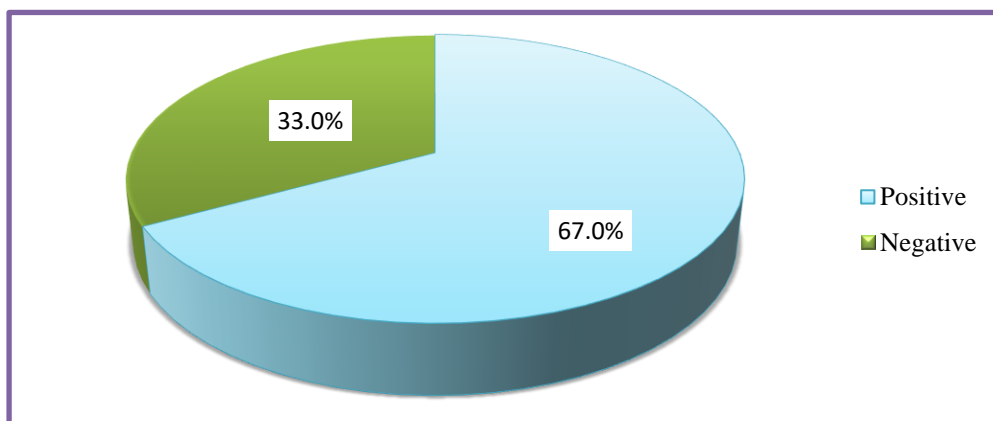


Figure (3): Distribution of studied nurses according to total level of attitude about endotracheal tube fixation (n=100)

Nurses' knowledge, Practice and Attitude regarding Endotracheal Tube Fixation: An Assessment Study

Table (4): Correlation coefficient matrix between total knowledge, practices, and attitude among studied nurses regarding endotracheal tube fixation

Item	Studied nurses (n = 100)			
	Total practice		Total attitude	
	R	p-value	R	p-value
Total knowledge	0.870	0.017*	0.601	0.011*
Item	Studied nurses (n = 100)			
	Total practice			
	R		p-value	
Total attitude	0.714		0.037*	

Discussion

A crucial and life-saving treatment carried out in the pediatric intensive care unit (PICU) is endotracheal intubation. To give the neonates an open airway during intubation, the endotracheal tube (ETT) must be inserted into the trachea and fixed to the appropriate depth. ETI is a primary airway management technique. It is safe, simple and should be done quickly in emergency situations. The procedure provides immediate breathing support for infants who are unable to breathe on their own (Shafik et al., 2019).

Regarding characteristics of the studied nurses', the results of present study revealed that, less than half of studied nurses were aged 30 years and more with mean age of 28.42±3.93 years. This result was in accordance with the result of a study by Abdelazeem et al., (2019) entitled "Effect of Training Program on Nurses Knowledge and Competence Regarding Endotracheal Tube and Tracheostomy Care in Mechanically Ventilated Patients" who found that, less than half of studied nurses (44.0%) were aged

between 30-40 years old. On the other hand, this finding was disagreed with Zhu, Xia & Li, (2018), in a study entitled "Management of early mobilization in intensive care units: a multicenter cross-sectional study" who mentioned that, more than three quarters of nurses in the age group ≤ 25years.

Regarding infants' characteristics, the current study found that more than half of studied infants are aged from 8 ≤ 12 months with mean age of 6.96±3.34 months and more than half of them were females. These results disagreed with Dagher, et al., (2018), who conducted a study about "Exploring Risk Factors with Ventilator Associated Pneumonia among Infants in Intensive Care Units" who found that, more than half of studied infants (53.7%) were less than 6 months of age and (64.8%) were males.

According to the knowledge of the studied nurses regarding endotracheal tube, the results of current study revealed that, less than half of studied nurses had average level of knowledge about ETT. These findings were in the same line with Chintada et al., (2020), in a study about "Effectiveness of

Self-Instructional Module (SIM) on knowledge regarding care of patients with endotracheal intubation among staff nurses" who found that, more than half of studied nurses (55.0%) had moderately adequate knowledge about endotracheal tube. Also, these findings were in the same line with **Hassan et al., (2018)**, in a study titled "Effect of Educational Program on Nurses' Knowledge Regarding Care of Patients with Endotracheal Tube " who illustrated that, total nurses' knowledge was unsatisfactory through preprogram, and continuous education lead to development in nurses' knowledge and performance about ETT.

According to nurses' knowledge about infant factors affecting endotracheal tube fixation, findings of the current study revealed that, more than two fifths of studied nurses had good level of knowledge and half of them had correct answer about use of sedation, this result is in the same line with **Kodicherla et al., (2021)**, who found that infants with inadequate sedation was a risk factor for incorrectly fixed endotracheal tube and unplanned extubation. In addition, the current results agreed with **Da Silva and Fonseca (2017)**, in the study entitled "Factors associated with unplanned extubation in children: A case-control study" who proved that continuous sedation infusion was associated with proper ETT fixation. From the researchers' point of view, the use of sedation decreases agitative movements of infants.

Concerning nurses' knowledge about tube factors affecting endotracheal tube fixation, the current result revealed that, two fifths of studied nurses had an average level of knowledge and nearly two thirds of studied nurses had correct answer about cuffed ETT reduce improper fixation. These results are in an accordance with **Chen et al., (2018)**, in a study titled "Cuffed versus unstuffed endotracheal tubes in pediatrics: a meta-

analysis" who demonstrated that, unstuffed endotracheal tubes increased the need for tube changes, but cuffed tubes are safely used and is the optimal option for pediatric patients. From the researchers' point of view, inappropriate size of the unstuffed ETT may lead to improper ETT fixation and cuff provides more internal stability of ETT.

In relation to studied nurses practice regarding their endotracheal tube fixation, the present study results viewed that more than half of studied nurses had incompetent level of practice and less than half of them had competent level of practice about ETT fixation. These results disagreed with **Mostafa et al., (2016)**, who conducted a study about "Assessment of nurses' performance Regarding Care of Children Undergoing Mechanical Ventilation", who reported that, all nurses in the study (100%) had unsatisfactory practice regarding the care of ETT. Nurses attitude regarding ETT fixation, the results of the current study revealed that nearly two thirds of studied nurses agreed that the efficiency of the nurse in PICU reduce errors present during the ETT fixation. These results were accordance with **Robert et al., (2015)**, who conducted a study about "Multicenter analysis of the factors associated with unplanned extubation in the PICU" who found that, infants with improperly fixed ETT received care from un experienced nurse from another unit.

Concerning correlation matrix between total knowledge, practice and attitude among studied nurses regarding ETT fixation, the current study revealed that there was positive correlation between total nurses' knowledge, total nurses' practices and attitude regarding endotracheal tube fixation (p- value < 0.05). The current findings were in the same line with **Lin et al., (2015)**, in a study about "Critical care nurses' knowledge, attitudes and practices of oral care for patients with oral

Nurses' knowledge, Practice and Attitude regarding Endotracheal Tube Fixation: An Assessment Study

endotracheal intubation: a questionnaire survey" who found that, there was positive correlation between knowledge, practice and attitude among the studied nurses.

Conclusion

Based on the findings of the current study it can be concluded that, slightly more than two fifths of studied nurses had an average level of knowledge, more than half of them had incompetent level of practice and more than two thirds of them had positive attitude regarding endotracheal tube fixation. Also, there was positive correlation between total nurses' knowledge, total practice and total attitude regarding endotracheal tube fixation.

Recommendations:

- ❖ Developing training programs regarding endotracheal tube fixation are recommended for nurses working in pediatric intensive care units to improve their knowledge and practice.
- ❖ Developing guidelines booklets about endotracheal tube fixation should be available to update nurses' knowledge and get more information about endotracheal tube fixation.
- ❖ Continuous evaluation for nurses' performance during fixation of endotracheal tube and provides them with new trends in the fixation methods to achieve high quality of nursing care.

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معلومات وممارسات وإتجاهات الممرضين تجاه تثبيت الأنبوبة الحنجرية (دراسة تقييمية)
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التثبيت الحنجري هو وضع أنبوبة في القصبة الهوائية ، إما عن طريق الفم أو عن طريق الأنف وذلك لفتح مجرى الهواء. يتم وضع الطفل الرضيع على جهاز التنفس الصناعي لتحسين عملية التنفس بصورة مستمرة من خلال الأنبوبة الحنجرية. لذا هدفت هذه الدراسة الى تقييم معلومات ، ممارسات واتجاهات الممرضين تجاه تثبيت الأنبوبة الحنجرية. تم استخدام تصميم تقييمي (وصفي) لإجراء هذه الدراسة. أجريت هذه الدراسة في وحدات العناية المركزة للأطفال بمستشفى الأطفال التخصصي بمدينة بنها التابعة لوزارة الصحة والسكان المصرية ومستشفى بنها الجامعي . تم تطبيق هذه الدراسة على عينة متاحة مكونة من (100) من الممرضين الذين يعتنون بالاطفال الرضع الخاضعين للأنبوبة الحنجرية وكذلك عينة غرضية مكونة من (100) من الأطفال الرضع الخاضعين لجهاز التنفس الصناعي. تم استخدام ثلاث ادوات: الأداة الأولى: استمارة استبيان بالمقابلة، الأداة الثانية: استمارة ملاحظة لممارسات الممرضين أثناء تثبيت الأنبوبة الحنجرية، الأداة الثالثة: اتجاهات الممرضين المرتبطة بمعرفتهم عن تثبيت الأنبوبة الحنجرية. أوضحت الدراسة ان أكثر من خمسى الممرضين الذين شملتهم الدراسة لديهم مستوى متوسط من المعلومات عن تثبيت الأنبوبة الحنجرية وكذلك أكثر من نصفهم لديهم مستوى غير كاف فى ممارساتهم وكذلك أكثر من ثلثى الممرضين لديهم إتجاهات إيجابية. كانت هناك علاقة ايجابية بين معلومات وممارسات واتجاهات الممرضين تجاه تثبيت الأنبوبة الحنجرية، كما أوصت الدراسة تطوير برامج تدريبية عن تثبيت الأنبوبة الحنجرية للممرضين العاملين فى وحدات العناية المركزة للأطفال لتحسين معرفتهم وممارستهم.