Nurses' Knowledge and Practice Regarding Caring of Patients with Tracheostomy in a University Hospital

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Abstract

Background, Tracheostomy care is a critical aspect of nursing responsibilities, requiring specialized skills to ensure optimal patient outcomes. Nurses play a pivotal role in the comprehensive care of patients with tracheostomies, undertaking essential tasks. Proper tracheostomy care not only enhances patient well-being but also mitigates the risk of complications associated with this procedure. **Aim of the study:** to assess nurses' knowledge and practice regarding the care of patients with tracheostomy in a University Hospital. **Research design**: A descriptive correlational design was used in this study. **Setting:** the present study was carried out in the critical care units namely Intensive Care Unit, Cardiothoracic unit, intermediate care units Stroke Unit, Intermediate Internal Unit and One day Surgery Unit affiliated to a University Hospital. **Sample:** A convenient sample of 90 staff nurses working in the mentioned settings. **Tools used for data collection**: The data were collected using two tools (1) A structured self-administered questionnaire to assess nurses' knowledge related tracheostomy care and (2) a nurses' observational checklist to assess nurses' practice regarding the care of patients with tracheostomy. **Results**: The study revealed that 81.5% of studied nurses were age falls between twenty and thirty years old and (76.7%) with a technical nursing degree. Approximately 40% their experience ranged from 1-5 years , while 86.7% didn't attend any tracheostomy care courses, a percentage of 78 had an unsatisfactory knowledge score, and 98.9% demonstrated an incompetent practice level. The study identified a correlation between educational level and nurses' knowledge in tracheostomy care **Conclusion:** Most of the studied nurses had an unsatisfactory level of knowledge of tracheostomy care and most showed an incompetent total practice level. A relationship between educational level and nurses' knowledge regarding tracheostomy care was put into evidence. **Recommendations**: Implementing regular educational guidelines about tracheostomy care and frequent feedback are recommended.

Keywords: Nurses' knowledge, Nurses' practice, tracheostomy care.

1. Introduction

In modern healthcare settings, patients with tracheostomies require specialized care. A tracheostomy is a surgical procedure that

involves creating an opening in the neck to provide an alternative airway for patients who have difficulty breathing or require prolonged mechanical ventilation. The presence of a tracheostomy may be permanent or temporary, necessitating a comprehensive understanding of the intricate care requirements associated with this procedure **(Patton, 2019).**

Tracheostomy is treatment of choice in prolonged airway monitoring for more than three weeks **(Babiker & Yousif, 2016)**. Each year, up to 12 % of the 800,000 patients undergoing mechanical ventilation in the United States require a tracheostomy **(Kumar et al., 2019).** While approximately 25% of individuals admitted to the intensive care unit (ICU) require a tracheostomy tube for long-term ventilatory support **(Onuoha, 2019).**

A stoma is a surgical aperture created in the anterior trachea, connecting the trachea to the external atmosphere **(Brass et al., 2016)**. The use of a tracheostomy tube is recommended to manage upper airway blockage stemming from factors such as inhalation burns, anaphylaxis, trauma, or laryngeal edema-related infections. It is also employed to ensure airway stability in cases of significant tracheobronchial secretions that necessitate frequent suctioning. Additionally, tracheostomy tubes are utilized as a component of other therapeutic approaches like head and neck surgery and for prolonged periods of ventilation **(El-Gawab, 2017).**

Patients with tracheostomy developed complications approximately 16.7%, such as laryngotracheal stenosis, surgical emphysema, stomal infection, tube blockage and pneumothorax **(Wahba et al., 2019).** Tracheostomy needs routine care to prevent complications that include daily cleaning of the tube, suctioning, regular checkup of cough pressure and providing care to stoma site, in addition to these procedures' oxygen supplementation must be humidified to prevent plugging of secretions that cause tube obstruction, maintain intact tracheal mucosa, and preserve oxygenation **(Yousefi & Agarwal, 2020)**.

The major indication of tracheostomy insertion is prolonged intubation in ICUs **(Wahba et al., 2019)**. In addition, tracheostomy can be a line of treatment to patients with obstructive sleep apnea, particularly in morbidly obese patients who failed to be treated by continuous positive airway pressure (CPAP) and patients with an impaired neurological function who are at risk of recurrent aspiration ;while tracheostomy has significant importance in relieving laryngeal edema, increase patient

psychological satisfaction and requirement of sedation administration **(Raimondi, Oven &Winters, 2020).**

The nurse plays a pivotal role in caring for tracheostomy patients and must retain knowledge and skills competence to decrease risk of airway compromise and life-threatening conditions secondary to mucus plugging, spontaneous decannulation or bleeding which is present in patients with tracheostomies. The rapid efficient identification and management of these events can help mitigate this risk; while many studies have shown that tracheostomy patients who transfer from the intensive care unit to the ward are frequently at risk of insufficient care and increased morbidity due to lack of competence and experience of of the floor nursing staff. **(McDonough et al., 2016a; Mehta, Schwartz, Falcone, & Kavanagh, 2019).**

1.1. Significance of the study:

Associated complications such as tube blockage, tube displacement (42.3%) and mortality levels (2.6%) have been reported in the early postoperative tracheostomy insertion period **(Ajiya, 2020)**. Poor nurses' knowledge and practice regarding nursing care of patients with tracheostomy in several research have been observed; thus, proper

tracheostomy care requires specific knowledge and skills to Because the decline of nursing care quality remains a constant problem, nurses must have the competencies to provide safe and effective care **(Nazir et al., 2022)**. Nurses with an adequate level of knowledge and skills regarding tracheostomy care contribute to better care, less complications and significant cost saving **(Abu-Sahyoun et al., 2023)**. Prolonged intubation and raises of ventilators dependence causes tracheostomy insertion. So, assessing nurses' knowledge and skills is an important issue to be implemented and monitored on a regular basis.

Aim of the study:

This study aimed to evaluate nurses' knowledge and practice regarding caring of patients with tracheostomy in Suez Canal University Hospital.

Objectives:

1. Assessment of nurses' knowledge regarding care of patients with tracheostomy in a University Hospital.

2. Assessment of nurses 'practice regarding the nursing care of patients with tracheostomy in a University Hospital.

Research Questions:

1. Is the level of nurses' knowledge regarding

the care of patients with tracheostomy in a University Hospital satisfactory?

2. Is the level of nurses 'practice regarding the care of patients with tracheostomy in a University Hospital competent?

3. Is there a relationship between nurses' level of knowledge and their practice regarding the care of patients with tracheostomy in a University Hospital?

2. Subject and Methods

Study design: The study had a descriptive correlational design.

The sample of the study:

A convenient sample of all nurses working at the selected University Hospital (90 nurses) regardless of their age, gender, years of experience & level of education and exposed to the care of patients having tracheostomies?

Study setting: The study was conducted at the critical care units namely (Intensive Care Unit, Cardiothoracic unit), intermediate care units (Stroke Unit, Intermediate Internal Unit) and One Day Surgery Unit affiliated to a University Hospital.

Tool of data collection:

Two tools were used for data collection.

TOOL (I): A structured self-administered questionnaire.

A structured self-administered questionnaire sheet for nurses' knowledge assessment and an observational checklist for nurses' practice assessment **(Klemm and Nowak, 2020; Alsunaid et al., 2021; Blakeman et al., 2022; Fahl, 2020 and Patton, 2019)**.

This tool was developed by the researchers based on recent literature review to assess nurses' knowledge caring for patients with tracheostomy and was translated into Arabic and retranslated. It consisted of two parts:

Part I :to collect demographic characteristics it includes 8 items such as nurses' age, gender, educational level, and work-related data such as years of experience and attending training course.

Part II: It included four sections:

(Section 1): It refers to basic knowledge regarding respiratory system such as anatomical structure, physiology, and respiration process. and it included (18 items).

(Section 2): It covers knowledge regarding tracheostomy tube definition, types, site of insertion, size, balloon pressure, fixation, indications, and complications. and it includes (15 items) .

(Section 3): It covers knowledge-related to tracheostomy tube suctioning, and it includes (16 items).

(Section 4): It covers knowledge-related tracheostomy care that include ; caring of stoma, caring of single lumen and double-lumen tube, change dressing, and tracheostomy tube tie and included (12 items).

Scoring System:

The total score of nurse's knowledge was calculated to be 61 score for total items. The respondent was given one point for each correct answer and zero for incorrect answers. A total score below 60% was considered inadequate knowledge, while scores from 60 % to 80% were considered average knowledge and those above 80 % were considered good knowledge **(Ncube& Christine, 2019).**

TOOL (II): Nurses' practice observational checklist.

An observational checklist was adopted to assess nurses' practice caring for patients with tracheostomy including assessment, preparation, suctioning, caring of stoma site, change dressing, and tracheostomy tube tie **(Perry, Potter & Ostendorf, 2021; Lister, Hofland and Grafton, 2021 and Kluwer, 2019)**. It was written in the English to be collected by the investigator. It's composed of five parts covering the following areas :

Part (I): Tracheostomy tube suctioning

Section 1: Tracheostomy tube suctioning pre-procedure steps including 10 practical skills items and how done, attributing 1 mark for each correct item.

Section 2: Tracheostomy tube suctioning procedure including practical skills items and how performed one mark given for each correct item.

Section 3: Tracheostomy tube suctioning post procedure steps including 6 items for practical skills and how performed with one mark given for each correct item.

 Part (II): Caring for the tracheostomy tube:

Caring for tracheostomy tube steps and it included 37 items of practical skills

and how they were done with one degree for each item divided into 13 items for tracheostomy care pre-procedure steps, 2 items of stoma site care, 2 items of tracheostomy cuff care, 5 items of tracheostomy tie care and 4 items of tracheostomy tube post procedure care.

Scoring system:

The total score of the nursing practices was calculated to be 68 of the 68 items of steps. The possible choice for each item was done and not done. Each nurse was given one scores for step done and zero for that was not done. A total score of 85% and more was considered competent, while a score below 85% was considered incompetent **(Youssef, Ali, & Samy, 2014).**

Fieldwork:

Upon receiving permission, data collection started with approval of nurses to willingly participate in individual interviews to achieve the study purpose. Knowledge questionnaires were completed on-duty hours of nurses within a time frame of 30-45 minutes. Subsequently, practices were observed using an observational checklist. The full data collection covered the period from January to December 2022, for three

days a week for 12 months, allying with nurses' hospital attendance schedules and time frame for both nurses and the unit.

Pilot study:

A pilot study was carried out on ten percent of subjects (9 nurses), which were not included in the study sample. The purpose of the pilot study was to test the applicability of the study tools and estimate the time needed to fill it. Necessary modifications were made according to the result of the pilot study and the final form was developed.

Ethical considerations:

In adherence to ethical standards, the study obtained approval (No. 106/4-2021) from the Faculty of Nursing's Ethics Committee, Suez Canal University. Participants were fully informed, empowered to decide on their participation, and ensured confidentiality and protection. A written consent was obtained, from nurses willing to participate.

Statistical design:

The Statistical Package for Social Sciences (SPSS) version 20.0 was used for data analysis. Chi Square test was used for categorical data. Correlations were used to test relationships between different variables.

P value was set at <0.05 for significant results.

3. Results

Table (1) showed that, more than one third (40%) of studied nurses' age ranged from 20 to less than 25 years and from 25 and less than 30 years respectively with mean age of 26.24±4.12. whereas, more than half (53.3%) were females and more than three quarters (76.6 %) had a technical degree.

Figure (1) Distribution of the studied nurses according to their years of experience in critical care unit, the study results showed that more than one third (40%) of the studied nurses had work experience ranging from 1 year to less than 5 years while more than one third (38.9%) of the studied nurses had work experience between 5 years to less than 10 years.

Table (2) Illustrates that, total nurses' knowledge regarding tracheostomy (60.3%) which considered average knowledge. The studied nurses showed average knowledge in respiratory physiology, tracheostomy tube and tracheostomy tube suctioning with mean percentage (65.8%), (63.3%), (66.1%) respectively, while the studied nurses showed poor knowledge regarding respiratory anatomy and tracheostomy care with mean

percentages of (59.8%) and (46.5%) respectively.

Figure (2) level of nurses' knowledge regarding tracheostomy, revealed that, more than three quarters (78%) of studied nurses had an average knowledge regarding level of knowledge of tracheostomy care while less than one fifth (16.5%) of the studied nurses had inadequate knowledge and only (5.5%) had good knowledge.

Figure (3) level of nurses' practice regarding tracheostomy care showed that 98.9% of nurses had incompetent total practice score, while only 1.1% of nurses had a competent total score.

Table (3) showed that nearly half (52.39%) of the studied nurses had competent level of practice regarding tracheostomy suctioning procedure, similarly more than half (52.5%) of the studied nurses had competent level of practice regarding tracheostomy care procedure.

Table (4) showed a significant relationship between nurses' education and their knowledge regarding tracheostomy.

Table (5) showed that there was no significant relationship between nurses' age, gender, education, experience, place of work, training courses attendance and nurses' practice regarding tracheostomy practice.

Table (6) showed that there was no significant correlation between nurses' knowledge and practice regarding tracheostomy care.

Discussion

Nurses have the primary responsibility for the care of tracheostomy patients, by ensuring proper care and adhering to best practices, nurses can enhance the quality of patient care for individuals with tracheostomies. Moreover, this approach helps prevent complications, promotes maintenance and improvement of respiratory function **Billington and Luckett, (2019).**

Regarding nurses' demographic data the present study revealed that studied nurses age ranged from 20 to 30 years with a mean age 26.24±4.12, this result was in identical line with **El-Gawab, (2017)**, who showed that more than three quarters of the studied nurses were aged between 20-30 years old and with **Abdelazeem et al., (2019)**. From the researcher's point of view, this may be related to combination of factors including the influx of recent nursing graduates, their adaptability to technology and contemporary training, and their potential willingness to embrace the demanding and high-stress nature of critical care.

More than half of the studied nurses were male, this result agreed with **Gaterega et al., (2021)** study on tracheostomy care at a selected referral hospital in Rwanda". From the researcher's point of view, proportional similarity of gender may reflect shifting societal beliefs; equal opportunities; career advancement prospects, and the recognition of diversity benefits in healthcare. This result could stem from shifting gender perceptions in healthcare, where both working male nurses and female nurses are breaking traditional barriers. Increasing male interest in critical care and potential career advancements might also contribute to this phenomenon; It's also possible may regionally factors and organizational policies influenced this distribution.

Above three quarters of studied nurses had a technical degree, in accordance with **El-Gawab, (2017 a)**.

In relation to nurses' knowledge regarding anatomy and physiology of respiratory system, the results of this study showed that, nearly two thirds of the nurses had unsatisfactory knowledge. Also, these results agreed with **Gaterega et al., (2021)** who notified that the majority of nurses had

poor knowledge on anatomy and physiology of respiratory system. From the researcher's point of view, it may be related to inadequacies in standard nursing education programs emphasizing a need for targeted educational interventions in these critical areas.

The study showed that nurses had an average knowledge about tracheostomy tube and these results agreed with **Alotaibi et al., (2022)** who studied the " Assessment of the ability, perception, and readiness of nurses to manage tracheostomy-related complication" and clarified, more than half of the participants exhibited a deficient understanding when it came to complications and indications associated with tracheostomy. From the researcher's point of view, this may be due to potential systemic gaps in nursing education and training; Shortcomings in covering complications and indications and coupled with limited emphasis on practical aspects may contribute to the observed deficiencies. Addressing these issues through targeted curriculum enhancements is crucial for improving nurses' proficiency in tracheostomy care.

The current study revealed that nearly two thirds of the studied nurses have good knowledge regarding tracheostomy suctioning these results were supported by study done by **Jose et al., (2021).** On the other hand, the current study results disagreed with **Nazir et al., (2022)** who clarified that nurses have insufficient knowledge regarding tracheostomy suctioning and care. From the researcher's point of view, the research results suggested effective training initiatives or educational programs specifically addressing this critical aspect of care. The shared competence underscores the impact of targeted interventions, emphasizing the importance of ongoing efforts to enhance education and training in procedural aspects, contributing to nurses' proficiency in tracheostomy suctioning.

More than half of the sample have inadequate knowledge regarding tracheostomy care and the results are supported by **Nazir et al., (2022a)** who reported that nurses had lack of knowledge regarding tracheostomy care as well **Beshay et al., (2020)** reported that two thirds of the nurses in the sample lacked adequate knowledge in providing care for patients with a tracheostomy. From the researcher's point of view, this may be due to potential systemic gaps in nursing education and training; Shortcomings in covering complications and

indications and coupled with limited emphasis on practical aspects may contribute to the observed deficiencies. Addressing these issues through targeted curriculum enhancements is crucial for improving nurses' proficiency in tracheostomy care.

Pre suction tracheostomy procedures were not practiced adequately as more than half of the studied nurses didn't check doctor's order; nor explained procedures to patients; they did not adjust bed to comfortable working positions; and neither adjusted suctioning to appropriate pressure. These results were in line with **Gaterega et al., (2021b)** report that nurses lack efficient pre-suctioning skills. From the researcher's point of view, the observed unsatisfactory practices in tracheostomy pre-suction procedures among nurses could be attributed to a range of factors. Limited emphasis on the importance of these specific steps in nursing education and training may contribute to oversight or neglect of crucial pre-suctioning actions. Time constraints and high workload in healthcare settings might affect nurses' ability to perform these tasks thoroughly. Addressing these challenges would involve reinforcing the significance of pre-suction procedures in training programs, providing adequate resources and support, and

implementing clear guidelines to ensure consistent and effective practices among nurses.

Regarding tracheostomy suctioning the result showed that nurses had unsatisfactory level of practice as majority of nurses didn't check suctioning pressure; opened suction package with sterile technique; followed infection control guidelines; closed suction while inserting tube; suctioned for more than 15 seconds; and allowed rest periods for more than one minute between suctioning. These result are consistent **with Abdulrahman et al., (2021)** who studied the "effects of an educational training program in tracheostomy care on nurses' knowledge and skills" and revealed that nearly three quarters of nurses had poor performance regarding tracheostomy suctioning as well as **Balasooriya and Seneviratne, (2020)** study who emphasized that there were deficiencies in patients positioning, the provision of verbal comfort, the implementation of infection prevention measures, and the process of chest auscultation. From the researcher's point of view, factors contributing to these suboptimal practices may include inadequate training, a lack of emphasis on infection control measures, and gaps in knowledge regarding essential steps in the suctioning process.

Addressing these issues would necessitate comprehensive educational interventions, ongoing training programs, and standardized guidelines to improve nurses' competence and ensure optimal tracheostomy suctioning practices.

The current study results showed that nurses had an unsatisfactory level of practice regarding post-suctioning skills, specifically about three quarters of nurses didn't perform oral hygiene following suctioning ; reassessed respiratory status; or completed standard documentation; these result are consistent with **Maras et al., (2017)** study reporting that the majority of nurses had unsatisfactory levels of practice on post suctioning skills, reassessing chest sound; oral hygiene ; vital signs recording ; and patient responses documentation.

The analysis of tracheostomy care pre-procedure revealed several areas of unsatisfactory practice levels: more than three quarters of nurses didn't check the doctor's order nor identified the patient; while most of the nurses didn't adhere to proper sterile technique or perform hyperoxygenation during suction, these deficiencies were observed with other suboptimal practices, such as incomplete explanation of the procedure to conscious or semi-conscious patients; among one third of nurses and improper position of patients. The result was in accordance with **Gaterega et al., (2021)** who reported that nurses had inadequate practices in tracheostomy care pre-procedure.

Regarding the stoma care procedure, the result showed unsatisfactory practices among nurses, with only less than half of the studied nurses adhering to the proper technique of using normal saline-saturated cotton-tipped swabs and gauze for cleaning the stoma area, this result was in accordance with **Gaterega et al., (2021)** whose notified that poor nursing practice regarding stoma care cleaning technique. From the researcher's point of view, this may be due insufficient emphasis on proper techniques during education; potential variations in clinical guidelines; time constraints; high workloads and lack of standardized protocols and the need for continuous education contribute to inconsistencies in practice. Addressing these challenges requires a comprehensive approach, including ongoing education, regular training, the establishment of standardized procedures, and fostering a culture of continuous learning and feedback within healthcare institutions to ensure optimal stoma care practices among nursing

staff.

The results of current study showed unsatisfactory practices among nurses in cuff management. Only less than half of the studied nurses correctly performed the deflation of the cuff. There were no participants who checked the balloon pressure and reinflated it as needed, indicating a complete lack of adherence to this critical step. The findings agreement with **Kin, Yesilbalkan and Akyol, (2022)** whose a study titled "Cuff Management Practices In Adult Intensive Care Units'' that implies the proficiency and understanding of intensive care nurses in measuring and managing cuff pressure is below the expected standard.

The current study reveals unsatisfactory practice among nurses in tracheostomy securing practices. Furthermore, these results were consistent with **Moser et al., (2022)** whose a study titled "Prevention of tracheostomy-related pressure injury: a systematic review and meta-analysis" which exposed unsatisfactory level of practice of nurses regarding tracheostomy securement which increase the incidence of tracheostomy-related pressure injury. From the researcher's point of view, may be due to many factors such as lack of available equipment needed

for tracheostomy fixation , lack of standard protocol and workload and time constrains , to address nurses' poor practice in tracheostomy fixation, implement comprehensive and up-to-date training programs, establish standardized protocols, encourage mentorship, prioritize continuous education.

As regards the relationship between total knowledge scores and demographic characteristics, the current study revealed that, there was no statistically significant relationship between total knowledge scores, age, Gender, experience, Place of work and received courses regarding tracheostomy. Also, these results were in accordance with **Gaterega et al., (2021)** whose suggested that there was no substantial correlation between the level of knowledge and the demographic features of the studied nurses.

The current research result showed that a significant relationship between nurses' education and knowledge regarding tracheostomy. This result was agreement by **Mosalli et al., (2022)** whose conduct a study titled "Assessment of Nurses' Knowledge and Confidence Regarding Tracheostomy Care in a Pediatric Long Term Care Hospital" showed that there is a statistically significant relationship between nurses' academic degree

and nurses' knowledge regarding tracheostomy care. From the researcher's point of view, this emphasizes the importance of curriculum development according to job marketing needs, t's clear that the relationship between nurses' education and their knowledge regarding tracheostomy care is a crucial factor in ensuring competent and effective patient care. The findings support the idea that higher academic degrees among nurses correlate with a better understanding of tracheostomy care, highlighting the importance of continuous education and professional development in healthcare.

The study revealed an unsatisfactory level of nurse knowledge in tracheostomy care, indicating potential gaps between education, training, and practical experiences. Addressing this requires a multifaceted approach, encompassing curriculum evaluation, targeted education, mentorship, competency assessments, technology integration, and collaborative initiatives. Additionally, inadequate practices in tracheostomy care especially in suctioning, stoma care, cuff management, and tie care may result from insufficient training opportunities, increased workload, and resource shortages. Improving tracheostomy care necessitates comprehensive training,

simulation labs, continuous education, mentorship, competency assessments, and standardized guidelines.

4. Conclusion:

In the light of the current study most of the nurses had unsatisfactory level of knowledge regarding tracheostomy care. As regards practice, the current study revealed that nurses had incompetent practice regarding tracheostomy care. The current study showed that there was a relationship between educational level and nurses' knowledge regarding tracheostomy care.

Recommendations:

- Implement educational nursing guidelines for nurses caring for patients with tracheostomy.
- Regular and continuous monitoring and evaluation of nurses' practices related to tracheostomy care.
- Regular and continuous monitoring and evaluation of nurses' knowledge related to tracheostomy care.
- Develop informative booklets or reference materials that provide step-by-step guidance for tracheostomy care.
- Develop Manuals of Procedures for Tracheostomy Care in the Unit available for nurses.

- Replicate the study on other respiratory disorders to get more results and finding that will improve nursing care in other respiratory disorders.

- To generalize the findings, further studies should be conducted on a larger sample obtained from different geographical areas in Egypt

Table (1): Percentage distribution of the studied nurses according to their demographic data (n=90)

Items	Total Sample (n=90)	
	No.	**%**
Age (Years)		
20:<25	36	40.0
25:<30	36	40.0
30:<35	14	15.6
35:<40	2	2.2
≥40	2	2.2
Mean ±SD	**26.24±4.12**	
Gender		
Male	48	53.3
Female	42	46.7
Education		
Secondary nursing diploma	6	6.7
Technical institute	69	**76.7**
Bachelor's degree in nursing	15	16.7
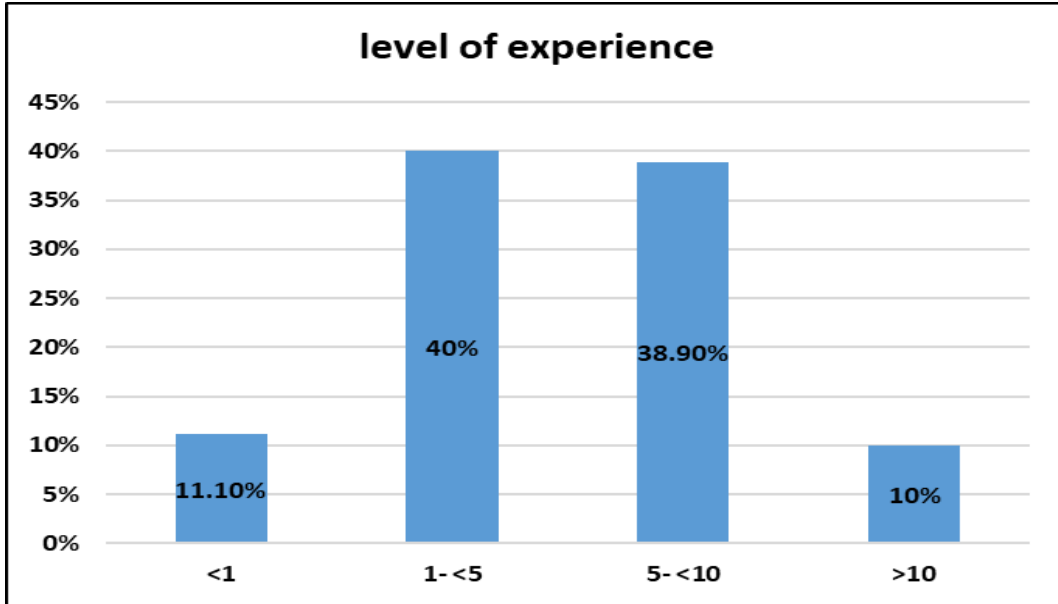
Figure (1): Distribution of the studied nurses according to their years of experience in critical care unit (n=90).

Table (2): Mean scores of the studied nurses' knowledge regarding tracheostomy (n=90).

Items	Total Sample (n=90)	
	Mean±SD	**Average percent (%)**
1. Respiratory anatomy	7.78±3.38	59.8
2. Respiratory physiology	3.29±.96	65.8
3. Tracheostomy tube	9.50±2.45	63.3
4. Suctioning through tracheostomy tube	11.24±2.94	66.1
5. Care of tracheostomy tube	5.58±2.33	46.5
Total Score	37.39±7.48	47.1%
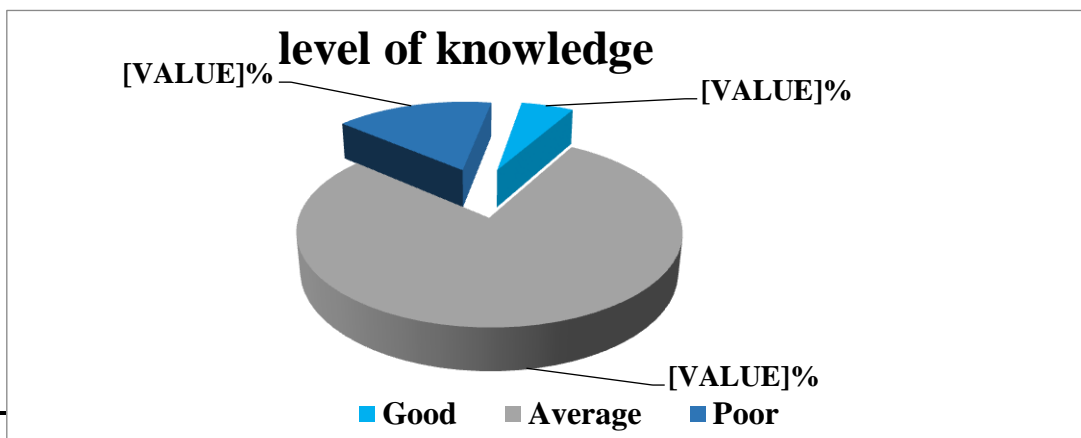
Figure (2): Level of nurses' knowledge regarding tracheostomy care (n=90)
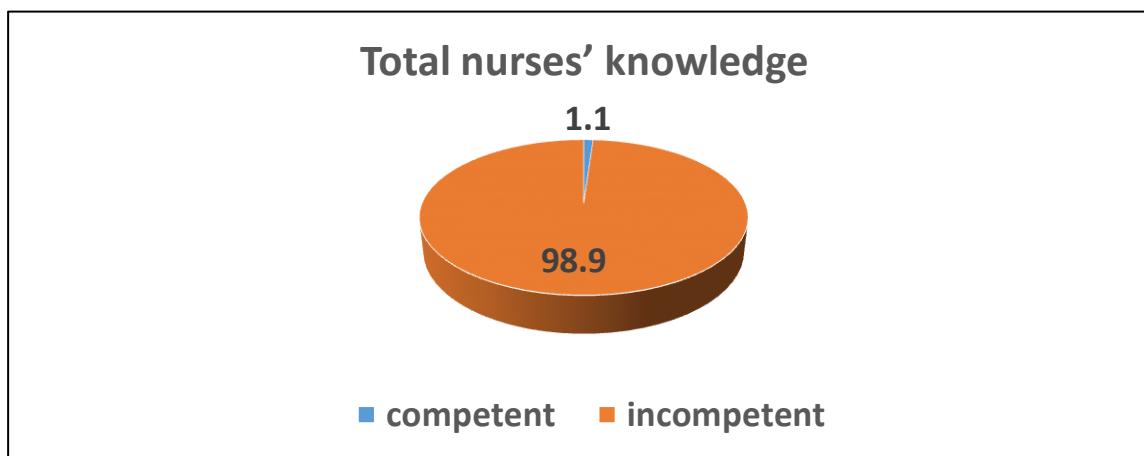
Figure (3): Level of nurses' practice regarding tracheostomy care (n=90)

Table (3): Mean scores of the studied nurses regarding tracheostomy care practices (n=90).

Items	Mean±SD	Composite percentage (%)
Suctioning		
1) Pre suctioning	4.36±1.84	43.56
2) During suctioning	13.96±3.90	55.82
3) Post suctioning	2.89±1.23	57.78
Total suctioning	21.20 ±5.86	52.39
Tracheostomy care		
4) Pre-Procedure care	6.28±2.11	48.29
5) During procedure	6.21±1.04	69.01
6) Post procedure	1.49±.88	37.2
Total Tracheostomy care	**13.98±3.11**	**51.5**
Total practice	**35.18±8.39**	**52.5**

Table (4): Relation between nurses' demographic data and nurses' knowledge

Items	Knowledge				X^2(P value)
	Satisfactory		Unsatisfactory		
	N	%	N	%	
Age (Years)					
20:<25	1	2.8	35	97.2	10.57(.176) [MC]

25:<30	1	2.8	35	97.2	
30:<35	1	7.1	13	92.9	
35:<40	1	50.0	1	50.0	
≥40	0	0	2	100.0	
Gender					
Male	2	4.2	46	95.8	.019(.344) F
Female	2	4.8	40	95.2	
Education					
Secondary nursing diploma	0	0	6	100.0	**10.28(.035*) MC**
Technical institute	1	1.4	68	98.6	
Bachelor's degree in nursing	3	20.0	12	80.0	
Experience (in years)					
<1	0	0	10	100.0	1.78(.608) MC
1-<5	1	2.8	35	97.2	
5-<10	2	5.7	33	94.3	
>10	1	11.1	8	88.9	
Place of work					
Intensive care unit	4	6.1	62	93.9	1.52 (.823) MC
Day surgery unit	0	0	7	100.0	
Cardiothoracic care unit	0	0	7	100.0	
Intermediate care unit	0	0	10	100.0	
Have you received training courses on caring for Tracheostomy patients?					
Yes	0	0	12	100.0	.644 (.422) f
No	4	5.1	74	94.9	
Training Courses					
Yes	4	8.5	43	91.5	3.83 (.118) f
No	0	0	43	100.0	

X^2 is chi-square test, MC is Monte Carlo for Chi square test P value is significant <.05

Table (5): Relation between nurses' demographic data and nurses' practice :

Items	Practice				X^2(P value)
	Satisfactory		Unsatisfactory		
	N	%	N	%	
Age (Years)					
20:<25	0	0	36	100.0	
25:<30	1	2.8	35	97.2	
30:<35	0	0	14	100.0	1.52(1.000) [MC]
35:<40	0	0	2	100.0	
≥40	0	0	2	100.0	
Gender					
Male	1	2.1	47	97.9	.885(.347) [f]
Female	0	0	42	100.0	
Education					
Secondary nursing diploma	0	0	6	100.0	
Technical institute	1	1.4	68	98.6	.308(1.000) [MC]
Bachelor's degree in nursing	0	0	15	100.0	
Experience (in years)					
<1	0	0	10	100.0	
1-<5	0	0	36	100.0	1.59(.588) [MC]
5-<10	1	2.9	34	97.1	
>10	0	0	9	100.0	
Place of work					
Intensive care unit	1	1.5	65	98.5	.368 (1.00) [MC]

Day surgery unit	0	0	7	100.0	
Cardiothoracic care unit	0	0	7	100.0	
Intermediate care unit	0	0	10	100.0	
Have you received training courses on caring for Tracheostomy patients?					
Yes	1	8.3	11	91.7	6.57 (.133) f
No	0	0	78	100.0	
Courses					
Yes	1	2.1	46	97.9	.925 (1.00) f
No	0	0	43	100.0	

X^2 is chi-square test, ^{MC} is Monte Carlo for Chi square test P value is significant <.05

Table (6): Correlation between total nurses' knowledge ad practice (n=90).

Items	Practice	
	R	**P value**
Knowledge	-.076	.474

r is Pearson correlation , P value is significant <.05

5. References

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