Original Research Article

Tracheostomy care knowledge and practice among nurses: insight from a tertiary hospital in Northern Tanzania

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ABSTRACT

Background: Tracheostomy, a well-established life-saving procedure, is commonly performed worldwide on patients requiring prolonged mechanical ventilation. Adverse events following tracheostomy are not rare and significantly impact patients' outcomes. Global estimates suggest that inadequate tracheostomy care leads to the death of between 10 and 60% of patients annually. The quality of nursing care after the procedure is crucial in determining patient outcome. From local settings, there is an observed increase in complications and mortality attributed to insufficient knowledge and suboptimal practice of tracheostomy care; however, the current gaps in knowledge and practice have not been systematically documented. This study aims to explore nurses' level of knowledge and practice of tracheostomy care and its associated factors.
Methods: An eight-month analytical cross-sectional study was conducted at Kilimanjaro Christian Medical Centre, where the ear, nose, and throat ward, medical, pediatric, and surgical intensive care units were the specified study units. Data collection tools were structured questionnaires and observation checklists. Descriptive and inferential statistics were utilized in data analysis.
Results: Among 52 enrolled nurses, 75% had moderate knowledge, 13.5% had poor knowledge, and 11.5% had good knowledge. 75% of nurses had unsatisfactory practice, and 25% had satisfactory practice. Working units significantly influence nurses' knowledge level and practice.
Conclusions: Knowledge and practice regarding tracheostomy care among nurses is limited. The development of standardized tracheostomy care guidelines, in-service continuous education, and the implementation of a comprehensive tracheostomy care training program are highly recommended to improve proficiency.

Keywords: Knowledge, Practice, Tracheostomy care, Nurses

INTRODUCTION

Tracheostomy is a surgical procedure frequently utilized to provide a stable airway for critically ill patients.[1] It is indicated for various conditions such as upper airway obstruction (UAO), as part of major head and neck procedures, or prolonged ventilator dependency and involves two approaches: open surgical or percutaneous dilatation tracheostomy.[2-4] Notably, the latter indication currently holds the highest global prevalence, accounting for 70% of cases.[5]

Tracheostomy related adverse events are not uncommon, accounting for 5 to 70% of cases, with an estimated mortality rate of 10 to 60% attributed to suboptimal tracheostomy care.[4-7]

The Global Tracheostomy Collaboration presents key drives to safety and quality tracheostomy care including multidisciplinary care, establishing standardized care protocols, staff education, patient and family involvement, and outcome-based database, hence ultimately eliminate preventable morbidity and mortality.[5]

Tanzania has made efforts to enhance healthcare services for its citizens, which include the construction of operating theatres at health centers and the education of specialized doctors in different disciplines. Despite these improvements, being classified as a low- and middle-income country (LMIC), there have been identified barriers towards effective perioperative care.[8] From the Theater registry and electronic health management system (eHMS) at Kilimanjaro Christian Medical Centre (KCMC), the number of tracheostomies performed increased by 15%, with UAO being the commonest indication, and also there is a reported increment of complications and mortality by 32% and 19%, respectively, for a ten-year duration.

Post-procedure care is typically provided in either the intensive care unit (ICU), high dependency unit (HDU), or general ward, with nurses playing a vital role in patient care. Research in similar settings has demonstrated that the quality of nursing care can significantly influence patient outcomes.[9] Moreover, knowledge also plays a key role in shaping medical practice.[10,11] This situation may lead to potentially preventable higher morbidity and mortality. However, it remains uncertain whether the increment observed in morbidity and mortality is attributed to insufficient knowledge and unsatisfactory practice of tracheostomy care. Moreover, the current knowledge and practice of nurses in caring for tracheostomized patients has not been explicitly explored in our specific context. The study seeks to describe the level of knowledge and practice of tracheostomy care among nurses and explore the potential factors that influence nurses' knowledge and practice of tracheostomy care.

The identifiable gaps existing in knowledge and practice of tracheotomy care will be used as a foundation to develop and implement evidence-based interventions for better tracheostomy care practice, which then positively impacts the patient's outcome.

METHODS

Study design

This was an observational analytical hospital-based cross-sectional study conducted from October 2023 to May 2024.

Study area

The study was conducted at Kilimanjaro Christian Medical Centre, Moshi, Tanzania, where: ear, nose, and throat (ENT) ward, medical intensive care unit (MICU), surgical

intensive care unit (SICU), and pediatric intensive care unit (PICU) were specific study units, with a total number of beds per unit being 24, 10, 10, and 5, with a number of nurse staffs per each unit being thirteen, fourteen, eighteen, and nine, respectively.

Study participants

All available nurses working in the specified study units during the time of data collection were enrolled (N=52). Response rate was 96% (Figure 1).
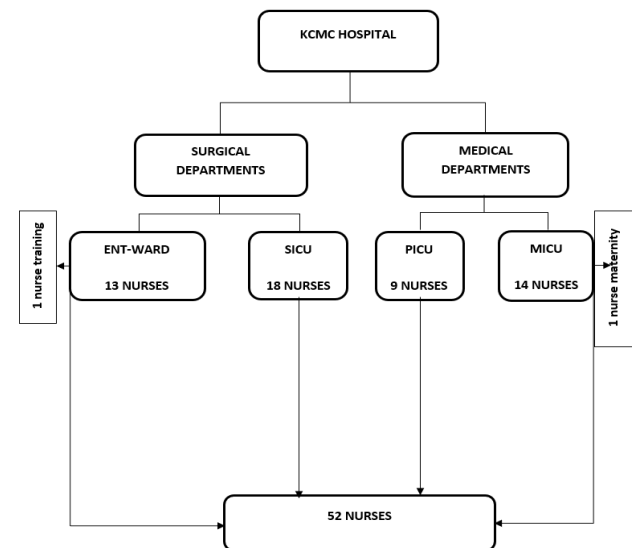

Figure 1: Flow diagram for participant enrolment.

Variables

The dependent variables were the nurse's knowledge level and the nurse's practice. Independent variables were demographic characteristics, education level, working unit, years of experience for caring for tracheostomized patients, and attendance to training/courses on tracheostomy care.

Data collection tools

A structured questionnaire with both open- and close-ended questions and an observation checklist were used to obtain the information required to answer the specific objectives. Internal validity was calculated using Cronbach's alpha, where from 39 knowledge items, $\alpha=0.7$, and for 12 practice items, $\alpha=0.5$.

Tool I: structured questionnaire

Part A consists of seven questions about background characteristics of study participants, including age, sex, educational level, working unit, tracheostomy and tracheostomy care as part of the curriculum in nursing school, attendance to training/courses on tracheostomy care, and years of experience of caring for tracheostomized patients.

Part B comprises four sections with 39 questions on the assessment of the nurse's knowledge. Eight questions on anatomy and physiology of the trachea, ten questions on tracheostomy and tracheostomy tube, fifteen questions on tracheostomy care, and six questions on tracheostomy-associated complications. Each correctly answered question scored 1, and incorrectly answered scored 0. An overall score >75% was considered as good knowledge, an overall score 50% to 75% was considered moderate knowledge, and an overall score <50% was poor knowledge.[12] These questions were partly adapted from previous studies and some were added and pretested to reflect the knowledge in this setting.[13-17]

Tool II: observational checklist

Comprises twelve items for assessment of the nurse's practice; the number of items correctly done is 1; not done/incorrectly done is 0; the category of satisfactory practice was ≥60% and unsatisfactory was less than 60%.[10] The tool was adopted and was modified and pretested to reflect the practice in this setting.[13]

Study procedure

Self-administered questionnaires and observations were utilized as the data collection methods, and the study was conducted in two phases.

Phase one

The first phase was an observational study and was conducted in six months. Nurses were observed by the researcher and trained research assistants while delivering tracheostomy care to patients, specifically on care of the tracheostomy tube and wound care during all nurses working shifts: morning, afternoon, and night shifts. Each nurse was observed at least three times for each skill.

Phase two

The second phase proceeds on completion of the first phase, where informed consent was obtained from nurses to participate in the study. A self-administered questionnaire was provided to nurses, and each nurse was required to fill in the questionnaire individually in the presence of the researcher/trained research assistant. The maximum time to fill in the questionnaire was 45 minutes.

Data analysis plan

The data were analyzed using STATA version 17 (Stata Corp LLC, College Station, Texas, USA). Encoding, labeling, defining variables and values, recoding, and generating variables was done. For descriptive statistics, categorical variables were summarized using frequency and percentage, while numeric variables were summarized using the median with interquartile range (IQR), and data was presented in narration, tables, and figures.

A total of 39 items were used to determine the knowledge scores of the study participants, while 12 items were used to assess the nurse's practice. Bloom's cut-off points were used to categorize knowledge into good, moderate, and poor. However, for practice, categories were satisfactory (score ≥60) and unsatisfactory (score <60).[10]

To assess the proportion of nurses' knowledge and practice by participant characteristics, knowledge was further categorized into binary categories: adequate (score ≥60) and inadequate (score <60),10 and then the Chi-square (χ^2) test was employed. Variables with a p value of less than 0.05 were considered to indicate a significant difference.

A modified Poisson regression model was used to assess factors associated with nurses' knowledge and practice. Univariate models were first fitted to obtain crude prevalence ratio (CPR), while multivariable models were fitted to obtain adjusted prevalence ratio (APR). Variables with a p value of less than 0.05 in multivariable analysis were considered statistically significantly associated with the study outcomes.

RESULTS

Background characteristics of study participants

The study included 52 nurses from four specific units: ENT Ward 12 (23.1%), MICU 13 (25%), SICU 18 (34.6%), and PICU 9 (17.3%). The median age of participants was 30 years (IQR=28-37.8), with 28 (53.8%) aged between 20 and 30 years. The majority of participants were female, 35 (67.3%). Most nurses, 35 (67.3%), held a diploma as their highest educational qualification, and 38 (73.1%) had tracheostomy care included in their nursing school curriculum. In terms of work experience, 36 (69.2%) had less than five years of experience, and 13 (25%) had received training on tracheostomy care (Table 1).

Table 1: Background characteristics of study participants (n=52).

Variables	Frequency	Percentage
Age-group (years)		
20 – 30	28	53.8
31 – 40	13	25
41 – 50	5	9.6
51 – 60	6	11.5
Median (IQR)	30 (28-37.8)	

Continued.

Variables	Frequency	Percentage
Sex		
Male	17	32.7
Female	35	67.3
Working unit		
ENT ward	12	23.1
MICU	13	25
SICU	18	34.6
PICU	9	17.3
Education level		
Certificate	2	3.8
Diploma	35	67.3
Degree	13	25
Masters	2	3.8
Tracheostomy care – nursing curriculum		
Yes	38	73.1
No	14	26.9
Working experience (years)		
<5	36	69.2
≥5	16	30.8
Median (IQR)	2.5 (1 – 6.5)	
Tracheostomy care – training/course		
Yes	13	25
No	39	75

Table 2: Nurses current practice regarding tracheostomy care (n=52).

Variables	Frequency	Percentage
Practice in wound care		
Unsatisfactory	35	67.3
Satisfactory	17	32.7
Practice in tube care		
Unsatisfactory	29	55.8
Satisfactory	23	44.2
Overall practice		
Unsatisfactory	39	75
Satisfactory	13	25

Table 3: Distribution of knowledge by participant's background characteristics (n=52).

Variables	Knowledge level, N (%)		χ^2	P value
	Inadequate	Adequate		
Education level			0.153	0.696
Certificate/diploma	17 (45.9)	20 (54.1)		
Degree/masters	6 (40)	9 (60)		
Working unit*			8.8682	0.003
Surgical departments	8 (26.7)	22 (73.3)		
Medical departments	15 (68.2)	7 (31.8)		
Working experience (years)			1.3535	0.245
<5	14 (38.9)	22 (61.1)		
≥5	9 (56.3)	7 (43.8)		
Tracheostomy care – training/course			0.2339	0.629
No	18 (46.2)	21 (53.8)		
Yes	5 (38.5)	8 (61.5)		

*P value <0.05

Nurses' knowledge level regarding tracheostomy care

In terms of overall knowledge on tracheostomy care, 75% (39/52) of the participants had moderate knowledge, while 11.5% (6/52) had good knowledge (Figure 2).
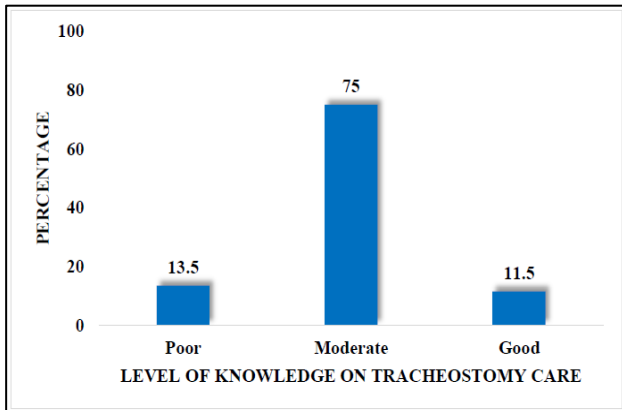

Figure 2: Nurses overall knowledge level regarding tracheostomy care.

The current practice of nurses in providing tracheostomy care

The overall practice of nurses regarding tracheostomy care was unsatisfactory for 75% (39/52) of the participants.

Specifically, 67.3% (35/52) had unsatisfactory practice in wound care, and 55.8% (29/52) had unsatisfactory practice in tube care (Table 2).

Distribution of knowledge by participant's background characteristics

The proportion of Tracheostomy care knowledge significantly differed by working unit (χ2=8.8682, p value=0.003) (Table 3).

Factors associated with nurse's knowledge on tracheostomy care

Working unit was significantly associated with knowledge level in both crude and adjusted analysis.

Compared to nurses working in the surgical departments, nurses working in the medical department were 57% and 59% less likely to have adequate knowledge in both crude and adjusted analysis, respectively (Table 4).

Distribution of practice by participant's background characteristics

The proportion of tracheostomy care practice significantly differed by working unit (χ^2=8.5091, p value=0.004) (Table 5).

Table 4: Factors associated with nurse's knowledge on tracheostomy care.

Variables	CPR (95%CI)	P value	APR (95%CI)	P value
Education level				
Certificate/diploma	Ref		Ref	
Degree/masters	1.11 (0.66-1.86)	0.691	1.09 (0.67-1.77)	0.728
Working unit*				
Surgical departments	Ref		Ref	
Medical departments	0.43 (0.23-0.83)	0.012	0.41 (0.21-0.77)	0.006
Working experience (years)				
<5	Ref		Ref	
≥5	0.72 (0.38-1.33)	0.29	0.68 (0.40-1.14)	0.147
Tracheostomy care - training/course				
No	Ref		Ref	
Yes	1.14 (0.68-1.93)	0.617	0.87 (0.51-1.47)	0.610

*P value <0.05

Table 5: Distribution of practice by participant's background characteristics (n=52).

Variables	Practice, N (%)		χ^2	P value
	Unsatisfactory	Satisfactory		
Education level			0.031	0.86
Certificate/diploma	28 (75.7)	9 (24.3)		
Degree/masters	11 (73.3)	4 (26.7)		
Working unit*			8.5091	0.004
Surgical departments	18 (60)	12 (40)		
Medical departments	21 (95.5)	1 (4.5)		

Continued.

Variables	Practice, N (%)		χ2	P value
	Unsatisfactory	Satisfactory		
Working experience (years)			1.9259	0.165
<5	29 (80.6)	7 (19.4)		
≥5	10 (62.5)	6 (37.5)		
Tracheostomy care – training/course			0.8547	0.355
No	28 (71.8)	11 (28.2)		
Yes	11 (84.6)	2 (15.4)		

*P value <0.05

Table 6: Factors associated with nurse's practice on tracheostomy care.

Variables	CPR (95%CI)	P value	APR (95%CI)	P value
Education level				
Certificate/diploma	Ref		Ref	
Degree/masters	1.10 (0.39-3.05)	0.860	1.11 (0.46-2.64)	0.821
Working unit*				
Surgical departments	Ref		Ref	
Medical departments	0.11 (0.02-0.83)	0.032	0.09 (0.14-0.69)	0.020
Working experience (years)				
<5	Ref		Ref	
≥5	1.93 (0.76-4.87)	0.165	1.64 (0.80-3.39)	0.177
Tracheostomy care – training/course				
No	Ref		Ref	
Yes	0.55 (0.14-2.17)	0.390	0.36 (0.09-1.46)	0.153

*P value <0.05.

Factors associated with nurse's practice on tracheostomy care

Working unit was significantly associated with nurse's practice in both crude and adjusted analysis. Compared to nurses working in the surgical departments, nurses working in the medical departments were 89% and 91% less likely to have satisfactory practice in both crude and adjusted analysis, respectively (Table 6).

DISCUSSION

Tracheostomy is a life-saving procedure, and the quality of care provided afterward significantly influences patient outcomes post-tracheostomy. Nurses play a crucial role in caring for the patient post-procedure. The quality of care they provide is reported to be influenced by their knowledge and skills.[5,9] Our study, which included 52 nurses, found that the overall knowledge level was 11.5% good, 75% moderate, and 13.5% poor. Regarding the current practice level, 25% were satisfactory and 75% were unsatisfactory.

Tracheostomy care knowledge level

According to our study, 75% of nurses demonstrated a moderate level of overall knowledge regarding tracheostomy care. This can be attributed to the fact that most nurses have not participated in specialized training or courses on tracheostomy care, coupled with the absence of comprehensive guidelines and in-service training for tracheostomy care. The results of several studies worldwide substantiate our primary findings, highlighting a significant deficiency in tracheostomy care-related knowledge among nurses.[11,14,15,18,19] This gap is attributed to limited availability of specialized training and courses on tracheostomy care, as highlighted by many of the researchers.

Tracheostomy care practice

The current study revealed that 75% of nurses exhibited an overall unsatisfactory level of practice on tracheostomy care. This deficiency is primarily attributed to the absence of standardized tracheostomy care guidelines and inadequate training in essential skills, such as tracheostomy tube suctioning. Furthermore, the study identified significant non-compliance with infection control protocols, with 70% of nurses failing to adhere to hand hygiene practice before and after tracheostomy care. Additionally, 80% of nurses demonstrated suboptimal suctioning techniques, including improper patient positioning, incorrect suction depth, and inadequate suction rinse.

These findings are consistent with those reported from the study done in Egypt, where 70% of ICU nurses exhibited unsatisfactory practice levels.[19] The similarity in the results may be due to the comparable sample size and the lack of procedural guidelines and in-service training programs, as noted by the researcher. Conversely, a study conducted in Egypt among 30 ICU nurses reported that

66% of nurses demonstrated satisfactory practice levels.[10] This discrepancy is likely due to effective monitoring and implementation of a comprehensive training program as reported by the researcher.

Factors influencing tracheostomy care knowledge and practice

Findings from the current study identified the working unit as the sole factor significantly influencing nurses' levels of knowledge and practice on tracheostomy care. Nurses working in surgical departments (ENT ward and SICU) were more likely to possess adequate knowledge and demonstrate satisfactory practice compared to those in medical departments (MICU and PICU). This disparity is attributed to the higher frequency of encounters with tracheostomized patients in surgical departments, leading to more frequent practice and skills enhancement. Additionally, nurses in surgical departments are more likely to receive instructions and training from doctors during daily patient reviews, thereby increasing their knowledge and practice proficiency.

Previous research has identified various factors, including educational level, years of experience, and participation in tracheostomy care training programs or courses, as significant determinants of nurses' knowledge and practice.[10,15,19] However, our study did not observe any significant association between these variables and nurses' proficiency in tracheostomy care. The observed discrepancies may be attributed to variations in sample size across different studies, potentially affecting the identification of factors associated with nurses' knowledge and practice on tracheostomy care.

Strength of the study

The study established an association between independent variables (level of education, working unit, working experience, and tracheostomy care training/course) and dependent variables (nurse's knowledge level and practice) via a regression model, which is superior to proportion/mean difference. Hence, it captures complex model relationships between variables, predicts, quantifies the effects, and controls for confounding variables.

The utilization of an observation checklist in our study facilitated the measurement of actual practice of nurses on tracheostomy care, hence the identification of the current existing gaps in practice, thus the implementation of evidence-based interventions.

CONCLUSION

The current study highlights that nurses' knowledge level and practice regarding tracheostomy care are deficient. Identifying gaps in the knowledge and practice sets a foundation for the development and implementation of evidence-based interventions, ultimately leading to the delivery of quality and standardized tracheostomy care.

Recommendations

Based on the study findings, we recommend the development and utilization of standardized tracheostomy care guidelines to ensure consistent and quality care across all units. Regular monitoring and evaluation of tracheostomy care practice are necessary to identify areas for improvement and ensure adherence to these guidelines. Furthermore, tracheostomy and tracheostomy care are to be included in the nursing training curriculum, and emphasis is to be placed on the development and implementation of comprehensive tracheostomy care training programs, including hands-on workshops and simulation-based practice on working stations to improve proficiency. Also, we recommend similar research to be conducted at other hospitals in the country to identify the existing gaps in specific settings. Additionally, further research is to be conducted to explore barriers towards effective tracheostomy care.

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