



Epidemiological pattern and clinical indications for tracheostomy at Bugando Medical Centre Mwanza Tanzania

Olivia M Kimario¹, Elimujuni Kalugila², Paschalina Nzelu³, Fabian Massaga⁴, Enica Richard⁵

^{1,2}Catholic University of Health and Allied Sciences, Department of otorhinolaryngology; P. O. Box 1464 Bugando Tanzania.

¹ORCID ID: <https://orcid.org/0009-0008-5499-7404>

³Archbishop Anthony Mayala School of Nursing, Department of clinical Nursing P.O.Box 1464 Bugando Tanzania

⁴Catholic University of Health and Allied Sciences, Department of General Surgery; P.O.Box 1464 Bugando Tanzania

⁵Muhimbili University of Health and Allied Sciences, Department of otorhinolaryngology; P. O. Box 65001 Dar Es Saalam Tanzania.

ABSTRACT

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Background: Tracheostomy is among the first surgical procedures done by man and is performed from generation to generation with the major reason of saving lives. In Tanzania this procedure is commonly done and in the medical universities is taught as one of the procedures that all doctors should know. Tracheostomy is a common emergency lifesaving procedure performed between 21 to 25 patients per year among all patients receiving ENT services (13, 14). Though there is a scarcity in recent data and literature on the magnitude of tracheostomies performed in the lake zone.

The most common indication for tracheostomy varies in studies from upper airway obstruction due to trauma, neoplasm, or prolonged intubation (13, 14). The pattern of tracheostomy indications may have changed with time due to advancement in medical practice. However, we lack current data in our setting highlighting indications for tracheostomies performed

Methodology: This study aims at finding the epidemiological pattern and clinical indications for tracheostomy patients attending at Bugando medical centre. The engagement was done in a zonal referral hospital serving 6 regions of the country. This is a descriptive cross-sectional study which spanned from September 2023 to May 2024.

Results: The total number of patients was 35 whereby males were 51.4% (18) and females 48.6% (17). Number of males was slightly higher compared to females by 1.1%. The median age for the patient was 23 years, with the mean age of 20 years. The leading age group with the largest number of patients was 50 to 59 years. Most patients came from rural areas 74 % (26). Among clinical indications for tracheostomy the leading was upper airway obstruction by 65.7%, within which malignancy predominated other conditions by 65.2%, followed by trauma 26.1%, then prolonged intubation. Females showed a significant predominant distribution of malignancies of head and Neck by 60% which were evenly distributed in varying head and neck sites with p value of 0.039 which is statistical significant; with exception of laryngeal malignancies which were observed in males alone accounting for 26.7% in the whole study period.

In **conclusion** this study shows the prevalence of tracheostomy in our environment, which is 1.8% and the clinical indication pattern has changed from trauma in previous studies to upper airway obstruction secondary to neoplastic conditions. It also shows the significance of site of malignancy to its relation to gender and this findings are not found in other studies.

Recommendation: Molecular studies are needed to analyze further the differences in subsite in terms of gender.

KEYWORDS:

epidemiology, clinical indication, pattern, tracheostomy, prevalence

INTRODUCTION

In these planet that we are living in the oldest surgical procedure to be done and still been performed from generation to generation is tracheostomy. Tracheostomy is among the most commonly performed surgical procedures done in emergency settings and in the ICU. It is commonly performed either in the operating room or as a bedside procedure (1, 2). This procedure aims at establishing an alternative airway by creating a surgical opening in the anterior wall of the trachea and maintaining it with a tube (2). The procedure is done in emergency and elective cases depending on the condition the patient arrives with at the hospital. Initially all tracheostomies were carried out only to relieve upper airway obstruction, gradually its indications became extensive and now it's being increasingly used as a temporary procedure for airway access especially for anesthetic purpose and artificial ventilation. Similarly the indications of long term or permanent tracheostomy, as in cases of severe respiratory distress, sleep apnoea syndrome and terminal malignant neoplasm are also increasing (3).

Tracheostomies may be either open or percutaneous dilatational tracheostomy (PDT). Other methods of airway intervention include endotracheal intubation and cricothyroidotomy (4, 5, 6, 7, 8).

The most common indications for tracheostomy are; relieving upper airway obstruction (UAO), prolonged mechanical ventilation, lower airway protection in the comatose patient, and facilitation of tracheobronchial toileting.(8)There is a changing trend in literature as regarding the indications and outcome of tracheostomy, especially in children for the management of the airway.(7,8,9,10)In the past, short-term tracheostomy for obstructive airway disease secondary to acute inflammatory infection was the most common indication(11)but in recent time trauma to the upper airway has become the most common indication (7,8). These have been attributed to the changes in the epidemiology of infectious diseases due to early diagnosis, adequate use of antibiotics, and the improvement in the capabilities of medical technology (7, 8, 12).

Some of the anticipated complications of tracheostomy include granulation formation, tube displacement, tube blockage, haemorrhage, pneumothorax and trachea stenosis. Granuloma formation may occur in mechanically assisted ventilation patients due to cuffed tracheostomy tubes. Tracheal stenosis may occur at site of tracheostomy tube insertion into the trachea, tracheostomy cuff site or tip of tracheostomy tube (1).Cuffs of tracheostomy tubes should be

Corresponding Author: Olivia M Kimario

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of high volume, with thin walls and low pressure. The pressure should be below that of capillaries and cuff deflation should be performed periodically (1).

Ten-year experiences with Tracheostomy at a University teaching hospital in Northwestern Tanzania: A retrospective review of 214 cases, found that male to female ratio was 3.1: 1. The majority of patients were in the 3rd decade of life. The most common indication for tracheostomy was upper airway obstruction secondary to traumatic causes in 55.1% of patients, followed by upper airway obstruction due to neoplastic causes in 39.3% of cases. The majority of tracheostomies (80.4%) were performed as an emergency. Transverse skin crease incision was employed in all the cases. Post-tracheostomy complication rate was 21.5%. Complication rate was significantly higher in emergency tracheostomy than in electives ($P < 0.001$). The duration of temporary tracheostomy ranged from 8 days to 46 months, with a median duration of 4 months. Tracheostomy decannulation was successively performed in 72.4% of patients who survived. Mortality rate was 13.6%. The mortality was due to their underlying illnesses, none had tracheostomy-related mortality (13).

Study done in KCMC about prevalence and indications for tracheostomy in patients attending ENT services at KCMC from 2013 to 2015 came with the following findings; A total of 75 patients were studied. The male to female ratio was 2.6:1. The majority of patients were in the fifth and sixth decades of their lives. The prevalence of tracheostomy among patients attending ENT services at KCMC was 1.7% averaging at 25 cases per year The most common indication for tracheostomy was upper airway obstruction secondary to neoplastic causes in 53.3% of all patients with the most common malignancy being laryngeal tumors which made up 56% of the neoplastic causes. This was followed by prolonged intubation in 13.3% of total cases. The majority of tracheostomy cases (85.3%) were performed as an emergency with the remaining 14.7% performed as elective. There were no significant complications recorded intraoperatively or postoperatively. The mortality rate was 16% and all of the deaths were due to the underlying diseases, none was tracheostomy related. They concluded that upper airway obstruction secondary to neoplastic causes; especially laryngeal tumors followed by prolonged intubation are the most common indications for tracheostomy at KCMC (14). Other study about Indications and Outcome of Tracheostomy in Ilorin, North Central Nigeria: 10 Years Review found that seventy-six patients had complete data for analysis, age range from 1-89yrs, and mean age of 41.9yrs. There were 48 males and 28 females with M:F ratio of 1.6:1. Majority of the patients were in the 3rd–5th decade. About 47.4% had temporary tracheostomy. The commonest indication for tracheostomy is upper airway obstruction secondary to aerodigestive tract tumors in 60.5%, then trauma in 26.3%. The complications are higher among the under tens'. Out of

Olivia M K et al, Epidemiological pattern and clinical indications for tracheostomy at Bugando Medical Centre Mwanza Tanzania

the 36 temporary tracheostomy only 18 were successfully decannulated. The mean hospital stay was 22±2days. Overall 15% mortality was recorded. Conclusion Common reason for tracheostomy is essentially same earlier documentation in developing countries, common among males, emergency type still most common, neoplasm, prolonged intubation and trauma are the commonest indications, its complication is still high among the under tens'. The outcome is good with 15% mortality due to the primary disease and not from tracheostomy.

Study population

All patients who received ENT services at Bugando Medical Centre within the period of the study.

Study design

This was a descriptive cross sectional prospective study involving a period of nine months from Sept 2023 to May 2024.

Study setting

The study were conducted at ENT department and included those patients receiving ENT services from other departments in Bugando Medical Centre (BMC). ENT department is made up of 9 specialists, 4 registrars, a speech therapist, audiologists and the nurses.

Sample size

The sample size (n) =
$$\frac{NZ^2(100-p)}{d^2(N-1)+Z^2P(100-P)}$$

In which;

N = size of the study population, which is 1914 patients receiving ent services in 9months

Z = confidence level (95%) equal to 1.96

P = proportion of tracheostomy patients , 1.7% will be used from a study done in KCMC (14).

d = marginal error in this research taken as 5%.

$n = \frac{1914 (1.96)^2 \times (100-1.7)}{5^2 \times (1914 - 1) + (1.96)^2 \times 1.7 \times (100-1.7)} = 14.9$

Therefore, **n** (sample size) will be 162 participants, but there will be an addition to the minimum sample size for non-responders.

N=n/R

Where R is response rate =0.9

N= 14.9/0.9

N= 16.6

Hence the minimum sample size will be 17 participants.

Inclusion criteria

All patients that undergo tracheostomy at BMC during the study period

Exclusion criteria

Patients treated at BMC who have undergone tracheostomy at other centre prior to admission.

Study variables

Independent variables were demographic data, while the dependent variables were epidemiological pattern and clinical indications for tracheostomy.

Data collection

The socio-demographic data, the clinical examination were obtained through hospital registries, computerized database and patient files.

All the information were counterchecked and corrected where necessary by using special designated coded questionnaire to obtain patients socio-demographic data primary diagnosis, indication for tracheostomy. Primary diagnosis were classified based on the etiology which was divided into infection/inflammation, trauma, neoplasm, and others. The indications for tracheostomy was divided into UAO, respiratory insufficiency, bronchial toileting, and major head and neck injury. Type of tracheostomy performed was either emergency or elective.

The procedure was performed in the operating room under general anesthesia (GA) or Local anesthesia (LA) and bedside tracheostomy was performed in the ICU under LA and also for some elective cases. Transverse skin crease incision was employed in all the cases.

All the information was retrieved entered into an SPSS computer software version 21.0 and data were analyzed descriptively and results presented in tables and figures. The mean ± standard deviation (SD), median and ranges were calculated for continuous variables whereas proportions and frequency tables were used to summarize categorical variables. Continuous variables were categorized. Chi-square test will be used to test for the significance.

Ethical clearance

This study was approved by the Research and Publication Committee of the CUHAS/BMC Joint Committee with research clearance certificate number CREC/825/2024

RESULTS

The total number of patients were 35 whereby male were 51.4%(18) and female 48.6% (17).Male were slightly higher compared to female by 1.1%.The prevalence of the study been 1.8%.The median range for the patient was 23 with the mean average of 20.The leading age group with large number of patients were 50years to 59 years. Most patients came from rural area were 74 %(26) .

Table 1. Demographic distribution of the study population

Patient characteristic	Frequency (n)	Percentage (%)
Age group		
0-2years	4	11
3-12years	3	8.5
13-19years	1	3
20-29years	2	5.7
30-39years	3	8.5
40-49years	7	20
50-59years	8	23
60years>	7	20
Gender		
Male	18	51.4
Female	17	48.6
Residence		
Rural	26	74
Urban	9	26

The leading clinical indication for tracheostomy was upper airway obstruction 65.7 patients followed by prolong intubation and pulmonary toilet 31.4% patients and major head and neck surgeries 2.9 patients.

Table 2. Distribution of patients with clinical indication with age group

Age –group	UAO	Prolong intubation and pulmonary toilet	Major Head and Neck Surgery	Total	p-value
0-2years	2(66.7)	1(33.3)	0(0)	3(100)	0.754
3-12years	1(33.3)	2(66.7)	0(0)	3(100)	
13-19years	1(100)	0(0)	0(0)	1(100)	
20-29years	2(100)	0(0)	0(0)	2(100)	
30-39years	1(33.3)	2(66.7)	0(0)	3(100)	
40-49years	5(62.5)	2(25)	1(12.5)	8(100)	
50-59years	5(62.5)	3(37.5)	0(0)	8(100)	
>60years	6(85.7)	1(14.3)	0(0)	7(100)	
Total	23(65.7)	11(31.4)	1(2.9)	35(100)	

There is no significance relationship between clinical indication and age variation (p-value 0.754). The leading clinical indication was found to be UAO by 65.7% followed by prolong intubation 31.4%

Table 3. Distribution of upper airway causes according to age

Age group	Malignancies	Trauma	Inflammation	Benign tumor	Total	P-value
0-2years	0(0)	2(100)	0(0)	0(0)	2(100)	0.284
3-12years	0(0)	0(0)	1(100)	0(0)	1(100)	
13-19years	1(100)	0(0)	0(0)	0(0)	1(100)	
20-29years	2(100)	0(0)	0(0)	0(0)	2(100)	
30-39years	1(100)	0(0)	0(0)	0(0)	1(100)	
40-49years	3(60)	1(20)	0(0)	1(20)	5(100)	
50-59years	3(60)	2(40)	0(0)	0(0)	5(100)	
60years>	5(83.3)	1(16.7)	0(0)	0(0)	6(100)	
Total	15(65.2)	6(26.1)	1(4.3)	1(4.3)	23(100)	

Olivia M K et al, Epidemiological pattern and clinical indications for tracheostomy at Bugando Medical Centre Mwanza Tanzania

There is no significance relationship between upper airway causes and variation of age distribution with (p value 0.284); among the causes of upper airway the leading is malignancies by 65.2% followed by trauma 26.1%.

Table 4. Distribution of clinical indications according to gender

	UAO	Prolong intubation& Pulmonary toilet	Major Head and Neck Surgeries	Total	p-value
Male	12(66.7)	6(33.3)	0(0)	18(100)	1.000
Female	11(64.7)	5(29.4)	1(5.9)	17(100)	
Total	23(65.7)	11(31.4)	1(2.9)	35(100)	

There is no significant relationship between clinical indication for tracheostomy and gender distribution (p value >1.0)

Table 5. Distribution of upper airway causes according to gender

	Malignancies	Trauma	Inflammation	Benign tumor	Total	p-value
Male	6(50)	4(33.3)	1(8.3)	1(8.3)	12(100)	0.355
female	9(81.8)	2(18.2)	0(0)	0 (0)	11(100)	
Total	15(65.2)	6(26)	1(4.3)	1(4.3)	23(100)	

There is no significant between upper airway causes and gender (p value 0.355)

Table 6. Distribution of site of malignancies according to gender

	NPC	Oropharyngeal ca	Hypopharyngeal ca	Thyroid ca	Laryngeal Ca	Total	p-value
Male	0(0)	0(0)	2(33.3)	0(0)	4(66.7)	6(100)	0.039
female	2(22.2)	2(22.2)	4(44.4)	1(11.1)	0(0)	9(100)	
Total	2(13.3)	2(13.3)	6(40)	1(6.7)	4(26.7)	15(100)	

There is a statistically significant relationship between the gender and distribution of site of malignance with the p value of 0.039

Table 7. Children clinical indication distribution

Clinical indication	frequency	Percentage (%)
Upper airway obstruction	4	57
Prolong intubation	3	43
Major Head and Neck surgery	0	0
Total	7	100

Leading indication in children was upper airway obstruction 57% followed by prolonged intubation 43%.

DISCUSSION

Tracheostomy has been and continues to be lifesaving procedure done over decades till now. At Bugando Mwanza this procedure is commonly performed. The prevalence has been found to be 1.8% which is nearly same with the study done at KCMC(14). This study found the number of the male exceeding slightly the number of females by 1.1%.This is the same with other studies (10,11,14,15).

Commonly affected age group was from 50 to 59years followed by two age groups with the same number from 40years to 49year and age group above 60years these is the same with the other studies(13, 14,15,25).The resemble comes upon due to the reason of the causative mechanism been upper airway obstruction followed by others.This explains the pathogenesis behind in the development of most

malignancies; also currently literatures shows the involvement of young age(26).

Majority of the affected patients came from rural area by 74% which tally with study done in the same setting 10years ago(13).This shows the distance from the areas of the services contributes more to the ill health of the patient also shortage of the train personnel in the districts areas.

In the distribution of clinical indication with age shows no much variation but according to the frequency of clinical indications of tracheostomy upper airway obstruction led by 65.7% with malignance predominating other conditions by 65.2% followed by trauma 26.1%.This study varies from the study done here 10years ago that showed trauma leading by 55.1% and neoplasm 39.3%(13) .The discrepancy has results to do society change as previous people were involved in

fighting more by using panga(machete) hence contributing to a lot of injuries . Also this study revealed similar results regarding clinical indications (14,15).

There were no gender predominance towards the clinical indication of tracheostomy. In children the leading clinical indication was upper airway obstruction 57% secondary to trauma which was 50%, Other clinical indication was prolong intubation 43%. This shows the diverse changes towards the increase initiation of antibiotics and use of modern instrument (18,19,20). In the first decade the commonest indication recorded was upper airway obstruction primarily from laryngeal papillomas, which necessitated emergency tracheostomy as these patients presented with respiratory distress as shown in other studies(21,22). High incidence of laryngeal papilloma could be mother to child transmission of the Human Papilloma virus (HPV) during delivery. Currently this incidence of laryngeal papillomas has significant decrease in the whole study time there wasn't a child with the laryngeal papilloma(19,22)

Females showed significant predominance distribution of malignancies of head and Neck by 60% which were evenly in the site. The characteristic which were different is the laryngeal malignancy been found in male alone for about 26.7% in the whole study period. Further molecular studies are needed to understand the pathophysiology behind this.

CONCLUSION

This study shows the prevalence of tracheostomy in our environment is 1.8% and the clinical indication pattern of upper airway obstruction to have changed from trauma to neoplastic conditions.

The leading clinical indication in children is upper airway obstruction 57% secondary to trauma which varies from previous causative agent.

It also shows the significance of site in relation to gender with females been predominantly distributed in Head and Neck malignancy different from the males.

Recommendation: Molecular studies are needed to analyze further the differences in subsite in terms of gender.

Competing interests: Authors declare that no competing interests.

Authors` Contributions

OMK-drafting the manuscript, data collection and discussions.

EK-Literature search, discussion of the data

PN-Results and discussion of the manuscript.

FM-Discussion of the results

ER-General overview of the manuscript and discussion.

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