Tanzania Journal of Health Research
Volume 25: Number 2, April 2024
https://dx.doi.org/10.4314/thrb.v25i2.5

Clinical profile, treatment modalities and outcomes among patients with upper aero-digestive tract emergencies at Bugando Medical Centre, Mwanza, Tanzania

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Abstract

Background: Upper aero-digestive tract emergencies (UADTEs) are common in our setting and can be life-threatening and challenging to otolaryngologists. However, there is a paucity of clinical studies on these emergencies. This study aimed to determine the clinical profile, treatment modalities and outcomes of upper aero-digestive tract emergencies at Bugando Medical Centre (BMC), Mwanza, Tanzania.

Methods: Between January and May 2019, a cross-sectional study involving patients presenting with a clinical diagnosis of UADTEs was conducted at BMC.

Results: Of 487 ENT emergencies seen during the study period, 128 (26.3%) patients had UADTEs. Males outnumbered females by a ratio of 1.5: 1. Their median age at presentation was 5 [range, 2-40] years. The major causes of UADTEs were foreign body ingestion, head and neck tumours, foreign body aspiration and cut-throat injuries that were seen in 56(43.8%), 33(25.8%), 25(19.5%) and (3.9%), respectively. The most frequent presentations were dysphagia 81(63.3%), difficulty in breathing 61(47.7%) and odynophagia 56(43.8). Age ≤ 40 years (p=0.02), prolonged duration to treatment (p=0.04) and low blood oxygen saturation (SPO_2) (p=0.04) were significantly associated with poor outcomes following esophagoscopy. In addition, delayed duration to treatment (p=0.01) and foreign body ingestion (p=0.001) were significantly associated with prolonged hospital stay.

Conclusion: UADTEs are common at BMC and constitute a significant cause of otorhinolaryngological admission with foreign bodies in the aerodigestive tract, which is the most typical cause of these emergencies. Most of these injuries can be prevented through public enlightenment campaigns. Early detection and management of UADTEs is essential to reduce morbidity and mortality associated with these emergencies.

Keywords: Upper aerodigestive tract emergencies, clinical profile, treatment modalities, outcomes, Tanzania

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Background

Emergencies of the upper aerodigestive tract are not uncommon in clinical practice and constitute a significant cause of morbidity and mortality worldwide (Furtado *et al*., 2011; Salih *et al*., 2016). Diseases causing upper aero-digestive tract emergencies (UADTEs) range from those that can be effectively and efficiently managed by the duty physician with an excellent prognosis to the complex ones that require prompt diagnosis and intervention by the otolaryngologists (Onotai & Ibegwe., 2012). In resource-limited countries like Tanzania, UADTEs are among the most common and potentially life-threatening conditions that need urgent assessment and aggressive management (Gilyoma& Chalya., 2011; Gilyoma & Chalya., 2013; Kirfi*et al*., 2014). At Bugando Medical Centre (BMC), UADTEs are the most common causes of otolaryngological admissions and contribute significantly to high morbidity and occasional mortality (Gilyoma & Chalya., 2011; Gilyoma & Chalya., 2013; Gilyoma & Chalya., 2014).

The clinical profile and treatment modalities of UADTEs differ worldwide, reflecting geographical differences in standard disease states (Kirfi*et al*., 2014). The causative factors also differ according to age groups in adults and children (Perez *et al*., 1995). In children and elderly patients, UADTEs are commonly caused by foreign bodies (FBs) in the larynx and oesophagus and have high rates of morbidity and mortality (Gilyoma& Chalya., 2013). Moreover, the children's population has the potential for aspiration and ingestion of FBs (Onotai& Ebong., 2011; Ibegwe*et al.,* 2012). In adults, the most standard emergencies seen are blunt and penetrating traumas to the neck following road traffic accidents, and cutthroat and gunshot injuries. These conditions can result in life-threatening situations that require immediate intervention by the duty doctor in the emergency department before referring the patients to otolaryngologists (Rathlev &Medzon., 2007; Mohammad *et al*., 2011).

Cut throat injuries pose a significant challenge because of multiple vital structures that are vulnerable in small, confined and unprotected areas (Bhattacharjee *et al.,* 1997; Okoye & Oteri., 2001; Manilal *et al*., 2011; Gilyoma & Chalya., 2014) . Other causes of UADTEs include corrosive ingestion, thermal burns, obstructive tonsillitis with its complications and head and neck tumours (laryngeal cancers, thyroid tumours & pharyngeal tumours) (Offer *et al*., 1995; Onotai & Nwogbo., 2010). Usually, the clinical features of UADTEs depend upon the etiological factor and time of presentation to the hospital. For instance, a large FB occluding the upper airway or esophagus may lead to severe symptoms like severe respiratory distress, dysphagia and even sudden death (Bleach *et al*., 1994; Lasis *et al*., 2006), while injuries of long-standing duration may be associated with complications such as mucosal ulcerations, esophageal obstruction, laryngeal stenosis and esophageal diverticulum (Brady., 1991). Either way, early diagnosis and treatment of these emergencies is an essential strategy to prevent morbidity and mortality.

The management of UADTEs poses diagnostic and therapeutic challenges to Otolaryngologists practicing in resource-limited countries. Late presentation of the disease, late diagnosis and late referral to hospital coupled with a lack of modern diagnostic and therapeutic facilities are among the hallmarks of the disease in developing countries (Lasis *et al*., 2006; Gilyoma & Chalya., 2011; Ibegwe et al., 2012; Gilyoma & Chalya., 2013; Gilyoma & Chalya., 2014; Nakku *et al*., 2016). It has been reported that UADTEs continue to be associated with significant morbidity and mortality despite recent advances in both pre-operative diagnosis and postoperative care (Singh *et al*., 2014; Shetty & Gangadhar., 2015). Understanding the factors responsible for increased morbidity and mortality in these patients will better guide appropriate management and improve survival (Majori*et al*., 2011; Showkat*et al*., 2015). This study aimed to describe our experience regarding the clinical profile, treatment modalities and outcomes among patients with UADTEs at BMC, a tertiary care hospital in northwestern Tanzania.

Methods and Patients

Study design and setting.

This cross-sectional study involved patients presenting with a clinical diagnosis of UADTEs conducted at the EMD, ICU, OT, Otolaryngological wards and clinics of Bugando Medical Centre from January to May 2019. Bugando medical Centre is a consultant and teaching hospital located in Mwanza City in the Lake Zone, North-Western Tanzania, serving approximately 18 million people. It is a tertiary care and teaching hospital for the Catholic University of Health and Allied Sciences (CUHAS) – Bugando. The hospital has a bed capacity of 1060 and handles most of the otolaryngological cases from eight Lake Zone regions (Mwanza et al.). About 15-20 patients with various otolaryngology conditions attended daily in the EMD at BMC, and among them, 4-6 present with UADTE (BMC-Medical Records database 2019/2020, unpublished).

Study population.

The study population included all patients diagnosed with UADTEs and treated at BMC during the study period and those who consented to the study. Patients known to have any chronic condition of the UADT (e.g. Tumors, chronic laryngitis) and those who died while in admission before completing the intervention were excluded from the study. The sample size was calculated using the Yamane Taro (1967) formula, whereby a total of 128 patients with UADTs were recruited in the study. Sampling of eligible patients was performed serially until the sample size was reached. Independent (predictor) variables included demographic data (age, sex, residence), clinical presentation, duration of symptoms, the time interval between admission, intervention and/or discharge, diagnosis of UADTEs on admission (etiologies of UADTEs) and Intervention done (esophagoscopy, tracheostomy, Fogarty catheter). The dependent variables included post-operative complications (like haemorrhage, surgical site infections, hemorrhagic shock, aspiration pneumonia, pulmonary embolism, deep venous thrombosis (DVT), reactional anaesthesia, pyrexia etc.), length of hospital stay, and-hospital mortality. This information was collected using a pre-tested questionnaire.

Recruitment of patients to participate in the study was conducted at the Emergency Department, Otolaryngological ward ENT clinic, and other wards of BMC, which are the main entry points for potential patients with UADTEs. The principal investigator, together with fellow residents, screened all arriving patients. Patients were recruited after meeting the eligibility criteria and obtaining written informed consent from patients themselves and/or parents/caregivers.

Evaluation of patients was predominantly clinical, supported by laboratory tests and radiological investigation. A detailed history regarding demographic data (age, sex, area of residence, occupation), clinical presentation, duration of symptoms, diagnosis on admission clinical, laboratory or imaging), the treatment offered, type of surgical intervention, the time interval between admission and surgery and outcome of management was obtained from the patients, parents or caregivers.

Resuscitation was administered according to the hospital protocol before recruiting eligible patients. Patients were then taken to the operating theatre for emergency surgery or admitted to Otolaryngological wards. Necessary investigations were completed, and further treatment was instituted. Patients who required ventilator support were admitted to the ICU. In the operating theatre, a consultant otolaryngological surgeon or a senior resident in otolaryngology performs operations under the direct supervision of a consultant surgeon. Postoperatively, patients were managed appropriately in the Otolaryngological ward or the ICU, depending on their clinical condition and the departmental standard operating procedures. Follow-up of each patient until after 30 days post-discharge was done.

Statistical data analysis

Statistical data analysis used SPSS software version 22.0 (SPSS et al., Ill, USA). Data were summarized in proportions and frequency tables for categorical variables. Continuous variables were summarized using median, mean and range. P-values were computed using the Chi-square ($\chi 2$) test and Fisher's exact test was used for categorical variables. The Wilcoxon Rank-sum (Mann-Whitney) test was used for continuous variables because the distribution of variables was not expected. Univariate analysis was used to determine factors associated with length of hospital stay. Multivariate logistic regression analysis was employed for the factors with a P value less than 0.05. A factor with a p-value less than 0.05 was considered statistically significant.

Results

During the study period, 487 patients were presented to Bugando Medical Centre with different otolaryngological emergencies. Of these, 128(26.3%) had upper aerodigestive tract emergencies (UADTEs). Out of 128 studied patients, 76 (59.6%) were males, and 52 (40.4%) were females, giving a male-to-female ratio of 1.5: 1. The youngest patient was six months old, and the oldest was 67. The average age of patients at presentation was 8 [IQR: 6-14] years. The modal age group at presentation was 0-10 years, accounting for 40.6% of cases. One hundred and ten (85.9%) patients were 40 years and below (Figure 1). The elderly population of more than 65 years old is comprised of the minority 6(4.7%)(Figure 1). Most patients, 79(61.7%) came from rural areas.

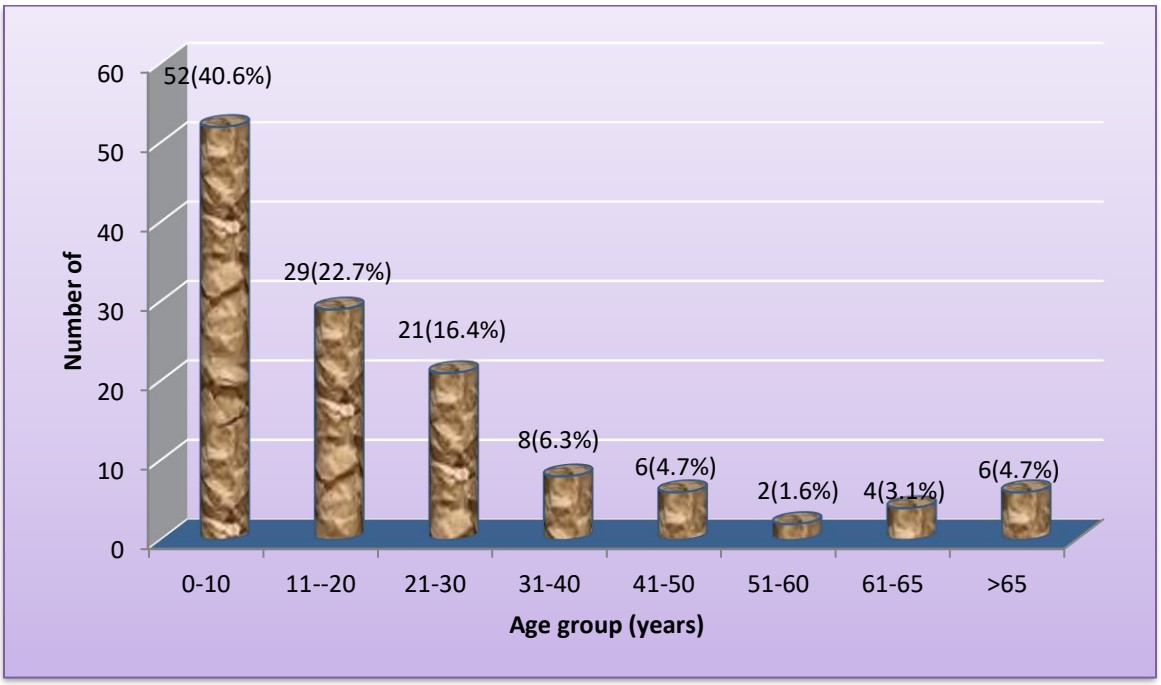

Figure 1: Age group distribution among patients with UADTEs at BMC

Etiologies of upper aerodigestive tract emergencies (UADTEs)

The common etiologies of UADTE among attended patients were foreign body ingestion, head and neck tumours and foreign body aspiration, which were seen in 56(43.8%), 33(25.8%) and 25(19.5%) patients, respectively. Corrosive ingestion and facial trauma were the minor causes of UADTE that were each seen in 1(0.8%) patient (Figure 2). Regarding gender distribution, male patients were the predominant group in most of the UADTE etiologies compared to their female counterparts. Cut-throat injury and corrosive ingestion were exclusively seen in male patients while vocal cord paralysis was only presented in female patients.

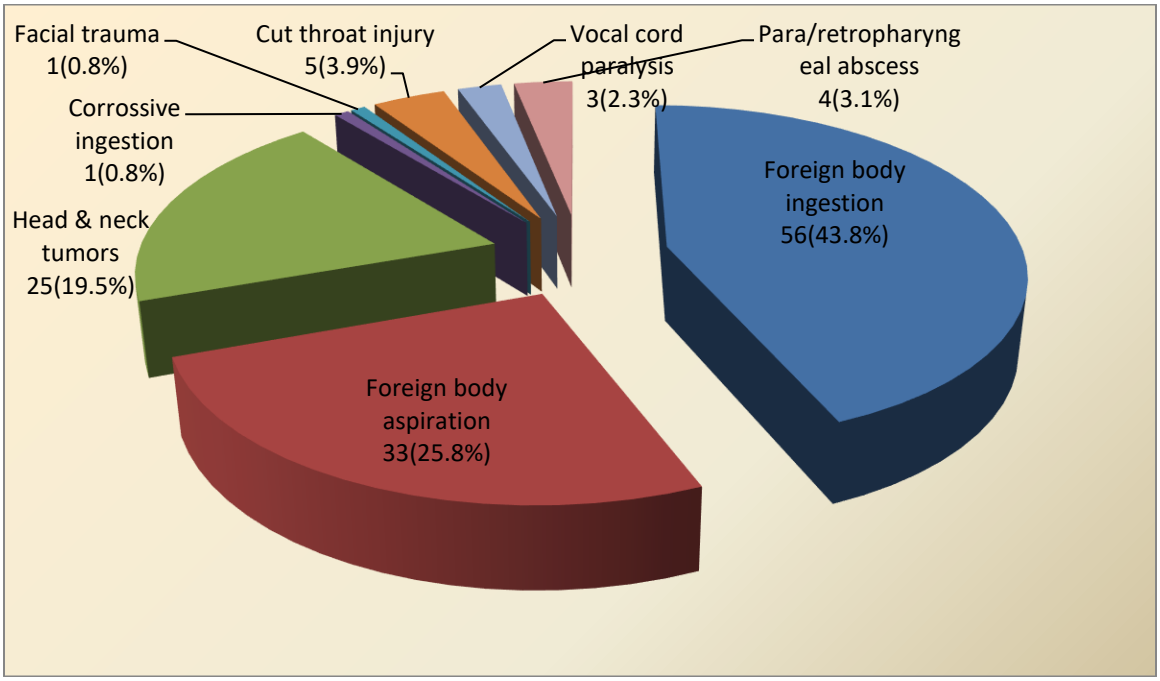

Figure 2: Distribution of patients according to UADTEs

Clinical presentation of upper aerodigestive tract emergencies (UADTEs)

Generally, in this study, dysphagia was the most common presentation, as illustrated in Figure 3 below.

https://dx.doi.org/10.4314/thrb.v25i2.5

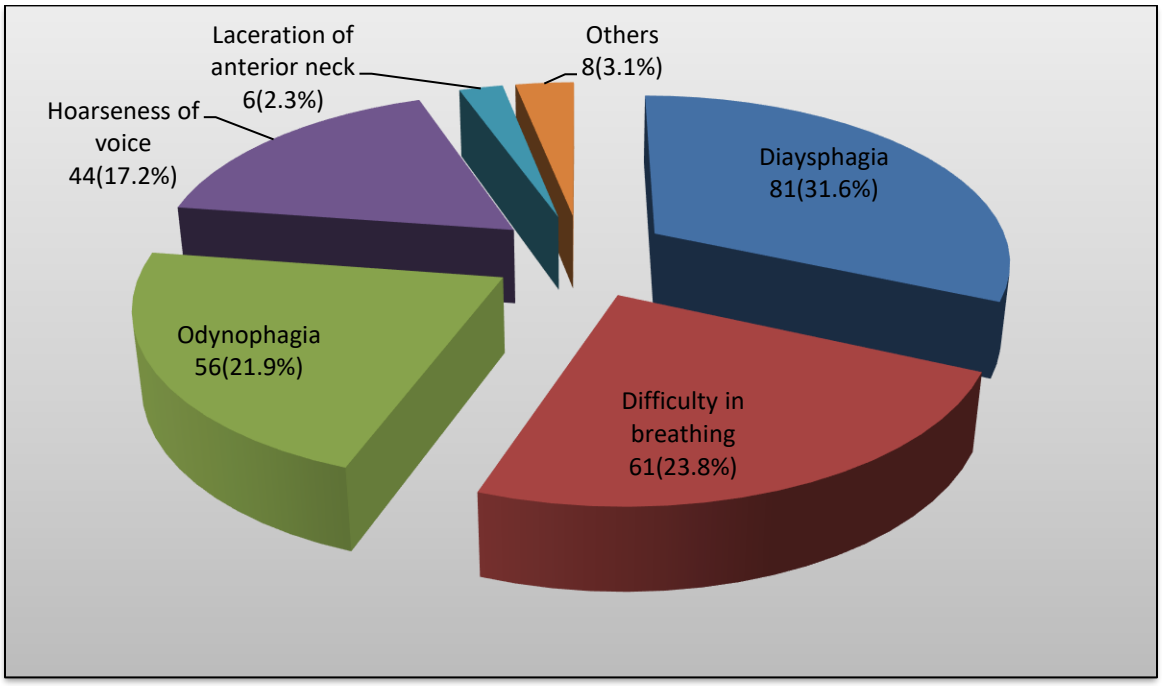

Figure 3: Clinical presentation among patients with UADTEs

Treatment modalities among patients with UADTEs at BMC

In this study, esophagoscopy was the most common endoscopic procedure for the removal of foreign bodies in the aerodigestive tract accounting for 43.0% of cases (**Figure 4**).

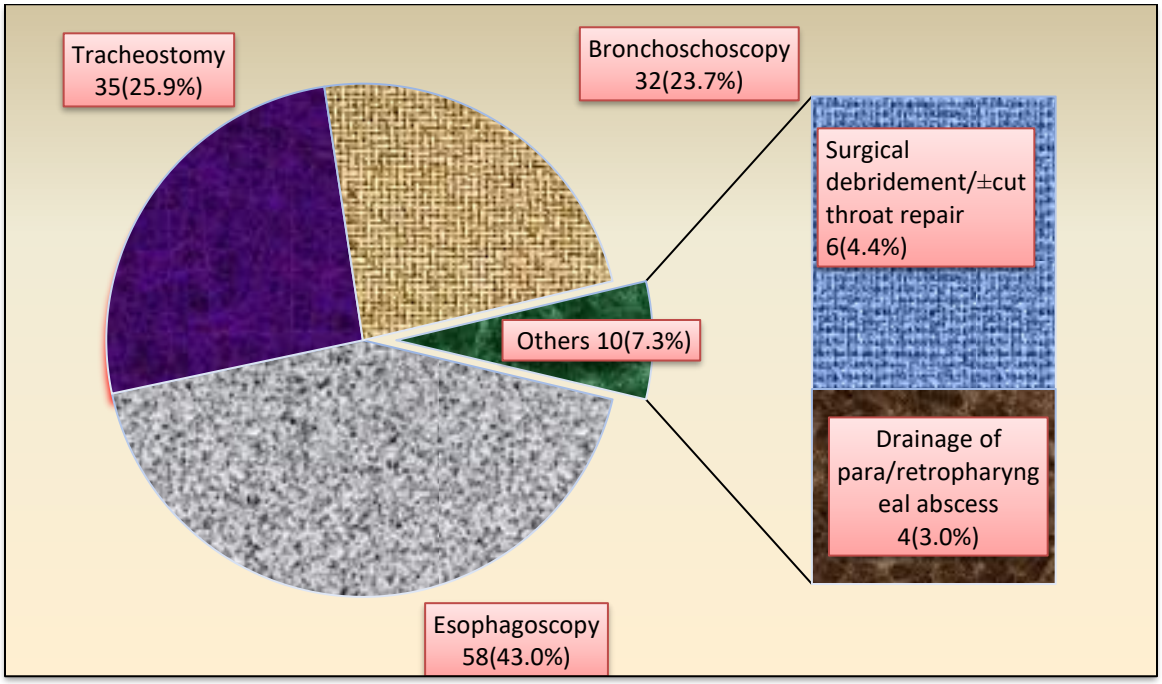

Figure 4: Treatment modalities among patients with UADTEs at BMC

Factors associated with poor clinical outcomes of UADTE treatment

a. Postoperative complications

i. Post-esophagoscopy:

Out of 58 patients who underwent esophagoscopy, five (8.6%) had poor outcomes. These included perforation in 2/5(40%), oesophagal stenosis in 2/5 (40%) and another injury in 1/5 (20%). Patients aged ≤40 years (p=0.02), long duration before the commencement of treatment from the time of insult [7(4-21) v/s2(1-3) days (p=0.04) and lower saturation of oxygen [96(95-96)] %v/s [98(96-98)] %were found to be significantly associated with poor outcomes (**Table 1).**

Table 1: Factors associated with poor outcome post-esophagoscopy at BMC (N= 58)

Independent valuables	Poor outcomes		p-value
	Yes (n=5)	No (n= 53)	
Age			
≤40	1(2.3)	43(97.7)	
>40	4(28.6)	10(71.4)	**0.020**
Sex			
Male	3(9.7)	28(90.3)	
Female	2(7.4)	25(92.6)	0.967
Area of residence			
Rural	4(8.3)	44(91.7)	
Urban	1(10.0)	9(90.0)	
Timing of treatment (days)	7[4-21]	2[1-3]	**0.040**
The rank of the attending surgeon			
Junior doctor	4(8.5)	43(91.5)	
Senior doctor	1(9.1)	10(90.1)	0.986
SPO_2	96(95-96)	98(96-98)	**0.040**

Variableswerecompared byFisher'sexacttest

ii. Post-tracheostomy complications

A total of 35 patients underwent tracheostomy, whereby the majority, 29/35 (82.9%) of them, presented with head and neck tumours as the main aetiology of UADTEs. Of these patients, 10/35(28.5%) had at least one poor outcome from the procedure. Four patients (40%) developed post-operative infection, 4/10(40%) developed tracheal stenosis, 2/10(10%) developed post-operative bleeding and1/10(10%) had perforation. None of the factors was associated with poor outcomes in this group of patients.

Table2: Factors associated with poor outcome post-tracheostomy (N=35)

Independent valuables	Poor outcomes		p-value
	Yes (n=10)	No (n= 25)	
Age			
≤40	1(33.3)	3(66.7)	
>40	9(29.0)	22(71.0)	0.581
Sex			
Male	8(30.8)	18(69.2)	
Female	2(22.2)	7(77.8)	0.267
Area of residence			
Rural	9(29.0)	22(71.0)	
Urban	1(25.0)	3(75.0)	0.892
Timing of treatment (days)	1.5[1.0-5]	3[2-6]	0.080
Rank of the attending surgeon			
Junior doctor	10(31.3)	22(68.7)	
Senior doctor	0(0.0)	3(100.0)	0.540
SPO_2	93.5(90-95)	94(90-95)	0.940

Fisher's exact test compared variables.

ii. post-bronchoscopy complications

During the study period, 32/128 (25.0%) patients underwent bronchoscopy, and out of these,7(21.9%) patients had poor outcomes, which included Electrolyte imbalance 7(100%), Infection2(28.6%), and perforation 1(14.3%). Using Fisher's exact test, none of the factors below was associated with poor outcomes among patients who underwent bronchoscopy (**Table 3).**

Table 3: Factors associated with poor outcome post-bronchoscopy (N=32)

Independent valuables	Poor outcomes		p-value
	Yes (n=7)	No (n= 25)	
Age			
≤40	5(20.8)	19(79.2)	
>40	2(22.2)	7(77.8)	0.990
Sex			
Male	6(23.1)	20(76.9)	
Female	1(20.0)	5(80.0)	0.732
Area of residence			
Rural	7(24.1)	22(75.9)	
Urban	0(0.0)	3(100.0)	0.112
Timing of treatment (days)	3[2-7]	2[1-3]	0.140
Rank of the attending surgeon			
Junior doctor	7(21.9)	25(78.1)	
Senior doctor	0(0.0)	0(100.0)	
SPO_2	93(88-95)	94(90-95)	0.464

Variableswerecompared byFisher'sexacttest

b. Length of hospital stay.

In this study, the overall length of hospital stay ranged from 1 to 15 days, with a median (IQR) age of 2.5 (1-11) days. Delayed duration to treatment (p=0.010) and foreign body ingestion (p=0.001) were significantly associated with prolonged hospital stay.

c. Mortality

No death was recorded in the current study.

Discussion

In this study, the prevalence of UADT among all ENT emergencies at BMC during the study period was 26.3%. This figure is higher than the 4.9% and 3.1% reported in California (Vassiliu et al., 2001) and Nigeria (Onotai & Ibegwe., 2012), respectively. These differences in the prevalence of UADTEs in these studies reflect differences in the prevalence of risk factors for developing UADTEs among different study settings. The author could not establish the reasons for this study's high prevalence of UADTEs. Upper aerodigestive tract emergencies can occur in all age groups (Onotai & Ibegwe., 2012).

In the present study, most patients were in the 1st and 2nd decade of life and comprised approximately two-thirds of the study population. Similar age distribution has been reported in other studies (Sunil & Achal, 1999; Khan & Arif, 2005; Sogebi*et al.,* 2006; Onotai&Ibegwe., 2012). There was no obvious explanation for the high prevalence of UADEs in this age group; however, this can be explained by the fact that an active age group engaging in high-risk activities predisposing them to UADEs. In this study, male patients were more affected than females. The male preponderance in this study agrees with what was reported elsewhere (Sunil & Achal., 1999; Kitcher *et al*., 2007). However, other researchers found an equal male-to-female ratio (Bleach et al., 1994). The male preponderance

in our series may be attributed to the males' overactive nature compared to their female counterparts.

The prevalence of UADTE's different etiologies varies considerably worldwide. In one study from Nigeria, for instance, it was reported that epistaxis was the most frequent emergency that was presented in the ENT emergency department in 16.1%, followed by nasal/facial trauma in14.7%, pharyngo-esophageal foreign bodies in13.3%andairwayobstruction in 8.1% (Shraga *et al*., 1980). Another Nigerian study that involved more than 5000 patients, reported that foreign body aspiration/ingestion or insertion were the most typical causes of UADTE in 41.7% of the patients (Adedeji *et al.,* 2015).

A previous study done at BMC to assess the causes of ENT injuries showed that foreign bodies in the throat were the most frequent aetiology (18.0%) which was followed by foreign bodies in the nasal pharynx at8.8% (Gilyoma & Chalya., 2013). In the present study, foreign body ingestion was the most common aetiology of UADTEs, followed by head and neck tumors. These findings suggest that there might be a higher prevalence of these tumours in our setting, and most of them probably present in late stages where the patient is already having severe UADTEs symptoms. These tumours' pathological patterns were beyond this study's scope, but our findings have raised an important area of focus for further studies. In previous studies, male subjects have been reported to outnumber their female counterparts in the presentation of cut-throat injuries and corrosive ingestion. In India, more than eighty per cent of patients with cut-throat injuries were males in their third and fourth decade of life (Chakraborty *et al*., 2017).

Likewise, in a Nigerian study, it was reported that all patients (100%) who were admitted with cut-throat injuries were males, and the most expected age group was 30-35 years (Onotai & Ibengwe., 2010). Gilyoma *et al. (2014) also reported similar findings in Tanzania, where male subjects with cut-throat injuries outnumbered the females by 2.4:1,* and the median age was 26 years. The most familiar reasons that were reported were suicidal attempts and accidental injuries. The reason males in their youth are more susceptible to cut-throat injuries than females is probably due to the nature of their work, which is related to a risky environment and curiosity. Sex predilection on corrosive ingestion is variable. Other studies have reported male predominance (Hashmi et al., 2018), while others reported female predominance (Swain *et al*., 2016). In the current study, only one male patient presented with corrosive ingestion; hence, it is difficult to comment on that.

Clinical presentations in patients with UADE depend on the etiologies. For example, a study in India showed that the most common presentation in patients with head and neck tumors was hoarseness of the voice with difficulty breathing (Swarma *et al.*, 2013). In another study conducted in Nigeria, the most common clinical presentations seen in patients with UADTEs were difficulty in breathing, odynophagia and dysphagia (Onotai & Ibegwe., 2012). A Tanzanian study by Gilyoma *et al* (2011) showed that the most common presentations were dysphagia and difficulty breathing. In the current study, the most common clinical presentations were dysphagia, difficulty in breathing, odynophagia and hoarseness of the voice.

The modality of treatment of UADTEs depends upon the etiological factors (Onotai &Ibegwe., 2012). Endoscopic removal of foreign bodies in the aerodigestive tract using rigid scopes under general anaesthesia has been reported to be a golden standard procedure (Gilyoma& Chalya., 2011). In the present study, rigid endoscopy (oesophagoscopy and bronchoscopy) with aerodigestive foreign bodies removal under general anaesthesia, cut-throat repair and surgical wound debridement ± tracheostomy were the most common treatment modalities performed. Others have also reported this treatment pattern elsewhere (Onotai &Ibegwe., 2012; Gilyoma& Chalya., 2013).

The presence of complications impacts the outcome of patients presenting with UADTEs as supported by the present study (Onotai & Ibegwe., 2012; Gilyoma & Chalya., 2013). In our study, complications following esophagoscopy included esophageal perforation and esophageal stenosis. The pattern of

complications in the present study is similar to what was reported by others (Onotai & Ibegwe., 2012; Gilyoma & Chalya., 2013). In a previous study conducted in China among 519 patients who underwent rigid esophagoscopy, the significant complications developed included oesophagal perforations and retropharyngeal abscesses (Lam *et al*., 2003). Also, one study in Nigeria revealed that the most typical complication encountered following esophagoscopy was oesophagal stenosis due to prolonged impacted foreign body in the oesophagus. In another study by Gilyoma *et al. (2011), among 98 patients who underwent esophagoscopy, the complication rate was 7.1%,* and bronchial pneumonia was the commonest. In the current study, the age ≤ 40 was significantly associated with poor outcomes following esophagoscopy. Moreover, increased duration before the intervention of treatment from the time of insult was significantly associated with an increased rate of poor outcomes. Nevertheless, lower oxygen saturation was highly associated with adverse outcomes among patients who underwent esophagoscopy.

A previous study of 100 patients that was done in India encountered surgical site infection around the stoma, hemorrhage, tracheostomy tube obstruction and displacement as the most common complications of tracheostomy. These results were not associated with poor outcomes (Mehta & Chamyal., 1999). Another study done in Nigeria found that the complications of tracheostomy were tracheal stenosis, subcutaneous emphysema and bleeding. This study showed no association between poor outcomes and complications (Alabi *et al*., 2018). The present study's post-tracheostomy development included post-operative infection, tracheal stenosis, post-operative bleeding and perforation. None of the factors was associated with poor outcomes.

In a previous study by Li *et al. (2020) in China, preoperative pulmonary disease, need for lung assistance, history of ineffective rigid bronchoscopy and prolonged length of bronchoscopy of more than 30 minutes were associated with postoperative poor outcomes*. In the current study, no factors were associated with poor outcomes.

A study done in China by Li *et al*. (2020) stated that prolonged duration between the assault of the UADTEs and treatment was a significant predictor of prolonged length of hospital stay. Another study by Zhang *et al. (2017) showed the predictors of prolonged length of hospital stay to patients with UADTEs to be prolonged duration of the incidence > 24 hours* to the time of intervention. In the current study by multivariate analysis, the only predictor for prolonged length of hospital stay was late presentation to the hospital from the onset of UADTEs. However, foreign body ingestion, as a cause of UADTE, was found to be a strong predictor for short hospital stays. This could be explained by fewer complications encountered pre- and post-management of foreign bodies in the oesophagus.

In conclusion, UADTEs are not uncommon at BMC and constitute a significant cause of otorhinolaryngological admission at BMC, with foreign bodies in the aerodigestive tract as the most typical cause of these emergencies. Children aged ten years and below and young adults are commonly affected. Rigid endoscopic procedures under general anesthesia are the primary treatment modalities performed. Patients aged ≤40 years, long duration before the commencement of treatment from the time of insult and lower saturation of oxygen were found to be significantly associated with poor outcomes after esophagoscopy. Most of these injuries can be prevented through public enlightenment campaigns. Early detection and management of UADTEs is essential in order to reduce morbidity and mortality associated with these emergencies.

Acknowledgements
The authors are grateful to all who participated in the preparation of this manuscript, and all those who were involved in the care of our patients.

Ethical clearance

The research proposal was presented and reviewed by the Department of Surgery and thereafter to the CUHAS / BMC ethical review committee for approval and ethical clearance with research clearance certificate No: CREC/353/2019

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