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Prevalence and Factors Associated with Oesophageal Tumour among Patients Attending Tanga Regional Referral Hospital, Tanga Region, Tanzania

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ABSTRACT

Background: Despite the high incidence and mortality of oesophageal tumours in Tanzania, particularly in the Tanga region, there is a lack of localised data on their prevalence and associated factors. This study aimed to determine the prevalence and risk factors of oesophageal tumours at Tanga Regional Referral Hospital (TRRH), Tanzania.

Methods: This retrospective hospital-based record review study utilised data from patients aged 18 and above who underwent endoscopy diagnostic services at TRRH's surgical department. Data were extracted from the patient register for those who underwent endoscopy diagnostic services from July 2022 to July 2024 and analysed using descriptive statistics, chi-square tests, and univariate and multivariate analyses to estimate adjusted odds ratios (AOR) and 95% confidence intervals (CI) for associations between oesophageal tumours and various associated factors.

Results: Among the 246 study participants, the majority were aged ≥50 years (58.1%). The most common clinical finding was "other endoscopic diagnoses" (51.2%), with mass lesions and bleeding each accounting for 13.8%. Tumours were most frequently located in the middle oesophagus (23.2%). The overall prevalence of oesophageal tumours was higher in smokers (55.1%) and those who underwent a biopsy (75.5%). Significant risk factors included smoking (AOR=2.92, *P*=.001), and a low-fat diet (AOR=3.00, *P*=.010), while age, sex, alcohol, and physical activity were not statistically significant.

Conclusion: This study highlighted a notable prevalence of oesophageal tumours at TRRH. Individuals who smoke and those with a low-fat diet were significantly associated with oesophageal tumour, emphasising the need for targeted prevention and early diagnostic interventions.

BACKGROUND

Oesophageal tumour is a malignant disease arising from abnormal cell growth in the oesophagus, the muscular tube that connects the throat to the stomach[1]. The disease is associated with poor prognosis and high mortality rate because most patients are diagnosed at an advanced stage[2]. Globally, oesophageal tumours rank among the top ten associated with tumour-related deaths[3]. The incidence and mortality rates vary significantly by geographic region, with higher rates observed in Eastern Asia and parts of Africa[4]. In Tanzania, oesophageal tumour is an important associate of tumour-related morbidity and poses a substantial burden on the healthcare system [5]. The Tanga region, in particular, has seen a notable number of oesophageal tumour cases and is located in northern Tanzania, which lies within the East African oesophageal cancer corridor, warranting a detailed study to understand the local epidemiology and associated factors[6].

Factors associated with oesophageal tumour in Africa and East Africa can be broadly categorised; firstly, lifestyle factors such as smoking and alcohol consumption have been strongly associated with an increased risk of oesophageal tumour [7]. Secondly, dietary factors, including the consumption of very hot beverages, certain preserved foods, and low intake of fruits and vegetables, also play a significant role[8]. Thirdly, genetic predispositions and a family history of oesophageal or related tumours can influence an individual's susceptibility to the disease[9]. Other studies conducted in Tanzania found that tobacco smoking, low socioeconomic status, family history, home-brewed alcohol consumption, home-stored grain, and the use of firewood for cooking and hot beverages were associated with increased prevalence and risk factors of oesophageal tumour[10].

In Tanzania, endoscopic and clinical patterns of oesophageal tumours pose a significant health challenge. A 21% prevalence was reported by the hospital-based study conducted in Dar es Salaam in 2022 among 471 cases[10]. Despite its high incidence (9.2 per 100000) and mortality rates[6], there remains a notable gap in understanding the local epidemiology and specific factors associated with endoscopic and

and clinical patterns of oesophageal tumour among patients at the Surgical Department of Tanga Regional Referral Hospital (TRRH). Oesophageal tumour presents a significant public health challenge, particularly in regions with high incidence and mortality rates, such as parts of Africa, including Tanzania[11]. The Tanga region has reported a considerable burden of oesophageal tumour cases, highlighting the need for a detailed investigation into the local epidemiological patterns and associated factors.

Despite its serious impact, there is a lack of comprehensive data on the local prevalence and factors associated with endoscopic and clinical patterns of oesophageal tumour in many areas, including the Tanga region. While global statistics highlight the severity of oesophageal tumours[12], there is a crucial need for localised data to understand the specific epidemiology within the Tanga region. This study filled a gap in current knowledge by providing detailed prevalence data for oesophageal tumours among patients at the TRRH. Identifying and evaluating factors associated with endoscopic and clinical patterns of oesophageal tumours specific to the Tanga region allowed for a more nuanced understanding of the disease's aetiology. This is particularly important given the variation in associated factor profiles across different populations. The study supports the development of tailored prevention strategies by identifying the key lifestyle, dietary, and occupational factors contributing to oesophageal tumours in this specific context of the study area. The existing literature predominantly focused on global trends and general risk factors[13], often lacking detailed, localised data necessary for targeted interventions and effective healthcare strategies within this specific population. Therefore, this study aimed to describe those potential factors associating endoscopic and clinical patterns of oesophageal tumour in TRRH in Tanga region in Tanzania. The findings are important in guiding healthcare policies, resource allocation, and the development of targeted interventions to reduce the burden of oesophageal tumours in the region.

METHODS

Study Site and Population

The study was conducted at the surgical department of TRRH in Tanga region. The hospital serves as a major referral facility for the region and only provides specialised endoscopy diagnostic services for patients presenting with upper gastrointestinal symptoms and suspected oesophageal diseases. The study utilised data from all patients aged 18 years and above who attended the surgical department and only those who underwent endoscopy diagnostic services within the TRRH between July 2022 and July 2024 and in the year 2023 the hospital experienced improved availability of endoscopy services, including increase functionality of endoscopic equipment and enhanced awareness among clinicians regarding the importance of endoscopic evaluation for patients presenting with upper gastrointestinal symptoms (According to the head of the surgical department of TRRH in Tanga region). Those patients who were diagnosed with an oesophageal tumour were only known as positive cases in this study. Also, TRRH offers emergency surgical services for intestinal obstruction, peritonitis, visceral injury and acute urinary retention due to bladder outlet obstruction, as well as routine surgical services for hernia, amputations from gangrene, cholecystitis, goitre, septic wounds, hydrocele and burns. According to the District Health Information System (DHIS2) (unpublished data), the hospital normally attends to an average of more than 70,000 patients per year. According to the Tanzania Population Census of 2022, Tanga region has a population of 2,615,597, most of whom live in an urban area. 498 health facilities (hospitals 22, health centres 64 and dispensaries 412) and among the population, 51.23% are females [14].

Study Design

The study utilised a retrospective hospital-based record review design using data from patients who attended endoscopy diagnostic services in the surgical department at TRRH. The data were extracted from the patient's register for those who underwent endoscopy diagnostic services from July 2022 to July 2024.

Training and Recruitment Procedures

Two qualified research assistants with prior experience in medical records review and health data collection were recruited through a competitive selection process based on their educational background and research experience. Before data collection, they received standardized training on the study objectives, data abstraction procedures, accurate completion of data collection tools, and ethical handling of hospital patients' information, including confidentiality and data protection, to ensure consistency and reliability of the collected data. The participants were recruited from the patient register of those patients who underwent endoscopic diagnosis from July 2022 to July 2024.

Variables

Dependent Variable

The dependent variable was oesophageal tumour status

Independent Variable

Independent variables included age, sex, occupation, place of residence, diagnosis year, diet, lifestyle and clinical patterns

Inclusion Criteria

All patients from the surgical department who received endoscopic diagnosis and who were aged 18 years and above were involved in this study.

Exclusion Criteria

All patients with incomplete endoscopy records, duplicate records

Sampling Technique and Sample Size

All eligible patients diagnosed with oesophageal tumour during the study period were first identified from the endoscopy unit records and listed in a sampling frame using their unique hospital-identified numbers. A simple random sampling technique was then used to select study participants from this list. Each eligible patient was assigned a unique number, and computer-generated random numbers were used to randomly select the required sample size without replacement, ensuring that every eligible patient had an equal chance of being

included in the study.

Sample size calculation

The sample size was calculated using STATA version 17 (STATA Corp Inc., TX, USA) to estimate the minimum sample size. This software used the following formula for the sample size (n):

n = Sample size

Z= The critical value of corresponding to 95% confidence level

P = Anticipated proportion of the population participating in oesophageal tumour (21%)

e = Absolute precision of ±5%

$$n = \frac{z^2 \times p(1-p)}{e^2}$$

Based on the total endoscopy population of 1,236 patients during the study period, the sample size for the study was calculated by estimating the prevalence of oesophageal tumour (21%) from the hospital-based study conducted in Dar es Salaam at Muhimbili and Ocean Road Hospitals [10]. Therefore, the sample size of this study was 246 patients.

Data Collection Tools and Procedures

The study team was trained to handle sensitive health data from the records of hospitalised patients to ensure confidentiality and ethical compliance. Then, data were extracted from the patient's register for those who underwent aged 18 years and above in the surgical department from July 2022 to July 2024. Among them, those patients who were diagnosed with an oesophageal tumour were known as positive cases. All the data were entered into the Microsoft Excel database. The Excel data collection tool table was prepared regarding the arrangement of variables in the patient register to ensure a simplified procedure in capturing all variables from the patient register.

Data Management and Analysis

After data collection, the data manager reviewed the data for precision and consistency, performing cleaning and validation. The final cleaned data were ready for the analysis process. During data analysis we defined tumour position as the location of the tumour along the oesophagus, and classified it into three: proximal (upper), middle and distal (lower) oesophagus position. Those endoscopic diagnoses not identified from those positions were termed as "other positions". Smoking means the history of current or previous tobacco use recorded in the patient file. Alcohol use, means any history of alcohol consumption reported in medical records. Physical activity, means an individual engaged in regular manual labour or routine exercise. Dietary was categorised into high, low, and mixed; a high-fat diet is a frequent consumption of fried foods, processed meats, and foods rich in saturated fats; a low-fat diet means predominantly plant-based or low-oil meals with limited fatty food intake; and a mixed diet refers to consumption of both high-fat and low-fat food components without a dominant pattern. Also, Petty business refers to small-scale informal income-generating activities conducted with limited capital, such as street vending, kiosk operations, and small local trading activities. Business referred to large-scale or formally established commercial activities involving registered enterprises, shops and wholesale trading. Descriptive statistics were used for exploratory analysis, and the findings were summarised in text and tabular form. The median age with its interquartile range (IQR) was analysed. Prevalence between groups were compared using the chi-square test. Univariate and multivariate analyses were performed to estimate adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for the association between endoscopic and clinical patterns of oesophageal tumours and other variables of interest. Univariate analysis was done to explore and describe the prevalence of covariates. Multivariate analysis was performed to determine the relationship between endoscopic and clinical patterns of oesophageal tumours against various independent variables, such as sociodemographic covariates. Backwards stepwise regression was used to include the variable in the model if the significance of the statistical level is at $P< .2$. All statistical analyses were done using STATA version 17.0 (STATA Corp LP, College Station, TX, USA). A $P<.05$ was considered to be significant.

Ethical Clearance

The proposal was submitted to the National Health Research Ethics Committee (NatHREC) of the National Institute for Medical Research (NIMR) for ethical and scientific approval and obtained the ethical clearance number NIMR/HQ/R.8a/Vol.IX/4752 dated 14th November 2024. Information on the purpose, benefit, and procedure for conducting the study was discussed with the administrative authorities and service providers of TRRH. During data management, analysis, and interpretation, individual names were not linked to any data collected from the study to protect the patients' information.

RESULTS

Baseline Characteristics of the Study Participants

The baseline characteristics of the study participants reveal a diverse demographic distribution. The median age of the study participants was 53 years, with an IQR of 37 to 66 years. Among the 246 patients, the majority (55.7%) were aged 50 years and above, males constituted a higher percentage (58.1%), and those with a tertiary level were the majority (27.6%) in terms of education. Occupational status varied, with leading 29.7% engaged in petty business, followed with 27.6% as farmers. While singles were the majority 31.7% among the marital status. The majority of participants were residing in urban 52.4% area and from rural area were 47.6% residences. The study included participants across three years, with the highest (49.2%) from 2023, followed by 35.4% in 2024 and 15.4% in 2022 (Table 1).

Clinical and Oesophageal Patterns of Tumour

Among the patients examined, the most common clinical and oesophageal finding was classified under clinical observation, as most patients (51.2%) had other aged18 years and above which included; gastric mass 62 (49.2%), pangastritis 19 (15.1%), oesophageal candidiasis 18

(14.3%), hiatal hernia 13 (10.3%), hypopharynx mass 5 (4.0%), duodenal obstruction 3 (2.4%) and incomplete diagnosis 6 (4.8%). Then followed by normal endoscopic appearances (16.3%). Bleeding and mass lesions were noted at equal frequencies (13.8% each), while obstruction (3.7%) and strictures (1.2%) were less frequently detected. Concerning swallowing status, 30.5% of patients experienced difficulty swallowing, whereas the majority (69.5%) had normal swallowing function. Tumour position varied, with the middle oesophagus being the most affected (23.2%), followed by the proximal (8.9%) and distal (7.3%) regions. Other positioning of endoscopic diagnosis examination was 60.6%. These included: gastritis (29.4), normal (15.4%), pharyngitis (12.8), hiatal hernia (10.1%), antral gastritis (6.7%), oesophageal candidiasis (5.4%), incomplete examination (4.7%), Gerd (3.4%), gastric ulcers and pyloric mass each had 2.0%, while oesophagitis, full of food content and gastritis tumour each had 1.3% (Table 2).

TABLE 1: Baseline Characteristics of the Study Participants

Variable	Participants n (%)
Median age (IQR)	53 (37 - 66)
Age group (in years)	
<50	109 (44.3)
>50	137 (55.7)
Sex	
Male	143 (58.1)
Female	103 (41.9)
Education level	
None	63 (25.6)
Primary	63 (25.6)
Secondary	52 (21.2)
Tertiary	68 (27.6)
Occupation status	
Farmer	68 (27.6)
Petty business	73 (29.7)
Government employee	48 (19.5)
Business	57 (23.2)
Marital status	
Single	78 (31.7)
Married	57 (23.2)
Divorced/separated	67 (27.2)
Widow/widower	44 (17.9)
Area of residence	
Urban	129 (52.4)
Rural	117 (47.6)
Year of study	
2022	38 (15.4)
2023	121 (49.2)
2024	87 (35.4)

The Prevalence and Factors Associated with Oesophageal Tumours among the Study Patients.

The overall prevalence among patients with oesophageal tumour was 41.9% and was also higher among patients aged ≥50 years (46.7%) compared to those <50 years (35.8%), though the association was not statistically significant (AOR = 0.72, 95% CI: 0.36–1.43, P =.345). Males had a higher prevalence (46.9%) than females (35.0%), smoking had 55.1% prevalence and was significantly associated with an increased risk of oesophageal tumours (AOR = 2.83, 95% CI: 1.65–4.86, P <.001). The low-fat diet type had a higher prevalence (50.0%) and an increased risk (AOR = 1.96, 95% CI: 1.00–3.88, P = .050) of the oesophageal tumour (Table 3).

TABLE 2: Clinical and Patterns of Oesophageal Tumour among Patients

variable	Patients n (%)
Clinical observations	
Bleeding	34 (13.8)
Obstruction	9 (3.7)
Strictures	3 (1.2)
Mass	34 (13.8)
Normal	40 (16.3)
Other endoscopic diagnoses	126 (51.2)
Swallowing status	
Difficult	75 (30.5)
Normal	171 (69.5)
Tumour position	
Distal	18 (7.3)
Middle	57 (23.2)
Proximal	22 (8.9)
Other positioning diagnosis	149 (60.6)

TABLE 3: Prevalence and Factors Associated with Oesophageal Tumours among the Study Patients

Variable	Prev (%)	COR	95% CI	*P value*	AOR	95% CI	*P value*
Age group (in years)							
<50	35.8	Ref			Ref		
>50	46.7	1.57	0.94 - 2.64	.085	1.26	0.72- 2.20	.419
Sex							
Female	35.0	Ref			Ref		
Male	46.9	1.64	0.97 - 2.86	.063	1.44	0.82 - 2.53	.201
Smoking							
No	29.7	Ref			Ref		
Yes	55.1	2.90	1.72 - 4.91	<.001	2.83	1.65 - 4.86	<.001
Diet type							
High fat	35.1	Ref			Ref		
Mixed	40.5	1.26	0.67 - 2.36	.476	1.23	0.63 - 2.40	.545
Low fat	50.0	1.85	0.98 - 3.52	.060	1.96	1.00 - 3.88	.050
Physical ability							
Active	39.3	Ref			Ref		
Inactive	43.3	1.18	0.69 - 2.00	.543	1.11	0.63 - 1.95	.719
Alcoholic							
No	41.7	Ref			Ref		
Yes	42.0	1.01	0.58 - 1.77	.967	0.90	0.50 - 1.63	.730

NOTE: Prev=prevalence, COR= Crude odds ratio, CI=Confidence Interval, AOR=adjusted odds ratio

DISCUSSION

The demographic characteristics observed in this study are comparable with findings reported in previous studies on oesophageal tumour. The median age of participants was 53 years (IQR: 37 - 66), indicating that the disease predominantly affected middle-aged and older adults. Similar age patterns have been reported globally, where the incidence of oesophageal tumours increased after 50 years of age.[15] A higher percentage of male participants is consistent with global epidemiological data, showing that oesophageal tumours are more common in men than women[16]. The high rate of participants with no formal education may reflect limited health literacy and delayed healthcare-seeking behaviours, factors previously associated with late presentation and poor cancer outcomes[17]. In addition, most participants engaged in petty business and farming. activities, suggesting the influence of socioeconomic factors on disease occurrence and the healthcare services. Similar associations between low socioeconomic status and oesophageal tumour burden have been reported elsewhere[18]. Marital status variations, particularly the notable majority of divorced or separated individuals, could hint at social factors affecting disease burden and support systems[19]. The nearly equal urban-rural distribution ensures a representative sample that captures lifestyle-related risk factors[20]. The study's temporal spread, with a peak in participant recruitment in 2023, may reflect improved access to endoscopy services, increased clinician awareness, and better referral practices during the study period rather than a true rise in disease occurrence.

The clinical and endoscopic findings demonstrated variability in the presentation of oesophageal tumour. The majority of patients classified under "other endoscopic diagnoses" suggests a significant burden of alternative oesophageal or gastrointestinal pathologies. This may mimic or coexist with oesophageal tumours, potentially complicating diagnosis[21]. The presence of a normal endoscopic appearance in patients raises the possibility of early-stage disease, limitations in detection methods, or other oesophageal disorders without visible mucosal involvement[22]. Endoscopic findings such as oesophageal bleeding and mass were commonly observed among cases of patients, reflecting advanced mucosal involvement and tumour progression, findings also reported by[23]. The lower frequency of obstruction and strictures suggests that complete luminal narrowing may occur at later stages or be less common among the study population, as reported elsewhere[24]. The swallowing status findings, other patients reported difficulty swallowing. It might indicate that dysphagia remains a primary clinical symptom but is not present in all cases, possibly due to variations in tumour size, location, or stage, as reported in other studies. The predominance of tumours in the middle oesophageal position is consistent with the epidemiological patterns of oesophageal squamous cell carcinoma commonly reported in East African populations[25]. Conversely, tumour cases identified in the distal oesophagus, where adenocarcinoma is more common distally, are reported in Western countries[26]. Notably, in most cases, tumour positioning was another positioning diagnosis, likely due to the absence of visible tumour masses on endoscopy, which could indicate early-stage disease, inflammatory changes, or diagnostic limitations[27]. These findings underscore the importance of comprehensive diagnostic approaches, including histopathological evaluation and imaging, to accurately assess oesophageal tumours and

their clinical impact[28].

Regarding associated factors, smoking demonstrated a statistically significant association with oesophageal tumours, supporting extensive evidence linking tobacco exposure to oesophageal carcinogenesis through chronic mucosal irritation and carcinogenic effects[29]. Dietary patterns also showed significant associations, particularly cautiously, because dietary changes may have occurred secondarily to disease symptoms such as dysphagia and weight loss, introducing the possibility of reverse association. Similar methodological concerns have been highlighted in nutritional epidemiological studies of oesophageal tumours[30]. Physical inactivity and alcohol consumption were not significantly associated with oesophageal tumours in this study, in contrast to findings from some previous studies[31]. These differences may be explained by variations in population characteristics, exposure measurement, sample size, or underreporting in retrospective hospital records.

This study has several limitations. The cross-sectional design prevents causal inference, and potential recall bias may have affected self-reported lifestyle factors. Also, the reverse causality exists because low-fat history could result from undiagnosed oesophageal cancer symptoms rather than a true risk factor; therefore, findings should be interpreted cautiously, and prospective studies are recommended. Additionally, unmeasured confounders such as genetic predisposition and detailed dietary patterns may have influenced the results. Larger, multicentre studies are needed to validate these findings.

CONCLUSION

In conclusion, the findings showed that oesophageal tumours were more common among middle-aged and older adults, with dysphagia being the predominant clinical presentation. Smoking and dietary patterns were identified as important modifiable factors associated with oesophageal tumours. The findings emphasize the importance of early endoscopic evaluation of symptomatic patients, public health interventions targeting lifestyle-related risk factors, and strengthening diagnostic services to support early detection and management of oesophageal tumours.

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