Esophageal carcinoma: An epidemiological analysis and study of the time trends over the last 20 years from a single center in India

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Abstract

Background and Aims: Esophageal carcinoma is a common gastrointestinal malignancy. There is a paucity of literature about the time trends from India. The aim of the study was to evaluate the time trends over 20 years and observe how they differ from the West. Material and Methods: We retrospectively evaluated the data of 552 patients from the gastroenterology database (single department, single-center) over a period of 20 years from 1996 to 2015. The study period was split into two groups, namely, Group A (1996 to 2005) and Group B (2006 to 2015). Results: There were 263 patients in Group A and 289 patients in Group B. The mean age was 54.83 years (range 25–89 years). There were 345 males and 207 females, with the ratio being 1.67. The most common histological type was squamous cell carcinoma (SCC) with 443 patients (80.25%). The most common location was mid esophagus with 229 patients (41.48%) followed by 208 patients (37.68%) in the lower esophagus. There was no significant increase in the lower esophageal malignancy. However, there was a significant increase in the gastroesophageal junction (GEJ) and adenocarcinoma (AC). There were no other time trend changes in gender, location, or histology. Conclusion: SCC is still far more common than AC in India. The mid esophagus is the most common site. There is no evidence of an increase in the lower esophageal malignancy in our study for over 20 years. However, the rates of GEJ-AC were found to be increasing.

Keywords: Adenocarcinoma esophagus, esophageal carcinoma, esophagus, squamous cell carcinoma esophagus, time trend

Introduction

Esophageal cancer is one of the common malignancies of the gastrointestinal tract (GI). As per the World Health Organization (WHO), Globocon 2018, esophageal cancer is the 7th most common cancer (3.2%) in the world, and the 6th most common cause of cancer related mortality (5.3%).¹ Among the malignancies of the GI, esophageal cancer accounts for 3.2% of all the newly diagnosed cancer patients in the world, which is behind colorectal (10.2%) and stomach (5.7%) cancer.² Esophageal cancer accounts for about 5% (407,000 deaths) of all cancer deaths annually in the USA.²,³ In India, as per WHO, Globocon 2018, esophageal cancer is the 6th most common cancer with incidence of 5.04%. It is 5th most common cancer in males and 6th most common cancer in females.⁴ The male to female ratio in India is 2.4:1.⁵

How to cite this article: Choksi D, Kolhe KM, Ingle M, Rathi C, Khairnar H, Chauhan SG, et al. Esophageal carcinoma: An epidemiological analysis and study of the time trends over the last 20 years from a single center in India. J Family Med Prim Care 2020;9:1695-9.
As per the population-based cancer registry (PBCR) of India (National Center for Disease Informatics and Research, National Cancer Registry Programme, Indian Council of Medical Research), the age-adjusted rate of esophageal cancer was highest in east Khasi Hill district of Meghalaya followed by Aizawl in Mizoram, irrespective of gender, for the latest period of 2012–2014. The age-adjusted rate of esophageal cancer was 71.2 for males and 33 for females (per 1,00,000) in east Khasi Hill District of India.[11]

Squamous cell carcinoma (SCC) and adenocarcinoma (AC) are the two main histological types of esophageal cancer. As the squamous epithelium is present throughout the esophagus, SCC can occur anywhere along the length of esophagus. AC arises from the Barrett’s esophagus, which has intestinal metaplasia. Barrett’s esophagus is seen in the lower esophagus and hence, AC of esophagus also arises from lower esophagus and GEJ. The most common form of esophageal cancer worldwide is SCC. About 90% of the esophageal carcinoma in the residents of Asia, Africa, and Eastern European countries is SCC.[6] In the western world, the incidence of SCC has declined steadily over the past three decades while AC has increased simultaneously. AC is now the most dominant histological type in the western world.[7–10] Some studies identify the upper third while others, the middle third as the most common site for SCC.[11] There are very few time-trend studies about the changing location and changing histologic subtypes of esophageal cancer from the developing world in the last couple of decades. These studies fail to show significant increase in the incidence of AC over time.[12] Esophageal cancer is a disease of advanced age, peaking in the seventh and eighth decades of life.

We present the epidemiology of carcinoma esophagus and the time trends in the location and the histology over a period of 20 years from a single, non-oncology department of a tertiary care hospital in western India. The patients belonged predominantly to the lower socioeconomic class (data not shown) as our hospital is a government hospital next to the largest slum in Asia (Dharavi, Sion, Mumbai).

Patients and Methods

The data for this retrospective analysis was collected from the database of the gastroenterology department. The study was approved by the institutional review board. Patients diagnosed with esophageal cancer (histologically proven) from 1st January 1996 to 31st December 2015 were included. The epidemiological and clinical data of all the patients were noted. Tumors were classified into four groups for location purpose: upper third (16–24 cm from incisors, Group 1), middle third (25–32 cm, Group 2), lower third (below 32 cm) with gastroesophageal junction (GEJ) involvement (Group 3), and without GEJ involvement (Group 4). For tumors that extended beyond one part, the tumor was included in that part which had the maximum extent of the tumor. In case the endoscope could not be negotiated across the tumor in the esophagus, the location of the tumor was determined by radiological imaging, using contrast-enhanced computed tomography (CE-CT). Mean and standard deviation were calculated for quantitative data. Ratio was calculated for qualitative data. A Chi-square test was used to assess the trend in the location, gender, and the histologic type of the tumor. P value of less than 0.05 was considered significant.

For time-trend evaluation, the study period was divided into 2-time frames of 10 years each, namely, 1996–2005 (Group A) and 2006–2015 (Group B). The patient distribution was studied in the two-time frames according to the histology, site, and gender.

Results

Data of 626 patients with esophageal cancer were retrieved. However, only 552 patients had all the necessary and relevant data. The other 74 patients could not be included due to incomplete data. The results of 552 patients are described below.

CONSORT DIAGRAM

Demographics

There were 552 patients in the study. The mean age was 54.83 years (range 25–89 years). There were 263 patients in Group A and 289 patients in Group B. The genderwise distribution is shown in Table 1. The ratio of male to female was 1.6 and 1.72 in ‘Group A’ and ‘Group B’, respectively. This was not statistically significant (P = 0.72).

Symptoms and signs

Most of the patients (97%) presented with dysphagia. Of these, 68.3% had dysphagia for both solids and liquids. Rest had dysphagia for solids only (31.7%). Majoritity of the patients (344, 62.33%) had symptom duration of 3 months or less. Anorexia and weight loss were present in 447 (81%) patients. History of upper GI bleeding was present in 21 (3.8%) patients. Tracheoesophageal fistula was present in 7 (1.26%) patients. Cervical lymphadenopathy was seen in 25 (4.52%) patients. History of tobacco chewing, smoking, and alcohol consumption...
was present in 293 (53.07%), 183 (33.15%) and 161 (29.16%) patients, respectively. Anemia was present in 334 (60%) patients. Esophageal web was present in 3 patients. The clinical features were similar across both the groups.

### Location

The most common location was mid esophagus with 229 (41.48%) patients followed by lower esophagus with 208 (37.68%) patients. The location-wise distribution of the patients is shown in Table 2.

The absolute number of patients with lower esophageal malignancy decreased from 110 to 98 in Group B. However, this was not statistically significant ($P = 0.06$). There was no significant time-trend difference in the location of esophageal malignancy ($P$-value = 0.11 for upper, $P = 0.60$ for mid, and $P = 0.06$ for lower esophageal malignancy) [Figure 1].

Even though the total number of cases in the lower esophagus decreased, there was a significant increase in the number of lower esophagus with GEJ malignancies ($P = 0.0001$, statistically significant) [Figure 2].

### Histology

The distribution of malignancy as per the histology is shown in Table 3. SCC was the most common histologic type with 443 (80.25%) patients. There was no significant time trend difference in the occurrence of SCC and AC over the 2 different time periods ($P = 0.20$ for SCC and $P = 0.51$). However, there was a significant increase in the rate of GEJ AC in Group B ($P = 0.0001$, statistically significant). This is shown in Figure 3.

### Discussion

Esophageal carcinoma is a disease with poor prognosis and most of the patients present with unresectable or metastatic disease. In most of the cases, modification of lifestyle with avoidance of addictions may be an attractive strategy in the prevention of this dreaded and mostly incurable disease. A nationwide campaign is required to generate public awareness about this dreaded disease along with identifying the high-risk population. Therefore, the findings of our study are important to plan an effective preventive approach in India.

Our retrospective data of 552 patients studied over a period of 20 years has shown that the mean age group is 54.78 years. Population-based data reveal that the incidence of esophageal cancer peaks in the sixth decade in many parts of the world.[13] This is earlier by one decade in our study as compared to some of the western data.[14] In a recent study from India, the mean age was 51.7 years.[15] The male to female ratio in our study was 1.6 and 1.72. This was 2.53 in the study mentioned above.[13] Moreover, Indian data reveal a low sex ratio from all major cancer registries with a national average of 1.2:1.[15] The WHO data suggests carcinoma esophagus is two to three times more common in males as compared to females (male to female ratio 2:4). Similarly, one recent study from Africa has shown male predominance.[16] The result from our study thus establishes

| Table 1: Genderwise distribution in the study period |
|-----------------------------------------------|
| Gender | Male | Female | Total | Ratio |
|--------|------|--------|-------|-------|
| Group A| 162  | 101    | 263   | 1.60  |
| Group B| 183  | 106    | 289   | 1.72  |
| Total  | 345  | 207    | 552   | 1.67  |

| Table 2: Location-wise distribution of the malignancy and time trend |
|---------------------------------------------------------------|
| Location | Group A | Group B | Total |
|----------|---------|---------|-------|
| Upper    | 47      | 68      | 115   |
| Mid      | 106     | 123     | 229   |
| Lower    | 110     | 98      | 208   |
| Without GEJ* | 84   | 47      | 131   |
| With GEJ* | 26     | 51      | 77    |
| Total    | 263     | 289     | 552   |

*GEJ – Gastroesophageal junction

![Figure 1: Time trend in the location of the malignancy](image1)

![Figure 2: Showing lower esophagus cancer distribution with a statistically significant increase in gastroesophageal junction malignancy](image2)

![Figure 3: Esophageal adenocarcinoma distribution, showing a statistically significant increase at the gastroesophageal junction](image3)
ICMR data reveals a high incidence of cancers in general and tobacco-related cancers, in many regions of India. This is highest in Assam and Meghalaya. The pattern of tobacco use in northeast India is different from the rest of the country. Another study from Punjab, looked at the risk factors of esophageal SCC in women (who generally neither smoke nor consume alcohol). Poor nourishment and consumption of hot beverages were found to be linked to SCC carcinogenesis in this study.

We found SCC in 80.25% and AC in 16.67% of the patients. The ratio of SCC to AC was 5.15. This result is similar to other studies from India, which show SCC predominance. This finding is slightly different from a retrospective data published recently from Mumbai, which had showed lower SCC to AC ratio of 3:1 and also similar study from India revealed the ratio of 3.18:1. This is likely because of the difference in the socioeconomic status of the patients evaluated in the two studies. The patients from our group belonged to the lower socioeconomic group whereas the other study was published from a corporate hospital in Mumbai with patients likely belonging to the affluent class. Reports from a few other Asian countries such as Singapore and China have shown a decline in the incidence of SCC. Our study did not show such a trend. The high percentage distribution of SCC (80.25%) over AC (16.67%) suggests that it is unlikely that AC would surpass SCC soon, at least in our part of the world. The presence of risk factors such as smoking, tobacco and alcohol consumption, a high number of patients belonging to lower socioeconomic strata in our study (not shown), and dietary deficiencies are some of the possible reasons for such high rates of SCC.

In our study, mid esophagus with 229 patients was the most common location followed closely by lower esophagus with 208 patients. This is like the data published in the National Cancer Registry of India for Mumbai. Our study showed higher involvement of lower esophagus (37.68%) than described in the regional cancer registry (30%). This finding is in contrast with that of other study from India where the most common location was mid esophagus. However, unlike western studies, our study did not show increase trend in the occurrence of lower esophageal malignancy, or increases in the rates of adenocarcinoma in lower esophagus. In fact, in our study we got slight reduction in the absolute number of lower esophageal malignancy, which was not statistically significant. This might be because of the lack of the widespread western type of risk factor such as obesity, gastroesophageal reflux disease, and other socioeconomic factors. However, there was an increase in the occurrence of GEJ tumors of adenocarcinoma type in our study which was statistically significant. Nevertheless, this trend of increase in adenocarcinoma of GEJ has been reported in cancer registries of European countries. The reasons for this should be scientifically evaluated in our population. This could reflect gradual transition of the disease as seen in the west couple of decades ago. There were similar observations observed from a recent multinational study.

**Conclusion**

Our study is one of the largest retrospective data of esophageal cancer from India in a non-oncology unit. Our study suggests that esophageal cancer occurs a decade earlier in India. It affects males more than females. SCC is still the most common histological subtype and is way ahead of AC. The mid esophagus is still the most common site. There is no evidence of an increase in the rate of lower esophageal malignancy in our study as opposed to western literature. However, the rates of GEJ AC were found to be increasing, resembling European cancer registry data.

**Limitations**

1. Retrospective data.
2. Possible referral bias, as it was a single departmental, single-center data.
3. The population studied may not be representative of the general population as the majority of the patients studied belonged to lower socioeconomic status, referred to a tertiary center from across the state.

**Declaration of patient consent**

Informed written consent was obtained from patients prior to submitting the article.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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