Oesophageal Carcinoma in Jamaica, 1978–2007: Histological Distribution and Trends in Incidence

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ABSTRACT

Objectives: To investigate the trends in incidence and histological distribution of oesophageal carcinoma in Kingston and St Andrew (KSA), Jamaica, over the 30-year period 1978–2007.

Methods: All oesophageal carcinomas registered in residents of KSA during the study period were extracted from the Jamaica Cancer Registry (JCR), and the following were collected for each case: gender, age, basis of diagnosis, year of diagnosis, histological subtype and subsite. The data were used to calculate age specific incidence rates and age-standardized incidence rates (ASRs). The results were compared to those from other countries.

Results: Oesophageal carcinoma was more common among males than females and both genders showed decreasing incidence over the 30-year period. The highest ASRs (males, 4.0 per 100 000; females 2.6 per 100 000 per year) were recorded in the 1978–1982 reporting period and the lowest (males, 1.7 per 100 000 per year; females 0.6 per 100 000 per year) in the 2003–2007 period. The leading histological subtype among both genders was squamous cell carcinoma (SCC), and this subtype showed a decrease in incidence in both genders over the period of review. Adenocarcinomas, the second commonest histological subtype, showed a decrease in ASR over time in females, and a rise in males.

Conclusions: Incidence rates of oesophageal carcinomas overall have decreased in KSA, Jamaica, and this trend is mirrored by the SCC subtype. However, while adenocarcinoma ASR is decreasing in females, it is increasing in males. These data support the need for investigation into the risk factors for oesophageal adenocarcinoma in Jamaica.

Keywords: Cancer, Jamaica, oesophagus

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INTRODUCTION

According to the 2014 World Cancer Report, low-to-middle income countries, such as Jamaica, accounted for 73% of all new cases of oesophageal cancer, with 49% of these cases occurring in China (1). Squamous cell carcinoma and adenocarcinoma represent the two leading histological subtypes of oesophageal cancer worldwide and each of these subtypes has its own epidemiological profile (1).

Squamous cell carcinoma has a high incidence in Central Asia, Eastern Asia and Eastern Africa and the lowest incidence rates occur in Western Africa and Latin America (1). Adenocarcinoma is commonest in Caucasian populations than in any other racial groups. It exhibits high incidence rates in the United Kingdom, Australia, the Netherlands and the United States of America, and the lowest rates in Latin America, Asia and Africa (1). Historically, squamous cell carcinoma has accounted for the majority of oesophageal cancers worldwide, but there has been a shift in epidemiology over the last several generations and adenocarcinoma now accounts for more than 50% of oesophageal cancer in Western countries (2).

Trends in incidence rates for oesophageal cancers in the Jamaican population for the period 1973–1997 were previously analysed (3), and showed decreasing incidence in both genders, however, analysis according to histological type was not undertaken. There has been no published data on the trends of oesophageal cancer incidence in the Jamaican population since 1997, and the histological distribution of oesophageal cancer in the Jamaican population has not been previously defined. These factors formed the basis of this study.

MATERIALS AND METHODS

Data was obtained from the Jamaica Cancer Registry (JCR), a population-based registry, which collects all cases of cancer diagnosed in the resident population of the parishes of Kingston and St Andrew, Jamaica. Data is collected from private and public hospitals, pathology departments, radiotherapy facilities and palliative care institutions in these parishes.

From the archives of the JCR, we abstracted all cases of oesophageal cancer diagnosed over the 30-year period 1978–2007, and documented the following for each case: gender, age, year of diagnosis, basis of diagnosis code (International Agency for Research on Cancer-International Association of Cancer Registries, IARC-IACR), subsite (International Classification of Diseases for Oncology, 3rd edition) and histology (World Health Organization Histological Classification for Oesophageal Tumours, 2010).

Data was used to calculate frequencies, age-specific incidence rates (ASIRs) and age standardized incidence rates (ASRs) for each five year stratum of the period 1978–2007.

Calculation of rates

Age-specific incidence rate (ASIR)

The age-specific incidence rate was calculated by dividing the total number of cases of each five year period by five times the population estimate for that stratum and multiplying the result by 100 000. The rate is therefore expressed as per 100 000 per year.

Age standardized incidence rate (ASR)

The age standardized incidence rate was calculated in a two-step procedure. For each site, the product of each age-specific incidence rate and its corresponding world standard population were obtained and then all were summed to produce the ASR.

Statistical analysis

Linear regression analysis was used to determine the significance of trends in ASRs over time. This was calculated using the GraphPad Quickcalcs Linear Regression Calculator (GraphPad Software, Inc) accessed at http://www.graphpad.com/quickcalcs/linear1. Significance was defined as a *p*-value of ≤ 0.05.

RESULTS

A total of 415 cases of oesophageal cancer were diagnosed over the period 1978–2007. Two hundred and eighty-three cases (68.2%) were ascertained *via* histology, 122 cases (29.4%) *via* clinical investigation, six cases (1.4%) *via* clinical history and examination only, and 2 cases (0.5%) *via* cytology. Of the 415 cases, 259 were males and 156 were females (male: female ratio 1.7:1), and the ages of these patients ranged from 26 to 93 years. Peak incidence in males occurred in the 75–79 year age group, and in females, in the 70–74 year group (Fig. 1).

Of the 283 cases ascertained *via* histology, squamous cell carcinomas were the commonest (251; 88.7%), followed by adenocarcinoma (20; 7.1%). The remaining 12 cases included four cases of anaplastic carcinoma, four cases of poorly differentiated carcinoma, three cases of undifferentiated carcinoma and one case of mucoepidermoid carcinoma.

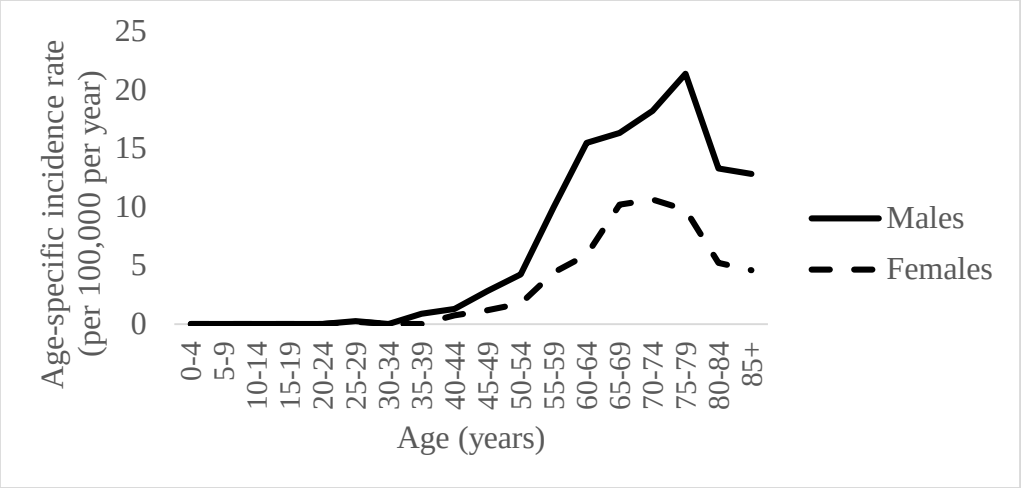

Fig. 1: Age-specific incidence of oesophageal cancer, Kingston and St Andrew, Jamaica, 1978– 2007.

Figure 2 shows the distribution of subsites for cases of oesophageal adenocarcinoma and squamous cell carcinoma. The majority of adenocarcinomas (18 out of 20; 90%) were located in the lower-third of the oesophagus; in the remaining two cases, no location had been recorded. For the 126 cases of squamous cell carcinoma in which the subsite had been recorded, there was a spread of distribution, with the middle-third of the oesophagus being the commonest subsite (55; 44%), followed by the lower-third (44; 35%) and then the upper-third (15; 12%).

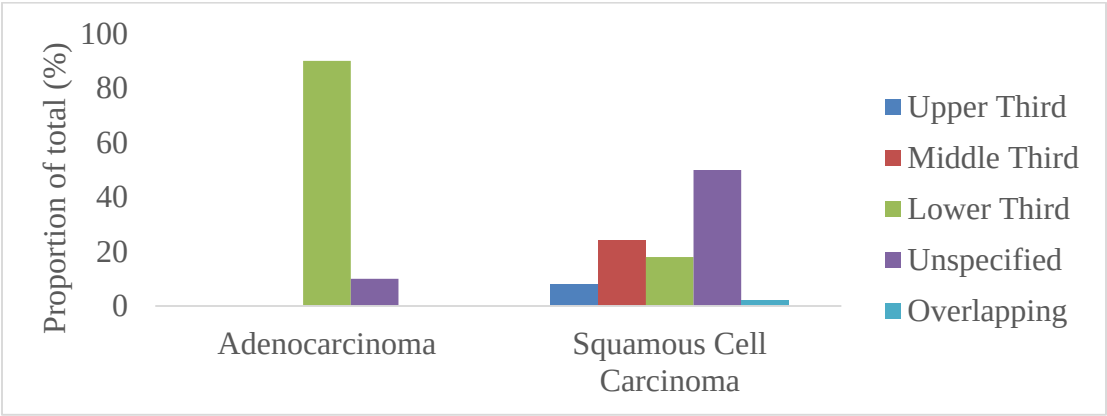

Fig. 2*:* Oesophageal adenocarcinoma and squamous cell carcinoma subsites, Kingston and St Andrew, Jamaica, 1978–2007**.**

The ASR for squamous cell carcinoma was higher in males than in females in every five-year period of the 30-year range (Fig. 3).

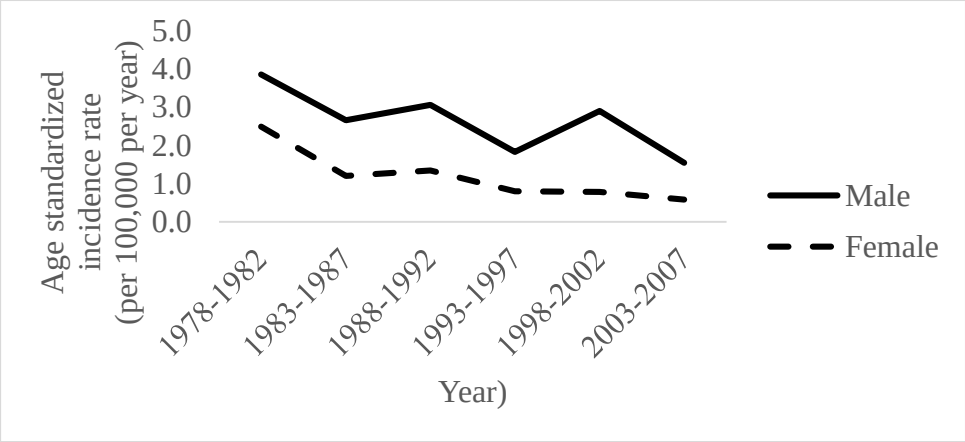

Fig. 3*:* Age standardized incidence rates, oesophageal squamous cell carcinoma, Kingston and St Andrew, Jamaica, 1978–2007.

The 1978–1982 period showed the highest ASRs of squamous cell carcinoma for both genders, and this was followed by a progressive decline in rate in both genders, with the lowest figures in both being seen in the final five-year period of the study (2003–2007). The decreasing trend was statistically significant only in females ($p = 0.028$).

Figure 4 shows that no cases of adenocarcinoma were recorded in the 1978–1982 reporting period. In the first two periods of the study in which this histological type was documented (1983–1987 and 1988–1992), it demonstrated higher ASRs in females than in males. However, subsequent to 1992, ASRs in males progressively increased, surpassing the rates in females and the ASRs in females showed progressive decline. The increasing trend of ASRs in males was statistically significant ($p = 0.001$). The trend observed in females was not significant.

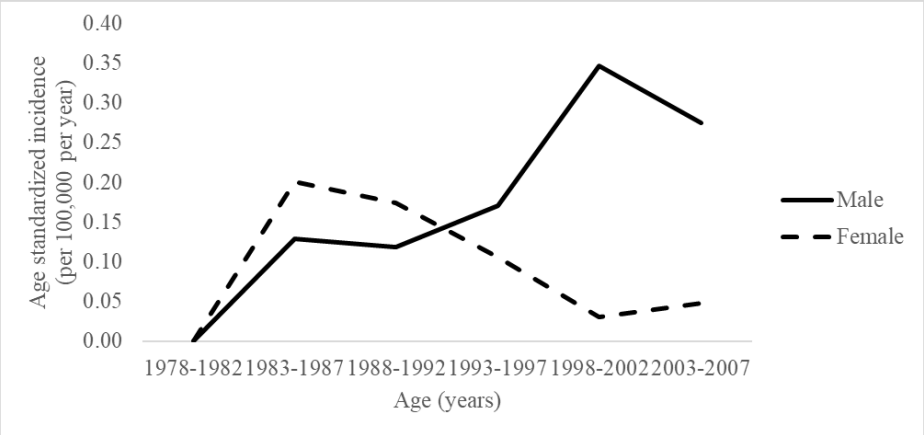

Fig. 4: Age standardized incidence rates, oesophageal adenocarcinoma, Kingston and St Andrew, Jamaica, 1978–2007.

DISCUSSION

In this study, the majority of cases of oesophageal carcinoma occurred in males. In addition, ASRs for squamous cell carcinoma of the oesophagus were consistently higher in males than in females, while those for adenocarcinoma were initially higher in females, but in the later periods of the study, were consistently greater in males. These findings are in keeping with international studies, which report both squamous cell carcinoma and adenocarcinoma of the oesophagus as being more common among men than women (4–6).

The higher squamous cell carcinoma ASRs in males documented globally has been explained by the higher consumption of alcohol and tobacco – the two main risk factors for the disease – among men, compared to women (4). The reasons for the gender disparity in oesophageal adenocarcinoma are less clear. Gastroesophageal reflux, a strong risk factor for Barrett's oesophagus (2, 4), and subsequent development of oesophageal adenocarcinoma, is reportedly more common in men than women (6–8), and this may contribute to the higher incidence rates of oesophageal adenocarcinoma in men. In addition, some studies have suggested a protective role

of estrogen in the development of oesophageal adenocarcinoma (8, 9), showing that strong male preponderance is seen in the pre- and peri-menopausal age groups, but that this is followed by a decline in the male to female ratio in the post-menopausal years (8). In our data, the initial higher rates in females for adenocarcinoma may perhaps be partially explained by the small numbers of cases overall.

Data from this study showed that oesophageal carcinoma was commoner after the age of 54 years, with peak frequencies occurring in the 75–79 year and 70–74 year age groups for men and women, respectively. These findings are similar to those reported internationally, where both squamous cell carcinoma and adenocarcinoma of the oesophagus occur in older age groups. Squamous cell carcinoma of the oesophagus is uncommon before the age of 30 years (5, 10), exhibiting peak incidence in the seventh decade (10–12), and the peak incidence of oesophageal adenocarcinoma is seen in the 50–60 year age group (11, 13).

Our data showed that squamous cell carcinoma accounted for the majority of oesophageal carcinomas, and most of these involved the middle-third of the oesophagus. This is similar to data reported globally, where squamous cell carcinoma is the predominant histological subtype of oesophageal carcinoma, and it most often affects the middle-third of the oesophagus, though it may occur throughout the oesophagus (6, 10). Our data additionally showed that the incidence of oesophageal squamous cell carcinoma decreased in both genders over the 30-year period under review, and this is in keeping with reports from other geographical regions (6, 10, 14), where the decrease has been attributed to decreasing smoking prevalence (10). Decreases in males but stable rates in females have been documented elsewhere (15). It is unclear whether changes in smoking patterns may have contributed to the decreases observed in our population, as national tobacco control programmes have only been recently implemented in Jamaica (16).

The trends in this study of increasing incidence in males and decreasing incidence in females for oesophageal adenocarcinoma, differ somewhat from international data which show an increasing incidence in both genders (2, 6, 15). Adenocarcinoma now accounts for more than 50% of cases of oesophageal cancer in some Western countries (2, 4, 6). This increase has been less dramatic in Black populations, and there has been no increase among Asians (14, 17). Oesophageal adenocarcinoma most commonly arises on the background of Barrett's oesophagus, caused by chronic gastro-oesophageal reflux, and therefore, most commonly occurs in the lower-third of the oesophagus (6, 10), which was the commonest topographical location for oesophageal adenocarcinoma in this study. It would therefore appear, that gastro-oesophageal reflux, which is reportedly more common in males (7, 8, 14) may be a significant contributor to the development of oesophageal adenocarcinoma in our population. The decreasing incidence in females, though not statistically significant, warrants further study, including an investigation into the risk factors for oesophageal adenocarcinoma in the Jamaican population.

In summary, in Jamaica, oesophageal carcinoma is commoner in males than in females, and squamous cell carcinoma is the commonest histological type, though its incidence has been decreasing in both genders. The incidence of oesophageal adenocarcinoma has been decreasing among females, but increasing among males, suggesting that gastro-oesophageal reflux may be more common in males than in females in the Jamaican population. Further study is warranted to investigate the risk factors for oesophageal adenocarcinoma in our population.

AUTHORS' NOTE

TN Gibson and B Hanchard conceived the paper, supervised database creation, performed data analyses, reviewed and corrected drafts of the paper, and approved the final draft. KCS Mills

abstracted collected data into an electronic database, performed data analyses and wrote drafts of the paper. DP McNaughton collected data and reviewed drafts of the paper. All authors approved the final draft. There are no financial interests or other dual commitments that represent potential conflicts of interest for any of the authors.

REFERENCES

1. Montgomery EA. Oesophageal cancer. In: Stewart BW, Wild CP, eds. World Cancer Report 2014. Lyon: International Agency for Research on Cancer, 2014: 374–82.
2. Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB et al, eds. Schwartz's principles of surgery, 10th ed. New York, New York: McGraw-Hill Education; 2015.
3. Hanchard B. Cancers – The changing patterns. In: Morgan O, ed. Health Issues in the Caribbean. Kingston: Ian Randle Publishers; 2005: 131–40.
4. Townsend CM, Beauchamp RD, Evers BM, Mattox K, eds. Sabiston Textbook of Surgery: The biological basis of modern surgical practice, 19th ed. Philadelphia, USA: Elsevier Saunders; 2012.
5. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, et al. GLOBOCAN 2012 v1.0, Cancer incidence and mortality worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer; 2013 [cited 2017 October 25]. Available from: http://globocan.iarc.fr.
6. Klingensmith ME, Aziz A, Bharat A, Fox A, Porembka M, eds. The Washington manual of surgery, 6th ed. Philadelphia, USA: Lippincott Williams & Wilkins; 2012.

7. Asanuma K, Iijima K, Shimosegawa T. Gender difference in gastro-esophageal reflux diseases. World J Gastroenterol 2016; **22:** 1800–10.

8. Mathieu LN, Kanarek NF, Tsai H-L, Rudin CM, Brock MV. Age and sex differences in the incidence of esophageal adenocarcinoma: Results from the Surveillance, Epidemiology and End Results (SEER) Registry (1973–2008). Dis Esophagus 2014; **27:** 757–63.

9. Lagergren K, Lagergren J, Brusselaers N. Hormone replacement therapy and oral contraceptives and risk of oesophageal adenocarcinoma: a systematic review and meta-analysis. Int J Cancer 2014; **135:** 2183–90.

10. Zhang Y. Epidemiology of esophageal cancer. World J Gastroenterol 2013; 19: 5598–606. Layke JC, Lopez PP. Esophageal cancer: a review and update. Am Fam Physician 2006; **73:** 2187–94.

11. Napier KJ, Scheerer M, Misra S. Esophageal cancer: A Review of epidemiology, pathogenesis, staging workup and treatment modalities. World J Gastrointest Oncol 2014; **6:** 112–20.

12. Lagergren, J. Adenocarcinoma of oesophagus: what exactly is the size of the problem and who is at risk? Gut 2005; 54(Suppl 1): i1–5.

13. Howlader N, Noone AM, Krapcho M, Miller D, Bishop K, Kosary CL et al, eds. SEER Cancer Statistics Review, 1975-2014 [Internet]. Bethesda, Maryland: National Cancer Institute; 2017 April [cited 2017 October 25]. Available from: https://seer.cancer.gov/csr/1975_2014/.

14. Otterstatter MC, Brierley JD, De P, Ellison LF, Macintyre M, Marrett LD, et al. Esophageal cancer in Canada: Trends according to morphology and anatomical location. Can J Gastroenterol 2012; **26:** 723–7.

15. Hodges P. Tobacco Regulations, Satisfying Outcome [Internet]. Kingston: Jamaica Information Service; 2014 April 29 [cited 2017 October 25] Available from: http://jis.gov.jm/satisfying-outcome-tobacco-regulations/

16. Hongo M, Nagasaki Y, Shoji T. Epidemiology of esophageal cancer: Orient to Occident. Effects of chronology, geography and ethnicity. J Gastroenterol Hepatol 2009; **24:** 729–35.