

# A tale of two cities – oesophageal cancer in Malawi and Scotland

Tom Crofts

Department of Surgery, Royal Infirmary of Edinburgh, Scotland  
Correspondence: Dr. Tom Crofts Email: bboycr@hotmail.com

## Abstract

The high incidence of oesophageal cancer in both Scotland and Malawi can be attributed to a combination of environmental and lifestyle factors. The aim of this study is to give a perspective on the comparative epidemiology of oesophageal cancer in these two very different populations (Blantyre, Malawi and Aberdeen, Scotland).

## Introduction

Oesophageal cancer is the eighth most common cancer in the world.<sup>1</sup> A report carried out in 2002 showed that it was responsible for 462,000 new cases and was the sixth most common cause of death from cancer with 386,000 deaths.<sup>1</sup> Cancer of the oesophagus usually presents at an advanced stage and has a poor prognosis: 16% of the cases in the United States and 10% in Europe survive for at least five years.<sup>1</sup> Variation in geographical incidence is quite profound. There is a 20 – fold variation between China, which is high risk and low risk western Africa. Oesophageal cancer is more common in males throughout the world.

Scotland is one of four constituent countries that make up the United Kingdom, situated to the North of England. It is home to over five million people with an average life expectancy of 73 years for males and 79 years for females.

In Scotland, approximately 1,700 patients are diagnosed with oesophageal and gastric cancer each year.<sup>2</sup> Together, they constitute the fifth most common cancer in Scotland (excluding non melanoma skin cancer), accounting for 6.5% of newly diagnosed cancers.<sup>2</sup> Furthermore, these cancers are the third most common cancer related deaths in Scotland and account for 9.4% of all cancer deaths.<sup>2</sup> The estimated incidence of oesophageal cancer is 12.2 per 100,000 and 4.5 per 100,000 for gastro-oesophageal cancers – amongst the highest reported in Europe and higher than in other parts of the UK.<sup>3</sup> The average age of a patient presenting with oesophageal cancer is 72 years, with diagnoses rarely seen in people aged less than 40 years and a stronger prevalence shown in males.<sup>3</sup>

Patients presenting with the symptoms of oesophageal cancer almost always have advanced disease. In Scotland, the median survival from the time of diagnoses is 8.4 months and in the region of 40% of patients are alive after one year<sup>2,3</sup>. However, since 1977, although still low, the 5 year survival period has doubled (males 4% to 10% and females 7% to 13%)<sup>2,3</sup>. This may be attributable to improved perioperative mortality, which has fallen from 15% to the present day figure of 7%<sup>4</sup>. Survival is worse with increasing age, although gender seems to have little effect on the outcome<sup>4</sup>.

Oesophageal cancer can be divided into two categories: squamous oesophageal cancer and adenocarcinoma of the oesophagus.

Squamous oesophageal cancer most frequently affects

the middle third of the oesophagus<sup>4</sup>. In Scotland, the incidence is increasing, particularly in men. Over 60% of the sufferers are under 75 years of age<sup>4</sup>. There are a number of lifestyle factors which predispose to squamous cell carcinoma; deprivation and poor nutrition are the main two<sup>4</sup>. Furthermore, tobacco and alcohol have a synergistic effect as risk factors. Certain occupations have been shown to have an increased risk including oil workers and alcohol distillery workers. Squamous cell cancer follows a classical dysplasia/carcinoma sequence<sup>4</sup>.

Adenocarcinoma affects the lower third of the oesophagus. In Scotland, the social class, ethnicity and the age of the patients affected by this cancer is similar, and the incidence is rising by up to 4.2% per year<sup>4</sup>. Dissimilar to squamous oesophageal cancer, the aetiological roles of tobacco and alcohol are much less marked and there is no link to deprivation<sup>4</sup>. However a large risk factor is gastro oesophageal reflux, affecting up to 10% of the population<sup>4</sup>. This contributes to a condition known as Barrett's oesophagus, a pre-neoplastic intestinal metaplasia, which in turn results in up over a 100 fold increased risk of adenocarcinoma. The ratio of men to women of this disease is seven to one<sup>4</sup>. There has been a considerable increase in the diagnoses of Barrett's oesophagus in recent years. However, to what extent acid reflux is responsible remains unclear.

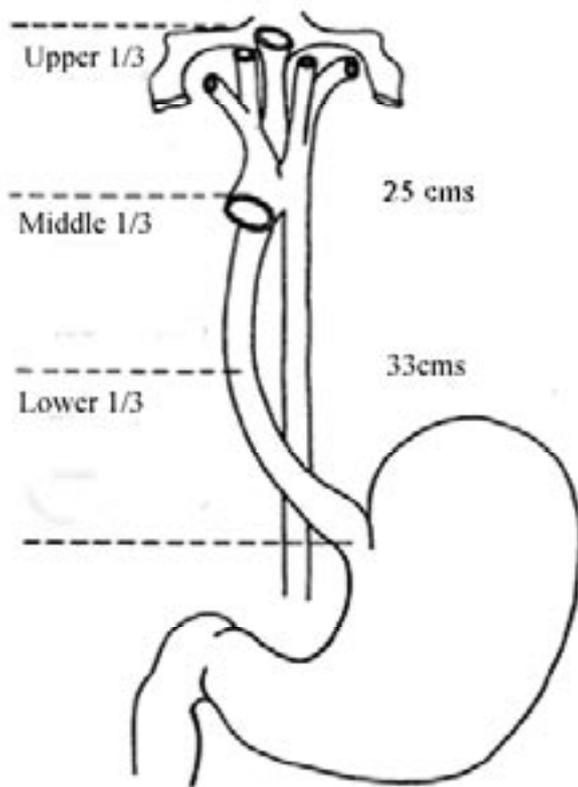
Symptoms are often non-specific in nature and do not make for an early diagnosis. The most common symptoms in Scotland include dysphagia, pain/heartburn and weight loss, occurring in about one third of patients; vomiting and symptomatic anaemia are also common presenting symptoms<sup>2</sup>. The most effective way of diagnosing these cancers is by upper gastrointestinal endoscopy and biopsy. This technique is currently used to diagnose 95% of oesophageal cancers<sup>4</sup>. Barium swallows/meals are rarely used in making a diagnosis but are useful in assessing resectability of the cancer. A CT scan is helpful for staging the disease, supplemented by a full blood count, electrolytes, liver function tests and a chest radiograph<sup>4</sup>. Laparoscopy plays an important role of staging potentially resectable lower third oesophageal cancers by visualizing previously undisclosed peritoneal metastases<sup>4</sup>.

The aim of this study was to compare two populations of patients (Malawi and Scotland) who suffered from oesophageal carcinoma.

## Method

The following criteria was compared: age, gender, pathology of tumour, body mass index - BMI (Malawi only) and site of primary tumour – divided into upper, middle and lower oesophagus according to a publication by CHEST journal in which the upper oesophagus is from the incisors to 25cms, middle from 25cms to 33cms and lower from 33cm onwards to the LOS.<sup>5</sup>

In Aberdeen, Scotland, the case notes of 45 consecutive patients diagnosed with carcinoma of the oesophagus between November 2007 and February 2008 were examined and reviewed for the relevant information. The data available included age, gender, pathology and location of the primary

Figure 1: Division of the oesophagus<sup>5</sup>

tumour. Primary tumours of the cardia and stomach which extended into the oesophagus have been excluded.

Data was collected prospectively at Queen Elizabeth Central Hospital (QECH) in Blantyre, Malawi from patients who attended endoscopy from mid November 2007 to March 2008. With the limited resources available, the patients age, gender, body mass index (BMI) and location of the primary tumour were noted.

Information regarding international statistics and demographic data were retrieved using various multinational healthcare databases. Where data regarding Aberdeen, Scotland was lacking, further information was sought from the Scottish Audit of Gastro Oesophageal Cancer (SAGOC) and used as a basis for comparison where indicated.

## Results and Discussion

Cancer of the oesophagus has been considered to occur with unusually high prevalence in Southern Africa and Western Europe, with Southern Africa ranked 2nd (with approximately 27 per 100,000) and Western Europe ranked 6th (with nine per 100,000) in the world<sup>1</sup>.

The numbers obtained within the approximate time period of this study of four months in both countries were similar (figure 2). However, the catchment areas of these two hospitals are very different. Aberdeen Royal Infirmary serves a population of 600,000 people whereas the QECH in Blantyre provides care for an area containing four million.

Several explanations can be deduced as to why the numbers were so close between the two cities when, on a national scale, oesophageal cancer affects up to three times the amount of people in Malawi as it does in Scotland. The level

of education and medical awareness amongst the general population in Malawi, especially in rural communities, is low. Many patients attend their 'local' practitioners, who may, or may not, be trained in modern day medicine. Initial failure to diagnose, in many cases, leads to delayed presentation to centres where definitive treatment might have been carried out. It is reasonable to assume that, in Malawi, a substantial number of people may not make it to hospital and therefore die without their condition being documented, further contributing to the mismatch of these figures.

Malawi is one of the worlds ten poorest countries, with two thirds of the population living on less than one US dollar a day<sup>6</sup>. With this level of poverty, patients can hardly be expected to pay for transport from rural Malawi to Blantyre. Furthermore, particularly during the rainy season, many rural roads are impassible, making transport and travel difficult.

A notable observation is the age at which people in Malawi are diagnosed with oesophageal cancer, when compared to Aberdeen. The age at which patients are diagnosed with the disease in Malawi is inverted with that of Aberdeen. The varying spectra of ages at presentation and the huge differences that exist between the two populations of patients may be accounted for by the very short life expectancy in Malawi skewing the population profile (average life expectancy 37 years compared to the UK where it is closer to 80). It may also be the result of a patient vulnerability exacerbated by the HIV epidemic lowering immune resistance (30% of cancer patients). Nutritional status is also poor leading to lack of trace elements and vitamins from the diet, enhancing vulnerability. The control of fertilizers and food additives is not strictly enforced in Malawi and this may account for some early tumours as could the drinking of very strong locally brewed alcohol. It is well known that carcinoma of the oesophagus is more common in Scotland in the whisky distilling areas.

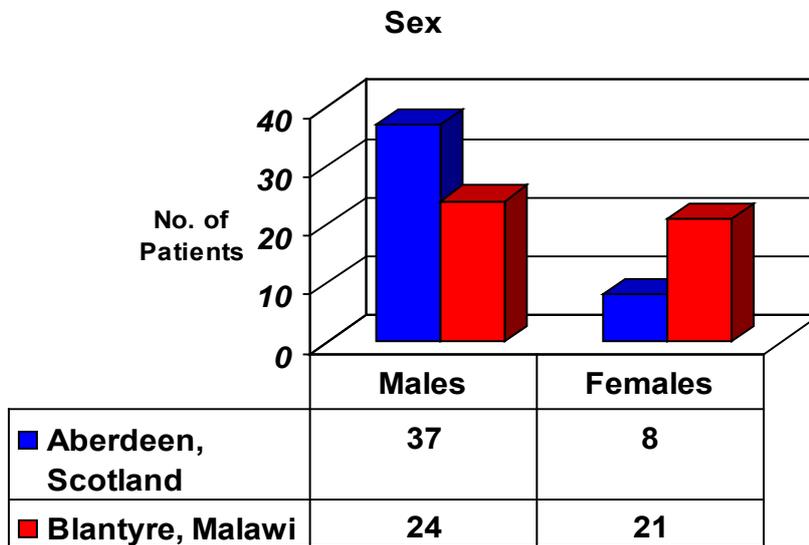
The gender difference between the two cities is quite dramatic. In Aberdeen there is a clear difference between the males and females with a ratio of almost 5:1 (figure 3). Lifestyle factors with males smoking and drinking alcohol more often and in larger quantities is significant in this respect. Conversely, in Blantyre, the ratio is less distinct with an approximately even gender distribution. Smoking could be a minor factor in Malawi. Malawi earns a majority of its foreign exchange from tobacco exports, however only a small population of Malawians smoke. Alcohol does not appear to be a major issue. Malawi has a significant Muslim population and, furthermore, females who drink are looked down upon in society. However, almost one fifth of all psychiatric admissions are related to alcohol, therefore although not unheard of, it would not explain the high incidence of oesophageal cancer or the close relationship of males and females to the disease. If alcohol were a major aetiological factor, the way in which the alcohol is produced may be responsible. The traditional home-made alcoholic beverages include Kachasu, Chibuku and Chikokeyani which are often prepared in pots containing carcinogenic substances e.g. oil drums.

No distinction can be made between the two locations with regards to the site of the tumour (figure 4). There is a slightly higher number of oesophageal tumours in the lower oesophagus in Aberdeen due to the fact that the majority are adenocarcinomas arising as a result of gastro oesophageal

Figure 2



Figure 3



reflux.

The difference between the pathology of the cancer between the two cities is striking (figure 5). Aberdeen, and Scotland (according to SAGOC) shows a higher number of people suffering from adenocarcinoma compared to squamous cell. Gastro-oesophageal Reflux Disease (GERD) is the most common predisposing factor for adenocarcinoma of the oesophagus<sup>7</sup>. As a result of the irritation caused by the reflux of gastric acid and bile, these patients are prone to developing a pre-malignant metaplasia known as Barrett's epithelium. Adenocarcinoma may develop in these patients, representing the last event of a sequence that starts with the development of GERD and progresses to Barrett's oesophagus, low grade dysplasia, high grade dysplasia and eventually adenocarcinoma<sup>7</sup>. The risk of adenocarcinoma among patients with Barrett metaplasia has been estimated to be 30-60 times that of the general population<sup>7</sup>. Obesity is an independent risk factor for the development of GERD. Obesity is a major issue in Scotland with 44% of adult men being overweight and 14% classified as obese<sup>8</sup>. Women have a slightly lower prevalence with 32% overweight and 17% obese<sup>8</sup>. The average UK BMI is 29.1 kg/m<sup>2</sup> and therefore overweight borderline obese according to World

Health Organisation (WHO) classification.<sup>8</sup> The average BMI in Malawi is 18-19 kg/m<sup>2</sup>, a reason perhaps as to why adenocarcinoma of the oesophagus is virtually non-existent.<sup>9</sup> Historically, previous pathological series have shown adenocarcinoma in Blantyre to be exceedingly rare.

Patients attending the endoscopy unit in QECH were weighed and measured to establish their body mass index, a statistical measurement which compares a person's height and weight. Classification according to WHO statistics suggest that on presentation at endoscopy clinic in Blantyre, 65% of patients were underweight and 28% are classified as starved.

Numerous risk factors exist for developing squamous cell carcinoma; chronic ingestion of hot liquids or foods, vitamin or nutritional deficiencies, poor oral hygiene, exposure to nitrosamines in the environment or food and cigarette smoking and chronic alcohol exposure; all common aetiological factors in the Western world<sup>7</sup>. Several causes have been accredited to the large numbers of cases seen in Malawi.

Suggested risk factors from studies conducted in South Africa and Zimbabwe include tobacco and alcohol consumption, although the low sex ratio (women tend not

Figure 4

Site of Primary Tumour

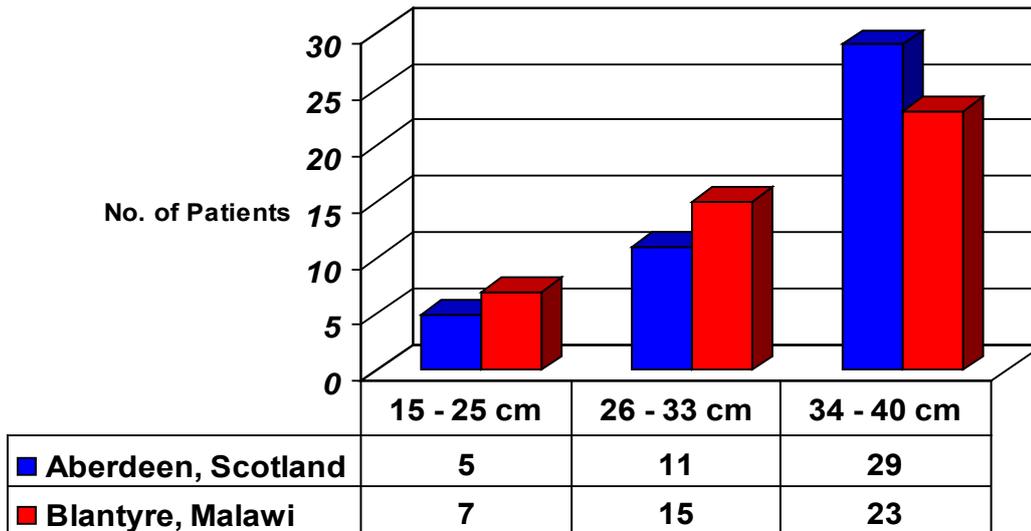
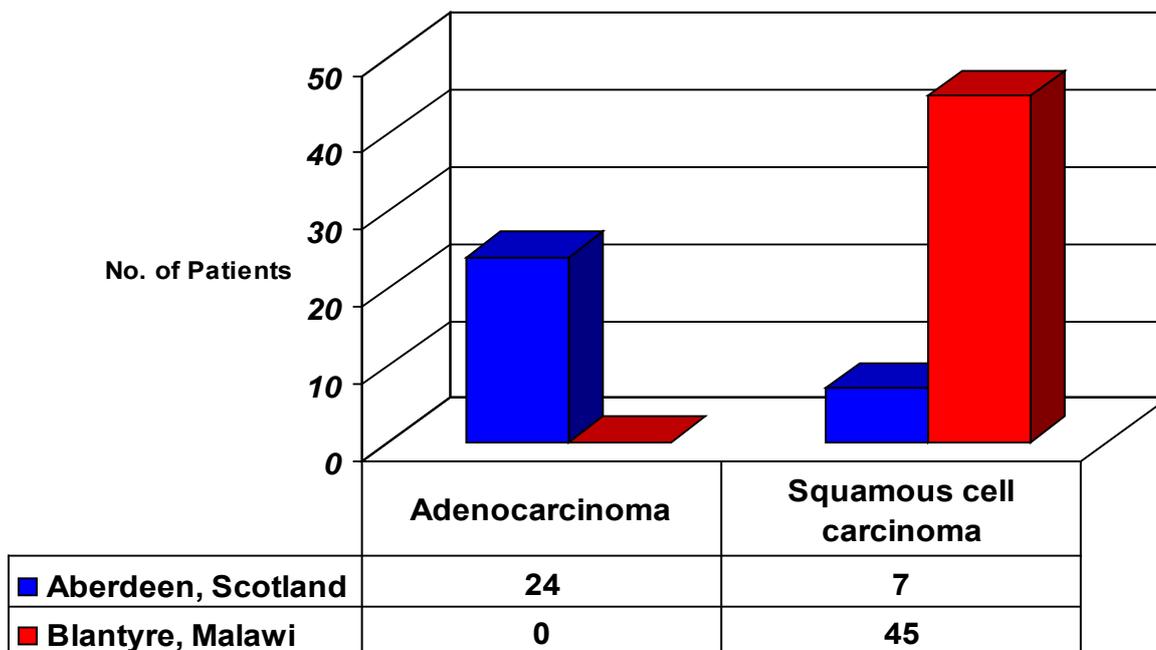


Figure 5

Pathology of Tumour



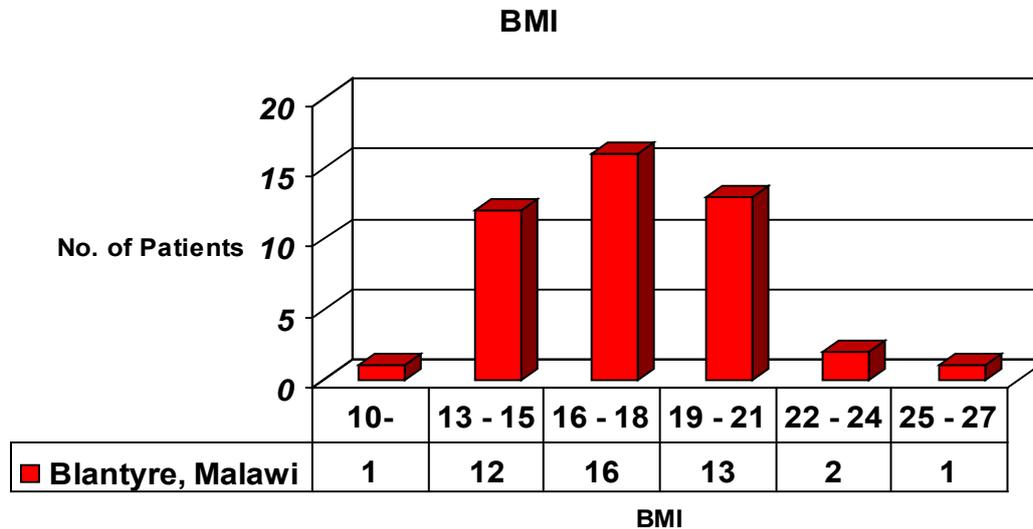
to smoke) and the low rates of other smoking related cancers suggest that tobacco is not an important cause. The staple diet in Malawi is maize, a paste like substance called nsima, provides up to three quarters of the daily calorie intake for the average Malawian. Maize diets have been associated with an increased risk of oesophageal cancer causing nutritional deficiencies. The mycotoxin, Fumonisin, produced by the fungal contaminant (*Fusarium moniliforme*) of maize when stored in a damp environment may also be an aetiological factor<sup>10</sup>.

In Scotland, surgery remains the mainstay for cure and is considered for all patients with potentially curable disease who are fit for major surgery (approximately 40% of those who partook in the SAGOC trial). Fifty to eighty per cent of

patients with oesophageal cancer have inoperable disease at diagnosis<sup>2</sup>. Therapeutic options are universally available for patients not suitable for surgery; external beam radiation (by itself or combined with chemotherapy) can be used in the radical non-surgical treatment of oesophageal cancer<sup>2</sup>. Studies of palliative treatments in patients with oesophageal cancer have focused on control of dysphagia and improvements in survival. Invasive palliative treatments include endoscopic ablative therapies, stenting and palliative resection of the oesophagus.

In Malawi, oesophageal cancer, one of the most distressing tumours, is almost impossible to palliate. No radiotherapy, chemotherapy or means to safely dilate these patients' narrow gullets is available. Stents and other means of introducing

Figure 6



them are not available. Until recently the only means of help for these starving patients was to inject the tumour through an endoscope using absolute alcohol to temporarily destroy the tumour mass; unfortunately no longer possible as the 'disposable use once only' needle has broken having been in constant use since the year 2000. Patients are therefore endoscoped to confirm the diagnosis (biopsies are not taken, the patient is usually dead by the time the result is available) and the patient sent home to die amongst their loved ones.

It is generally recognized that oesophageal cancer is rarely cured but that palliation is of great benefit to quality of life, which is more easily achieved. It remains a great challenge to the medical community in Malawi to enhance the quality of care for this group of patients.

### Acknowledgements

I would like to acknowledge the help received from Mr

Kenneth Park, Professor Eric Borgstein and Professor Nyengo Mkandawire in the preparation and publication of this paper.

### References

1. <http://pn.bmj.com/cgi/reprint/5/1/56.pdf>
2. <http://www.who.int/countries/mwi/en/>
3. Parkin DM, Bray F, Ferlay J, Pisani P. Global Cancer Statistics 2002. A Cancer Journal for Clinicians. 2005; 55: 93-95
4. <http://www.sign.ac.uk/pdf/sign87.pdf>
5. Gilbert FJ, Park KGM, Thompson AM et al. Scottish Audit of Gastric and Oesophageal Cancer. 2002
6. Thompson AM. Cancer Scenarios: An aid to planning cancer services in Scotland in the next decade – Oesophageal and Stomach Cancers. 2006; 32-47
7. Wapnick S, Zanamwe LND, Chitiyo M, Mynors JM. Cancer of the Oesophagus in Central Africa. CHEST. 1972; 61: 649-654
8. [http://www.unicef.org/infobycountry/malawi\\_statistics.html](http://www.unicef.org/infobycountry/malawi_statistics.html)
9. <http://www.emedicine.com/MED/topic741.htm>
10. <http://www.sign.ac.uk/pdf/sign8.pdf>
11. [www.nature.com/ejcn/journal/v60/n2/full/1602281a.html](http://www.nature.com/ejcn/journal/v60/n2/full/1602281a.html)
12. Banda LT, Parkin DM, Dzamalala CP, Liomba NG. Cancer incidence in Blantyre, Malawi 1994-1998. Trop Med Int Health. 2001 Apr;6(4):296-304