

ESOPHAGEAL CANCER IN AFRICAN BLACKS OF KWAZULU NATAL, SOUTH AFRICA: AN EPIDEMIOLOGICAL BRIEF

Background: Esophageal cancer is the most common carcinoma in Black South African men. A number of etiological factors have been associated with the high prevalence.

Objectives: The present study was undertaken to address social and environmental factors associated with the cancer in the African Black population of KwaZulu-Natal.

Case-Control Studies and Statistical Analysis: The total number of cases recruited was 208. Of these, 87 were esophageal cancer patients, 61 non-esophageal or other-cancer patients, and 60 were non-cancer patients. We tested several symptoms and risk factors to find out causes of the cancer: eyes watering (symptom), smoking, effects of smoking and alcohol consumption combined, and consumption of beer fermented with infected maize.

Results and Conclusions: Our study demonstrated statistically significant differences between the rates of eyes watering or smoking in the esophageal and the non-esophageal cancer patients. Further, a statistically significant difference was found in the rates of eyes watering between esophageal cancer and non-cancer patients. There was indeed a significant difference in the number of cases of esophageal cancer between patients who smoked or drank beer and those who did not. Patients who drank beer fermented from infected maize were more likely to have esophageal cancer than non-cancer patients. (*Ethn Dis.* 2005;15:786–789)

Key Words: Esophageal Carcinoma, Smoking, Alcohol

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INTRODUCTION

Esophageal cancer is the sixth most common cancer in the world and one of the most lethal tumors.¹ Cancer of the esophagus is the second most common cancer in South African men and the most common in Black men.² Several factors have been associated with esophageal cancer in South Africa. One factor that has prevailed is that the increase in esophageal carcinoma may be attributed to the importation of maize that replaced sorghum as the main staple diet.³ This cereal is deficient in nicotinamide and tryptophan. The consumption of moldy maize contaminated with fungus, especially *Fusarium moniliforme*, and the resultant ingestion of mycotoxins, has been implicated in the development of esophageal cancer.³ The association of smoking to esophageal cancer has been recorded especially in Zulu men,^{2–4} whereas drinking home-brewed beer, often made from moldy maize, contributes to the high incidence in the Eastern Cape.⁵

The focus of the present study was to address whether ethnicity and lifestyle choices, which included smoking and consuming alcohol and food contaminated with mycotoxins, was linked to esophageal cancer in the African Black population of KwaZulu-Natal in South Africa.

CASE-CONTROL STUDIES AND STATISTICS

Patient Demographics and Epidemiology

Of the 208 cases recruited, 87 were esophageal carcinoma patients, 61 were non-esophageal cancer patients (excluding head and neck and upper gastrointestinal cancers), and 60 were non-cancer patients. Senior nurses who were skilled in the Zulu language used a comprehensive questionnaire to interview each patient within 24 hours of admission to a hospital. The interview was conducted prior to surgical intervention or chemotherapy. The diagnosis of esophageal carcinoma was confirmed by endoscopy within 48 hours of admission. The carcinomas of all cancer patients recruited in the study were confirmed by histology.

The three major groups were divided into four subgroups: 1) those whose eyes watered (clinical sign) if they were burning wood to cook their meals; 2) patients with a history of smoking; 3) patients with a history of smoking and drinking alcohol; 4) patients who had consumed homemade beer made from moldy maize. Table 1 shows the groups into which the

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Table 1. Demographics of sample patient population (N=208)

Groups	Oesophageal cancer patients N=87	Percentage (%)	Other cancer patients N=61	Percentage (%)	Non-cancer patients N=60	Percentage (%)
Eyes Water	58	66.7	31	50.8	18	30.0
Smoking (N+P)	49	56.3	15	24.6	16	27.0
Smoking and alcohol	43	49.4	16	26.2	16	27.0
Beer fermented with infected maize	44	50.6	25	41.0	10	16.7
Sex						
Males	47	54.0	7	11.5	20	33.3
Females	40	46.0	54	88.5	40	66.7

The Pearson Chi-Square Test was used to test whether there was no association (null hypothesis) between the three groups and other variables eg, family history, eyes water, smoking, smoking and consumption of beer fermented with infected maize and infected beer subgroups.

patients were assigned and the number of males and females in each group.

Statistical Analysis

The Pearson chi-square test was used to test whether an association existed (null hypothesis) between esophageal carcinoma, non-esophageal carcinoma and non-cancer patients with regard to the four subgroups. Nonparametric statistical analysis (Kruskal-Wallis one-way ANOVA) was used to compare the age distribution in the three groups.

RESULTS

Age Distribution in Three Patient Groups

Patient recruitment was sequential and followed non-probability methods. The mean age of the esophageal cancer patients was 56.5 ± 1.1 years. The mean age of the non-cancer patients was 43.6 ± 1.9 years, indicating that non-cancer patients were not purposefully age matched to the cancer patients. The mean age of other-cancer patients was 53.1 ± 1.8 years.

Family History

We found a significant difference in the number of cases with family history of cancer between esophageal carcinoma and non-cancer patients, although the number of patients was too small for statistical purposes (data not shown). Those with esophageal carcinoma reported the largest number of cases of family history of cancer, more than any of the other two patient groups.

Other Factors Linked to Esophageal Cancer

In most Black African households, fire wood is used to cook meals. The smoke and the watering of the eyes it causes from this method of cooking appeared to be linked to esophageal carcinoma. More esophageal cancer patients experienced watering eyes than the non-cancer patients. The significance

was confirmed by Fisher’s exact test and the very large Pearson chi-square of 19.12. Other-cancer patients also experienced less watering of the eyes than those with esophageal cancer (P=.05). This finding was also confirmed by Fisher’s exact test P values of .04 and .06.

Those with esophageal carcinoma were more likely to have smoked than non-cancer patients and other-cancer patients. The largest number of cases who were smokers was in the esophageal carcinoma group. There was no significant difference in the number of cases for smokers between the other-cancer and non-cancer patients (P=.79).

In our investigation, we found more smokers and drinkers in the esophageal cancer group compared to the non-cancer or other-cancer group. There was no significant difference in the number of cases between other-cancer and non-cancer patients (P=.96). In addition, the esophageal cancer group had the highest number of cases who consumed beer fermented with infected maize, a finding that has been reported in other studies.

DISCUSSION

Ethnicity is a strong indicator of risk for this disease because ethnic groups tend to share similarities in diet and geography. There are, however, several reports that indicate an increased incidence of esophageal cancer among blood relatives, suggesting a genetic link to the disease.^{6,7} A follow-up survey of 622 families with a history of esophageal cancer was conducted in China; the results showed that offspring whose parents died from esophageal cancer had a higher mortality rate from the same disease.⁸ Our study, performed in a single ethnic group, shows a similar trend between esophageal cancer and family history of the disease. Such a family association could also arise from the fact that Zulus are a closely knit cultural group who share dietary habits and lifestyle. In addition, the use of fire wood to cook meals in most Black African houses may be a contributor to higher rates of esophageal cancer.

The role of tobacco abuse in the etiology of esophageal carcinoma appears to be well established.⁹ Results obtained from well-designed case-controlled studies report an association between cigarette smoking and risk of esophageal carcinoma.¹⁰ Pipe and cigar smokers have a greater risk of cancer of the oral cavity and the esophagus rather than cigarette smokers. It has been proposed that pipe tobacco residues are swallowed into the esophagus, allowing close contact of the tobacco carcinogens with the esophagus.¹⁰ Hand-rolled cigarette smoking is also associated with a higher risk of esophageal carcinoma, compared with the use of commercial cigarettes.¹¹ The risk increases with increasing number of cigarettes and duration of the smoking habit.¹¹

Alcohol and tobacco abuse in the etiology of esophageal carcinoma is well established.¹¹ It has been estimated that more than 80% of esophageal cancer cases in industrialized countries can be attributed to exposure to these lifestyle choices, either singly or jointly.¹² Differential risks for esophageal carcinoma are observed also with different types of alcoholic drink.¹³ For any given level of ethanol intake, the risk from spirits is usually more than twice that from beer; the risk from wine is intermediate between that from spirits and that from beer.¹⁴

Fungi have also been implicated as etiological agents in the cancer of the esophagus.¹⁵ Studies of esophageal carcinoma in China showed that some common species of fungus, belonging to the genera *Fusarium*, *Alternaria*, *Geotrichum*, *Aspergillus*, *Cladosporium*, and *Penicillium*, are frequently detected in grain.¹⁶ Of the various infections of the esophagus, fungal infections, particularly those of *Candida* species, are by far the most common.¹ The presence of a high level of mycotoxins, such as Fumoin B1 (a cancer promoter), in the moldy corn samples and the capability of producing nitrosoamines (carcinogens) by *Fusarium* may play an important role in esophageal carcinogenesis in Black Africans.^{5,17,18}

Limitations

Several limitations should be considered in reviewing our results. It could be argued that the interviews represent qualitative data; however, they represent a valid aspect of social science research. Questions directed to determine the degree of eye watering, the number of cigarettes smoked, and the amount of alcohol consumed could not be quantified in the Zulu patients, and therefore they had to be recorded in a finite manner as "yes" or "no" answers.

CONCLUSION

Our study demonstrated a clear connection between esophageal cancer and lifestyle choices in the groups who participated in the study. Those with esophageal cancer had

higher rates of smoking, drinking alcohol, and drinking fermented beer with infected maize than these in either of the other two groups of non-cancer and other-cancer patients.

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Design and concept of study: Dlamini, Bhoola
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Data analysis and interpretation: Dlamini, Bhoola

Manuscript draft: Dlamini, Bhoola

Statistical expertise: Dlamini, Bhoola

Acquisition of funding: Dlamini, Bhoola

Administrative, technical, or material assistance: Dlamini, Bhoola

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