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Descriptive epidemiology of esophageal carcinoma in the Ohio Cancer Registry☆

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Abstract

Background: Etiologic factors and demographics in esophageal cancer have not been fully characterized at a population-level. This study aimed to compare incidence rates of esophageal adenocarcinoma (EAC) and squamous cell carcinoma (ESCC) by race. Other aims were to evaluate the impact of race, age, gender, and histology on presenting stage, and to describe tobacco use history in EAC as documented in a cancer registry. *Methods*: Invasive esophageal cancer cases reported to Ohio's Cancer Registry 1998–2002 were identified. Incident staged EAC and ESCC cases were analyzed for factors associated with metastatic disease. *Results*: 930 ESCC and 1801 EAC cases were identified. African-Americans had higher ESCC incidence than whites (5.0 versus 1.3 cases/100,000/year). However, whites had higher EAC incidence (3.3 versus 0.8 cases/100,000/year). 77% of EAC cases with available tobacco history were reported in tobacco users. In univariate analyses, race, age, gender, and histology differed significantly by stage. 31% of patients aged ≥65 presented with distant stage, versus 26% of those <65 ($p < 0.001$). 32% of African-Americans had distant stage, versus 34% of whites ($p = 0.048$). In logistic regression modeling, male gender [OR 1.76, CI (1.15, 2.67)] and age <75 [OR 1.95, CI (1.21, 3.15)], but not race, predicted distant stage ESCC. Distant stage EAC was associated with age <56 [OR 1.82, CI (1.39, 2.38)] but not significantly associated with African-American race ($p = 0.062$) for the sample size available. *Conclusions*: Whites had higher EAC rates, and African-Americans had higher ESCC rates. African-Americans were not more likely than whites to present with metastatic ESCC.

Keywords: Esophagus; Adenocarcinoma; Squamous cell carcinoma; Esophageal neoplasm; Neoplasm staging; Neoplasm metastasis; Incidence; Tobacco; Smoking; Race

1. Introduction

The incidence of esophageal cancer has risen rapidly over the past several decades, with a sharp increase in the incidence of esophageal adenocarcinoma (EAC) over that of esophageal squamous cell carcinoma (ESCC) [1]. Risk factors for EAC include obesity, white race, male gender, and Barrett's esophagus [2,3]. While tobacco use is a strong risk factor for ESCC, its role in the development of EAC is less clear. Although some studies have suggested that tobacco exposure is linked to EAC [4,5], others have found no association [6,7].

While relatively uncommon, esophageal cancer is usually fatal, with a relative 5-year survival rate of only 16% in the United States [8]. Survival is worse in African-Americans, who tend to present at a later stage. However, within a given stage, 5-year survival is lower in African-Americans than in whites [8].

Given the rising incidence of EAC and prior evidence for demographic factors in esophageal cancer, the primary goal

☆ Cancer incidence data used in this study were obtained from the Ohio Cancer Incidence Surveillance System, Ohio Department of Health (ODH), a registry participating in the National Program of Cancer Registries of the Centers for Disease Control and Prevention (CDC). Use of these data does not imply ODH or CDC either agrees or disagrees with any presentations, analyses, interpretations, or conclusions. Information about the OCISS can be obtained at: http://www.odh.ohio.gov/odhprograms/svio/ci_surv/ci_surv1.aspx.

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of this study was to compare age-adjusted incidence rates of adenocarcinoma and squamous cell carcinoma by race and gender. Other aims were to investigate the impact of race, age, gender, and histology on stage at presentation, and to describe tobacco use history as reported for cases of esophageal adenocarcinoma. We used data from the state Cancer Registry of Ohio to address these aims.

2. Materials and methods

The Ohio Cancer Incidence Surveillance System (OCISS) State Cancer Registry of the Ohio Department of Health was established in 1991. By state law, all primary malignancies except for non-melanoma skin cancers and carcinoma in situ of the cervix diagnosed in Ohio residents on or after January 1, 1992 are required to be reported to OCISS. Data regarding cases of esophageal cancer diagnosed 1998–2002 were requested from the OCISS. The North American Association of Central Cancer Registries (NAACCR) awarded the OCISS Silver Certification for the high quality of its incidence data for all years of this study period. NAACCR evaluates cancer registry data annually based on data quality index indicators including case ascertainment completeness, data timeliness, and degree of missing demographic data and assigns certification status of ''gold,'' ''silver,'' or ''other with feedback'' accordingly. The following data elements were obtained from the OCISS: age at diagnosis, gender, race, histology, history of previous malignancy, stage, date of diagnosis, tobacco use, and anatomical site of the cancer. Race was documented in the registry as assigned by provider report. A data user's agreement was submitted to the OCISS, and data was maintained on a password-protected computer. Because of the lack of patient identifiers and the inability to obtain informed consent, the study was deemed exempt from formal Institutional Review Board (IRB) approval at University Hospitals Case Medical Center.

Cases of invasive esophageal cancer diagnosed 1998–2002 were included, the most recent years for which data with reliable race information was available. Cases of lymphoma, carcinoma in situ, or cases without tissue confirmation were excluded. Stage at diagnosis was reported as localized, regional, or distant. Although the OCISS is not part of the Surveillance, Epidemiology, and End Results (SEER) program, the SEER summary stage variable was used because not all the data elements employed in the AJCC algorithm have been validated. Therefore, stage was localized if the tumor was confined to its site of origin and regional if the tumor had spread to adjacent organs by direct extension and/or had spread to regional lymph nodes. Classification of histologic variants into EAC and ESCC subtypes was made based upon consultation with Dr. Joseph Willis, gastrointestinal pathologist at University Hospitals Case Medical Center. The following International Classification of Diseases for Oncology, Third Edition (ICD-O-3) codes were classified as esophageal adenocarcinoma: 8140, 8143, 8144, 8211, 8255, 8260, 8262, 8323, 8480, 8481, and 8490. The following ICD-O-3 codes were classified as esophageal squamous cell carcinoma: 8032, 8051, 8070, 8071, 8072, 8073, 8074, 8076, 8083, and 8094. ICD-O-3 codes for less differentiated histologies or uncommon histologies, which could be inadvertently misclassified, were categorized as others: 8000, 8010, 8012, 8020, 8041, 8046, 8050, 8075, 8145, 8240, 8246, 8560, 8720, 8890, and 8935.

2.1. Incidence rates

The total number of cases of histologically confirmed invasive esophageal cancers was determined, as well as the total number of invasive EAC or ESCC cases further stratified by race and gender. Given the paucity of cases diagnosed in younger patients, cases were categorized into four age groups: <55 years old, 55–64 years old, 65–74 years old, and >74 years old. Age-specific rates were calculated for these age groups and incidence rates adjusted for age with direct standardization using U.S. Census 2000 data regarding the Ohio population. 95% confidence intervals (95% CI) were obtained using a 1-sample proportions test without continuity correction.

2.2. Tobacco use

Tobacco use history was reported to the OCISS by providers as any of the following categories: no history of tobacco use; current cigarette use; current pipe or cigar use; current snuff, chewing tobacco, or smokeless tobacco use; current use of a combination of the previously listed categories of tobacco; and previous use of tobacco. Current tobacco users were defined as those using tobacco of any form at the time of diagnosis or who had quit within the past year. Former tobacco users were patients who had quit over a year prior to cancer diagnosis. Because the vast majority of current tobacco users were cigarette smokers, current tobacco use in the form of cigarettes, cigars, pipe smoking, snuff, chew, or smokeless tobacco, or any combination of these forms was grouped together.

2.3. Analysis of stage at presentation

Cases with history of previous malignancy were excluded from analysis of stage at presentation because metastases from prior cancers might inadvertently affect stage. Unstaged cases and cases with missing race information were excluded. Due to the small number of cases with race reported as ''Asian'' or ''Other,'' analysis was limited to major race groups (African-American or white). Cases were grouped by stage (localized, regional, or distant) and further stratified by race, histology, age, and gender.