Effect of type of alcoholic beverage on the risks of upper aerodigestive tract cancers in Brazil

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Abstract

Objectives: We investigated the effects of alcohol consumption on the risk of cancers of the upper aerodigestive tract (UADT) in a hospital-based case–control study in Brazil.

Methods: A total of 784 cases of cancers of the mouth, pharynx, and larynx and 1578 non-cancer controls matched on age, gender, hospital area, and admission period provided information on alcohol drinking, smoking, and other characteristics via interview. Using logistic regression, we evaluated the relative risks (RR) of UADT cancer for different beverage types based on cumulative ethanol content exposure and frequency of consumption.

Results: Relative to nondrinkers of any alcohol, risks of UADT cancers varied across sites both with increased exposure to ethanol and by alcohol type. RRs at equivalent levels of ethanol consumption were highest for cancers of the mouth for hard liquor (6.9 for >100 kg lifetime consumption, 95% confidence interval (CI) = 2.8–17.1) and cachaça (4.5 for 101–500 kg, 95% CI = 2.2–9.0). Although RR increased with frequency of drinks per week, when evaluated against higher proportional alcohol intake, reductions in risk were observed for beer and wine.

Conclusion: Although methods of measurement can influence the interpretation of the carcinogenic nature of alcohols, increased RRs persisted with continued exposure for all types.

Introduction

Alcohol drinking and tobacco smoking have long been identified as the two most important risk factors for upper aerodigestive track (UADT) cancers [1, 2]. Alcohol drinking has long been suspected as an independent risk factor for cancers of the UADT, including the larynx [3, 4]. Several epidemiological studies have demonstrated independent risk effects from alcohol intake [5, 6] that vary by alcohol type [7–9] and by cancer site [10, 11]. Various hypotheses have been postulated as to what the cancer-causative agents in alcohol may be, ranging from ethanol content [12] to organic solvents [13]. Varied risk associations by type of alcohol have been observed in prior studies primarily due to difficulties in dealing with the highly correlated nature of drinking behaviors for different types of alcohol [8, 9]. Little is known, however, about the risk effects associated with consumption of different beverage types at comparable levels of cumulative alcohol intake.

We analyzed data from a large hospital-based case–control study of UADT cancers to assess the independent role of alcohol consumption by type on disease risk. In a previous report, we investigated the interaction effects of tobacco and alcohol and the effects of cumulative alcohol drinking among never-smokers [6]. The study was conducted in populations from Central and Southern Brazil, areas known for their high incidence of UADT cancers [14, 15]. Alcohol consumption in these regions of Brazil include beer, wine, and various forms of hard liquor or spirits. Also common in Brazil is the consumption of a strong alcoholic beverage, cachaça, distilled from sugar cane. We compared the risk of cancer across specific UADT sites and investigated the separate effects of alcohol type among those
with both substantial and little or no reported smoking exposure.

Materials and methods

Population

Seven hundred and eighty-four patients with newly diagnosed carcinomas of the oral cavity (International Classification of Diseases, version 9 (ICD-9) 140–145), pharynx (ICD-9 146–149), and larynx (ICD-9 161) were selected from hospitals in three metropolitan areas of Brazil: São Paulo, Curitiba, and Goiânia, between February 1986 and January 1989. All new cases of head-and-neck cancer, confirmed histopathologically, were considered eligible excepting patients with tumors of the salivary gland (ICD-9 142) or nasopharynx (ICD-9 147). Patient accrual in all oncology centers included almost all incident cases occurring in each area over the period of study with the exception of the head-and-neck surgery service in São Paulo, which is responsible for about 20% of all cases for the city.

One thousand five hundred seventy-eight control subjects were matched, two per case, on gender, 5-year age group, and trimester of admission. Controls were recruited from the same or nearby hospital as the index case. Reasons for hospitalization among controls ranged from digestive system diseases (ICD-9 520–579) (26%), to cardiovascular diseases (ICD-9 390–459) (24.9%), to trauma and poisoning (ICD-9 800–999) (8.6%), to genitourinary tract diseases (ICD-9 580–629) (7.5%) and respiratory system diseases (ICD-9 460–519) (6.1%). Patients with mental disorders (ICD-9 290–319) or neoplastic diseases (ICD-9 140–239) were not eligible for participation. In total, nine cases were eliminated before matching: one refused, seven interviews were interrupted due to physical conditions, and one was excluded when no suitable controls were identified.

Risk factor information

Trained nurses carried out all interviews before treatment. Information on sociodemographic status, health conditions, environmental and occupational exposures, tobacco and alcohol consumption, diet, and oral hygiene were collected using standardized questionnaires.

Lifetime consumption of alcohol was collected for all types of alcoholic beverages, including beer, wine, hard liquor, and cachaca. Consumption was expressed in two different ways. First, as expression of cumulative exposure, we combined data on frequency and volume of alcohol consumption into a synthetic index, which expressed lifetime consumption of ethanol in kilograms. Ethanol concentration was estimated as follows: beer = 5%, wine = 10%, hard liquor and cachaca = 50%. Secondly, we used an expression of exposure frequency based on the reported number of glasses per week consumed overall and for each alcohol type. Subjects were also further grouped according to the percentage of total alcohol consumed of each type in kilograms of ethanol.

Information on tobacco smoking was likewise expressed in a cumulative exposure measure (pack-years) corresponding to smoking one pack of cigarettes (20 cigarettes) per day for 1 year. Tobacco dose equivalents were calculated as follows: 20 manufactured cigarettes = four hand-rolled, black tobacco cigarettes = four cigars = five pipefuls with regular pipe tobacco = one pack.

Statistical analysis

We estimated relative risks (RR) of disease associated with different levels of alcohol consumption by computing odds ratios and their respective 95% confidence intervals (CI) by multivariate logistic regression using conditional maximum-likelihood estimation preserving the matching used in the design [16]. Analyses were performed using MULTLR, a public domain logistic regression software [17] and Stata® version 6 (Texas, USA).

The potential for confounding was examined for all sociodemographic, dietary, occupational, environmental, and oral hygiene variables collected. Empirical confounders were selected based on a 5% change-in-estimate criterion for the mutually adjusted RRs for alcohol and smoking [18] and subsequently controlled for in all models. Statistical test of trend in dose response–relationship for a given variable was assessed in models containing the factor treated as an ordinal variable. Since drinking of some types of alcohol is associated with certain cultural and socioeconomic levels, we also included some a-priori sociodemographic variables in the models.

Results

A total of 784 cases were recruited across the three centers: 213 (27.2%) in São Paulo, 380 (48.5%) in Curitiba, and 191 (24.4%) in Goiânia. Among these, 373 (47.6%) were patients with oral cancer, 217 (27.7%) with pharyngeal cancer, and 194 (24.7%) with laryngeal cancer. There was little difference in distribution of