



Cancer cases attributable to alcohol consumption in Brazil



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ARTICLE INFO

Article history:

Received 14 November 2015

Received in revised form

9 April 2016

Accepted 20 May 2016

Keywords:

Alcohol consumption

Cancer

Incidence

Population attributable fraction

Risk

ABSTRACT

This is the first study specifically estimating the proportion of new cancer cases that could be attributable to alcohol consumption in the year 2012 in Brazil. The proportion of exposed cases and the association between alcohol and lip and oral cavity, nasopharynx, other pharynx, larynx, esophagus, colorectum, female breast, liver, and intrahepatic bile ducts cancers was based on data made available by the Integrator System of Hospital Cancer Registries. The cancer incidence was obtained from the estimates produced by GLOBOCAN. In 2012 there were 437,592 new cancer cases in Brazil, excluding non-melanoma skin cancers. Of these, alcohol consumption was responsible for 4.8% of all new cases. The alcohol-attributable fraction was higher for men (7.0%) than for women (2.6%). A total of 21,000 new cancer cases, 15,554 in men and 5,646 in women, could be attributable to alcohol consumption. In Brazil, a significant fraction of cancer cases can be attributed to alcohol consumption, and public health measures to prevent heavy alcohol use should be implemented.

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Introduction

Alcohol consumption is one of the most important known causes of human cancer after tobacco smoking (Boffetta, Hashibe, La Vecchia, Zatonski, & Rehm, 2006). Although since the first half of the twentieth century there have been suspicions that alcohol was involved in the production of cancer (Doll & Peto, 1981), only in the last 25 years has it been recognized that long-term alcohol consumption increases the risk of cancer. Since 1988, the International Agency for Research on Cancer (IARC) indicated that malignant tumors of the oral cavity, pharynx, larynx, esophagus, and liver are causally related to the consumption of alcoholic beverages (IARC, 1988). IARC included alcohol consumption in the group of substances, mixtures, and exposure circumstances that are carcinogenic to humans (IARC Group 1 carcinogens) (IARC, 1988). A large number of epidemiological studies have demonstrated the association between alcohol ingestion and the occurrence of different types of cancer. More recently, Roswall and Weiderpass (2015) extensively reviewed the 2007 World Cancer Research Fund/American Institute for Cancer Research Report (WCRF & AICR, 2007)

and the 2012 IARC monograph (IARC, 2012), and concluded that there is convincing scientific evidence that alcohol can cause cancer of the oral cavity, pharynx, larynx and esophagus in men and women, colon, and rectum in men, and cancer of the breast in women. The two reports diverge on the evidence for the association with liver cancer and colon and rectum cancer in women. A recent systematic literature review analyzing the association between alcohol consumption and the development of cancer confirmed these data and added that there are still increased risks of developing cancer of the prostate and central nervous system in men (de Menezes, Bergmann, & Thuler, 2013).

The mechanisms by which alcoholic drinks exert their mutagenic and carcinogenic effects are not fully understood, but several biological mechanisms have been proposed: genotoxic effect of acetaldehyde (a metabolite of ethanol); induction of cytochrome P450 2E1; increased level of estrogen (important for breast carcinogenesis); solvent for tobacco carcinogens; production of reactive oxygen and nitrogen species; angiogenesis; nutritional deficiencies (e.g., vitamin B6, methyl donors) or excesses (vitamin A, β -carotene); reduced immune surveillance, and changes in folate metabolism (Boffetta et al., 2006; IARC, 2010). For some cancers, there is a synergistic effect of drinking alcohol and smoking tobacco that substantially surpasses the risk from any isolated factor. Concurrent alcohol and tobacco dependence may be influenced by a variety of genetic, neurobiological, conditioning, and psychosocial mechanisms (Drobes, 2002). Also, it is well known that the risk of cancer

Funding sources: The authors declare that they have no funding sources.

Conflict of interest: The authors declare that they have no conflicts of interest.

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<http://dx.doi.org/10.1016/j.alcohol.2016.05.004>

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depends on the type of alcoholic beverage consumed and increases with increasing consumption of alcohol, producing a dose–response relationship (Collaborative Group on Hormonal Factors in Breast Cancer, 2002; Corrao, Bagnardi, Zamboni, & La Vecchia, 2004; WCRF & AICR, 2007).

Several authors have analyzed the proportion of new cancer cases that can be attributed to alcohol. In France, it was estimated that among men and women, 10.8% and 4.5%, respectively, of all cancer cases in the year 2000 were attributable to alcohol consumption (IARC, 2007). An estimate of the global number of cancer cases attributable to alcohol consumption was published in 2006 and stated that 3.6% of all cancers (5.2% in men and 1.7% in women) were caused by alcohol (Boffetta & Hashibe, 2006). In another study, including eight European countries (France, Italy, Spain, United Kingdom, the Netherlands, Greece, Germany, Denmark), among men and women, 10% (95% confidence interval 7–13%) and 3% (1–5%), respectively, of the 2008 cancer incidence was attributable to former and current alcohol consumption (Schütze et al., 2011). On the other hand, in Australia these figures ranged from 2.2% to 6.5% in both sexes for the year 2009 (Cancer Council Australia Public Health Committee, 2012). Differences in these statistics result mostly from variations in the prevalence of consumption in the populations (Testino, 2011). Additionally, with regard to the number of deaths that can be attributable to alcohol consumption, in one of the earliest studies on the subject, Rothman (1980) estimated that in 1974 about 3% of all U.S. cancers were attributable to alcohol. At almost the same time, Doll and Peto (1981) estimated that for U.S. cancer deaths in 1978, the true percentage lay outside the range of 2–4%. More recently, Rehm and colleagues (Rehm et al., 2009) concluded that 4% of all cancer deaths worldwide were attributable to alcohol use.

In Brazil, alcohol consumption has increased in recent years. Rising use in the youth population, increased marketing of the industry, fragile public health infrastructure, and scarcity of governmental policies and control programs may explain this increase (Caetano & Laranjeira, 2006). Data from the World Health Organization (WHO) (2014) and 2° Levantamento Nacional de Álcool e Drogas (Laranjeira, 2014) showed that half of the Brazilian population aged 15 years or older had drunk alcohol at least once in the previous 12 months. In 2010, alcohol consumption was 7.2 L of pure alcohol per capita in the country, which is considered medium to high. The beverage which Brazilians drink the most is beer (61% of the total consumption of alcoholic beverages in the country), followed by wine (25%) and spirits (12%). Among the spirits, the most consumed is cachaça, followed by whiskey and rum. Data from a telephone survey in 2010 involving 54,339 adults, in all Brazilian state capitals and in the Federal District, showed that a history of alcohol abuse is a matter of concern in both men (26.8%; 95% CI 25.2–28.3) and in women (10.6%; 95% CI 9.7–11.4) (Iser, Yokota, de Sá, de Moura, & Malta, 2012). To our knowledge, no study to date has assessed the number of new cancer cases attributable to alcohol consumption in the Brazilian population. Therefore, the objective of this study is to estimate the number of new cancer cases that can be attributed to alcohol consumption in the year 2012 in Brazil.

Methods

This is an observational study based on secondary data. The Population Attributable Fraction (PAF) measures the proportion and number of cancer cases that would not have occurred if the exposure had been nonexistent. The calculation of PAF depends on two variables: the prevalence of exposure and the risk of disease. In this study, the proportion of cases in the Brazilian population that could be attributed to alcohol exposure in 2012 was estimated as follows:

$PAF = Pc (aOR - 1) / aOR$, where Pc is the alcohol exposure prevalence among the cases and aOR is the adjusted odds ratio (Nurminen & Karjalainen, 2001).

The risk estimates (odds ratios adjusted by sex, age, race, education, marital status, smoking, region of residence, and year of diagnosis) concerning the association between alcohol consumption and the development of each cancer type were obtained from a Brazilian case–control study comprising 203,506 cancer cases (de Menezes, Bergmann, Aguiar, & Thuler, 2015). The data source for this study was the web-based system of Hospital Cancer Registries in Brazil (Integrator System). This secondary database was also used to estimate the proportion of exposure to alcohol in cancer cases used in the present study. PAFs were calculated only for the cancer types associated with alcohol based on the evaluation of the IARC (IARC, 2012), WCRF/AICR (WCRF & AICR, 2007), and a systematic literature review (de Menezes et al., 2013): lip and oral cavity (C00–08); nasopharynx (C11); other pharynx in men (C09–10; C12–14); larynx (C32); esophagus (C15); colorectum (C18–21); female breast (C50); liver and intrahepatic bile ducts (C22) (Table 1).

In this study, data on cancer incidence were obtained from the estimates produced by GLOBOCAN for the year 2012 (Ferlay et al., 2012), since estimates produced by the Brazilian National Cancer Institute (INCA) for the years 2014 and 2015 (Brasil, 2013), although more current, did not include the cancers of pharynx, larynx in women, and liver.

We have obtained the absolute number of alcohol-attributable cancer cases by multiplying the population attributable fraction with the total number of new cancer cases estimated for 2012, for each type of cancer by sex, and summed them.

We conducted data analyses by using SPSS version 21.0 (IBM Corp., Armonk, NY, USA) and Excel 2007 (Microsoft Corporation, Redmond, WA, USA).

Results

In 2012 there were 437,592 new cancer cases in Brazil, excluding non-melanoma skin cancers. Of these, alcohol consumption was responsible for 4.8% of all new cases (7.0% of 223,077 cases in men and 2.6% of 214,515 cases in women) (Table 2).

Table 1

Adjusted odds ratios, proportion of exposed cases, and population-attributable fraction.

Cancer site (ICD-10)	Men			Women		
	aOR ^a	Pc ^b	PAF (%) ^a	aOR ^a	Pc ^b	PAF (%) ^a
Lip, oral cavity (C00–08)	3.0	71.9	47.9	2.3	27.5	15.5
Nasopharynx (C11) ^c	1.7	48.5	20.0			
Other pharynx (C09–10 and C12–14) ^d	3.8	26.7	19.7	3.9	5.7	4.2
Larynx (C32)	2.5	68.0	40.8	2.4	32.7	19.1
Esophagus (C15)	3.6	73.9	53.4	3.5	33.7	24.1
Colorectum (C18–21)	1.3	36.9	8.5	1.3	9.8	2.6
Female breast (C50)				1.6	13.3	5.0
Liver and intrahepatic bile ducts (C22)	2.8	56.2	36.1	1.9	17.0	8.1

aOR: Adjusted odds ratio; Pc: Proportion of exposed cases; PAF: population-attributable fraction

ICD-10: The 10th revision of the International Statistical Classification of Diseases and Related Health Problems.

^a de Menezes et al., 2015.

^b Hospital Cancer Registries in Brazil (Integrator System).

^c There is no association between alcohol consumption and nasopharynx cancer in women.

^d There was no data available for the tonsils (C09) and Unspecific parts of the pharynx (C14).

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