

Alcohol consumption pattern and Coronary Heart Disease risk in Metropolitan São Paulo: analyses of GENACIS Project

Consumo de álcool e risco para doença coronariana na região metropolitana de São Paulo: uma análise do Projeto GENACIS

Maria Cristina Pereira Lima¹

Florence Kerr-Côrrea¹

Jurgen Rehm^{II}

¹ Botucatu Medical School, São Paulo State University (UNESP), Botucatu, SP, Brazil.

^{II} Social and Epidemiological Research (SER) Department, Centre for Addiction and Mental Health, Toronto, Canada; Population Health Research Group, CAMH, Canada; Addiction Policy, Dalla Lana School of Public Health, University of Toronto (UofT), Canada; Department of Psychiatry, Faculty of Medicine, UofT, Canada; PAHO/WHO Collaborating Centre on Mental Health & Addiction; Epidemiological Research Unit, Technische Universität Dresden, Klinische Psychologie & Psychotherapie, Dresden, Germany; Graduate Department of Community Health and Institute of Medical Science, UofT.

The present research project refers to the analysis of data from the "Gender, Alcohol and Culture: an International Study" (GENACIS) conducted in São Paulo, Brazil. This project was performed in a postdoctoral training program at the Centre for Addiction and Mental Health, University of Toronto, Canada (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES, Processo BEX3552/07-1)

Corresponding author: Maria Cristina Pereira Lima. Departamento de Neurologia e Psiquiatria, Faculdade de Medicina de Botucatu, Universidade Estadual Paulista Júlio de Mesquita Filho, Distrito de Rubião Jr., Botucatu, SP, Brazil, 18618-000. E-mail: kika.botucatu@gmail.com

Abstract

Objectives: To examine the association between patterns of drinking and coronary heart disease (CHD) risk in a population sample. **Methods:** A population-based cross-sectional study carried out from January 2006 to June 2007, in Metropolitan São Paulo, Brazil, in conjunction with the international collaborative GENACIS project (Gender, Alcohol, and Culture: an International Study), with PAHO support. The subjects (1,501; 609 men, 892 women) of this study were residents of randomly chosen households aged 30 years and above who consented to provide information. The dependent variable was cardiac risk as assessed by the WHO Rose Angina Questionnaire. Logistic Regression analysis was used and the data were adjusted for Body Mass Index (BMI) and smoking. **Results:** The response rate was 75%. Being female, older, African-American, a current smoker, and having a greater BMI were associated with higher risk of coronary heart disease. Lifetime abstainers (OR = 2.22) and former drinkers (OR = 2.42) had greater CHD risk than those who consumed up to 19g pure alcohol per day, with no binge. Among those who had binged weekly or more there was a tendency toward higher risk (OR = 3.95, p = .09). **Conclusions:** Our findings suggest a lower risk for CHD among moderate drinkers. It is important, in studies which were investigating cardiac risk, assess heavy alcohol use, since it can change that risk. Also, effective public policies are needed to reduce harmful drinking and related morbidity in Brazil.

Keywords: Alcohol. Alcohol consumption. Coronary heart disease. Cross-sectional study. Epidemiology.

Resumo

Objetivos: Examinar a associação entre consumo de álcool e risco para doença coronariana em amostra populacional.

Métodos: Estudo transversal, de base populacional, conduzido de janeiro/2006 a junho/2007, na região metropolitana de São Paulo, como parte do estudo internacional (*Gender, Alcohol, and Culture: an International Study*). Os sujeitos (1.501, sendo 609 homens e 892 mulheres) eram residentes da região metropolitana de São Paulo, tinham 30 anos ou mais de idade e foram selecionados aleatoriamente, a partir de amostragem complexa por conglomerados. Todos os indivíduos consentiram em participar da pesquisa. A variável dependente foi risco cardíaco avaliado através do *WHO Rose Angina Questionnaire*. A análise multivariada consistiu em regressão logística, tendo sido realizado ajuste para uso de tabaco e índice de massa corpórea.

Resultados: A taxa de resposta foi 75%. Ser mulher, ter mais idade, ser negro, fumante e ter um índice de massa corpórea elevado, foram associados a maior risco para doença coronariana. Indivíduos que nunca beberam na vida (OR = 2,22) e ex-bebedores (OR = 2,42) tiveram maior risco de doença cardíaca do que aqueles que informaram beber até 19 g de álcool por dia, sem episódios de beber excessivo. Entre os que tiveram episódios de embriaguês observou-se uma tendência a maior risco (OR = 3,95, $p = 0,09$).

Conclusões: Nossos achados sugerem um menor risco para doença coronariana entre os bebedores moderados. Destaca-se que os estudos que avaliam o impacto do álcool sobre doença cardíaca precisam identificar o padrão de uso de álcool dos sujeitos, visto que este aspecto pode modificar o risco. Políticas públicas são necessárias para reduzir o uso nocivo de álcool e a morbidade a ele relacionada no país.

Palavras-chave: Álcool. Consumo de álcool. Doença coronariana. Estudo transversal. Epidemiologia.

Introduction

Epidemiological studies have shown that alcohol consumption is an important risk factor for burden of disease and social harm^{1,2}. The relationship between alcohol and cardiovascular disease (CVD), especially coronary heart disease (CHD) is still a controversial question. Although there is some evidence of the beneficial effects derived from light to moderate drinking for certain conditions³, some studies suggest an increased risk of CHD associated with heavy episodic drinking⁴⁻⁶. This kind of alcohol consumption could be associated with adverse effects on blood pressure or platelet activation. Mckee & Britton⁴ observed that binge drinkers had acquired adverse alterations in low-density lipoproteins without undergoing cardioprotective changes in high-density lipoproteins. Irregular drinking has been associated with an increased risk of thrombosis, occurring after drinking cessation and predisposing towards histological changes in both the myocardium and conducting systems and towards a reduction in the ventricular fibrillation threshold. In fact, the association between binge drinking and CHD death appears to meet standard causality criteria⁷. Moreover, there is evidence that alcohol consumption is also associated with non-submission to preventive cardiovascular tests⁸.

Given the global epidemiological transformation towards longer life, CVD has become increasingly important to middle-income countries such as Brazil, with most of the CVD burden related to CHD^{9,10}. However, few Brazilian studies have examined the relationship between alcohol and CVD or its subcategories. Moraes et al.¹¹ found a positive association between incident cardiovascular disease and alcohol consumption (measured in grams per day). In another study, Piegas et al.¹² observed that alcohol intake was a protective factor against acute myocardial infarction. Unfortunately, these works have no measured alcohol consumption, which could explain the apparently incongruent results^{11,12}.

The present study aimed to examine the association between CHD and the drinking patterns of adults living in Metropolitan Sao Paulo, Brazil. It is hypothesized that there is an association between cardiac risk and binge drinking, indicating that a higher level of binge drinking will be associated with higher cardiac risk.

Methods

This study is part of the GENACIS project, an acronym for Gender, Alcohol, and Culture: an International Study. It is a cross-sectional survey study carried out in the metropolitan area of São Paulo (MSP), Southeastern Brazil, which encompasses 39 cities and the capital of Sao Paulo state, including a population of 19 million. This research formed part of a collaborative study with the support of the Pan American Health Organization (PAHO), aimed at investigating alcohol consumption and gender. The survey was carried out between January 2006 and June 2007.

Subjects

Subjects in this study were individuals aged 30 years or over, living in households randomly selected from a stratified two-stage cluster sample, with census tract and household as sampling units. This sample is representative of the MSP. Respondent aged 30 years or more were chosen because the risk of CHD related to lifestyle is higher in older subjects. The response rate was 75%; higher for men than women. The sample consisted of 1,489 subjects, 609 men and 892 women. More details on sampling can be found in Taylor et al.¹³.

Procedures

All interviewers had previous experience with household surveys and were specifically trained for this survey. A total of 10% of interviews were double-checked by supervisors for quality control. In an attempt to reverse refusals, letters expressing the

objectives, importance and expected impact of the study, as well as providing the credentials and contact information of the main investigators, were sent to those who had refused to participate at first attempt. The project website address (www.viverbem.fmb.unesp.br/pesquisa) was also included, so that study subjects could obtain detailed information.

Instruments

The main dependent variable was cardiac risk as assessed by the shortened version of the WHO Rose Angina Questionnaire (RAQ)¹⁴. This questionnaire consists of three questions: "Do you ever have any pain or discomfort in your chest? (Yes/No)", "When you walk at an ordinary pace on the level does this produce pain? (Yes/No)", "When you walk uphill or hurry does this produce pain? (Yes/No)". "Cardiac risk" has been defined by a response pattern of "yes" to the first question and "yes" to either the second or third questions.

It is important to highlight that the outcome is not cardiac disease, but its risk, estimated at the population level and corroborated by studies which have consistently found a positive association between responses to the RAQ and CHD in both sexes^{15,16}.

The main explanatory variable was alcohol use pattern, with control for demographic indicators, body mass index (BMI), and tobacco use. Alcohol use was estimated by self-reporting. The GENACIS questionnaire investigates quantity and frequency of different types of beverage in a typical day, minimizing bias. Alcohol intake was calculated in grams of ethanol consumed per day using all information on quantity, frequency, and type of beverage. One drink unit was standardized as 13g of ethanol. Subjects were classified according to alcohol consumption into: "*lifetime abstainers*", those reporting not having drunk at any point in their lives; "*former drinkers*" who reported not having drunk at all in the previous year; and "*drinkers*", who reported

having drunk in the previous year. In addition to the usual alcohol consumption, they were asked about heavy episodic (binge) drinking, defined as drinking five or more drinks in one day. Drinkers were classified as follows, according to the average daily alcohol intake and the presence or absence of heavy episodic drinking: those “*who drank up to 19g but without bingeing*”, “*who drank up to 19g with bingeing*”, and “*who drank 20g or more with or without bingeing*”. The “*current smoker*” category was described as daily or occasional smoking. Those who had never smoked were placed in the “*never smoked*” category, while those who had smoked and quit were described as “*former-smokers*”. The BMI was calculated as weight (kg) divided by height squared (m²), both measurements being self-reported.

Statistical Analysis

Multiple logistic regression was used to calculate odds ratio (OR) and 95% confidence interval (95%CI) with “*cardiac risk*” as the dependent variable. The associations between drinking and cardiac risk were analyzed with demographic variables and then adjusted for tobacco and body mass index. Additionally, interactions between ethnicity and drinking pattern were tested (Wald test) and models were compared using the likelihood ratio test¹⁷. All analyses were conducted using the Stata software, version 10.0 (Stata Corporation, College Station, Texas, USA), and the sample design weights were incorporated.

The present research project was approved by the Research Ethics Committee of the Botucatu Medical School – UNESP, on September 13th, 2004.

Results

Sample characteristics and CHD prevalence are shown in Table 1. With regard to alcohol use, the largest category was lifetime abstainers (32.5%), followed by those who drank up to 19g ethanol per day. Half the sample had never smoked and 21.6% were

current smokers. The prevalence of cardiac risk estimated by the RAQ was 7.9%.

The odds ratios for CHD, after controlling for demographic characteristics, smoking, and BMI, are shown in Table 2. Higher risks were observed for older subjects, women, former drinkers, and lifetime abstainers. The tendency towards higher risk in those who had drunk up to 19g per day with bingeing did not change with the inclusion of other variables. There were no significant interactions between drinking and smoking.

With respect to the other variables in the model, being black had a higher CHD risk when compared to white respondents (OR=1.98). Similarly, the odds ratio was higher for current smokers (OR=1.93) than those who had never smoked.

Discussion

In summary, a higher CHD risk was found in older and black individuals, women, former drinkers, lifetime abstainers, and smokers. There was a tendency toward higher risk for those who reported drinking up to 20g ethanol, but with binge drinking.

A potential protective effect in those who drank up to 19g of ethanol per day without bingeing has previously been described, compared to the remaining individuals. In fact, the protective effect has been part of folklore for centuries, and was first empirically demonstrated by Pearl in the 1920s¹⁸. In modern science, in 1974, Klatsky and colleagues started serious discussions about the protective effect of moderate drinking against CHD¹⁹. Since then, many researchers have tried to examine this point, some arguing that this protective effect occurred solely because abstainer groups had included former drinkers, the “*sick-quitter*” effect²⁰. Although it could explain a higher risk in this group, this specific misclassification error was eliminated from this study by separating former drinkers from lifetime abstainers. The present findings on cardio-protective effects in moderate drinkers are consistent with other studies, such as the

Table 1 - Demographic characteristics, drinking pattern, smoking and cardiac risk of Metropolitan Sao Paulo sample (n = 1,489).

Tabela 1 - Características sociodemográficas, uso de álcool, tabagismo e risco cardíaco em amostra da região metropolitana de São Paulo (n = 1.489).

	N	% adjusted ¹
Sex		
Male	601	46.2
Female	888	53.8
Age (years)²		
30-39	448	34.1
40-49	385	31.2
50-59	253	17.5
60 or more	402	17.2
Ethnic group		
White	877	59.4
Black	155	10.9
Mixed	405	26.9
Others	48	2.8
Alcohol use³		
Lifetime abstainers	577	32.5
Up 19g with no HED ⁴	462	32.4
Up 19g with HED	17	1.6
20g or more	92	7.5
Former-drinker	341	26.0
Tobacco use		
Never smoked	786	50.6
Former smoker	385	27.8
Current smoker	318	21.6
Cardiac Risk⁵		
No	1355	92.1
Yes	134	7.9

¹ Adjusted for design. ² One missing. ³ Alcohol volume in grams per day ⁴ HED=Heavy Episodic Drinking ⁵ Defined by the WHO-Rose Angina Questionnaire.

¹ Percentual ajustado para desenho amostral. ² Sem informação sobre 1 sujeito. ³ O volume de consumo de álcool está expresso em gramas de álcool por dia. ⁴ EBE=Episódio de beber excessivo. ⁵ Definido pelo WHO-Rose Angina Questionnaire.

case-control study by Piegas et al.¹², where one of the authors observed that alcohol intake was a protective factor against acute myocardial infarction. Unfortunately, the Piegas study did not investigate heavy episodic drinking, which made it impossible to know whether the protective effect existed with binge drinking. Likewise, the present study only showed a tendency for those

who reported drinking up to 19g with heavy episodic drinking to have lost the protective effect. With a larger sample, it should be possible to show the impact of binge drinking. In a cohort study of men with a healthy lifestyle, Mukamal et al.²¹ found a strong inverse association between CHD and alcohol intake of 5.0 to 14.9g/day.

In the same manner, the higher risk of

Table 2 - Odds ratios (95% confidence limits) for cardiac risk¹ and alcohol use, mutually adjusted for demographics variables, smoking and body mass indices in metropolitan Sao Paulo area (n = 1,485).

Tabela 2 - Odds ratios e intervalos de confiança (95%) para risco cardíaco¹ e padrão de uso de álcool, ajustados para variáveis sociodemográficas, tabagismo e índice de massa corpórea em amostra da região metropolitana de São Paulo (n = 1.488).

	OR	95%CI	P-value
Age (years)	1.02	1.01-1.03	0.001
Sex			
Male	1.00		
Female	1.78	1.12-2.83	0.01
Alcohol use²			0.01
Up 19g with no HED ³	1.00		
Lifetime abstainers	2.23	1.27-3.90	0.005
Up 19g with HED	3.95	0.81-19.2	0.09
20g or more	1.43	0.50-4.07	0.49
Former-drinkers	2.37	1.32-4.23	0.004
Ethnic group			0.04
White	1.00		
Black	1.98	1.17-3.32	0.01
Mixed	1.02	0.65-1.62	0.91
Others	0.76	0.23-2.56	0.65
Tobacco use			0.04
Never smoked	1.00		
Former smoker	1.12	0.68-1.78	0.69
Current smoker	1.93	1.15-3.04	0.01
BMI⁴	1.02	0.99-1.07	0.16

¹ Defined by the WHO-Rose Angina Questionnaire. ²Alcohol volume in grams per day ³HED=Heavy Episodic Drinking ⁴Body mass index - defined as weight (in kg) divided by height squared (m²).

¹ Definido pelo WHO-Rose Angina Questionnaire. ²O volume de álcool consumido é expresso em gramas por dia. ³EBE=Episódio de beber excessivo. ⁴Índice de Massa corpórea foi definido como peso (em kg) dividido pela altura em metros ao quadrado (m²).

CHD in former drinkers is also consistent with the literature²². Graham²³ studied the reasons for abstaining and abstainers' characteristics in adults. They observed that, compared to other abstainers, former drinkers reported significantly different reasons for not drinking; these included health-related concerns, health problems, and medication use.

The association between CHD and

higher BMI and tobacco use is not surprising, given that they are very well known risk factors for coronary disease¹². On the other hand, the present findings on ethnicity and the greater risk in black respondents was not observed in previous studies. Fuchs et al.²⁴, studying African-American men and women regarding alcohol consumption and CHD incidence in four US communities, found a strong relationship between

alcohol and cardiac risk for those who had drunk 140-220g of ethanol per week, an association not observed in white individuals. Pletcher et al.²⁵ examined the association between alcohol consumption and coronary calcification, and observed differences in calcification in heavy drinkers from different ethnic backgrounds. Their findings suggest the presence of the proatherogenic effects of alcohol, especially in African Americans. Another unexpected finding was the higher risk in women, which may be associated with more willingness to report physical symptoms than men, an essential feature in self-reporting questionnaires.

Drinking patterns appear to be an important predictor of cardiac risk. In a meta-analysis, Bagnardi et al. found that binge drinking was associated with a higher risk of CHD after controlling for overall volume of alcohol consumption²⁶. However, this meta-analysis was only based on six articles, as there are only a few medical epidemiology studies which include binge drinking as a category. In another recent meta-analysis²⁷ which analyzed cohort and case-control studies, Roercke & Rehm (2010) observed that the cardioprotective effect of moderate alcohol consumption disappears when light or moderate drinking is mixed with irregular heavy drinking sessions. Both meta-analyses were important steps forward on this issue; however neither was from low- or average-income countries, underlining the importance of studies such as the present one on the health impact of binge drinking in these specific regions.

Moraes et al.¹¹ found a positive association between higher alcohol consumption and CVD incidence. However as previously mentioned, their study did not appropriately measure alcohol consumption and binge drinking. In the present study, binge drinking tended to be associated with higher cardiac risk, even when subjects were drinking less than 20 grams per day. *Binge*

drinking is already a public health concern in Brazil, because of its high prevalence. Lima et al.²⁸ observed a 35.8% prevalence of heavy drinking in current male drinkers in the city of São Paulo. Guimarães et al.²⁹ found a 52.9% prevalence of harmful alcohol use in men and 26.8% in women in different areas of the state of São Paulo. Laranjeira et al.³⁰, in a nationwide study on alcohol use in Brazil, observed that 28% of current drinkers had binge drunk in the previous year. All these studies and other surveys in Brazil confirm that heavy episodic drinking is an important public health problem in Brazil.

One limitation found in many studies on alcohol is self-reported information, and some underreporting may have occurred. There is only one study with test-retest reliability of information on alcohol intake in a Brazilian sample³¹. The authors in that study observed Kappa coefficients ranging from 0.54 to 0.78, with a tendency to increase in older subjects and those with more years of education. Another possible limitation is that the WHO Rose Angina Questionnaire, although producing very good estimates in other localities, has specificity and validity calculations that are not tailored for a Brazilian population^{15,16}.

Despite its limitations, this study adds to the information on alcohol use and cardiac risk in this country, a topic rarely studied. This paper also contributes to the discussion on exploring alcohol use in detail when investigating cardiac risk, both in clinical practice and research. Heavy alcohol use is a concern for violent deaths in Brazil and a recent survey has shown an increase in this pattern of alcohol use (Moura & Malta, 2011). The potential association with higher cardiac disease risk emphasizes the need for understanding this problem in detail and to alert public policy makers about the need for effective control of alcohol consumption in Brazil.

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