International Journal of Cardiology 215 (2016) 257–262

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Alcohol consumption and cardiovascular diseases in rural China☆

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ARTICLE INFO

Article history:
Received 15 February 2016
Accepted 11 April 2016
Available online 16 April 2016

Keywords:
Alcohol consumption
Cardiovascular disease
Hypertension
Ischemic stroke

ABSTRACT

Objectives: This study aimed to update the current information on alcohol consumption and evaluate the associations between drinking status and cardiovascular diseases in a general population from rural China.
Methods: The study examined a total of 11,269 adults using a multi-stage cluster sampling method to select a representative sample of individuals 35 years or older. Related medical histories were obtained using a standard questionnaire, and blood biochemical indexes were collected by well-trained personnel. Participants were asked for information about whether they regularly consumed alcohol, their average alcohol consumption per day, and the number of days per month that they consumed alcohol.
Results: This population consisted of 75.8% non-drinkers, 7.5% moderate drinkers, and 16.7% heavy drinkers. And the mean alcohol consumption per day for the total population was 15.29 ± 0.35 g/d (women: 1.0 ± 0.11 g/d and men 32.5 ± 0.69 g/d, $p < 0.001$). Multivariate logistic regression analysis showed that heavy drinkers had an approximately 1.3-fold and 1.7-fold greater risk for coronary heart disease and hypertension, respectively (OR: 1.252, 95% CI: 1.012 to 1.549; OR: 1.741, 95% CI: 1.519 to 1.994, respectively) compared with that of the non-drinking group. After fully adjusting the data for all variables, the data showed no significant association between moderate alcohol consumption and CHD, HT or ischemic stroke.
Conclusions: Alcohol consumption in rural populations is high, particularly in men. Heavy drinking is a risk factor for coronary heart disease and hypertension, but not for ischemic stroke. There was no significant association between moderate alcohol consumption and CHD, HT or ischemic stroke.

1. Introduction

Globally, an estimated 3.8% of all deaths and 4.6% of disability-adjusted life-years are attributable to pathological alcohol use. These alcohol-attributable costs exceed 1% of the gross national product of high- and middle-income countries, making pathological alcohol use one of the largest avoidable risk factors for the global burden of disease [1]. Studies have reported that alcohol use is associated with cardiovascular disease (CVD), although there is debate about these conclusions [2–8]. However, there is the lack of updated information that specifically examines the status of alcohol consumption in China, which has been experiencing rapid economic progress and epidemiologic transitions that are often associated with an increase in CVD [9–13].

The latest studies have found that the prevalence of CVD in northeast China is much higher than it was in previous years [14–16]. Whether this is related to the drinking status of people in this region needs to be further analyzed. Therefore, we performed the present study to update the current information on the status of alcohol consumption and to evaluate the associations between alcohol consumption and cardiovascular disease in a general population from rural China. We tested the hypothesis that the level of alcohol consumption would correlate to a higher risk of CVD. The present study generated a profile based on a large population. We hope to use this profile as a primary data set for a long-term follow-up study that can provide updated data about the burden of mortality and disease that is attributable to alcohol in China.

2. Methods

2.1. Study population

Methods of this study were ever been published elsewhere [44]. Liaoning Province is located in northeast China. Between January 2012 and August 2013, a representative sample population of adults aged

☆ Funding: This study was supported by grants from the 'Twelfth Five-Year' project funds (National Science and Technology Support Program of China, Grant no. 2012BAJ18B02), the Social Development Research Program of Liaoning Province (2013225089) and the National Natural Science Foundation of China (Grant no. 81373018).
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http://dx.doi.org/10.1016/j.ijcard.2016.04.095
0167-5273/

≥35 years was selected to analyze the prevalence, incidence and history of cardiovascular risk factors in rural areas of Liaoning Province. The study used a multi-stage, stratified random-cluster sampling scheme. In the first stage, 3 counties (Dawa, Zhangwu, and Liaoyang County) were selected to represent the eastern, southern, and northern regions of Liaoning province. In the second stage, one town was randomly selected from each county (a total of 3 towns). In the third stage, 8–10 rural villages from each town were randomly selected (a total of 26 rural villages). Participants that were pregnant, had malignant tumors and or mental disorders were excluded from the present study. All eligible permanent residents aged ≥35 years from each village were invited to participate in the study (a total of 14,016 potential participants). Of those, 11,956 participants agreed to participate in the present study (response rate of 85.3%). The study was approved by the Ethics Committee of China Medical University (Shenyang, China). All procedures were performed in accordance with the ethical standards of this committee. Written consent was obtained from all participants after they had been informed of the objectives, benefits, and medical details of this study as well as the confidentiality agreement relating to personal information. If the participants were illiterate, we obtained their written informed consent from their proxies. In this report, we analyzed the baseline data, and only participants who provided a complete set of data regarding the variables analyzed in the study were included. The final sample size was 11,269 (5101 men and 6168 women).

2.2. Data collection and measurements

Data collection and measurements methods of this study were ever been described previously [45,46].

Data were collected by cardiologists and trained nurses using a standard questionnaire by face-to-face interview during a single clinic visit. Before the survey was performed, we invited all eligible investigators to attend an organized training session. The training included the purpose of this study, how to administer the questionnaire, the standard measurement methodology, the importance of standardization, and the study procedures. A strict test was conducted after this training, and only those who scored perfectly on the test were allowed to serve as investigators. During data collection, our inspectors provided further instructions and support.

Data on demographic characteristics, lifestyle risk factors, dietary habits, family income, history of heart disease and any medication used in the two weeks prior to the survey were obtained by interview using a standardized questionnaire. The study was monitored by a central steering committee with a subcommittee for quality control. Educational level categories were divided into primary school or below, middle school and high school or above. Family income was classified as ≤5000, 5000–20,000 and >20,000 CNY/year. Self-reported sleep duration (including nocturnal and nap durations) was obtained from the questionnaire. Physical activity categories included occupational and leisure-time physical activity. A detailed description of the methods has been presented elsewhere [17]. Occupational and leisure-time physical activity were combined and re-categorized into three categories: (1) low—subjects who reported light levels of both occupational and leisure-time physical activity; (2) moderate—subjects who reported moderate or high levels of either occupational or leisure-time physical activity; and (3) high—subjects who reported a moderate or high level of both occupational and leisure-time physical activity [43]. The dietary pattern was assessed using the patients' recall of foods eaten in the previous year. The questionnaire included questions on the average consumption of several types of food per week. The reported consumption was quantified as the approximate number of grams consumed per week for each type of food and re-categorized into four categories (vegetable consumption: rarely = 3, <1000 g = 2, 1000–2000 g = 1, ≥2000 g = 0; meat consumption including red meat, fish, and poultry: rarely = 0, <250 g = 1, 250–500 g = 2, ≥500 g = 3). A special diet score (vegetable consumption score plus meat consumption score) was calculated for each participant (range: 0–6). Higher values of the diet score indicate higher meat consumption and lower vegetable consumption and a greater adherence to a Westernized diet, while lower values indicate adherence to a Chinese diet. Similar methods for calculating diet scores can be found in the ATTICA study [18].

Blood pressure was measured three times at 2-min intervals after at least 5 min of rest using a standardized automatic electronic sphygmomanometer (HEM-907; Omron) according to American Heart Association protocol, which had been validated according to the British Hypertension Society protocol [19]. The participants were advised to avoid caffeinated beverages and exercise for at least 30 min before the measurement. During the measurement, the participants were seated with their arm supported at the level of the heart. The mean of three blood pressure (BP) measurements was calculated and used in all analyses.

Weight and height were measured to the nearest 0.1 kg and 0.1 cm, respectively, with participants in lightweight clothing and without shoes. Waist circumference (WC) was measured to the nearest 0.1 cm at the umbilicus using a non-elastic tape with the participants standing and at the end of normal expiration. Body mass index (BMI) was calculated as the participant's weight in kilograms divided by their height in meters squared.

Fasting blood samples were collected from all participants in the morning after at least 12 h of fasting. Blood samples were obtained from an antecubital vein using BD Vacutainer tubes containing EDTA (Becton, Dickinson and Co., Franklin Lakes, NJ, USA). Serum was subsequently isolated from whole blood, and all serum samples were frozen at −20 °C for testing at a central, certified laboratory. Fasting plasma glucose (FPG), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), triglyceride (TG), serum potassium and magnesium and other routine blood biochemical indexes were analyzed enzymatically on an auto-analyzer (Olympus AU640 Auto-Analyzer; Olympus Corp., Kobe, Japan). All laboratory equipment was calibrated and blinded duplicate samples were used.

2.3. Alcohol consumption assessment

Alcohol consumption was assessed during the interview using the questionnaire. Participants were asked for information on whether they regularly consumed alcohol, average alcohol consumption per day, and the number of days per month that they consumed alcohol. Ethanol content (by weight) differed among beverages and was assumed to be 5% for beer, 12.5% for red wine, and 45% for hard liquor. One drink was defined as an average of 15 g of ethanol. We used the cut-off values based on the definition of National Institute on Alcohol Abuse and Alcoholism. Daily alcohol consumption levels used to classify a participant's level of consumption were defined as non-drinkers (abstainers, no history of alcohol consumption), moderate drinkers (up to 1 drink/day for women and up to 2 drinks/day for men), heavy drinkers (>1 drink/day for women and >2 drinks/day for men) [20].

2.4. Definitions

As described previously [45,46],according to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) [21], hypertension (HT) is defined as a systolic BP (SBP) above 140 mm Hg and/or a diastolic BP (DBP) above 90 mm Hg and/or use of antihypertensive medications. Participants were asked about doctor-diagnosed coronary heart disease (CHD), including interventional therapy for the coronary artery (e.g., cardiac catheterization, percutaneous coronary intervention, or coronary artery bypass grafting), stable angina pectoris, unstable angina pectoris, a history of myocardial infarction, and congestive heart failure caused by myocardial ischemia [22]. The occurrence of ischemic stroke (IS), was determined by an epidemiological questionnaire and was