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RAPID COMMUNICATION

Alcohol consumption and metabolic syndrome among Shanghai adults: A randomized multistage stratified cluster sampling investigation

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Abstract

AIM: To examine the relations of alcohol consumption to the prevalence of metabolic syndrome in Shanghai adults.

METHODS: We performed a cross-sectional analysis of data from the randomized multistage stratified cluster sampling of Shanghai adults, who were evaluated for alcohol consumption and each component of metabolic syndrome, using the adapted U.S. National Cholesterol Education Program criteria. Current alcohol consumption was defined as more than once of alcohol drinking per month.

RESULTS: The study population consisted of 3953 participants (1524 men) with a mean age of 54.3 ± 12.1 years. Among them, 448 subjects (11.3%) were current alcohol drinkers, including 405 males and 43 females. After adjustment for age and sex, the prevalence of current alcohol drinking and metabolic syndrome in the general population of Shanghai was 13.0% and 15.3%, respectively. Compared with non drinkers, the prevalence of hypertriglyceridemia and hypertension was higher while the prevalence of abdominal obesity, low serum high-density-lipoprotein cholesterol (HDL-C) and diabetes mellitus was lower in subjects who consumed alcohol twice or more per month, with a trend toward reducing the prevalence of metabolic syndrome. Among the current alcohol drinkers, systolic blood pressure, HDL-C, fasting plasma glucose, and prevalence of hypertriglyceridemia tended to increase with increased alcohol consumption. However, low-density-lipoprotein cholesterol concentration, prevalence of abdominal obesity, low serum HDL-C and metabolic syndrome showed the tendency to decrease. Moreover, these statistically significant differences were independent of gender and age.

CONCLUSION: Current alcohol consumption is associated with a lower prevalence of metabolic syndrome irrespective of alcohol intake (g/d), and has a favorable influence on HDL-C, waist circumference, and possible diabetes mellitus. However, alcohol intake increases the likelihood of hypertension, hypertriglyceridemia and hyperglycemia. The clinical significance of these findings needs further investigation.

Key words: Alcohol; Metabolic syndrome; Obesity; Type 2 diabetes; Epidemiology; Chinese

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INTRODUCTION

Alcohol consumption is a double-edged sword, and perhaps no other factor in cardiovascular health is capable of cutting so deeply in either direction depending on how it is used. Accumulating scientific evidence indicates that light to moderate alcohol consumption is associated with a lower cardiovascular mortality and a reduced risk of developing type 2 diabetes mellitus[1-6]. Some of the biological mechanisms reported to explain this observation include an improvement in lipid profile, especially high-density-lipoprotein-cholesterol (HDL-C) and increased insulin sensitivity[1-6]. In contrast, heavy or risky drinking is toxic to both the heart and the overall health and is the third

leading cause of premature death among Americans[1].

Metabolic syndrome is a clustering of low serum HDL-C, elevated serum triglycerides, hyperglycemia, abdominal obesity, and elevated blood pressure, mediated in part by insulin resistance. Metabolic syndrome is associated with an increased risk of developing diabetes mellitus and cardiovascular disease[7]. Alcohol consumption has a favorable influence on selective components of metabolic syndrome, contributing to the reduction in risk of developing metabolic syndrome in the U.S. population[8-10]. However, the validity of its putative benefits to metabolic disorders has not been well evaluated in Chinese.

The present study was to investigate the prevalence of current alcohol drinking and metabolic syndrome among Shanghai adults, and to explore the relationship between alcohol consumption and components of metabolic syndrome.

MATERIALS AND METHODS

Survey design and study sample

We assigned a number to each of the 16 urban districts of Shanghai and selected two districts at random (Yangpu District and Pudong New District). Of the 11 residential districts within Yangpu and Pudong, we randomly selected the Pingliang and Shanggang residential districts, containing 30 and 26 neighborhood communities, respectively. From these, we selected eight neighborhood communities in total. Resident groups were randomly selected from each sample neighborhood community. From October 2002 to April 2003, investigations were conducted in adults aged 20 years or more in the selected resident groups at home. We excluded individuals from the study if they had a history of malignancy and other severe diseases.

This program was approved by the Research Ethics Committee of the Shanghai Health Bureau and all participants provided their written informed consent prior to their inclusion in the study. General physical examinations and laboratory assessments were performed for each study subject at a mobile examination center following an overnight fast of at least 12 h.

Data collection

Interview: Selected individuals were interviewed at their homes using a self-designed questionnaire that gathered information on demographic characteristics, medical history, medications and health-related habits. Consumption of alcohol was ascertained from a series of questions including whether the respondent consumed 12 drinks (one drink is considered to contain 10 g alcohol) in the past 12 mo. If so, respondents were asked to quantify the number of days they consumed alcohol over the past 1 year and the number of drinks per day on drinking days. From these data, we calculated an average daily intake of alcohol. The questionnaire was pre-tested in the population prior to the study.

Physical examination: Body weight of the participants was measured in light clothing and without shoes to the nearest half kilogram. Their height was measured to the nearest half centimeter. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). Waist circumference (to the nearest half centimeter) was measured at the mid-point between the lower border of the rib cage and the iliac crest, whereas hip circumference was similarly obtained at the widest point between the hip and buttock, enabling calculation of the waist-to-hip ratio. Three blood pressure readings were obtained at intervals of one min. The second and third systolic and diastolic pressure readings were averaged and used in the analyses.

Laboratory assessments: Venous blood samples were collected at 0 and 120 min following a 75 g oral glucose challenge for non-diabetics or 100 g steamed bread for diabetics. Samples were centrifuged at 2000 *g* for 10 min at 25℃ immediately, frozen and shipped to a central laboratory of the Shanghai Center for Disease Control and Prevention, where they were stored initially at -20℃ and then at -70℃. Subsequently, serum glucose was determined using a modified hexokinase method. Fasting serum total cholesterol (TC) and triglyceride concentrations were measured enzymatically by color absorptiometry based on a peroxidase-catalysed reaction. HDL-C was measured after precipitation of other lipoproteins with a polyanion/divalent cation mixture. Low-density-lipoprotein-cholesterol (LDL-C) was calculated from the measured values of TC, triglycerides and HDL-C using the following formula: LDL = (TC) - (HDL) - (triglycerides/5). LDL was not calculated if the triglyceride concentration was > 4.52 mmol/L. All these serum biochemistries were performed using a Bayer model 1650 automated bio-analyzer (Bayer Diagnostic, Basingstoke, UK).

Quality control: Field researchers were recruited from Shanghai Center for Disease Control and Prevention, and Shanghai Jiaotong University School of Medicine. Before the investigation, the researchers were given systematic training to ensure standardization of the investigation procedure. For further quality control, 5% of questionnaires and blood samples were re-examined. Kappa analysis of these samples showed a good consistency in the diagnostic test (data not shown).

Definitions: Obesity and abdominal obesity were categorized according to the new BMI criteria for Asians by the regional office for Western Pacific Region of the World Health Organization (WHO)[11]. Hypertension was defined as given in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7)[12]. Diagnoses of impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and type 2 diabetes were based on WHO criteria published in 1999 (WHO/NCD/NCS/99.2)[13,14]. Dyslipidemia (including hypertriglyceridemia and low HDL-C) and metabolic syndrome were diagnosed on the basis of the adapted U.S. National Cholesterol Education Program's Adult Treatment Panel Ⅲ (NCEP ATP Ⅲ) criteria with the exception of abdominal obesity (waist circumference 90 cm in men and 80 cm in women)[7,15]. We regarded participants who reported current use of antihypertensive or anti-diabetic medications or fibrates as participants with a high blood pressure or diabetes or hypertriglyceridemia, respectively.

Current alcohol consumption was defined as more than once of alcohol drink per month. The participants were then divided into current alcohol drinkers and current non drinkers, the former were further classified into light drinkers (1-9.9 g/d), moderate drinkers (10-29.9 g/d) and excessive drinkers (≥ 30 g/d) according to their average daily alcohol intake in the past 12 mo[1,9,10,16].

Statistical analysis

All data were analyzed using SPSS 11.0 software (SPSS, Chicago, IL, USA). Unpaired *t*-test, χ^2 contingency test, Fisher's exact test and trend analysis were performed whenever appropriate. Non-parametric methods were also used for abnormally distributed values. Some analyses were adjusted for age and sex. Kappa analysis was performed for blood biochemical data as a quality control. All *P* values provided are for two-sided tests. $P < 0.05$ was considered statistically significant.

RESULTS

Sampling status and general data

We used a stratified, multistage probability cluster sampling method to obtain a representative sample from the Shanghai non-institutionalized population. The neighborhoods investigated contained 3953 residents aged 20 years or more as subjects in the present study, corresponding to approximately 2.99/10 000 of the Shanghai population according to the data collected in the Fifth China National Census in 2002 (http://www.china-un.ch/eng/ljzg/shjjtj/t85845.htm).

The study population included 1524 males and 2379 females (excluding pregnant women), giving a male to female ratio of 1:1.56. Their age ranged 20-88 years and no significant difference was noted between the ages of male and female subjects. In comparison with the sex and age obtained from the Fifth National Census of Shanghai, the study population contained a higher percentage of elderly subjects and women ($P < 0.01$). Therefore, some of the results were adjusted for age and sex in order to better represent the real situation in Shanghai.

Prevalence of current drinking and metabolic syndrome

Of the 3953 enrolled subjects, 448 (11.3%) had a history of current alcohol consumption, men accounted for 26.6% and women 1.8% ($P < 0.001$). As shown in Table 1, the prevalence of current alcohol drinking both in overall subjects and in males increased with age and reached its peak at the age of 40-49 years. However, no significant changes were found in females. After adjusted for age and sex, the prevalence of current alcoholic drinking among Shanghai adults was found to be 13.0%, which was significantly higher in males than in females (24.5% *vs* 1.5%, $P < 0.001$).

Among the 448 participants with a history of current alcohol drinking, over two-thirds (72.1%) of them were light to moderate drinkers, light to moderate female drinkers accounted for 95%. There was no difference in age among different drinking groups (Table 2). Since only 125 (27.9%) subjects were found to be excessive drinkers in the study, their average daily alcohol consumption was 58 g, and few of them were heavy or risky drinkers (alcohol consumption > 40 g/d), so we did not further distinguish heavy drinkers from excessive drinkers.

Table 1 Sex and age related prevalence of current alcohol drinking in 3953 adults in Shanghai *n* (%)

Age (yr)	Total	Current drinking	Male	Current drinking	Female	Current drinking
20-29	139	8 (5.8)	61	7 (11.5)	78	1 (1.3)
30-39	157	16 (10.2)	65	15 (23.1)	92	1 (1.1)
40-49	895	118 (13.2)	306	108 (35.3)	589	10 (1.7)
50-59	1305	167 (12.8)	477	153 (32.1)	828	14 (1.7)
60-69	794	77 (9.7)	327	67 (19.1)	467	10 (2.1)
≥ 70	663	62 (9.4)	288	55 (19.1)	375	7 (1.9)
Total	3953	448 (11.3)	1524	405 (26.6)	2379	43 (1.8)

Current alcohol drinking is defined as more than once of alcohol drinking per mo in the past one year.

Table 2 Classification of 448 subjects with current alcohol drinking according to alcohol consumption *n* (%)

	Light drinking	Moderate drinking	Excessive drinking
Total (*n* = 448)	180 (40.2)	143 (31.9)	125 (27.9)
Male (*n* = 405)	149 (36.8)	133 (32.8)	123 (30.4)
Female (*n* = 43)	31 (72.1)	10 (23.3)	2 (4.7)
Age (yr)	54.47 ± 10.80	55.35 ± 11.62	55.05 ± 9.84
Alcohol intake (g/d)	2.60 ± 2.84	17.95 ± 5.07	58.30 ± 80.13

Light drinking is defined as average alcohol consumption of less than 10 g/d, moderate drinking as average daily alcohol consumption of 10-30 g, and excessive drinking as average alcohol consumption of equal to or more than 30 g/d in the past 12 mo.

The prevalence of obesity, abdominal obesity, hypertension, hypertriglyceridemia, low serum HDL-C, diabetes mellitus and metabolic syndrome in the 3953 study subjects was 43.3%, 35.4%, 49.3%, 25.7%, 21.3%, 14.8% and 23.9%, respectively. After adjusted for age and sex, the prevalence of metabolic syndrome among adults in Shanghai was 15.3% according to the adapted NCEP-ATP Ⅲ criteria[17].

Effects of current alcohol consumption on metabolic syndrome

The effects of current alcohol drinking on metabolic syndrome features in 3953 Shanghai adults are shown in Table 3. The blood pressure, serum concentration of triglyceride, HDL-C and FPG, prevalence of hypertension and hypertriglyceridemia were higher while the prevalence of abdominal obesity, low serum HDL-C and diabetes mellitus were lower in alcoholic drinkers than in non-alcoholic drinkers. However, the prevalence of metabolic syndrome in alcoholic drinkers only decreased mildly compared with the non-alcoholic drinkers. When adjusted for sex and age, the differences in metabolic syndrome features still existed between the two groups.

Among the 448 subjects with current alcohol consumption, the trend analysis showed that systolic blood pressure (SBP), serum HDL-C and FPG, and prevalence of hypertriglyceridemia increased progressively, while se-

Table 3 Effects of current alcohol drinking on metabolic syndrome features in 3953 Shanghai adults

	Non-drinking (n = 3505)	Current drinking (n = 448)	P value
Age (yr)	54.2 ± 12.4	54.9 ± 10.8	> 0.05
BMI (kg/m^2)	24.6 ± 4.39	24.8 ± 3.84	> 0.05
Waist-to-hip ratio	0.84 ± 0.14	0.85 ± 0.15	0.12
SBP (mmHg)	129.0 ± 18.8	132.8 ± 17.2	< 0.001
DBP (mmHg)	81.8 ± 11.9	85.8 ± 10.4	< 0.001
Triglyceride (mmol/L)	1.36 ± 1.04	1.62 ± 1.38	< 0.001
Total cholesterol (mmol/L)	4.98 ± 0.97	4.91 ± 0.93	0.15
HDL-C (mmol/L)	1.49 ± 0.40	1.57 ± 0.41	< 0.001
LDL-C (mmol/L)	2.90 ± 0.82	2.73 ± 0.83	< 0.001
FPG (mmol/L)	5.77 ± 1.60	5.98 ± 1.70	< 0.01
Obesity, n (%)	1512 (43.1)	199 (44.2)	0.67
Abdominal obesity, n (%)	1270 (36.2)	129 (28.8)	< 0.01
Hypertension, n (%)	1525 (43.5)	246 (45.9)	< 0.001
Hypertriglyceridemia, n (%)	874 (24.9)	140 (31.3)	< 0.001
Low HDL-C, n (%)	770 (22.0)	72 (16.1)	< 0.05
IFG/IGT, n (%)	950 (27.1)	118 (26.3)	0.24
Diabetes mellitus, n (%)	540 (15.4)	45 (10.0)	< 0.01
Metabolic syndrome, n (%)	841 (24.0)	103 (23.0)	0.09

BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HDL-C: High-density-lipoprotein cholesterol; LDL-C: Low-density-lipoprotein cholesterol; FPG: Fasting plasma glucose; IFG: Impaired fasting glucose; IGT: Impaired glucose tolerance.

Table 4 Effects of alcohol consumption on metabolic syndrome features in 448 subjects with current drinking according to the amount of alcohol consumption

	Light drinking (n = 180)	Moderate drinking (n = 143)	Excessive drinking (n = 125)	P value
BMI (kg/m^2)	24.9 ± 3.25	24.7 ± 4.59	24.9 ± 3.72	> 0.05
Waist-to-hip ratio	0.85 ± 0.12	0.86 ± 0.14	0.84 ± 0.18	> 0.05
SBP (mmHg)	132.3 ± 16.6	132.6 ± 17.1	133.7 ± 18.3	< 0.05
DBP (mmHg)	85.7 ± 10.1	85.4 ± 9.4	86.5 ± 12.0	> 0.05
Triglyceride (mmol/L)	1.47 ± 1.12	1.77 ± 1.61	1.66 ± 1.41	> 0.05
TC (mmol/L)	4.92 ± 0.92	4.86 ± 0.92	4.96 ± 0.94	> 0.05
HDL-C (mmol/L)	1.56 ± 0.39	1.57 ± 0.39	1.60 ± 0.44	< 0.05
LDL-C (mmol/L)	2.74 ± 0.79	2.72 ± 0.77	2.71 ± 0.92	< 0.05
FPG (mmol/L)	5.92 ± 1.46	5.96 ± 1.60	6.09 ± 2.10	< 0.01
Obesity, n (%)	84 (46.7)	60 (42.0)	55 (44.0)	> 0.05
Abdominal obesity, n (%)	66 (36.7)	34 (23.8)	29 (23.2)	< 0.05
Hypertension, n (%)	100 (55.6)	73 (51.1)	73 (58.4)	> 0.05
Hypertriglyceridemia, n (%)	53 (29.4)	46 (32.2)	41 (32.8)	< 0.05
Low HDL-C, n (%)	36 (20.0)	24 (16.8)	12 (9.6)	< 0.01
IFG/IGT, n (%)	43 (23.9)	43 (30.1)	32 (25.6)	> 0.05
Diabetes mellitus, n (%)	21 (11.7)	1 (0.70)	10 (8.0)	> 0.05
Metabolic syndrome, n (%)	46 (25.6)	32 (22.4)	25 (20.0)	< 0.05

BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HDL-C: High-density-lipoprotein cholesterol; LDL-C: Low-density-lipoprotein cholesterol; FPG: Fasting plasma glucose; IFG: Impaired fasting glucose; IGT: Impaired glucose tolerance. P value for trend analysis reflects the overall difference among the three groups.

rum LDL-C, prevalence of abdominal obesity, low serum HDL-C and metabolic syndrome declined progressively with increased alcohol consumption among the three drinker groups (Table 4). When adjusted for sex and age, alcohol consumption still showed its effects on metabolic disorders among alcoholic drinkers.

DISCUSSION

In the present study, the sex- and age-adjusted prevalence of current alcohol drinking and metabolic syndrome among Shanghai adults was 13.0% and 15.3%, respectively; serum LDL-C concentration, risk of abdominal obesity, low serum HDL-C and metabolic syndrome tended to decrease in parallel to the history of alcohol consumption; arterial blood pressure, FPG and serum triglyceride concentration tended to increase in parallel to the amount of alcohol consumption; the effects of current alcohol drinking on metabolic syndrome features were independent of gender and age.

Metabolic syndrome is highly prevalent in industrialized Shanghai with a high Western life style[15-17]. However, the prevalence of current alcohol drinking among Shanghai adults is relative lower (only accounting for 13.0% of the total population and 24.5% of men), than that in other cities of China (accounting for 27.0% in Hangzhou, Zhejiang Province and 35.1% in Xi'an, Shaanxi Province)[18,19]. According to the Third National Health and Nutrition Examination Survey conducted in the USA, 57.9% of the participants were current alcohol drinkers with a higher percentage of men (66.0%) than of women (50.0%)[9], and the prevalence of current alcohol drinking in 27 030 healthy Korean men was even up to 83.3%[20]. The majority of subjects were light to moderate alcohol drinkers, and the average daily alcohol consumption even in the excessive drinkers was less than 60 g/d in the present study. This might be related to the different alcohol drinking culture backgrounds worldwide and the universal concern about the overall health among Shanghai adults[16,18,21]. The low prevalence of current alcohol drinking is consequently consistent with the uncommon alcoholic fatty liver (0.79%). Alcoholism only accounts for 5% of the etiology of fatty liver among Shanghai adults[16].

Although alcohol consumption has a negative effect on the morbidity and mortality of liver disease, the correlation between alcohol consumption and metabolic syndrome gives rise to much controversy[1,2,5,6,20,22-27]. A cross-sectional analysis of data from the Third National Health and Nutrition Examination Survey conducted in the USA showed that mild to moderate alcohol consumption is associated with a lower prevalence of metabolic syndrome, showing a favorable influence on lipids, waist circumference, and fasting insulin[8,9]. Yoon *et al*[24] reported that 1-15 g of alcohol per day is associated with decreased prevalence of metabolic syndrome. Park *et al*[25] reported that the prevalence of metabolic syndrome decreases only in women, and Santos *et al*[26] have not found any association between alcohol consumption and metabolic syndrome in both genders. However, Yokoyama *et al*[22] reported that alcohol consumption (> 20 g/d) is associated with an increased prevalence of metabolic syndrome in male Japanese. In the present study, alcohol consumption was associated with reduced prevalence of metabolic syndrome and excessive alcohol drinkers had the lowest prevalence of metabolic syndrome. However, no statistically significant difference was found between alcohol and non-alcohol

drinkers. Inconsistent results were also found between alcohol consumption and obesity. Some studies demonstrated that light to moderate alcohol drinking can reduce weight whereas non-alcohol and heavy alcohol drinking cannot reduce weight[1,2,23,25]. In the present study, neither positive nor negative association was found between alcohol consumption and BMI and risk of obesity. However, a consistent association was observed between alcohol consumption and decreased prevalence of abdominal obesity. Most excessive alcohol drinkers consumed only a little higher than 30 g/d in our study, and might be moderate alcohol drinkers in some other studies[1,2,18,20,24,28-30]. Therefore, it is not entirely clear how different levels of alcohol consumption affect the risk of obesity and metabolic syndrome.

Epidemiologic investigations showed that moderate alcohol consumption is associated with increased blood pressure[1,29,30]. It was reported that SBP and diastolic blood pressure (DBP) are increased to 2.7 mmHg and 1.4 mmHg, respectively, after a period of sustained alcohol consumption[1,29]. In the present study, SBP and DBP had an average increase of 3.78 mmHg and 4.06 mmHg, respectively, in current alcoholic drinkers. Furthermore, SBP increased gradually in alcohol drinkers. A meta-analysis of data showed that excessive alcohol consumption was associated with a higher blood pressure while a fall in blood pressure of 2-4 mmHg is associated with reduced alcohol consumption[30].

It is well known that increased concentration of triglycerides and HDL-C is associated with increased alcohol consumption[1,2]. Interestingly, alcohol consumption was negatively associated with serum LDL-C concentration and was the lowest in excessive alcohol drinkers in this study, which is consisted with the findings in Korean men[20].

The relationship between alcohol consumption and glucose regulation is rather complex[1,2]. A meta-analysis based largely on the prospective studies suggested that there is a U-shaped relationship between alcohol consumption and type 2 diabetes, and moderate alcohol drinkers have the lowest risk of developing type 2 diabetes[31]. However, several cross-sectional evaluations of healthier population have reported higher fasting glucose concentrations and greater risk of diabetes associated with alcohol consumption[31-34]. Paradoxically, alcohol consumption has also been found to be associated with lower insulin concentrations[8,20]. In our study, alcohol consumption was positively associated with FPG but negatively with the risk of diabetes. However, no change was observed in IFG and IGT, suggesting that regular alcohol consumption might benefit to insulin sensitivity and improve insulin resistance. However, it is not entirely clear how different levels of alcohol consummation affect glucose homeostasis.

The strengths of our investigation include the use of a large sample from Shanghai adults with good quality control (thereby enhancing our generalization) and the evaluation of both serum lipids and oral glucose tolerance. However, there are several limitations that merit comment. First, given the cross-sectional design, we could not draw any causal inferences regarding the association of alcohol consumption with metabolic syndrome. Second, the data on alcohol consumption were based on self-report with the possibility of misclassification of exposure (e.g., under reporting). However, such bias, if non-differential, would be expected only to increase the amount of alcohol consumption associated with reduced prevalence of metabolic syndrome. Third, other factors such as smoking, physical activity, and type of beverages were not excluded by multivariable linear regression analysis, thus limiting our ability to give comment on the relation of alcohol consumption to the prevalence of metabolic syndrome[1,2,35]. Prospective studies are therefore needed to confirm these findings and to assess the influence of alcohol drinking patterns and other possible factors on the association between alcohol consumption and metabolic syndrome.

In summary, current alcohol drinking is associated with a lower prevalence of metabolic syndrome and a favorable influence on serum lipids, waist circumference, and possibly type 2 diabetes mellitus. The clinical significance of these findings needs further investigation. It must be noted that alcohol consumption also causes hypertension, hypertriglyceridemia and hyperglyceridemia, constituting alcohol-related metabolic syndrome. The latest American Heart Association guidelines advise that people should not start alcohol drinking if they have not drunk it, because it is not possible to predict who will have a problem due to alcohol abuse[35].

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COMMENTS

Background

Alcohol consumption is a double-edged sword to health. Light to moderate alcohol consumption is usually associated with a lower cardiovascular mortality and a reduced risk of developing type 2 diabetes mellitus. However, heavy or risky alcohol drinking is toxic to the heart and overall health, and is the third leading cause for premature death among Americans. Metabolic syndrome is associated with an increased risk of developing diabetes and cardiovascular disease, the favorable influence of alcohol consumption on selective components of metabolic syndrome has contributed to the possibility that alcohol consumption reduces the risk of metabolic syndrome in the adults of USA, Japan and South Korean. However, its putative effect on metabolic disorders has not been well evaluated in mainland China or oversea Chinese.

Research frontiers

It was recently reported that moderate alcohol drinking is associated with a lower prevalence of metabolic syndrome. Although studies showed statistically significant interactions between alcohol consumption and metabolic syndrome, integration of variables and homogeneity in definitions is required. Since alcohol-associated health problem is also influenced by ethnicity, it is thus needed to investigate the interactions in Chinese.

Innovations and breakthroughs

One of the major findings in the present study is the relative lower prevalence of current alcohol drinking (13%) in Shanghai than in other regions of China and most foreign countries. This might be due to the different alcohol drinking culture backgrounds and the general concern about the dangers of alcohol consumption to the overall health among Shanghai people. However, metabolic syndrome is common in Shanghai as compared to Japan and South Koran, and the prevalence

of metabolic syndrome among Shanghai adults is only slightly lower than that in USA, suggesting that alcohol drinking is not a major risk factor for metabolic syndrome in humans, even though current alcohol consumption is associated with a lower prevalence of metabolic syndrome irrespective of the average daily alcohol consumption in the present study. On the one hand, alcohol drinking reduces serum LDL-C concentration, risk of abdominal obesity and low HDL-C. On the other hand, alcohol consumption might increase the prevalence of hypertension, hypertriglyceridemia and hyperglycemia. These effects of alcohol consumption on metabolic disorders are consistent with the most other related or similar findings from other countries. The results of this study provide the epidemiological data on the correlation between alcohol consumption and metabolic syndrome in Chinese.

Applications

There is sufficient evidence that light to moderate alcohol consumption is associated with decreased risk of cardiovascular disease. Nevertheless, the effects of alcohol consumption on health are dependent on the consumed amount of alcohol, the pattern of drinking, and the potential for problem drinking, suggesting that alcohol should not be advised for health enhancement of individuals.

Terminology

Metabolic syndrome refers to a cluster of metabolic derangements that increased the risk of developing type 2 diabetes and cardiovascular diseases associated with insulin resistance. Current alcohol drinker refers to alcohol drinking habituation regardless of the amount of alcohol consumption, and is usually defined as more than once of alcohol drinking per month over the past 12 mo. The classification of current alcohol consumption is far from consensual at present. In the present study, light alcohol drinking is defined as average alcohol consumption of less than 10 g/d, moderate alcohol drinking as average daily alcohol consumption of 10-30 g/d, and excessive alcohol drinking as average alcohol consumption of equal to or more than 30 g per day in the past 12 mo.

Peer review

The authors conducted a population-based study on 3953 adults in Shanghai to evaluate the association between alcohol consumption and metabolic syndrome, and found that current alcohol consumption was associated with a lower prevalence of metabolic syndrome. Overall, the study was well designed with good quality control, and detailed data were collected from participants with a randomized multistage stratified cluster sampling method. The manuscript provides important data and is relatively well written.

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