Journal of Clinical Lipidology (2014) 8, 273–278

Journal of Clinical Lipidology

Association between alcohol intake, overweight, and serum lipid levels and the risk analysis associated with the development of dyslipidemia

Zhe Shen, MD, Stefan Munker, MD, Chenyang Wang, PhD, Lei Xu, MD, Hua Ye, PhD, MD, Hongtan Chen, MD, Genyun Xu, MD, Hong Zhang, PhD, Lihua Chen, MD, Chaohui Yu, PhD, MD, Youming Li, MD*

Department of Gastroenterology, The First Affiliated Hospital, College of Medicine, Zhejiang University, 310003 Hangzhou, China (Dr. Shen, Dr. Lei Xu, Dr. Ye, Dr. H. Chen, Dr. L. Chen, Dr. Yu, Dr. Li); Molecular Hepatology–Alcohol Associated Diseases, II. Medical Clinic Faculty of Medicine at Mannheim, University of Heidelberg, 68167 Mannheim, Germany (Dr. Munker); Institute of Biostatistics, School of Life Sciences, Fudan University, 200433 Shanghai, China (Dr. Wang, Dr. Zhang); and Clinical Laboratory, The First Affiliated Hospital, College of Medicine, Zhejiang University, 310003 Hangzhou, China (Dr. Genyun Xu)

KEYWORDS:
Alcohol;
Overweight;
Triglycerides;
Total cholesterol;
High-density lipoprotein cholesterol;
Low-density lipoprotein cholesterol

BACKGROUND: Alcohol, overweight, and lipid metabolism contribute to fatty liver and atherosclerosis pathogenesis.

OBJECTIVE: To study the association of alcoholic intake, overweight, and dyslipidemia.

METHODS: We randomly selected 482 age- and sex-matched individuals from East China. Gender, age, education level, smoking, hypertension, daily alcohol intake, drinking duration, and body mass index (BMI) were evaluated in association with triglyceride, total cholesterol, high-density (HDL-C), and low-density lipoprotein-cholesterol.

RESULTS: The association between dyslipidemia and 8 predictors of disease was made by regression analysis through the generalized additive model. The results showed that age, daily alcohol intake, and BMI were all closely associated with hypertriglyceridemia. Age, duration of drinking, and BMI were all closely associated with hypercholesterolemia. Age and BMI status were both closely associated with high LDL-C levels. By contrast, none of the 8 predictors was closely associated with low HDL-C levels (all $P < .05$).

CONCLUSIONS: Daily alcohol intake was a risk factor for hypertriglyceridemia. By contrast, drinking duration was a protective factor against hypercholesterolemia. Age and BMI were important risk factors for dyslipidemia (excluding HDL-C).

It has been long known that chronic and excessive alcohol intake and obesity are associated with the incidence of many diseases, including fatty liver, coronary heart disease, and other chronic diseases.[1–3] However, these diseases are all relevant to plasma lipid levels. Feinman et al. believed that the interaction of alcohol and lipid metabolism was relevant to the effects of alcohol consumption on body weight and body composition, to the pathogenesis of alcoholic fatty liver and hyperlipidemia, and to the development of atherosclerosis.[4]

Z.S. and S.M. contributed equally to this work.

* Corresponding author.
E-mail address: zjulym@126.com

Submitted August 8, 2013. Accepted for publication February 4, 2014.

1933-2874/$ - see front matter © 2014 National Lipid Association. All rights reserved.
http://dx.doi.org/10.1016/j.jacl.2014.02.003

Moreover, there are many other studies describing alcohol consumption and obesity/overweight and their association with fatty liver. In addition, it is a relatively unusual that alcohol consumption and obesity/overweight are associated with dyslipidemia. Thus, it is highly relevant and timely to study the effect of alcohol consumption and obesity/overweight on serum lipid levels. For this reason, we conducted a population-based and sex- and age-matched study of the association of alcohol consumption and overweight with dyslipidemia in East China.

Methods

Subjects

The study was conducted in the 2 islands (Hepu and Dongmen) of Xiangshan County located along the coast of Zhejiang Province in China. We randomly selected 9 villages of the 12 villages found on the 2 islands between August 2006 and September 2006. Through a stratified multistage probability cluster sampling method, we acquired a representative sample from the coast of Zhejiang Province. All individuals recruited to this study were ≥18 years. To reduce a risk of selection bias in this study as much as possible, all participants were required to conform to the following inclusion criteria: all participants were confirmed not to present with familial hypercholesterolemia, cancer, severe liver disease, pancreatitis, and kidney diseases according to their medical history, their hepatitis B surface antigen levels, and confirmation that recruited subjects were anti-hepatitis C virus negative. Additionally, participants were selected randomly by sex- and age-matched selection criteria by a dedicated software program. We eventually recruited 482 individuals (241 males and 241 females) as a representative sample from the island population for this study. All procedures were approved by the local Ethics Committee of Zhejiang University College of Medicine, China. Study participants provided written and informed consent before the survey.

Data collection

Demographic variables, alcohol intake, medical history, and health behavior were assessed by questioning the subjects who were recruited into this study. Educational level was categorized into 4 groups according to the number of years of education (1–6, 7–9, 10–12, and ≥12 years). Subjects were also defined as nonsmokers (never smoked and ceased smoking for more than 6 months) and those who were actively and addictively smoking (defined as daily smoking for more than 6 months) or those who were actively but not necessarily addictively smoking (defined as cessation of smoking or daily smoking for less than 6 months).[5]

Subjects were asked about alcohol use, including the quantity of alcohol intake each time, the number of times per day of alcohol intake, the number of months of alcohol intake each year, the number of years of alcohol intake, the types and alcoholic content of the alcoholic beverage, and other drinking and dietary habits. These data were converted into an average daily alcohol intake (g) and a duration of drinking (years) as defined by an alcohol dose conversion algorithm.[6]

Physical examinations were administered in the morning after a fasting overnight, following which body measurements were taken by a trained medical professional using a standardized protocol. Height and weight were measured with the subjects wearing light clothing and no shoes. Body mass index (BMI) was then calculated as weight (kg)/height (m).[2] Blood pressure was measured using an automated blood pressure monitor on the right arm of each of the subjects in a comfortable sitting position after a 5-minute rest period. Three measurements were taken, and the second and third pressure data were averaged and used for analysis. Diagnosis of hypertension was based on the Joint National Committee 7 report or the collected facts of current use of antihypertensive medications.[7]

Fasting blood samples were collected by venipuncture after 10 to 12 hours of fasting. Blood samples were taken to confirm the levels triglyceride (TG), total cholesterol (TCh), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C). All serum values were measured with a Hitachi 7600-110 automatic analyzer (Hitachi Co., Tokyo, Japan).

Definitions and statistical analysis

Hypertriglyceridemia was defined according to a TG > 1.7 mmol/L, hypercholesterolemia was defined based on a TCh >5.2 mmol/L, a high LDL-C level was defined based on an LDL-C >2.6 mmol/L, a low HDL-C level was defined based on an HDL-C <0.9 mmol/L (for male subjects), or an HDL-C <1.1 mmol/L (for female subjects).[8–10] Patients with familial hypercholesterolemia (TCh >9.4 mmol/L, LDL-C >6.8 mmol/L, and/or TG > 4.5 mmol/L) were excluded from the present analysis.[10]

Statistical analysis was performed with R 15.3. The mean value for different groups was compared using Wilcoxon rank-sum test. The chi-square (χ^2) test was used for comparing group ratios. The generalized additive model was used to evaluate the risk factors for each of the 8 responses (backward: Wald; cutoff for entry: 0.05, cutoff for removal: 0.10). An alpha value of $P < .05$ was considered statistically significant.

Results

Characteristics of study subjects

Of the 482 enrolled subjects, 258 (53.5%; 132 males and 126 females) were diagnosed with hypertriglyceridemia