Original Article

Alcohol Drinking, Dyslipidemia, and Diabetes: A Population-based Prospective Cohort Study among Inner Mongolians in China*

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Abstract

Objective No previous studies have evaluated the association between dyslipidemia, alcohol drinking, and diabetes in an Inner Mongolian population. We aimed to evaluate the co-effects of drinking and dyslipidemia on diabetes incidence in this population.

Methods The present study was based on 1880 participants from a population-based prospective cohort study among Inner Mongolians living in China. Participants were classified into four subgroups according to their drinking status and dyslipidemia. Multivariate logistic regression analysis and receiver operating characteristic (ROC) curves were used to evaluate the association between alcohol drinking, dyslipidemia, and diabetes.

Results During the follow-up period, 203 participants were found to have developed diabetes. The multivariable-adjusted odds ratios (95% confidence interval) for the incidence of non-dyslipidemia/drinkers, dyslipidemia/non-drinkers, and dyslipidemia/drinkers in diabetic patients were 1.40 (0.82-2.37), 1.73 (1.17-2.55), and 2.31 (1.38-3.87), respectively, when compared with non-dyslipidemia/non-drinkers. The area under the ROC curve for a model containing dyslipidemia and drinking status along with conventional factors (AUC=0.746) was significantly (P=0.003) larger than the one containing only conventional factors (AUC=0.711).

Conclusion The present study showed that dyslipidemia was an independent risk factor for diabetes, and that drinkers with dyslipidemia had the highest risk of diabetes in the Mongolian population. These findings suggest that dyslipidemia and drinking status may be valuable in predicting diabetes incidence.

Key words: Diabetes; Dyslipidemia; Drinking; Prospective; Cohort study

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a major risk factor for cardiovascular disease and can have devastating consequences on quality of life. In China, the prevalence of diabetes is high and increasing[1-2], a development that has followed rapid economic growth and changes in lifestyle. Diabetes has reached epidemic proportions in the general Chinese adult population and about 92.4 million adults 20 years of age or older (9.7% of the adult population) have diabetes[3]. Dyslipidemia is a common co-morbidity in T2DM patients[4], and over 70% of adults with T2DM have one or more lipid abnormalities[5]. Low levels of high-density lipoprotein (HDL) cholesterol, often associated with elevated triglyceride levels, is the most prevalent form of dyslipidemia in T2DM patients. It has been shown that poor glycemic control increases triglyceride levels and decreases HDL levels in T2DM[6]. In addition, emerging evidence suggests that dyslipidemia is a significant risk factor for the future development of T2DM[7-8].

Alcohol is also a potential risk factor for diabetes, and with its influence depending on the type of alcohol consumed and the level of consumption[9]. Alcohol consumption may also play an important role in changing lipid levels[10-11]. A Japanese study found that alcohol drinking influences components of metabolic syndrome, such as dyslipidemia. Furthermore, in heavy drinkers, the prevalence of high triglyceride levels was higher than that in non-drinkers[12]. Our previous study showed that Mongolian population had a higher prevalence of alcohol drinking and a significant association existed between alcohol drinking and dyslipidemia[13]. However, there have been no reports specifically analyzing the co-effects of dyslipidemia and alcohol drinking on diabetes risk among the Mongolian population (an ethnic minority in China). Considering the potential interplay between dyslipidemia and drinking, we analyzed the association between drinking, dyslipidemia, and diabetes incidence on the basis of a 10-year-follow-up study in an Inner Mongolian population in China.

METHODS

Study Participants

This study was established to evaluate potential risk factors for chronic diseases from 2002 to 2003 in an Inner Mongolia, an autonomous region in northern China. The methods used to recruit study participants and collect baseline data have been described elsewhere[14]. Study participants were recruited from 32 villages in two adjacent townships, Kezuohou Banner rural and Naiman Banner. The majority of the residents were Inner Mongolians who had lived there for a long time and a number of generations and maintained a traditional diet and lifestyle. In total, there were 3475 Mongolian people aged over 20 years living in the selected villages. Among them, 886 people were excluded because of the presence of cardiovascular diseases, endocrine diseases including hyper/hypothyroidism, and antihypertensive drug use, or refusal to participate. Moreover, 94 diabetic patients and 61 non-diabetics without complete key variables were excluded. Finally, 2434 individuals were included in this study at baseline. Written informed consent was obtained for all study participants. This study was approved by the ethics committee at Soochow University in China.

Data Collection

The trained staff interviewed participants in Chinese using a standard questionnaire to obtain information on demographic characteristics, medical history, and lifestyle risk factors. Cigarette smoking was defined as having smoked at least one cigarette per day for 1 year or longer. Almost all residents we investigated drank the native distilled liquor that has an alcohol concentration of approximately 50%. Information regarding the amount and type of alcohol consumed over the past several years was collected, and alcohol drinking was defined as consuming at least 50 g distilled spirits (about 50% alcohol concentration, i.e., 25 g alcohol) per day for at least 1 year. Three blood pressure (BP) measurements were conducted for each participant using a mercury sphygmomanometer while participants were seated according to a standard protocol[15]. The first and fifth Korotkoff sounds were recorded as the systolic (SBP) and diastolic blood pressures (DBP), respectively. The mean of these three blood pressure measurements was used in the data analysis. Height and body weight were measured by trained staff using a balance beam scale after subjects removed their shoes and wore light clothing. The body mass index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters (kg/m^2).

Blood samples were obtained in the morning after at least 8 h of fasting. All plasma and serum