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Original Article

Higher triglyceride level predicts hyperuricemia: A prospective study of 6-year follow-up

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BACKGROUND: Despite abundant evidence indicating that higher triglyceride (TG) levels are associated with increased risks of hyperuricemia (HUA), it is unclear whether TG levels can independently predict the incidence of HUA.

OBJECTIVE: The aim of the study was to investigate whether TG is an independent risk factor of HUA in a cohort study.

METHODS: We explored the relationship between TG levels and HUA in a dynamic cohort established in 2009. During the 6 years of follow-up, 5442 subjects without HUA were studied. We divided subjects into 4 groups based on baseline TG levels and used the Cox hazard regression model to estimate HUA risk by TG quartile, after adjustment for potential confounding factors. Kaplan–Meier survival analysis compared the risk of HUA incidence among individuals in each TG quartile.

RESULTS: The incidence of HUA in this cohort was 25.9%. The hazard ratios (95% confidence intervals) for HUA in the second, third, and fourth TG quartiles, compared with the first quartile, were 1.19 (1.01–1.40), 1.33 (1.13–1.57), and 1.62 (1.37–1.92), respectively. The Kaplan–Meier survival analysis suggested that higher TG levels predicted higher incidences of HUA in a dose-dependent relationship. Stratification analyses showed that the association between TG levels and the presence of HUA was more pronounced in individuals aged <50 years, of obese, with normal estimated glomerular filtration rate, and with hypertension.

CONCLUSION: Our findings suggest that TG level is a significant and independent risk factor for HUA.

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Introduction

Hyperuricemia (HUA) has become a global public health problem because of its high and increasing prevalence.[1–3] People with HUA are prone to disease through the formation of urate crystals, but HUA, independent of crystal formation, has also been linked with diabetes, hypertension, dyslipidemia, cardiovascular disease, atherosclerosis, stroke, and chronic kidney disease.[4–10] The prevalence of HUA in adults is about 21% in the United States,[11] 13.3% in mainland China,[12] and 25.8% in Japan.[13] However, up to now, a clearly defined pathologic mechanism for HUA has not been fully elucidated. Therefore, identifying asymptomatic individuals with high risk of developing HUA would contribute to early prevention and treatment of the condition and of subsequent gouty arthritis.

Triglycerides (TGs), stored in adipose cells, are the most abundant lipids in the human body. In the United States, National Health and Nutrition Examination Survey data demonstrated that 31% of adults have a TG level ≥1.7 mmol/L and that 16.2% and 1.1% have high (≥2.26 mmol/L) and very high (≥5.6 mmol/L) TG levels, respectively.[14] Numerous epidemiologic studies have indicated that higher TG levels were positively correlated with risk of HUA.[15–17] In addition, a study found that TG was the best lipid index associated with HUA.[9] Series cross-sectional studies and longitudinal studies have also observed a link between dyslipidemia and HUA.[16,18,19] However, most previous studies did not study TGs as an independent factor and did not fully adjust for potential confounders,[15,20] and some studies examined the link between TG and risk of HUA in men only,[21,22] so a lack of scientifically sound studies exists.

We aimed to explore the association between TG and HUA while adjusting for known risk factors, including gender, age, estimated glomerular filtration rate (eGFR), body mass index (BMI), and several metabolic factors. We performed a dynamic cohort study in Tianjin, China, and conducted a routine physical examination each year from 2009 to 2015.

Materials and methods

Study population

A total of 7453 adults (5638 men and 1815 women) comprising primarily senior citizens were recruited. Recruited subjects were invited to take part in a physical examination each year up to 2015. Of the 7453 participants, a total of 2031 were excluded because of HUA or missing data (eg, TG levels and serum uric acid [SUA] levels) or because subjects took medications to lower uric acid levels. Ultimately, we used data from 5422 subjects for analysis (Fig. 1). All subjects provided written informed consent before starting the study, and the protocol was approved by the Human Ethics Committee of Tianjin Medical University.

Ascertainment of incident cases of HUA

HUA was defined as SUA ≥ 7.0 mg/dL (420 μmol/L) in men and SUA ≥ 6.0 mg/dL (360 μmol/L) in women. Subjects who were free of HUA (no medication for and no past history of HUA) at baseline but received a diagnosis of HUA at any subsequent physical examination were defined as incident HUA cases.

Assessment and definitions of covariates

Height, weight, and blood pressure were obtained by physical examination. BMI was calculated as weight (kilogram) divided height (meter) squared. Fasting glucose levels, liver function (total serum protein, albumin, globulin, aspartate aminotransferase, direct bilirubin [DBIL], and total bilirubin), renal function (blood urea nitrogen, and serum creatinine), lipid profiles (total cholesterol and TG), and hemoglobin levels were obtained by laboratory examination. SUA levels were measured by enzymatic methods (Chemistry Analyzer Au2700; Olympus Medical Engineering Company, Japan).

Hypertension was defined as systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg, a self-reported history of physician-diagnosed hypertension, or use of an antihypertension drug.[23] According to the recommended criteria for Chinese people,[24] normal weight was defined as a BMI of 18.5 to 23.9 kg/m^2, overweight as a BMI of 24.0 to 27.9 kg/m^2, and obese as BMI ≥28.0 kg/m^2. Chronic kidney disease was defined as eGFR < 60 mL/min/1.73 m^2.[6]

Statistical analysis

Demographic and clinical biochemical indexes were described in all the subjects using mean ± standard deviation for continuous variables and percentages for

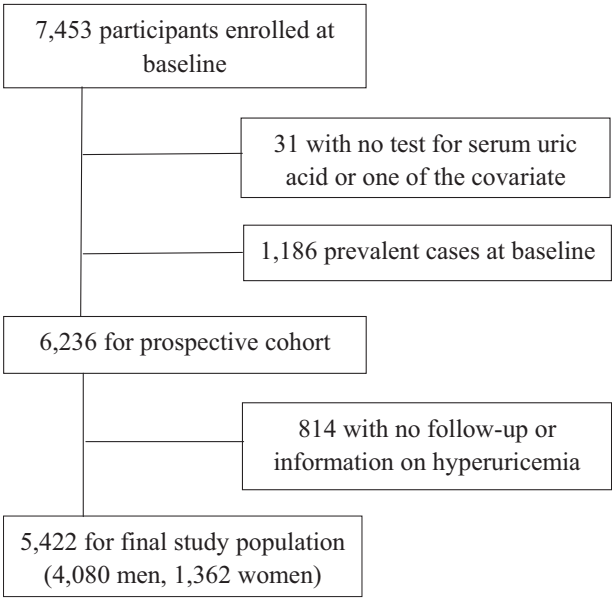

Figure 1 Flow chart of subject selection for the present study.