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Comparison between European and Iranian cutoff points of triglyceride/high-density lipoprotein cholesterol concentrations in predicting cardiovascular disease outcomes

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BACKGROUND: High triglyceride (TG) and low high-density lipoprotein cholesterol (HDL-C) are important cardiovascular risk factors. The exact prognostic value of the TG/HDL-C ratio, a marker for cardiovascular events, is currently unknown among Iranians so this study sought to determine the optimal cutoff point for the TG/HDL-C ratio in predicting cardiovascular disease events in the Iranian population.

METHOD: The Isfahan Cohort Study (ICS) is an ongoing, longitudinal, population-based study that was originally conducted on adults aged ≥35 years, living in urban and rural areas of three districts in central Iran. After 10 years of follow-up, 5431 participants were re-evaluated using a standard protocol similar to the one used for baseline. At both measurements, participants underwent medical interviews, physical examinations, and fasting blood measurements. "High-risk" subjects were defined by the discrimination power of indices, which were assessed using receiver operating characteristic (ROC) analysis; the optimal cutoff point value for each index was then derived.

RESULTS: The mean age of the participants was 50.7 ± 11.6 years. The TG/HDL-C ratio, at a threshold of 3.68, was used to screen for cardiovascular events among the study population. Subjects were divided into two groups ("low" and "high" risk) according to the TG/HDL-C concentration ratio at baseline. A slightly higher number of high-risk individuals were identified using the European cutoff points of 63.7% in comparison with the ICS cutoff points of 49.5%. The unadjusted hazard ratio (HR) was greatest in high-risk individuals identified by the ICS cutoff points (HR = 1.54, 95% CI [1.33–1.79]) vs European cutoff points (HR = 1.38, 95% [1.17–1.63]). There were no remarkable changes after adjusting for differences in sex and age (HR = 1.58, 95% CI [1.36–1.84] vs HR = 1.44, 95% CI [1.22–1.71]) for the ICS and European cutoff points, respectively.

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CONCLUSION: The threshold of TG/HDL ≥3.68 is the optimal cutoff point for predicting cardiovascular events in Iranian individuals.

Introduction

Epidemiologic studies have revealed a strong relationship between dyslipidemia and the incidence of cardiovascular disease (CVD).[1,2] Numerous studies have published evidence of the association between lipids (total cholesterol and triglycerides [TGs]) and their associated blood transporting lipoproteins (HDL-C, LDL-C, and VLDL-C) with the occurrence of atherosclerosis in general and CVD in particular.[3,4] The first step in the diagnosis of dyslipidemia is to describe the lipoprotein pattern of the plasma lipids and lipoproteins.[5] The association between the risk of CVD, high TG, and low levels of HDL-C has been established.[3,6] The TG/HDL-C ratio indicates the presence of small, dense LDL particles and could serve as a good predictor of coronary heart disease.[7] One previous study has been conducted on the relationship between TG and HDL-C, however, and has shown that the ratio of TG to HDL-C could be considered to be a strong predictor of myocardial infarction.[8] The ability to identify high-risk individuals with elevated TG and low HDL before they develop manifest disease would have substantial clinical benefits; several studies have raised the possibility that the use of plasma concentrations of TG/HDL-C might fulfill this function.[9–11]

Another previous study has shown that using the plasma TG/HDL-C concentration ratio has acceptable power to predict cardiovascular events among the European population.[12] A recent study showed that the values of ≥2.5 (women) and ≥3.5 (men) among the European population provide useful cutoff points to identify individuals who are insulin resistant and thus are at increased cardiometabolic risk.[9] To the best of our knowledge, no data from Middle East populations have yet been reported to show the cutoff point of TG/HDL-C and cardiovascular events. As such, this study has aimed to determine the best cutoff point of TG/HDL-C in predicting cardiovascular events among the Iranian population.

Methods

Study population

The Isfahan Cohort Study (ICS) is an ongoing, population-based, longitudinal study of adults aged ≥35 years old, living in urban and rural areas of three central Iranian counties (Isfahan, Najafabad, and Arak).[13]

The participants were recruited from 2 January to 28 September 2001. Participants were selected by multistage random sampling and were recruited to reflect the age, sex, and urban and/or rural distribution of the general community.[14] The methodology used to obtain the measurements of the clinical and biochemical variables has been previously published.[14] The Ethics Committee of the Isfahan Cardiovascular Research Institute approved this study.

Assessments

After obtaining informed, written consent, medical interviews, and physical examinations were conducted. Measurements of blood pressure, anthropometric parameters, and fasting blood tests were conducted following standard protocols and using calibrated instruments, as has been described previously.[15] In 2011 (the tenth year of the follow-up), participants were invited for repeated laboratory measurements, physical examinations and interviews using the same protocol as in the baseline survey. Although the laboratory measurement methods were similar in 2001 and 2011, the auto analyzer used was different (Eppendorf, Hamburg, Germany in 2001 and Hitachi 902, Osaka, Japan in 2007). Both instruments were validated by an external standard laboratory center.

For the biochemical analysis, 5-ml blood samples were drawn after 12 h overnight fasting for measuring lipid profile and fasting blood sugar. In brief, using a mercury sphygmomanometer, blood pressure was measured in a sitting position and after a minimum resting period of 10 min. Phase I and V Korotkoff sounds were used to identify systolic blood pressure and diastolic blood pressure, respectively; systolic blood pressure and diastolic blood pressure values were taken as the average of three different measurements, separated by two minutes from one another. Weight was determined with individuals wearing light clothes and no shoes (Sega, Germany). Height was also measured without shoes, using a metallic metric tape; waist circumference (WC) was measured with a relaxed abdomen using a metric tape on a horizontal plane above the iliac crest; body mass index (BMI) was calculated using the formula kg/m^2.

All determinations of lipids and lipoprotein cholesterol concentrations were performed in the Isfahan Cardiovascular Research Center Laboratory. Plasma total cholesterol and triglycerides (TGs) were analyzed with a Hitachi Auto Analyzer (Japan) using enzymatic reagents (Pars Azmon, Tehran, Iran[1]). High-density lipoprotein