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Original Research

Distribution of 10-year risk for coronary heart disease and eligibility for therapeutic approaches among Tehranian adults

M. Barzin [a], P. Mirmiran [b,*], M. Afghan [a], F. Azizi [c]

[a] Obesity Research Centre, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[b] Department of Human Nutrition, Faculty of Nutrition and Food Technology, National Nutrition and Food Technology Institute, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[c] Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Article history:
Received 8 April 2010
Received in revised form
22 December 2010
Accepted 3 February 2011
Available online 14 May 2011

Keywords:
10-Year risk
Coronary heart disease
Adults
NCEP ATP III

SUMMARY

Objectives: To establish the distribution of 10-year risk for coronary heart disease (CHD) and eligibility for therapeutic approaches among Tehranian adults within the framework of the Tehran Lipid and Glucose Study (TLGS).

Study design: Cross-sectional study conducted on data from Phase III of the TLGS (12,521 people aged ≥3 years).

Methods: The modified Framingham algorithm adopted by the National Cholesterol Education Program Adult Treatment Panel III was used to estimate participants' 10-year risk of developing CHD; only participants aged 20–79 years were included. Following the exclusion of subjects without full relevant data, 9483 participants (42.6% men) were enrolled in the final analysis. The distributions of the population needing therapeutic lifestyle changes (TLCs) and additional drug therapy were calculated.

Results: Overall, the mean (standard deviation) age was 43.7 (15.4) years; 44.6 (15.9) for men and 43.0 (14.9) for women. Ten-year risk for CHD of <10%, 10–20% and >20% was observed in 86.0%, 12.0% and 2.0% of participants with at least two risk factors and without CHD or a CHD risk equivalent, respectively. For subjects with less than two risk factors and without CHD or a CHD risk equivalent, these values were 14.0%, 8.3% and 14.7%, respectively; 63.1% of subjects had less than two risk factors. The need for TLCs and additional drug therapy was observed in 12% and 12.5% of subjects, respectively.

Conclusions: Regarding the estimated 10-year risk for CHD, about one-quarter of Tehranian adults are eligible for therapeutic approaches.

Introduction

Coronary heart disease (CHD) is a leading cause of death in many countries.[1] Mortality from CHD is gradually decreasing in developed countries due to reductions in cigarette smoking and hypertension[2,3]; however, it is reportedly on the rise in some developing countries.[4–6] While accurate trend data regarding CHD mortality are not available in Iran, as for other

* *Corresponding author*. Tel.: +98 21 22432503; fax: +98 21 22402463.
E-mail address: mirmiran@endocrine.ac.ir (P. Mirmiran).

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doi:10.1016/j.puhe.2011.02.002

developing nations,[7,8] it seems likely that changing lifestyles in Iran, along with the rising prevalence of obesity and type 2 diabetes, are leading to a progressive increase in the prevalence of CHD. The CHD rate in Iran is high (approximately 19%)[9] and is of great concern to clinicians and health officials.

Prospective studies around the world have identified major risk factors for the development of CHD. Based on these risk factors, functions have been developed to predict the occurrence of CHD in individual patients.[1] An algorithm which has been used successfully for CHD risk assessment is adopted by the National Cholesterol Education Program Expert Panel in their third report on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III; NCEP ATP III).[10] The ATP III used the risk prediction algorithm from the Framingham Heart Study[11] with some modifications to identify certain individuals with multiple (two or more) risk factors whose short-term (10-year) risk of CHD warrants consideration of intensive treatment. Since a reduction in low-density lipoprotein cholesterol (LDL-C) should be the primary target of therapy in ATP III, therapeutic criteria are defined for this purpose according to each individual's risk.

Although some studies have provided estimates of the distribution of risk for CHD in other populations,[12–14] there were differences between the study populations, the definitions of variables and the additional variables included in the equations, and these could be responsible for the differences between coefficients across studies. Since no studies have been conducted to estimate the risk of CHD according to NCEP ATP III in a diverse Iranian population, this study was carried out to investigate the risk of developing CHD in Tehranian adults, and the distributions of the population needing therapeutic lifestyle changes (TLCs) and additional drug therapy using the NCEP ATP III. Such information may be helpful to those developing diagnostic and treatment guidelines for topics related to CHD. These findings may also help in the estimation of costs associated with such guidelines. In addition, this information may hold promise for surveillance purposes.

Methods

Study population

This study was conducted within the framework of the Tehran Lipid and Glucose Study (TLGS), a large-scale community-based prospective study on a representative sample of residents of District 13 of Tehran, the capital of Iran, with the aim of ascertaining the prevalence of non-communicable disease risk factors and developing a healthy lifestyle to curtail these risk factors. The rationale and design of the TLGS have been published in detail elsewhere.[15] The TLGS includes three phases: Phase I (1999–2001), Phase II (2002–2004) and Phase III (2005–2008). The current study was conducted on data from Phase III; 12,521 people aged $\geq$3 years were selected using multistage cluster random sampling method. The modified Framingham algorithm, as adopted by NCEP ATP III, was used to estimate participants' 10-year risk of developing CHD; only subjects aged 20–79 years were included. Of the 9910 participants in this age range, 427 individuals did not have full demographic, anthropometric and laboratory data to calculate the modified Framingham risk score and were excluded from the study. Therefore, 9483 participants (42.6% men and 57.4% women) were enrolled in the final analysis. The proportions of participants at each risk level were calculated after excluding those with CHD or a CHD risk equivalent, and those with less than two risk factors (1460 individuals) to estimate the proportion of the population at high risk group because of risk factors only. Informed written consent was obtained from each subject.

Assessment of variables

Details of the TLGS protocol and all laboratory procedures have been published elsewhere.[15] Weight was measured using digital scales (Seca 707, Hanover, MD, USA), recorded to the nearest 100 g, with the subjects wearing minimal clothing and without shoes. Height was measured with a tape measure (Seca 208 Portable Body Meter Measuring Device, Hanover, MD, USA), recorded to the nearest 1 cm, with the subjects in a standing position with shoulders in a normal resting state and without shoes. Body mass index (BMI) was calculated. To reduce subjective error, all measurements were taken by the same technician. There were significant correlations between the test and retest results taken by the technician ($r > 0.75$, $P < 0.001$).

Blood pressure was measured twice after the participants rested in a sitting position for 15 min. Blood samples were taken after an overnight fast of 12–14 h for biochemical analysis. The samples were taken in a standard sitting position and then centrifuged for 45 min after collection. All the assays were performed at the TLGS research laboratory on the day of sampling. Blood glucose was measured by the glucose oxidase method (Glucose Kit, Pars Azmoon, Tehran, Iran); method sensitivity and intra and inter coefficients of variation for baseline and follow-up examination were 1 mg/dl, 2.2% and 3.3%, respectively. Serum total cholesterol was measured using a commercially available enzymatic reagent (Pars Azmoon, Tehran, Iran), adapted to the Selectra II autoanalyser (Merck, Dieren, The Netherlands). LDL-C was calculated according to the method of Friedwald *et al.*[16] High-density lipoprotein cholesterol (HDL-C) samples were measured by precipitation and the enzymatic colurimetric method (HDL-C Kit, Pars Azmoon, Tehran, Iran); method sensitivity and coefficient of variation were 1 mg/dl and 2.1% respectively. All the assays were performed using the Selectra II autoanalyser.

Demographic and lifestyle information were obtained using a standard questionnaire.[17] All subjects were questioned about their past history of CHD, which reflected any prior diagnosis by a physician and was defined as a positive answer to the relevant question at the time of the interview. Family history of premature CHD reflected any sudden death from CHD in any female first-degree relative under 65 years of age or male first-degree relative under 55 years of age, and was defined as a positive answer to the relevant question at the time of the interview. Cigarette smoking status was categorized according to the guidelines of the World Health Organization[18]: daily smoker; smokes at least once a day; occasional smoker; smokes but not everyday; ex-smoker; former daily or occasional smoker who does not currently