

Original Article

Risk stratification of atherosclerotic cardiovascular disease in Chinese adults

Xue-Li Yang^a, Ji-Chun Chen^a, Jian-Xin Li^a, Jie Cao^a, Xiang-Feng Lu^a,
Fang-Chao Liu^a, Dong-Sheng Hu^b, Xiao-Qing Liu^c, Chong Shen^d, Ling Yu^e,
Fang-Hong Lu^f, Xian-Ping Wu^g, Lian-Cheng Zhao^a, Jian-Feng Huang^a, Ying Li^a,
Xi-Gui Wu^a, Dong-Feng Gu^{a,*}

^a Department of Epidemiology, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing 100037, China

^b Department of Prevention Medicine, Shenzhen University School of Medicine, Guangdong 518000, China

^c Division of Epidemiology, Guangdong Provincial People's Hospital and Cardiovascular Institute, Guangzhou, Guangdong 510000, China

^d Department of Epidemiology and Biostatistics, School of Public Health, Nanjing Medical University, Nanjing, Jiangsu 211166, China

^e Department of Cardiology, Fujian Provincial People's Hospital, Fuzhou, Fujian 350004, China

^f Cardio-Cerebrovascular Control and Research Center, Institute of Basic Medicine, Shandong Academy of Medical Sciences, Jinan, Shandong 250062, China

^g Sichuan Center for Disease Control and Prevention, Chengdu, Sichuan 610041, China

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Abstract

Objective: This study aims to determine the distribution of observed atherosclerotic cardiovascular disease (ASCVD) incidence in contemporary cohorts in China, and to identify cut-off points for ASCVD risk classification based on traditional criteria and new equations developed by Prediction for ASCVD Risk in China (China-PAR).

Methods: The study populations included cohorts in the China-PAR project, with 34,757 participants eligible for the current analysis. Traditional risk stratification was assessed by using Chinese guidelines on prevention of CVD and hypertension, and 5 risk groups were classified based on these guidelines after slight modification for available risk factors. Kaplan–Meier analysis was conducted to obtain the cumulative incidence of observed ASCVD events for all subjects and sub-groups. The predicted 10-year ASCVD risk was obtained using the China-PAR equations.

Results: A total of 1922 ASCVD events were identified during an average follow-up of 14.1 years. According to the group classification based on traditional risk stratification, the observed 10-year risks for ASCVD were 4.61% (95% confidence interval

* Corresponding author. Fax: +86 10 88363812.

E-mail address: gudongfeng@vip.sina.com (D.-F. Gu).

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[CI]: 4.11–5.10%) in the moderate-risk group and 8.74% (95% CI: 7.82–9.66%) in the high-risk group. Based on the China-PAR equations for risk assessment of ASCVD, those with predicted risks of <5%, 5–10%, and $\geq 10\%$ could be classified into categories of low-, moderate-, and high-risk for ASCVD, respectively.

Conclusion: The findings enable development of a simple method for classification of individuals into low-, moderate-, and high-risk groups, based on the China-PAR equations. The method will be useful for self-management and prevention of ASCVD in Chinese adults.

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Keywords: Risk stratification; Atherosclerotic cardiovascular disease; Cohort; China-PAR project

Introduction

Atherosclerotic cardiovascular disease (ASCVD) is the leading cause of mortality and disease burden in China.¹ From 1990 to 2010, stroke became the leading cause of death in China, followed by ischemic heart disease.² The rapid increase in ASCVD is attributable to the aging population, lifestyle changes, and high prevalence of ASCVD risk factors such as hypertension, dyslipidemia, diabetes, and obesity.^{3–5}

Risk factors for ASCVD were first identified by the Framingham Heart Study,^{6–8} followed by extensive research in China and other countries.^{9,10} Several tools and equations for risk stratification, such as the Framingham general cardiovascular disease (CVD) equations⁸ and the Pooled Cohort Equations (PCE),¹¹ have been developed to help healthcare practitioners identify individuals at high-risk of CVD. In China, Liu et al and Wu et al also developed risk prediction tools for coronary heart disease (CHD) and ischemic CVD, respectively, over 10 years ago.^{12,13} However, risk factor profiles in China have changed dramatically, and new equations have recently been developed by Prediction for ASCVD Risk in China (China-PAR) to predict 10-year ASCVD risk; these have been derived and validated using 4 contemporary Chinese cohorts, based on traditional lifestyles, metabolic risk factors, and several new indicators such as waist circumference (WC), geographic region (Northern vs. Southern), urbanization (Urban vs. Rural), and family history of ASCVD.¹⁴ To facilitate the use of China-PAR equations for ASCVD risk assessment in prevention and clinical practice in China, we examined ASCVD incidence and differences in ASCVD risk among diverse age groups, genders, and geographic regions.

In addition, the Chinese Guideline on Prevention of CVD was published in 2011 and recommended a scale of risk stratification for CVD prevention by classifying

5 groups as very-low-, low-, moderate-, high-, and very-high-risk.¹⁵ This scale of risk stratification was also one of the main references for Chinese guidelines on prevention and control of hypertension and dyslipidemia in the evaluation of risk for CVD. However, traditional risk stratification was somewhat complicated, and was not commonly used by primary healthcare practitioners, especially in defined communities and rural areas. As an alternative, the newly developed China-PAR equations can serve as a valuable tool for prediction of 10-year ASCVD risk in the general Chinese population; for the equations to be useful, we must identify cut-off points for ASCVD risk classification, and make these more accessible for physicians and the general populations. Availability through Web App tools is also necessary.

Therefore, we aimed to identify the distribution of observed ASCVD incidence in large-scale contemporary cohorts in China, and to determine cut-off points for 10-year ASCVD risk stratification based on the new China-PAR equations and traditional risk stratification criteria derived from the Chinese Guidelines on Prevention of CVD and hypertension.

Methods

Study population

The study population was derived from cohorts in the China-PAR project, including those in the International Collaborative Study of Cardiovascular Disease in Asia (InterASIA) and China Multi-Center Collaborative Study of Cardiovascular Epidemiology (China MUCA-1998 and China MUCA-1992-1994). Details of baseline and follow-up information for the cohorts have been published elsewhere.¹⁴ Briefly, a total of 41,412 participants were enrolled in the 3 cohorts. After excluding participants lost to follow-up, those with ASCVD at baseline, and those with

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