

SPECIAL FOCUS ISSUE: CARDIOVASCULAR HEALTH PROMOTION

Adherence to Healthy Lifestyle and Cardiovascular Diseases in the Chinese Population



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ABSTRACT

BACKGROUND Adherence to a combination of healthy lifestyle factors has been related to a considerable reduction of cardiovascular risk in white populations; however, little is known whether such associations persist in nonwhite populations like the Asian population.

OBJECTIVES This study aimed to examine the associations of a combination of modifiable, healthy lifestyle factors with the risks of ischemic cardiovascular diseases and estimate the proportion of diseases that could potentially be prevented by adherence to these healthy lifestyle patterns.

METHODS This study examined the associations of 6 lifestyle factors with ischemic heart disease and ischemic stroke (IS) in the China Kadoorie Biobank of 461,211 participants 30 to 79 years of age who did not have cardiovascular diseases, cancer, or diabetes at baseline. Low-risk lifestyle factors were defined as nonsmoking status or having stopped smoking for reasons other than illness, alcohol consumption of <30 g/day, a median or higher level of physical activity, a diet rich in vegetables and fruits and limited in red meat, a body mass index of 18.5 to 23.9 kg/m², and a waist-to-hip ratio <0.90 for men and <0.85 for women.

RESULTS During a median of 7.2 years (3.3 million person-years) of follow-up, this study documented 3,331 incident major coronary events (MCE) and 19,348 incident ISs. In multivariable-adjusted analyses, current nonsmoking status, light to moderate alcohol consumption, high physical activity, a diet rich in vegetables and fruits and limited in red meat, and low adiposity were independently associated with reduced risks of MCE and IS. Compared with participants without any low-risk factors, the hazard ratio for participants with ≥4 low-risk factors was 0.42 (95% confidence interval: 0.34 to 0.52) for MCE and 0.61 (95% confidence interval: 0.56 to 0.66) for IS. Approximately 67.9% (95% confidence interval: 46.5% to 81.9%) of the MCE and 39.1% (95% confidence interval: 26.4% to 50.4%) of the IS cases were attributable to poor adherence to healthy lifestyle.

CONCLUSIONS Adherence to healthy lifestyle may substantially lower the burden of cardiovascular diseases in Chinese. (J Am Coll Cardiol 2017;69:1116–25) © 2017 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



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Ischemic heart disease (IHD) and ischemic stroke (IS) are posing major burdens to global health (1), and they are the leading causes of death in China (2). Although pharmacological treatment has shown considerable effectiveness in improving therapy of these diseases, it is costly and may have side effects. In contrast, adherence to a healthy lifestyle has become a mainstream approach to lower cardiovascular burden through primary prevention (3).

In epidemiological studies, modifiable lifestyle factors, such as nonsmoking (4), moderate alcohol consumption (5), physical activity (6), healthy diets (7,8), and low adiposity (9,10), have been consistently linked to a reduced cardiovascular risk. Several previous studies showed that adherence to a healthy lifestyle defined by a combination of these modifiable factors was related to up to roughly an 80% reduction in coronary heart disease (CHD) incidence (11–14), and a 50% reduction in IS incidence (15), in white populations from developed countries. However, little is known whether such protective effects persist in other nonwhite populations like the Asian population.

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We thus aimed to examine the associations of a combination of modifiable, healthy lifestyle factors with the risks of IHD and IS in a large cohort of 0.5 million of adult Chinese: the China Kadoorie Biobank (CKB) study (16). In addition, we estimated the proportion of ischemic cardiovascular diseases (CVDs) that could potentially be prevented by adherence to the healthy lifestyle patterns.

METHODS

STUDY POPULATION. The CKB cohort was established in 10 study areas geographically spread across China during 2004 to 2008, when all nondisabled, permanent residents of each area who were 35 to 74 years of age were invited to participate in the study. Of the total of approximately 1.8 million eligible adults in these areas, almost 1 in 3 (33% in rural areas

and 27% in urban areas) responded (17). Overall, 512,891 adults 30 to 79 years of age were enrolled in the study, including a few who were just outside the targeted age range. All participants had completed a questionnaire, had physical measurements taken, and had completed a written informed consent form. The Ethical Review Committee of the Chinese Center for Disease Control and Prevention (Beijing, China) and the Oxford Tropical Research Ethics Committee at the University of Oxford (Oxford, United Kingdom) approved the study. Further details of the CKB cohort have been described in previous publications (16,17).

In the present analysis, we excluded participants who reported previous medical histories of heart disease ($n = 15,472$), stroke ($n = 8,884$), or cancer ($n = 2,577$); had prevalent diabetes ($n = 30,300$) on the basis of self-reported or glucose testing at baseline; had missing data for body mass index (BMI; $n = 2$); or were lost to follow-up shortly after baseline assessment ($n = 3$). After these exclusions, a total of 461,211 participants remained for the current analysis.

ASSESSMENT OF LIFESTYLE FACTORS. Participants reported on a range of lifestyle factors in the baseline questionnaire. Questions about tobacco smoking included frequency, type, and amount of tobacco smoked per day for ever smokers, and years since quitting and the reason for quitting for former smokers. Questions about alcohol consumption included typical drinking frequency, type of alcoholic beverage consumed habitually, and volume of alcohol consumed on a typical drinking day in the past 12 months. Questions about physical activity included the usual type and duration of activities in occupational, commuting, domestic, and leisure time-related domains in the past 12 months. The daily level of physical activity was calculated by multiplying the metabolic equivalent task value for a particular type of activity by hours spent on that activity per day and summing the metabolic equivalent task-hours for all activities. A short qualitative food frequency

ABBREVIATIONS AND ACRONYMS

BMI	= body mass index
CHD	= coronary heart disease
CKB	= China Kadoorie Biobank
CVD	= cardiovascular disease
IHD	= ischemic heart disease
IS	= ischemic stroke
MCE	= major coronary events
WHR	= waist-to-hip ratio

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