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Life's Simple 7 and Calcific Aortic Valve Stenosis Incidence in Apparently Healthy Men and Women

Nicolas Perrot[1,6], **S. Matthijs Boekholdt**[2,6], **Patrick Mathieu**[1,6], **Nicholas J. Wareham**[3,6], **Kay-Tee Khaw**[4,6], and **Benoit J. Arsenault**[1,5,6,*]

[1]Centre de recherche de l'Institut universitaire de cardiologie et de pneumologie de Québec, Canada [2]Department of Cardiology, Academic Medical Centre, Amsterdam, the Netherlands [3]MRC Epidemiology Unit, Cambridge, United Kingdom [4]Department of Public Health and Primary Care, University of Cambridge, Cambridge, United Kingdom [5]Department of Medicine, Faculty of Medicine, Université Laval, Québec, Canada

Abstract

Background—Calcific aortic valve stenosis (CAVS) is the most prevalent heart valve disease in Western societies. The American Heart Association 2020 Strategic Impact Goals introduced the concept of ideal cardiovascular health, which includes seven cardiovascular health metrics, namely body mass index, a healthy diet, physical activity, smoking status, blood pressure, fasting plasma glucose and cholesterol levels. Several prospective studies have shown that compared to people who meet few of the criteria of ideal cardiovascular health, those with ideal cardiovascular health have an 80-90% lower risk of CVD events. Whether or not ideal cardiovascular health is associated with CAVS risk is unknown. The purpose of this study was to assess the association between ideal cardiovascular health status and the risk of CAVS

Methods—In this analysis of the EPIC-Norfolk study, 21,856 participants were followed for 11.5 years and 430 of them developed CAVS. A cardiovascular health score was calculated based on the number of the seven health metrics.

Results—In comparison to individuals in the bottom quartile of ideal cardiovascular health (CAVS event rate of 2,9%), those in the top quartile of the ideal cardiovascular health score had a relative risk of CAVS of 0,45 (95% CI 0,31-0,65, AVS event rate of 0,8%).

Conclusions—In apparently healthy individuals, modifiable clinical and lifestyle-related risk factors for CVD are strongly associated with the risk of CAVS, thereby suggesting that CAVS may be a preventable disease.

Keywords

Calcific aortic valve stenosis; Lifestyle; Cardiovascular risk factors; Primary prevention

[*]Address for correspondence: Benoit J. Arsenault, PhD, Centre de recherche de l'Institut universitaire de cardiologie et de pneumologie de Québec, Y-3106, Pavillon Marguerite D'Youville, 2725 chemin Ste-Foy, Québec (QC) Canada, G1V 4G5, T: 418-656-8711 ext. 3498, benoit.arsenault@criucpq.ulaval.ca.
[6]This author takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation

Introduction

Calcific aortic valve stenosis (CAVS) is the most prevalent heart valve disease in Western societies. In the United States, estimates indicate that up to 1 million individuals have CAVS and this prevalence is expected to double within the next 20 years. Prospective studies have shown that CAVS and coronary heart disease (CHD) share similar risk factors such as age, male gender, smoking, type 2 diabetes (T2D) and elevated blood pressure. Evidence also support low-density lipoprotein cholesterol (LDL) and lipoprotein(a) [Lp(a)] as causative risk factors for CAVS. Mounting evidence also suggests that regardless of the genotype and presence/absence of some risk factors, the adherence to a sedentary lifestyle and the adoption of unhealthy dietary habits is also strongly linked with the incidence of CHD. In this regard, the American Heart Association (AHA) has identified and prioritized seven modifiable cardiovascular health metrics to decrease cardiovascular disease (CVD) burden by 2020 including: body mass index, a healthy diet, physical activity levels, smoking status, blood pressure, blood glucose control and total cholesterol (together known as ideal cardiovascular health or life's simple seven) [1]. Although many studies have shown that ideal cardiovascular health is a strong predictor of cardiovascular outcomes in population studies [2,3], whether ideal cardiovascular health also predicts the risk of CAVS is currently unknown. The purpose of this study was to assess the association between ideal cardiovascular health status and the risk of CAVS in apparently healthy individuals included in the European Prospective Investigation Into Cancer and nutrition (EPIC)-Norfolk prospective study.

Methods

A total of 21,856 participants were included in the analysis. Of them, 430 developed CAVS during a mean follow-up of 11.5 years. Participants were identified as having incident CAVS if they were hospitalized with CAVS as an underlying cause (International Classification of Diseases, 10th Revision, code I35) or if they died with CAVS as an underlying cause. The association between ideal cardiovascular health and the onset of CVD in this cohort has been published previously [3]. The cardiovascular health score was calculated based on the number of the seven health metrics as previously described (Table). Since Hba1c was only available in approximately half of the study participants, we opted for the presence/absence of diabetes mellitus to increase power. Diabetes mellitus status was ascertained by means of self-report of diabetes medication use or a Hba1c ≥6.5 mmol/L. Cox proportional hazards models were used to describe the association of the seven with the risk of CAVS after adjustment for age and sex.

Results

As shown in Figure 1, in comparison to individuals in the bottom quartile of ideal cardiovascular health (CAVS event rate of 2,9%), those in the second quartile had a relative risk of CAVS of 0,86 (95% CI 0,68-1,10, event rate of 2,5%), those in the third quartile had a relative risk of CAVS of 0,64 (95% CI 0,50-0,81, CAVS event rate of 1,6%) and those in the top quartile of the ideal cardiovascular health score had a relative risk of CAVS of 0,45 (95% CI 0,31-0,65, AVS event rate of 0,8%).

Discussion

The present analysis showed in a large series of incident CAVS cases that individuals with a higher score of ideal cardiovascular health had a substantial risk reduction. In this regard, if adopted and causally related to CAVS, the components of an ideal health status could reduce the burden of CAVS by as much as 55%. We and others have shown that genetic risk factors are involved in the development of CAVS, the strongest genetic variation linked with aortic valve calcium and CAVS being Lp(a) level [4]. In a previous analysis of the EPIC-Norfolk study, we have shown that individuals with an elevated ideal cardiovascular health score were at reduced CVD risk compared to those with a lower score, even in individuals with an elevated Lp(a) level [5]. Because of the low CAVS event rate compared to CVD, larger studies will eventually be required to document the association between the ideal cardiovascular health score and CAVS risk in the setting of genetically determined high Lp(a) levels. Additional studies will also be needed to determine whether the adoption of a healthy lifestyle could decrease the incidence of CAVS. Nevertheless, the present study suggests that adherence to the life's simple 7 proposed by the AHA could reduce the incidence of CVD, but also of CAVS significantly in the general population. Other studies have shown that clinical risk factors such as systolic blood pressure, type 2 diabetes and cholesterol levels could be associated with CAVS onset and/or progression [6,7]. In conclusion, in apparently healthy individuals representative of a contemporary Western population, modifiable clinical and lifestyle-related risk factor for CVD are strongly associated with the risk of CAVS, thereby suggesting that CAVS may be a preventable disease.

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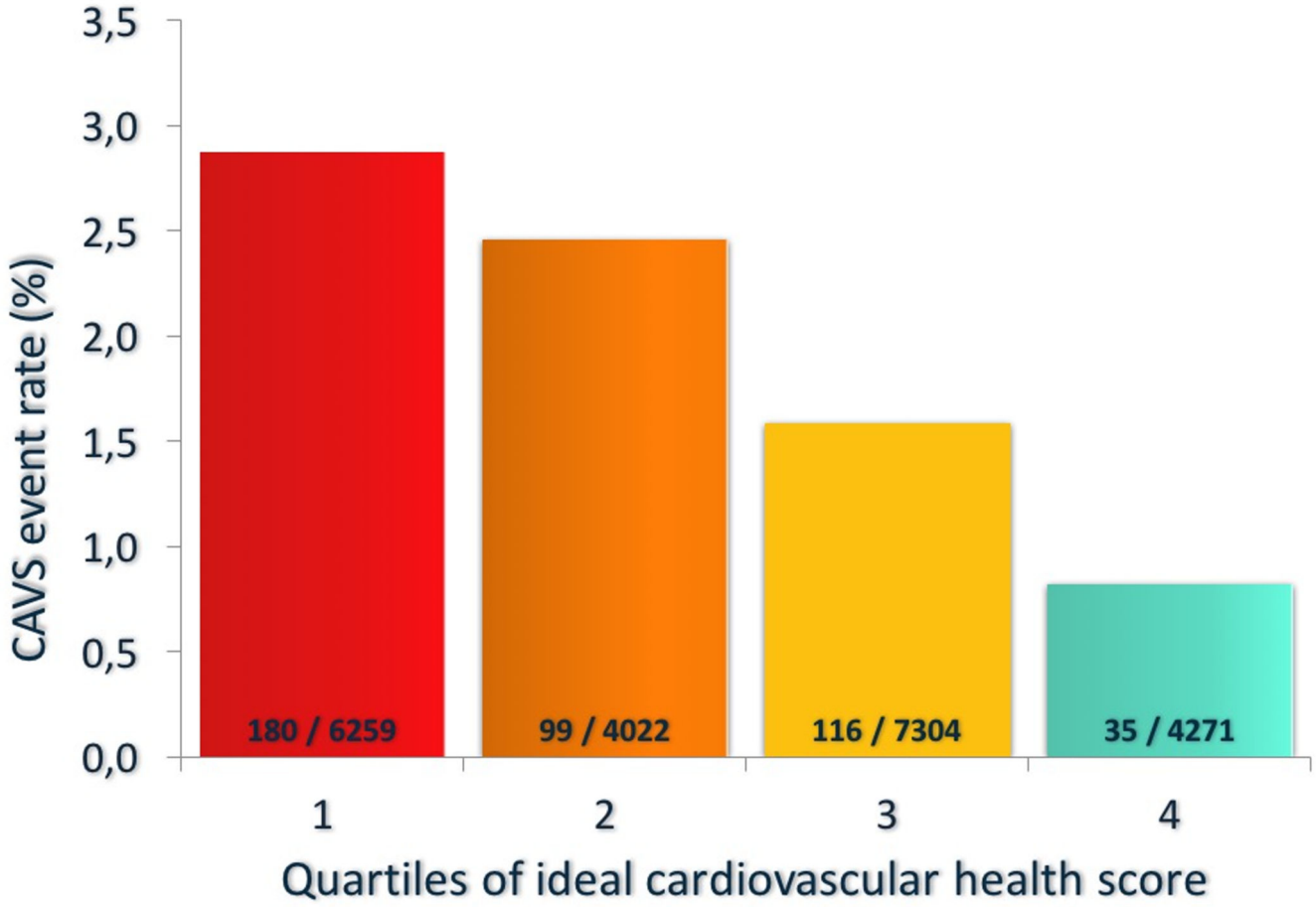

Figure.

Aortic valve stenosis event rates (bars) and hazard ratios for incident aortic valve stenosis in participants classified on the basis of ideal cardiovascular health quartiles after adjusting for age and sex.

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Table

Definition of the American Heart Association Life's Simple 7 used in the European Prospective Investigation into Cancer and Nutrition-Norfolk study.

Cardiovascular health metric	Ideal (2 points)	Intermediate (1 point)	Poor (0 point)
Body mass index	<25 kg/m^2	25-30 kg/m2	≥30 kg/m2
Healthy diet score	≥4 of the following criteria	2-4 of the following criteria	<2 of the following criteria
	5+ cups of fruits and vegetables per day		
	2+ fish servings per week		
	3+ fibre-rich whole grains servings (1 oz) per day		
	<1500 mg sodium per day		
	≤450 kcal sugar-sweetened beverages per week		
Physical activity	Sedentary job with >1 h recreational physical activity per day or standing job with >0.5 h recreational physical activity or physical job with at least some recreational physical activity or heavy manual job	Sedentary job with ≤1 h recreational physical activity per day or standing job with ≤0.5 h recreational physical activity or physical job with at least some recreational physical activity or heavy manual job or no recreational physical activity	Sedentary job and no recreational physical activity
Smoking Behaviour	Never	Former	Current
Blood pressure	SBP <120 and DBP <80 mmHg	SBP ≥120 to <140 or DBP 80> to <90 or treated to SBP <140 or DBP <90 mmHg	SBP ≥140 or DBP ≥90 mmHg
Diabetes mellitus	Without DM	With DM	With DM
Total cholesterol	<5.5 mmol/l	5.2-6.2 mmol/l	≥6.2 mmol/l

SBP indicates systolic blood pressure, DBP indicates diastolic blood pressure and DM indicates diabetes mellitus.