



Lifetime measures of ideal cardiovascular health and their association with subclinical atherosclerosis: The Cardiovascular Risk in Young Finns Study[☆]



Tomi T. Laitinen^{a,*}, Katja Pahkala^{a,b,1}, Costan G. Magnussen^{a,c,1}, Mervi Oikonen^{a,1}, Jorma S.A. Viikari^{d,1}, Matthew A. Sabin^{e,1}, Stephen R. Daniels^{f,1}, Olli J. Heinonen^{g,1}, Leena Taittonen^{h,i,1}, Olli Hartiala^{a,1}, Vera Mikkilä^{j,1}, Nina Hutri-Kähönen^{k,1}, Tomi Laitinen^{l,1}, Mika Kähönen^{m,1}, Olli T. Raitakari^{n,o,1}, Markus Juonala^{d,p,1}

^a Research Centre of Applied and Preventive Cardiovascular Medicine, University of Turku, Turku, Finland

^b Paavo Nurmi Centre, Sports & Exercise Medicine Unit, Department of Physical Activity and Health University of Turku, Turku, Finland

^c Menzies Research Institute Tasmania, University of Tasmania, Hobart, Australia

^d Department of Medicine, University of Turku and Division of Medicine, Turku University Hospital, Turku, Finland

^e Murdoch Childrens Research Institute, Royal Children's Hospital and University of Melbourne, Parkville, Victoria, Australia

^f Department of Pediatrics, University of Colorado School of Medicine, Children's Hospital Colorado, Aurora, CO, USA

^g Paavo Nurmi Centre, Sports & Exercise Medicine Unit, Department of Physical activity and Health, University of Turku, Turku, Finland

^h Department of Pediatrics, University of Oulu, Vaasa, Finland

ⁱ Vaasa Central Hospital, Vaasa, Finland

^j Department of Food and Environmental Sciences, University of Helsinki, Finland

^k Department of Pediatrics, University of Tampere and Tampere University Hospital, Tampere, Finland

^l Department of Clinical Physiology and Nuclear Medicine, Kuopio University Hospital and University of Eastern Finland, Kuopio, Finland

^m Department of Clinical Physiology, University of Tampere and Tampere University Hospital, Tampere, Finland

ⁿ Research Centre of Applied and Preventive Cardiovascular, University of Turku, Turku, Finland

^o Department of Clinical Physiology, Turku University Hospital, Turku, Finland

^p Murdoch Childrens Research Institute, Parkville, Victoria, Australia

ARTICLE INFO

Article history:

Received 6 October 2014

Received in revised form 24 January 2015

Accepted 3 March 2015

Available online 5 March 2015

Keywords:

Children

Cardiovascular diseases

Epidemiology

Risk factors

Longitudinal

ABSTRACT

Background: The American Heart Association recently defined 7 ideal health behaviors and factors that can be used to monitor ideal cardiovascular health (ICH) over time. These relate to smoking, physical activity, diet, body mass index (BMI), blood pressure, blood glucose and total cholesterol. Associations between repeated measures of ICH across the life-course with outcomes of subclinical atherosclerosis in adult life have not been reported.

Methods and results: The sample comprised 1465 children and young adults aged 12 to 24 years (mean age 17.5 years) from the Cardiovascular Risk in Young Finns Study cohort. Participants were followed-up for 21 years since baseline (1986) and had complete ICH data available at baseline and follow-up. Average lifetime ICH index was associated with reduced risk of coronary artery calcification (CAC) ($P = 0.0004$), high-risk carotid intima-media thickness (IMT) ($P = 0.0005$) and high-risk carotid distensibility (<0.0001) in middle age. Participants with persistently low ICH status (lower than the median), as compared with persons with persistently high ICH status (higher than the median), had an increased risk of CAC ($P = 0.02$), high-risk IMT ($P = 0.02$), and high-risk distensibility ($P < 0.0001$). Participants who improved their ICH status from low to high did not have a different risk of CAC ($P = 0.90$), high-risk IMT ($P = 0.25$), or high-risk distensibility ($P = 0.80$) than participants who always had high ICH status.

Abbreviations: CVD, cardiovascular disease; AHA, American Heart Association; ICH, ideal cardiovascular health; BMI, body mass index; CAC, coronary artery calcification; IMT, intima-media thickness; T2DM, type 2 diabetes.

[☆] Acknowledgement of grant support: The Cardiovascular Risk in Young Finns Study was financially supported by the Academy of Finland (grants 121584, 126925, 124282, 129378), the Social Insurance Institution of Finland, the Turku University Foundation, Special Federal Grants for University Hospitals, the Juho Vainio Foundation, Paavo Nurmi Foundation, Sigrid Juselius Foundation, Maud Kuistila Foundation, Paulo Foundation, the Finnish Medical Foundation, the Finnish Foundation of Cardiovascular Research, Orion-Farmos Research Foundation and the Finnish Cultural Foundation. C.G.M. is supported through a National Health and Medical Research Council Early Career Fellowship (APP1037559). M.A.S. holds a National health and Medical Research Council Postdoctoral Training Fellowship (APP1012201).

* Corresponding author at: Research Centre of Applied and Preventive Cardiovascular Medicine, University of Turku, Kiinamylynkatu 4-8, FIN-20520 Turku, Finland.

E-mail address: tomi.laitinen@utu.fi (T.T. Laitinen).

¹ This author takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

Conclusions: The results show that ICH can be lost and regained, and importantly that regaining of ICH has a beneficial effect on cardiometabolic health. Health care providers should work to improve health behaviors especially in those who have lost ICH.

© 2015 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Cardiovascular diseases (CVD) are largely preventable. Extensive evidence indicates that adults with none of the established major CVD risk factors experience very low rates of CVD events [1–3]. Recently, the American Heart Association (AHA) released its 2020 impact goals that highlighted primordial prevention [4]. The goal was to help the general population move towards ‘ideal cardiovascular health’ (ICH) by focusing on seven ideal metrics [not smoking, being physically active, eating a healthy diet, and having a normal blood pressure, glucose and cholesterol levels and a normal body-mass-index (BMI)] that can be used in monitoring cardiovascular health over time.

Previous studies have substantiated the ICH concept in adults by showing it to be inversely associated with CVD outcomes, all-cause mortality, and incident cancer [5–9]. These studies have measured the ICH in middle age and followed participants to outcomes later. The assumption has been that those with high ICH status had been that way all of their life. This lack of data increases the importance of knowing how much shifting in ICH status happens from childhood to adulthood and what the effect of change in ICH on cardiometabolic outcomes. We have previously reported that a higher ICH in childhood was associated with lower carotid intima-media thickness (IMT) in adulthood independent of change in the index during follow-up [10] and that a worsening of the ICH index was associated with arterial stiffness [11]. We have also shown that ICH can be promoted in adolescents [12]. When the AHA released their metrics they emphasized that monitoring of available data in children will be critical to increase the prevalence of ICH and to maintain it through middle and older ages [4]. However, longitudinal studies that have examined associations between repeated measures of ICH across the life-course with outcomes of subclinical atherosclerosis in adult life have not been reported.

Using data from the Cardiovascular Risk in Young Finns Study, we examined among 1465 participants aged 12–24 years at baseline and followed up for 21 years whether average lifetime ICH and change in ICH status from childhood and young adulthood to middle age are associated with coronary artery calcification (CAC), carotid distensibility, and IMT.

2. Methods

2.1. Participants

The Cardiovascular Risk in Young Finns Study sample and methods have been previously described in detail [13]. The present sample comprised 1465 participants aged 12–24 years at baseline (1986) that were followed up for 21 years until middle age (2007). All participants provided written informed consent and the study was approved by local ethics committees.

2.2. Metrics for cardiovascular health

Where possible, we followed the metrics described by the AHA. In 1986, we applied the childhood ICH metric criteria for participants 12–18 years of age and adult criteria for participants 21–24 years of age [4].

2.3. Health factors

All serum lipoprotein and triglyceride determinations were performed with standard methods reported previously [14]. In children,

ideal total cholesterol status was defined as <4.40 mmol/l (<170 mg/dl) and in adults as <5.17 mmol/l (<200 mg/dl). Blood pressure was measured using a random zero sphygmomanometer. In children, ideal blood pressure status was defined as systolic blood pressure (SBP) <90th percentile and diastolic blood pressure (DBP) <90th percentile and in adults as SBP <120 mm Hg and DBP <80 mm Hg. Fasting plasma glucose (FPG) concentrations were classified in children and adults as ideal <5.6 mmol/l (<100 mg/dl) [4].

2.4. Health behaviors

Height and weight were measured, and BMI calculated as $BMI = \text{weight, kg}/(\text{height, m})^2$. In children, ideal BMI was classified as <85th percentile and in adults as <25 kg/m² [4]. The dietary goals included in AHA's definition of ICH include recommended intake levels of 5 dietary metrics: fruits and vegetables, fish, whole grains, sodium, and sugar-sweetened beverages, indicative of a healthy diet as a whole (Supplemental Table 1). In 1986 and 2001, information on dietary habits was obtained with a non-quantitative food frequency questionnaire and ideal diet score was defined as 2–3 of 3 ideal diet components (fruits and vegetables, fish, soft drinks), as previously described [10]. In 2007, achievement of all 5 AHA ideal dietary goals was categorized as previously described [10] and ideal diet score was defined as having 4–5 of these 5 ideal diet components [4]. In children, ideal smoking status was defined as “never smoked a whole cigarette”. Adults were classified as current smokers (non-ideal) and never or former smokers (ideal). Physical activity was assessed by a questionnaire. AHA's definition of ideal physical activity in children is ≥60 min of moderate or vigorous activity every day (approximated as ≥7 h of moderate or vigorous activity per week in the present study) and in adults ≥150 min/week moderate or ≥75 min/week vigorous intensity or ≥150 min/week moderate + vigorous (approximated as ≥1 h/week vigorous or ≥2–3 h/week moderate or ≥2–3 h/week moderate + vigorous in the present study). The length of participant's education was assessed by a self-report questionnaire in adulthood and used as an indicator of socioeconomic status.

2.5. Ideal cardiovascular health (ICH)

ICH is defined as having all 7 ideal metrics. In this study, we determined optimal ICH as having ≥5 ideal metrics. The ICH index at baseline corresponds to the number of ideal health factors and behaviors present in 1986. The ICH index at follow-up corresponds to the number of ideal health factors and behaviors present at the 2007 survey (N = 1131). If complete ICH data were not available from 2007, then data from 2001 survey were used (N = 334, 22.8%). The calculated ICH indices were standardized for age and sex to ensure that the data were comparative between children (childhood criteria) and young adults (adult criteria). Average lifetime ICH index indicates the arithmetic mean of ICH indices at baseline and follow-up. Change in ICH index indicates change between the ICH indices at baseline and follow-up. Low ICH index was defined as lower than the median and high ICH index as higher than the median.

2.6. Cardiometabolic outcomes

In 2008, a cardiac CT study to measure CAC was conducted for a subsample of the Cardiovascular Risk in Young Finns Study participants [15], then 40 to 46 years of age. This was a convenience sample; the three oldest cohorts from 3 study centers (maximum 5) with a possibility to

Download English Version:

<https://daneshyari.com/en/article/2929086>

Download Persian Version:

<https://daneshyari.com/article/2929086>

[Daneshyari.com](https://daneshyari.com)