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REVIEW

A Systematic Review of the Prevalence and Outcomes of Ideal Cardiovascular Health in US and Non-US Populations

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Abstract

Several population-based studies have examined the prevalence and trends of the American Heart Association's ideal cardiovascular health (CVH) metrics as well as its association with cardiovascular disease (CVD)–related morbidity and mortality and with non-CVD outcomes. However, no efforts have been made to aggregate these studies. Accordingly, we conducted a systematic review to synthesize available data on the distribution and outcomes associated with ideal CVH metrics in both US and non-US populations. We conducted a systematic search of relevant studies in the MEDLINE and CINAHL databases, as well as the Cochrane Register of Controlled Trials (CENTRAL). Search terms used included "life's simple 7", "AHA 2020" and "ideal cardiovascular health". We included articles published in English Language from January 1, 2010, to July 31, 2015. Of the 14 US cohorts, the prevalence of 6 to 7 ideal CVH metrics ranged from as low as 0.5% in a population of African Americans to 12% in workers in a South Florida health care organization. Outside the United States, the lowest prevalence was found in an Iranian study (0.3%) and the highest was found in a large Chinese corporation (15%). All 6 mortality studies reported a graded inverse association between the increasing number of ideal CVH metrics and the all-cause and CVD-related mortality risk. A similar relationship between ideal CVH metrics and incident cardiovascular events was found in 12 of 13 studies. Finally, an increasing number of ideal CVH metrics was associated with a lower prevalence and incidence of non-CVD outcomes such as cancer, depression, and cognitive impairment. The distribution of ideal CVH metrics in US and non-US populations is similar, with low proportions of persons achieving 6 or more ideal CVH metrics. Considering the strong association of CVH metrics with both CVD and non-CVD outcomes, a coordinated global effort for improving CVH should be considered a priority.

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With about 800,000 deaths per year, cardiovascular disease (CVD) remains the leading cause of mortality in the United States, accounting for 1 in 3 deaths.[1] The high rate of mortality from CVD is driven by prevalent CVD risk factors. According to data from the 2014 heart disease and stroke statistical update of the American Heart Association (AHA), more than 30% of Americans have hypertension and approximately 54% of the 80 million Americans with hypertension have their blood pressure (BP) under control.[1] Moreover, 36% are unaware that they have elevated BP.[2] In 2010, the prevalence of obesity was 36%, a figure that has not changed considerably from previous years.[3] With prevention efforts, CVD mortality has declined by 11.5% from 2007 to 2011.[1] Despite this, CVD remains a huge burden both epidemiologically and economically, accounting for more than US$320 billion in health care expenditure.[1]

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ARTICLE HIGHLIGHTS

- This systematic review highlights the low prevalence of ideal cardiovascular health (CVH) status within and outside the United States.
- Overall distribution of ideal CVH metrics is similar in US and non-US studies, with low proportions of persons achieving 6 or more ideal CVH metrics.
- Overall, the lowest ideal status was noted for diet and physical activity metrics.
- The presence of favorable CVH status is associated with a considerably lower risk of incident cardiovascular disease as well as all-cause and cardiovascular disease–related mortality.
- An increasing number of ideal CVH metrics were also associated with fewer noncardiovascular outcomes including cancer, depression, cognitive impairment, and incident diabetes in the general population.

In response to the increasing burden of CVD, the AHA established several strategic goals. In 1999, the AHA introduced the 2010 Impact Goal, which aimed for a 25% reduction in deaths from CVD by mitigating traditional CVD risk factors associated with CVD, such as smoking, physical inactivity, elevated blood cholesterol level, and uncontrolled high BP, along with obesity and diabetes.[4] By 2008, several targets had been achieved: a 31% reduction in coronary heart disease mortality and a 29% decline in stroke mortality.[4] In addition, there was a 29%, 25%, and 16% reduction in the prevalence of uncontrolled high BP, high cholesterol level, and smoking, respectively.[4] However, some shortcomings were evident. The prevalence of obesity and diabetes increased, and the prevalence of physical inactivity remained largely unchanged.[4]

Recognizing the limitations of focusing only on CVD, in 2010 the AHA redefined its strategic impact goal for 2020. In addition to targeting an additional 20% reduction in CVD mortality, it aimed to improve ideal cardiovascular health (CVH) in all Americans by 20%.[4] To define CVH, the AHA used simple, easily reproducible metrics known as *CVH metrics*. The CVH metrics are derived from 7 components, often referred to as *Life's Simple 7*, and include 4 health behaviors (body mass index [BMI, calculated as the weight in kilograms divided by the height in meters squared], smoking, diet, and physical activity) and 3 health factors (cholesterol level, BP, and fasting glucose level). Each metric is categorized into ideal, intermediate, and poor levels (Supplemental Table 1, available online at http://www.mayoclinicproceedings.org).[4]

Over the past 5 years, there have been several studies, both within and outside the United States, that have examined the CVH metrics, their trends over time, and their associations with multiple CVD and non-CVD end points. With this plethora of information, it is important to sort the evidence in such a manner as to inform policy and program planning and to highlight potential for future research. In this systematic review of CVH metrics, we aimed to synthesize the available evidence on the prevalence of ideal CVH metrics in US cohorts and highlight resemblances to non-US populations. We also systematically examine the relationship of ideal CVH metrics with health outcomes.

PATIENTS AND METHODS

Data Sources and Study Selections

A systematic review of the MEDLINE database was conducted using PubMed and OvidSP search engines. A systematic search was also undertaken using CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL). We included articles published in the English Language from January 1, 2010, to July 31, 2015. In PubMed, MeSH and relevant free text terms used included *Life's Simple 7*, *AHA 2020*, *American Heart Association 2020*, *ideal cardiovascular health*, and *AHA 2020 cardiovascular diseases*.

To be included in the review of abstracts, studies had to assess the association between the prevalence of Life's Simple 7 or CVH as defined by the AHA and mortality, CVD, and/or non-CVD outcomes. Studies were included if the CVH metrics were measured, and they enrolled participants 18 years or older who were free of CVD. We manually scanned the references of articles for other relevant studies. Three researchers (A.Y., E.C.A., K.N.) reviewed the articles; discordances were discussed and a

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