

Are angry men more likely to develop cardiovascular disease?

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Chang PP, Ford DE, Meoni LA, Wang NY, Klag MJ. Anger in young men and subsequent premature cardiovascular disease: the precursors study. *Arch Intern Med* 2002;162:901-6.

Research question

Does anger predict cardiovascular disease (CVD) in young men?

Type of article and design

Prospective cohort study.

Relevance to family physicians

Cardiovascular disease is the most common cause of death in Canadian men. Primary prevention focuses on modifying traditional risk factors, such as smoking, high cholesterol, and hypertension. Psychosocial risk factors for CVD are becoming more accepted (eg, studies on depression suggest it could be a risk factor for CVD¹).

Anger as a risk factor for CVD is becoming better understood. The biochemical mechanisms might be mediated through catecholamine release, increased myocardial demand for oxygen, vasospasm, and increased platelet aggregation.² Anger might also have a role in atherogenesis. In one study, recalling anger during symptomatic myocardial ischemia invoked high levels of anger again that were associated with vasoconstriction of narrowed coronary arteries but not of non-narrowed ones.² This study sought to determine whether, at a population level, evidence links anger to CVD.

Overview of study and outcomes

Participants were medical students enrolled from 1948 to 1964 in the Johns Hopkins Precursors Study. They completed a standardized medical examination and questionnaire about personal and family history, health status, health behaviours, and reactions to stress. Follow-up questionnaires were mailed

annually. Baseline data included weight, height, smoking history, alcohol consumption, hypertension, hyperlipidemia, parental health history, diabetes mellitus, and history of clinical depression. These participants' self-reports of health and disease were previously found to be extremely accurate.

Reactions to stress were quantified by the Habits of Nervous Tension Questionnaire.³ Participants were asked, "Whenever you find yourself in situations of undue pressure or stress, how do you usually react?" On a checklist of 27 items, anger was indicated by one or more of the following responses: "expressed or concealed anger," "irritability," and "gripe sessions." Association of anger responses with the Multidimensional Anger Inventory questionnaire⁴ completed by 700 of the men in 1988 verified the validity of these questions.

The main outcome measure was incidence of premature CVD (events before 55 years of age) and total cardiovascular events. Cardiovascular disease was defined as coronary artery disease composed of myocardial infarction, sudden death, angina, chronic ischemic heart disease, and other coronary artery disease requiring coronary bypass surgery or percutaneous coronary interventions; hypertensive heart disease; congestive heart failure; cerebrovascular disease; atherosclerosis; aortic aneurysm; peripheral vascular disease; and arterial embolization.

Results

The original cohort was 1337 people; women (121), nonresponders to questions about anger (133), people with CVD before graduation (two), and people who died in medical school or were unavailable for follow up (26) were excluded. A total of 1055 men were included in the analysis.

Median follow up was 36 years. Average response rate was 90% during every 5-year period. Nonresponders were sought by telephone, contacting family members, scanning obituaries, and systematically searching the National Death Index. The study does not

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mention whether nonresponders differed from responders. Serum cholesterol levels, body mass index, and mean blood pressure were similar across all groups. Average age at last follow up was 64.5 years.

Of the 1055 men in the study, 22% (229 men) reported expressing or concealing anger, 16% (169 men) gripe sessions, and 9% (99 men) irritability. Twenty-one men (2%) reported experiencing all three anger items. Incidence of CVD before age 55 was significantly higher among men with the highest-level anger (20%) compared with men with lower-level anger (7%). This difference was no longer significant after age 55.

Bivariate analysis controlled for traditional cardiac risk factors, including high serum cholesterol levels, and a high body mass index, parental history of premature coronary artery disease, cigarette smoking, hypertension, diabetes mellitus, clinical depression, and alcohol use. The adjusted relative risk (RR) of CVD in those with the highest-level anger compared with those with lower-level anger was 3.1 (95% confidence interval [CI], 1.1 to 8.6). Men with coronary artery disease and men with myocardial infarction had adjusted RRs of 3.5 (95% CI 1.1 to 11.8) and 6.4 (95% CI 1.8 to 22.3), respectively.

Analysis of methodology

This observational cohort study had a consistently excellent response rate (90%) throughout a very long follow up (32 to 48 years). The total sample size was very large, but the number of anger reactions and cardiovascular events was small. Among the 21 men reporting experiencing all three anger responses, there were only six cardiovascular events. Misclassification of one person could have made a significant difference. The small number of events meant there was not enough power to distinguish a threshold effect from a dose-response effect. Also, results were specific to a particular population that excluded non-whites, women, and those of lower socioeconomic status.

A causal relationship between anger and premature CVD cannot be determined from this study. The significantly increased risk of premature CVD among those with higher levels of anger cannot be overlooked, however, especially since these results are consistent with results of other studies that showed increased incidence of CVD among those who are angry and react in a hostile way to stress.^{4,5}

Effects were not maintained after age 55. The authors hypothesize that the decreased effect after age 55 was seen because other risk factors for CVD become more important later in life, levels of anger

change over time, or underlying CVD was exacerbated by high levels of anger.

Application to clinical practice

Average patients in this study were from a select population: white, educated men of high socioeconomic status who smoked during school, drank alcohol, and had no parental history of premature CVD. Although such patients might not visit family doctors for anger, stress, or even CVD, they might make yearly visits for other reasons. The opportunity to counsel on appropriate responses to stress and anger could become a standard of care for risk stratification and primary prevention of CVD.

Bottom line

- Young men's high levels of anger in response to stress were associated with increased risk of premature CVD (RR 3.1), especially myocardial infarction (RR 6.4).
- The effects of anger on CVD become less important after age 55.
- Whether anger management and appropriate response to stress can help prevent premature CVD remains to be evaluated. ❖

Points saillants

- Les forts degrés de colère manifestés par les jeunes hommes en réaction au stress étaient associés à un risque accru de maladies cardiovasculaires (MCV) prématurées (RR 3,1), en particulier les infarctus du myocarde (RR 6,4).
- Les effets de la colère sur les MCD revêtent moins d'importance après 55 ans.
- Il reste à analyser si la prise en charge du stress et une réaction appropriée à ce dernier peuvent aider à prévenir les MCV prématurées.

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