High trait anger increased stroke in people ≤60 years and those with high density lipoprotein cholesterol concentrations >47 mmol/l

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QUESTION: What is the relation between trait anger and incident stroke risk? How is this relation affected by selected risk factors?

Design

Population based cohort study with median follow up of 77.3 months.

Setting

Communities in Maryland, Minnesota, North Carolina, and Mississippi, USA.

Participants

13 851 people who were 48–67 years of age (mean age 57 y, 56% women, 76% white).

Assessment of risk factors

The frequency and degree to which participants had anger was assessed using the Spielberger Trait Anger Scale. High trait anger was defined by scores of 22–40, moderate anger by scores of 15–21, and low anger by scores of 10–14. Other risk factors assessed included blood pressure, waist to hip ratio, diabetes, alcohol consumption, cigarette smoking, education, von Willebrand factor antigen, left ventricular hypertrophy, high density lipoprotein (HDL) cholesterol and low density lipoprotein cholesterol concentrations, and prevalent coronary artery disease.

Main outcome measure

Incident ischaemic or haemorrhagic stroke (hospitalised events).

Main results

257 participants had strokes (226 ischaemic and 31 haemorrhagic) during the follow up period. In the full cohort, trait anger was not associated with stroke (table). Among participants ≤60 years of age, individuals with high trait anger had a higher risk of any stroke and ischaemic stroke than did individuals with low trait anger (table); no such association was found for individuals >60 years of age. Among participants with HDL cholesterol concentrations >47 mmol/l, individuals with high trait anger had a higher risk of any stroke and ischaemic stroke than those with low trait anger (table); no such association was found for individuals with HDL cholesterol concentrations ≤47 mmol/l.

Conclusion

High trait anger was associated with an increased risk of stroke in people ≤60 years of age and those with high density lipoprotein cholesterol concentrations >47 mmol/l.

Associations between high trait anger and stroke

Population	Hazard ratios (95% CI)*	
	Any stroke	Ischaemic stroke
All	1.19 (0.75 to 1.89)†	Not reported†
≤60 years of age	1.96 (1.06 to 3.62)	2.28 (1.18 to 4.41)
HDL cholesterol >47 mmol/l	2.30 (1.18 to 4.46)	2.56 (1.30 to 5.03)

*Compared with individuals with low trait anger (hazard ratio 1.00). Adjusted for race/ethnicity, education, sex, waist to hip ratio, smoking, plasma low density lipoprotein and high density lipoprotein (HDL) cholesterol concentrations, diabetes, hypertensive status, von Willebrand factor, prevalent coronary artery disease, and left ventricular hypertrophy. Hazard ratios for HDL cholesterol >47 mmol/l also adjusted for age.

†Not significant.

COMMENTARY

Research on the contribution of psychological factors to risk of atherosclerotic heart disease (ASHD) has evolved from early work on the Type A behaviour pattern, to a more recent focus on hostility and anger. Although there is debate about the extent to which these concepts differ, there is, none the less, a shared assumption that the mind and body are inextricably linked. Plausible causal pathways have been proposed to explain the observed relation between hostility or anger and ASHD, which may be extrapolated to cerebrovascular disease. 2 commonly suggested pathways are the biological model, related to the effects of sympathetic nervous system arousal on initiation and progression of atherosclerosis and the environmental model, which relates to the mediating effects of lifestyle behaviours such as smoking, alcohol consumption, and lack of exercise.

Williams *et al* explored the relation between the stable, trait form of anger and incident stroke in a subsample of participants who were originally enrolled in the Atherosclerosis Risk in Communities (ARIC) study. This work extends the field of research related to diseases or health outcomes that may be associated with psychological factors. Their finding that the risk of stroke was approximately 3 times greater in participants ≤60 years of age is consistent with other research that has shown a similar age related association with respect to coronary artery disease.^{1 2} The finding of an increased risk of stroke in patients with higher HDL cholesterol concentrations is curious and, from the perspective of the biological model, difficult to explain, because high HDL concentrations are generally associated with lower risk of atherosclerotic disease. This finding bears further investigation. Participants who had higher levels of trait anger also smoked more cigarettes, consumed more alcohol, and had a history of heart disease. These factors speak to the environmental model as a possible pathway for the findings. Some, but not all, of these variables were controlled in the analysis. Finally, it is important to note that 307 of the original ARIC participants were excluded because they had sustained a stroke between entry and baseline data collection for this study. This presents a possible systematic bias in the study findings. Further research needs to be done to elucidate the possible causal pathways that underlie these findings.

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- Williams RB Jr, Barefoot JC, Haney TL, *et al*. Type A behavior and angiographically documented coronary atherosclerosis in a sample of 2289 patients. *Psychosom Med* 1988;50:139–52.
- Arthur HM, Garfinkel PE, Irvine J. Development and testing of a new hostility scale. *Can J Cardiol* 1999;15:539–44.