

Decreasing prevalence of abdominal aortic aneurysm and changes in cardiovascular risk factors

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ABSTRACT

Objective: A significant reduction in the incidence of cardiovascular disease, including abdominal aortic aneurysm (AAA), has been observed in the past decades. In this study, a small but geographically well defined and carefully characterized population, previously screened for AAA and risk factors, was re-examined 11 years later. The aim was to study the reduction of AAA prevalence and associated factors.

Methods: All men and women aged 65 to 75 years living in the Norsjö municipality in northern Sweden in January 2010 were invited to an ultrasound examination of the abdominal aorta, registration of body parameters and cardiovascular risk factors, and blood sampling. An AAA was defined as an infrarenal aortic diameter ≥ 30 mm. Results were compared with a corresponding investigation conducted in 1999 in the same region.

Results: A total of 602 subjects were invited, of whom 540 (90%) accepted. In 2010, the AAA prevalence was 5.7% (95% confidence interval [CI], 2.8%-8.5%) among men compared with 16.9% (95% CI, 12.3%-21.6%) in 1999 ($P < .001$). The corresponding figure for women was 1.1% (95% CI, 0.0%-2.4%) vs 3.5% (95% CI, 1.2%-5.8%; $P = .080$). A low prevalence of smoking was observed in 2010 as well as in 1999, with only 13% and 10% current smokers, respectively ($P = .16$). Treatment for hypertension was significantly more common in 2010 (58% vs 44%; $P < .001$). Statins increased in the population (34% in 2010 vs 3% in 1999; $P < .001$), and the lipid profile in women had improved significantly between 1999 and 2010.

Conclusions: A highly significant reduction in AAA prevalence was observed during 11 years in Norsjö. Treatment for hypertension and with statins was more frequent, whereas smoking habits remained low. This indicates that smoking is not the only driver behind AAA occurrence and that lifestyle changes and treatment of cardiovascular risk factors may play an equally important role in the observed recent decline in AAA prevalence. (J Vasc Surg 2016;■:1-8.)

In many countries, there has been a noticeable decrease in abdominal aortic aneurysm (AAA) prevalence and mortality, whereas in others, AAA mortality is stable or has even increased.¹ These different trends seem to correlate with variations of traditional cardiovascular risk factors.¹ The most important documented risk factors for AAA are high age, male sex, having a first-degree relative with AAA, and smoking. Hypertension, hyperlipidemia, and abdominal obesity have also been associated with AAA.²⁻⁶

Mortality from cardiovascular diseases was higher in the county of Västerbotten in northern Sweden than in the

rest of Sweden in the 1970s and in the early 1980s.⁷ The highest mortality in the county of Västerbotten was found in Norsjö municipality. The highest prevalence of AAA in a general population ever reported was found in a population-based screening study carried out in Norsjö municipality 1999.⁸ Risk factors for cardiovascular diseases were recorded in the screened subjects.

To reduce mortality and morbidity in cardiovascular disease, health care providers and politicians started the Västerbotten Intervention Project (VIP) in 1985 with a pilot project in Norsjö (Fig 1). The aim was to reduce cardiovascular morbidity and mortality by reduction of smoking, hypertension, and hypercholesterolemia, mainly by lifestyle changes (healthy food and physical activity). The strategy used was a combination of a population-based and an individual high risk-based program.⁹ All men and women aged 40, 50, and 60 years were invited to an individual health screening including a questionnaire on significant cardiovascular risk factors. Body mass index (BMI) and blood pressure were measured, blood lipids were analyzed, and an oral glucose tolerance test was performed. A specialist nurse and, for high-risk patients, a physician offered personal feedback to every participant of the health survey. In 1991, this program was introduced in all municipalities in the county of Västerbotten. The population strategy included media information, public meetings, school programs, study groups, health information at work sites,

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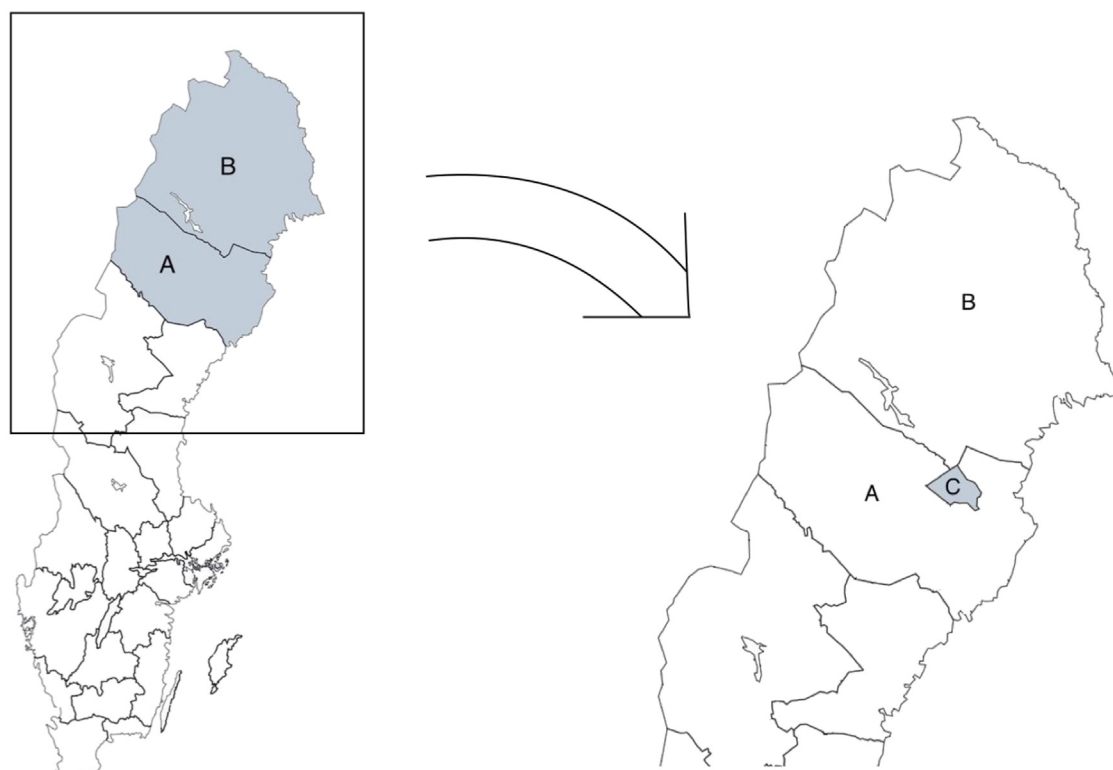


Fig 1. Map over Sweden: **A**, Västerbotten county; **B**, Norrbotten county; **C**, Norsjö municipality (4304 inhabitants in 2010).

dental care programs, courses on healthy food, physical activities, and labeling of healthy food (in general, food without high fat content) by a logo illustrating a keyhole on a green background. The effect on cardiovascular risk factors and the subsequent decline in cardiovascular morbidity and mortality have been previously published.¹⁰⁻¹³

Several studies have reported a marked reduction in AAA prevalence during the last years, mainly attributed to a significantly decreased smoking frequency.¹⁴⁻¹⁷ No results of the long-term effects of a broad cardiovascular intervention program on the prevalence of AAA have earlier been published.¹⁴⁻²⁰ The aim of this study was to investigate possible changes in the prevalence of AAA in Norsjö municipality and to relate this to changes in cardiovascular risk factors 11 years after the index survey (Fig 1).

METHODS

The population. In 1999, Norsjö municipality had 4806 inhabitants. The first study, performed by Wanhainen et al in 1999, invited all men and women aged 65 to 75 years in the municipality of Norsjö to an AAA ultrasound screening.⁸ For the second study, performed in 2010, all 602 men and women 65 to 75 years of age in Norsjö were invited to an AAA screening. The study was performed at the local health care center in Norsjö. In June 2011, all study participants were invited to donate

blood for analyses of high-sensitivity C-reactive protein level, blood lipid profile, and creatinine concentration.

Ultrasound. The ultrasound examination in 1999 was performed by one experienced radiologist. The measurement differed from the current one in that the outer-to-outer diameter was used. All study persons with an aortic diameter ≥ 28 mm were examined with computed tomography (CT). The diameter measured by ultrasound was used in all statistical calculations.

The AAA screening in 2010 was performed by two experienced sonographers with portable ultrasound equipment (Logiq e; GE Healthcare, Wauwatosa, Wisc) equipped with a 4 MHz transducer. The study was performed during three separate weeks, and each patient was examined once by one sonographer. The screening procedure was standardized. The infrarenal abdominal aorta was visualized longitudinally, and the largest anteroposterior (AP) diameter was measured by means of leading edge to leading edge, which means measuring the distance between the outermost part of the ventral wall of the aorta and the innermost part of the dorsal aortic wall. In all study persons with an AP aortic diameter ≥ 25 mm, measurement of the transverse aortic diameter was performed. An infrarenal aorta with an AP or transverse diameter ≥ 30 mm was defined as an AAA. All examinations were stored digitally. In a few cases in which the aortic diameter could not be measured

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