Research

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Screening for cardiovascular risk factors and self-rated health in a community setting:

a cross-sectional study in Finland

Abstract

Background
Self-rated health is an independent predictor of mortality. However, general health checks in populations unselected for disease or risk factors have not been shown to reduce mortality or morbidity.

Aim
To describe new comorbidities and cardiovascular risk factors in apparently healthy people and to relate this to their self-rated health.

Design and setting
A targeted screening programme identified 462 middle-aged people with cardiovascular risk factors without previously diagnosed chronic disease in a Finnish community in 2005–2006.

Method
Home blood pressure monitoring, oral glucose tolerance test, estimated glomerular filtration rate, and ankle brachial index were used to detect previously undiagnosed conditions. The Short-Form Health Survey and Beck's Depression Inventory were completed by participants before the diagnostic tests were performed.

Results
The prevalence of previously undiagnosed disease was: hypertension 113/462 (24% [95% confidence interval {CI} = 21% to 29%]), diabetes 19/462 (4% [95% CI = 2% to 6%]), renal insufficiency 23/462 (5% [95% CI = 3% to 7%]), and peripheral arterial disease 17/462 (4% [95% CI = 2% to 5%]). Of the 139 participants who regarded their health as 'fair–poor', 60 (43%) had a previously undetected condition affecting their vasculature.

Conclusion
Out of the screen-detected apparently healthy cardiovascular risk subjects, one in three had undiagnosed hypertension, diabetes, peripheral arterial disease, or renal insufficiency. Those individuals experiencing ill health tended to be at high risk of cardiovascular problems.

Keywords
cardiovascular disease; community health; health promotion; prevention; primary care; risk factors; screening

INTRODUCTION

A Cochrane Review carried out in 2012 showed that general health checks do not reduce mortality or morbidity, although they lead to more diagnoses and medical treatment.[1] This finding has shaken the concept of primary prevention, which is performed in apparently healthy individuals to postpone the onset of symptoms so they can live longer and healthier lives. The prevention of cardiovascular disease particularly has been an important goal in general practice, since cardiovascular disease remains the major cause of non-communicable diseases in the world.[2]

However, there are strong arguments in favour of strategies promoting primary prevention programmes. In the UK, it has been estimated that reductions in total cholesterol, mean blood pressure, and prevalence of smoking in apparently healthy people achieved a fourfold larger reduction in coronary heart disease deaths between 1981 and 2000 than risk factor reduction in patients with coronary heart disease (secondary prevention).[3] In Finland, coronary heart disease mortality rates decreased by 63% between 1982 and 1997, which can be attributed largely to reductions in population risk factors and also to improvements of medical treatments.[4]

Self-rated health is known to be an independent predictor of mortality.[5,6]

However, information about patients' wellbeing from their own point of view is too often missing in health care. The aim of the present study was to describe new comorbidities and cardiovascular risk factors in apparently healthy people who are at increased risk of cardiovascular disease, and to relate this to their self-rated health.

METHOD

Participants
The participants of the present study were drawn from a targeted screening programme for cardiovascular risk factors, which was carried out in the rural town of Harjavalta in southwestern Finland in 2005–2006.

A risk factor survey was posted to all inhabitants aged 45–70 years living at home (n = 2856). Participation and all of the tests included were free of charge for the subjects. Of the 2085 (73%) responders, those found to have at least one cardiovascular risk factor (n =1756) were invited for an enrolment examination. Risk factors taken into account were a waist circumference of at least 80 cm in females and 94 cm in males, a latest measured blood pressure ≥140 mmHg systolic (SBP) or ≥90 mmHg diastolic (DBP), a history of gestational hypertension or diabetes, a family history of premature cardiovascular disease, and a score of ≥12 in the Finnish Diabetes Risk

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How this fits in

Self-rated health is known to be an independent predictor of mortality, but general health checks in populations unselected for disease or risk factors have not been shown to reduce mortality. This study used a targeted screening programme and identified apparently healthy middle-aged people with cardiovascular risk factors in the community. One in three of them were found to have undiagnosed hypertension, diabetes, peripheral arterial disease, or renal insufficiency. Moreover, many subjects with undiagnosed comorbidities felt general ill health. Self-rated health may therefore be important to include in screening programmes.

Score.[7] Of the risk subjects, 1469 out of 1756 (84%) attended the enrolment examination at the community health centre. Trained public health nurses performed the enrolment examination, which included a physical examination, laboratory tests, and a medical history.

Information about chronic comorbidities was gathered from questionnaires, medical records, medications, and physical examination. For the analyses described here, patients with previously diagnosed chronic diseases (cardiovascular disease, renal disease, diabetes, hypertension, cancer, neurological disorders, pulmonary disorders, musculoskeletal, or connective tissue disorders) were excluded, yielding a cohort of 462 apparently healthy individuals.

All participants provided written informed consent for the project and subsequent medical research.

Measurements and definitions

A 2-hour oral glucose tolerance test was performed, and type 2 diabetes was diagnosed according to the World Health Organization's 2006 criteria.[8] Hypertension was diagnosed if the mean SBP taken by the nurse was ≥140 mmHg or the mean DBP was ≥90 mmHg, and if the mean home blood pressure monitoring was ≥135 mmHg systolic or ≥85 mmHg diastolic.[9]

Height and weight were measured by the nurse. Body mass index was calculated as weight (kg) divided by height squared (m^2).

Subclinical organ damage was assessed by measuring the ankle brachial index and estimated glomerular filtration rate. The ankle brachial index was calculated by dividing the lower ankle SBP by the higher brachial SBP.[10] An ankle brachial index of ≤0.90 in either leg was considered to indicate peripheral arterial disease. The estimated glomerular filtration rate was determined using the four-variable Modification of Diet in Renal Disease Study equation.[11] Estimated glomerular filtration rate levels below 60 ml/min/1.73m^2 were reported as renal insufficiency.

Questionnaires

Participants completed self-administrated questionnaires at the clinic before the enrolment examination was performed. These measured sociodemographic factors, occupational status, physical activity level, smoking status, and health-related quality of life using the Short-Form Health Survey (SF-36), and Beck's Depression Inventory (BDI).[12,13] The first question of the SF-36 was used to assess self-rated health in categories of good–excellent; and fair–poor. Participants with a BDI score of ≥10 were regarded as having depressive symptoms.[14]

Leisure-time physical activity (LTPA) was classified as: high — LTPA of at least 30 minutes at a time for at least six times a week; moderate — LTPA of at least 30 minutes at a time from four to five times a week; and low — LTPA of at least 30 minutes at a time three times a week or less.

Statistical analyses

Data are presented as means with standard deviations or as counts with percentages. The most important results are given with 95% confidence intervals (CIs). Statistical comparison between groups in measures with binary distribution was made by χ^2 or Fisher's exact test, when appropriate. The independent samples t-test was used for continuous variables, except for biochemical variables, which were analysed using the bootstrapped type t-test because of their skewed distributions.

RESULTS

Of the 462 apparently healthy cardiovascular risk subjects (mean age 57 ±7 years, 50% female), the prevalence of previously undiagnosed diseases were: hypertension 113 out of 462 (24% [95% CI = 21% to 29%]), diabetes 19 out of 462 (4% [95% CI = 2% to 6%]), renal insufficiency 23 out of 462 (5% [95% CI = 3% to 7%]), and peripheral arterial disease 17 out of 462 (4% [95% CI = 2% to 5%]). Eighteen subjects had at least two of these conditions. Thus, 154 out of 462 (33%) of the apparently healthy cardiovascular risk subjects were not truly healthy.

Table 1 shows the characteristics of the participants. Compared with participants

Table 1. Characteristics of the participants

| | Self-rated health | | |
	Fair–poor n = 139	Good–excellent n = 323	P-value
Demographic			
Female, n (%)	68 (49)	162 (50)	0.81
Age in years, mean (SD)	59 (7)	57 (7)	0.005
Blue-collar workers, n (%)	113 (87)	215 (70)	<0.001
LTPA low, n (%)	34 (26)	40 (13)	<0.001
Smokers, n (%)	34 (24)	58 (18)	0.11
Clinical			
Systolic blood pressure, mmHg, mean (SD)	148 (19)	146 (17)	0.37
Diastolic blood pressure, mmHg, mean (SD)	88 (9)	88 (8)	0.76
eGFR, ml/min, mean (SD)	84 (17)	78 (16)	<0.001
Body mass index, kg/m^2, mean (SD)	29.5 (5.3)	28.1 (4.2)	0.002
Waist, cm, mean (SD)			
Male	102 (13)	99 (9)	0.023
Female	94 (13)	92 (11)	0.18
Obesity, body mass index ≥30 kg/m^2, n (%)	56 (40)	90 (28)	0.008
Metabolic syndrome, n (%)	67 (48)	162 (50)	0.70
Beck's Depression Inventory ≥10, n (%)	35 (26)	28 (9)	<0.001
Biochemical			
Total cholesterol, mmol/l, mean (SD)	5.32 (1.03)	5.35 (0.95)	0.76
HDL-cholesterol, mmol/l, mean (SD)	1.49 (0.44)	1.47 (0.39)	0.71
LDL-cholesterol, mmol/l, mean (SD)	3.21 (0.87)	3.28 (0.87)	0.46
Triglycerides, mmol/l, mean (SD)	1.39 (0.64)	1.36 (0.38)	0.67
Fasting plasma glucose, mmol/l, mean (SD)	5.61 (0.98)	5.61 (0.78)	0.99
2-hour plasma glucose, mmol/l, mean (SD)	7.70 (2.66)	7.21 (2.17)	0.037

eGFR = estimated glomerular filtration rate. HDL = high-density lipoprotein. LDL = low-density lipoprotein. LTPA = leisure-time physical activity. SD = standard deviation.

who felt their health to be good or excellent, those who felt ill health were slightly older, more often blue-collar workers (low socioeconomic status), had lower LTPA, higher BMI, wider waist circumference if male, and more often depressive symptoms. Of the biochemical factors, only 2-hour plasma glucose values were significantly higher in those who felt ill health.

Of the 323 participants who regarded their health as being good–excellent, 94 (29%) were not truly healthy, while 60 out of 139 (43%) whose self-rated health was fair–poor were not healthy (P = 0.003). Among those who felt ill health, the age- and sex-adjusted odds ratio (OR) for having one of the screened diseases was 1.76 (95% CI = 1.16 to 2.67, P = 0.008), for hypertension OR 1.43 (95% CI = 0.91 to 2.24, P = 0.12), for type 2 diabetes OR 2.13 (95% CI 0.84 to 5.43, P = 0.11), for peripheral arterial disease OR 1.88 (95% CI = 0.70 to 5.04, P = 0.21), and for renal insufficiency OR 1.53 (95% CI = 0.63 to 3.69, P = 0.34).

DISCUSSION
Summary
Of the screen-detected apparently healthy cardiovascular risk subjects, one in three were not truly healthy when diagnostic tests easily available to a GP were used to detect undiagnosed conditions affecting the vasculature. These not-healthy individuals (defined as having previously undetected hypertension, type 2 diabetes, peripheral arterial disease, or renal insufficiency) also more often had a sense of general ill health than participants who were truly healthy in regard to these conditions.

Strengths and limitations
The strengths of this study are that the data come from a community-based representative sample of the middle-aged Finnish population, bias regarding previously detected comorbidities was excluded, and the health of the study participants was assessed from their own point of view and that of a medical professional. The major limitation of this study is the cross-sectional design, which prevents the study from drawing conclusions regarding any causal associations.

Comparison with existing literature
The 2012 Cochrane analysis only used

randomised controlled trials, which may not be the best design to study effectiveness of prevention programmes.[1] Most of the studies included in the Cochrane Review were conducted more than 20 years ago, before statins were invented and when modern antihypertensive agents were not in general use. Moreover, most studies included people at low overall cardiovascular risk; many did not specifically include cardiovascular disease risk and were not conducted in primary care.

The screening programme in the present study was targeted at cardiovascular risk subjects among whom the likelihood of having disease is higher than in the general population. It can therefore be considered reasonable to detect further risk and early signs of cardiovascular disease. The programme also included a patient-centred approach by assessing health-related quality of life before the clinical tests were obtained. A meta-analysis of prospective cohort studies showed that poor self-rated health is strongly associated with mortality, even after adjustment for known comorbidities.[5] However, longitudinal follow-up is needed to demonstrate the failure or success of this screening programme.

Implications for clinical practice
The results suggest that in people at increased cardiovascular risk, hypertension, type 2 diabetes, peripheral arterial disease, or renal insufficiency are frequent. Although these diseases have often been regarded as symptomless, participants more often had a sense of generally poorer health than the participants who were truly healthy with regard to these conditions. The value of self-rated health as an independent predictor of mortality[5,6] and the results of the present study suggest that this may be due to undiagnosed comorbidities. Self-rated health may therefore be important to include in screening programmes.

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