Health views and metabolic syndrome in a Finnish rural community: a cross-sectional population study

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Introduction: Metabolic syndrome (MetS) can be prevented through the promotion of healthy lifestyles. In rural areas, MetS is associated with unhealthy lifestyles and socioeconomic and demographic changes. However, there is scarce evidence on how health views contribute to the unhealthy lifestyles that result in MetS.
Methods: The study involved adults in 8 birth cohorts between 30 and 65 years of age living in the rural community of Lapinlahti in eastern Finland. We assessed participants' demographic and lifestyle factors and health views. For assessment of health views, we applied factor analysis. For MetS classification, we used the 2005 criteria of the National Cholesterol Education Program.
Results: The prevalence of MetS among the participants was 38%. In a backward logistic regression analysis adjusted for other variables, there was a significant association between MetS and older age (odds ratio [OR] 2.91) as well as low level of physical activity (OR 1.99). In a factor analysis, 4 principal factors of lay health views were identified, of which blame-shifting (OR 1.36, 95% confidence interval [CI] 1.21–1.49) and social alienation (OR 1.23, 95% CI 1.24–1.40) were significantly associated with MetS in an unadjusted logistic regression analysis.
Conclusion: It is important, particularly in primary health care, to recognize health views behind MetS and to empower communities in the prevention of MetS.

Introduction : Il est possible de prévenir le syndrome métabolique par la promotion d'habitudes de vie saines. Dans les régions rurales, le syndrome métabolique est associé à des habitudes de vie malsaines et à des changements socioéconomiques et démographiques. Il y a toutefois peu de données probantes au sujet de la contribution que les opinions sur la santé apportent aux habitudes de vie malsaines qui jouent un rôle dans l'apparition du syndrome métabolique.
Méthodes : L'étude a porté sur des adultes de huit cohortes de naissance, âgés de 30 à 65 ans et vivant dans la communauté rurale de Lapinlahti, dans l'est de la Finlande. Nous avons évalué les facteurs liés aux caractéristiques démographiques et aux habitudes de vie des participants, ainsi que leurs opinions sur la santé. Nous avons appliqué l'analyse des facteurs pour évaluer les opinions sur la santé. Pour classer le syndrome métabolique, nous avons utilisé les critères de 2005 du National Cholesterol Education Program.
Résultats : La prévalence du syndrome métabolique chez les participants s'est établie à 38 %. Une analyse de régression logistique rétrograde corrigée en fonction d'autres variables a révélé qu'il y avait un lien important entre le syndrome métabolique et l'âge plus avancé (risque relatif [RR] 2,91) et le peu d'activité physique (RR 1,99). Une analyse des facteurs a révélé quatre principaux facteurs d'opinion de non-initiés sur la santé et on a établi un lien important entre le transfert du blâme (RR 1,36, intervalle de confiance [IC] à 95 %, 1,21–1,49) et l'aliénation sociale (RR 1,23, IC à 95 %, 1,24–1,40), d'une part, et le syndrome métabolique de l'autre, dans le contexte d'une analyse de régression logistique non corrigée.

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Conclusion : Il importe, particulièrement en contexte de soins de santé primaires, de reconnaître les opinions sur la santé à l'origine du syndrome métabolique et de responsabiliser les communautés dans la prévention du syndrome.

INTRODUCTION

Metabolic syndrome (MetS) is an important cluster of risk factors for cardiovascular morbidity and diabetes, and a definite contributor to cardiovascular and all-cause mortality.[1,2] It has been found to be associated with genetic factors and lifestyles that include a lack of physical activity.[3] Sedentary behaviour during leisure time has been found to be associated with MetS and with individual cardiovascular risk factors in men, regardless of whether the men meet physical activity recommendations, and has been found to be associated with MetS in women who do not meet physical activity recommendations.[4]

Rurality may[5] or may not[6] contribute to a diminished level of physical activity in daily life. According to a health survey in Canada, however, the higher prevalence of obesity in rural than in urban areas[7] may indicate more sedentary lifestyles and lower levels of physical activity in rural than in urban areas. There is also growing evidence of the association between MetS, poor socioeconomic status[8,9] and psychosocial factors.[10,11] Socioeconomic and demographic shifts in rural areas have resulted in a steady increase in the incidence of MetS.[12]

At the community level, primary health care providers should identify people at high risk for MetS. Not much is known about the association between confirmed MetS and lay health views. However, the SHIELD (Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes) population study, which assessed the association between risk factors for MetS and health attitudes and behaviour, found that people most at risk were not concerned about their diet, overall nutrition and fitness.[13] The researchers concluded that it would be difficult to provide treatment to these high-risk residents because of their habits related to diet, exercise and medication.

Our objective was to study the association between confirmed MetS and age, vocational education, physical activity and vegetable intake. More specifically, we sought to study the association between MetS and views on health and health care in an adult Finnish rural population. We aimed to explore perceptual determinants of lifestyle behind MetS. Factor analysis was used to find profiles of health views that may predict MetS.

METHODS

Study population and procedure

Lapinlahti, with a total population of 7513, is a typical rural community in eastern Finland with a demographic shift to older age strata and increasing migration of the young and economically active population to urban centres. The study was carried out in collaboration between the University of Eastern Finland and the Lapinlahti Primary Health Care Centre, which is responsible for all public primary care in the catchment population.

In the first phase of the study, we mailed a questionnaire to all adult residents in the Lapinlahti municipality who were born in 1939, 1944, 1949, 1954, 1959, 1964, 1969 and 1974. Volunteers from the first phase of the study participated in a health survey, the second phase of our study, which was carried out in the health care centre by a team of one research nurse and one laboratory technician. The first author (J.M.) supervised the procedures. The health survey consisted of a physical health examination, laboratory tests and a structured questionnaire that included statements related to health and health services that were rated by participants using a Likert scale. In our analyses, we did not include previous health records kept at the health care centre. Therefore, all our findings were based on the information collected in the health survey.

All participants in the health survey from the second phase filled out a structured questionnaire including 29 statements about views on health and health care on a 5-point Likert scale (1 = totally agree, 2 = agree to some extent, 3 = disagree to some extent, 4 = totally disagree, 5 = not applicable). Similar statements have been used in previous studies in Finland, such as studies in the North Karelia project since 1972 and in the World Health Organization MONICA (monitoring trends and determinants in cardiovascular disease) Project since the early 1980s.[14] Based on our long-term practical experience, the statements in the structured questionnaire about health views measure the health understanding and behaviour of the Finnish general population quite well.

We sought to find factors of health views that would describe the health understanding and behav-

iour of our study participants. Factor analysis identified 20 statements for health view factors. To measure only the views of those participants who could locate their health views on the continuum, category 5 ("not applicable") was excluded from the analysis.

MetS was determined from anthropometric measurements and blood test results. The presence of at least 3 of the 5 MetS criteria of the National Cholesterol Education Program (NCEP) classified the participants as having MetS.[15] The 5 criteria were

1. fasting plasma glucose level 5.6 mmol/L or greater and/or medication for diabetes, or previously diagnosed type 2 diabetes;
2. serum triglyceride level 1.7 mmol/L or greater and/or medication for elevated triglyceride level;
3. serum high-density lipoprotein (HDL) cholesterol level under 1.03 mmol/L in men and under 1.29 mmol/L in women and/or medication for low HDL cholesterol;
4. systolic blood pressure 130 mm Hg or greater and/or diastolic blood pressure 85 mm Hg or greater and/or antihypertensive medication;
5. waist circumference greater than 102 cm in men and greater than 88 cm in women.

Waist circumference was measured at the midpoint between the lowest rib and the iliac crest, and blood pressure was taken 3 times at intervals of 5 minutes, in a sitting position after 10 minutes of rest. For the blood pressure measurements, we routinely used a calibrated Omron M4-1 semiautomatic device. A manual mercury sphygmomanometer was used for participants with reported or detected cardiac arrhythmias. For the statistical analysis, we calculated the means of the 3 measurements. Glucose level was tested from capillary blood with a glucometer calibrated for plasma glucose level, and other laboratory tests were done from the serum of a venous blood sample. The blood samples were drawn after 12 hours of fasting. All the laboratory investigations were performed according to the routine protocol of the Kuopio University Hospital's medical laboratory.

Statistical analysis

We used SPSS 14.0 for Windows (SPSS Inc.). In all the statistical analyses, we regarded a p value of less than 0.05 as statistically significant. The association between MetS and categorical background and lifestyle variables was explored with a χ^2 test. A Mann–Whitney U test was used for all continuous variables except for HDL cholesterol in women, which was the only normally distributed variable. For HDL cholesterol, we used an independent samples t test. Further, the association between MetS and lifestyle factors was studied using logistic regression analysis adjusted for age, sex, marital status, vocational education level and employment status.

We used SPSS principal component factor analysis with oblimin rotation to condense the statements on health views in the structured questionnaire into a smaller set of statements to identify different health view factors with a minimum loss of information.[16] Sampling adequacy for factor analysis was studied using the Kaiser–Meyer–Olkin method. At a minimum loading level of 0.4, the analysis reduced the number of statements from 29 to 20 (Appendix 1). Because we could not find previous reports of studies with a similar arrangement, we had to agree on the selection of the most appropriate labels to describe the statements that loaded under each category. The labels used are expressions that are used in the disciplines of medicine, sociology and psychology.

Cronbach α was used to indicate the adequacy of the internal coherence of the sample. The occurrence of each health view factor in the sample was calculated from the sum variables, which did not give exactly 100% as the total. This was because of co-occurrence of health views among the participants. Finally, a linear regression analysis was performed to explore the association between MetS and health view factors.

Ethical approval

The ethics committee of Kuopio University Hospital and the University of Eastern Finland approved the study. All participants gave written informed consent.

RESULTS

Of the 760 adults who were mailed questionnaires for basic background and lifestyle information, 594 (78%) completed the questionnaire. In the second phase of the study, 480 participants filled out our structured questionnaire (Appendix 1) for a participation rate of 63% (230 men, 250 women). The rate of participation in the health survey was better among residents aged 50 years or more (69%) than among residents less than 50 years of age (57%). It was also better among women than among men in all age groups, except for residents born in 1944 (74% among men and 68% among women).

The basic characteristics of the participants of the health survey (as identified by our 20 statements

for health view factors) are presented in Table 1. The prevalence of MetS among the participants was 38% (40% among men and 36% among women). The prevalence of positive single MetS components was 74% for blood pressure, 44% for serum HDL cholesterol, 42% for fasting plasma glucose, 33% for waist circumference and 25% for serum triglyceride.

MetS was significantly associated with older age ($p < 0.001$), and low levels of physical activity ($p = 0.001$), vegetable intake ($p = 0.008$) and vocational education ($p = 0.010$). In a backward logistic regression analysis, the association of MetS with older age (odds ratio [OR] 2.91, 95% confidence interval [CI] 1.91–4.45) and low physical activity (OR 1.99, 95% CI 1.31–3.01) persisted.

In the factor analysis of the health views of all the health survey participants, 4 health view factors were identified (Table 2): blame-shifting (blaming external factors), denial (rejecting facts), high awareness (adopting facts) and social alienation (self-estrangement/distancing from social interaction). Calculated from the sum variables, the occurrence of high awareness was 87%; blame-shifting, 34%; social alienation, 10%; and denial, 8%. The total percentage of all the sum variables was more than 100%, as described in the methods section. A significant correlation was found between social alienation and denial ($p = 0.009$). "Doctors and nurses push too much health advice" was the only statement that loaded in 2 factors, namely social alien-

Table 1. Characteristics of the participants of the health survey, *n* = 480*

Characteristic	Group; no. (%)*			*p* value
	Total	MetS† absent	MetS† present	
Age, mean (SD) yr	50.4 (10.2)	48.6 (10.1)	53.3 (9.7)	< 0.001
Male sex	230 (48)	138 (46)	92 (51)	0.40
Marital status‡ (single/divorced/ widowed), *n* = 479	86 (18)	49 (16)	37 (20)	0.27
Level of vocational education§ (lower level), *n* = 479	335 (70)	195 (66)	140 (77)	0.010
Employment status¶ (unemployed/retired), *n* = 465	138 (30)	77 (27)	61 (35)	0.094
Smoking status** (smoker), *n* = 475	133 (28)	83 (28)	50 (28)	> 0.99
Alcohol use†† (alcohol user)	377 (79)	234 (79)	143 (79)	> 0.99
Physical activity‡‡ (inactive), *n* = 474	230 (49)	126 (43)	104 (58)	0.001
Dietary vegetable intake§§ (low intake), *n* = 479	215 (45)	119 (40)	96 (53)	0.008
Taking medication for diabetes	21 (4)	6 (2)	15 (8)	0.002
Taking medication for hypertension	104 (22)	30 (10)	74 (40)	< 0.001
Taking medication for dyslipidemia	65 (14)	25 (9)	40 (22)	< 0.001
Physical measure, mean (SD)				
Waist circumference, cm				
Men	98.5 (11.9)	92.2 (7.7)	107.9 (10.9)	< 0.001
Women	85.1 (13.8)	77.6 (8.0)	97.8 (12.1)	< 0.001
Blood pressure, mm Hg				
Systolic	139 (19)	135 (18)	146 (18)	< 0.001
Diastolic	83 (11)	81 (10)	87 (11)	< 0.001
Fasting plasma glucose, mm Hg	5.6 (1.2)	5.3 (1.0)	6.1 (1.3)	< 0.001
Serum HDL cholesterol, mmol/L				
Men	1.09 (0.34)	1.22 (0.32)	0.89 (0.26)	< 0.001
Women¶¶	1.37 (0.43)	1.54 (0.40)	1.08 (0.31)	< 0.001
Serum triglycerides, mmol/L	1.36 (0.82)	1.04 (0.41)	1.90 (1.02)	< 0.001

HDL = high-density lipoprotein; MetS = metabolic syndrome; SD = standard deviation.
*Unless otherwise indicated.
†National Cholesterol Education Program 2005 criteria.
‡Married or cohabitating versus single, divorced or widowed.
§Higher level of vocational education (degree from a polytechnic or university) versus lower level of vocational education (lower than polytechnic level or no education).
¶Employed versus unemployed or retired.
**Nonsmoker versus smoker.
††No (no use of alcohol for 12 mo) versus yes (current alcohol user).
‡‡Active (≥ 3 units/wk) versus inactive (≤ 2 units/wk); 1 unit equals a minimum of 30 minutes of physical exercise at work or during leisure time.
§§High intake (≥ 3 times/wk) versus low intake (≤ 2 times/wk).
¶¶Independent samples *t* test used (nonparametric Mann–Whitney U test used for the other continuous variables).

ation (0.412) and denial (0.495). In an unadjusted logistic regression analysis, blame-shifting (OR 1.36, 95% CI 1.21–1.49) and social alienation (OR 1.23, 95% CI 1.24–1.40) were associated with MetS. The 4-factor solution explained 43% of the total variance. The frequency of option 5 ("not applicable") for each statement is presented in Table 2.

DISCUSSION

Nearly 4 out of 10 of the participants of the health survey had MetS. We identified 4 health view profiles, of which blame-shifting and social alienation were significantly associated with MetS. A large number of the respondents cited "not applicable" to all statements under the blame-shifting profile because they found these statements irrelevant to their situation. In this profile, interestingly, 4 of the 5 loading statements explored views related to obesity/overweight and the fifth one explored views related to ailments. Although obesity and ailments were common among the participants, a large majority of them did not have any substantial problems with their body image.

Knowledge about MetS among the general population is low.[13,17] The SHIELD population study[13] explored the association between self-reported MetS risk factors and health attitudes and behaviour. In that study, the high-risk group was used as a surrogate for MetS risk. To our knowledge, however, the present study is the first comprehensive report on the association between confirmed MetS and health views in a general adult population. We confirmed a MetS diagnosis with a health examination using NCEP 2005 criteria. The blame-shifting group in our study is similar to the "don't bother me" group in the SHIELD study. Neither group would embrace changes in health behaviour without major external support.

Socioeconomic and demographic changes have been substantial in our study area. Because of a lack of scientific evidence, however, it is impossible to confirm an attitude change in the rural general population. Australian researchers have reported that psycho-educational barriers compromise prevention of diabetes in rural communities.[18] Similar barriers are likely to hamper prevention of MetS in Finnish rural communities. In our study, social alienation and

Table 2. Statements in the structured questionnaire with 0.4 loading and health view factors identified in the factor analysis

Statement (no. in the questionnaire)	Not applicable; no. (%)*	Health view factors			
		Blame-shifting	Social alienation	High awareness	Denial
Nurses cannot give good advice for reducing my weight (24)	178 (37.2)	0.851			
Doctors cannot give good advice for reducing my weight (20)	165 (34.5)	0.816			
I can't do anything for my overweight since it is hereditary (3)	154 (32.2)	0.746			
I can't reduce my weight since food is one of my few enjoyments (4)	126 (26.4)	0.677			
I don't want to practise physical exercise to control my weight (15)	86 (12.9)	0.512			
It is impossible to exercise due to my ailments (22)	80 (16.7)	0.446			
Eating together with the family promotes the health of all family members (21)	9 (1.7)			0.609	
Stress may cause cardiovascular illnesses (14)	7 (1.5)			0.588	
Continuous medication can have harmful consequences (17)	11 (2.3)			0.587	
I don't want lifelong medication (9)	5 (1.0)			0.509	
Media pushes too much health advice (12)	6 (1.3)				0.608
Risks of fatty foods are exaggerated (19)	4 (0.8)				0.580
Food with little salt is tasteless (7)	3 (0.6)				0.558
Doctors and nurses push too much health advice (11)	20 (4.2)				0.495
Smoking is not as dangerous as argued (10)	71 (14.8)				0.476
Medical check-ups are unpleasant (18)	8 (1.7)		0.710		
Doctor's consultations are unpleasant (13)	8 (1.7)		0.622		
I don't go out for physical exercise in wintertime since it is cold and dark (27)	23 (4.8)		0.476		
My lifestyle is no one else's business (6)	15 (3.1)		0.422		
My family members don't support me in my health promotion (2)	19 (7.5)		0.416		

*Number of participants who selected option 5 ("not applicable") on a 5-point Likert scale.

blame-shifting were clear manifestations of individual resistance against traditional measures for health education. Based on our clinical experience, promotion of health literacy from childhood leads to lifelong healthy behaviour. Therefore, it should be given preference over traditional health education, which is based on illness risk assessment. The concept of salutogenesis (from the Greek *salus*, meaning health and genesis) introduced by Aaron Antonovsky[19] is a promising approach to health literacy.[20]

The main strengths of this study are its wide coverage of a single community and its comprehensive assessment of MetS. The age and sex distributions of the participants of the health survey differed slightly from those of the nonrespondents. However, this minimal difference does not weaken the significance of the study results. Because of the fairly high rate of participation, the health survey population represents the adult population of the community, which is a typical semirural community in eastern Finland. Similar prevalence figures based on other MetS definitions have been reported from other parts of Finland.[21] Therefore, the results may be generalized at least to the average Finnish adult population. Typical for this kind of survey, the lower participation rate of younger age groups and men in particular may have affected the results.

In the factor analysis, we selected the best possible expressions to cover the statements in each group. The items loaded quite clearly in the 4 factors. The structured questionnaire had high validity in the factor analysis, although it is not a validated instrument. The Kaiser–Meyer–Olkin method coefficient was 0.69, which justified the method we used. Further, the Cronbach α was 0.76 (0.69–0.81), indicating the adequacy of the internal coherence of the sample. The factor matrix explained 43% of the total variance. Because of the fairly high proportion of "not applicable" responses to the health view statements, however, the significant association found between MetS and the 2 factors (social alienation and blame-shifting) warrants careful interpretation of the results.

Blame shifting, which was significantly associated with MetS, resembles an external locus of control attitude.[22] Therefore, our findings support the findings of Ravaja and colleagues[23] on the association between MetS precursor states and external locus of control. However, we could not find supporting or conflicting evidence from the literature for our finding on the significant association between MetS and social alienation. This seems to be a novel finding.

CONCLUSION

It is important in primary care to recognize health views of community members most at risk of MetS for effective and patient-centred prevention of the syndrome and other illnesses related to lifestyle.

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Appendix 1. Health and health care statements in the structured questionnaire*

1. It is difficult for me to practise physical exercise.
2. My family members don't support me in my health promotion.†
3. I can't do anything about being overweight since it is hereditary.†
4. I can't reduce my weight since food is one of my few enjoyments.†
5. A small amount of alcohol taken daily supports health.
6. My lifestyle is no one else's business.†
7. Food with little salt is tasteless.†
8. I do not want to trouble myself with continuous thinking of my health condition.
9. I don't want lifelong medication.†
10. Smoking is not as dangerous as argued.†
11. Doctors and nurses push too much health advice.†
12. Media pushes too much health advice.†
13. Doctors' consultations are unpleasant.†
14. Stress may cause cardiovascular illnesses.†
15. I don't want to practise physical exercise to control my weight.†
16. I cannot afford a healthy diet.
17. Continuous medication can have harmful consequences.†
18. Medical check-ups are unpleasant.†
19. The risks of fatty foods are exaggerated.†
20. Doctors cannot give good advice for reducing my weight.†
21. Eating together with the family promotes the health of all family members.†
22. It is impossible to exercise because of my ailments.†
23. I have tried to do my best to reduce my weight.
24. Nurses cannot give good advice for reducing my weight.†
25. It is difficult for me to select healthy foods when shopping.
26. It is difficult for me to eat healthy foods at home because other family members have their own desires.
27. I don't go outside for physical exercise during winter since it is cold and dark.†
28. My work/studies do not hamper a healthy lifestyle.
29. Obesity has nothing to do with getting diseases.

*Statements were rated by participants using a 5-point Likert scale (1 = totally agree, 2 = agree to some extent, 3 = disagree to some extent, 4 = totally disagree, 5 = not applicable).
†Statements loading at the minimum level of 0.4 in the factor analysis.

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