Original Research

Association between body mass index and prevalence of multimorbidity: a cross-sectional study

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ABSTRACT

Objectives: To explore the prevalence of multimorbidity in Serbia according to sex and body mass index (BMI) categories, and to examine the association between BMI and multimorbidity. In addition, this study examined the relationships between the main demographic and socio-economic characteristics of the population (age, settlement, education) and multimorbidity.

Study design: Secondary analysis of data from the 2013 Serbian National Health Survey.

Methods: This study analyzed data from 13,103 participants aged ≥20 years with BMI data. The associations between BMI, age, education and multimorbidity were analyzed by multivariate logistic regression.

Results: The overall prevalence of multimorbidity was higher than the overall prevalence of a single disease (26.9% vs 20.7%). The proportion of participants who reported two or more chronic diseases increased with each BMI category in both sexes, reaching the highest values in obese category III. Odds ratios (ORs) for the prevalence in all morbidity groups increased gradually with BMI category, and the highest OR values were found in obese category III. Males of obese category III were seven times more likely to have multimorbidity [OR 7.2, 95% confidence interval (CI) 4.2—12.6] than males of normal weight, whereas females of obese category III were nine and a half times more likely to have multimorbidity (OR 9.5, 95% CI 4.0—22.4) than females of normal weight. In the multivariable analysis, age (both sexes), low and middle level of education (males), and rural settlement and low level of education (females) were found to be predictors of multimorbidity.

Conclusions: This study found positive associations between obesity and multimorbidity and between overweight and multimorbidity. Recognizing these associations is of great importance from both clinical and public health perspectives because this could lead to an integrated approach for patients.

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Introduction

Patients with chronic diseases, especially the elderly, often face multimorbidity, defined as the simultaneous presence of two or more chronic diseases.[1–3] It is well documented that multiple chronic diseases are associated with impaired quality of life, risk of functional limitations,[4] difficulties in treatment delivery,[4] and increased need for healthcare services.[5] A recent review from Scotland revealed that there were more people with multimorbidity than with a single chronic disease,[6] indicating that multimorbidity is becoming the norm rather than the exception.[6,7] This is supported by findings which indicate that the prevalence of multimorbidity worldwide has risen substantially in recent decades.[5] International estimates suggest that this trend will continue to rise in the coming years.[8] The proportion of adults with a body mass index (BMI) ≥ 25 kg/m^2 has also been increasing globally over the last three decades, affecting 36.9% of men and 38.0% of women in a study conducted in 2013.[9] It has been determined that increased BMI is a major risk factor for a range of chronic diseases, including cardiovascular diseases, diabetes, musculoskeletal disorders and some cancers.[10,11] The determinants of multimorbidity continue to be studied. Factors that have been found to be associated with increased risk of multimorbidity include age, female sex, lower socio-economic status, lower education, unemployment and smoking.[1,4] The role of obesity as a risk factor for multimorbidity has been evaluated recently by various studies.[12–15]

Serbia, like many other countries, is suffering from increasing prevalence of certain chronic diseases, in addition to increasing rates of obesity.[16,17] Several studies have contributed significantly to a better understanding of the overall disease burden and the subsection of this disease burden that is attributable to avoidable risk factors in Serbia.[18,19] However, information on the association between BMI and multimorbidity is still lacking.

Therefore, this study aimed to explore the prevalence of multimorbidity in Serbia according to sex and BMI categories, and to examine the association between BMI and multimorbidity. In addition, this study examined the relationships between the main demographic and socio-economic characteristics of the population (age, settlement, education) and multimorbidity.

Methods

Study design and participants

This study is a secondary data analysis of the 2013 National Health Survey (NHS 2013) undertaken by the Ministry of Health of Serbia and the Institute of Public Health of Serbia. People living in collective households and/or institutions, and residents of Kosovo and Metohija (under the United Nations Mission) were not included in the survey.

In order to provide statistically reliable estimates for this survey at national level, a two-staged representative sample of the Serbian population was selected, firstly within four geographical areas/statistical regions (Vojvodina, Belgrade, Sumadija and Western Serbia, and Southern and Eastern Serbia) and secondly among urban and rural settlements/areas. In total, 670 enumeration areas (EAs) were selected in the first stage of sampling, on the basis of probability proportional to size (probability proportional sampling). Households, as the units of the second stage of sampling, were selected using simple random sampling without replacement. The lists of households in all selected EAs were updated before the selection of specific households. Ten households were selected from each selected EA, plus three backups from the original list. Of the 2,487,886 households registered in Serbia in 2011 (Population Census), a sample of 10,089 households and a framework were selected. A total of 6500 households agreed to participate in NHS 2013, with a household response rate of 64.4%. Of the 16,474 registered members of the chosen households aged >15 years, 14,623 were interviewed, which yielded a response rate of 88.9%. Health information was obtained by face-to-face interviews, using a standardized questionnaire, as well as anthropometry and blood pressure measurements. In-home interviews and measurements were performed by trained teams consisting of two trained interviewers and a healthcare worker. Ethical standards in the survey complied with the Declaration of Helsinki[20] and Serbian legislation. To protect the confidentiality of the survey information, as well as the privacy of the participants, all necessary steps were taken in accordance with Serbian Laws on Personal Data Protection,[21] Serbian State Statistics Laws[22] and Directive 95/46/EC.[23] Written consent was obtained from all respondents. The Review Board of the Ministry of Health of the Republic of Serbia and the Institute of Public Health of Serbia issued the necessary approval for undertaking this study.[17] This study analyzed data from 13,103 participants aged ≥ 20 years with BMI data (89.6% of all interviewed participants).

Study variables

This analysis included data on demographic characteristics (age, sex, type of settlement), socio-economic status (education) and presence of chronic diseases; these data were collected during NHS 2013 through the standardized questionnaire.

Type of settlement (urban or rural) and education level (low: no schooling, incomplete primary, and primary education; middle: 3 or 4 years of secondary education; high: college and university education) were identified at the survey level. Data on the presence of chronic diseases were collected on the basis of a list where participants specified which diseases they had been suffering. Participants were asked to answer the following question: 'Have you had any of the following diseases or conditions in the previous 12 months?'[17] Following this question, the data were analyzed on the presence of 13 self-reported chronic diseases: bronchial asthma; chronic bronchitis, chronic obstructive pulmonary disease, emphysema; myocardial infarction or long-term consequences of myocardial infarction; coronary heart disease or angina pectoris; hypertension; stroke or long-term consequences of stroke; arthrosis—degenerative joint disease (excluding arthritis); diabetes mellitus; cirrhosis; kidney disease; depression; malignancy; and hyperlipidaemia. BMI was