Prevalence of the Metabolic Syndrome in the Old Institutionalized People in Zagreb, Croatia

Branimir Nevajda¹, Ana Havelka-Meštrović² Morana Bilić³ Andreja Podvez Nevajda⁴ Dominik Romić¹, Vladimira Vuletić¹, Snejana Ćukljek³, Mario Sičaja⁵ and Željko Boćina¹

¹ University of Zagreb, Dubrava University Hospital, Department of Neurology, Zagreb, Croatia
² University of Zagreb, Dubrava University Hospital, Department of Psychiatry, Zagreb, Croatia
³ University of Applied Health Studies, Department of Health Psychology, Zagreb, Croatia
⁴ University of Zagreb, University Hospital for Tumors, Department of Internal Medicine, Zagreb, Croatia
⁵ University of Zagreb, Dubrava University Hospital, Department of Internal Medicine, Zagreb, Croatia

ABSTRACT

Metabolic syndrome (MeS) is defined by a cluster of abnormalities comprising obesity, hypertension, carbohydrate intolerance and dyslipidemia. MeS increases the risk of developing various diseases, including coronary heart disease, stroke, peripheral angiopathy and type 2 diabetes¹². In our study, the subjects were 561 persons, residents of 11 homes for the elderly in Zagreb, Croatia. There were 160 men (28.5%) and 401 women (71.5%), aged from 56 to 96 years (the average being 79 years). Physical examination was conducted, which included blood pressure measurement, and body height and weight. Blood samples were taken for biochemical analysis. Along with other biochemical parameters, the levels of glucose, triglycerides and cholesterol (LDL, HDL-C) were also measured. The results have shown the prevalence of MeS in the elderly institutionalised people to be in the range of 20.8%, according to WHO criteria. The most common MeS component was hypertension, and it was significantly more frequent in women than in men; also, the elevated triglyceride levels were more often found in women; the difference between men and women was also statistically significant. MeS is a serious and growing health problem not only in Croatia but worldwide as well. Further studies are needed to verify the prevalence of MeS in Croatia, as it is a major risk for CVD and many other severe diseases.

Key words: metabolic syndrome (MeS), hypertension, senior population

Introduction

Metabolic syndrome (MeS) is defined by a cluster of abnormalities that consists of obesity, hypertension, carbohydrate intolerance and dyslipidemia. MeS increases the risk of developing various diseases, including coronary heart disease, stroke, peripheral angiopathy and the development of type 2 diabetes¹². At first MeS was named »syndrome X« and in 1998 the term »metabolic syndrome« was accepted by the World Health Organization (WHO) and according to WHO criteria obesity was taken as the main component for the definition of MeS⁵. Prevalence of MeS rises with age and it is believed that 40% of individuals of 60 years and above, and 10% in the age group 20–60 years have MeS⁴,⁵. Significant increase in MeS prevalence is noted in developed countries, recent studies showed that age adjusted prevalence (adults 20 and above) of MeS in the U.S. rose from 24% in NHANES III study to 27% in NHANES study⁶. Undeveloped countries also are not excluded, where MeS prevalence is increased especially in the obese and the overweight youth⁷. Two recent studies in isolated populations in Croatia were conducted, one took place in the interior of Croatia: the Baranja region; and the other in an island population of eastern Adriatic coast, they showed the prevalence of MeS of 40 and 42% respectively⁸. The data about the prevalence of MeS in the elderly population vary, ranging from 11.3% in women and 12.5% in men in people over 70 in a French representative study of the population (using NCEP ATP III criteria) and up to 69% in a Greek population-based study (using the IDF criteria). We found no data in the literature about the prevalence of MeS in the elderly population of Croatia⁹.

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There are several definitions used to identify MeS, such as the WHO criteria, European group for the study of insulin resistance (EGIR) criteria, National cholesterol education program – adult treatment panel (NCEP ATP III) criteria and International diabetes federation (IDF) criteria. Mostly two definitions are used in diagnosing MeS, the WHO criteria and the second one as defined in the NCEP ATP III criteria\textsuperscript{10,11}. In our survey we used the WHO criteria that take obesity as the main component of MeS. With obesity, as the main component, at least two of the following four components must be fulfilled: carbohydrate intolerance (fasting glucose above 6.1 mmol/L), elevated blood pressure (measured above 140/90 mmHg), elevated triglycerides (above 1.7 mmol/L), low HDL – cholesterol (in men <0.9 mmol/l; women <1.0 mmol/L) and obesity (waist hip ratio more than 0.9 in men and more than 0.85 in women; or body mass index (BMI) over 30 kg/m\(^2\)).

Materials and Methods

Subjects were 561 persons, residents of 11 old peoples’ homes in Zagreb, Croatia, 160 men (28.5\%) and 401 women (71.5\%), aged 56 to 96 (average 79 years). Physical examination was conducted, which included measuring of blood pressure, height and weight. Blood samples were taken for biochemical analysis. Along with other biochemical parameters we measured level of glucose, triglycerides and cholesterol (LDL, HDL-C). 505 subjects had all the data needed for detection of MeS, and 56 subjects had missing data, invalid data or have left the study. They were excluded from further evaluation of MeS prevalence.

WHO criteria takes hyperglycemia (defined as a history of diabetes or a fasting blood glucose greater than or equal to 6.1 mmol/L) as the main component of MeS with at least two of the following four components:

1) hypertension – defined as a history of hypertension or a blood pressure greater than or equal to 140/90 mm Hg
2) hypertriglyceridemia – defined as fasting triglycerides greater than or equal to 1.7 mmol/L
3) a low HDL-C – defined as a fasting HDL-C less than 0.9 mmol/L in men or less than 1.0 mmol/L in women, and
4) central obesity – defined as a Body Mass Index (BMI) greater than or equal to 30 kg/m\(^2\).

Data were collected individually, in the institution, as a part of a greater longitudinal study named ‘Biological, psychological and sociological factors of ageing. The study received approval from ethical committee. All participants have signed informed consent and no fee was paid to participants, they could leave the research at their own will at any time without any consequences. Results were statistically analyzed using statistical software package Statistica 7. Level of statistical significance was set at 95\% (\(\alpha = 95\%\)), p value less than 0.05 was considered as statistically significant.

Results

We found positive criteria for MeS in 35 men and in 70 women, with prevalence of MeS of 25.4\% in men, and 19.1\% in women. Totally, MeS was noted in 120 participants with the prevalence of 20.8\%. When we analyzed the components of MeS separately, abnormal glucose level or previous diagnosis of diabetes mellitus was found in 35 men (25.4\%) and 70 women (19.1\%). Triglycerides levels were elevated in 38 males (27.5\%) and 138 females (37.6\%). HDL – cholesterol was below normal level in 18 males (15.0\%) and 31 females (8.4\%). Elevated BMI (equal to or above 30 kg/m\(^2\)) was noticed in 21 males (16.4\%) and 90 females (23.7\%). Prevalence of metabolic syndrome components shows that hypertension is present in 87 men (54.4 \%) and 276 women (68.8\%). Totally, elevated glucose level or previous diagnosis of diabetes mellitus was found in 120 participants (21.3\%). Abnormal triglycerides levels were noticed in 206 subjects (36.5\%). Low HDL cholesterol has been established in 49 examinees (9.7\%). Hypertension was recorded in 363 participants (64.7\%), and elevated BMI we found in 111 subjects (21.9\%). When comparing components of MeS in men and women, we found that men had higher percentage of glucose intolerance or diabetes mellitus (25.4 to 20.8\%) and abnormal levels of HDL cholesterol (13.0 to 9.7\%), but the difference was not statistically significant (\(p>0.05\) and \(p>0.05\)). We also noticed that women more often have elevated triglycerides levels (27.5 to 34.8\%), elevated blood pressure (68.8 to 54.4\%) and elevated BMI (23.7 to 16.4\%). Statistical significance was found when comparing elevated triglycerides levels and elevated blood pressure in women and men (\(p=0.03\) and \(p<0.01\) respectively). There was no statistical significance for BMI between men and women (\(p>0.05\)). All data are summarized in Table 1.

Discussion

In our current study the criteria proposed by the WHO for the epidemiological studies, which excluded microalbuminuria, for the MeS were used. Our results show that prevalence of MeS in an old people is 20.8\% using the WHO criteria. MeS was found more frequently in men than in women (25.4 to 19.1\%) but the difference was not statistically significant (\(p>0.05\)). The most frequent MeS component was hypertension, and it was significantly more frequent in women than in men (\(p<0.05\)), also raised triglycerides levels were more often found in women, the difference was also statistically significant (\(p<0.05\)).

MeS is believed to be a strong predictor of cardiovascular disease (CVD), which was confirmed by a number of studies\textsuperscript{12}. A sub-study of Botonia study, which included 4000 Finish and Swedish adults, showed that people with MeS have a three times higher risk of CVD that those without the syndrome, also cardiovascular mortality was significantly increased (12\% to 20\%) in people with MeS than in those without the syndrome\textsuperscript{13}. Mentioned above was confirmed by the number of observational studies.
which included the Finnish Kuopio study\textsuperscript{14}, the San Antonio Heart Study\textsuperscript{15}; European DECODE Study\textsuperscript{16} and the AIRC study\textsuperscript{17}. Also some studies have disputed whether the MS is a good predictor of CVD above individual CVD risks, this was possibly related to an inadequate definition of MS or the cut points used\textsuperscript{18}. When comparing people who meet criteria for MS but do not have diabetes, it has been noted that they have a very high risk for developing diabetes; the risk is five times higher than in people without MS\textsuperscript{18}. According to McNeill et al. women and men with MS were 20\% to 30\% more likely to develop any CVD than subjects without MS\textsuperscript{19}. Many international studies have shown high correlation of MS and the complex diseases, coronary disease, brain infarction and diabetes type II\textsuperscript{20–22}. When comparing our results to similar studies we found that our results were in concordance with their findings. Earl et al.\textsuperscript{23} showed that the prevalence of MS in US adults was 21.8\% to 23.7\%. Also they have noted that the prevalence of MS rises with age, from 6.7\% in individuals aged 20–29 to 43.5\% in subjects aged over 60, their results are somewhat higher than ours, taking in consideration that most of our population was aged above 60. It must be noted that hypertension was again the most often single risk factor for MS\textsuperscript{24}. Missoni also noted that MS is a high risk factor for those complex diseases\textsuperscript{24}. A few other studies using the WHO criteria for MS were conducted in Croatia.\textsuperscript{25} Deka et al. found that the prevalence of MS using the BMI as the indicator of obesity is 26\% in the island of Hvar (32\% in men and 24\% in women above the age of 19)\textsuperscript{1}. Kolcic et al. performed a several studies in Croatia, in an isolated island population of Rab, Mljet, Vis and Lastovo. The highest prevalence of MS was found in Mljet (using the NCEP version) of 53\%.\textsuperscript{2\textsuperscript{5}} Unfortunately there is no data about the overall prevalence of MS in Croatia, and there is no data about MS in the elderly population of Croatia.

\begin{table}
\centering
\caption{Metabolic Syndrome according to WHO and gender} \label{table:1}
\begin{tabular}{lccccccc}
\hline
\multicolumn{3}{c}{Gender} & & \multicolumn{3}{c}{$\chi^2$} \\
\multicolumn{1}{c}{Glucose} & Normal & Male & 103 & 74.6 & 297 & 80.9 & 400 & 79.2 & \textsuperscript{2.41} & \textsuperscript{1} & Abnormal & 35 & 25.4 & 70 & 19.1 & 105 & 20.8 & 2.41 & 1 & 0.12 \\
N & 138 & 100 & 367 & 100 & 505 & 100 \\
\multicolumn{3}{c}{Triglycerides} & & \multicolumn{3}{c}{Abnormal} & 38 & 27.5 & 138 & 37.6 & 176 & 34.8 & 4.47 & 1 & 0.03* \\
N & 138 & 100 & 367 & 100 & 505 & 100 \\
\multicolumn{3}{c}{HDL-cholesterol} & & \multicolumn{3}{c}{Abnormal} & 18 & 13.0 & 31 & 8.4 & 49 & 9.7 & 2.42 & 1 & 0.12 \\
N & 138 & 100 & 367 & 100 & 505 & 100 \\
\multicolumn{3}{c}{Hypertension} & & \multicolumn{3}{c}{Abnormal} & 87 & 54.4 & 276 & 68.8 & 363 & 64.7 & 10.46 & 1 & 0.00* \\
N & 160 & 100 & 401 & 100 & 561 & 100 \\
\multicolumn{3}{c}{BMI} & & \multicolumn{3}{c}{Abnormal} & 21 & 16.4 & 90 & 23.7 & 111 & 21.9 & 2.97 & 1 & 0.08 \\
N & 128 & 100 & 380 & 100 & 508 & 100 \\
\multicolumn{3}{c}{MS (WHO)} & & \multicolumn{3}{c}{Yes} & 35 & 25.4 & 70 & 19.1 & 105 & 20.8 & 2.41 & 1 & 0.12 \\
N & 138 & 100 & 367 & 100 & 505 & 100 \\
\hline
\end{tabular}
\end{table}

p<0.05; N – number of participants; df – degrees of freedom
Conclusion

MeS is a serious and growing health problem worldwide and in Croatia. Further studies are needed to verify the prevalence of MeS in Croatia as it a major risk for CVD and complex diseases. Studies are especially needed in subjects of all ages so preventive actions, including the education about exercise and nutritional habits, could be performed until it is too late.

REFERENCES


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B. Nevajda

University Of Zagreb, Dubrava University Hospital, Department of Neurology, Av. Gojka Štuka 6, 10000 Zagreb, Croatia

e-mail: bnevajda@zvu.hr

PREVLAJENJA METABOLIČKOG SINDROMA KOD STARIJE INSTITUCIONALIZIRANE POPULACIJE, ZAGREB, HRVATSKA

SAŽETAK

Metabolički sindrom (MeS) definiramo nizom abnormalosti, uključujući gojaznost, povišen krvni tlak, netoleranciju na ugljokohidrata i dislipidemiju. MeS povećava opasnost nastanka niza bolesti, kao npr. koronarne srčane bolesti, moždanog ili srčanog udara, periferne angiopatije te dijabetesa tip 2. U našem istraživanju je sudjelovala 561 osoba; to su bili ženi i muškarci u dobima 56-96 godina. MeS je značajan i rastući zdravstveni problem ne samo u Hrvatskoj i daleko je već u cijelom svijetu. Potrebna su daljnja ispitivanja kako bi se potvrdila prevladavajuća MeS-a u Hrvatskoj, jer je to značajan rizični čimbenik ne samo za srčanoožilne bolesti već i za razne druge zdravstvene i socijalne probleme.