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Prevalence and factors associated with Metabolic Syndrome in elderly users of the Unified Health System

Prevalência e fatores associados à Síndrome Metabólica em idosos usuários do Sistema Único de Saúde

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ABSTRACT: ***Objective:*** To evaluate the prevalence and factors associated with metabolic syndrome in the elderly. ***Methods:*** Cross-sectional study, with 133 individuals randomly selected in the Unified Health System in Goiania, Goiás. The following variables were researched: anthropometric (BMI, waist circumference, fat percentage by Dual X-ray absorptiometry), sociodemographic (gender, age, color, income, marital status and years of schooling), lifestyle (physical activity, smoking and risk alcohol consumption) and food intake (risk and protective foods). The metabolic syndrome was assessed according to harmonized criteria proposed by the World Health Organization (WHO). The combinations were tested by Poisson regression for confounding factors. ***Results:*** The prevalence of metabolic syndrome was 58.65% (95%CI 49.8 – 67.1), with 60.5% (95%CI 49.01 – 71.18) for females and 55.7% (95%CI 41.33 – 69.53) for males. Hypertension was the most prevalent component of the syndrome in both men, with 80.8% (95%CI 64.5 – 90.4), and women, with 85.2% (95%CI 75.5 – 92.1). After the multivariate analysis, only the excess of weight measured by body mass index (prevalence ratio = 1.66; $p < 0.01$) remained associated with the metabolic syndrome. ***Conclusions:*** The prevalence of metabolic syndrome in this sample was high, indicating the need for systematic actions by health workers in the control of risk factors through prevention strategies and comprehensive care to the elderly.

Keywords: Metabolic syndrome. Elderly. Nutrition. National Health System. Epidemiology. Risk factors.

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RESUMO: ***Objetivo:*** Avaliar a prevalência e os fatores associados à síndrome metabólica em idosos. ***Métodos:*** Estudo transversal que incluiu 133 idosos, selecionados aleatoriamente entre os usuários da atenção básica do Sistema Único de Saúde em Goiânia, Goiás. Foram pesquisadas variáveis antropométricas (índice de massa corporal, circunferência da cintura e percentual de gordura por meio da Dual x-ray absorptiometry), sociodemográficas (sexo, idade, cor, renda, estado civil e anos de estudo), de estilo de vida (prática de atividade física, tabagismo e consumo alcoólico de risco) e consumo alimentar (alimentos protetores e de risco). A síndrome metabólica foi avaliada segundo o critério harmonizado proposto pela OMS. As associações foram testadas por meio da regressão de Poisson, para o controle dos fatores de confusão. ***Resultados:*** A prevalência da síndrome metabólica encontrada foi de 58,65% (IC95% 49,8 – 67,1), sendo 60,5 % (IC95% 49,01 – 71,18) para as mulheres e 55,7% (IC95% 41,33 – 69,53) para homens. A hipertensão arterial foi o componente da síndrome mais prevalente tanto para homens, 80,8 % (IC95% 64,5 – 90,4), quanto para mulheres, 85,2 % (IC95% 75,5 – 92,1). Após análise multivariada, apenas o excesso de peso corporal medido pelo Índice de Massa Corporal (razão de prevalência = 1,66; $p < 0,01$), permaneceu associado à síndrome metabólica. ***Conclusões:*** A prevalência de síndrome metabólica nesta amostra foi alta, evidenciando a necessidade de atuação sistemática dos profissionais de saúde no controle dos fatores de risco, por meio de estratégias de prevenção e atenção integral ao idoso.

Palavras-chave: Síndrome Metabólica. Idoso. Nutrição. Sistema Único de Saúde. Epidemiologia. Fatores de risco.

INTRODUCTION

In the past three decades, the population aged over 60 years has more than doubled in Brazil[1]. As a result of population aging, a predominance of chronic noncommunicable diseases (NCDs) can be observed[2-4]. In this context, the Metabolic Syndrome (MS) stands out as a cluster of risk factors for the development of illnesses such as diabetes and cardiovascular diseases[5,6]. It is characterized by central obesity, dyslipidemia (hypertriglyceridemia and low HDL), insulin resistance and increased blood pressure. For the elderly individual, the consequences of this syndrome appear to be even more pronounced, mainly due to physiological changes associated with aging[7].

The first reports of MS were mentioned in the literature over 80 years ago, but only since 1998 a group of consultants from the World Health Organization (WHO) proposed the first diagnostic criteria to facilitate the clinical and epidemiological investigations of MS, taking insulin resistance as its main component. Recently, the criteria of the National Cholesterol Education Program - Adult Treatment Panel III (NCEP ATP III) presented a definition in which glycemia is not considered an essential factor, being listed as only one of the diagnostic components of MS. The American Heart Association (AHA) and the National Heart, Lung and Blood Institute (NHLBI) also advocate the use of the NCEP ATP III criteria as a diagnostic tool for not emphasizing a single etiology for MS[8]. The Brazilian Guideline

for Diagnosis and Treatment of MS is based on this same perspective, with the same cutoffs points for the diagnosis of MS[9].

Data on prevalence of MS among elderly are still discordant. According to the NCEP ATP III criteria, in the U.S. study called Third National Health and Nutrition Examination Survey (NHANES III), in the 60 to 69 years old age group, a prevalence of 43.5% was observed, and the prevalence was 42% in the over 69 years old age group[10]. In other international studies, the prevalence ranged from 11.3 to 24.0% based on the same criteria (NCEP ATP III). In Brazil, studies indicate prevalence rates ranging from 30.9 to 53.4%[14-16].

Some studies suggest that MS may be associated with sociodemographic factors such as low educational level, age, inequality and social isolation, psychosocial stress and with a lifestyle of unhealthy dietary patterns, physical inactivity, alcohol consumption and smoking. Clinical conditions such as abdominal obesity, hypertension, low HDL cholesterol (or HDL-c) seem to be defining the onset of MS, but may vary depending on the ethnic group in question[17,18].

Although there is evidence of the impact of MS on health of the elderly population, there are few studies to identify the prevalence of this clinical condition in this group[7]. Given this reality, the objective of this study was to evaluate the prevalence of MS and its association with anthropometric, sociodemographic and lifestyle variables in a sample of elderly users of the Unified Health System (SUS).

METHODS

CASUISTRY

This is a cross-sectional study, conducted in Goiânia (GO), in elderly aged over 60 years. This research project is is part of a matrix project, entitled "Health Status and Anthropometric Indicators for the Assessment of Nutritional Status of Elderly Members of the Unified Health System in Goiânia (GO)". The study sample consisted of 418 elderly of both genders. Further details about the methodological procedures employed in the sampling process are described in a previous publication[19]. Seniors who have undergone care in primary health care units in the twelve months prior to sample selection were included. Individuals unable to walk were excluded.

A subsample of 133 elderly without losses or refusals, was selected by random draw, which was enough to investigate factors associated with MS in this population. For this estimate, a confidence level of 95%, power of 80%, prevalence ratio of 2 and MS prevalence of 43% were considered among those exposed[9].

Data collection took place during July and August 2009, in a private clinic, by trained nutritionists, who collected anthropometric data and information on sociodemographic and lifestyle variables. Blood collection was performed by a laboratory technician hired at the same location. Densitometry of the whole body was also performed by dual energy x-ray absorptiometry (DEXA) by the clinical radiologist. To give greater accuracy to

anthropometric measures, standardizations were performed according to the technique described by Habicht[20]. For adequacy of other information, a pilot study was conducted.

ANTHROPOMETRIC EVALUATION AND BODY COMPOSITION

Anthropometric measurements (weight, height and waist circumference) were performed in duplicate, according to the protocol of Lohman, Roche and Martorell[21]. The weight (in kilograms) was obtained in a portable digital Tanita® scale, Model 080W, with a capacity for up to 150 kg and 100 g precision. The height (in meters) was measured using an inelastic tape with 0.1 cm precision, mounted on a wall without baseboard, 50 cm from the soil, and with the aid of a frame of wood. Subsequently, the Body Mass Index (BMI = kg/m^2) was calculated. Subjects were classified according to their nutritional status, using the cutoff points recommended by Lipschitz[22]: $< 22\ kg/m^2$ (low weight); ≥ 22 e $\leq 27\ kg/m^2$ (normal weight); $> 27\ kg/m^2$ (overweight). Waist circumference (WC) was measured at the midpoint between the iliac crest and the lower costal margin at the time of expiration, using inelastic tape with 0.1 cm precision. It was considered increased when the result was ≥ 88 cm for women and ≥ 102 cm for men, as recommended by the NCEP ATP III[8].

To determine body fat, the whole body densitometry by dual energy X-ray absorptiometry (DEXA), considered the gold standard for this type of evaluation. The examination was performed by technicians trained in the hired clinic. The model used was DPX-MD PLUS, Lunar®, and standard procedures were adopted for the positioning of the individuals during the exam[23]. The images obtained were analyzed using the specific software for version 7.52.002 DPX-L®. The fat percentage was classified as increased when it was as above the 90th percentile of the reference standard proposed by Kyle et al.[24].

BIOCHEMICAL DETERMINATIONS

In biochemical evaluation, factors measured were fasting glucose, high density lipoprotein (or HDL) cholesterol and triglycerides by enzymatic method, using the equipment Selectra 2® and Doles® reagent.

DETERMINATION OF ARTERIAL PRESSURE

Blood pressure was measured using the semiautomatic equipment OMRON HEM-705 CP®, according to standardized procedures[25]. Two measurements were performed, with a minimum difference of five minutes between them. Blood pressure levels were considered abnormal when the average of the two measurements was ≥ 130/85 mmHg and/or when there was use of antihypertensive medications.

SOCIODEMOGRAPHIC AND LIFESTYLE VARIABLES

Through a questionnaire, the following variables were investigated: gender, age, marital status, schooling, per capita income, skin color, physical activity, food intake, smoking and alcohol consumption. Smokers were defined as those who smoked or had stopped smoking less than six months from the time of the interview. The consumption of alcoholic beverages was assessed by questions on consumption (yes/no), type of beverage, frequency and amount (dose, bottles, glasses or cups) consumed during the week preceding the interview. The amounts were converted to grams of ethanol per day, according to Franco[26]. Risk alcohol consumption was evaluated as follows: for men, > 30 g ethanol/day and for women, > 15 g ethanol/day[25].

For physical activity, the short version of the International Physical Questionnaire (IPAQ), validated for the Brazilian elderly population, was used[27]. The questions concerned the frequency (days/week) and time (minutes/day) spent in walks and activities involving physical effort in the previous week. Initially, the elderly were classified as very active, active, irregularly active, irregularly active A and B and sedentary, according to Matsudo et al.[28]. For analysis, the elderly were classified as active by the sum of the first four categories, and sedentary by the sum of the last two.

Food intake was assessed by means of a Food frequency Questionnaire (FFQ) adapted from Block et al.[29], which aimed to assess the intake of protective and risk foods for MS. The FFQ, which contained 36 items (foods or food groups), was evaluated in the following categories: sources of fat (burgers, meat with visible fat, fried chicken, offal, sausages, bacon, snacks, fries, whole milk, yellow cheese and cream cheese); Fruits and Vegetables (FV) (fruits, vegetable A and vegetable B); sweets (ice cream, chocolates, homemade pastries, cakes and soft drinks); lean dairy products (skim milk and white cheese), whole dairy products (whole milk, yellow cheese and cream cheese); legumes (bean and soybean).

Foods were classified into nine categories of frequency of consumption, according to the methodology described by Fornés et al.[30]. So that the consumption frequency of each food over the past year could be treated as a quantitative variable, a weight (S_f) was assigned for each category of consumption frequency (f_i) based on annual consumption. The maximum weight value was defined as ($S_7 = 3$) for foods consumed three or more times/day. The other weights were obtained according to the equation: $S_n = (1/365)[(a + b)/2]$, with a and b being the number of days of the frequency. The analysis of food consumption was performed according to tertiles of consumption.

METABOLIC SYNDROME

The dependent variable was the MS. We considered the presence of MS when the individual presented at least three of the following: systolic blood pressure ≥ 130 or diastolic blood pressure ≥ 85 mmHg or use of antihypertensive medication; fasting glucose

≥ 100 mg/dL or use of hypoglycemic; triglycerides ≥ 150 mg/dL or use of fibrate and/or nicotinic acid; HDL cholesterol < 40 mg/dL for men and < 50 mg/dL for women and/or use of fibrates and nicotinic acid; and increased WC. For the latter, the cutoff points considered were ≥ 88 cm for women and ≥ 102 cm for men[8].

STATISTICAL ANALYSIS

Statistical analysis was performed using Stata® 8.0 software (Stata Corporation College Station, USA). Continuous variables were described as means and standard deviations. Categorical variables were described using absolute and relative frequencies, studying the prevalence and confidence interval with significance level of 5%. Analysis of association between the independent variables and the outcome variable (presence or absence of MS) was performed using the chi-square and Fisher's, Student's *t* and Mann-Whitney tests. Poisson regression analysis was conducted according to a hierarchical model for the control of confounding factors. The variables that, in the bivariate analysis, were significantly lower than 20% ($p < 0.20$) were included in the regression. A p-value < 0.05 was used as criteria for permanence in the model.

ETHICAL ASPECTS

The study was approved by the Research Ethics Committee of Universidade Federal de Goiás (UFG) and all participants signed a free and informed consent form.

RESULTS

A total of 133 elderly patients were studied, 81 women and 52 men. The mean age was 70.2 ± 6.6 years, mean BMI was 26.7 ± 5.2 kg/m² and median per capita income was BRL 465.00, with no difference between genders.

The clinical characteristics of the study population can be seen in Table 1. There was no statistically significant difference between men and women regarding age, BMI and components of metabolic syndrome, with the exception of HDL-C, which was lower among men.

The overall prevalence of MS was 58.65% (95%CI 49.8 – 67.1); for men, 55.7% (95%CI 41.3 – 69.5) and for women, 60.5% (95%CI 49.1 – 71.2), with no significant difference between genders ($p = 0.589$). Regarding the components of MS, it was found that, for men, systemic hypertension was the most prevalent (80.8%; 95%CI 64.5 – 90.4), followed by decreased HDL-c (65.4%; 95%CI 50.9 – 78.0); hypertriglyceridemia (46.2%; 95%CI 32.2 – 60.5), hyperglycemia (46.2%; 95%CI 32.2 – 60.5) and central obesity (37.2%; 95%CI 24.1 – 51.9). For women, hypertension

Table 1. Clinical Characteristics of study population according to gender, Goiania, GO, 2009.

Characteristics	Males (n = 52) Mean ± SD	Females (n = 81) Mean ± SD	p-value
BMI (kg/m^2)	27.3 ± 5.2	26.3 ± 5.2	0.288*
Waist circumference (cm)	95.7 ± 11.5	92.4 ± 14.9	0. 051†
Systolic Blood Pressure (mmHg)	133.1 ± 18.01	137.2 ± 21.6	0.261*
Diastolic Blood Pressure (mmHg)	76.9 ± 11.8	76.8 ± 11.5	0.975 *
Glycemia (mg/dL)	116.7 ± 60.6	107.7 ± 39.2	0.299†
HDL Cholesterol (mg/dL)	39.8 ± 9.6	48.9 ± 12.6	< 0.001†
Triglycerides (mg/dL)	153.4 ± 83.3	164.6 ± 86.6	0.433†

*Student's *t* Test; †Mann Whitney's Test.

was also the most prevalent component (85.2%; 95%CI 75.5 – 92.1), followed by central obesity (60.5%; 95%CI 49.0 – 71.2), hypertriglyceridemia (51.8%; 95%CI 40.5 – 63.1), decreased HDL-C and hyperglycemia (38.3%; 95%CI 27.7 – 49.7).

Table 2 shows that the variables gender, age, ethnicity, marital status, schooling, income, smoking, alcohol consumption and physical activity were not associated with the presence of MS. However, overweight (82.7%) and high percentage of total body fat (74.3%) were factors statistically associated with MS.

Regarding food consumption, none of the food groups analyzed showed association with MS (Table 3).

The variables included in the multiple Poisson regression were: income tertiles (1st level); overweight; increased percentage of fat; intake of FV, lean dairy and legumes (2nd level). After performing the regression, according to the hierarchical model for the control of confounding factors, only overweight ($p < 0.001$) remained associated with MS (Table 4).

DISCUSSION

The prevalence of MS found in this sample of elderly users of the primary care network of SUS was high. This is a particular concern, especially the association of MS with chronic diseases, increased morbidity and mortality and impact on the health system, since SUS is responsible for 70% of spending on care of the elderly in our population[31]. Moreover, about one third of the expenses of hospitalization with elderly are intended to treat diseases such as heart failure, cerebrovascular diseases and ischemic heart diseases[32], which are likely related to the complications inherent to MS.

Regarding the components of metabolic syndrome, hypertension showed the highest prevalence (83.5%), and that value exceeded that observed in the elderly population in other studies[15,33]. However, there was a similarity with the results of the study in elderly from Novo-Hamburgo (RS), with a prevalence of 84%[15], and with the study conducted in elderly Italians, whose prevalence of systemic hypertension was 85.4%[11]. This data is really

Table 2. Sample distribution and prevalence of Metabolic Syndrome in elderly users of the Unified Health System, according to sociodemographic and lifestyle variables and anthropometric data, Goiania, GO, 2009.

Variables	Sample distribution n (%)	Metabolic syndrome n (%)	p-value*
Gender			0.589
Male	52 (39.1)	29 (55.8)	
Female	81 (60.9)	49 (60.5)	
Age (years)			0.385
60 – 69	69 (51.9)	38 (55.1)	
≥ 70	64 (48.1)	40 (62.5)	
Skin color			0.751
White	68 (51.1)	42 (61.8)	
Brown	52 (39.1)	29 (55.8)	
Black	13 (9.8)	07 (53.8)	
Marital status			0.204
Lives with partner	76 (52.1)	41 (53.9)	
Does not live with partner	57 (42.9)	37 (64.9)	
Schooling (years)			0.806
Did not study	33 (26.8)	14 (57.6)	
1 to 4	45 (36.6)	28 (62.2)	
5 to 8	30 (24.4)	16 (53.3)	
≥ 9	15 (12.2)	10 (66.7)	
Income			
1st tertile†	44 (33.8)	25 (56.82)	
2nd tertile†	43 (33.1)	22 (51.16)	
3rd tertile†	43 (33.1)	30 (69.77)	
Risk alcoholic consumption			0.613
Yes	09 (6.7)	06 (66.7)	
No	124 (93.2)	72 (58.1)	
Smoking			0.381**
Non-smoker	65 (48.9)	42 (64.6)	
Smoker	14 (10.5)	07 (50.0)	
Former smoker	54 (40.6)	29 (53.7)	
Sedentary lifestyle			0.879
No	57 (42.86)	33 (57.89)	
Yes	76 (57.14)	45 (59.21)	
Overweight			<0.001
No***	75 (56.4)	30 (40.0)	
Yes	58 (43.6)	48 (82.7)	
% of fat			<0.001
Normal	59 (44.36)	23 (38.98)	
High	74 (55.64)	55 (74.32)	

*Pearson's χ^2 test; **Fisher's exact test; ***Underweight and normal weight individuals were grouped as not overweight according to BMI; † 1st tertile (0.82% of MS); 2nd tertile (0.83% of the MS; 1.01% of MS) and 3rd tertile (1.02% of MS; 7.5% of the MS).

Table 3. Sample distribution and prevalence of Metabolic Syndrome in elderly users of the Unified Health System, according to food consumption, Goiânia, GO, 2009.

Variables	Sample distribution n (%)	Metabolic syndrome n (%)	p-value*
Sources of fat			0.360
1st tertile (1.58†)	45 (33.83)	28 (62.22)	
2nd tertile (2.97†)	44 (33.08)	22 (50.00)	
3rd tertile (5.41†)	44(33.08)	28 (63.64)	
FV			0.050
1st tertile (1.31†)	45 (33.83)	20 (44.44)	
2nd tertile (2.73†)	46 (34.59)	29 (63.04)	
3rd tertile (4.82†)	42 (31.58)	29 (69.05)	
Sweets			0.225
1st tertile (0.50†)	50 (37.59)	34 (68.00)	
2nd tertile (1.80†)	39 (29.32)	20 (51.28)	
3rd tertile (3.28†)	44 (33.08)	24 (54.55)	
Lean dairy			0.091
1st tertile (0.03†)	47 (35.34)	26 (55.32)	
2nd tertile (0.38†)	46 (34.59)	23 (50.00)	
3rd tertile (1.73†)	40 (30.08)	29 (72.50)	
Legumes			0.168
1st tertile (0.78)	56 (42.11)	34 (60.71)	
2nd tertile (1.94)	69 (51.88)	37 (53.62)	
3rd tertile (2.24)	08 (6.02)	07 (87.50)	

*Pearson's χ^2 test; †Average number of portions consumed in each tertile; FV: fruits and vegetables.

Table 4. Prevalence ratio hierarchically adjusted for Metabolic Syndrome in the elderly, according to NCEP ATP III, Goiânia, GO, 2009.

Variables	Crude PR (95%CI)	p-value*	Adjusted PR (95%CI)	p-value*
Overweight				
No	1.00		1.00	
Yes	2.07 (1.53 – 2.80)	< 0.01	1.66 (1.15 – 2.41)	< 0.01
% of fat				
Normal	1.00		1.00	
High	1.90 (1.35 – 2.70)	< 0.01	1.23 (0.82 – 1.84)	0.321
FV				
1st tertile	1.00		1.00	
2nd tertile	1.42 (0.95 – 2.11)	0.084	1.20 (0.82 – 1.75)	0.337
3rd tertile	1.55 (1.05 – 2.28)	0.025	1.33 (0.90 – 1.95)	0.151
Lean dairy				
1st tertile	1.00		1.00	
2nd tertile	0.90 (0.61 – 1.33)	0.610	0.89 (0.63 – 1.26)	0.507
3rd tertile	1.31 (0.95 – 1.81)	0.099	1.26 (0.90 – 1.75)	0.172
Legumes				
1st tertile	1.00		1.00	
2nd tertile	0.88 (0.65 – 1.20)	0.425	0.85 (0.63 – 1.16)	0.309
3rd tertile	1.44 (1.03 – 2.02)	0.034	0.95 (0.60 – 1.50)	0.819

*Poisson regression; all values adjusted for per capita income tertiles; NCEP- ATP III: National Cholesterol Education Program – Adult Treatment Panel III; PR: prevalence ratio; FV: fruits and vegetables.

noteworthy since SH seems to have more profound impacts on the health of the elderly. A cohort study with 1,032 elderly Finnish in a 20-year follow-up found that hypertension was the strongest predictor of congestive heart failure among all components of MS alone[34].

A wide variation in the prevalence of MS among elderly can be found in the literature, probably because of the profile of the population studied and the criteria used[15]. In the American population-based study NHANES III, conducted between 1988 and 1994, a prevalence of 43.5% was found in the 60-69 years old age group, and 42% for seniors over 69 years old, with no statistically significant difference between the genders[9]. Although this information is outdated, the current situation would probably surpass the results of this study, especially with the increasing trend in the prevalence of each component of MS alone. In a population-based cohort in Italy, a prevalence of MS of 27.2% was found, also among elderly aged 65 or above[11]. In a cross-sectional study conducted in Turkey, the prevalence of MS was 61.7%[35]. In Brazil, in a population-based study of elderly (≥ 60 years) held in New-Hamburg (RS), the rate of MS was 53.4%[15]. Some Brazilian studies present conflicting prevalence data. In Londrina (PR), in a study that assessed geriatric outpatients, the prevalence of MS was 39.9%[36], and in elderly enrolled in the Family Health Strategy of Viçosa (MG), it was 30.9%[13]. Although all the above studies have used the same diagnostic criteria, NCEP ATP III[8], the prevalence ranged from 27.2 to 53.4%

There was no association between income and MS, probably due to the similarity of the sample, since all subjects were users of primary care network of SUS. Another possibility is that income is not a variable that affects the distribution of MS, given its high prevalence in the elderly population of all income levels. The other sociodemographic variables (age, skin color, gender, marital status and educational level) were not associated with MS, as well as in other studies[32,34]. Lifestyle variables (alcohol consumption, smoking and physical activity) were not associated with MS, as well as in studies by Franco et al.[37] and Freire et al.[38].

In the present study sample, overweight was associated with MS ($p < 0.01$) with 1.66 times higher prevalence in this group compared to individuals without excess weight, data consistent with Franco et al.[37] and Velasquez-Melendez et al.[39]. This result deserves attention since obesity has a major impact on cardiovascular morbidity in the elderly and represents over 40% of the deaths recorded recently in Brazil[40]. The association between metabolic syndrome and overweight assessed by BMI could be explained by the fact that although BMI is not specific to predict central obesity, it may reflect the ectopic fat deposition in skeletal muscle, which could increase the resistance to insulin, subsequently limiting its secretion[41].

The increased percentage of body fat was not associated with MS in the multivariate analysis. These findings demonstrate that excess weight determined by BMI may better reflect the metabolic alterations associated with MS in the elderly than body fat. Questions concerning changes in body composition of the elderly, the redistribution of body fat, the cutoff points for assessing BMI and to fat percentage itself are still controversial and need further studies to validate the new criteria of BMI in diagnosing obesity in elderly[42]. No other studies that evaluated the percentage of total body fat in the elderly and its association with MS were found, which makes it even more difficult to elucidate this question.

No association was observed between dietary intake and MS. The cross-sectional design of this study does not allow the identification of the precedence in time between exposure and outcome. Another aspect to be considered relates to the techniques of study of the food consumption frequency, which, despite its wide use, can be considered limited by their lack of quantitative accuracy[43]. On the other hand, the use of consumption tertiles favored the analysis of the average consumed portions.

CONCLUSION

It can be concluded that a high prevalence of MS was found in this sample of elderly users of SUS without association with sociodemographic and lifestyle variables. MS was only associated with the nutritional status assessed by BMI. This high prevalence of MS demonstrates the need for early identification and control of risk factors for cardiovascular diseases in the primary care level in order to promote a more efficient control of MS. This justifies the need to intensify prevention strategies and full attention to the elderly, improving their nutritional status through the prevention and treatment of obesity and promotion of healthy eating.

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