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AGE AS A CARDIOVASCULAR RISK FACTOR IN PATIENTS WITH METABOLIC SYNDROME TREATED IN AN OUTPATIENT SERVICE

Macksuelle Regina Angst Guedes[1], Andréa Pereira Vicentini[2], Fabíola Lacerda Pires Soare[3]

ABSTRACT

Aim: The aim of this study was to assess age as a cardiovascular risk factor in patients with and without metabolic syndrome treated in an outpatient nutrition service. Methods: Sociodemographic, behavioral, anthropometric and clinical data, including dietary intake, were collected. Results: Participants were 56 adults aged on average 45 ± 10.9 years. Of these, 29 (51.7%) had three or more risk factors for metabolic syndrome, and the most frequent were dislypidemia (p<0.001), hypertension (p<0.001), insulin resistance/diabetes mellitus (p<0.001) and high waist circumference (107.2 ± 14.1cm). Physical inactivity was detected in 75.9% of patients with metabolic syndrome. There was a statistically significant difference regarding mean age between groups, and individuals with metabolic syndrome had higher mean age (49.6 ± 7.5 years; p<0.001). Regarding daily food intake, there was no statistically significant difference between groups. Conclusion: It was concluded that age is possibly a major factor for the development of metabolic syndrome. Thus, appropriate nutrition intervention in the younger population is needed to prevent the progress of metabolic syndrome over time caused by increasing obesity and its several metabolic disorders that cultminate in metabolic syndrome.

Key words: Aging. Obesity. Metabolic disorders.

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RESUMO

Idade como um fator de risco em pacientes com síndrome metabólica tratados em um serviço ambulatorial

Objetivo: O objetivo foi avaliar a idade como fator de risco cardiovascular em pacientes com e sem síndrome metabólica em atendimento ambulatorial da nutrição. Métodos: Foram coletados dados sociodemográficos, comportamentais, antropométricos e clínicos, além do consumo alimentar. Resultados: Foram avaliados 56 adultos, com média de 45 ± 10,9 anos. Destes, 29 (51,7%) apresentaram três ou mais fatores para a síndrome metabólica, dos quais os mais frequentes foram a dislipidemia (p<0,001), hipertensão arterial (p<0,001), resistência à insulina/diabetes mellitus (p<0,001) e circunferência da cintura elevada (107,2 ± 14,1cm). A inatividade física esteve presente em 75,9% dos pacientes com síndrome metabólica. A média de idade entre os grupos apresentou diferença significativa, sendo que os indivíduos com síndrome metabólica apresentaram uma média de idade maior (49,6 ± 7,5 anos; p<0,001). Quanto ao consumo alimentar diário, os grupos não diferiram estatisticamente. Conclusão: Conclui-se que possivelmente a idade se apresenta como um fator preponderante para o desenvolvimento da síndrome metabólica. Dessa forma, é necessário realizar a intervenção adequada na população mais jovem para evitar que esta evolua, no decorrer do tempo, como agravamento da obesidade e seus diversos transtornos metabólicos, que culminam na síndrome metabólica.

Palavras-chave: Envelhecimento. Obesidade. Transtornos metabólicos.

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INTRODUCTION

Obesity is a public health problem and a major risk factor for cardiovascular disorders (CVD). According to data from the World Health Organization, more than 600 million adults in the world are obese (WHO, 2015).

In Brazil, the prevalence of obesity reaches 17.9% of the population, with no difference of prevalence between men and women (Brasil, 2015).

Such rates draw attention to the complexity of the disease, because associated to other risk factors such as hypertension (SAH), insulin resistance/diabetes mellitus (DM) and dyslipidemia, this condition composes the metabolic syndrome (MS) and worsens health status (SBC, 2005).

Metabolic syndrome is mainly characterized by central adiposity and insulin resistance. It consists of the combination of at least three of the following components: abdominal obesity, hypertriglyceridemia, low high density lipoprotein (HDL cholesterol), hypertension and fasting hyperglycemia (IDF, 2006; Lopez-Jaramillo and et al., 2014).

Thus, it could be inferred that several factors may favor the development of obesity and its metabolic disorders among adults in all age groups, and thus, several proposals have been elaborated with the purpose of identifying factors that contribute to this condition.

Obviously, increased calorie intake, especially in the form of carbohydrates and fats, is correlated with the increase in the number of patients with MS. Thus, these individuals should be encouraged to improve their nutrition, which would contribute to the prevention of metabolic disorders (SBC, 2005).

According to some studies, obesity should be treated as a disease, even if the patient does not present any comorbidity. It is not possible to determine how long this condition remains stable (Hinnounho and cols., 2013) due to the presence of other MS components, such as inflammatory markers, which cannot be detected in traditional tests (Hamer and Stamatakis, 2012).

In addition, one non-modifiable factor, age, can aggravate the condition and cause MS, because aging is extremely relevant in individuals exposed to unhealthy lifestyle (Coelho and Burini, 2009; Hamer and Stamatakis, 2012).

The present study aimed to assess age as a cardiovascular risk factor in patients with and without metabolic syndrome treated in a nutrition outpatient service, and the food components involved in the development of this disorder.

MATERIALS AND METHODS

A descriptive cross-sectional study was performed in an outpatient nutrition service (specialized in metabolic syndrome) at the Hospital Universitário da Grande Dourados, Dourados-MS. Data were collected from July 2013 to October 2014. The study was approved by the Research Ethics Research Committee of the Universidade Federal da Grande Dourados (under protocol number. 326.012/2013), according to Resolution 466, of December 12, 2012 of the Health Council, Ministry of Health.

Study site and sample characterization

All participants signed the Free Informed Consent in case of agreement. All patients assisted in the service in the referred period aged 20-59 years were invited to participate in the study. Indigenous people, pregnant women, lactating women, psychiatric and neurological patients unable to orally communicate were excluded from the study.

During the study period, 92 patients were assisted in the outpatient nutrition service, and 56 of them were considered eligible to participate in the study. There were different reasons for non-participation, and the most common was noncompliance with inclusion criteria (particularly age and ethnicity). Only one patient refused to participate. However, all patients had wide and indiscriminate access to assistance in the service, regardless of whether or not they participated in the study.

Data collection and instruments used

Sociodemographic, economic and behavioral data (gender, ethnicity, income, education, level of physical activity, smoking and drinking), as well as anthropometric (weight, height, waist circumference - WC, body composition) and clinical data (diagnosis of insulin resistance/DM, SAH, dyslipidemia)

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were collected. Food intake was assessed using the 24-hour dietary recall - R24h.

The proposal of the International Diabetes Federation (IDF, 2006) was considered in the MS diagnosis. It considers association of high waist circumference according to ethnic patterns and sex with two or more risk factors such as: elevated fasting blood glucose or previous type 2 DM; elevation of pressure levels or SBP under treatment and previously diagnosed; atherogenic dyslipidemia, with increased serum triglyceride levels and/ or reduced high-density lipoprotein levels.

Weight was calculated in a previously calibrated 200-kg mechanical scale Toledo®, the scale was previously turned on and the patient was positioned at its center wearing light clothing, barefoot, with feet together and arms along the body, waiting for the stabilization of the display and recording the value (Brasil, 2011), and for measuring height a tape was fixed on a wall without baseboard, maximum height 200 cm 0.5 cm interval, the patient was positioned barefoot, with head free of adornments and positioned at the center of the equipment, erect and with arms along the body with legs parallel and head positioned in the Frankfurt plane, the height was checked and recorded (Brasil, 2011).

Body mass index (BMI) was calculated according to WHO's recommendation (WHO, 2000) for nutritional status assessment. The following cutoff points were used for BMI classification (kg/m²): 25 to 29.9 - overweight, 30 to 34.9 - grade I obesity, 35 to 39.9 grade II obesity and ≥40 grade III obesity (WHO, 2000).

WC was measured considered the midpoint between the last rib and the iliac crest, and the last reading occurred during expiration (WHO, 2000). The following cutoff points were considered: high ≥94 cm for men and ≥80 cm for women; very high ≥102 cm for men and ≥88 cm for women (WHO, 2000).

Body composition was measured using bioelectrical impedance analysis (BIA) Biodynamics BIA 450®, according to appropriate recommendations: fasting for at least 4 hours (except for patients taking insulin); do not drink alcohol 48 hours before tests; do not ingest stimulant drinks like coke, coffee, tea; do not perform intense physical activity 24 hours before tests; urinate 30 minutes before tests; do not smoking before examination; remove all metals that are in contact with the body (jewelry) (Cômodo and cols., 2009).

The following body fat percent classification was adopted: risk of diseases associated to obesity ≥25 in men and ≥32 in women (Lohman, Roche and Martoreli, 1991).

The level of physical activity of individuals was assessed using the level of physical activity indicator (NAF), which ranks into sedentary (domestic activities without major efforts, day-to-day activities, sitting for several hours), light (walking at a speed of 6.4 km / h, in addition to the same activities related to sedentary NAF), moderate (aerobic, running, swimming, playing tennis, besides the same activities related to sedentary NAF) and intense (moderate intensity cycling, running, skipping rope, playing tennis, in addition to activities related to sedentary NAF), expressed by the ratio of basal metabolic rate and 24 hour-energy expenditure. The reference of the Institute of Medicine Food and Nutrition Board (Trumbo and cols., 2002) was used in the classification.

Information on, consumption of alcoholic beverages (yes or no) and use of tobacco (ex-smoker, smoker, non-smoker), regardless the amount, was asked in the study. Clinical diagnosis for insulin resistance/DM, hypertension and dyslipidemia was obtained from patients' records or referred by them.

The 24-hour dietary recall - R24h was used to assess the daily dietary intake of patients only once. Total caloric intake, calories per kg of body weight, macronutrients, total cholesterol (mg), fibers (g) and number of portions consumed were analyzed, and the Estimated Average Requirements (EAR) values were used to compare recommended intake and patients' intake. In the absence of this parameter, the Recommended Dietary Allowances (RDA) value was used. Regarding the classification of the size of food portions, the Brazilian Eating Pyramid was used as reference (Philippi and cols., 1999).

Data analysis

For nutrient calculation, Avanutri® software (version 4.5.111) was used. Jandel Sigma Statistical® software (version 2.0, English, 1995) was used in statistical analysis. Categorical data in percentage were analyzed by Chi-square or Fisher's Exact tests. The

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continuous variables described as averages and standard deviations were analyzed by Student-t-test or Mann-Whitney test. The significance level was fixed at α=5%.

RESULTS

Sociodemographic data

In the present study, 56 patients: 42 (75%) women and 14 (25%) men were assessed. The ages of patients ranged from 20 to 59 years, with average of 45 ± 10.9 years. Of these patients, 29 (51.8%) had three or more factors that predisposed to MS, and the most frequent were dyslipidemia, hypertension, insulin resistance/DM and high WC. Also, 27 patients (48.2%) were classified as not affected by MS.

In Table 1, sociodemographic and economic indexes are arranged and distributed according to the presence of MS. It could be observed that the group of patients with MS has significantly higher mean age compared to the group of patients without MS (49.6 ± 7.5 years; p=0.001). Most patients were white (67.9%), had completed primary education (50%), income >1 and ≤2 minimum wages (33.9%) and were married or lived with a partner (57.1%).

Anthropometric assessment, lifestyle and clinical data

Regarding the anthropometric assessment, although there was no statistically significant difference, the group with MS had average weight and WC measures higher than the group without MS (93.8 ± 21.3 kg and 107.2 ± 14.1 cm, respectively). Regarding nutritional status, of the total number of patients assessed, 75% were obese. Another important aspect concerns the high prevalence of physical inactivity observed in patients with MS (75.9%) (Table 2).

Table 1 - Sociodemographic indicator of patients assisted at the Ambulatório de Síndrome Metabólica of Hospital Universitário, 2014.

Variables	Total	Metabolic Syndrome		p
	n=56	Yes n=29	No n=27	
Gender	**n (%)**	**n (%)**	**n (%)**	
Female	42 (75)	20 (69)	22 (81.5)	0.440
Male	14 (25)	9 (31)	5 (18.5)	
Age (years)	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	
	45 ± 10.9	49.6 ± 7.5	40.7 ± 11.8	0.001
Ethnicity	**n (%)**	**n (%)**	**n (%)**	
White	38 (67.9)	20 (69)	18 (66.7)	
Brownish	15 (26.8)	8 (27.6)	7 (25.9)	0.801
Black	3 (5.4)	1 (3.4)	2 (7.4)	
Education	**n (%)**	**n (%)**	**n (%)**	
Illiterate	2 (3.6)	2 (6.9)	0	
Primary Education	28 (50.0)	16 (55.2)	12 (44.4)	
Secondary Education	12 (21.4)	5 (17.2)	7 (25.9)	0.373
Higher Education/ Postgraduate studies	14 (25.0)	6 (20.7)	8 (29.6)	
Income (m. w.)	**n (%)**	**n (%)**	**n (%)**	
≤ 1	6 (10.7)	3 (10.3)	3 (11.1)	
> 1 and ≤ 2	19 (33.9)	8 (27.6)	11 (40.7)	0.599
> 2 and ≤ 3	14 (25.0)	7 (24.1)	7 (25.9)	
> 3	17 (30.4)	11 (37.9)	6 (22.2)	
Marital Status	**n (%)**	**n (%)**	**n (%)**	
Single	13 (23.2)	5 (17.2)	8 (29.6)	
Married/ living with a partner	32 (57.1)	17 (58.6)	15 (55.6)	0.457
Separated/ widowed	11 (19.6)	7 (24.1)	4 (14.8)	

Legend: SD: standard deviation; m.w.: minimum wage; Significant difference: $p \leq 0.05$; Mann-Whitney test and Fisher's Exact test.

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Table 2 - Anthropometric and behavioral data of patients assisted at the *Ambulatório de Síndrome Metabólica* of Hospital Universitário, 2014.

Variables	Metabolic Syndrome			p
	Total n=56	Yes n=29	No n=27	
Anthropometry	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	
Weight (kg)	91.4 ± 19.5	93.8 ± 21.3	88.7 ± 17.3	0.330
Height (m)	1.6 ± 0.1	1.6 ± 0.1	1.5 ± 0.1	0.043
BMI (Kg/m²)	35.5 ± 7.0	35.6 ± 7.3	35.5 ± 6.7	0.924
WC (cm)	104.5 ± 14.1	107.2 ± 14.1	101.9 ± 13.8	0.157
% BFP – BIA[a]	40.3 ± 0.4	38.8 ± 6.6	41.2 ± 6.2	0.244
Classification for BMI	**n (%)**	**n (%)**	**n (%)**	
Overweight	14 (25)	6 (20.7)	8 (29.7)	0.583
Obesity	42 (75)	23 (79.3)	19 (70.3)	
Lifestyle Smoking	**n (%)**	**n (%)**	**n (%)**	
Non smoker	36 (64.3)	17 (58.6)	19 (70.4)	
Former smoker	15 (26.8)	10 (34.5)	5 (18.5)	0.385
Smoker	5 (8.9)	2 (6.9)	3 (11.1)	
Drinking				
Yes	22 (39.3)	10 (34.5)	12 (44.4)	0.625
No	34 (60.7)	19 (65.5)	15 (55.6)	
Level of physical activity				
Sedentary lifestyle	41 (73.2)	22 (75.9)	19 (70.4)	
Mild	12 (21.4)	7 (24.1)	5 (18.5)	0.175
Moderate	3 (5.4)	0	3 (11.1)	

Legend: SD: standard deviation; BMI: body mass index; WC: waist circumference; %BFP: body fat percentage; [a]Total n=42; MS n=16; without MS n=26. Significant difference: $p \leq 0.05$; Student–t-test or Mann-Whitney test; Chi-square test or Fisher's Exact test.

Table 3 - Clinical data from patients assisted at the *Ambulatório de Síndrome Metabólica* of Hospital Universitário, 2014.

Variables	Metabolic Syndrome			p
Presence of disease	Total n=56	Yes n=29	No n=27	
Diabetes *mellitus*	**n (%)**	**n (%)**	**n (%)**	
Yes	24 (42.9)	21 (72.4)	3 (11.1)	
Pre diabetic	6 (10.7)	6 (20.7)	0	0.001
No	26 (46.4)	2 (6.9)	24 (88.9)	
SAH				
Yes	40 (71.4)	27 (93.1)	13 (48.1)	0.001
No	16 (28.6)	2 (6.9)	14 (51.9)	
Dyslipidemia				
Yes	21 (37.5)	18 (62.1)	3 (11.1)	0.001
No	35 (62.5)	11 (37.9)	24 (88.9)	

Legend: Significant difference: $p \leq 0.05$; Fischer's Exact test; SAH = Systemic Arterial Hypertension.

Table 3 shows the clinical data from patients assisted in the nutrition outpatient service. Concerning the group with MS, 93.1% of patients reported being hypertensive ($p<0.001$), 72.4% diabetic ($p<0.001$) and 62.1% had dyslipidemia.

Food consumption assessment

There was no significant difference between groups for daily food intake; however, cholesterol levels were high in both groups,

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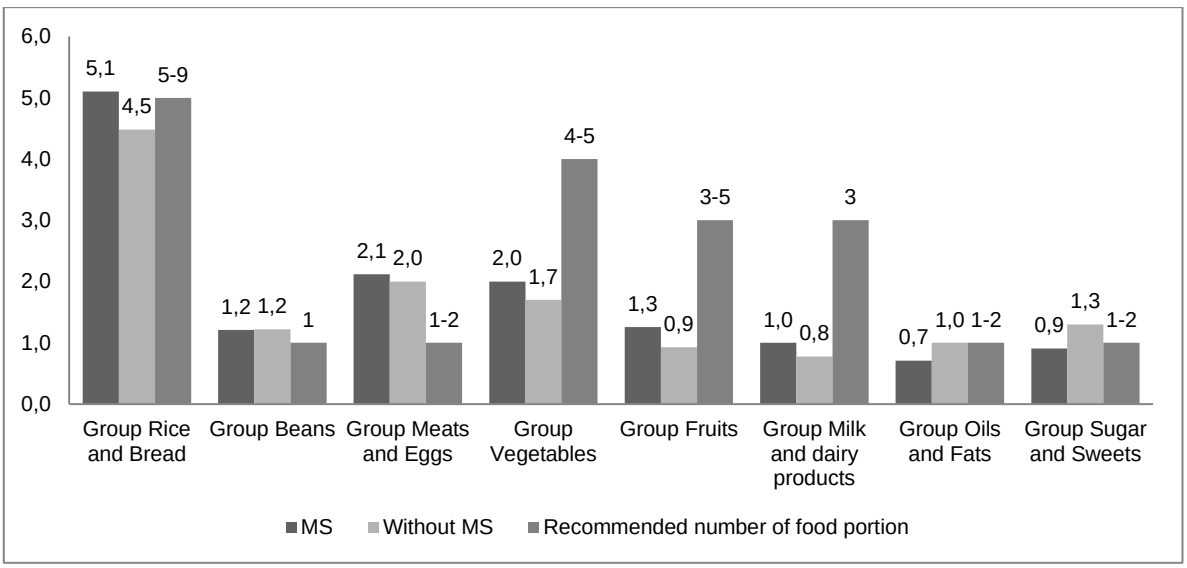
and food intake was higher among patients with MS (Table 4).

Figure 1 includes the number of portions of food groups consumed by patients. It was observed that, although insufficient, patients with MS had higher intake of vegetables, fruits and milk and dairy products; on the other hand, patients without MS had higher intake of oils/ fats and sugars/ sweets.

Table 4 - Daily dietary intake assessed by the 24-Hour Dietary Recall of patients assisted at the Ambulatório *de Síndrome Metabólica* of Hospital Universitário, 2014.

Variables	Metabolic Syndrome			p
	Total n=56	Yes n=29	No n=27	
Nutrients	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	
Total Kcal	1621.6 ± 773.5	1793.2 ± 911.1	1437.3 ± 551.1	0.085
Kcal/ weight kg	18.1 ± 8.2	19.1 ± 8.4	17.1 ± 8.1	0.362
Proteins (g)	71.2 ± 41.5	89.4 ± 48.7	61.2 ± 29.3	0.056
Proteins (g/kg weight)	0.9 ± 0.5	1 ± 0.5	0.8 ± 0.4	0.214
Carbohydrates (g)	206.7 ± 100.4	228.0 ± 114.9	183.9 ± 77.8	0.101
Carbohydrates (% TEV)	52.2 ± 12.7	52.2 ± 14.0	52.3 ± 11.6	0.969
Lipids (g)	53.1 ± 35.9	58.2 ± 44.0	47.7 ± 24.3	0.278
Lipids (% TEV)	27.9 ± 9.0	27.2 ± 9.8	28.6 ± 8.1	0.577
Total cholesterol (mg)	233.3 ± 212.0	253.2 ± 236.3	211.9 ± 184.4	0.560
Saturated Fat (g)	14.5 ± 10.8	16.5 ± 13.0	12.3 ± 7.5	0.149
Saturated Fat (% TEV)	7.8 ± 3.6	8.0 ± 3.7	7.6 ± 3.6	0.706
Monounsaturated Fat (g)	14.4 ± 11.9	16.6 ± 14.7	12 ± 7.6	0.147
Monounsaturated Fat (g) (% TEV)	7.5 ± 4.1	7.6 ± 4.4	7.4 ± 3.8	0.817
Polyunsaturated Fat (g)	7.9 ± 7.1	7.7 ± 7.5	8 ± 6.8	0.883
Polyunsaturated Fat (%TEV)	4.1 ± 2.8	3.5 ± 2.0	4.7 ± 3.3	0.228
Fibers (g)	11 ± 6.8	10.7 ± 6.6	11.2 ± 7.2	0.775

Legend: TEV: total energy value; Kcal: calories; Significant difference: p≤0.05; Student-t-test or Mann-Whitney test.



Legend: MS: metabolic syndrome. Recommended number of food portions of according to Philippi and cols. (1999).

Figure 1 - Comparison of the intake of portions of food groups among patients with and without metabolic syndrome assisted at the *Ambulatório de Síndrome Metabólica* of Hospital Universitário, 2014.

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DISCUSSION

This was the first study to evaluate age as a risk factor in patients with MS assisted in an outpatient nutrition service specialized in this disorder.

Patients with MS had higher mean age (p=0.001) than those without MS. This is corroborated by studies that have demonstrated that age is a risk factor for cardiovascular diseases and that aging combined with weight gain and other metabolic disorders aggravate the health status of patients (Cabral and cols., 2003; Lima and Sampaio, 2007; Girotto, Andrade and Cabrera, 2010).

Epidemiological studies have shown that from the age of 55 years, the risks of developing metabolic disorders associated to cardiovascular diseases double (Steffens, 2003), particularly when combined with overweight, as observed in this study, where 75% of patients were classified as obese. Obesity associate to other determinants such as SAH, insulin resistance and dyslipidemia aggravates the health status of individuals and is closely related to the development of noncommunicable chronic diseases (NCD) (Girotto, Andrade and Cabrera, 2010).

Thus, aging and age-associated diseases cause nutritional and hormonal changes in metabolism (Hafe, 2008), which may contribute to the increased incidence of several metabolic disorders.

It should be stressed that the prevalence of MS in adults ranges from 25 to 45% in Latin America (Lopez-Jaramillo and cols., 2014), and the present study has detected prevalence of 51.8%. Although this result was expected, since the outpatient nutrition service where the study was conducted treats factors that compose this syndrome, the high number of individuals affected by NCD who seek specialized care is noticeable.

The fact that the patients are overweight was expected, since this was the profile of the patients treated in this service. The group of patients with MS showed higher frequency of risk factors that contribute to the development of fatal and non-fatal cardiovascular events.

The prevalence of sedentary lifestyle observed in patients was 73.2% (total), with 75.9% of patients with MS, while the national prevalence ranges from 28.2% to 54.5% (Brasil, 2015). Associated to sedentary lifestyle, body fat accumulation, especially central obesity, is an indicator that maximizes cardiovascular risks (Carneiro and et al., 2003), and the body fat percentage in the population of this study was 40.3 ± 0.4%, which indicates high risk for the development of metabolic complications. According to clinical studies, Valmorbida and cols. (2013) reported that changes in lifestyle can be beneficial to heart, reducing triglyceride levels and blood pressure.

It is important to stress that the results were not significant for some parameters due to the low number of patients assessed, which is a limiting factor of this study.

Regarding smoking, a high number of former smokers was found in the group with MS compared with the group without MS, i.e., these individuals were concerned with the association of smoking with cardiovascular diseases. Smoking is an alarming indicator, as it is one of the most serious risk factors for cardiovascular diseases, being five times higher in individuals under 60 years of age (Erhardt, 2009). It should be stressed that the prevalence of smoking in Brazil ranges from 12.9% to 25.2% (Brasil, 2015).

Regarding the dietary habits of patients assessed in this study, cholesterol levels were high in both groups. The literature provides abundant evidence on the strong association between increased cholesterol and higher incidence of atherosclerosis (SBC, 2013).

When dietary intake was assessed by food groups among patients, the number of daily food portions was inadequate for food groups grains, fruits, vegetables; milk and dairy products; meats and eggs; fats and sweets (Philippi and et al., 1999).

Most obese individuals eat more carbohydrates not only to be satiated, but also to fight stress, anxiety, mental fatigue and depression (Bernardi, Cichelero and Vitolo, 2005). Similarly to fruits and vegetables, the group of milk and dairy products plays a key role in fighting MS, since they promote weight loss and help in the treatment of this syndrome (Wennersberg and cols., 2009; Castanho and et al., 2013). Patients treated in the outpatient nutrition service who participated in the study, both those diagnosed with MS and those not diagnosed with MS, reported low intake of

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these food groups, which did not favor the improvement of their symptoms.

When analyzing the consumption in number of food portions for the group of meats and eggs for both patients with and without MS reported intake above the recommended, opposite to the consumption of fats, a group directly associated with the consumption of proteins, mainly of animal origin (Philippi and cols., 1999). Some obese patients involuntarily fail to reveal a substantial part of their diet, and this generally occurs due to variations in food behavior (Bernardi, Cichelero and Vitolo, 2005).

Based on the aspects above, several epidemiological studies have demonstrated that inappropriate diet, such as those that increase the levels of cholesterol, lipids and saturated fatty acids, combined with low intake of fibers, increases the risks of coronary diseases and other NCD. When unsatisfactory food intake is associated to a sedentary lifestyle, the risk is maximized (Cabral and et al., 2003; Castro and cet al., 2004; Guedes and Guedes, 2001; Lopes and et al., 2005; Petribú, Cabral and Arruda 2009).

The counseling of healthier nutrition practices is a very common, ordinary method in any health service, which demonstrates their relevance, as individuals who receive this guidance are able to make more suitable choices and reduce the risks for NCD (Castanho and et al., 2013; SBC, 2005).

CONCLUSION

It was concluded that adults are subjected to the development of NCD, and advancing age is a preponderant factor. Even though there were no significant differences between groups of patients in relation to food consumption, the high intake of meats and eggs and low intake of fruits and vegetables were observed mainly by patients with MS, requiring changes in dietary habits to obtain a better quality of life.

Such findings help identifying the profile of individuals treated in outpatient nutrition services, increasing the effectiveness of nutritional treatment and changes in lifestyle, and thus ensuring therapy success. Moreover, it is necessary to implement appropriate interventions to prevent that the younger population becomes obese and affected by the various related metabolic disorders that culminate in MS.

Conflict of interest

The authors declare no conflict of interest.

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