## METABOLIC SYNDROME: IDENTIFYING RISK FACTORS IN CLIMACTERIC WOMEN

Silvan Márcio de Oliveira[1], Ronilson Ferreira Freitas[2]; Maria Suzana Marques[1]
Fernanda Paluszkiewicz Dullius[1], Vivianne Margareth Chaves Pereira Reis[2]
Marcelo Eustáquio de Siqueira e Rocha[3,4], Josiane Santos Brant Rocha[5,6]

**ABSTRACT**

Objective: To identify the association of Metabolic Syndrome (MS) and sociodemographic factors, life habits, eating habits, anthropometric measures and clinical factors of climacteric women assisted in primary care. Methods: Cross-sectional and analytical epidemiological study, with a sample composed of 874 climacteric women selected by means of a simple random sampling. The evaluation of the MS was performed according to National Cholesterol Education Program Adult Treatment Panel III. We used the statistical analysis by the chi-square test, considering p <0.05. Results: The characterization of variables related to the Metabolic Syndrome reported that most women had MS (56.8%). There were significant associations of MS with age (p= 0.004), schooling (p= 0.015), paid activity outside the home (p = 0.050), smoking (p = 0.016), salt usage in food (p= 0.021), fruit ingestion (p= 0.009) and body mass index (p=0.000). Conclusiones: It was possible to observe a high prevalence of MS in the studied population. MS was associated with sociodemographic factors, life habits, eating habits, anthropometric measures, clinical and obstetric factors.

**Key words:** Metabolic Syndrome. Climacteric. Family Health Strategy.

**RESUMO**

Síndrome metabólica: identificando fatores de risco em mulheres climatéricas

Objetivo: Identificar a associação da Síndrome Metabólica (SM) e fatores sociodemográficos, hábitos de vida, hábitos alimentares, medidas antropométricas e fatores clínicos de mulheres climatéricas atendidas na atenção básica. Métodos: Estudo epidemiológico transversal e analítico, com amostra composta por 874 mulheres climatéricas selecionadas por meio de amostragem aleatória simples. A avaliação do SM foi realizada de acordo com o National Child Prolide Education Programme Adult Treatment Panel III. Utilizou-se a análise estatística pelo teste do qui-quadrado, considerando p <0,05. Resultados: A caracterização das variáveis relacionadas à Síndrome Metabólica relatou que a maioria das mulheres apresentava SM (56,8%). Houve associações significativas da SM com a idade (p = 0,004), escolaridade (p = 0,015), atividade remunerada fora de casa (p = 0,050), tabagismo (p = 0,016), uso de sal nos alimentos (p = 0,021) ingestão (p = 0,009) e índice de massa corporal (p = 0,000). Conclusão: Foi possível observar uma alta prevalência de SM na população estudada, alimentares, medidas antropométricas, fatores clínicos e obstétricos.

**Palavras-chave:** Síndrome Metabólica. Climatério. Estratégia Saúde da Família.

1-Master's degree in Primary Health Care from the State University of Montes Claros (Unimontes), Montes Claros-MG, Brazil.
2-State University of Montes Claros (Unimontes), Montes Claros-MG, Brazil.
3-Federal University of São Paulo (UNIFESP), São Paulo-SP, Brazil.
4-Center for Biological Sciences and Health of the State University of Montes Claros (Unimontes), Montes Claros-MG, Brazil.
5-University of Brasília (UnB), Brasília-DF, Brazil.

6-Postgraduate Program in Primary Health Care at the State University of Montes Claros (Unimontes), Montes Claros-MG, Brazil.

E-mails:
josianenat@yahoo.com.br
silvan.oliveira@ig.com.br
ronnypharmacia@gmail.com
suzana.residente@yahoo.com.br
ferdullius@uol.com.br
viola.chaves@yahoo.com.br
josianenat@yahoo.com.br

## INTRODUCTION

Climateric is defined by the World Health Organization (WHO) as a woman's life phase comprising the transition between the reproductive and the non-reproductive periods, with variable duration.

At this stage, there is a decrease in fertility and, progressively, a decline in oestradiol production. It is also characterized as a physiological state of progressive hypoestrogenism, responsible for definitive cessation of menstrual cycles, ending with the advent of menopause (SOBRAC, 2013).

Studies report that the reduction of the secretion of ovarian hormones is responsible for the metabolic changes that occur in the body during this period of life, contributing to the increase in weight, visceral adiposity (Son and collaborators, 2015), lipid changes, increased insulin resistance and diabetes, increasing the risk of cardiometabolic diseases, including the Metabolic Syndrome (MS) (Polotsky and Polotsky, 2010).

MS is defined as a set of cardiovascular risk factors related to central adiposity, insulin resistance, systemic arterial hypertension, low HDL-cholesterol (HDL-c) and hypertriglyceridemia (Figueiredo Neto and collaborators, 2010).

The prevalence of this disease can be influenced by intrinsic and extrinsic factors. It is also suggested that the menopausal transition phase may be an important predictor in increasing this prevalence (Mendes and collaborators, 2013).

Although the etiology of MS is uncertain, we believe that a complex interaction occurs among genetic, environmental and metabolic factors (Fan and Say, 2013).

Thus, this study aimed to identify the association among Metabolic Syndrome and sociodemographic factors, life habits, eating habits, anthropometric measures, clinical and obstetric factors of climacteric women assisted in primary care.

## MATERIAL AND METHODS

This is an analytical epidemiological study with climacteric women who were registered in the Family Health Strategy (ESF) of Montes Claros-MG, during the period from August 2014 to July 2015.

The selection of the sample occurred in two stages. In the first stage, the strategies were selected by clusters where 73 ESFs from Montes Claros were involved - registered in the Health Department in 2014, covering the rural and urban areas.

Further, in the second stage, a simple random sampling was carried out, considering the phases of climacteric which are defined by the Brazilian Society of Climacteric in: pre-, peri- and post-menopause.

The sample size was calculated for a 95% confidence interval and a maximum acceptable difference of 5% and the error was fixed around 3%. A true prevalence of 50% of the study population was estimated, based on the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) (NCEP-ATPIII, 2001).

For each unit were selected 48 women, making a total of 960 women called. of these, 86 women were excluded, 40 of whom did not show up for data collection after three attempts and 36 were in the condition of pregnant women, puerperal women and bedridden individuals. At the end, we obtained for the study a sample of 874 women registered in ESFs.

To incorporate the structure of the complex sampling plan into the statistical analysis of the data, each interviewee was associated with a weight w, which corresponded to the inverse of their probability of inclusion in the sample (*f*) (Matsudo and collaborators, 2001).

The selected women were invited to sign the free and informed consent form for their participation. The day to attend the ESF to perform anthropometric assessments, clinical and laboratory tests was scheduled by the health agent. They were told they should be fasting for at least 12 hours.

The application of the sociodemographic questionnaire, life habits, eating habits, anthropometric measures, clinical factors and obstetric factors was performed by a trained team, composed of doctors, health academics, pharmacist and the researcher in charge.

Sociodemographic characteristics, including the following information: age (40 to 45 years old, 46-51 years old and 52-65 years old), skin color (white, brown, black and other color), education (elementary I, II, secondary

and higher), and paid work outside the home (works and does not work).

The questionnaire that evaluated the characteristics of life habits, eating habits, clinical and obstetric factors addressed the following information: Physical activity (active/irregularly active/sedentary), smoking (smokes/does not smoke); ingestion of salt in food (never puts salt/puts salt), fruit intake per week (3 to 6 times/<3 times/never), climacteric symptoms (mild/moderate/intense).

The height evaluation was performed in an anthropometric and barefoot position, with the sanny stadiometer. The result was considered at the end of the deep inspiration and the weight was measured barefoot and with the least amount of clothing possible, using the Digital Scale EKS 9800 FOCUS - 180kg. The calculation of the body mass index (BMI) was (BMI=weight/height$^2$). The results were classified according to the criteria of WHO (WHO, 2010) in adults: Adequate weight (18.5-24.9), Overweight (25.0-29.9) and Obesity (30.0 - over).

For abdominal waist measurement, the inelastic millimeter tape was used in regions and with standardized technique. Values higher than 80cm in Abdominal Circumference (AC) were classified as altered according to Molarius and collaborators (1999).

Blood pressure (BP) was measured with an aneroid sphygmomanometer positioned in the proximal region of the left upper limb above the cubital fossa. It was obtained with the patient sitting, after 5 minutes of rest. It was evaluated through the indirect method with calibrated digital sphygmometer, brand ONROM®. Two measurements were taken, the gap was of one minute, establishing the mean as defined by the Brazilian Guidelines on Hypertension (Sociedade Brasileira de Cardiologia; Sociedade Brasileira de Hipertensão; Sociedade Brasileira de Nefrologia, 2011).

The systolic blood pressure corresponds to the first arterial noises (phase I of the Korotkoff sounds) with the deflation of the cuff, and the diastolic blood pressure corresponds to its disappearance (phase V of the Korotkoff sounds).

Biochemical parameters such as fasting glycemia, fraction of high-density lipoprotein cholesterol (HDL-c) and triglycerides (TG). In this case, subjects were submitted to peripheral venous blood collection for analysis of laboratory parameters. Serum levels of TG were colorimetric enzimatic. The level of HDL-c was obtained by selective precipitation of low density lipoprotein (LDL-c) and very low density lipoprotein (VLDL-c) with dextran sulfate in the presence of $MG^{++}$ ions, followed by dosing by enzymatic cholesterol oxidase/peroxidase system with calorimetry and reading, as performed in the CT dosage, in Cobas Mira S. apparatus. The levels of LDL-c and VLDL-c were calculated using the Friedewald formula (Friedewald, Levy and Fredrickson, 1972). T

he lipid profile was analyzed according to parameters proposed by the Brazilian Society of Cardiology (Santos, 2001), and fasting glycemia according to the standards of Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (The Committee on the Diagnosis and Classification of Diabetes Mellitus, 2011).

The MS characterization considered five parameters: abdominal circumference, systemic arterial pressure, fasting glycemia, TG and HDL-c, according to NCEP-ATPIII (2001), in 2001. Which advocates the diagnosis of metabolic syndrome in the presence of at least three of the following criteria: abdominal waist (>88cm), HDL-c (<50mg/dL), TG or in treatment (≥150 mg/dL), blood pressure or in treatment (≥130/85mmHg) and fasting glycemia or in treatment (≥ 100mg/dL).

For statistical analysis, we used the statistical program *SPSS,* version 21.0. The prevalence of the outcome variable MS (presence or absence of MS) and the percentage of sociodemographic variables, life habits, eating habits, anthropometric measures, clinical and obstetric factors were first presented in the descriptive phase of the study.

Afterwards, analyzes of associations of the MS and the socio-demographic factors, life habits, eating habits, anthropometric measures, clinical and obstetric factors of climacteric women were performed through the chi-square test, using the level of significance $p < 0.05$.

This study meets the regulatory norms of research involving human beings - Resolution nº 466/12 of the National Health Council. It was approved by the Research Ethics Committee of the College Integrated Pythagoras of Montes Claros with opinion nº

817.666. Only the women who signed the Free and Informed Consent Term participated in the study.

## RESULTS

The final sample consisted of 874 women between the ages of 40 and 65. It was observed that the majority of women were in the age group between 52 and 65 years old (45.4%), belonging to brown race (64.8%). Regarding schooling, the majority had concluded Elementary school I and Elementary school II (68.2%) and they do not perform any type of paid activity outside of home (59.6%) (Table 1).

The practice of physical activity in an irregular and sedentary manner, were reported by (87.3%), were reported not to be smokers (89.8%). Regarding eating habits, most of them reported not to put salt in food (95.2%), and ate fruit 3 to 6 times a week (70.6%). Regarding the anthropometric measurements, the majority were overweight (74.1%). Climacteric symptomatology was presented by the majority (62.3%) in a mild manner.

For the obstetric factors, it was observed that the majority of the women (67.1%) had more than 3 children, and the weight of the first child was below 4000gr (84.8%) (Table 1).

**Table 1 -** Characterization of the sample according to sociodemographic factors, life habits, eating habits, anthropometric measurements and clinical and obstetric factors in climacteric women, Montes Claros-MG, 2014.

| Variables | | N | %* | Value p (x²) |
|---|---|---|---|---|
| **Sociodemographic factors** | | | | |
| Age | 40 to 45 | 236 | 27.8 | |
| | 46 to 51 | 241 | 26.8 | 0.001 |
| | 52 to 65 | 397 | 45.4 | |
| Skin color | White | 154 | 17.2 | |
| | Brown | 553 | 64.8 | |
| | Black | 112 | 12.1 | 0.001 |
| | Other | 49 | 5.9 | |
| Schooling | High or superior education | 281 | 31.8 | |
| | Elementary school II | 231 | 26.6 | 0.001 |
| | Elementary school I | 358 | 41.6 | |
| Work | Works | 347 | 40.4 | 0.001 |
| | Does not work | 520 | 59.6 | |
| **Life habits** | | | | |
| Physical Activity | Active | 114 | 12.7 | |
| | Irregurarly active | 480 | 55.7 | 0.001 |
| | Sedentary | 280 | 31.6 | |
| Smoking | Does not smoke | 739 | 89.8 | 0.001 |
| | Smokes | 80 | 10.2 | |
| **Eating habits** | | | | |
| Salt in food | Never puts salt | 781 | 95.2 | 0.001 |
| | Puts salt | 39 | 4.8 | |
| Ingestion of fruit per week | 3 to 6 times | 781 | 95.2 | |
| | < 3 times | 39 | 4.8 | 0.001 |
| | Never | 781 | 95.2 | |
| **Anthropometric Measurements** | | | | |
| BMI | Adequate weight | 228 | 25.9 | |
| | Overweight | 333 | 38.1 | 0.001 |
| | Obesity | 306 | 36.0 | |
| **Clinical factors** | | | | |
| Climacteric symptoms | Mild | 541 | 62.3 | |
| | Moderate | 246 | 27.9 | 0.001 |
| | Intense | 86 | 9.8 | |
| **Obstetric factors** | | | | |
| Pregnancy | None | 44 | 5.1 | |
| | 1 to 2 pregnancies | 240 | 27.8 | 0.001 |
| | 3 or more pregnancies | 582 | 67.1 | |
| Weight of the first child at birth | Lower than 4000g | 600 | 84.8 | 0.001 |
| | Higher than 4000g | 106 | 15.2 | |

**Legends:** * Corrected by the drawing effect *(deff)*; BMI: Body Mass Index.

**Table 2 -** Sample characterization according to the variables related to Metabolic Syndrome of the climacteric women, Montes Claros-MG, 2014.

| Metabolic Syndrome | | N | %* |
|---|---|---|---|
| Metabolic Syndrome (MS) | MS Absence | 393 | 43.2 |
| | MS Presence | 489 | 56.8 |
| AC | Normal | 139 | 15.3 |
| | Alterated | 730 | 84.7 |
| Triglycerides | Low<150 | 460 | 52.3 |
| | High>150 | 389 | 47.7 |
| HDL-c | Wanted | 160 | 18.5 |
| | Low | 694 | 81.5 |
| Glycemia | Normal | 754 | 86.6 |
| | Alterated | 115 | 13.4 |
| Hypertension | Non-hypertensive (until 120x80) | 489 | 56.2 |
| | Hypertensive (130x85) | 378 | 43.8 |

**Legends:** %*: Corrected by the drawing effect (deff); HDL-c: Lipoproteins of high density; AC: Abdominal Circumference.

**Table 3 -** Metabolic Syndrome association with the sociodemographic factors, life habits and eating habits, anthropometric measurements and clinical and obstetric factors.

| Variables | | Absence MS | | Presence MS | | P value |
|---|---|---|---|---|---|---|
| | | N | %* | n | %* | (x²) |
| **Sociodemographic factors** | | | | | | |
| Age | 40 to 45 years | 139 | 56.6 | 139 | 56.6 | |
| | 46 to 51 years | 110 | 45.2 | 110 | 45.2 | 0.000 |
| | 52 to 65 years | 136 | 33.0 | 136 | 33.0 | |
| Schooling | School (high + superior) | 154 | 53.1 | 127 | 46.9 | |
| | Elementary school II | 105 | 44.7 | 126 | 55.3 | 0.000 |
| | Elementary school I | 123 | 33.5 | 235 | 66.5 | |
| Works | Works | 173 | 48.8 | 174 | 51.2 | 0.023 |
| | Does not work | 208 | 38.6 | 312 | 61.4 | |
| **Life habits** | | | | | | |
| Physical activities | Active | 52 | 43.2 | 62 | 56.8 | |
| | Irregularly active | 205 | 41.3 | 175 | 58.7 | 0.523 |
| | Sedentary | 128 | 45.5 | 152 | 54.5 | |
| Smoking | Does not smoke | 323 | 42.7 | 416 | 57.3 | 0.016 |
| | Smokes | 36 | 42.6 | 44 | 57.4 | |
| **Eating habits** | | | | | | |
| Salt in food | Does not put salt | 334 | 41.6 | 447 | 58.4 | 0.021 |
| | Puts salt | 25 | 62.9 | 14 | 37.1 | |
| Ingestion of fruit per week | 3 to 6 times | 271 | 46.3 | 308 | 53.7 | |
| | < 3 times | 52 | 32.8 | 98 | 67.2 | 0.028 |
| | Never | 34 | 35.5 | 53 | 64.5 | |
| **Anthropometric Measurements** | | | | | | |
| BMI | Adequate weight | 152 | 67,4 | 76 | 32,6 | |
| | Overweight | 142 | 41,1 | 191 | 58,9 | 0.000 |
| | Obesity | 86 | 26,2 | 220 | 73,8 | |
| **Clinical factors** | | | | | | |
| Climacteric symptoms | Mild | 253 | 45,6 | 288 | 54,4 | |
| | Moderate | 102 | 40,2 | 144 | 59,8 | 0.070 |
| | Intense | 30 | 33,6 | 56 | 66,4 | |
| **Obstetric factors** | | | | | | |
| Pregnancy | None | 20 | 43,6 | 24 | 56,4 | |
| | 1 to 2 pregnancies | 122 | 50,7 | 118 | 49,3 | 0.031 |
| | 3 or more pregnancies | 239 | 39,4 | 343 | 60,6 | |
| Weight of the first child at birth | Lower than 4000g | 280 | 45,6 | 320 | 54,4 | 0.021 |
| | Higher than 4000g | 35 | 31,9 | 71 | 68,1 | |

**Legends:** *Corrected by the drawing effect (*deff*); MS: Metabolic Syndrome; BMI: Body Mass Index.

The variables characterization related to the metabolic syndrome reported that the majority of the women had MS (56.8%), showed alterations of the AC (84.7%) and low HDL-c (81.5%). Triglyceride levels were considered low in 52.3% of women, yet 86.6% showed normal glycemia and were considered non-hypertensive (56.2%) (Table 2).

781

**Revista Brasileira de Obesidade, Nutrição e Emagrecimento**
**ISSN 1981-9919** *versão eletrônica*

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício
**w w w . i b p e f e x . c o m . b r - w w w . r b o n e . c o m . b r**

Table 3 shows the association of MS and sociodemographic factors, life and eating habits. Significant associations of MS occur with age (p = 0.000), schooling (p = 0.000), and the exercise of a paid activity outside the home (p = 0.023). Noting that women aged 52 to 65 years old (67.0%) have lower educational level (66.5%), and did not perform paid activities (61.4%), were more predisposed to the event of MS.

For life habits, the smoking variable was significantly associated to MS (p = 0.016), showing that women who smoke are more prone to develop MS. Regarding eating habits, the associations were significant with the use of salt in food (p = 0.021), and fruit ingestion (p = 0.028). Observing that women who do not put salt in food (58.4%) and eat fruit < 3 times a week (67.2%), showed more possibilities to develop MS (Table 3).

Significant associations were presented of MS and BMI (p = 0.000). It is possible that obesity (73.8%) is associated with the involvement of this pathology.

For climacteric symptomatology, although it was not significant, it was possible to show that women with intense symptoms (66.4%) had MS (Table 3).

Regarding the obstetric factors, the associations were significant, both for the variable pregnancy (p = 0.031) and first born weight (p = 0.021). This shows that women with more than 3 children (60.6%) and children born with more than 4000gr (68.1%) are more likely to develop MS (Table 3).

**DISCUSSION**

The climacteric period is associated with the appearance of metabolic abnormalities, which may increase the risk of triggering chronic diseases (Udo and collaborators, 2014).

Genetic, dietary, physical activity, age, sex, and lifestyle differences influence the prevalence of MS and its components (Figueiredo Neto and collaborators, 2010).

In this sense, this study aimed to identify the association of Metabolic Syndrome and sociodemographic factors, life habits, eating habits, anthropometric measures, clinical and obstetric factors of climacteric women.

After analyzing the data, it was possible to verify that the prevalence of metabolic syndrome in these women was high, facing the results of studies carried out with similar populations (Gallego and collaborators, 2015; Politano and collaborators, 2015).

In this study, high proportions of abdominal obesity and low levels of HDL-c, abnormalities that were present, were found in the most frequent combinations of three or more components of MS, which may justify the high prevalence of syndrome in the analyzed women.

Similar results to those were found by Figueiredo Neto and collaborators (2010), in which they observed a higher prevalence of abdominal obesity and low HDL-c in climacteric women who were also analyzed.

Still in this context, Gravena and collaborators (2013) evaluated 456 postmenopausal women pointing to central obesity prevalence of what confirms the profile of this study sample.

In the climacteric period, there is a tendency to increase adipose tissue in the abdominal region, due to hypoestrogenism that modifies the metabolic profile, favoring this pattern of body distribution, which is considered as an important risk factor for cardiovascular diseases, diabetes, dyslipidemias and metabolic syndrome (Gravena and collaborators, 2013).

Regarding the anthropometric marker BMI, the results point to attention, since there was a high prevalence of overweight and obesity in the evaluated women and, according to Figueiredo Neto and collaborators (2010), the BMI and AC are frequent components of MS in climacteric. In addition to this finding, a study developed with Chinese women showed that the combination of AC and BMI was associated with an increased risk of hypertension, diabetes and dyslipidemia, when compared to the unit use of these measures (Hou and collaborators, 2013).

In this sense, it is important to highlight that these findings can serve as an alert, since climacteric women are considered a vulnerable population for the development of future morbidities, becoming an important target for the development of educational programs in primary care.

When associated MS to age, it was possible to observe that older women have a higher possibility of developing this pathology.

Studies carried out by Figueiredo Neto and collaborators (2010) and Salaroli and

collaborators (2007) also described a more pronounced prevalence of MS in women in the same age group, suggesting that the greater the age, the greater the risk of developing cardiovascular diseases, namely MS.

This can occur because as advent of aging occurs a decrease in basal metabolic rate, causing a lower energy expenditure and predisposition to global and abdominal obesity (Salaroli and collaborators, 2007), that, among other factors, have a main role in the physiopathology of MS.

Regarding variables, schooling and the exercise of paid activities, these had associations to MS, observing that extrinsic factors may influence the affection of this pathology.

Pimenta and collaborators (2011) describes that less study time and idleness make it difficult to practice preventive care for any disease that affects the fifth decade of life. It is important to point out that in populations with scarce socioeconomic resources, women constitute a vulnerable group for the occurrence of chronic non-communicable diseases because they present higher rates of sedentary lifestyle, obesity and metabolic alterations (Pimenta and collaborators, 2011).

In this study, physical activity practice did not present a significant association with MS. This finding may be related to the instrument used, since the perception of the duration of effort estimated by the women may cause errors in the interpretation of IPAQ data. However, this instrument is used in research with large populations in order to estimate the intensity of physical activity (Anjos and collaborators, 2012; Steiner and collaborators, 2015).

Regarding cigarette smoking, women who were not smokers had more predisposition to have MS, which is in agreement with a study by Soares and Barreto (2014), who emphasized smoking as a protective action overweight and obesity, effectively abdominal, determining factors for the affection of this pathology, since tobacco competes with the brain reward sites of food, generating a reduction of appetite, in addition to nicotine raising levels of oxidation of lipids, contributing to a more significant catabolic state and a lower weight gain.

According to Steiner and collaborators (2015), the evaluation of food consumption and the impact of dietary components are of fundamental importance for the planning of interventions in health promotion, since investigating the relationship between adequacy/inadequacy of nutrients that are ingested through food becomes an essential tool for the control of comorbidities in climacteric women (Hou and collaborators, 2013).

Contributing to the findings described above, for eating habits, associations were significant with the use of salt in food and fruit intake. Although, in this study, the low salt intake of this population may be underestimated, since only the addition salt (used in food preparation) was verified, and the consumption of sodium in industrialized food and *in natura* was not quantified. There is evidence that the diet rich in salt is associated with elevated blood pressure, the incidence of stroke and cardiovascular disease (Steiner and collaborators, 2015).

In this perspective, the discussion about the high consumption of salt in the world has increased. In Brazil, the situation is worrying, since the sodium availability for consumption exceeds more than twice the recommended (PAHO and WHO, 2009), requiring urgently the adoption of effective policies to reduce salt intake in the country, a more cost-effective measure to reduce mortality due to cardiovascular diseases (Castro, Giatti and Barreto, 2014).

With regard to fruit intake, epidemiological studies have suggested the importance of fruit consumption in promoting health and preventing chronic noncommunicable diseases such as cardiovascular disease, cancer, diabetes and obesity.

Knowledge about the consumption of these foods considered to be protective becomes essential for health (Costa, Vasconcelos and Corso, 2012). In this study, association showed significant between fruit intake and MS, going against findings of Castanho and collaborators (2013), who showed that the adequate consumption of fruits exerted protective effect both for the presence of MS and its components.

As in studies conducted in other populations (Felipe-de-Melo and collaborators, 2011; Figueiro Neto and collaborators, 2010), overweight was one of the main factors for MS, noting that obesity may be a triggering factor for the syndrome. These results confirm that

obesity emerges as a chronic and serious health problem, even in socially vulnerable populations such as climacteric women.

Regarding obstetric factors, the associations were significant with MS. But the results suggest that women who had more pregnancies have a higher chance to have weight gain (Santos and collaborators, 2014).

This a triggering factor for MS involvement. In addition, other authors (Silva and collaborators, 2014) reaffirm that regardless traditional risk factors for the onset of MS, among which the family history, hypertensive diseases of pregnancy, may increase its emergence in the long run.

It should be noted that limitations can be highlighted with regard to the interpretation of results in a cross-sectional study. One limitation is that the confirmation of the association of study variables is actually the cause of MS.

However, the design and methodology employed in this research were adequate to meet the proposed goals and could provide important results for the handling and underpinning of future longitudinal studies.

In Brazil, studies about MS in the general population are rather scarce, especially those that relate factors associated with MS in the climacteric.

This lack of data, coupled with the importance of knowing the factors associated with MS in climacteric, may contribute to the creation of public policies in primary care to assist the health of this population.

## CONCLUSION

Through this study, it was possible to observe a high prevalence of MS in the studied population, besides the findings indicate that climacteric women present significant evidence of MS development due to the influence of sociodemographic factors, life habits, eating habits, anthropometric measures, clinical and obstetric factors.

## REFERENCES

1-Anjos, L. A.; Barbosa, T. B. C.; Wahrlich, V.; Vasconcellos, M. T. L. Padrão de atividade física em um dia típico de adultos de Niterói, Rio de Janeiro, Brasil: resultados da Pesquisa de Nutrição, Atividade Física e Saúde (PNAFS). Cad. Saúde Pública. Vol. 28. Núm. 10. p. 1893-1902. 2012.

2-Castanho, G. K. F.; Marsola, F. C.; Mclellan, K. C. P.; Nicola, M.; Moreto, F.; Burini, R. C. Consumption of fruit and vegetables associated with the Metabolic Syndrome and its components in an adult population sample. Cien Saude Colet. Vol. 18. Vol. 2. p. 385-392. 2013.

3-Castro, R. S. A.; Giatti, L.; Barreto, S. M. Fatores associados à adição de sal à refeição pronta. Ciênc. saúde coletiva. Vol. 19. Núm. 5. p. 1503-1512. 2014.

4-Costa, L. C. F.; Vasconcelos, F. A. G.; Corso, A. C. T. Fatores associados ao consumo adequado de frutas e hortaliças em escolares de Santa Catarina, Brasil. Cad. Saúde Publica. Vol. 28. Núm. 6. p. 1133-1142. 2012.

5-Fan, S.; Say, Y. Leptin and leptin receptor gene polymorphisms and their association with plasma leptin levels and obesity in a multi-ethnic Malaysian suburban population. J Physiol Anthropol. Vol.33. Núm.1. p. 15. 2014.

6-Felipe-de-Melo, E. R.; Silva, R. C. R.; Assis, M. O.; Pinto, E. J. Fatores associados à síndrome metabólica em trabalhadores administrativos de uma indústria de petróleo. Ciência & Saúde Coletiva. Vol. 16. Núm. 8. p. 3443-3452. 2011.

7-Figueiredo Neto, J. Á.; Figuerêdo, E. D.; Barbosa, J. B.; Barbosa, F. F.; Costa, G. R. C.; Nina, V. J. S.; Nina, R. V. A Síndrome Metabólica e Menopausa: Estudo Transversal em Ambulatório de Ginecologia. Arq Bras Cardiol. Vol. 95. Núm. 3. p. 339-345. 2010.

8-Friedewald, W. T.; Levy, R. I.; Fredrickson, D. S. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin Chem. Vol. 18. Núm. 6. p. 499-502. 1972.

9-Gallego, O. M. P.; López, B. P.; Armero, T. M. A.; Alemán, A. J.; Albero, S. J.; López, T. P. J. Metabolic syndrome and its componentes in Spanish postmenopausal women. Nutr Hosp. Vol. 32. Núm. 2. p. 656-666. 2015.

10-Gravena, A. A.; Brischiliari, S. C.; Lopes, T. C.; Agnolo, C. M.; Carvalho, M. D.; Pelloso, S. M. Excess weight and abdominal obesity in postmenopausal Brazilian women: a population-based study. BMC Womens Health. Vol. 13. p. 46. 2013.

11-Hou, X.; Lu, J.; Weng, J.; Ji, L.; Shan, Z.; Liu, J.; Tian, H.; Ji, Q.; Zhu, D.; Ge, J.; Lin, L.; Chen, L.; Guo, X.; Zhao, Z.; Li, Q.; Zhou, Z.; Shan, G.; Yang, Z.; Yang, W.; Jia, W.; China National Diabetes and Metabolic Disorders Study Group. Impact of waist circumference and body mass index on risk of cardiometabolic disorder and cardiovascular disease in Chinese adults: a national diabetes and metabolic disorders survey. PloS ONE. Vol. 8. Núm. 3. p. e57319. 2013.

12-Matsudo, S. M.; Araújo, T.; Matsudo, V. R.; Andrade, D.; Andrade, E.; Oliveira, L. C.; and collaborators. Questionário Internacional de Atividade Física (IPAQ): estudo de validade e reprodutibilidade no Brasil. Rev Bras Ativ Fís Saúde. Vol. 6. p. 5-18. 2001.

13-Mendes, K. G.; Theodoro, H.; Rodrigues, A. D.; Busnello, F.; Lorenzi, D. R. S.; Olinto, M. T. A. Menopausal Status and Metabolic Syndrome in Women in Climacteric Period Treated at a Clinic in Southern Brazil. Open Journal of Endocrine and Metabolic Diseases. Vol. 3. p. 31-41. 2013.

14-Molarius, A.; Seidell, J. C.; Sans, S.; Tuomilehto, J.; Kuulasmaa, K. Waist and hip circumferences, and waist-hip ratio in 19 populations of the WHO MONICA Project. Int J Obes Relat Metab Disord. Vol. 2. p. 116-25. 1999.

15-National Cholesterol Education Program (NCEP). The Third Report of the National Cholesterol Education Program. Expert Panel on Detection. Evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA. Vol. 16. Núm. 19. p. 2486-97. 2001.

16-Pan American Health Organization (PAHO), World Health Organization (WHO). Prevenção de doenças cardiovasculares pela redução de sal na alimentação: Relatório da Reunião do grupo de especialistas. Washington. PAHO. WHO. 2009.

17-Pimenta, A. M.; Gazzinelli, A., Velásquez-Meléndez, G. Prevalência da síndrome metabólica e seus fatores associados em área rural de Minas Gerais (MG, Brasil). Cien Saúde Coletiva. Vol. 16. Núm. 7. p. 3297-306. 2011.

18-Politano, C. A.; Valadares, A. L.; Pinto-Neto, A.; Costa-Paiva, L. The metabolic syndrome and sexual function in climacteric women: a cross-sectional study. J Sex Med. Vol. 12. Núm. 2. p. 455-62. 2015.

19-Polotsky, H. N.; Polotsky, A. J. Metabolic implications of menopause. Semin Reprod Med. Vol. 28. Núm. 5. p. 426-34. 2010.

20-Salaroli, L. B.; Barbosa, G. C.; Mill, J. G.; Molina, M. C. Prevalence of metabolic syndrome in population-based study, Vitória, ES-Brazil. Arq Bras Endocrinol Metabol. Vol. 51. Núm. 7. p. 1143-52. 2007.

21-Santos, K. C. R.; Muraro, L. O.; Witkowski, M. C.; Breigeiron, M. K. Gestational weight gain and nutritional state of the newborn: a descriptive study. Rev Gaúcha Enferm. Vol. 35. Núm. 1. p. 62-69. 2014.

22-Santos, R. D.; Sociedade Brasileira de Cardiologia. III Diretrizes Brasileiras sobre Dislipidemias e Diretriz de Prevenção da Aterosclerose do Departamento de Aterosclerose da Sociedade Brasileira de Cardiologia. Arq Bras Cardiol. Vol. 77. Núm. 3. p. 1-48. 2001.

23-Silva, M. L. C.; Galvão, A. C. A. A.; Souza, N. L.; Azevedo, G. D.; Jerônimo, S. M. B.; Araújo, A. C. P. F. Mulheres com risco cardiovascular após pré-eclâmpsia: há seguimento no Sistema Único de Saúde?. Rev. Latino-Am. Enfermagem. Vol. 22. Núm. 1. p. 1-7. 2014.

24-Soares, D. A.; Barreto, S. M. Sobrepeso e obesidade abdominal em adultos quilombolas, Bahia, Brasil. Caderno de Saúde Pública. Vol. 30. Núm. 2. p. 341-354. 2014.

25-Sobrac. Guia de Menopausa. Sociedade Norte-Americana de Menopausa-NAMS. 7ª edição. 90 p. 2013.

26-Sociedade Brasileira de Cardiologia; Sociedade Brasileira de Hipertensão; Sociedade Brasileira de Nefrologia.VI Diretrizes Brasileiras de Hipertensão. Arq Bras Cardiol. Vol. 95. supl. 1. p. 1-51. 2010.

27-Son, M. K.; Lim, N.; Lim, J.; Cho, J.; Chang, Y.; Ryu, S.; Cho, M.; Park, H. Difference in blood pressure between early and late menopausal transition was significant in healthy Korean women. BMC Women's Health. Vol. 15. Núm. 64. 2015.

28-Steiner, M. L.; Azevedo, L. H.; Bonacordi, C. L.; Barros, A. Z.; Strufaldi, R.; Fernandes, C. E. Food consumption in postmenopausal women and its relation with anthropometric measurements and time since menopause. Rev. Bras. Ginecol. Obstet. Vol. 37. Núm. 1. p. 16-23. 2015.

29-The Committee on the Diagnosis and Classification of Diabetes Mellitus. Report of The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. Vol. 20. Núm. 7. p 1183-97. 2011.

30-Udo, T.; McKee, S. A.; White, M. A.; Masheb, R. M.; Barnes, R. D.; Grilo, C. M. Menopause and metabolic syndrome in obese individuals with binge eating disorder. Eat Behav. Vol. 15. Núm. 2. p. 182-5. 2014.

31-World Health Organization - WHO. Global recommendations on physical activity for health. Geneve: World Health Organization, 2010. Available in: <http://www.who.int/dietphysicalactivity/factsheet_recommendations/en>. Access in: October 18th, 2015.

Author for correspondence:
Josiane Santos Brant Rocha
Postgraduate Program in Primary Health Care,
State University of Montes Claros
Av. Rui Braga, Vila Mauricéia.
Montes Claros-MG. Brasil.
CEP: 39401-089.