

Prevalence of Metabolic Syndrome in individuals with Type 2 Diabetes Mellitus

Prevalência da Síndrome Metabólica em pessoas com Diabetes Mellitus tipo 2

Prevalencia del Síndrome Metabólico en personas con Diabetes Mellitus tipo 2

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ABSTRACT

Objective: to identify the prevalence of Metabolic Syndrome and its components in a population of patients with type 2 Diabetes Mellitus. **Method:** a cross-sectional study was conducted with 201 diabetic patients. A descriptive analysis and Chi-square and Fisher's exact tests ($p < 0.05$) were performed. **Results:** the majority of participants were females and overweight, with a mean age of 63.1 years and a low level of education, and categorized as physically inactive. Of all individuals investigated, 50.7% were diagnosed with Metabolic Syndrome and 92% had at least one of the syndrome components with values beyond those recommended. **Conclusion:** it is essential to take preventive actions and develop studies that help to identify the factors associated with this syndrome.

Descriptors: Metabolic X Syndrome; Type 2 Diabetes Mellitus; Prevalence; Adult Health; Clinical Markers.

RESUMO

Objetivo: identificar a prevalência da Síndrome Metabólica e de seus componentes em uma população de pacientes com Diabetes Mellitus tipo 2. **Método:** estudo transversal realizado com 201 pacientes diabéticos. Realizou-se análise descritiva, testes Qui-Quadrado e de Fisher ($p < 0,05$). **Resultados:** grande parte da amostra era do sexo feminino, com média de idade de 63,1 anos, baixo nível de escolaridade, classificados como sedentários e apresentando excesso de peso. Do total de investigados, 50,7% foram diagnosticados com Síndrome Metabólica, e 92,0% têm pelo menos um dos componentes da síndrome fora dos valores recomendados. **Conclusão:** torna-se imperioso a realização de práticas preventivas e da ampliação de inquéritos que favoreçam a elucidação dos fatores ligados à síndrome.

Descritores: Síndrome X Metabólica; Diabetes Mellitus Tipo 2; Prevalência; Saúde do Adulto; Marcadores Clínicos.

RESUMEN

Objetivo: identificar la prevalencia del Síndrome Metabólico y de sus componentes en una población de pacientes con Diabetes Mellitus tipo 2. **Método:** estudio transversal realizado con 201 pacientes diabéticos. Se realizó análisis descriptivo, tests de Chi-cuadrado y de Fisher ($p < 0,05$). **Resultados:** gran parte de la muestra era de sexo femenino, con media etaria de 63,1%, bajo nivel de escolarización, clasificados como sedentarios y presentando exceso de peso. Del total de investigados, 50,7% fueron diagnosticados con Síndrome Metabólico, y 92,0% tiene al menos uno de los componentes del síndrome por fuera de los valores recomendados. **Conclusión:** resulta imperiosa la realización de prácticas preventivas y de aumento de encuestas que faciliten la elucidación de los factores vinculados al síndrome.

Descriptor: Síndrome X Metabólico; Diabetes Mellitus Tipo 2; Prevalencia; Salud del Adulto; Biomarcadores.

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INTRODUCTION

Metabolic Syndrome (MS) can be defined as a cluster of cardio-metabolic dysfunctions characterized by the increase in fasting blood sugar (FBS), abdominal circumference (AC), arterial pressure (AP) and triglycerides (TG), and reduction in high-density lipoprotein cholesterol (HDL)⁽¹⁾.

This syndrome directly contributes to the development of cardiovascular diseases (CVD) and the appearance of type 2 Diabetes Mellitus (type 2 DM). Additionally, it increases the risk of premature death, renal disease, mental disorders and cancer, thus representing a serious public health problem in modern times⁽²⁾.

Affecting approximately 25% of the world population, MS accounts for 7% of overall mortality and 17% of deaths associated with CVD. The literature emphasizes that individuals with MS are two times more likely to die, regardless of the cause; three times more likely to have a heart attack and/or stroke; and five times more likely to develop type 2 DM⁽³⁻⁴⁾.

Innumerable criteria have been adopted to diagnose MS, developed by different organizations. However, currently, the consensus established by the revised National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) and International Diabetes Federation (IDF) have been the ones most frequently used⁽⁵⁾.

In the present study, the revised NCEP ATP III criterion was the one selected, due to its easy applicability and strong clinical evidence. According to this criterion, MS must have a combination of three or more of the following parameters: AC (>102 cm for males and >88 cm for females), HDL (<40 mg/dl for males and <50 mg/dl for females or patients using antilipemic drugs), TG (\geq 150 mg/dl or patients using dyslipidemia drugs), AP (\geq 130/85 mm/Hg or patients using antihypertensive drugs) and FBS (>100 mg/dl or patients using hypoglycemic drugs)⁽⁶⁾.

The prevalence of MS varies according to age, sex, ethnicity, the diagnostic criterion used and the group assessed. Taking these factors into consideration, in recent years, studies have been developed aiming to identify the prevalence of MS in individuals diagnosed with type 2 DM through the NCEP ATP III criterion. Until this moment, the values found vary from 80% to 96.1%, in different regions of the world⁽⁷⁻⁹⁾. In Brazil, a study conducted in Rio Grande do Sul also found a high prevalence of MS in individuals with type 2 DM, totaling 78.6%⁽¹⁰⁾. In this sense, there is a high prevalence of this syndrome in individuals with type 2 DM.

Investigations on MS in diabetic individuals cannot be ignored, as the presence of such syndrome is associated with a considerable increase in the number of micro/macrovacular complications, resulting in high rates of morbid-mortality⁽¹⁻²⁾.

Searches performed in the Brazilian literature have shown that studies on this theme are still scarce in the Northeastern region, especially in the state of Piauí. The lack of robust data can, consequently, mask the significant damage caused by MS and compromise the planning and implementation of strategies aimed at minimizing the complications resulting from patients with diabetes.

OBJECTIVE

To identify the prevalence of MS and its components through the NCEP ATP III criterion in a population of patients with type 2 DM.

METHODS

Ethical aspects

The present study was approved by the Research Ethics Committee of the Federal University of Piauí. Individuals were approached in the Primary Health Clinics (PHC) during nursing consultations aimed at the population with diabetes, when the research objectives and Informed Consent Form were described.

Study design, location and period

A cross-sectional study with a qualitative approach was conducted in 17 PHCs of the urban area of the city of Floriano, state of Piauí, between August 2014 and April 2015.

Study sample and inclusion and exclusion criteria

Initially, more than 50 individuals were recruited. However, the final sample obtained by convenience for this study was 201 individuals with type 2 DM. The target population was comprised of individuals aged more than 18 years, of both sexes, diagnosed with type 2 DM and undergoing treatment with oral antidiabetic drugs for at least six months, followed by the city PHCs. Individuals who combined the use of insulin with oral antidiabetic drugs, pregnant women and hospitalized patients were excluded from this study.

Study protocol

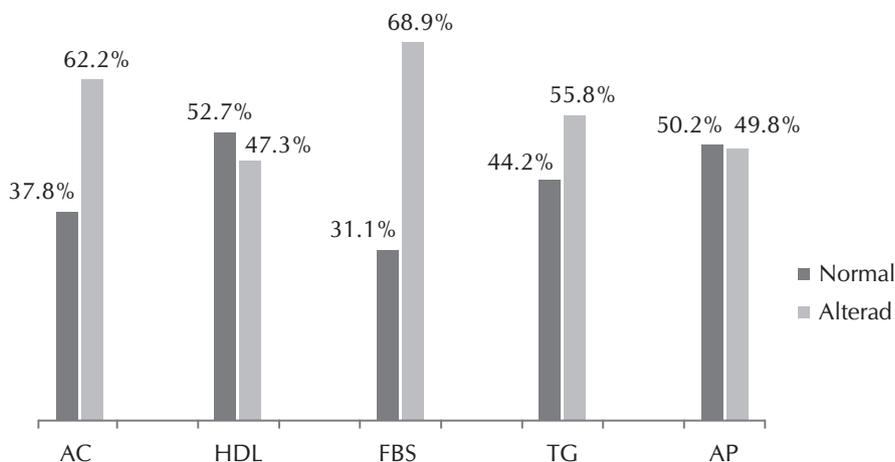
For data collection, a form that included socio-demographic aspects (age, sex, marital status, employment status and economic class, among others), anthropometric and clinical aspects (height, weight, nutritional status, smoking, alcohol use and physical inactivity) and those associated with the MS analysis (AC, AP, FBS, TG and HDL).

Anthropometric data (weight and height) were only assessed one time taking some precautions. Weight was obtained from patients while they were barefoot and wearing light clothing, using a portable digital scale with 150 kg of capacity and 0.1 kg of accuracy. Height was assessed with a measuring tape with a scale of 0.5 cm. Aiming to guarantee the accuracy of measurements, participants were instructed to stand upright and motionless, with their palms touching their thighs and their head adjusted to the Frankfurt plane. Nutritional status was calculated through the Body Mass Index (BMI), defined by the ratio between weight (kg) and the square of the height (m). Individuals whose BMI was between 25.0 and 29.9 kg/m² were categorized as overweight, while those with a BMI \geq 30 kg/m² were obese⁽¹¹⁾.

Tobacco and alcohol use was self-reported. With regard to tobacco, individuals who affirmed using this drug were considered to be smokers and categorized into daily smokers (who smoke at least one cigarette per day) or occasional smokers⁽¹²⁾. In terms of alcohol, patients who reported using this drug were considered to be users, regardless of the frequency. Moreover,

participants who practiced physical activity for less than 30 minutes and with a frequency lower than three times per week were considered to be physically inactive⁽¹³⁾.

According to the revised NCEP ATP III criterion for the classification of MS, study participants should have at least three of the five following components: AC (>102cm for males and >88 cm for females); AP (\geq 130/85 mm/Hg or use of anti-hypertensive drugs); HDL (<40 mg/dl for males and <50 mg/dl for females or use of antilipidemic drugs); TG (\geq 150mg/dl or use of dyslipidemia drugs) and/or FBS (>100mg/dl or use of hypoglycemic drugs)⁽⁵⁻⁶⁾. Data were categorized into "Normal" and "Altered"



Note: AC: abdominal circumference; HDL: high-density lipoprotein cholesterol; FBS: fasting blood sugar; TG: triglycerides; AP: arterial pressure.

Figure 1 – Distribution of prevalence of the components of Metabolic Syndrome, according to the revised NCEP-ATP III criterion, in patients with type 2 Diabetes Mellitus, city of Floriano, Piauí, Brazil, 2016 (N=201)

Analysis of results and statistics

The values obtained were tabulated in Excel, version 2010, and analyzed in the Epi-Info statistical software, version 3.5.3. Initially, central trend measures were calculated. The Bartlett test was adopted to analyze the normality of variables. Based on this information, parametric (T test) and non-parametric tests (Kruskal-Wallis test) were used. In the association of proportions of variables, the Chi-square test and Fisher's exact test were used in the case of 2x2 tables. In all analyses, a 95% confidence interval and 5% significance level were used.

RESULTS

The present study included 201 patients with type 2 DM, mainly females (72.6%), aged between 19 and 96 years and with a mean age of 63.1 years (\pm 12.5), and with a low level of education (29.4%) as the mean obtained was only 4.7 years of school. The majority of participants were of mixed ethnicity (68.7%), retired (50.7%) and in a civil union (50.2%), followed a religion (95.0%), did not consume alcohol (87.6%) or tobacco (89.1%), and were categorized as overweight (71.6%) and physically inactive (71.1%).

Of all 201 patients with type 2 DM who participated in this study, 101 (50.7%) were diagnosed with MS according to the revised NCEP ATP III criterion.

Based on the distribution of prevalence of components of MS, according to the revised NCEP ATP III criterion, among the components analyzed, the levels of FBS, AC, TG and AP were high in 68.9%, 62.2%, 55.8% and 49.8% of the sample, respectively. In contrast, HDL was low in 47.3% of patients, as shown in Figure 1.

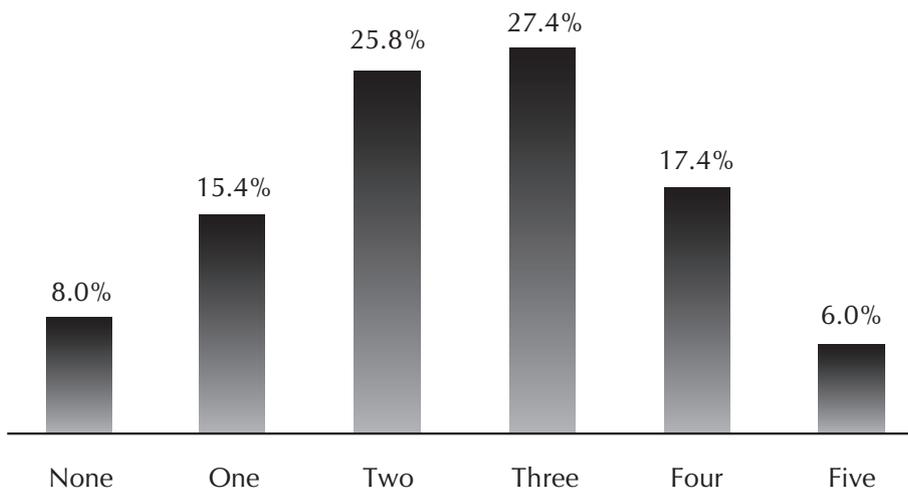


Figure 2 – Distribution of the number of components of Metabolic Syndrome in patients with type 2 Diabetes Mellitus, city of Floriano, Piauí, Brazil, 2016 (N=201)

Regarding the distribution of patients according to the number of components of MS, 92% of study participants had at least one component characteristic of this metabolic disorder (Figure 2).

When MS was associated with socio-demographic, anthropometric and clinical variables, a higher percentage of MS was found among females (58.9%), of mixed ethnicity (52.9%), retired (55.9%), belonging to the economic classes D and E (55.8%), illiterate (57.6%), without a partner (single, widowed or divorced) (56%), without a religion (60%), who did not own a house (51.1%), physically active (51.7%), obese (63.6%), non-smokers (50.8%) and who did not consume alcohol (54%). However, there were only statistically significant associations between the presence of MS and sex ($p < 0.001$), nutritional status ($p < 0.001$) and alcohol use ($p = 0.012$) (Table 1).

Table 1 – Association between the prevalence of Metabolic Syndrome and socio-demographic, anthropometric and clinical variables, city of Floriano, Piauí, Brazil, 2016 (N=201)

Variables	Metabolic syndrome				p value
	Yes		No		
	n	%	n	%	
Sex					0.001*
Female	86	58.9	60	41.1	
Male	16	29.1	39	70.9	
Ethnicity					0.663**
White	10	45.5	12	54.5	
Black	19	46.3	22	53.7	
Mixed	73	52.9	65	47.1	
Employment status					0.311**
Formal/Informal employment	15	42.9	20	57.1	
Retired	57	55.9	45	44.1	
Unemployed/ housework	30	46.9	34	53.1	
Economic class					0.112*
B-C	49	46.2	57	53.8	
D-E	53	55.8	42	44.2	
Level of education					0.358**
Illiterate	34	57.6	25	42.4	
Primary education	53	49.5	54	50.5	
Secondary/higher education	15	42.9	20	57.1	
Marital status					0.089*
Married/civil union	46	45.5	55	54.5	
Single, widowed, divorced	56	56	44	44	
Religion					0.392*
With a religion	96	50.3	95	49.7	
Without a religion	6	60	4	40	
Housing					0.474*
Owns a house	94	51.1	90	48.9	
Rents a house	8	47.1	9	52.9	
Physical activity					0.491*
Physically active	30	51.7	28	48.3	
Physically inactive	72	50.3	71	49.7	
Nutritional status					0.001**
Eutrophic	13	22.8	44	77.2	
Overweight	47	60.3	31	39.7	
Obese	42	63.6	24	36.4	
Smoking					0.559*
Yes	11	50	11	50	
No	91	50.8	88	49.2	
Alcohol use					0.012*
Yes	7	28	18	72	
No	95	54	81	46	

Note: *Fisher's exact test; **Chi-square test

DISCUSSION

The prevalence of MS identified in this population was higher than 50%, similar to the worldwide prevalence, which is varying between 45.8% and 96.3%⁽¹⁴⁻¹⁵⁾ according to the revised NCEP ATP III criterion.

When the components of MS are analyzed individually, high levels of FBS, AC and TG were found among individuals. This result is similar to that obtained in a study performed in Bangladesh, where the percentage of individuals with altered blood sugar levels was 69%⁽¹⁶⁾. Regarding the similarity of high AC, the international literature emphasizes that patients with type 2 DM have similar or higher values than those from the study in question⁽¹⁶⁻¹⁷⁾. Moreover, Malaysian researchers found that 92.9% of patients with type 2 DM had hypertriglyceridemia, higher than the results found in the present study⁽⁸⁾. The appearance of such imbalance is mainly due to the current inactive lifestyle of the population associated with inadequate eating habits, which generates innumerable cardio-metabolic complications, apart from MS.

Regarding blood pressure and HDL cholesterol values, more than half of the sample managed to control such variables, although without relevance. However, the blood pressure levels found in study participants were better than those obtained in other studies, where high AP was observed in 90.4% of individuals⁽⁷⁻⁸⁾. It should be noted that one of the main comorbidities associated with diabetes is precisely arterial hypertension, due to the sequence of changes linked to lack of metabolic control in this population. Regarding HDL values, a study performed in India that aimed to find the prevalence of MS in individuals with type 2 DM showed that 53.3% of the sample had good levels of this type of cholesterol, corroborating the study in question⁽¹⁸⁾.

The number of components of MS shows evidence on the risk of development of CVD and helps to establish interventions aimed at the empowerment of this population. In

this sample, 15.4% of individuals had at least one of the components of MS and 25.9% had two components. Being aware that MS is a group of irregular factors, it should be emphasized that individuals who already have one or two of these metabolic disorders will probably suffer from this syndrome in the short term, if intervention measures are not taken and lifestyle changes are not made. Additionally, 27.4%, 17.4% and 6% of patients had three, four or five altered components of MS, respectively, which were lower than those found among diabetics in other studies⁽¹⁴⁾.

In the present study, female participants ($p < 0.001$) and those who were obese ($p < 0.001$) and did not consume alcohol ($p = 0.012$) were directly associated with the diagnosis of MS. The diagnostic percentages of MS found in women were similar to those of the study in question⁽¹⁴⁾. In terms of nutritional status, the literature emphasizes the proportional association between weight gain and the onset of MS⁽¹⁹⁾. These results lead to alarming implications for the population in Brazil, as more than 18% of Brazilians can be categorized as obese according to a population-based study. However, regarding those who consume alcohol, study participants obtained a lower prevalence of MS. Some studies show that moderate alcohol use, especially wine, is associated with a lower chance of onset of type 2 DM, MS and CVD in general.

Regardless, these observations are alarming, as they imply great vulnerability for the onset of a syndrome that contributes to the development of complications that are frequently irreversible. In this sense, gathering a multi-professional health team is essential to curb the factors responsible for the onset of this set of cardio-metabolic changes. In their practice in health services, nursing professionals frequently deal with the imbalance of factors that trigger MS and have an important role in the diagnosis, care planning, intervention of strategies and control of this syndrome. Based on this, considering the magnitude of MS in a population of individuals with diabetes provides better technical-scientific support for the work of the nursing team, whether it is in primary health care, hospital services or even in the academic world, through greater incentive to research on this theme.

Study limitations

There were some limitations to the present study due to its design. In this case, having a cross-sectional design, causal relationships could not be established. Moreover, although not recent, studies that include the use of the revised NCEP

ATP III criterion in individuals with type 2 DM to analyze its prevalence and associated factors and Brazilian studies with a longitudinal or experimental nature are still scarce, so that evidence on this theme remains insufficient.

Contributions to the area of nursing, health or public policy

Among the distinct contributions that can be emphasized for the nursing area, the present study showed the need of and care for the assessment of clinical markers associated with diabetes in outpatient, hospital and/or home services, apart from better disease management, as it is characterized as a condition that requires continuous management given its prolonged treatment. Furthermore, due to the financial crisis affecting the entire world and Brazil in particular, associated with the inevitability of seeking efficiency in the allocation of financial resources, studies such as this one can show how important it is to provide nursing services based on evidence, aiming to find new means to contribute to actions already performed in primary care.

CONCLUSION

MS is closely associated with type 2 DM and the present study revealed that its prevalence was 50.7% among participants, according to the revised NCEP ATP III criterion. Additionally, female diabetics categorized as obese and who did not consume alcohol were directly associated with this syndrome. When MS was diagnosed, the majority of individuals showed high levels of FBS, AC and TG. Although the studies available indicate the importance of this theme, it is essential to perform new studies, especially with individuals with type 2 DM, aiming to assess and support the data on this population. Additionally, to further studies that seek to elucidate the factors associated with the development of MS is key to perform future interventions. The importance of individual follow-up or through therapeutic groups provided by health units should be emphasized, aiming to prevent the onset of more comorbidities that compromise the health and quality of life of this population.

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