NUTRITIONAL AND METABOLIC CHANGES IN PEOPLE WITH DIABETES: CHALLENGES FOR THE HIPERDIA PROGRAM OF A FAMILY HEALTH STRATEGY

Alterações nutricionais e metabólicas em diabéticos: desafios ao HiperDia de uma Estratégia de Saúde da Família

Alteraciones nutricionales y metabólicas de diabéticos: desafíos para el HiperDia de una Estrategia de Salud de la Familia

Original Article

ABSTRACT

Objective: To assess the anthropometric profile, health conditions and lifestyle of patients with diabetes mellitus (DM) enrolled in the *HiperDia* program (*Programa HiperDia*) of the Family Health Strategy (*Estratégia de Saúde da Família - ESF*) of Sinop, Mato Grosso. **Methods:** This was a descriptive cross-sectional study conducted in an ESF located in the center of Sinop, Mato Grosso, from June to October 2013, with patients with diabetes of both genders and age $\geq$ 18 years. Weight, height, pressoric levels, body fat percentage (BF%), waist circumference (WC), fasting glucose, body mass index (BMI), blood pressure and lifestyle habits were assessed. **Results:** Participants (n=54) had a mean age of 64.2 $\pm$ 10.2 years and BMI of 29.0 $\pm$ 5.4 kg/m², and were mostly women (n=34). Nutritional and metabolic changes were found among participants: excessive weight (77.8%), high BF% (92.0%), high WC suggesting risk for complications associated with obesity (85.5%), hypertension (87.0%) and sedentary lifestyle (66.7%). Glucose was altered in both genders (p>0.05) and 16.7% of the individuals with diabetes were undiagnosed. Of the participants, 5.6% were smokers, 29.6% consumed alcohol, the mean meal fractioning was 4.2±0.9 times/ day and the daily sleep hours were 7.7 $\pm$ 1.3. **Conclusion:** Most individuals with diabetes presented excessive weight, high BF% and WC and hyperglycemia. These results, associated with hypertension, metabolic syndrome, sedentary lifestyle, smoking, alcohol consumption, low meal fractioning and unawareness of the diagnosis may contribute to the occurrence of severe complications.

Descriptors: Diabetes Mellitus; Obesity; Lifestyle; Glucose.

RESUMO

Objetivo: *Avaliar o perfil antropométrico, condições de saúde e estilo de vida de diabéticos cadastrados no HiperDia de uma Estratégia de Saúde da Família (ESF) de Sinop-MT.* **Métodos:** *Tratou-se de um estudo transversal e descritivo realizado em uma ESF, localizada no centro de Sinop-MT, de junho a outubro de 2013, com diabéticos, de ambos os sexos e idade ≥18 anos. Avaliou-se peso, altura, níveis pressóricos, percentual de gordura corporal (%GC), circunferência da cintura (CC), glicemia jejum, Índice de Massa Corporal (IMC), aferição da pressão arterial e hábitos de vida.* **Resultados:** *Os participantes (n=54) apresentaram idade média de 64,2±10,2 anos e IMC de 29,0±5,4 kg/m², sendo a maioria mulheres (n=34). Alterações nutricionais e metabólicas foram encontradas entre os avaliados: excesso de peso (77,8%), %GC elevado (92,0%), CC elevada pressupondo risco para complicações associadas à obesidade (85,5%), hipertensão (87,0%) e sedentarismo (66,7%). A glicemia apresentou-se alterada em ambos os sexos (p>0,05), e 16,7% dos diabéticos desconheciam seu diagnóstico. Dos participantes, 5,6% eram tabagistas, 29,6% consumiam bebidas alcoólicas, o fracionamento das refeições foi de 4,2 ± 0,9 vezes/dia e as horas diárias de sono de 7,7±1,3.* **Conclusão:** *A maioria dos diabéticos apresentou excesso de peso, %GC e CC elevados e hiperglicemia. Esses resultados, associados à*

Suzane Fatima Fuzinato[1]
Jackline Freitas Brilhante de São José[2]
Monise Viana Abranches[3]
Tânia Ramos Silva Fonseca[1]
Karize Tanita Martins de Souza[1]
Fernanda Cristina Esteves de Oliveira[1]

1) Applied Social Sciences College (*Faculdade de Ciências Sociais Aplicadas - FACISAS*) - Sinop (MT) - Brazil

2) University of Espírito Santo (*Universidade do Espírito Santo - UFES*) - Vitória (ES) - Brazil

3) University of Viçosa (*Universidade de Viçosa - UFV*) - Campus Rio Paranaíba - Rio Paranaíba (MG) - Brazil

hipertensão, síndrome metabólica, sedentarismo, tabagismo, consumo de bebidas alcoólicas, baixo fracionamento de refeições e desconhecimento sobre seu diagnóstico, podem contribuir para a ocorrência de complicações graves.

Descritores: *Diabetes Mellitus Tipo 2; Obesidade; Estilo de Vida; Glicemia.*

RESUMEN

Objetivo: *Valorar el perfil antropométrico, las condiciones de salud y el estilo de vida de diabéticos inscritos en el HiperDia de una Estrategia de Salud de la Familia (ESF) de Sinop-MT.* ***Métodos:*** *Se trató de un estudio transversal y descriptivo realizado en una ESF localizada en el centro de Sinop-MT entre junio y octubre de 2013 con diabéticos de ambos los sexos y edad ≥18 años. Se valoró el peso, la altura, los niveles de presión, el porcentual de grasa corporal (%GC), la circunferencia de la cintura (CC), la glucemia en ayunas, el Índice de Masa Corporal (IMC), la medición de la presión arterial y los hábitos de vida.* ***Resultados:*** *Los participantes (n=54) presentaron la edad media de 64,2±10,2 años, el IMC de 29,0±5,4 kg/m² y la mayoría son mujeres (n=34). Las alteraciones nutricionales y metabólicas encontradas en los participantes fueron: el exceso de peso (77,8%), el %GC elevado (92,0%), la CC elevada lo que contribuye para las complicaciones asociadas con la obesidad (85,5%), la hipertensión (87,0%) y el sedentarismo (66,7%). La glucemia se presentó alterada en ambos los sexos (p>0,05) y el 16,7% de los diabéticos desconocían su diagnóstico. Entre los participantes el 5,6% era tabaquista, el 29,6% consumía bebidas alcohólicas, el fraccionamiento de las comidas fue de 4,2±0,9 veces/día y las horas de sueño al día fue de 7,7±1,3.* ***Conclusión:*** *La mayoría de los diabéticos presentó exceso de peso, el %GC y la CC elevados y hiperglucemia. Eses resultados asociados con la hipertensión, el síndrome metabólico, el sedentarismo, el tabaquismo, el consumo de bebidas alcohólicas, el bajo fraccionamiento de las comidas y el no conocimiento de su diagnostico pueden contribuir para la ocurrencia de complicaciones graves.*

Descritores: *Diabetes Mellitus Tipo 2; Obesidad; Estilo de Vida; Glicemia.*

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder of multiple etiology, which is characterized by a chronic hyperglycemic state resulting from deficiency in insulin secretion and/or action[1]. It can be classified into three types: 1) type 1 (DM1), which is mainly manifested in childhood or adolescence; 2) type 2 (DM2), which accounts for 85% to 90% of the cases, with onset usually in adulthood; and 3) specific types including gestational diabetes and other types that result from functional defects in pancreatic β cells and disturbances in insulin action, in response to medicines, chemical agents or infections[2].

In recent years, the prevalence of DM is increasing throughout the world, specially among persons aged over 65 years. Estimates for year 2030 say that approximately 366 million people will present this disease. In Brazil, for the same year, it is estimated that 11.3 million people will have DM, thus putting the country in the eighth position in the number of cases rankings[3].

It is also worth pointing out that this disease may be associated with acute or chronic complications, if not early diagnosed and/or treated [2,4]. Thus, the World Health Organization (WHO) began to consider prevention a priority for the twenty-first century[5].

DM can be prevented through the identification of individuals at risk (primary prevention); identification of undiagnosed cases (secondary prevention); and treatment of those already affected by the disease, to avoid complications (tertiary prevention)[6,7].

In Brazil, the national plan for rehabilitation of attention to systemic arterial hypertension (SAH) and DM encompasses the HiperDia Program, which is aimed at registering and monitoring cases of diabetes and hypertension with previously confirmed diagnosis, and at ensuring the continuous supply of prescription drugs[4,7]. Moreover, its medium-term goal is to define the epidemiological profile of this population and develop public health strategies that are able to modify the current health scenario and, thus, improve the quality of life and reduce the social cost related to these diseases[4,8]. According to the Ministry of Health[8], this program represents an essential tool to instrumentalize the practice of care to users, aimed at mapping the risks, strenghtening patient care and minimizing the conditioning factors of complications of these diseases.

In this context, the implementation of the Family Health Strategy (*Estratégia de Saúde da Família - ESF*), in conjunction with the Family Health Support Center (*Núcleo de Apoio à Saúde da Família - NASF*) has become fundamental for the development of actions to prevent complications associated with DM, and for the control of health problems resulting from complications[8-11]. It can encourage self-care and the adoption of a healthy lifestyle. Moreover, it can promote the creation of a stronger bond with the patients, facilitating the understanding of their individual singularities and contributing to a better adherence to treatment[10].

The objective of this study was to identify the anthropometric profile, the health status and lifestyle of diabetic patients linked to the HiperDia program of an ESF in the municipality of Sinop, Mato Grosso, in order to indirectly evaluate the effectiveness of current actions and contribute with information to the development and implementation of educational measures for prevention

of complications associated with DM, and for health promotion as well.

METHODS

This was a cross-sectional descriptive study, which evaluated patients with DM linked to the HiperDia program of an ESF, located in the central area of the city of Sinop, Mato Grosso. Data collection was performed from June to October 2013. This study corresponded to a subproject from an extension project entitled *"Uma saúde melhor para pacientes hipertensos e diabéticos atendidos pelo programa HiperDia, Sinop, MT"*.

The diabetic patients linked to the HiperDia program of the said ESF, who appeared in the register by the end of the data collection period, were visited at their their homes and/or approached in the meetings of the group and invited to participate in the study. It included individuals of both sexes, aged over eighteen, who voluntarily agreed to participate, by signing the free and informed consent after receiving verbal and written guidance about the study.

Weight, height, waist circumference (WC), body fat percentage (BF%), blood pressure and fasting glucose were registered, and the body mass index (BMI) was calculated and expressed in kg/m^2. All assessments were conducted after a 10-hour fasting period.

For weight measurement, the volunteers remained barefoot and wore light clothing, and were placed on a digital scale (G.Tech®, China), with capacity of 150 kg and sensitivity of 100g. Identification of the BF% was performed on the same scale, which features the bioelectrical impedance analysis function. To minimize errors in this measure, participants were instructed, prior to the assessment date, not to perform physical exercise within 8 hours before the assessment, not to ingest alcoholic beverages within 48 hours, avoid tea, coffee and mate the night before, and not to perform intense exercise on the same day. They were also requested to be at rest for 10 minutes before measurement, remove metal objects attached to the body, and empty the bladder 30 minutes before the test.

Height was measured by using the stadiometer Sanny® (*American Medical do Brasil Ltda.*), with capacity of 230 cm and sensitivity of 0.1 cm. For this measurement, the subjects kept their feet together, heels touching the wall in upright posture, with eyes fixed on the horizon, not flexing or extending the head. Classification of the nutritional status followed the cutoff points proposed by the World Health Organization[11] and, for body fat, the cutoff points were adopted[12].

The WC was assessed with an inextensive and inelastic measurement tape with accuracy of 1 mm, at the midpoint between the anterior superior iliac crest and the lowest rib. The participants were classified into increased risk and greatly increased risk for complications associated with obesity, by means of the following cutoff points: for men, values greater than or equal to 94 cm and 102 cm, respectively, and for women, values greater than or equal to 80 cm and 88 cm, respectively[13].

Auscultation of the blood pressure (BP) was performed using an aneroid sphygmomanometer P.A.MED® (P.A. MED/*Produtos médicos Brasil*) properly calibrated, and following the protocol proposed in the document VI Brazilian Hypertension Guidelines[14]. For measurement of fasting glucose, the glucometer Portable Optium® (*ABBOTT Laboratórios do Brasil Ltda.*) was adopted, following the classification proposed by the Brazilian Society of Diabetes[15]. Additionally, a rating for metabolic syndrome was conducted, considering only the three criteria evaluated in this study (SAH, DM and the WC measure)[16].

A questionnaire on lifestyle habits, comprising questions about physical activity practice, number of daily meals, alcohol consumption, and smoking, among others, was applied to the diabetic patients.

Data analysis was carried out with SPSS software version 17.0, applying the Kolmogorov-Smirnov Z test to evaluate the data distribution; t-test to compare the averages of independent groups; Mann-Whitney test to compare medians of independent groups; Pearson's correlation to measure the degree of correlation and direction between two numerical variables with normal (parametric) distribution; and Spearman correlation to measure the degree of correlation and direction between two numerical variables with nonparametric distribution. The results were expressed as mean ± standard deviation, median (minimum-maximum), absolute and relative frequency. The significance level was set at 5%.

The study was authorized by the Health Secretariat of Sinop, Mato Grosso, and approved by the Ethics Committee on Human Research of the University of Cuiabá (opinion no. 378292).

RESULTS

The study evaluated 54 patients, all presenting DM, 64.8% (n=35) of which were elderly; 63.0% (n=34) were female, with mean age of 64.2 ± 10.2 years, weight 71.3 ± 13.3 kg and BMI 29.0 ± 5.4 kg/m^2. The BMI showed statistical difference between the sexes (women: 30.2 ± 5.2 kg/m^2 vs. men: 26.8 ± 4.9 kg/m^2, p<0.05) (Table I). When considering all the diabetics, it may be seen that, according to the BMI, 1.9% (n=1) had low weight, 20.4% (n=11) were eutrophic, 40.7% (n=22) were overweight, 25.9% (n=14)

presented obesity class I, 9.3% (n=5) presented obesity class II, and 1.9% (n=1) presented obesity class III. By analyzing the sex distribution of the nutritional status, it was found that excess weight (considering the sum of overweight, obesity class I, class II, and class III ratings) was the most prevalent dystrophy observed in females (85.3%; n=29) and males (65%; n=13) as well (Figure 1).

The average BF% was found at 29.7% ± 7.8%, with higher value observed in females [Women: 32.3% (22.8-41.0) vs. Men: 23.6% (6.7-36.7); p<0.05] (Table I). Moreover, it was observed that 79.6% (n=43) of the assessed patients exhibited BF% above average (cutoff points: Men = 16% to 24% and Women= 24% to 31%) and presented risk for diseases related to obesity (cutoff points: Men ≥
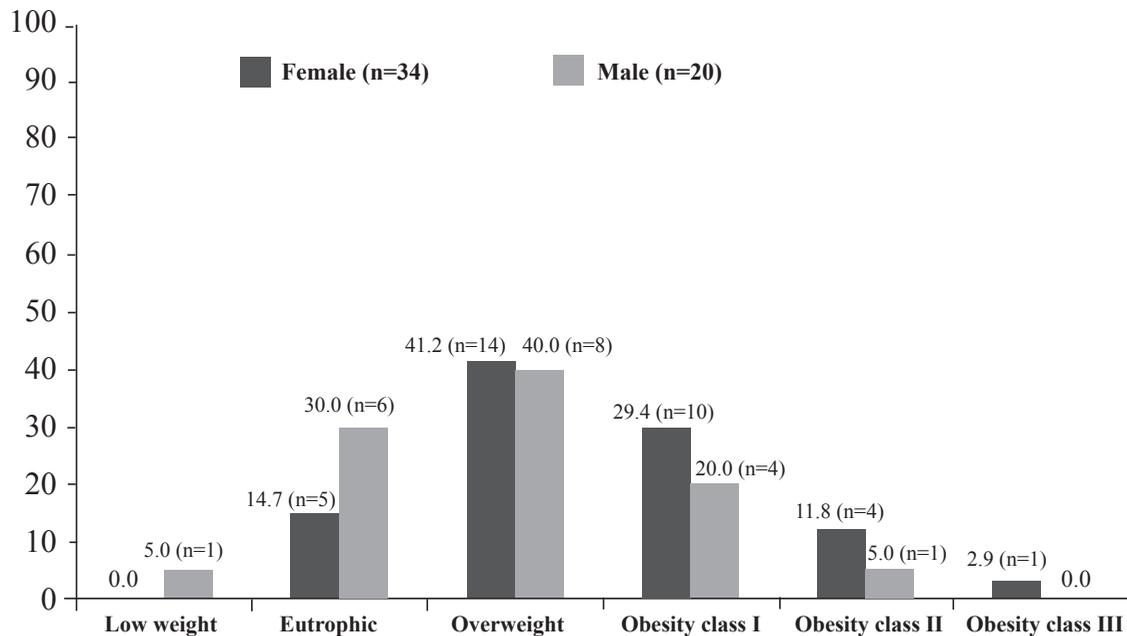

Figure 1 - Distribution of the nutritional status of diabetic patients, according to sex, linked to the HiperDia Program of a Family Health Strategy. Sinop, Mato Grosso, 2013.

Table I - Characteristics of diabetic patients linked to the HiperDia Program of a Family Health Strategy. Sinop, Mato Grosso, 2013.

Variables	All (n=54) Mean ± SD Median (min-max)	Female (n=34) Mean ± SD Median (min-max)	Male (n=20) Mean ± SD Median (min-max)	p-valor
Age (years)	64.2 ± 10.2	63.1 ± 9.4	66.1 ± 11.5	0.305
Weight (kg)	71.3 ± 13.3	69.3 ± 12.1	74.7 ± 14.8	0.150
Height (cm)	159.4 ± 10.0	154.4 ± 6.1	167.9 ± 9.7	
	158.0 (143.0-196.0)	154.0 (143.0-166.0)	165.5 (154.0-196.6)	<0.001*
BMI (kg/m²)	29.0 ± 5.4	30.2 ± 5.2	26.8 ± 4.9	0.021
Fasting glucose (mg/dL)	188.8 ± 90.5	177.9 ± 85.2	207.3 ± 98.3	0.253
SBP (mmHg)	131.6 ± 13.1	128.8 ± 12.4	136.2 ± 13.2	0.044
DBP (mmHg)	84.3 ± 12.4	85.3 ± 12.5	82.7 ±12.4	0.450
Body Fat (%)	29.7 ± 7.8	33.3 ± 4.5	22.1 ± 7.8	
	31.3 (6.7-41.0)	32.3 (22.8-41.0)	23.6 (6.7-36.7)[#]	<0.001*
WC (cm)	94.8 ± 10.5	93.6 ± 9.5	96.9 ± 12.0	0.263

BMI: Body Mass Index; WC: Waist circumference; SBP: systolic blood pressure; DBP: diastolic blood pressure; [#]n=16; 4 lost data. Analysis performed using the t-test or *Mann Whitney (p<0.05). Note: nonparametric variables are shown as mean and median to facilitate comparison with other studies.

24% and Women ≥ 31%). Among women, it was found that 23.5% (n=8) were above the average and 73.6% (n=25) were at risk for diseases associated with obesity, while 37.5% (n=6) of men were above the average and 43.8% (n=7) were at risk for diseases associated with obesity.

The average WC was found at 94.8 ± 10.5 cm for the total study population; with higher values observed for males, but with no significant difference when compared to the group of women (Women: 93.6 ± 9.5 cm vs. Men: 96.9 ± 12.0 cm; p>0.05) (Table I). Furthermore, according to the classification of the WC, it was found that 85.5% (n=44) of the diabetics presented themselves at high risk and very high for metabolic complications associated with obesity. When analyzed by gender, 30.0% (n=6) of men were at high risk for metabolic complications associated with obesity, and 30.0% (n=6) were at very high risk (abdominal obesity), whereas, among females, these values represented 23.5% (n=8) and 70.6% (n=24), respectively.

Considering all the research volunteers, it was found regular positive correlation between the anthropometric variables (BMI, weight and WC) and diastolic blood pressure (DBP). A similar observation was found for women in relation to the variables WC vs. SBP and, for men, between BMI vs. Systolic blood pressure (SBP). Also, when analyzing the anthropometric variables (BMI, weight and WC) for all individuals, and by gender, positive correlations with BF% were observed, which ranged from regular to strong, according to the classification proposed in the literature[17] (Table II).

In the assessment of fasting glucose, an average value of 188.8 ± 90.5 mg/dL was observed for the diabetic population participanting in the study (Table I), with no difference between genders (p>0.05). However, it is worth pointing that this result is above the recommended values (100.0 mg/dL), with the highest prevalence of inadequacy observed in males (men: 90.0%; n=18 vs. women: 85.3%; n=29).

The most prevalent comorbidity among diabetics was hypertension (87.0%; n=47), being observed in 88.2% (n=30) of women and 85.0% (n=17) of men. There was statistical difference in SBP between the sexes, but not in DBP [SBP Women: 128.8 ± 12.4 mmHg vs. Men: 136.2 ± 13.2 mmHg, p<0.05; DBP Women: 85.3 mmHg ± 12.5 vs. Men: 82.7 ± 12.4 mmHg, p>0.05]. From a clinical point of view, however, these values demonstrated the control of this disease, as they are within the normal range. The second most prevalent morbidity was obesity (37.1%, n=20). It is worth emphasizing the fact that 16.7% (n=9) of those assessed were not aware of their diabetes diagnosis, despite being registered in the HiperDia program and presenting the fasting blood glucose above 100 mmHg. Moreover, the metabolic syndrome was present in 40.7% (n=22) of individuals.

Table II - Association between anthropometric variables and metabolic profile of patients linked to the HiperDia Program of a Family Health Strategy. Sinop, Mato Grosso, 2013.

Metabolic variables / Anthropometric variables	DBP r (p value)	SBP r (p value)	BF%[a] r (p value)	FG r (p value)
All volunteers				
BMI	0.343 (0.011)	0.105 (0.450)	0.757 (<0.001)	-0.081 (0.559)
Weight	0.323 (0.017)	0.190 (0.168)	0.372 (0.008)	0.095 (0.495)
WC	0.358 (0.008)	0.305 (0.025)	0.399 (0.004)	0.041 (0.767)
Women				
BMI	0.294 (0.091)	0.039 (0.828)	0.797 (<0.001)	-0.208 (0.237)
Weight	0.307 (0.077)	-0.013 (0.941)	0.748 (<0.001)	-0.144 (0.418)
WC	0.368 (0.032)	0.167 (0.375)	0.587 (<0.001)	-0.153 (0.388)
Men				
BMI	0.394 (0.086)	0.509 (0.022)	0.888 (<0.001)	0.246 (0.295)
Weight	0.422 (0.064)	0.356 (0.123)	0.829 (<0.001)	0.898 (0.163)
WC	0.406 (0.076)	0.420 (0.065)	0.894 (<0.001)	0.219 (0.354)

Abbreviations: BMI: body mass index; WC: waist circumference; DBP: diastolic blood pressure; SBP: systolic blood pressure; BF%: body fat percentage; FG: fasting glucose. Pearson's correlation coefficient or [a]Spearman's correlation coefficient (p<0.05).

Regarding lifestyle habits, inactivity was reported by 66.7% (n=36) of individuals, being more prevalent among women (women: 73.5%; n=25 vs men: 55.0%; n=11). Among those who practice physical activities (n=18), walking was the most frequently cited (88.9%; n=16), with mean duration of 1.3 ± 2.0 hours per week.

Additionally, in this study, it was observed that only 5.6% (n=3) of the diabetic patients were smokers. However, several of the patients reported they have smoked at some point in life, but quit this habit when learned of the diagnosis of DM. It was also found that 29.6% (n=16) consumed alcoholic beverages, with values representing 50% (n=10) of males and 30.0% (n=6) of females. The average number of meals of the volunteers was 4.2 ± 0.9 and the daily hours of sleep were 7.7 ± 1.3 h.

DISCUSSION

DM is a disease becaming increasingly prevalent every year, mainly in developing countries. Its human and economic costs are high[3] and can be extended because of the associated complications. Thus, primary care should be the preferred strategy for its control in Brazil, in compliance with the principles of the Unified Health System (*Sistema Único de Saúde - SUS*) of comprehensiveness and universality, through the characterization of populations of patients with DM, in order to better target the health actions[18], especially in areas with scarcity of scientific information on this subject, as is the case of the Northern region of Mato Grosso State.

In this study, there was a higher percentage of diabetic women, similarly to other studies[19,20]. A possible explanation is that women seek medical assistance earlier and more often than men, revealing a greater concern for their health[21,22].

The nutritional status classification by means of the BMI showed that 77.8% of patients were overweight. Similarly, study[23] conducted in Roca Sales, RS, with participants aged over 60 years, revealed that 57.1% (n=64) of participants were overweight and 82.1% (n=92) exhibited a greatly increased risk for metabolic complications, DM among them, showing a relationship between diabetes and increased body weight. This relationship can be explained by a dysfunction of adipose tissue, observed in obesity. Excessive intake of nutrients leads to hypertrophy of the adipocyte and macrophage infiltration and, in the process, the excess free fatty acids are released into the bloodstream, hindering the insulin signaling and consequently causing the resistance to its action. This toxic effect of free fatty acids is due to their accumulation in organs such as muscle, liver and pancreas. Furthermore, adipokines released by the adipose tissue may also hinder the action of insulin[24].

The larger percentage excess weight observed in females (p<0.001) is in accordance with a study that evaluated Brazil's DM load in 2008, which found that 70.6% of DM in women were attributable to excess weight, while a lower percentage (60.3%) was observed among men[25].

The correlation between anthropometric and metabolic variables suggest that excess weight is one of the main risk factors for the onset of metabolic complications, such as increased blood pressure, insulin resistance and cardiovascular diseases (CVDs). It is known that high BMI values correspond to a significant risk factor for the development of diabetes and associated comorbidities (for instance, CVDs and cerebrovascular diseases), which can cause serious damage to the individual's quality of life[26,27], as well as a reduction in life expectancy and a high burden on health, being of utmost importance the implementation of educational measures to reduce its prevalence among the population, as a non-pharmacological treatment option of the disease.

It was also observed a high prevalence of individuals with BF% above average and at risk for diseases associated with obesity (79.6%; n=43). Corroborating these results, a study[28] with participation of 43 diabetic patients showed similar results ($35.3 \pm 6.2\%$ for women and $21.0 \pm 5.3\%$ for men). The higher BF% values (p<0.001) observed in females, when compared to males, can be explained by hormonal changes due to the menopause process (reduction of estrogen concentrations), which lead to the gain of body fat, as well as its redistribution from gluteal/femoral regions to the abdominal region in females[22,28,29]. Moreover, a sedentary lifestyle, combined with physiological changes inherent to the aging process, is directly associated to weight gain, which is in line with the positive correlation found between BF% and weight in this study.

The evaluation of the WC resulted in an average of 94.8 ± 10.5 cm, and found high risk of developing CVDs (increased risk and greatly increased risk for complications associated with obesity), for both sexes (85 5%, n=44). Among men, this percentage was 60.0% (n=12) and, among women, 94.1% (n=32). Another study[30] performed with 19 diabetic patients also found a high percentage of individuals at risk of developing CVDs (57.9%). It is noteworthy that this high percentage of individuals with increased risk and greatly increased risk of developing CVDs can be partially explained by the composition of the sample, which showed a higher number of elderly. It is known that, during the aging process, changes take place in the body composition, with a slow and gradual redistribution of fat, resulting in its centralization and internalization, and storage in larger amounts in intra-abdominal and intramuscular forms, rather than subcutaneously[30,31]. This redistribution of body fat is,

in turn, directly associated with weight and body fat gain and with changes in blood pressure levels, as observed in this study.

Considering all volunteers in this research, it was found regular positive correlation between the anthropometric variables (BMI, weight and WC) and diastolic blood pressure (DBP). A similar observation was found for women, in relation to variables WC vs. DBP. As for men, a positive correlation was observed between BMI vs. systolic blood pressure (SBP). These results demonstrate the need to reduce anthropometric dystrophies observed in this work, since these can have a direct impact on blood pressure levels (a metabolic variable).

Most of the diabetic patients (95.0%) had fasting glucose concentrations (187.8 ± 89.9 mg/dL) above the recommended reference values (100 mg/dL), with higher values observed in male individuals (p>0.05). Similar work[32] confirmed these results, as it revealed that 72.0% of the diabetic patients investigated had glucose concentrations above the recommended level. It is noteworthy that decompensated DM can cause circulatory and inflammatory complications, resulting in vision and kidney problems, amputations and CVDs[33].

Additionally, a high prevalence of hypertension was observed among the evaluated diabetics (87%), regardless of gender. Similarly, in another study[20], hypertension was identified in 80.9% of the diabetic patients evaluated. The coexistence of hypertension, diabetes mellitus and increased WC characterize the metabolic syndrome, which leads to increased risk for macrovascular and microvascular complications, resulting in increased risk for cardiovascular morbidity and mortality from this group of diseases[34,35]. Associated with this fact, the patients' lack of knowledge about the disease can worsen the clinical status and render ineffective any strategy used for its control and treatment.

Recent research in a health facility in the city of Santarém, PA, found that 56.94% of diabetic patients declared not knowing what the disease is, neither its causes (72.25%) and consequences (38.75%), demonstrating possible flaws in the current educational actions for this group, which directly compromise control of the DM[36].

When assessing lifestyle habits, it was observed that physical inactivity was reported by the largest part of the sample studied, with the highest percentage observed among women (73.5%). These results are in line with higher BMI, BF%, WC and SAH percentages found among them, as a sedentary lifestyle favors the accumulation of body fat. The scientific literature reports that a less active lifestyle is a risk factor for the development of complications in diabetic patients[20] and increased mortality. Conversely, the weekly practice of 150 minutes of moderate activity reduces the risk of developing DM, given the reduction of weight, body fat and, consequently, of the WC[37].

The prevalence of smoking and alcohol consumption found in this study was similar to the findings of another study[30], which showed that 10.2% of the assessed diabetic patients used tobacco and 28.6% consumed alcohol. The real mechanisms of action of alcohol on the DM are not well established yet, but some hypotheses have been pointed, such as its relationship with the release of inflammatory markers and its influence on the strenghtening of nutritional problems, seizures, hypoglycemia and neuropathy[27]. As for smoking, it is related to vascular disorders involving endothelial dysfunction, excessive blood coagulation and abnormalities in lipid metabolism[35].

Another important lifestyle variable for the diabetic patient is the division of the daily food intake into a number of meals. Study of 156 diabetic patients found that 54% used to divide food into five to six daily meals[38], which is in line with the recommendations of the Brazilian Society of Diabetes[33]. It is noteworthy that, in the present study, this average was not in accordance with the recommendations, which may be related to excess weight, increased BF% and WC, as well as poor glycemic control of a majority of patients studied. Regarding daily hours of sleep, it is described in the literature that the percentage of individuals who have difficulties to sleep gradually increases with age[39]. However, it is emphasized that, in this study, the average daily amount of sleep was found within the recommendations, from 7 to 8 hours, which can be justified by the fact that the sample is mostly composed of elderly in the age range of 60 to 65 years.

A limitation of this study was its conduction in a single unit of the Family Health Strategy in the city of Sinop, MT, which is responsible for assisting only the diabetics of the central area of the city. However, before the results already observed, and given the relevance of this theme, it is suggested that similar research be conducted in other units, to privide a holistic view of the effectiveness of the actions developed by the HiperDia Program to date. Moreover, it is important to conduct studies to assess the socioeconomic profile, eating habits, adherence to and satisfaction with treatment of individuals linked to the program, since these variables can fill in the gaps left by the findings.

They are also valid proposals for studies that seek to evaluate the diabetics' perception of the disease, since this study identified that some patients are unaware of the diagnosis of DM. This happens because living with a chronic illness, for many individuals, means to be put in a situation of uncertainty towards life. The uncertainty in the context of the disease is a condition that renders them unable to assign a meaning to the events related to the

disease[40], preventing the conducts for its control, as the patient might not understand it, or else, understand it and reject treatment. From the understanding of this perception, educational activities can be better planned and executed, with the aim of clarifying the patient that a healthy living with the disease is possible but, for that to be achieved, some guidelines should be put into practice, that is, should be seen as opportunities for health promotion.

CONCLUSION

A majority of the diabetics submitted to evaluation were overweight and presented high BF%, in addition to increased WC and hyperglycemia. These results, in conjunction with the presence of hypertension and metabolic syndrome, physical inactivity, smoking, alcohol consumption, low number of daily meals, and ignorance of their diagnosis may contribute to the occurrence of more serious complications, resulting in increased social costs and in the health area.

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First author's address:
Suzane Fatima Fuzinato
Faculdade de Ciências Sociais Aplicadas de Sinop - FACISAS
Departamento de Saúde
Estrada Nanci. Km 01, 900
Bairro: Eunice - Caixa Postal 52
CEP: 78.550-970 - Sinop - MT - Brasil
E-mail:suzy_fuzinato@hotmail.com

Mailing address:
Fernanda Cristina Esteves de Oliveira
Faculdade de Ciências Sociais Aplicadas - FACISAS
Departamento de Enfermagem
Estrada Nanci. Km 01, 900
Bairro: Eunice - Caixa Postal 52
CEP: 78.550-970 - Sinop - MT - Brasil
Email: fernandaestevesufv@gmail.com