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Health overview of a group of public university employees in São Paulo: metabolic syndrome, anthropometric indices, and dietary adequacy

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Abstract

Obesity, recognized as a public health issue, is associated with an increased risk of cardiovascular diseases, high blood pressure, insulin resistance, type II diabetes, dyslipidemia, and metabolic syndrome. Coupled with a sedentary lifestyle and inadequate diet, elevated body mass index, waist circumference, and waist-to-height ratio have been observed. This study aimed to characterize the Metabolic Syndrome profile in adults (89 women and 46 men) using anthropometric indices, biochemical data, and dietary adequacy. This descriptive epidemiological study was conducted with 135 non-teaching staff members, including basic, technical, and higher categories, at a public university in Sao Paulo. Sociodemographic data, dietary surveys, weight, height, waist circumference, blood pressure measurements, and biochemical tests (glucose, triglycerides, and High-density lipoprotein-c) were collected. Results: 36% of participants were overweight, 28% were obese, with 62.0% of the sample showing altered biochemical parameters. The prevalence of Metabolic Syndrome was 13.3% in men and 19.2% in women. In the waist-to-height ratio, 81% had cardiovascular or metabolic disease risk range indices. An inadequate diet across all three macronutrients was observed in 34.9% of participants with altered body mass index and 37.0% with altered waist circumference. The results revealed that characterizing metabolic syndrome with the evaluated parameters and dietary analysis provides insights that guide actions for programs, even within university institutions and those connected to the health field.

Keywords: Metabolic Syndrome. Body Mass Index. Waist Circumference. Waist-to-Height Ratio. Dietary Adequacy.

INTRODUCTION

A sedentary lifestyle, inadequate diet, altered anthropometric indices, and biochemical patterns are associated with obesity and the so-called Metabolic Syndrome (MS). Globally, approximately 70% of the population is considered sedentary[1]. In Brazil, this percentage reaches 80% of adults, according to IBGE - Brazilian Institute of Geography and Statistics[2] data from 2011, and this percentage may be even higher in the ongoing census results.

According to studies conducted by the Ministry of Health - Vigitel 2006-2020 (Surveillance of risk and protection factors for chronic diseases by telephone survey)[3], in the assessment of physical activity practice

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in 2009, it was identified that adults aged 18 and over up to 65 and over (16.3% of men and 15.6% of women) are physically inactive. By 2016, there was a reduction to 12.2% among men and 14.9% among women, indicating an improvement in the parameter of physical activity in this group.

The increase in the prevalence of obesity in the global and Brazilian populations, in the face of this context of physical inactivity and calorie-rich diets, has increasingly become a public health problem. It is associated with a higher risk of cardiovascular diseases (CVDs) and factors such as systemic arterial hypertension (SAH), insulin resistance, type II diabetes mellitus (DM2), dyslipidemia, and metabolic syndrome (MS)[4].

The promotion of healthy habits through nutritional education has been recommended as a strategy to reduce the incidence of NCDs - chronic non-communicable diseases, including MS. This promotion includes encouraging the consumption of diets rich in fruits, vegetables, and grains as part of dietary balance, thereby contributing to disease prevention[5].

MS is recognized as the manifestation of these associated organic dysfunctions[6,7], and its prevalence in the global population is around 20% to 25%, affecting men and women of older ages[8].

With the goal of early identification of individuals at risk of developing type 2 diabetes mellitus and cardiovascular diseases, diagnostic criteria for MS were proposed by the World Health Organization (WHO) as early as the late 1990s[9]. In 2001, clinical and laboratory criteria for diagnosing MS were defined by the Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults[10]. Additionally, in 2006, central obesity was emphasized by the International Diabetes Federation (IDF) in redefining the standards for MS[11].

According to the literature, health risks are higher in the context of MS. For instance, overall mortality may increase by about 1.5 times and cardiovascular mortality by 2.5 times[12].

In evaluating the nutritional status, which includes anthropometric assessment of populations, the Body Mass Index (BMI) is used to examine the association between obesity and various health issues[13]. This method is widely used due to its easy handling and low cost. However, there are limitations in its use, as it does not provide precise results for diagnosing body composition, which can be affected by factors such as sex, skin color, and age[14]. BMI does not provide information about body fat distribution, a fact highlighted by authors Witt & Bush[15] in their study, where despite low body fat, BMI was elevated.

Among indicators of abdominal adiposity, the Waist-to-Height Ratio (WHtR) has also been widely used due to its ease of measurement and calculation[16]. In this anthropometric parameter, the waist circumference reflects obesity, while height remains constant in adults, allowing for comparison in the general population[17]. SAH and altered blood pressure have been observed in some studies using the WHtR indicator[18,19].

In a study by Taing *et al.*[19], conducted with 7601 participants aged 18 to 59 years, associating anthropometric indices, blood pressure, and SAH, it was observed that a 10-centimeter increase in waist circumference was positively correlated with a 4mmHg increase in blood pressure. They concluded that central adiposity better-reflected blood pressure and SAH than overall adiposity.

In detecting organic dysfunctions such as SAH and MS, Rodrigues *et al.*[20] state in a cross-sectional study conducted with 1662 individuals aged 25 to 64 years that the WHtR showed better effectiveness than the BMI.

In this regard, it is known that prevention

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is crucial to avoid health issues, especially among working adults who can develop conditions ranging from obesity, diabetes mellitus, and SAH to MS. Some activities can promote sedentary behavior, such as working in enclosed environments and using computers for long hours a day. Ideally, individuals should walk and exercise through stretching every two hours. To prevent further health damage and MS, it is desirable to conduct projects and studies to improve knowledge and empower individuals to address health deterioration caused by their activities.

This study aimed to assess nutritional status through parameters of dietary consumption, anthropometry, and biochemical analyses, as well as to characterize the profile of Metabolic Syndrome according to the IDF[11] definition among adult employees of a public university in Sao Paulo, SP.

METHODOLOGY

This is a descriptive epidemiological study based on data from the extension project 'Healthcare Attention to Non-Teaching Staff Members of a Public University in the State of São Paulo,' conducted with employees from the functional categories: basic, technical, and higher levels from 2016 to 2018. The Institutional Research Ethics Committee approved the project under approval number 516.520 on October 25, 2013.

Participants were invited through letters outlining the study's objectives and methodology. The exclusion criterion was the non-acceptance of the informed consent form for the research. The studied population comprised 135 employees, representing 73% of the Institution's workforce. The occupational levels of these employees encompassed 28 in higher-level positions, 69 in technical roles, and 38 in basic posts (administrative assistants, general services, laboratory technicians, and drivers). Out of 184 employees, there were 20 refusals, 22 cases of the Voluntary Resignation Program (VRP), five medical leaves, and two sabbatical leaves.

Data collection took place from 2016 to 2017 and included sociodemographic information (gender, age, marital status, family income, education) and nutritional assessment[21] encompassing anthropometric data, dietary consumption, and biochemical parameters. Trained nutritionists conducted data on consumption and anthropometric measurements.

Anthropometry:

Weight, height, BMI (body mass index), waist circumference (WC), and waist-to-height ratio (WHtR) were used to assess the nutritional status. For weight measurement, the Micheletti digital scale with a capacity of 200 kg and a precision of 1g was used, and participants were weighed without shoes and heavy clothing. The height was measured using a fixed stadiometer (Sanny® brand) with a precision of 0.1 cm. Participants were instructed to stand with their arms alongside their body, heels, calves, hips, shoulders, and head, touching the stadiometer while looking straight ahead (Frankfurt plane)[21,22]. The BMI (weight (kg) / height (m^2)) was classified using adult criteria according to WHO[23] and the Ministry of Health[24] (Table 1).

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Table 1 – Nutritional Status for Adults, according to BMI. Sao Paulo, Brazil, 2018.

Classification	BMI (Kg/m^2) – adults*
Underweight	< 18.5
Normal weight	18.5 < 25.0
Risk for obesity	25.0 < 30.0
Obesity class I	30.0 < 35.0
Obesity class II	35.0 < 40.0
Obesity class III	≥ 40.0

Source: 2000, World Health Organization[23]; 2004, Ministério da Saúde-SISVAN[24]

The WC was measured at the midpoint between the iliac crest and the outer face of the last rib, and its result was in centimeters. For WC measurement, an inelastic, flexible, and self-retracting fiberglass tape measure (Skinfold Bioimpedance Tape - SBT), scale from 0 to 150 cm, with a precision of 0.1 cm, was used. The criteria recommended by IDF[11] were applied: 94 cm for men and 80 cm for women.

The WHtR was obtained by dividing waist circumference by height, where WC indicates abdominal obesity and height remains constant in adults[17]. The obtained values were stratified into three categories: 0.40 to 0.44 (lowest fat percentage, below the risk threshold); 0.45 to 0.50 (moderate risk); 0.50 to 0.56 (above the risk threshold), according to Fontes *et al.*[16].

Dietary survey:

The selected dietary survey method was the 24-hour recall, which involves obtaining the food consumption over the 24 hours of the previous day before the survey, including meals such as breakfast, snack, lunch, afternoon snack, dinner, and supper[25].

Data from the Brazilian Food Composition Table (BFCT) were used for nutrient analysis, available through the Excel® program (2016). The program provides nutrient data for national and regional foods obtained through representative sampling[26].

The assessment of dietary intake provided data for analyzing the energy supplied by macronutrients and their adequacy to the anthropometric indices of WC and BMI for each participant.

The proportion among them provides the necessary balance for optimal health, established based on epidemiological and intervention studies. The Institute of Medicine (the National Academy of Sciences) of the United States proposed a level of assessment regarding the percentage of energy derived from macronutrients, abbreviated as AMDR (acceptable macronutrient distribution range)[27,28]. This represents an acceptable range of macronutrient distribution expressed as a percentage of carbohydrates, proteins, and lipids in individuals' dietary intake, which are as follows: carbohydrates 45 – 65%; proteins 10 – 35%; lipids 20 – 35%. Each food provides approximate values of 4 Kcal/g for carbohydrates and proteins and 9 Kcal/g for lipids[29,30].

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Chart 1 – Distribution and Classification of Macronutrient Consumption Adequacy per Participant, São Paulo, Brazil, 2018.

Adequacy	Carbohydrates- C	Proteins- P	Lipids- L
Adeq*;CPL.	45-65%	10-35%	20-35%
Adeq.; CL/Inadeq.**-P	45-65%	< 10%	20-35%
Adeq:. CP/Inadeq.-L	45-65%	10-35 %	< 20%
Inadeq.: CPL-	> 65 %	> 35 %	> 35%
Inadeq.:CL/ Adeq.-P	> 65 %	10-35%	< 20%
Inadeq.: CP/Adeq.-L	< 45%	> 35%	20-35 %

Adeq= adequate. **Inadeq=inadequate

Biochemical tests:

The biochemical tests were conducted at the public university's School Health Center laboratory. The characterization of Metabolic Syndrome (SM) was done according to IDF[11], meaning central obesity was considered, defined as waist circumference plus two out of the four following biochemical factors:

1) Fasting blood glucose - glucose was obtained from serum or plasma after a 12-hour fast, and the reference value was equal to or less than 100 mg/dL.

2) Lipid profile, composed of triglycerides and HDL-c (High-density lipoprotein) levels, were measured and classified according to IDF[11]: triglyceride values of 150 mg/dL or less after a 12-hour fast were considered normal; HDL-c levels were classified by gender: for men, values equal to or greater than 40 mg/dL, and for women, values equal to or greater than 50 mg/dL, measured after a 12-hour fast.

3) Nursing professionals took blood pressure measurements from the School Health Center of the public university. According to IDF[11], systolic blood pressure was considered equal to or less than 130 mmHg, and diastolic blood pressure was considered equivalent to or less than 85 mmHg. Medications were not taken into consideration as factors in this study.

RESULTS

Table 2 presents the sociodemographic variables of the 135 non-teaching staff members who comprised the sample, ranging in age from 36 to 63 years, with 89 (66%) women and 46 (24%) men. Regarding the occupational level, 69 (51%) were in technical positions, and staff members with higher education had backgrounds in biomedical sciences (13, 9.7%), arts and humanities (11, 8.2%), and exact sciences (4, 3.0%). Most technical participants were in administrative roles (38.5%).

Regarding occupational distribution by gender, men were largely present (52%) in basic positions. On the other hand, female participants were mostly in technical roles (56%) and higher-level positions (30%), as described in Table 2.

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Table 2 – Distribution among the Levels and Activities of Staff Members at a Public University in Sao Paulo, Brazil, 2016-2018.

Variables	n (%)	n (%)	n (%)
Occupational Level	Higher	Technical	Basic
	28 (20.8%)	69 (51.1%)	38 (28.1%)
Gender			
Men	4 (3.0%)	19 (14.1%)	23 (17.0%)
Women	24(17.8%)	50 (37.0%)	15 (11.1%)
Average Age (min-max)	53.5 (45--62)	46.8 (36-58)	54.1 (45-63)
Work Activity	Biological Sciences 13 (9.7%) Humanities 11 (8.2%) Exact Sciences 4 (3.0%)	Administrative Technician 52 (38.5%) Nursing technician 11 (8.1%) Laboratory Technician 6 (4.4%)	Administrative Assistant 17 (12.6 %) General Services Assistant 13 (9.6%) Laboratory Assistant 3 (2.2%) Driver 5 (3.7%)

N=135

Table 3 presents the results of anthropometric measurements and biochemical analysis of the employees, their relationships with normal or abnormal BMI and WC, and the cardiological aspect through WHtR.

Regarding nutritional status, Table 3 shows that among the 43 (31.8%) individuals with adequate BMI, some already exhibited alterations in biochemical tests: 6 (4.4%) of the men and 7 (5.2%) of the women, particularly in terms of blood glucose and triglycerides. Among the 86 (64%) employees with BMI ≥ 25.0, 49 (36%) were classified as overweight, 38 (28%) as obese, and 22 (16.3%) of them had normal biochemical test results. Notably, in terms of WHtR values, most employees are in a cardiovascular risk pattern.

For WC, 22.2% of men showed values above 94.0 cm, while among women, 52.6%, equal to or greater than 80.0 cm. Among women, altered biochemical test results included: HDL-c in 35 of them (26.1%), triglycerides in 19 (14.2%), blood pressure in 15 (11.2%), and blood glucose in 14 (10.4%). For men, the highest percentage was observed for triglycerides (11.8%), followed by HDL-c and blood pressure indices.

In Table 4, out of the total sample, 99 (73.3%) had an elevated WC, with a higher prevalence among women, 69 (51.1%). However, regarding Metabolic Syndrome (MS), 13.3% of men and 19.2% of women have it. Regarding BMI, there was a gender difference, with a higher number of women, 28 (20.9%) being overweight and 28 (20.7%) being obese. Another noteworthy point is that women's WC was higher than men's, 30 (22.2%). Considering the cutoff points of Rodrigues *et al.*[20] for WHR with Metabolic Syndrome, we found 0.53 for men and 0.54 for women. Under these conditions, we identified 37 men (80.4%) and 59 women (66.3%).

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Table 3 – Biochemical and anthropometric data (BMI, WHtR, and WC) of employees from a public university in São Paulo, Brazil, 2016-2018.

Biochemical data Anthropometric indices	Blood pressure	Glycemia	Triglycerides****	HDL-c*****	Total (N=135; 100%)
BMI*					
Appropriate BMI					**43** (31.8%)
Normal Biochemical	-	-	-	-	30 (22.2 %)
Altered Biochemical					13 (9.6%)
Men 6 (4.4%)	2 (1.5 %)	2 (1.5%)	3 (2.2%)	1 (1.0%)	
Women 7 (5.2%)	1 (1.0%)	4 (3.0%)	4 (3.0%)	2 (1.5%)	
BMI ≥ 25.0					**92** (68.2 %)
Normal Biochemical					22 (16.3%)
Altered Biochemical					70 (51.9 %)
Men 24 (17.8%)	14 (10.4%)	7 (5.2%)	13 (9.6%)	17 (12.6%)	
Women 46 (34.1%)	13 (9.6%)	14 (10.4%)	21 (15.6%)	29 (21.5 %)	
WHtR**					**135** (100%)
0.40 - 0.449	2 (1.5%)	1 (0.7%)	-	-	7 (5.2 %)
0.45 - 0.50	1 (0.7%)	3 (2.2%)	1 (0.7%)	6 (4.5%)	18 (13.4%)
0.51 - 0.56 and above	28 (20.9%)	22 (16.4%)	33 (24.6%)	51 (38.0%)	110 (81.5%)
WC***					
Men ≤ 94.0 cm					**16** (11.9%)
Normal Biochemical	-	-	-	-	9 (6.7%)
Altered Biochemical	2 (1.5%)	2 (1.5%)	-	4 (3.0%)	7 (5.2%)
Men ≥ 94.0 cm					**30** (22.2%)
Normal Biochemical	-	-	-	-	5 (3.7%)
Altered Biochemical	14 (10.5%)	7 (5.2%)	16 (11.8%)	15 (11.1%)	25 (18.5%)
Woman ≤ 80.0 cm					**18** (13.3%)
Normal Biochemical	-	-	-	-	14 (10.3%)
Altered Biochemical	1 (0.7%)	2 (1.5%)	1 (0.7%)	2 (1.5%)	4 (3.0%)
Woman ≥ 80.0 cm					**71** (52.6%)
Normal Biochemical	-	-	-	-	22 (31.0%)
Altered Biochemical	15 (11.2%)	14 (10.4%)	19 (14.2%)	35 (26.1%)	49 (69.0%)

*BMI; Body Mass Index; **WHtR: Waist-to-Height Ratio, ***WC: Waist Circumference, ****HDL: High-Density Lipoprotein, *****TG: Triglycerides

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Table 4 – Description of risk factors associated with Metabolic Syndrome among public university employees in Sao Paulo, Brazil, 2016-2018.

	Men	Women	Total
Risk Factors	N = 46 34.1 %	N = 89 65.9 %	N = 135 100.0 %
High fasting blood glucose	9 (6.7 %)	17 (12.7 %)	26 (19.4 %)
Elevated TG[1]	15 (11.1 %)	20 (14.8%)	35 (25.9 %)
Low HDL-cholesterol[2]	21 (15.7 %)	36 (26.8 %)	57 (42.5 %)
High blood pressure[3]	16 (11.9 %)	15 (11.2 %)	31 (23.1%)
Elevated waist circumference[4]	30 (22.2%)	69 (51.1 %)	99 (73.3%)
Metabolic Syndrome	18 (13.3 %)	26 (19.2 %)	44 (32.6 %)
Overweight BMI[5]	17 (12.7%)	28 (20.9%)	45 (33.6%)
Obesity BMI	13 (9.6%)	28 (20.7%)	41 (30.3%)
Elevated WHtR[6] (with MS)	0.53 (37) 80.4%	0.54 (59) 66.3%	96 (71.1%)

[1]TG: Triglycerides; [2]HDL-c: High-density lipoprotein cholesterol; [3]BP: Blood pressure; [4]WC: Waist circumference; [5]BMI: Body Mass Index; [6]WHtR: Waist-to-Height Ratio.

Table 5 – Distribution of anthropometric assessment and classification of dietary macronutrient adequacy among the employees of a public university in Sao Paulo, Brazil, 2016-2018.

Anthropometric index	BMI[1]		WC[2]	
Classification	Adequate Nº %	Inadequate Nº %	Adequate Nº %	Inadequate Nº %
Adeq[3]. CPL[4]	7 (5.2)	5 (3.7)	5 (3.7)	7 (5.2)
Adeq. CL	8 (5.9)	10 (7.4)	7 (5.2)	11 (8.1)
Adeq. CP	3 (2.2)	6 (4.4)	0 0	8 (5.9)
Inadeq[5]. CPL	20 (14.8)	47 (34.9)	16 (11.9)	50 (37.0)
Inadeq. CL	5 (3.7)	17 (12.6)	4 (3.0)	20 (14.8)
Inadeq. CP	3 (2.2)	4 (3.0)	3 (2.2)	4 (3.0)
TOTAL	46 (34.0)	89 (66.0)	35 (26.0)	100 (74.0)

[1]BMI: Body Mass Index, [2]WC: Waist Circumference, [3]Adeq: Adequate, [4]CPL: C: carbohydrate; P: protein; L: lipid, [5]Inad: Inadequate.

DISCUSSION

The literature reveals that, despite well-defined criteria for the characterization of Metabolic Syndrome, various causal factors, such as sociodemographic variables, can influence its development and make its comparability between populations difficult[31].

The National Survey of the Ministry of Health on surveillance of risk and protective factors for CNCDs showed that, among the 27 state capitals, the prevalence of adults with obesity was 19.8%, with women having a slightly higher prevalence (20.7%) than men (18.7%)[32].

In our study, most participants exhibited overweight and obesity, with the highest percentage found among women. It is noteworthy that despite having a normal BMI, elevated biochemical indices are present in both genders, albeit at low but significant rates. Alterations in HDL-c levels among women stand out. Additionally, values of WC exceeding those recommended by IDF[11] were observed in both men and women. Among women whose WC falls within the IDF[11] guidelines, a low biochemical result for HDL-c was noted. Literature indicates that ovarian failure and

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consequent reduction in estrogen levels promote increased visceral fat in women[33]. This aspect might be contributing to the observed outcome.

In women, alterations in blood pressure were present independently of BMI and CC, with the highest occurrence observed in those with measurements above 80.0 cm. Interestingly, this prevalence was slightly higher than that in men. Regardless of the diagnostic criteria, elevated blood pressure is the most commonly associated risk component of Metabolic Syndrome. Leão *et al.*[34], in a study on Metabolic Syndrome, conducted among adults in a clinic in Rio de Janeiro, observed that the most frequent isolated components for women were abdominal obesity and elevated blood pressure. For men, high blood pressure and triglycerides were the most prevalent. Pelegrini *et al.*[35] reported that risk factors are distributed heterogeneously in the population. Therefore, in preventing these factors, demographic, socioeconomic, and lifestyle differences must be considered.

The Ministry of Health's Vigitel study from 2006 to 2020 presents results on physical activity in Brazil. Adult men engage in more physical activity than women. Notably, physical inactivity decreased from 16.0% in 2015 to 12.2% in 2016. However, as people age, there is a tendency for the intensity of physical activity to decrease, leading to an increase in CNCDs[3]. Currently, health awareness is prominent for both sexes, spurred by media campaigns, which could contribute to reducing the prevalence of obesity.

One factor that increases the risk of mortality in both men and women is MS[33]. The characterization of MS was done according to IDF[11] criteria, which considers central obesity defined as waist circumference along with two of the biochemical factors. In the present study, fewer participants had MS, with a higher prevalence among women, which aligns with the syndrome classification. This might not have been captured if the parameters of the World Health Organization[9] and the National Cholesterol Education Program – The Adult Treatment Panel III[10] were used, as they are more generic.

Regarding the anthropometric index WHtR, a significant number of participants had values equal to or above 0.51, considered at risk. The WHtR class interval for men and women with MS was 0.53 for men and 0.54 for women. Rodrigues *et al.*[20] observed that WHtR is the best anthropometric index to identify SAH and MS in the general population, regardless of gender. The cutoff points they found were 0.52 and 0.53 for SAH, and 0.53 and 0.54 for MS, for men and women, respectively, which are narrower ranges than those observed in this study.

In the studied group, we identified that individuals without obesity can still have MS or an increased risk of it. This secondary consideration strengthens the argument for having at least two parameters in addition to WC for characterizing Metabolic Syndrome. This contention aligns with the recommendations of IDF[11]. Moreover, when combined with the WHtR, a relatively underutilized index, it provides information about the risk of CVD and MS.

In their review, Browning, Hsieh, and Ashwell highlight evidence that the use of waist-to-height ratio (with a cutoff of 0.5) is a good predictor of diabetes mellitus, CVD, and related risk factors. It can offer more data and relevant clinical information[36].

Adequate diets in terms of carbohydrates, proteins, and lipids were identified in only a few servers with appropriate BMI and WC. However, an excessive inadequacy in all three macronutrients was observed (Table 4) in a large portion of employees with inappropriate BMI and WC. Despite some employees having appropriate BMI and WC values, their diets were classified as inadequate in terms of carbohydrates, proteins, and lipids, with excessive consumption of sweets, biscuits, bread, sodas, fatty meats, and fried foods. This result underscores the importance of assessing the quality of dietary intake to prevent

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developing long-term diseases.

The significance of macronutrients in a diet is linked to the reduction in the incidence of chronic diseases and diseases associated with nutritional deficiencies. Such decreases have implications for public expenditures related to the treatment of these illnesses. Proteins, for instance, play a crucial role in tissue construction and maintenance, enzyme and hormone formation, antibody production, metabolic regulation, and energy supply. Lipids assist in absorbing carotenoids and fat-soluble vitamins such as A, D, E, and K. Finally, carbohydrates provide energy to the body's cells, particularly the glucose-dependent brain[30,37].

The dietary inadequacy observed in this study, involving carbohydrate, protein, and lipid intake concurrently, affected 35% of the participants, with 37% having an elevated WC, some of whom already had characterized MS, with women being more affected, although in lower numbers compared to other studies. High prevalence rates of SM have been observed in studies conducted in different populations worldwide, ranging from 8% to 24% among men and 7% to 46% among women[38]. Brazilian studies adopting the IDF[11] criteria to identify MS showed varying percentages, ranging from 35.7% to 43.2%[39].

The inadequate caloric intake of food, combined with other factors such as low energy expenditure, age, genetic and hormonal factors, and lack of physical activity, as noted by Castanho *et al.*[40], may have contributed to the observed results in the studied sample.

This result complements and confirms data and observations from an intervention study involving 57 basic-level employees. The intervention included nutritional assessment, culinary workshops, and educational materials in the form of pamphlets about nutrition education. The participants' interest and feedback provided valuable insights into their lack of awareness regarding the importance of connecting dietary habits with anthropometric measurements and biochemical results. Despite being within a healthcare institution, participants expressed that such information is not widely disseminated (unpublished data).

CONCLUSION

Metabolic syndrome was present in a portion of the population, indicating patterns of risk for cardiovascular diseases or metabolic issues, with only a small fraction of participants having an adequate and balanced diet. The results demonstrate that characterizing metabolic syndrome using the assessed parameters and dietary analysis establishes a framework of information that guides actions for Nutritional Education programs, even within university institutions affiliated with the field of Health.

The workplace and even the level of knowledge do not guarantee behaviors conducive to health promotion, such as maintaining appropriate anthropometric, biochemical, and dietary standards.

Author Statement CREdiT

Conceptualization: M.E.M.Pinto-e Silva; M.Wheat. Methodology: M.E.M.Pinto-e Silva; M.Wheat. Validation: M.E.M.Pinto-e Silva; M. Wheat; S.A.Kfouri. Statistical Analysis: M.E.M.Pinto-e Silva; M.Wheat; S.A.Kfouri. Formal Analysis: M.E.M.Pinto-e Silva; M.Wheat; S.A.Kfouri. Research: M.E.M.Pinto-e Silva; M.Wheat. Resources: M.Wheat; S.A.Kfouri. Writing-Elaboration of the Original Draft: M.E.M.Pinto-e Silva; M.Wheat. Writing-Revision and Editing: M.E.M Pinto-e Silva; M.Wheat. Visualization: M.E.M.Pinto-e Silva; M.Wheat; S.A.Kfouri. Orientation: M.E.M.Pinto-e Silva; M.Wheat. Project Management: M.E.M.Pinto-e Silva; M.Wheat.

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