



Research Article

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# Antopometric Evaluation of Employees at the Municipal Hospital of Cuiabá-HMC

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To Cite This Article: Rodrigo Poderoso\*, Pedro Poderoso and Drackcyelle Almeida. Antopometric Evaluation of Employees at the Municipal Hospital of Cuiabá-HMC. Am J Biomed Sci & Res. 2023 19(3) AJBSR.MS.ID.002597, DOI: [10.34297/AJBSR.2023.19.002597](https://doi.org/10.34297/AJBSR.2023.19.002597)

Received: 📅 July 06, 2023; Published: 📅 July 10, 2023

## Abstract

**Introduction:** Currently, non-communicable chronic diseases have an important impact on the population's morbidity and mortality, which is influenced by demographic and epidemiological changes, increased life expectancy and the practice of unhealthy habits. Obesity presents itself as a serious public health problem, being considered a risk factor and, at the same time, a chronic disease.

**Objective:** To evaluate the anthropometric profile of collaborators at Hospital Municipal de Cuiabá-HMC. Methodology. The sample had 580 employees, 360 female and 190 males, aged between 20 and 70 years, employees of the HMC. All assessments were carried out in the morning and volunteers were recommended to prepare for the assessment: fasting from food for 8 hours and fasting from alcohol for 48 hours, not practicing physical exercise in the 12 hours prior to the test. Anthropometric assessment included weight, height, waist and hip circumferences to verify data normality. The collected data were age, practice time, weight data, abdominal circumference, hip circumference, height, ICQ, BMI, IAC.

**Results:** The results found according to the references in the literature is that most employees of the Hospital Municipal de Cuiabá are overweight or obese.

**Conclusion:** As a result of our study, and with the whole approach related to it, and in accordance with the literature, most of the collaborators are committed to the development of the metabolic syndrome or chronic degenerative diseases, the intervention of the practice of physical exercise and a diet would be essential for the number of overweight and obese people to change to low-risk metabolic syndrome patterns. waist and hip circumferences to verify data normality. The collected data were age, practice time, weight data, abdominal circumference, hip circumference, height, ICQ, BMI, IAC.

**Keywords:** Nurses, Anthropometry, Obesity

## Introduction

Chronic non-communicable diseases currently have an important impact on the morbidity and mortality of the population, which is influenced by demographic and epidemiological changes, increased life expectancy and the practice of unhealthy habits. Obesity presents itself as a serious public health problem, being considered a risk factor and, at the same time, a chronic disease [1]. The World Health Organization estimated that, in 2016, the rate of overweight

people consumed more than 1.9 billion adults, of which 650 million would be obese, corresponding to 13% of the world's adult population. Regarding children under 5 years of age, the estimate was 41 million [1]. Work is an essential activity for human beings; incorporates the man-nature relationship and the relationship between men and with themselves, which is established through social interaction [2,3]. Seen as a growth factor, personal achievements

or even survival. It can be considered an organizer of social life, although it contemplates paths for the process of cultural, social and economic dominance, and for the submission of the worker to capital, according to historical determinants [4].

The transformations that have occurred in this environment in recent decades have caused changes in the work environment and, depending on the way it has been performed, may be related to wear and tear, worsening health conditions and even generate the illness itself [5]. In the era of globalization, the distribution of work activities, the increase in productivity in the labour market and the rejection of unemployment end up inducing the worker to submit to moral and sexual harassment, accumulation of functions, to achieve professional goals, excessive workload, among others. These factors can contribute to the imbalance of the emotional state, eating pattern, physical activity routine, sleep and, thus, reaching the incident of psychic and metabolic diseases [6].

As a result of these changes in the work environment, there was a concern with the Quality of Life at Work (QWL), which is defined by factors and characteristics present in the work environment. This theme aims to enable (ensure) the needs of workers when carrying out their work activities, with the purpose of acquiring more satisfied, productive people and better-quality services [7]. Specifically, in the case of nursing, which is a technical-scientific profession in which mental activities are used, but also physical activities; if the individual does not have both in perfect harmony, he begins to present health problems that compromise his work activity [8-10].

Obesity is considered a serious public health problem worldwide, affecting men and women of all social classes, ages, and cultures. It constitutes a risk factor for cardiovascular, musculoskeletal, and neoplastic diseases. The prevalence of obesity is increasing among adults in both developed and developing countries. In Brazil, obesity reached between 2010 and 2019 at least 30% of the population. Projections based on national surveys carried out in recent decades estimate that obesity will reach, in 2025, 40% of the population in the United States, 30% in England and 20% in Brazil.<sup>2</sup> Anthropometry is the most used method in the diagnosis of obesity in population studies because it is the cheapest, non-invasive, universally applicable, and well accepted by the population. Among the most used anthropometric indicators are the Body Mass Index (BMI) and Waist Circumference (WC).<sup>3</sup> The practice of physical exercise, in addition to combating a sedentary lifestyle, contributes significantly to maintaining the physical fitness of the elderly. Whether in terms of health or functional capabilities [11]. However, physical exercises may present some limitations for the elderly, due to the physiological changes imposed by the aging process. Water aerobics has some advantages for this population group, with the use of the physical properties of water allowing better performance for the elderly,

Risk factors associated with obesity among workers include social stressors, psychosocial work factors, working hours, night work, and sedentary behaviour [12]. Work-related stress includes

conflicts with colleagues and supervisors, lack of job control, and negative group climate at work [13]. The cited authors studied the influence of social stress among working women on the Body Mass Index (BMI) and the change in BMI over a year. Measures of social stress in the workplace - including job control and conflict with co-workers - were positively correlated with BMI. In addition, the authors observed that increased social stressors at work and reductions in work control increased BMI longitudinally [13]. Body mass index (BMI) and waist circumference (WC) have been widely used in the assessment of excess weight and abdominal obesity; are measures recommended by the World Health Organization [1] and by the National Heart, Lung, and Blood Institute of the National Institute of Health

## Methods

The study complied with the Regulatory Guidelines and Norms for Research Involving Human Beings by opinion (466/2022) and (510/2016) edited by the National Health Commission. Initially, a request was sent to the study site for data collection. That after the authorization of the place that was approved and authorized, the research project was sent to the Ethics Committee in Research with Human Beings of the UNIC University of Cuiabá for the ethical opinion, which was approved by the same institution, all signed the Term of Consent Free and Clarified (TCLE).

All assessments were carried out in the morning and volunteers were recommended to prepare for the assessment: fasting from food for 8 hours and fasting from alcohol for 48 hours, not practicing physical exercise in the 12 hours prior to the test. Anthropometric assessment included weight, height, waist and hip circumferences. Weight was measured on a digital scale with a maximum capacity of 150kg and division of 100g, according to the standards recommended by Jelliffe [14], with barefoot individuals. Height was measured with a stadiometer fixed to a wall without a baseboard, with a length of two meters, divided into centimetres and subdivided into millimetres, with a plastic display and a square attached to one end, according to Jolliffe's 1966 standards. body weight (BMI) was calculated from weight and height measurements using the formula:

Circumferences were obtained with a flexible and inelastic tape, according to the techniques proposed by Callway, *et al.*, [15]. To measure the waist circumference, the tape was placed around the normal waist or in the smallest curvature located between the ribs and the iliac crest, keeping it tight, without compressing the tissues. The reading was taken between one expiration and one inspiration, and the hip circumference was obtained by placing the tape around the hip region, in the area of greatest protuberance, without compressing the skin.

The BAI is calculated by the ratio  $[\text{Hip}/(\text{height} \times \text{height})] - 18$ .

To verify the normality of the age data, the weight, height, and BMI data were normal. Initially, descriptive statistics were performed.

med to obtain mean, standard deviation, 95% confidence intervals, and absolute and relative frequency values. The Mann-Whitney U test was performed to compare non-parametric variables between sexes for. Student's t test was performed to compare parametric variables between genders. For all analyses, a 95% confidence level was adopted ( $p < 0.05$ ). Data were analyzed using SPSS IBM® version 20.0 statistical software [16-20].

## Results

When it comes to epidemiological studies, the most frequently reported is the body mass index or BMI. It represents the most common measure, calculating the ratio between weight in kg by the square of height in meters. It is considered a world standard for analyzing the accumulation of body fat, as it is inexpensive and easy to analyze.

Created in the 19<sup>th</sup> century by the mathematician Lambert

Quételet, the Body Mass Index, known by the acronym BMI, is a simple calculation that allows you to measure whether someone has the ideal weight. It points out if the weight is adequate or if it is under or overweight. To calculate, simply divide weight by height squared. The final number represents how much muscle mass + fat mass + bone mass the person has. With the result, the next step is to interpret it.

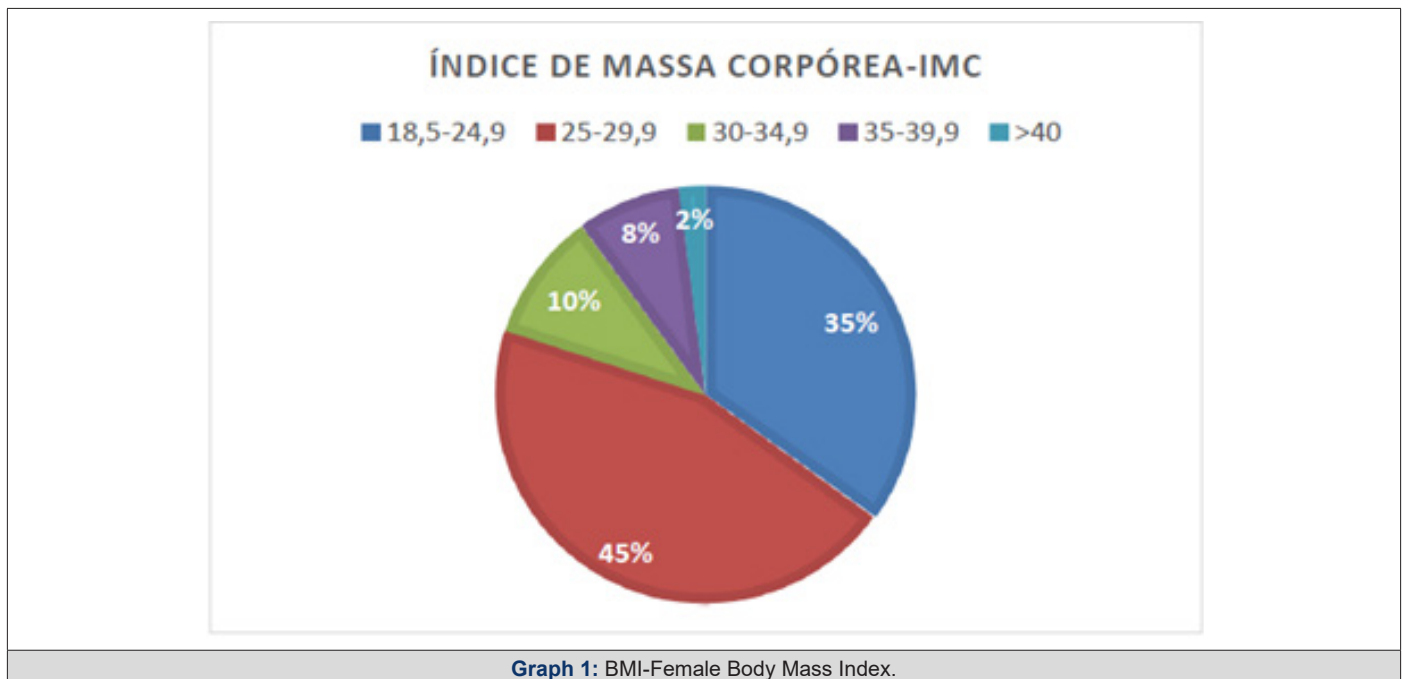
It is used by the WHO to classify the degree of obesity, when its value is above  $30 \text{ kg/m}^2$ . Classification is carried out as follows: grade I obesity, BMI is between 30 and  $34.9 \text{ kg/m}^2$ , grade II obesity, BMI is between 35 and  $39.9 \text{ kg/m}^2$ , grade III obesity, BMI is equal to or above  $40 \text{ kg/m}^2$ , considered morbid obesity.

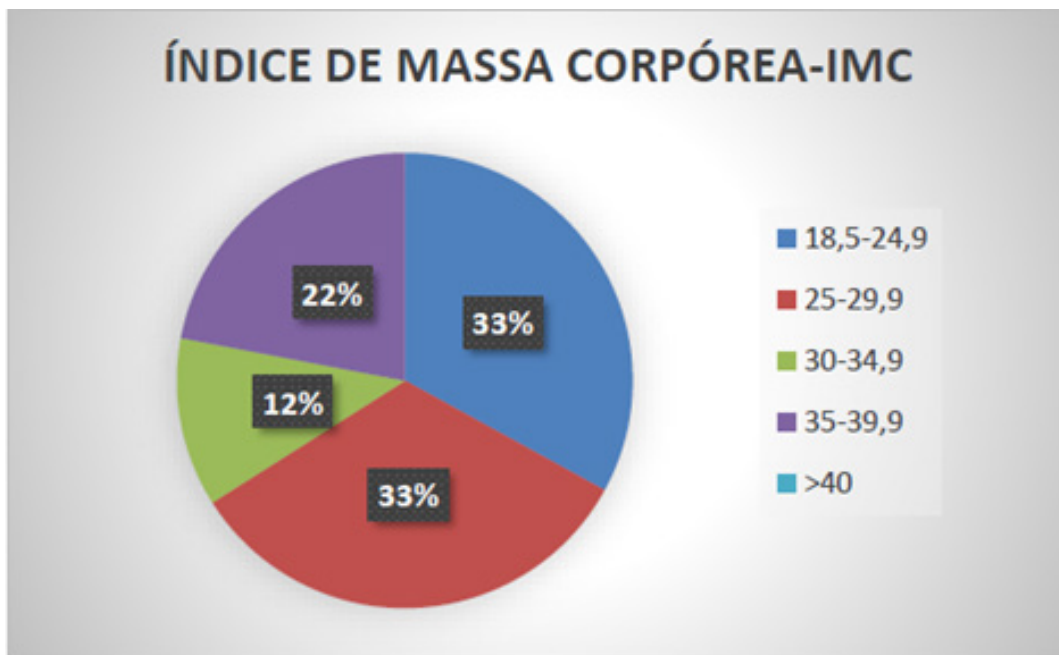
Although BMI does not clearly show one's body composition, it has a good correlation with body mass and a poor correlation with a person's size (Table 1) (Figures 1,2).

**Table 1:** Classification of nutritional status by BMI.

Classification	BMI Kg/m <sup>2</sup> )	Risk of comorbidity
Low weight	< 18.5	Low
Normal weight	18.5-24.9	Average
overweight	> .25	-
pre-obesity	25-29.9	Increased
Grade I obesity	30-34.9	Moderate
Grade II obesity	35-39.9	Serious
Grade III obesity	40	Very serious

Source\*: ABESO, 2016.





Graph 2: BMI - Male Body Mass Index.

According to table 1, the HMC male employees are as follows: 33% healthy, 33% overweight, 12% obesity grade 1 and 22% obesity grade II (considered severe), no employee with obesity grade III (considered morbid) was found.

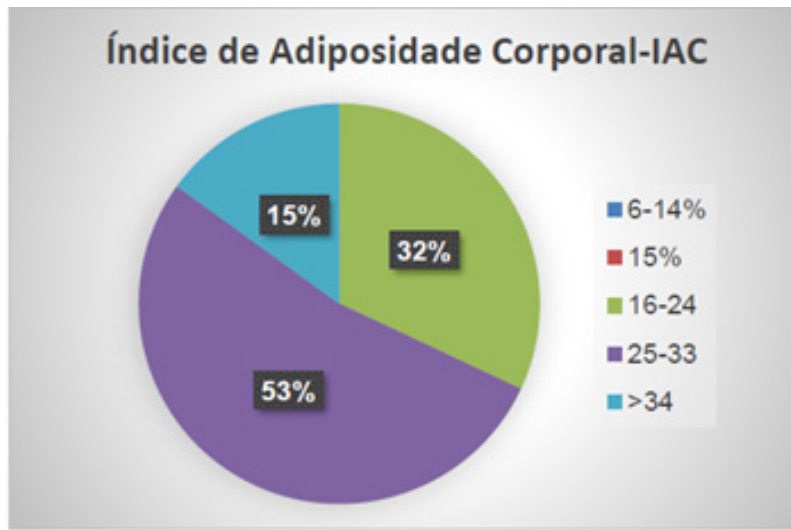
For females, according to Table 1, we find the following classification: 35% Healthy, 45% Overweight, 10% Obesity Grade I, 8% Obesity Grade II (considered severe) and 2% Obesity Grade III (considered morbid) When the recommended body mass index is exceeded, it is because the person may be overweight with a tendency to obesity or already have obesity. If the index is far below the normal range for men and women, it indicates that the person may be in a state of malnutrition, of significant loss of mass. And just like obesity, there are also degrees of thinness (Source: Ministry of Health 2019). According to the 2019 IBGE census, HMC employees, both male and female, are overweight, female employees have a hi-

gher prevalence of overweight compared to males. Considering the limitations presented by the BMI to estimate body adiposity and the absence of an index that would directly, simply, objectively and safely identify the percentage of total body fat, Bergman, et al., apud Segheto [21,22], suggested a new form of assessment called IAC. This index is calculated based on measurements of height and hip circumference, with no need to measure body mass [23-25].

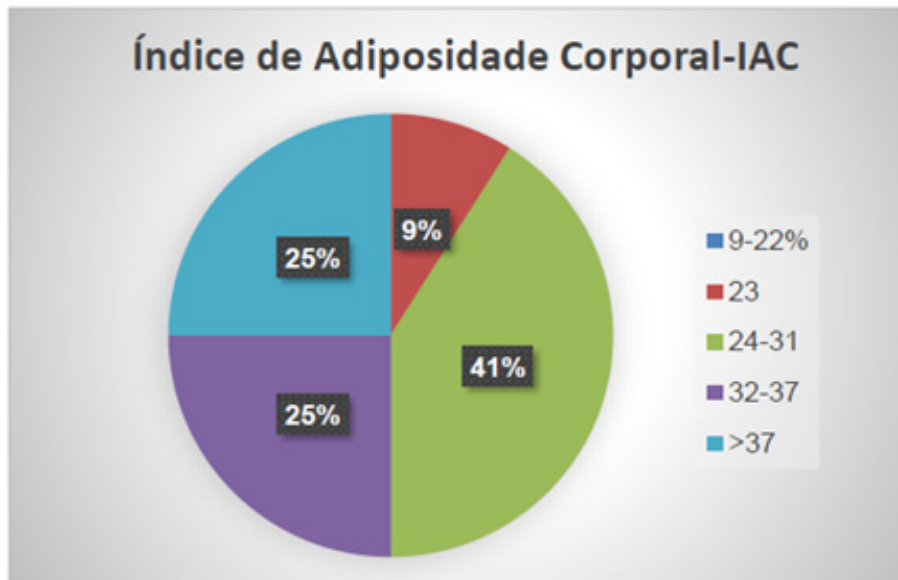
This form of evaluation, according to Jucá [26], the IAC considers the differences in the hips of men and women. In this sense, the use of hip circumference could represent an important conceptual advantage of the BAI. The formula described by Jucá [26] shows that the BAI formula is a little more complex, considering that it considers hip circumference and height, being represented by the following equation:  $[\text{Hip}/(\text{height} \times \sqrt{\text{height}})] - 18$  (Table 2) (Figures 3,4).

Table 2: WHO percentage fat classification.

Classification	Men	Women
Below average	6 to 14%	9 to 22%
Average	15%	23%
Above Average	16 to 24%	24 to 31%
Very high	25% to 33%	32% to 37%
Obese	➤ 34%	➤ 37%



Graph 3: IAC-Body Adiposity Index Masculine.



Graph 4: IAC-Body Adiposity Index feminine.

The BAI is calculated by the ratio  $[\text{Hip}/(\text{height} \times \text{height})]-18$ . A healthy CAI for women ranges from 21 to 32; 33 to 38 indicates overweight and values above 38 are considered cases of obesity. Already healthy men should be between the range of 8 and 20; from 21 to 25 are considered overweight, and from 25 onwards, obese. According to Table 2 and comparing it to Table 3, we find that the percentage of fat among HMC male employees is 32% above average, 53% very high and 15% obese. Concerning the increase in the % of fat for the collaborators that there is a tendency of the development of the metabolic syndrome. Comparing Table 2 with Table 4 for females we find the following result, 9% average 41% above average 25% very tall and 25% obese. In the present study, we found that 50% of female employees are overweight and obese, a worrying factor for the development of metabolic syndrome. The

relationship between gynecoid and android body fat distribution patterns and the prevalence of chronic diseases was first described by Vague in 1956[27]. In 1984, Larsson, et al., published a classic study showing that central body fat distribution better predicts the cardiovascular risk than excess weight per se. A simple and very revealing measurement is the abdominal circumference, which is taken with a measuring tape around the abdomen. According to the World Health Organization, ideal measurements for this region of the body are between 102 cm for men and 88 cm for women [28-32].

These authors used the waist/hip ratio to predict cardiovascular risk. Approximately 10 years after the publication by Larsson and collaborators, studies by Lean and collaborators were publi-

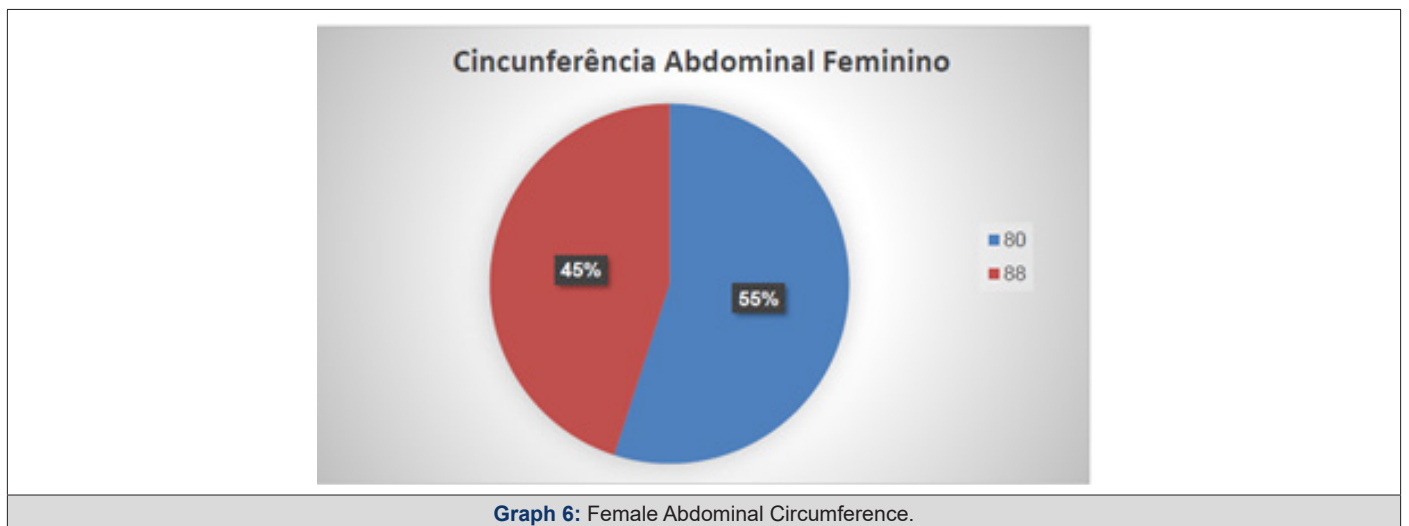
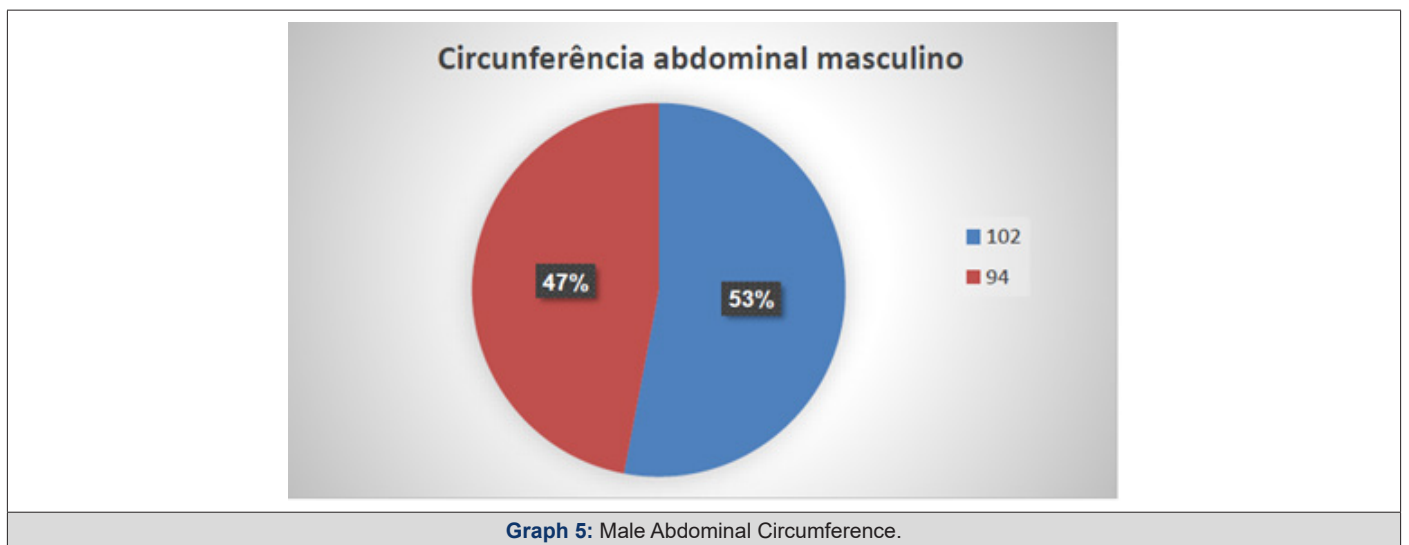
shed, confirming what other studies had already pointed out, that simple waist circumference (WC) represented a risk for chronic disease. *Lean, et al.*, (1995) proposed cutoff points of 80 and 88 cm for women and 94 and 102 cm for men, characterizing risk (level 1) and increased risk (level 2). Based on these references, many studies were developed in different parts of the planet and evidence of

an association between abdominal obesity and a higher prevalence of morbidities has been confirmed. The measurement of WC, as it is recognized as an important and simple indicator of central obesity and risk for chronic diseases, is therefore considered in the diagnosis of the metabolic syndrome [33,34] (Table 3) (Figures 5,6).

**Table 3:** Waist circumference.

Sex	Risk of Metabolic Complications Associated with Obesity	
	high	high fine
Man	≥94 cm	≥102 cm
Woman	≥ 80 cm	≥ 88 cm

Source\*: OMS, 1998



Following the reference of Table 3 of the WHO - World Health Organization, we found male employees with 47% risk factor and 53% at risk breastfeeding, among female employees we found that 55% are in the risk group and 45% in the increased risk. In evaluating these protocols, we found that there is a high level of risk for both groups. Abdominal obesity affects more women than men. This data is worrying, since overweight is considered a public health problem with a growing tendency. This variable deserves at-

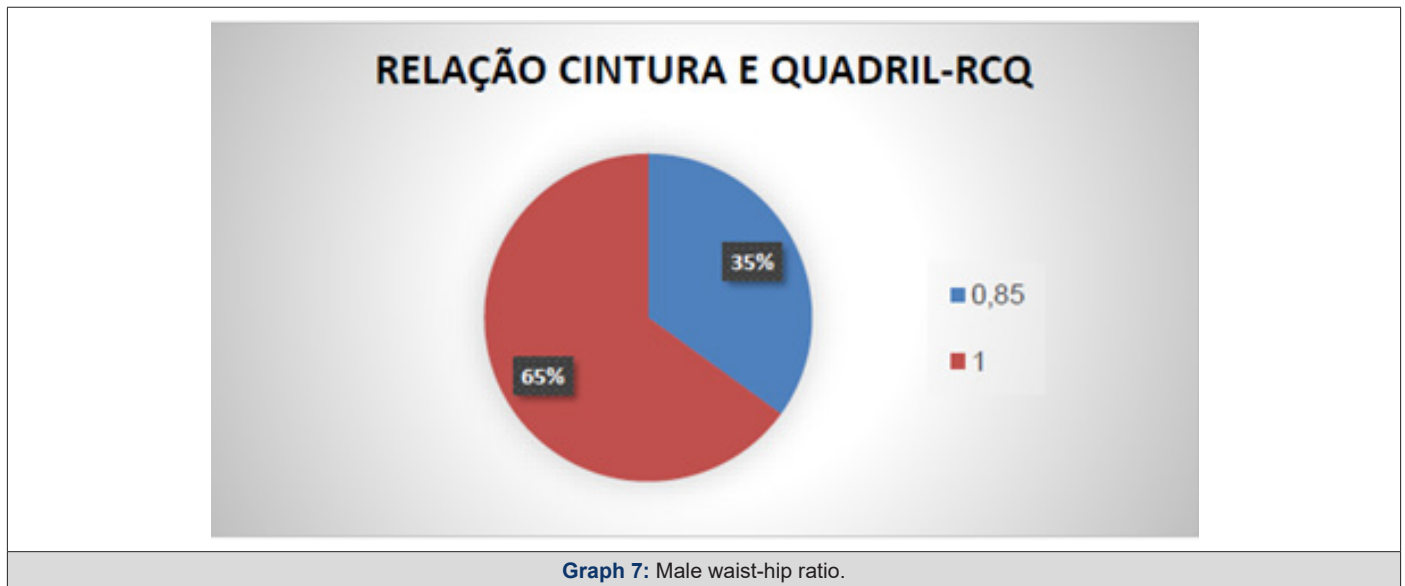
lating these protocols, we found that there is a high level of risk for both groups. Abdominal obesity affects more women than men. This data is worrying, since overweight is considered a public health problem with a growing tendency. This variable deserves at-

tention, since excess weight and waist circumference are included in the risk factors for CVD and for chronic degenerative diseases. The ICQ is used as an indicator or measure of a person's health, and the risk of developing serious adverse health conditions. Research shows that apple-shaped people (with more weight around the waist) face more health risks than pear-shaped bodies, who carry more weight around the hips. ICQ is used as a measure of obesity, which in turn is a possible indicator of other more serious health

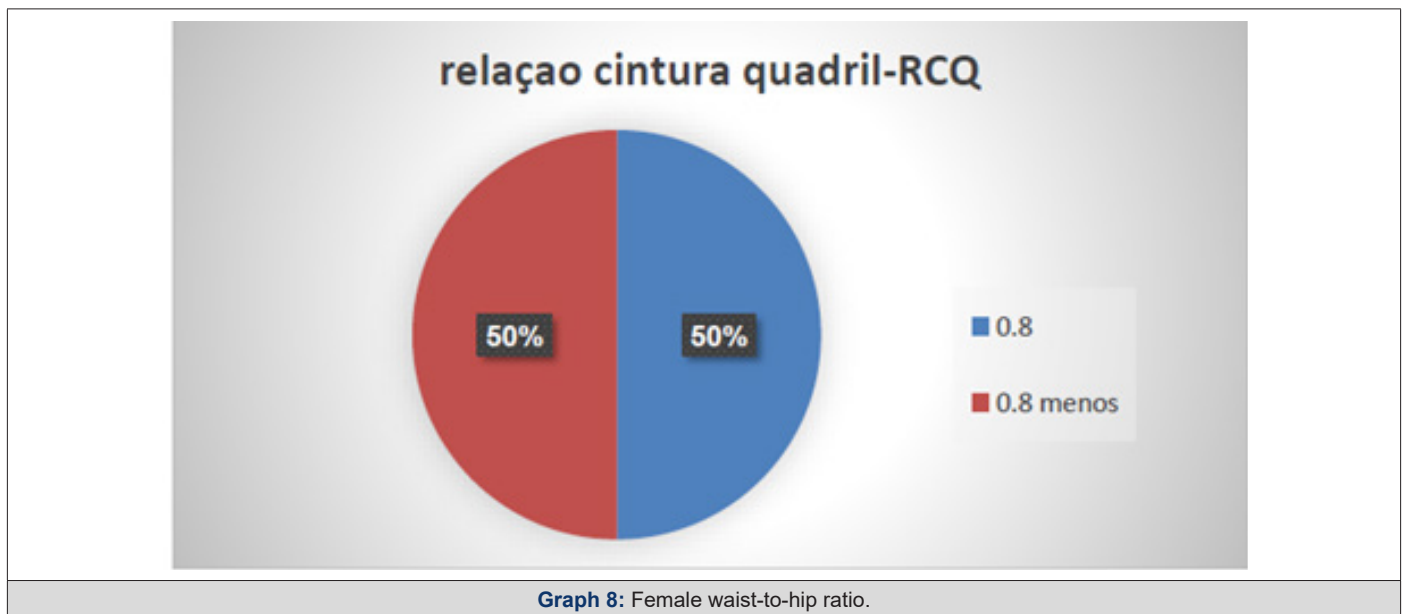
risks. WHO STEPS says that abdominal obesity is defined as a waist-to-hip ratio above 0.90 for men and 0.85 for women [35-39] (Table 4) (Figures 7,8).

**Table 4:** WAIST-HIPS RATIO (WHR).

Masculine	Feminine
> 0.90	> 0.85



**Graph 7:** Male waist-hip ratio.



**Graph 8:** Female waist-to-hip ratio.

Analysing the data, we found that both groups have an increased risk of developing the metabolic syndrome. This data is worrying, since overweight is considered a public health problem with a growing trend, especially in nurses. This variable deserves attention since excess weight and WHR are included in the risk factors for CVD and for chronic degenerative diseases [40-42].

### Discussion

The profile of overweight and obesity in nursing workers in intensive care and emergency units, which showed a high percentage of overweight and obesity in the investigated workers, where changes in lifestyle, mainly the inclusion of a healthy diet and the practi-

ce of physical exercises are important and necessary measures for the prevention and control of cardiovascular diseases, considering the growing increase in overweight and obesity in this society.

According to Hoffmeister and Sousa [43], the classification into different groups as a result of the BMI calculation is important in view of the "high obesity rate", which is present among Brazilian children and adolescents and has as causes main ones: "indulgence, in which they do not practice physical activities and the excessive use of electronic equipment, mainly caused by a sedentary lifestyle" In this perspective, the BMI values can be used both to diagnose overweight and obesity and to diagnose chronic malnutrition, in the same way when obtaining the BMI values, which classify the percentage of fat in: risk (high body fat), excess of fat, moderately lean, lean, ultra lean, risk (low body fat). These studies, however, are contaminated by the influence of factors such as smoking, pre-existing diseases, recent weight loss, small number of participants and short observation period. In addition, BMI is an imprecise parameter, because it does not allow discriminating whether excess weight is linked to the exuberance of fatty tissue or muscle hypertrophy. It also does not allow for differentiating whether the adipose tissue is more concentrated in the abdomen-a higher risk situation-or in the buttocks and thighs, less threatening locations. These limitations reduce the accuracy of BMI in identifying those most likely to develop chronic diseases, such as cardiovascular, diabetes and cancer.

The accumulation of fat in the abdominal region does not only involve aesthetic issues, but it is also directly related to the deposition of adipose tissue inside the abdominal cavity, a characteristic associated with increased overall mortality. The fat present in the buttocks or thighs has a less harmful metabolic effect. The largest study ever carried out on the influence of waist circumference on population mortality, in the various BMI ranges, has just been published by James Cernan and collaborators of the Mayo Clinic, in the United States. There is evidence that moderate physical activity combined with less caloric diets causes metabolic changes capable of preventing the onset of diseases such as diabetes, high blood pressure, heart attacks and strokes, even when body weight loss is less than 3%. Eleven prospective studies conducted among 650,000 participants were evaluated. In each of the four BMI ranges-undernourished, healthy weight, overweight and obese-participants were divided into six subgroups, separated by 5 cm increments in waist circumference. The mortality rates of each subgroup were compared with those in which the participants had the smallest waist circumference (within that BMI range). During the observation period, 78,000 deaths occurred. In both men and women, waist circumference measurement was strongly linked to overall mortality. Compared to men with a circumference smaller than 90 cm, those measuring 110 cm or more had a 52% higher mortality. Women measuring 95 cm or more had 80% higher mortality than those with a circumference less than 70 cm. For every 5 cm increase in abdominal circumference, there was a 7% increase in male mortality and a 9% increase in female mortality, data that was repeated in all BMI ranges, with the exception of those below 20 kg/m<sup>2</sup>, in men.

The association was most pronounced among 20- to 59-year-olds but was documented even among 70- to 84-year-olds [44-54].

Compared with the subgroup with the smallest waist circumference, men with the largest circumference lost approximately 3 years of life; in women, the loss was 5 years. The most evident association was with respiratory and cardiovascular diseases; the relationship with cancer deaths was less clear, although significant. There is evidence that moderate physical activity combined with less caloric diets causes metabolic changes capable of preventing the onset of diseases such as diabetes, arterial hypertension, heart attacks It is strokes, even when body weight loss is less than 3%. ICQ is used as a more efficient predictor of mortality in older people than waist circumference or BMI [55] If obesity is redefined using ICQ instead of BMI, the proportion of people categorized as at risk of attack around the world increases by three times [56] The body fat rate is considered to be an even more accurate measure of relative weight. Of these three measurements, only the waist-hip ratio takes differences in body structure into account [57-59]. So, it is possible for two women to have vastly different body mass indices but the same waist and hip indices, or to have the same body mass indices but vastly different waist and hip indices. Even in ancient civilizations, globally, female representations are more frequent in variations of 0.6 to 0.7 for ICQ, suggesting a preference for low ICQ [60]. ICQ has been shown to be a better predictor of cardiovascular disease than waist circumference and body mass index [61] However, other studies have shown that waist circumference, not ICQ, is a good indicator of risk factors cardiovascular, [62] Body fat distribution [63] and hypertension in type 2 diabetes [64].

## Conclusion

As a result of our study, and with the entire approach related to it, and in agreement with the literature, anthropometric assessment is of great importance to verify the level of obesity, and the association with metabolic syndrome. The intervention of the practice of physical exercise to improve the profile of HMC employees is extremely important to raise awareness of the practice of physical exercise, to improve the anthropometric profile as well as improve their quality of life.

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