ORIGINALES

Association between anxiety levels and depression in adults with obesity

Associação entre níveis de ansiedade e depressão em adultos com obesidade
Asociación entre niveles de ansiedad y depresión en adultos con obesidad

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ABSTRACT:
Objective: To verify the association between levels of anxiety and depression of participants in a Multidisciplinary Program for the Treatment of Obesity, with anthropometric variables; body composition; biochemical and hemodynamic parameters; and health-related physical fitness.
Method: Quantitative, correlational, cross-sectional study carried out with adults who participated in the Multidisciplinary Program for the Treatment of Obesity in a municipality in the Northwest of Paraná. For data collection, anthropometric measurements were applied in July 2021; body composition; biochemical and hemodynamic parameters; health-related physical fitness tests; and scale to assess levels of anxiety and depression.
Results: 116 individuals participated in the study, 87.94% female, 12.06% male, with a mean age of 40 years. There was a considerable positive correlation between hemoglobin and hematocrit; total and LDL cholesterol; glucose and HbA1C1; weight and BMI; weight and abdominal circumference; weight and waist circumference; BMI and abdominal circumference; BMI and waist circumference; as well as anxiety and depression.
Conclusion: The levels of anxiety and depression of the participants of the Multidisciplinary Program for the Treatment of Obesity did not present a significant correlation with the variables of anthropometric measurements; body composition; biochemical and hemodynamic parameters; and health-related physical fitness assessment tests.

Keywords: Obesity; Anxiety; Depression.

RESUMO:
Objetivo: Verificar associação entre níveis de ansiedade e depressão de participantes de um Programa Multiprofissional de Tratamento da Obesidade, com variáveis antropométricas; composição corporal; parâmetros bioquímicos e hemodinâmicos; e aptidão física relacionada à saúde.
Método: Estudo transversal, realizado com adultos que participaram do programa em município do Noroeste do Paraná. Para a coleta de dados, aplicou-se em julho de 2021, avaliações de medidas antropométricas; composição corporal; parâmetros bioquímicos e hemodinâmicos; testes de aptidão física relacionada à saúde; e escala para avaliar os níveis de ansiedade e depressão.
Resultados: Participaram do estudo 116 indivíduos, sendo 87,94% do sexo feminino, 12,06% do sexo masculino, com média de idade de 40 anos. Houve correlação positiva entre hemoglobinas e hematócritos; colesterol total e LDL; glicose e HbA1C1; peso, IMC e circunferências abdominal e de cintura; além de ansiedade e depressão.
Conclusão: Os níveis de ansiedade e depressão não apresentaram correlação significativa com as variáveis estudadas.

Palavras-chave: Obesidade; Ansiedade; Depressão.

RESUMEN:
Objetivo: Verificar la asociación entre los niveles de ansiedad y depresión en participantes de un Programa Multidisciplinario para el Tratamiento de la Obesidad, con variables antropométricas; composición corporal; parámetros bioquímicos y hemodinámicos; y aptitud física relacionada con la salud.
Método: Estudio cuantitativo, correlacional, transversal, realizado con adultos participantes del Programa Multidisciplinario de Tratamiento de la Obesidad en un municipio del Noroeste de Paraná. Para la recolección de datos se aplicaron medidas antropométricas en julio de 2021; composición corporal; parámetros bioquímicos y hemodinámicos; pruebas de aptitud física relacionadas con la salud; y escala para evaluar los niveles de ansiedad y depresión.
Resultados: Participaron del estudio 116 individuos, 87,94% mujeres, 12,06% hombres, con una edad media de 40 años. Hubo una correlación positiva considerable entre la hemoglobina y el hematocrito; colesterol total y LDL; glucosa y HbA1C1; peso e IMC; peso y perímetro abdominal; peso y circunferencia de la cintura; IMC y perímetro abdominal; IMC y perímetro de cintura; así como ansiedad y depresión.
Conclusión: Los niveles de ansiedad y depresión de los participantes de Programa Multidisciplinario para el Tratamiento de la Obesidad no se correlacionaron significativamente con las variables de medición antropométricas; composición corporal; parámetros bioquímicos y hemodinámicos; y pruebas de evaluación de la aptitud física relacionadas con la salud.

Palabras clave: Obesidad; Ansiedad; Depresión.

INTRODUCTION

Studies indicate that people with obesity are more likely to develop psychiatric diagnoses[1], especially symptoms of depression and anxiety[2], as well as those who have depressive and anxiety disorders have poor eating habits, lack of desire to perform physical activity and adherence to the modifications necessary for the treatment of obesity, thus contributing to gain weight[3].

Although the relationship between depression and anxiety and obesity is a highly complex topic, it is known that stress and inflammation are developed in both diseases, being possible mediators between them[4].

Growing evidence reveals that metabolic and vascular disorders, including inflammation, hypertension, insulin, and leptin resistance, are identified as the main risks for the development of depression and anxiety. Research also highlights the important contribution of the different effects of obesity and its impact on the neuroimmune state and neural circuits that control mood and emotional states[5].

Obesity negatively affects adult health, increasing the prevalence of other comorbidities and complications, including: high cholesterol levels, stress, eating disorders, diabetes, high blood pressure, vascular and mental diseases, such as depression and anxiety[6]. The sum of these pathologies has a significant impact on health, reducing quality of life and generating mental disorders[7].

Therefore, the question arises: Are the levels of anxiety and depression of individuals with obesity, enrolled in a Multiprofessional Obesity Treatment Program (MOTP), related to anthropometric variables, body composition, hemodynamic and biochemical parameters, and physical fitness?

Thus, the objective of this study was to verify the association between the levels of anxiety and depression of MOTP participants with anthropometric variables; body composition; biochemical and hemodynamic parameters; and health-related physical fitness.

METHOD

A quantitative, correlational, cross-sectional study, carried out with pre-intervention data from a group of adults with obesity who participated in the MOTP in Primary Care in a municipality in the Northwest of Paraná state.

Data were collected in July 2021, considering as inclusion criteria, adult individuals with obesity, following the World Health Organization (WHO) classification criteria, body mass index (BMI) ≥30, who began participating in the MOTP in the year 2021.

All individuals who were registered to begin participating in the MOTP were invited to participate in the study, totaling 116 individuals, with the assessment scheduled in advance, with guidance on preparation for it.

For data collection, anthropometric measurements were assessed; body composition; biochemical and hemodynamic parameters, health-related physical fitness assessment tests (HRPF); and Hospital Anxiety and Depression Scale (HADS) to assess levels of anxiety and depression[8].

Weight was measured using a digital scale weighing up to 200 kilograms (kg), with 100-gram (g) scales. Height was checked with a stadiometer fixed to the wall with an accuracy of 0.1 centimeter (cm). Waist Circumference (WC) and Abdominal Circumference (AC) were measured using a 2-meter (m) anthropometric tape with a precision of 0.1 millimeters (mm)[9]. The analysis of body bioelectrical impedance, using a multifrequency octapolar bioimpedance meter, following the Heyward protocol[10].

The biochemical parameters were carried out through the collection of laboratory tests, after an eight-hour fast, by Nursing technicians and trained nurses from the Municipal Health Department, namely: hemoglobin, hematocrit, leukocytes, platelets, total cholesterol, high-density lipoproteins (HDL), triglycerides, low-density lipoproteins (LDL), fasting blood glucose, glycated hemoglobin (HbA1c), C-reactive protein (CRP), urea and creatinine[11].

Blood pressure was measured using a sphygmomanometer, considering normotensive those whose systolic blood pressure (SBP) and diastolic blood pressure (DBP) measurements were below 140/90 millimeters of mercury (mmHg) according to the Brazilian Guideline of Arterial Hypertension[12].

HRPF was analyzed using BMI, cardiorespiratory fitness (CRF), muscle strength and flexibility. BMI classification was carried out according to the cutoff points established by the WHO, using the formula: BMI = Body mass (kg) / Height² (m). The CRF was analyzed based on the 6-minute walk test (6MWT), where the participant walked as quickly as possible (without running) on a 20-meter path that was marked with cones and a tape measure for 6 minutes. The subjective perception of exertion was recorded after performing the test using the adapted Borg scale. The flexibility of the back of the trunk and legs was analyzed using the Wells bench, where everyone sat facing the bench, placed their feet on the support with their knees extended, raised their arms with their hands placed together, bringing both to forward and pushed the marker as far as possible on the ruler. Dynamic muscular resistance of the lower limbs was measured using the sit-stand test. The handgrip test measured maximal isometric handgrip strength from a dynamometer. Heart rate (HR) and oxygen saturation (SpO2) were checked before the start of the test, at rest, immediately after the test and one minute after stopping the test[13].

The assessment of anxiety and depression levels was measured using the Hospital Anxiety and Depression Scale (HADS), a scale developed by Zigmond and Snaith (1983), consisting of 14 items (7 to assess anxiety and 7 to assess depression). Each item is answered on a nominal scale of 4 positions (0-3), with scores varying between 0 and 21 for each scale. The two scales are classified separately. The analysis of the scores on the two scales occurs as follows: 0 to 7 is considered normal anxiety/depression; 8 to 10 mild anxiety/depression; 11 to 15 moderate anxiety/depression; and 16 to 21 anxiety /severe depression[8].

The data were tabulated in Microsoft Excel 365 Software, version 2301, and descriptive statistics were performed in Software R, version 4.2.2. Categorical variables were analyzed according to absolute and relative frequencies, while the continuous variable age was analyzed according to summary measurements: mean, median and standard deviation. To observe the correlation between the variables, Spearman and Pearson Correlations were applied. Comparisons with $p < 0.05$ were considered significant.

This study is an excerpt from the project entitled "Effect of Nursing consultation in the treatment of obesity" which was approved by the Ethics Committee of the Universidade Estadual do Paraná – UNESPAR, under opinion report number 5.029.243, CAAE no. 51675321.8.0000.9247 and followed all procedures of Resolution no. 466 of December 12, 2012, of the National Health Council, for research involving human beings.

RESULTS

One-hundred and sixteen116 individuals participated in the study; 87.94% female and 12.06% male, with an average age of 40 years.

Regarding body composition variables, in the BMI classification, 25% of patients had grade I obesity; 43.96% had grade II obesity; and 31.04% had grade III obesity. Abdominal circumference (AC) was altered in all individuals, as well as waist circumference (WC). Likewise, the percentage of body fat (%BF) and the percentage of muscle mass (%MM) were also outside the normal range in all cases.

Table 1 presents the descriptive analysis of the participants' biochemical parameters according to normality parameters, where it appears that 92.24% have normal hemoglobin levels while only 7.76% have altered levels. Regarding hematocrits, 77.58% have normal levels and 22.42% have altered levels. When observing leukocytes, 93.96% have levels within the expected range, while 6.04% have levels considered outside the normal range. It was also observed that regarding the platelet count, 93.10% of patients have amounts within the expected range, while 6.90% have an altered amount. When it comes to total cholesterol, 68.96% of patients had desirable levels of this indicator, 22.42% had a borderline level and 8.62% had increased levels. The HDL variable was normal in 96.56% of patients and altered in only 3.44%. In the case of LDL, 38.80% have excellent levels, as well as 38.80% with desirable levels, 13.80% at the borderline level, 6.04% at the high level and 2.58% at the very high level. When checking triglycerides, 72.42% are at desirable levels, 12.94% at borderline levels and 14.66% at high levels. Glucose, when analyzed, can be considered normal in 76.72% of patients and altered in 23.28%. When it comes to glycated hemoglobin, it can be considered normal in 64.66% of cases, in 20.68% of cases a level of pre-diabetes can be identified and in 14.66% a level of diabetes. The analyzed CRP is considered normal in only 31.90% of patients, the other 68.10% have levels outside the normal range. Urea analysis is found to be normal in 100% of patients. Creatinine was normal in 95.68% of patients and altered in only 4.32%.

Table 1. Absolute and relative frequencies of biochemical parameters. Maringá, Paraná, Brazil, 2023

Variables	Categories	n (116)	% (100)
Hemoglobin	Normal	107	92.24
	Altered	9	7.76
Hematocrit	Normal	90	77.58
	Altered	26	22.42
Leukocytes	Normal	109	93.96
	Altered	7	6.04
Platelets	Normal	108	93.10
	Altered	8	6.90
Total cholesterol	Desirable	80	68.96
	Bordeline	26	22.42
	High	10	8.62
HDL-Cholesterol	Normal	112	96.56
	Altered	4	3.44
LDL-Cholesterol	Excellent	45	38.80
	Desirable	45	38.80
	Limítrofe	16	13.80
	High	7	6.04
	Very high	3	2.58
Triglycerides	Desirable	84	72.42
	Borderline	15	12.94
	High	17	14.66

Glucose	Normal	89	76.72
	Alterd	27	23.28
HbA1C	Normal	75	64.66
	Pre-diabetic	24	20.68
	Diabetes	17	14.66
C-Reactive Protein	Normal	37	31.90
	Altered	79	68.10
Urea	Normal	116	100
Creatinine	Normal	111	95.68
	Altered	5	4.32

Source: Research data, 2023.

n – number; % - Percentage; HDL-cholesterol, Cholesterol linked to high-density lipoproteins; LDL-colesterol, Cholesterol linked to low-density lipoproteins; HbA1C- Relevant fraction of glycated hemoglobin.

Table 2 presents the analysis of the absolute and relative frequencies of hemodynamic variables, and 66.38% of patients have normal systolic blood pressure and 33.62% have altered blood pressure, as well as 70.68% have normal diastolic blood pressure and 29 .32% changed. The heart rate is considered normal in 87.94% of patients and altered in 12.06%, results like saturation levels, where 86.20% have normal rates and 13.80% have altered rates.

Table 2. Absolute and relative frequencies of hemodynamic variables.
Maringá, Paraná, Brazil, 2023

Variables	(n) Normal	%	(n) Altered	%
SBP	77	66,38	39	33.62
DBP	82	70,68	34	29.32
Heart rate	102	87,94	14	12.06
SpO2	100	86,20	16	13.80

Source: Research data, 2023.

SBP - Systolic blood pressure; DBP - Diastolic blood pressure; SpO2 - Peripheral oxygen saturation.

Table 3 presents the results of the descriptive statistical analysis regarding HRPF. When the sit-to-stand test was applied, 85.34% showed normal results and 14.66% had altered results. For the sit-and-reach test, the results are divided into 27.58% poor; 5.18% fair; 17.24% average; 11.20% good; and 38.80% excellent. When observing the subjective perception of effort (SPE), it is distributed as follows: 2.64% very mild; 6.14% mild; 7.90% moderate; 28.94% moderate/strong; 39.48% strong; 12.28% very strong; and 2.64% extremely strong. As for the handgrip test (dynamometer), only 24.14% obtained results within the expected range, while 75.86% obtained results outside the normal range. The 6-minute walk test gave 96.56% of patients normal levels and 3.44% altered levels.

Tabela 3. Frequências absolutas e relativas da AFRS. Maringá, Paraná, Brasil, 2023

Variables	Categories	n (116)	% (100)
SST	Altered	17	14.66%
	Normal	99	85.34%
SRT	Poor	32	27.58%
	Fair	6	5.18%
	Average	20	17.24%
	Good	13	11.20%
	Excellent	45	38.80%
SPE	Very mild	3	2.64%
	Mild	7	6.14%
	Moderate	9	7.90%
	Moderate/Strong	33	28.94%
	Strong	45	39.48%
	Very strong	14	12.28%
	Extremely strong	3	2.64%
Dynanometer	Altered	88	75.86%
	Normal	28	24.14%
6MWT	Altered	4	3.44%
	Normal	112	96.56%

Source: Research data, 2023.
n - Number; % - Percentage; SST - Sit-to-stand test; SRT – Sit-and-reach test; SPE - Subjective perception of effort; 6MWT - 6-minute walk test.

Table 4 presents the analysis of the variables level of anxiety and depression, demonstrating that 36.88% of patients have anxiety levels within the normal range, 27.66% have mild anxiety, 26.96% moderate anxiety and 8.52% anxiety severe, in the depression variable 44.28% of patients have normal levels, 26.42% have mild depression, 27.14% have moderate depression and 2.14% severe depression.

**Table 4.** Absolute and relative frequencies of anxiety and depression levels. Maringá, Paraná, Brazil, 2023

Variables	Categories	n (116)	% (100)
Anxiety	Normal	52	36.88%
	Mild	39	27.66%
	Moderate	38	26.96%
	Severe	12	8.52%
Depression	Normal	62	44.28%
	Mild	37	26.42%
	Moderate	38	27.14%
	Severe	3	2.14%

Source: Research data, 2023.

Figure 1 presents the results for the correlation test between all variables present in the study. It appears that there was a considerable positive correlation between hemoglobin and hematocrit, as well as between total cholesterol and LDL. Likewise, the test showed a positive correlation between glucose and HbA1C1, weight and BMI, weight and waist circumference, weight and waist circumference, BMI and abdominal circumference, BMI and waist circumference, in addition to anxiety and depression. There appears to be a positive, but weaker, relationship between height and dynamometer. The positive correlation in all the cases mentioned above

indicates that, when the levels of one variable increase, consequently the other also increases, according to the strength of the correlation between them.

Figure 1: Correlation graph between variables.
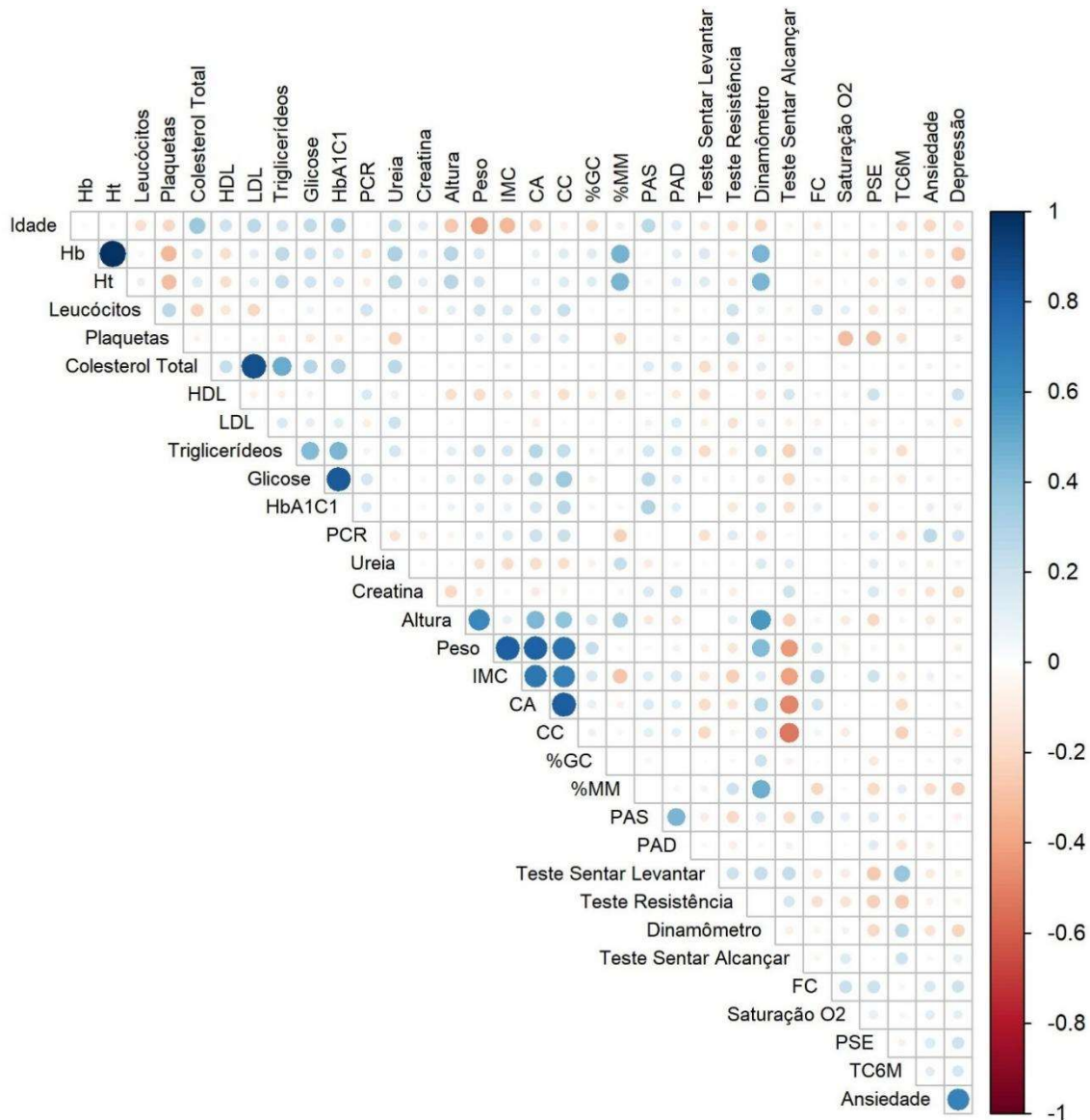
Source: Research data, 2023.

DISCUSSION

The levels of anxiety and depression of MOTP participants did not show a significant correlation with the anthropometric measurement variables; body composition; biochemical and hemodynamic parameters; and HRPF. However, it is important to highlight that there were significant correlations between the other variables, such as: hemoglobin and hematocrit; between total cholesterol and LDL; between glucose and HbA1C1; weight and BMI; weight and abdominal circumference; weight and waist circumference; BMI and abdominal circumference; BMI and waist circumference; in addition to anxiety and depression, indicating an increase in levels of one variable as a consequence of an increase in the other.

The results of this study corroborate a cohort study carried out in Brazil with 2,977 young adults, indicating that this is not an isolated result[14]. Another research carried out in China also did not significantly associate anxiety with the inflammatory markers of obesity. Sociodemographic factors, lifestyle, history of other diseases and the use of medications can interfere with this correlation and the distinction between the research results[15].

It is important to highlight that there are other studies in the literature, which in turn, show the high prevalence of anxiety and depression disorders in obese patients[2,3,16] such as a cohort study carried out with the Norwegian population from a sample of 23,557 adult participants, which demonstrated the association between anxiety, depression and abdominal obesity[17].

Mental disorders have a major impact on the quality of life of those affected, the loss of interest in carrying out daily activities affects self-care, leading to a lack of motivation to practice physical activity and disordered eating behaviors, thus contributing to gain weight. Low self-esteem and emotional suffering are associated with an unhealthy lifestyle, making weight loss difficult[4]. Therefore, monitoring the biochemical parameters of unhealthy individuals is essential.

Blood performs essential functions as it circulates throughout the body, transporting oxygen and nutrients to body tissues. Hemoglobin is responsible for transporting this oxygen, and hematocrit measures the proportion of blood that is made up of red blood cells, so hemoglobin and hematocrit are directly interconnected. The abnormality of the levels of these blood components, more or less, can indicate several problems[18], so controlling these levels in an individual with obesity is necessary, mainly due to their relationship with other chronic diseases, such as diabetes and cardiovascular diseases (CVD), and the general metabolic disorder it causes in the body[19]. This metabolic disorder that obesity causes also interferes with cholesterol levels, which has an important role in the synthesis of hormones, vitamin D and bile salts, in addition to being responsible for the transport of lipids in the plasma aqueous medium. However, when altered, cholesterol increases the risk of morbidity and mortality from CVD, including obesity[20].

Total cholesterol is the sum of its fractions, and logically, an increase in low-density lipoprotein (LDL) implies an increase in cholesterol, however, the monitoring of high-density lipoprotein (HDL) has become evident, due to their collaboration in the prevention of CVD, acting as a cardiovascular protector[21].

In turn, poor diet and physical inactivity associated with mental disorders contribute to increased cholesterol and consequent weight gain. When these individuals use psychotropic medications, these risks increase[22].

WC and AC are important variables in controlling an individual's health, especially those with obesity, since inflammation and an increase in adipose tissue, mainly visceral, caused by obesity, cause an altered glucose metabolism and a lack of insulin receptor response leading to insulin resistance The higher the blood glucose level, the greater the conversion of this glucose into fat by the liver, the greater the increase in the inflammatory process in adipose tissue, the greater the inflammatory response and the greater production and resistance to insulin, making this a never-ending cycle[23,24].

Furthermore, scientific evidence shows that people with anxiety or depression also has an increased risk of metabolic syndrome, which includes obesity, dyslipidemia, high blood pressure and insulin resistance[25].

Weight gain accompanied by increased AC and WC characterize abdominal obesity, which is an important risk factor for CVD, which are the main causes of death worldwide. everal studies link abdominal obesity with CVD, increasingly affecting young people, who, if they do not monitor these risk factors throughout their lives, tend to be increasingly exposed to the occurrence of CVD[26].

WC and AC measurements are combined in the assessment of individuals with obesity, since studies question the use of BMI as the sole criterion for diagnosing obesity, this occurs due to limitations in indicating the percentage of fat and how it is distributed in the body. Currently, there are several other measurements that can provide a better diagnostic parameter, such as AC, WC, waist-to-hip ratio, percentage of body fat and muscle mass measured using bioimpedance devices, and even X-ray exams[27]. However, the WHO and the Ministry of Health still consider BMI as the best diagnostic method considering the ease of measurement, low cost and availability of access to health services[9,28].

Finally, as the nurse is an integral part of the health team and responsible for the care of people with obesity, they must always monitor and monitor all these variables, whether biochemical, hemodynamic, anthropometric, and mental health, to provide care to this population with an emphasis on health promotion, disease prevention and reduction of exposed damage, thus promoting the adoption of healthy habits[29].

The possible limitation of this study was the use of BMI as an index for diagnosing obesity, considering that many other studies have shown the correlation of anxiety and depression with obesity using other indexes as a measure[30], which is a suggestion for future studies.

CONCLUSION

The levels of anxiety and depression of MOTP participants did not show a significant association with the anthropometric measurement variables; body composition; biochemical and hemodynamic parameters; and health-related physical fitness assessment tests (HRPF).

However, many other variables had significant correlations, showing the importance of comprehensive care for patients with obesity and monitoring the most varied parameters, to prevent the damage caused by this disease.

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