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Prevalence of sleep disorders in obese before bariatric surgery.

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ABSTRACT

Introduction: The prevalence of sleep disorders (SD) has increased significantly in recent decades in parallel to the worldwide obesity epidemic. The presence of SD provides an increased risk of postoperative complications, requiring greater care in these patients. The gold standard for evaluation and diagnosis of SD is polysomnography, but it is an expensive and highly complex exam, making the questionnaires and scales more accessible for diagnosis and screening. **Objectives:** To evaluate the presence of SD and to analyze the influence of anthropometric measures on the scores of the Epworth Sleepiness Scale (ESS), snoring (ERS) and Stanford Sleepiness Scale (SSS) in obese patients. **Method:** An observational, cross-sectional study performed from August 2015 to August 2016. The patients in the preoperative group of bariatric surgery of the University Hospital were submitted to anthropometric evaluation and application of the ESS, ERS and SSS during the preoperative physiotherapy evaluation. **Results:** Were evaluated 100 obese (78 women), mean age of 41.4±10.7 years and BMI of 46.1±7.8kg/m^2. SD were identified in 25% by ESS and 21% by SSS of obese. There were no differences between genders for the scales scores. The score of the ERS correlated itself with waist (r=0.20, p=0.04) and neck (r=0.33, p=0.001) circumferences. **Conclusion:** The use of scales for diagnosis of SD is useful in the follow-up of the preoperative of bariatric surgery and our study found that 25% of patients present daytime somnolence. We also observed the influence of waist and neck circumferences on increasing snoring scale.

Keywords: Obesity, Snores, Obstructive Sleep Apnea Syndrome

INTRODUCTION

Sleep is increasingly recognized as an important health predictor, being directly related to quality of life and cardiovascular health. The increase in the rates of sleep disorders (SD) and its negative effects on cardiovascular disease has been raising interest in researchers from all over the world[1]. According to the American institute *National Heart, Lung, and Blood Institute* approximately 50 to 70 million adults suffer from sleep disturbance or report poor habitual sleep[2]. In a national epidemiological study involving the population of the city of São Paulo, 77% of subjects interviewed had a SD[3]. Changes in sleep quality may arise from psychosocial problems and pathological changes [4], as well as behavioral factors such as current living standards related to technology and social involvements[5].

The impact of sleep disorders on cardiovascular disease (CVD) and metabolic disorders is impressive. Recent epidemiological studies reinforce this association between sleep deprivation and the increase in the incidence of hypertension, obesity, coronary diseases, diabetes and dyslipidemia[1]. The presence of obstructive sleep apnea hypopnea syndrome (OSAHS) or insomnia significantly increase the risk of CVD (arrhythmias, atherosclerosis, coronary heart disease, heart failure, hypertension and stroke) and metabolic disorders (overweight, type 2 diabetes mellitus and dyslipidemia)[6-8].

The concern is even greater when there is the presence of obesity. Anatomical and functional aspects of the upper airways, central nervous system and serum levels of leptin interact for the development of sleep disorder in obese[9]. It is known that the transverse diameter of the upper airways, often reduced in the obese, is an independent predictor of the presence of OSAHS[10]. The association between sleep disturbances and obesity presents a bi-directional pathway, since obesity worsens the severity of sleep disorders and the obstructive sleep apnea syndrome promotes weight gain[11,12]. This relationship between obesity and SD is so strong that studies indicate that weight loss is due to lifestyle changes[13] or intervention by bariatric surgery[14] and have a positive impact on reducing the severity of OSAHS, consequently, improving the quality of sleep.

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Anthropometric markers of adiposity, such as body mass index (BMI) and waist and neck circumferences, are considered strong predictors of SD[15]. The diagnosis of the presence of SD is essential especially for those who will undergo surgical procedures, since obese adults with OSAHS submitted to large surgeries, for example bariatric surgery, may present several complications such as difficulties for intubation and/or extubation, need for non-invasive ventilation and caution in the use of opioids after surgery[16]. Thus, there is a need for the multiprofessional team of bariatric surgery to evaluate the presence of sleep disorders for appropriate conduct. The physiotherapist in particular should pay attention to the clinical management of airways in the pre and postoperative period.

The gold standard for diagnosis of SD is Polysomnography (PSG), but it is an exam of high complexity and cost, making impossible the access to some patients. As an alternative, subjective measures can be highlighted through questionnaires, such as the Epworth Sleepiness Scale (ESS), Snoring Scale (ERS) and Stanford Sleepiness Scale (SSS). Thus, this research aimed to verify the presence of SD in patients in the preoperative period of bariatric surgery through the ESS, ERS and SSS, and to correlate the findings of the scales with the anthropometric measures.

METHODS

The study evaluated obese patients in the preparation phase for University Hospital of Natal, Rio Grande do Norte, from August 2015 to August 2016. These patients are routinely evaluated by the responsible physiotherapy team, being performed clinical evaluations, pulmonary function test and preoperative guidelines. The evaluation of SD was performed through the ESS, ERS and SSS.

For the study were selected patients aged between 18 and 65 years; both genders; BMI of ≥30 Kg/m^2; have no previous diagnosis of OSAHS; authorization to voluntarily participate in evaluations through the Free and Informed Consent Form. Were excluded from the study individuals who: lived alone; showed inability to understand or respond to surveys; expressed desire to leave the study. The work was previously submitted to the Ethics and Research Committee of the University Hospital Onofre Lopes (CEP-HUOL) and obtained a favorable opinion (Protocol 192/08).

Anthropometric evaluation

Initially, the patient underwent routine physiotherapy evaluation, and then was performed the measurements of anthropometric markers. Measurement of body weight (kg) was obtained through a portable digital scale, with precision of 100 g and capacity of 180 kg, with the volunteer wearing light clothes, without accessories or shoes, disposed in an anatomical and orthostatic position. The same posture was adopted to measure height in meters through a ruler with a precision of 0.5 cm. Secondarily to these measures, the BMI was calculated by dividing the body weight by the square of the height in meters (kg/m^2).

An inelastic tape measure was used to measure waist (WC), hip (HC) and neck (NC) circumferences, positioned firmly but not tightly, at the midpoint between the last floating rib and the iliac crest for measurement of WC, and at the height of the major trochanter of the femur for measurement of HC. The measurement of NC was performed above the laryngeal prominence, perpendicular to the axis of the neck. Such procedures were performed with the volunteers with relaxed abdomen and in apnea after expiration.

Then was calculated the waist-hip ratio (WHR) by the division between the WC and HC[17], and the body adiposity index (BAI) by measures of height and HC[18].

Assessment of Sleep Disorders

The assessment of SD was performed through the application of three scales on drowsiness and existence of snoring by the evaluator in the following sequence.

Initially, the ESS was used to evaluate the degree of daytime sleepiness, consisting of 8 daily situations in which the patient is proposed to score between 0 and 3 for their chance of napping when performing such situations, in which 0 denotes no chance of napping and 3 consist of a high probability of napping. Its score ranges from 0 to 24 points, with a score above 10 suggesting the occurrence of excessive daytime sleepiness[19].

Next, the ERS was applied questioning an accompanying person residing in the same household as the evaluated one, in which a score of 0 to 10 is attributed to how uncomfortable snoring is to other people[20].

Finally, the SSS was explained and applied in the volunteer, in order to obtain the frequency which the individual sleeps during the day, scoring from 0 to 10[21].

Statistical analysis

Statistical analysis was performed using the IBM SPSS Statistics to Windows (Version 20.0. Armonk, NY) and adopted the level of significance of 0.05. Initially the normality of the data was verified through the Kolmogorov-Smirnov test, and then the descriptive data were presented in mean and standard deviation for the variables with normal distribution, and in medians and quartiles for the nonparametric data. The presence of sleep disturbances was presented in absolute and relative frequencies, and to verify possible differences in the frequencies between the genders was performed the chi-square analysis. The unpaired T test was also performed to verify differences between the genders of the anthropometric variables, and in the scales scores was used the Mann-Whitney test. The analysis of the correlation between the anthropometric measurements and the scales scores was performed through the Spearman's Correlation.

RESULTS

During the study period, 100 patients who fit the criteria of inclusion and exclusion of the research were evaluated and women comprised 78% of the sample. The average age of participants was 41.4±10.7 years, with IMC of 46.1±7.8 Kg/m², with similar presentation between the sexes. Men presented higher adiposity markers, except for the hip circumference that was homogeneous in both groups (Table 1). The evaluation of sleep disorders through the ESS and SSS identified the presence of sleep disorders in 25% of the patients (Table 2) and no differences were observed in the scales scores between the genders (Table 3).

The hypothesis of influence of the anthropometric variables (weight, height, age, BMI, waist, hip and neck circumferences, WHR and BAI) was tested in the scores of the ESS, ERS and SSS, however the correlation analysis identified that only the waist ($r=0.20$, $p=0.04$) and neck ($r=0.33$, $p<0.01$) circumferences positively influence the score of ERS, i.e., the greater the waist and hip circumferences, the worse the discomfort generated by the snoring of the patient (Figure 1).

Table 1. Descriptions of anthropometric measurements.

	Total (n=100)	Males (n=22)	Females (n=78)
Age (years)	41.4±10.7	40.5±9.9	41.6±10.9
Weight (kg)	118.9±23.6	136.2±30.2*	114.0±18.7*
Height (cm)	160.2±9.2	170.7±9.1*	157.2±6.7*
BMI (kg/m²)	46.1±7.8	45.8±9.0	46.2±7.5
Waist (cm)	125.3±15.3	131.7±15.8*	123.5±14.8*
Hip (cm)	137.8±15.4	136.4±19.5	138.3±14.2
WHR	0.91±0.09	0.97±0.06*	0.89±0.09*
Neck (cm)	41.0±7.8	45.8±3.9*	39.6±3.4*
BAI	50.2±9.3	42.5±8.4*	52.4±8.3

*p<0.05. Data presented as mean and standard deviation. Kg: kilograms, cm: centimeters, WHR: Waist-hip ratio, BAI: Body adiposity index.

Table 2. Distribution of the frequency of Sleep Disorders.

	Total	Males	Females
Epworth Sleepiness Scale *Score>10*	N=25 25%	N=5 22%	N=20 26%
Stanford Sleepiness Scale *Score > 4*	N=21 21%	N=5 22%	N=16 21%

Data presented in absolute and relative frequencies.

Table 3. Score of Sleep Disorder Scales in relation to gender.

	Total (n=100)	Males (n=22)	Females (n=78)
$Epworth_{0-24}$	6 (3-9.75)	6 (2.5-9.25)	6 (3.0-10.0)
$Snoring_{0-10}$	2 (1-5.0)	3,5 (1.75-5.25)	2 (0.5-5.0)
$Stanford_{0-10}$	2 (1-3.0)	1,5 (0.75-2.75)	2 (1.0-3.0)

Data presented as median and quartiles. No statistical differences were found between groups.

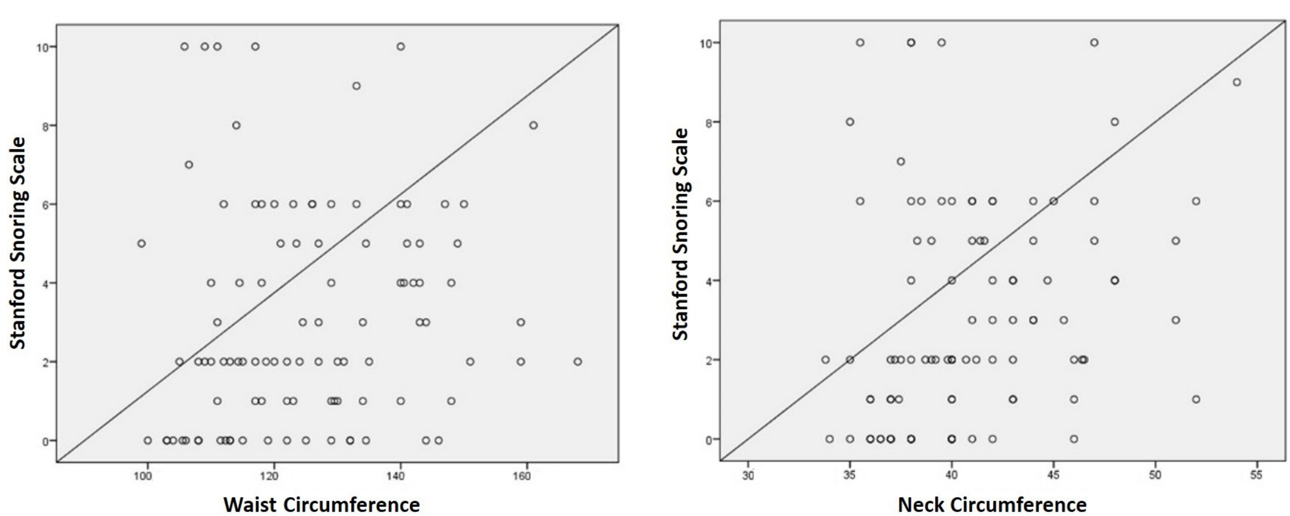

Figure 1. Correlation between Snoring Scale and waist and neck circumferences.

DISCUSSION

The present study aimed to verify the presence of SD from the application of the ESS, ERS and SSS questionnaires in obese patients in the preoperative phase of bariatric surgery. It was identified that 25% of the interviewees presented scores compatible with sleep disorders in the evaluation of the ESS and SSS, reflecting a large number of possibly undiagnosed patients with sleep disorders.

However, our data are much lower than those found in previous studies, in which obese patients were submitted to polysomnography and was found a prevalence of OSAHS in 83.7% and 71% of the patients[12,22]. Other study identified mild sleep disturbance in 21.9% of obese patients, moderate in 28.8% and severe in 49.3%[23]. The disparity in the number of patients affected between our study and the others is mainly due to the evaluation method used. It is known that polysomnography is a more detailed examination that evaluates the polygraph record of the electroencephalogram (EEG), the electrooculogram (EOG), the electromyography (EMG), the measurements of the oronasal flow, the thoracoabdominal movement, the electrocardiogram (ECG) and of the pulse oximetry, and therefore more sensitive and specific for the diagnosis of SD[24]. This makes alarming the possible number of asymptomatic SD patients in our sample.

The negative impact of obesity on sleep quality was confirmed by correlation analysis, in which increased waist and neck circumferences contributed significantly to increase the score of ERS ($r=0.20$, $p=0.04$ e $r=0.33$, $p<0.01$, respectively), corroborating with the findings of previous studies. The presence of central obesity increases the accumulation of visceral fat, causing instability or even collapse of the upper airways[25,26]. The obesity and the SD have congruent pathophysiology, one-night sleep deprivation significantly affects ghrelin and cortisol levels, favoring the reduction of energy expenditure and increasing the sensation of hunger. In addition, there is a relationship between obstructive sleep apnea and resistance to leptin, a hormone derived from adipose tissue that is important in weight control and energy expenditure[27].

Another important aspect, is that the SD generally have a higher prevalence in males[26], However, we found no difference in the frequency distribution, besides the scales scores were also similar between the genders. The small number of male patients evaluated in the study (22%) may have been responsible for the result.

The preoperative evaluation of SD is of paramount importance, requiring more attention to patients with OSAHS in the pre, intra and postoperative management of these patients[23-27]. Caution should be exercised when administering drugs used as anesthetics and analgesics, which may induce hypotonia of the dilator muscles of the pharynx, and also depress the respiratory center, causing hypopnea and desaturation. Special attention is required with airway management, especially during intubation and extubation procedures, in which excess soft tissue may lead to an increased risk of collapse of the upper airways[29].

A recent review study suggests the use of non-invasive ventilation (NIV) through continuous positive airway pressure (CPAP) therapy, aiming maintenance of continuous flow in the airways, reducing the chance of occlusion of VAS. The authors suggest that NIV should be routinely used before the intubation procedure, aiming to increase the lumen in the airway, increasing permeability and facilitating the procedure of passage of the orotracheal tube[28]. And also as a strategy during weaning of mechanical ventilation, providing improvement of ventilatory mechanics and increasing the success of extubation without intercurrences[28,30]. Prescription and titration of the pressure used must be individualized, requiring adequate medical and physiotherapeutic evaluation.

CONCLUSION

The results of our study affirm the need for knowledge of SD in obese patients who will undergo bariatric surgery, due to the care in clinical management that must be performed in the pre and postoperative evolution of these patients. Our findings indicate that patients with greater waist and neck circumferences are the most affected with SD. Another aspect that should be emphasized is the indication of a specific evaluation regarding the presence of SD in these patients, since a large part of these patients may be asymptomatic. We suggest new studies, showing other assessment instruments that can better detect the presence of SD in obese patients.

AUTHOR'S CONTRIBUTION

RC contributed in the conception and design of the study, analysis and interpretation of the data, statistical analysis and writing of the manuscript. NO contributed in the design and conception of the study, data collection, data analysis and interpretation, statistical analysis. ALFC contributed in the data collection, data analysis and interpretation, statistical analysis and writing of the manuscript. SLS and JMS contributed in the data collection and data analysis and interpretation. BHFS contributed in the data collection, data analysis and interpretation and writing of the manuscript. DF contributed in the data collection, data analysis and interpretation and statistical analysis. SSB contributed in the conception and design of the study, data analysis and interpretation and writing of the manuscript.

CONFLICTS OF INTEREST

The author(s) declare that they have no competing interests.

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