Original Article

Sleep quality in patients in patients submitted to coronary artery bypass grafting with different body mass indexes

Qualidade do sono em pacientes pós-cirurgia cardíaca com diferentes índices de massa corporal

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ABSTRACT | INTRODUCTION: Evidence shows that there is a positive correlation between the Body Mass Index (BMI) and sleep quality. The assessment of how the BMI can influence the sleep quality of patients in the postoperative period can be useful for decision making related to physiotherapeutic treatment. **OBJECTIVES:** To compare the sleep quality in patients undergoing CABG at different BMI. **METHODS:** Patients of both sexes, aged 18 years or over and submitted to coronary artery bypass grafting via median sternotomy and cardiopulmonary bypass (CPB) were included. This is an observational study. The Pittsburgh Sleep Quality Index Questionnaire, which measures the retrospective sleep quality, was applied, upon discharge from the Intensive Care Unit (ICU), in patients of both sexes grouped by BMI into eutrophic, overweight, and obesity groups to investigate changes in sleep behavior post-cardiac surgery in these groups. The data were expressed as means and standard deviations. For comparison between groups, the ANOVA test was used. P <0.05 was considered significant. **RESULTS:** The study consisted of 120 patients, with a predominance of males in a total of 79 (65.83%) patients and age around 60,22 ± 1,34 years. The scores of the variables in this questionnaire such as Sleep Duration (Eutrophic Group:0, Overweight:0, Obesity:2, p=0.02), Sleep Disturbances (Eutrophic Group:1, Overweight:1, Obesity:2, p=0.01) and Daytime Dysfunction (Eutrophic Group:1, Overweight:1, Obesity:2, p=0.04) were statistically significant. Comparing the total score between the groups eutrophic:2, overweight:5, and obesity:10, it was found that sleep quality tends to worsen as the BMI increases. **CONCLUSION:** Patients with a higher BMI, as in the obesity group, had worse sleep quality, while patients in the eutrophic group had better sleep quality.

KEYWORDS: Sleep. Post-Operative Period. Body mass index. Cardiac surgery

RESUMO | INTRODUÇÃO: Evidências mostram que existe correlação positiva entre o Índice de Massa Corpórea (IMC) e a qualidade do sono. A avaliação de como o IMC pode influenciar a qualidade do sono de pacientes no pós-operatório pode ser útil para tomada de decisão relacionada ao tratamento fisioterapêutico. **OBJETIVO:** Comparar a qualidade do sono em pacientes pós-cirurgia cardíaca em diferentes IMC. **MÉTODOS:** Trata-se de um estudo transversal. Pacientes de ambos os sexos, com idade superior a 18 anos e submetidos a revascularização do miocárdio via esternotomia mediana e circulação extracorpórea foram incluídos. O Questionário do Índice de Qualidade do Sono de *Pittsburgh*, que mede a qualidade retrospectiva do sono, foi aplicado, na alta da Unidade de Terapia Intensiva (UTI), em pacientes de ambos os sexos agrupados por IMC em grupos eutrófico, sobrepeso e obesidade, para investigar as alterações no comportamento do sono pós-cirurgia cardíaca desses grupos. Pontuações de 0-4 indicam boa qualidade do sono e de 5-10 indicam qualidade ruim. Os dados foram expressos em média e desvio padrão. Para comparação entre os grupos o teste de ANOVA foi usado. Foi considerado como significativo um p<0,05. **RESULTADOS:** O estudo foi composto por 120 pacientes, com uma predominância do sexo masculino num total de 79 (65,83%) pacientes e idade em torno de 60,22 ± 1,34 anos. As pontuações das variáveis desse questionário como Duração do sono (Grupo eutrófico:0, sobrepeso:0, obesidade:2, p=0,02), Distúrbio do sono (Grupo eutrófico:1, sobrepeso:1, obesidade:2, p=0,01) e Disfunção diurna (Grupo eutrófico:1, sobrepeso:1, obesidade:2, p=0,04) foram estatisticamente significativos. Comparando a pontuação geral entre os grupos eutrófico:2, sobrepeso:5 e obesidade:10 identificou-se que a qualidade do sono tende a piorar à medida que o IMC aumenta. **CONCLUSÃO:** Os pacientes que apresentavam um IMC maior, como do grupo obesidade, apresentaram pior qualidade do sono, enquanto os pacientes do grupo eutrófico possuíram melhor qualidade do sono.

PALAVRAS-CHAVE: Sono. Período Pós Operatório. Índice de Massa Corporal. Cirurgia Cardíaca.

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Introduction

Cardiac surgery is considered major, and patients who undergo this procedure are referred to an Intensive Care Unit (ICU) in the postoperative period (PO). Although monitoring in the ICU is necessary to optimize recovery, the length of hospital stay can impair the quality of sleep, as it is a unit considered to be a stress generator[1-3].

The stress in the ICU comes from the large number of equipment, professionals, and procedures that frequently interrupt the circadian cycle, causing losses such as the increase in blood pressure of patients[4]. In addition, problems related to surgical wounds, drug therapy, changes in appetite, emotional changes, and neuromuscular disorders can lead to changes in the quality of sleep of patients in PO[5].

Studies have shown that poor sleep quality affects most individuals undergoing surgical procedures, with insomnia being the main related disorder. Therefore, the individual who does not sleep may experience fatigue, tiredness, tension, decreased intellectual performance, symptoms of depression, anxiety, daytime sleepiness, muscle pain and irritability[6,7]. Therefore, assessing the quality of sleep can enable therapeutic adjustments related to the prescription of physical exercises. In this context, the use of the instrument known as the Pittsburg Sleep Quality Index (PSQI)[8] has been shown to be effective and capable of providing quantitative and qualitative information about sleep quality[9,10].

Several scientific studies show that there is evidence that the Body Mass Index (BMI) can influence the quality of sleep[11-17]. Madrid-Valero et al.[16] reported that poor sleep quality was associated with a higher BMI. For Hung et al.[17] individuals with overweight or obesity have a worse sleep quality than those with normal weight. Although the literature shows that there is a positive correlation between the Body Mass Index and the quality of sleep, the amount of work is scarce when a third descriptor is added as cardiac surgery to that correlation.

Therefore, this study aims to compare the quality of sleep in patients undergoing coronary artery bypass grafting with different body mass indexes.

Methods

Study Design

An observational study was carried out with patients at the Hospital - Instituto Nobre de Cardiologia (INCARDIO), located in the city of Feira de Santana, Bahia, from August 2019 to January 2020. It was approved by the Research Ethics Committee Faculty of Noble in Feira de Santana, under the number 4,008,896. CAAE (29839020.0.0000.5654). All participating patients signed a Free and Informed Consent Form (ICF).

Eligibility criteria

Patients of both sexes aged 18 years or over and submitted to coronary artery bypass grafting via median sternotomy and cardiopulmonary bypass (CPB) were included. Patients with oncological diseases, infectious diseases with repercussions in general condition, endocrine (diabetes mellitus and untreated thyroid), patients in the recent postoperative period (up to 60 days postoperatively) were excluded from any surgical intervention, patients who had difficulty understanding the proposed questionnaire, bringing incompatibility of information or having an inability to answer the same question, or who refused to answer it.

Study protocol

After the patients met the inclusion criteria, personal data, clinical history, height, weight, and the Body Mass Index (BMI) calculation were calculated inside the ICU in the preoperative period of cardiac surgery, which is calculated by dividing weight (in Kg) by height squared (in meters). Thus, we divided the groups into three classifications: eutrophic (BMI between 18.5 to 24.9 kg / m2), overweight (BMI between 25 to 29.9 kg / m2), and obese (BMI greater than 30.0 kg / m2). For the information on sleep behavior, the Pittsburgh Sleep Quality Index Questionnaire (PSQI) was applied, which assesses the quality and disturbances of sleep during the period of one month preceding the surgery. It consists of 19 questions in self-report and 5 questions directed to the spouse or roommate.

After all the data collected and the groups divided, the PSQI questionnaire was applied at discharge from the ICU. We checked scores of each questionnaire and analyzed the changes in sleep behavior after related cardiac surgery by each classified group.

Research instrument

The Pittsburgh questionnaire, originally developed by Buysse et al.[8], measures the retrospective quality of sleep and disturbances over a period of 1 month for use in clinical practice and research. It discriminates between good and bad sleepers and provides a brief, clinically useful assessment of various sleep disorders.

It consists of 19 questions grouped into 7 components, each on a scale graded in scores from zero (no difficulty) to three (severe difficulty). The components of the PSQI are: C1 Subjective sleep quality, C2 Sleep latency, C3 Sleep duration, C4 Usual sleep efficiency, C5 Sleep changes, C6 Use of medication, C7 Daytime sleep dysfunction. The sum of the values attributed to the seven components varies from 0 to 21 in the total score of the questionnaire, indicating that the higher the number, the worse the quality of sleep. Scores of 0-4 indicate good sleep quality, 5-10 indicate poor quality and above 10 indicate sleep disorders.

Statistical analysis

For data analysis, the Statistical Package for Social Sciences (SPSS) version 20.0 was used. Normality was assessed using the Kolmogorov-Smirnov test. The data were expressed as means and standard deviations. For comparison between groups, the ANOVA test was used. P <0.05 was considered significant.

Results

During the research period, 134 patients were admitted, 34 of whom were excluded due to recent postoperative (4), difficulty understanding the proposed questionnaire (20), and refused to answer it (10) (figure 1). The study consisted of 120 patients, with a predominance of males in a total of 79 (65.83%) patients and a mean age around 60 ± 1 years. The most prevalent comorbidity was Systemic Arterial Hypertension (SAH), with 86 (71.66%) patients and Body Mass Index (BMI) around 27.3 ± 4.5 kg / m2. The other data are shown in Table 1.

Figure 1. Patient eligibility flowchart

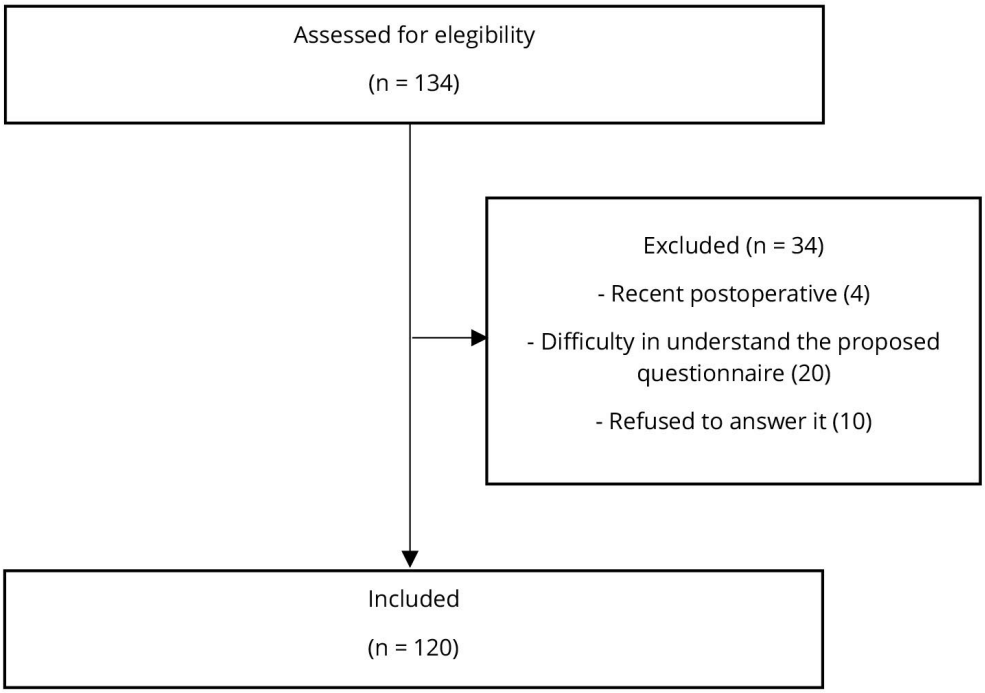

Table 1. Clinical characteristics of the patients studied

Variable	Eutrophic group (n = 31)	Overweight Group (n = 55)	Obesity Group (n = 34)	p value
Age (years)	59 ± 4	62 ± 5	59 ± 5	0,64
Gender				
Male	20 (65%)	37 (67%)	22 (65%)	0,11
Female	11 (35%)	18 (33%%)	12 (35%)	
BMI (kg/m²)	22 ± 3	27 ± 3	33 ± 2	<0,01
Comorbidities				
SAH	23 (74%)	39 (71%)	24 (71%)	0,83
DLP	15 (48%)	22 (40%)	19 (56%)	0,35
DM	12 (39%)	20 (36%)	15 (44%)	0,38
AMI	3 (10%)	5 (9%)	4 (12%)	0,87
Sedentary lifestyle	14 (45%)	22 (40%)	16 (47%)	0,54

BMI - Body Mass Index; SAH - Systemic Arterial Hypertension; DLP - Dyslipidemia; DM - Diabetes Mellitus; AMI - Acute Myocardial Infarction.

Patients in all analyzed groups who underwent cardiac surgery had a Cardiopulmonary Bypass Time (CPB) of 91.32 ± 2,78 minutes. On the Mechanical Ventilation Time (MV) of the patients, it was about 6.33 ± 0.47 hours. The values are shown in Table 2.

Table 2. Surgical characteristics of the studied patients

Variable	Eutrophic group (n = 31)	Overweight Group (n = 55)	Obesity Group (n = 34)	p value
CPB time (min)	89 ± 12	91 ± 9	94 ± 11	0,64
MV time (hours)	6 ± 2	7 ± 3	6 ± 3	0,78
Number of grafts	2 ± 1	2 ± 1	2 ± 1	0,93
Number of drains	2 ± 1	2 ± 1	2 ± 1	0,94
Clamping time (minutes)	79 ± 18	85 ± 15	83 ± 14	0,53
Surgery time (hours)	231 ± 24	245 ± 19	255 ± 21	0,11

CPB – Cardiopulmonary bypass; MV - Mechanical ventilation.

Table 3 shows the scores of the groups of patients studied in the Pittsburg questionnaire that assesses sleep quality. It is noticed that variables such as Sleep duration (eutrophic group: 0, overweight group: 0, obesity group: 2, p = 0.02), sleep disorder (eutrophic group: 1, overweight group: 1, obesity group: 2, p = 0.01) and diurnal dysfunction (eutrophic group: 1, overweight group: 1, obesity group: 2, p = 0.04) were statistically significant. It is still possible to verify that among the scores of the groups of patients, the overall score was 10 in the obesity group, indicating a worse sleep quality.

Table 3. Score of the Pittsburg questionnaire between the groups studied

Variable	Eutrophic group (n = 31)	Overweight Group (n = 55)	Obesity Group (n = 34)	p value
Subjective sleep quality	0	1	1	0,23
Sleep latency	0	0	1	0,14
Sleep duration	0	0	2	0,02
Usual sleep efficiency	0	1	1	0,25
Sleep disturbance	1	1	2	0,01
Use of sleeping medication	0	1	1	0,18
Daytime Dysfunction	1	1	2	0,04
Overall score	2	5	10	<0,01

Discussion

Our study has shown that sleep quality is worse in patients with obesity as they scored higher than in other groups. The eutrophic group had a low score, showing that patients in this BMI range have better sleep quality. The overweight group had an intermediate score between the other two, having impaired sleep in relation to the eutrophic group.

Thus, we found that when comparing the total score between the groups studied, it can be seen that the quality of sleep tends to worsen as the BMI increases. A similar finding is shown in the study by Araújo et al.18, where the scores for sleep duration and daytime dysfunction for obese patients were statistically significant, directly contributing to the increase in the total PSQI score, which represented poor sleep.

Although there is a scarcity of studies in the literature that assess sleep quality in post-cardiac surgery patients, at different body mass indexes, to corroborate our findings, the following scientific evidence reveals that sleep quality can be influenced by the BMI.

As shown in the literature, there is a correlation between sleep quality and cardiac surgery. Bornhausen et al.[19] investigated the subjective quality of sleep in chronic ischemic heart disease patients and identified 60% of patients with poor sleep who were obese according to the Pittsburgh questionnaire score. Similarly, in the results of the study by Beck et al.[20], it was evidenced that patients who underwent cardiac surgery have a high frequency of excessive daytime sleepiness, demonstrating changes in sleep quality, as demonstrated in this study.

This increase in postoperative daytime sleepiness, according to Dianatkhah et al.[21] is due to the reduction in melatonin secretion during this period. Navarro-García et al.[2] showed that the quality of sleep in patients undergoing cardiac surgery was impaired by factors such as pain, drainage and discomfort caused by noise from alarms, monitoring devices and the voices of ICU employees.

In parallel, several scientific studies reveal a correlation between BMI and quality of sleep, showing that body mass is a parameter that alone can influence the quality of sleep in patients regardless of surgical procedures. Chem et al.[22] showed that the inadequate sleep pattern (sleeping less than 6-8 hours a night) was associated with obesity. For him, the reduction in hours of sleep is caused by increased sympathetic activity, increased cortisone secretion and decreased glucose intolerance.

According to Cournot et al.[23], obese individuals who are less physically active need less sleep, which explains the high prevalence of sleep disorders in this BMI range. According to Rahe et al.[24], being overweight can lead to a reduction in physical activity during the day, reducing the desire to sleep. Since obese patients tend to be less active, caloric burning and energy expenditure are lower, so the restoration of this storage that occurs during sleep is reduced. In addition, for Driver et al.[25], the exercise, when increasing body temperature, would create a condition capable of facilitating the triggering of sleep onset, by activating the heat dissipation processes controlled by the hypothalamus.

Given the previous evidence that explains how BMI can influence sleep, these findings can be associated with high scores on sleep duration, sleep disturbance and daytime dysfunction in obese patients. Obese patients have difficulty initiating or maintaining sleep. It is possible that reducing the need for sleep reduces sleep duration, which explains the higher sleep duration score for obese patients. Besides, obesity can cause changes in breathing control, leaving sleep unstable and increasing nighttime awakenings, which may explain the higher score of the sleep disorder variable in this BMI range. Consequently, the accumulation of non-restorative nights, in the long run, can cause a reduction in the performance of an individual's daily activities, leading to excessive daytime sleepiness, justifying the change in the daytime dysfunction variable. These effects generally do not affect eutrophic or overweight patients.

The evaluation of the sleep quality of patients in the postoperative period, performed in the present study, can be useful for decision-making related to physical therapy treatment since it is possible to use the results of this evaluation to guide the creation of individualized protocols in the preoperative for these patients according to their BMI.

The limitations of this study are mainly due to the lack of gender stratification of the eutrophic, overweight, and obesity groups, which makes it impossible to know how different body mass indexes influence the quality of sleep only in men or women.

Conclusion

Based on the findings, it is concluded that patients who had a higher body mass index have worse sleep quality. Therefore, obese patients had worse sleep quality, while eutrophic patients had better sleep quality.

Author contributions

Santos ALC, Silva ALP and Brandão GM participated in the conception and design of the research, obtaining data and writing the manuscript. Cordeiro ALL participated in the conception and design of the research, obtaining data, writing the manuscript and critical review of the manuscript for important intellectual content. Guimarães AR participated in the critical review of the manuscript for important intellectual content.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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