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Did social isolation due to COVID-19 interfere with the quality of sleep and excessive daytime sleepiness in individuals with grade III obesity about to enter a surgical prehabilitation program? An observational study

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ABSTRACT

Social isolation (SI) can have negative effects on health, although little is known about the SI consequences on patients with grade III obesity and even less if they are entering a prehabilitation program. Objective: the present study analyzes the effects of SI determined by the SARS-CoV-2 pandemic in people with grade III obesity who about to enter a prehabilitation program for bariatric surgery. Methods: Five patients with grade III obesity who entered a prehabilitation program or which had to be stopped on March 17th, 2020 were evaluated. Excessive daytime sleepiness (EDS) (Epworth Sleepiness Scale - ESS) and sleep quality (SQ) (Pittsburgh Sleep Quality Index - PSQI) were investigated. Data collection took place in the week before the SI government decree and after 30 and 90 days of SI. Statistical analysis was performed using SPSS 20.0 and GraphPad Prism 8.0. The Friedman test was used to verify the difference between the times and a significance level of $p < 0.05$ was adopted. Results: with SI, EDS improved by 8 points after 30 days and 3 points after 90 days ($p < 0.05$). The PSQI did not change ($p = 0.819$). Conclusion: the SI improved the EDS of individuals with grade III obesity entering the prehabilitation program, but did not change complementing their SQ. The improvement in EDS may be related to a longer daily sleep time provided by the SI and the lower number of daily work commitments. Measures to improve the SQ of these patients should be considered, including remote forms.

1. Introduction

Obesity is defined as the abnormal accumulation and/or excess of body fat and is a worldwide epidemic of accelerated growth in the last 50 years. In 2016 it was estimated that 650 million people around the world had obesity [1,2]. This high prevalence is of concern to the health system since obesity is responsible for numerous physical and psychological complications, such as systemic arterial hypertension, diabetes mellitus, cardiovascular diseases, poor sleep quality, anxiety, excessive daytime sleepiness, depression, and more recently for COVID-19 (Coronavirus Disease - 2019) [3–6].

COVID-19 is caused by a simple and enveloped RNA Coronavirus (SARS-CoV-2), being the third coronavirus to generate a serious disease in humans [7]. This severity was initially reported in China through a series of cases of patients with severe viral pneumonia, at the end of 2019 and was later defined as one of the complications of the disease [7]. The clinical manifestations reported in infected and hospitalized patients are fever, dry cough, headache, dyspnea, fatigue, diarrhea, nausea, among others [7]. Its transmission can occur through respiratory droplets or aerosols dispersed in the air [8] and from person to person or through contact with an infected surface with subsequent hand contact in the eyes, nose, and/or mouth [7,9]. In an attempt to

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prevent this mass transmission, basic public health actions have been adopted worldwide, with emphasis on social isolation (SI) [10].

However, although it seems to be a well-regarded solution, some studies have pointed out negative effects of the new routine imposed by the SI, with changes in the physical and psychological component of the population, with an increase in the manifestations of stress, anxiety, anger and depression, in addition to impairment of sleep quality [11,12]. These damages to mental health and sleep also influence immunity, since a good amount and quality of sleep can help the body immunologically [12]. Knowing this, the pandemic, especially in the obese population, becomes even more worrying due to the chronic presentation of inflammation with changes in the innate immune response, in physical and psychosocial aspects [3,6]. Besides, as it is a little-used resource until the emergence of the COVID-19 pandemic, almost nothing is known about this situation in individuals with grade III obesity who were starting a prehabilitation program to be authorized to perform bariatric surgery.

Considering that so far few studies that associate the impacts of the SI imposed by COVID-19, on sleep in obese people, recording what happened to a group of patients in this condition is of scientific interest and we consider it necessary to investigate the subject, to assess the behavior of these variables in this special condition [13–15].

Thus, the present study analyzes the effects of SI in individuals with grade III obesity about to enter a surgical pre-rehabilitation program based on exercises, guidelines, and respiratory reeducation, on the variables excessive daytime sleepiness and sleep quality.

2. Materials and methods

This observational, pragmatic, descriptive, longitudinal, quantitative, and uncontrolled study (case series) was carried out in the city of Florianópolis, Brazil. Data collection took place from March to June 2020, divided into three moments: before the SI government decree, after 30, and after 90 days of SI. The initial evaluation was carried out in person and the evaluations after 30 and 90 days of SI were performed by telephone contact.

2.1. Population

The sample consisted of adult individuals classified as grade III obesity, according to the World Health Organization (WHO) proposal, aged between 18 and 65 years old, of both genders, entering the preoperative physiotherapy program (prehabilitation) in March 2020. Exclusion criteria were pregnant and lactating women, major surgical procedures (cardiac, abdominal, orthopedic, neurological surgery) in the last 3 (three) months from the beginning of the program, and who are undergoing medical treatment for a sleep disorder, neuropsychological cause.

2.2. Study protocol

In March 2020, participants were evaluated in person, by a trained researcher, for anthropometric measurements, sociodemographic characteristics, excessive daytime sleepiness (EDS) and sleep quality (SQ). Anthropometric measurements were taken without shoes and with as little clothing as possible. EDS and SQ were assessed through interviews. 30 and 90 days after the beginning of the SI, the same instruments (EDS and SQ) were applied, however, by telephone contact with all participants.

2.3. Anthropometric measurements

To measure body mass, a Filizola Personal digital scale was used. To measure body composition, a bioimpedance equipment brand OMRON model HBF 306INT was used, and to measure height a stadiometer brand Sanny model Standard. The participants' body mass index (BMI) was calculated in order to classify the degree of obesity. Grade III obesity was considered when the BMI was 40 kg/m^2 or more [16].

2.4. Instruments

2.4.1. Epworth Sleepiness Scale (ESS)

The ESS was developed by Johns [17] and validated for use in the study country by Bertolazi et al. [18]. The ESS aims to verify whether the individual has EDS, thus assessing the probability, in eight contexts of activities of daily living, of the individual falling asleep. The total score ranges from 0 to 24 points, being suggestive of EDS when more than 10 points are obtained [18].

2.4.2. Pittsburgh Sleep Quality Index (PSQI)

The PSQI questionnaire was developed by Buysse et al. [19] and assesses the quality and disturbances of sleep over four weeks, being validated in the study country by Bertolazi et al. [20]. The total score varies between 0 and 21 points, being indirectly proportional to the quality of sleep. When higher than 5 points, it indicates major dysfunctions in at least 2 components, or moderate dysfunction in at least 3 of the components [21].

2.5. Statistical analysis

Statistical analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS) version 20.0 software. Descriptive statistics (frequency distribution, median and interquartile range) were used to characterize the investigated variables. The normality of the data was tested using the Shapiro-Wilk test and the comparison between the three evaluation moments (before-SI, 30 days' post and 90 days' post) was analyzed using the Friedman test. A significance level of $p < 0.05$ was adopted. The graphs were generated using the GraphPad Prism version 8.0 program.

2.6Ethical approval

This study was approved by the Human Research Ethics Committee of the University of the State of Santa Catarina under opinion number 4.243.122. All participants sent the researchers the informed consent form (ICF) digitally. Participants were assured of non-identification and confidentiality.

3. Results

The clinical characteristics of the study participants are shown in Table 1, with the majority of participants being female (60%), with a BMI that characterized them as having grade III obesity and age range between the 3rd and 5th decade of life.

Table 2 shows the scores obtained in the initial assessment and the two moments of the SI on the study variables (EDS and SQ).

Table 1
Clinical characteristics of obese people entering the prehabilitation program.

Characteristics	n	%
Participants	5	100%
Gender		
Female	3	60%
Male	2	40%
	Median	IQR
Age (years)	40.0	[30.5–52]
BMI (kg/m^2)	44.3	[42.35–54.5]
Body mass (kg)	115.3	[114.25–146]
Height (m)	1.61	[1.56–1.72]

Legend: n = absolute frequency; % = relative frequency; IQR = interquartile range; BMI = body mass index. Source: prepared by the authors, 2020.

Table 2
Psychosocial parameters of obese people entering the prehabilitation program in the three stages of the study.

Parameters	Before-SI	30 d post-SI	90 d post-SI	p
ESS	13.0 [5.5–14.5]	5.0 [3.0–10.5]	10.0 [4.5–11.0]	<0.05
PSQI	11.0 [7.0–15.0]	8.0 [5.0–16.0]	13.0 [9.0–15.5]	0.819

Legend: ESS = Epworth Sleepiness Scale; PSQI = Pittsburgh Sleep Quality Index. Source: prepared by the authors (2020).

Table 3 shows the scores of the PSQI components obtained in the initial assessment and the two moments of the SI.

Fig. 1 shows the differences in the scores over the three periods in each instrument with their respective resulting variables. Excessive daytime sleepiness showed a statistically significant difference ($p < 0.05$) with reduction over time.

The prevalence of individuals with EDS decreased from 60% before SI to 20% and 40% after 30 days and after 90 days of SI, respectively, with a statistically significant reduction ($p < 0.05$). Regarding the SQ, we can consider that the quality of sleep was already poor in the assessment (80% of the participants had severe or moderate dysfunction) and worsened with the SI because 100% had moderate or severe dysfunction after 90 days of SI.

4. Discussion

In the present study, we analyzed the effect of SI on individuals with grade III obesity, who entered a prehabilitation program and who had to postpone the start of the program due to the government decree for SI due to the COVID-19 pandemic. To our knowledge, this is the first study that investigates the consequences of an SI decree, comparing data before the COVID-19 pandemic in this population. The study finds that there is a compromise of the ESS and the SQ of individuals with grade III obesity entering the prehabilitation program, in turn, the SI improved the EDS but did not improve the participants' SQ.

Specifically, about to the EDS variable, a decrease in the mean scores of excessive daytime sleepiness was observed. The reduction was considerable in the first 30 days of SI but was followed by an increase after 90 days of SI, without, however, reaching the initial values (pre-SI) and presenting a statistically significant difference ($p < 0.05$) over the three moments. This indicates that the SI decreased the EDS, which can be justified by the possibility of more time to sleep at night provided by the SI and which is suggested by the improvement in the PSQI component 3 (sleep duration) score.

The improvement in the EDS scores found in our study is surprising, given that according to the literature, individuals with obesity should have higher levels of depression, which is independently associated with more EDS [22]. Therefore, it was expected that the stress of the SI, as a result of the COVID-19 pandemic, would increase tension and depression levels and this, in turn, would increase EDS levels. This interaction would create a vicious cycle of stress, depression, poor sleep, and increased excessive daytime sleepiness. Besides, all study participants had poor sleep quality, which is also a cause of higher EDS [23].

Table 3
PSQI components of obese people entering the prehabilitation program in the three study periods.

Components	Before-SI	30 d post-SI	90 d post-SI	p
Subjective sleep quality (C1)	2.0 [1.0–3.0]	2.0 [1.0–3.0]	3.0 [1.5–3.0]	0.80
Sleep latency (C2)	2.0 [1.0–3.0]	2.0 [1.0–3.0]	3.0 [2.5–3.0]	0.24
Sleep duration (C3)	3.0 [1.5–3.0]	1.0 [0.5–2.5]	2.0 [1.0–2.5]	0.29
Usual sleep efficiency (C4)	0.0 [0.0–0.5]	0.0 [0.0–1.5]	0.0 [0.0–0.5]	0.71
Sleep disorders (C5)	2.0 [2.0–3.0]	2.0 [1.5–2.5]	2.0 [2.0–3.0]	0.58
Use of sleeping medications (C6)	0.0 [0.0–1.5]	1.0 [0.0–2.0]	1.0 [0.0–3.0]	0.36
Daytime sleep dysfunction (C7)	1.0 [0.5–2.5]	1.0 [0.0–2.0]	1.0 [1.0–2.0]	0.64

Legend: p = p-value for significance level. Source: prepared by the authors (2020).

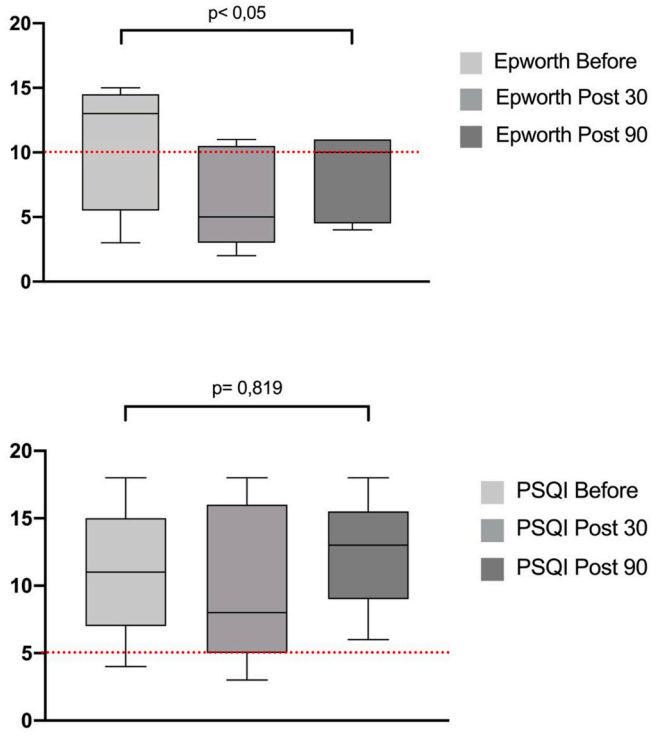

Fig. 1. Sleepiness and sleep quality in the 3 moments of assessment of obese people entering the prehabilitation program.

Regarding SQ, after 30 days of SI, the PSQI showed an improvement in sleep quality scores, however, after 90 days of SI, there was a trend reversal. The scores worsened and exceeded the initial assessment score in relation to the SQ, which was already bad and got worse. However, these differences were not statistically significant. The general median score after 30 days of PSQI SI in our study is similar to a study carried out with health workers and non-health workers during the COVID-19 pandemic, which also presented poor scores of 8.78 and 6.2 points respectively in the PSQI, indicating the persistence of poor SQ with the SI [24].

The increase in individuals with poor SQ is in line with the literature, as it is known that there is an association between sleep disorders and depression, and the condition of SI can cause stress and depression and needs to be considered [22]. However, we also cannot affirm that the worsening in SQ is a consequence of SI because SQ was already compromised in the initial, pre-SI assessment and may be a characteristic of individuals with grade III obesity.

Despite this, the hypothesis that the SI harmed the SQ cannot be ruled out and the increase in PSQI scores may be justified as a consequence of the psychological distress suffered due to both the SI and the uncertainties resulting from the serious pandemic situation experienced in the globe without strong prospects improvement [14]. In addition to the uncertainties regarding the severity of the spread of the virus, which at the time could compromise the availability of vacancies in hospital beds with a possible catastrophic burden on the unified health system and the stressful financial issues, this situation leads to insecurity regarding the future and predisposes emotional damage and SQ [25–27].

Even the results did not show a statistically significant difference

with the SI, we need to look beyond the research and pay attention to the baseline clinical conditions presented by the participants since even without the stressful effect of the pandemic and the SI decree, they already had high levels of EDS and bad SQ. These changes have already been pointed out previously [4,5,13]. The daily changes caused by the pandemic and the SI change the quality of life and the behavior of people causing psychological suffering by adding anguish, loneliness, and fear in the routine, to generate changes in life habits with an increase in physical inactivity and changes in food intake with more consumption of comforting foods such as sweets, which can aggravate obesity and sleep disorders [14,15,25]. Still, it is known that the pandemic has had consequences for the world economy, so families may have their income affected and interfere even more in lifestyle changes, especially directly influencing eating habits, since cheaper foods are the most caloric and less healthy [13,15,25].

Another factor to be considered due to the high prevalence of impairment of the EDS and SQ variables in our study is that sleep influences food choices since its scarcity and poor quality are associated with excessive consumption, poor quality, and abundant in energy as fats [28,29]. This whole cascade with domino effect becomes even more worrying in these subjects, as it is a population prone to elevated psychological food disorders and difficulties in self-care when exposed to emotional upheavals [25].

For this reason, it is believed that a pre-rehabilitation program would be essential even amid a pandemic, since in addition to involving multidisciplinary attention and health education, it has advantages in adding physical activity and its numerous physical and psychological benefits, in addition to controlling body mass, delaying an increase in the severity of obesity. Therefore, we cannot ignore that clinically the participants of our study presented sleep impairment, and even if this is a consequence of obesity and not exclusively of SI, it is essential to offer adequate treatment, either with the implementation of adequate and adapted physiotherapeutic prehabilitation using the telerehabilitation or implementing remote access to patients by professionals from the multidisciplinary team to assist participants in an attempt to alleviate sleep impairments [5,13,14].

5. Study forces and limitations

This study's main strengths are the originality and the validated and widely used instruments in clinical research. The main limitation of the present is the small sample size, however, the sample covered the population of patients who entered the surgical prehabilitation program at the time of SI. Another limitation is that the participants already had a commitment from the EDS and the SQ, which may then have led the SI to not generate more commitments. Another limitation is that the assessments 30 and 90 days after the SI were carried out by telephone, not in person and the instruments used in the assessment have not yet been validated for use by this means of communication. Another limitation is that we do not have a control group to compare the effects of SI. However, patients were familiar with the instruments because they were evaluated in person using the same assessment instruments. Finally, another limitation is that we were unable to monitor how much the patients were effectively complying with the SI rules imposed by the government decree and even if there was a change, for example in body weight and BMI during the study period, which could influence the results.

6. Conclusion

Individuals with grade III obesity about to enter a surgical prehabilitation program have excessive daytime sleepiness and severely impaired sleep quality, and a SI due government decree reduced excessive daytime sleepiness but did not change the quality of sleep after 30 and 90 days. Further studies are needed to effectively understand the effect of SI on this population. Given the EDS and SQ are compromised in this population, specialized multidisciplinary care is suggested, even if online, aiming to correct or mitigate the health conditions worsening during the SI that is indicated to control the COVID-19 pandemic.

Authors' contributions

GM conceived of the idea at the basis of the article, collected and interpreted the data, prepared the manuscript; RSA conceived of the idea at the basis of the article interpreted the data and revised the manuscript; JHLB conceived of the idea at the basis of the article and processed the data; PC, BS and VPPSF collected the data; DLM conceived of the idea at the basis of the article, designed the study, was responsible for submitting the project to the Ethics Committee and revised the manuscript. All authors contributed to and approved the final manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.metop.2021.100104.

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Ethical consideration

This study was approved by the ethics committee, number 4.243.122 of the State University of Santa Catarina.

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