

# Correlation Between Perceived Stress and BMI Among Obstructive Sleep Apnea Individuals

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## Author's Contribution

<sup>1,2</sup>Substantial contributions to the conception or design of the work, acquisition, analysis, or interpretation of data for the work, Final approval of the version to be published, <sup>3,6</sup>Drafting the work or revising it critically for important intellectual content, <sup>4,5</sup>Active participations in active methodology

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## ABSTRACT

**Objective:** To investigate the potential association between higher perceived stress levels and elevated Body Mass Index (BMI) in patients with obstructive sleep apnea (OSA).

**Methodology:** This prospective study was conducted at the Pulmonology Department of Dow University Hospital, Dow University of Health Sciences, from July to October 2020. The study included adults aged 18 and above, of both genders, diagnosed with OSA through clinical evaluation and sleep studies. BMI was calculated using the formula  $BMI = kg/m^2$ , and the Perceived Stress Scale (PSS) was utilized to assess participants' perceived stress levels. The PSS questionnaire, comprising 10 items, was completed by participants, with each item rated on a 5-point Likert scale (ranging from 0 to 4). Higher scores indicated higher perceived stress. Relevant clinical data were recorded, and the Pearson correlation coefficient was calculated to determine the direction of the relationship.

**Results:** The study included 160 OSA cases, with an average age of approximately 50.29 years. The majority of participants were male (59.4%), while females constituted 40.6% of the sample. BMI categories revealed that 13.8% were overweight, 85.0% were obese, and only two individuals had a normal BMI. Concerning stress levels, 41.3% experienced low stress, 45.6% reported moderate stress, and 13.1% reported high perceived stress. Importantly, the study found an insignificant association between BMI and perceived stress ( $p$ -value < 0.278).

**Conclusion:** The study identified a predominant occurrence of obesity among OSA patients. A positive correlation between elevated BMI and perceived stress was observed. The limited number of similar studies and the acknowledged limitations of the current study underscore the necessity for further research and interventions to explore the impact of BMI on stress in OSA.

**Keywords:** BMI, Perceived stress, OSA, Correlation

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## Introduction

Obstructive sleep apnea syndrome (OSAS) is a respiratory condition marked by repeated occurrences of apnea and hypopnea, leading to interruptions or reductions in the flow of air, and this may or may not be accompanied by the upper air passages collapsing.<sup>1</sup> It happens due to the natural muscle relaxation during sleep, lasting for a duration of at least ten seconds, resulting in a drop in blood

oxygen levels, known as hypoxemia, and in some cases, even an increase in carbon dioxide levels (hypercapnia). This condition is typically observed in individuals with severe OSAS and a higher BMI.<sup>1-3</sup> Individuals suffering from OSA frequently describe experiencing emotional symptoms beyond the typical daytime sleepiness, such as feelings of depression and anxiety.<sup>4,5</sup> Assessing global perceived health (GPH) plays a significant role in nursing care, encompassing elements like depression, insomnia,

and daytime sleepiness, all of which are linked to OSA among individuals referred to the sleep clinics.<sup>6,7</sup> These factors also contribute to decreases the health perceptions in the general population.<sup>6</sup>

Stress is a substantial influence impacting various dimensions of both physical and mental well-being in contemporary society. Specifically, "perceived stress," referring to a person's personal evaluation of their stress levels over a certain timeframe, can be influenced by a person's life experiences, physical and mental health, and social support, among other factors.<sup>8</sup> Elevated levels of perceived stress may lead to reduced participation in physical activities and an increased likelihood of adopting unhealthy behaviors like an unbalanced diet and smoking. This can have consequences for various health concerns, including a compromised immune system.<sup>8,9</sup> Certain risk factors have been identified for the development of OSAS, which include overweight (obese), high blood pressure, diabetes, being male, alcohol consumption and tobacco use, asthma and persistent nasal congestion. Recent research indicates that roughly 50% of individuals with OSAS are classified as obese, and there is an occurrence of sleep apnea in approximately 40% of moderately overweight individuals (both men and women).<sup>10,11</sup>

Furthermore, it is approximated that among severely obese individuals, the prevalence of sleep apnea ranges from 40% to 90%.<sup>10,11</sup> Experimental and epidemiological studies have shown that certain forms of stress are linked to higher food consumption and eventual weight gain.<sup>12</sup> Based on the findings discussed earlier, it is evident that perceived stress is correlated with both OSA and obesity. Consequently, it can be inferred that individuals with OSA who are overweight may experience more severe perceived stress, which, in turn, could have a greater impact on their overall quality of life. According to a previous study observed that the level of perceived stress had an impact on the link between sleep quality and obesity.<sup>13</sup> Among individuals experiencing moderate stress, there was an evident connection between sleep quality and obesity.<sup>13</sup> In individuals with a pre-existing chronic health condition, stress is a predictor of unfavorable results, implying that addressing stress in cases of OSA with obesity might result in enhanced outcomes.

The lack of sufficient evidence-based studies in the current literature, especially at the local level, regarding the relationship between perceived stress and elevated BMI in obstructive sleep apnea (OSA) patients represents a significant research gap. This gap presents an opportunity

for a study that could uncover a correlation between perceived stress and BMI in this specific population. Therefore, this study has been done for gaining valuable insights into the interplay between perceived stress and obesity in individuals with OS.

## Methodology

This prospective investigation of the Relationship Between Perceived Stress and BMI in Patients with Obstructive Sleep Apnea was done at Pulmonology Department of Dow University Hospital Dow University of health sciences July to October 2020. All the adults aged 18 and above, both genders, diagnosed with OSA based on clinical evaluation and sleep studies, willing and able to provide informed consent, and no history of other sleep disorders or chronic medical conditions were included.

All the individuals with chronic medical conditions, such as cardiovascular diseases, respiratory disorders, and other chronic illnesses, pregnant women and those who were unwilling or unable to provide informed consent for their participation in the study were excluded. All study participants provided their informed consent and were fully briefed on the study's objectives. They were also assured that they had the option to withdraw from the study at any time, and it was emphasized that their information would be kept confidential. After taking demographic information and clinical examination BMI was calculated by formula ( $BMI=kg/m^2$ ) and Perceived Stress Scale (PSS) was used to assess participants' perceived stress levels. Participants were completed the PSS questionnaire, which consists of 10 items, each rated on a 5-point Likert scale (ranging from 0 to 4). Higher scores indicate higher perceived stress. OSA severity was measured by the "Apnea-Hypopnea Index, AHI". All the relevant clinical data was recorded by the pre-structure study proforma. The Pearson correlation coefficient was calculated to determine the direction of the relationship. A p-value  $<0.05$  was considered as significant.

## Results

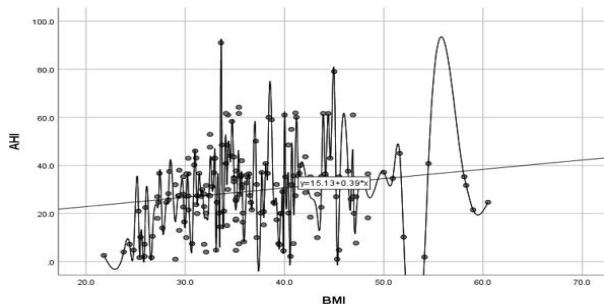
Total 160 cases of OSA were studied; their mean age was 50.29 years with standard deviation of 12.65 years. Overall average of BMI was  $33.70 \pm 7.08 \text{ kg/m}^2$ . Male were in majority 59.4% and females were 40.6%. According to BMI, 13.8% cases were overweight and 85.0% were obese, while only two cases were with normal BMI. However, 41.3% cases had low stress, 45.6% had moderate stress and 13.1% had high perceived stress. Although there was insignificant association between BMI

and perceived stress ( $p=0.278$ ). The p-value showing insignificant may because of, almost all patients were overweight and obese, only two patients were with normal BMI. (Table I)

**Table I: Perceived stress scale according to BMI. (n=160)**

BMI	Perceived Stress Scale			P value
	Low Stress	Moderate Stress	High Perceived Stress	
Normal weight	2	0	0	
	1.3%	0.0%	0.0%	
Over weight	12	7	3	0.278
	7.5%	4.4%	1.9%	
Obese	53	66	17	
	33.1%	41.3%	10.6%	
Total	67	73	20	
	41.9%	45.6%	12.5%	

Pearson correlation showed a positive correlation between perceived stress and BMI ( $r=0.127$  and  $p=0.110$ ), indicating that raised BMI raises the perceived stress among patients of OSA. Figure 1



**Figure 1. Correlation between body mass index and AHI (n=160)**

## Discussion

A sympathetic medical disease that substantially decreases quality of life overall is obstructive sleep apnea, which has been linked to a number of health issues. Perceived stress is one of the potential elements that contributes to OSA; it can worsen the disorder and affect body weight. This study investigates the relationship between body mass index (BMI) and felt stress in people with OSA by including a total of 160 cases with an average age of 50.29 years and a male predominance of 59.4%. Comparatively Gabbay IE et al<sup>14</sup> reported that average age of the patients was  $51.12 \pm 13.0$  years and males were 74.3%. Consistently Venkatnarayan K et al<sup>15</sup> found patient's average age  $49.7 \pm 11.3$  years and males in majority with men and women ratio as 70:22. In the study by Peres BU et al<sup>16</sup> reported that the males were in majority 68% and mean age was 58.8 years. In this study the overall average of BMI was  $33.70 \pm 7.08 \text{ kg/m}^2$ , particularly 13.8% cases were

overweight and 85.0% were obese, while only two cases were with normal BMI and these findings were supported by some other studies like Gabbay IE et al<sup>14</sup> found average BMI of the patients was  $30.2 \pm 5.9 \text{ kg/m}^2$ . On the other hand, Venkatnarayan K et al<sup>15</sup> found average BMI as  $32.1 \pm 6.4 \text{ kg/m}^2$ . Peres BU et al<sup>16</sup> reported also reported that the average BMI of the patients was  $31.62 \pm 6.49 \text{ kg/m}^2$ . Most of the studies found BMI more than  $30 \text{ kg/m}^2$  like this study. Studies often include patients with OSA, and a significant proportion of them may have obesity, which can skew the average BMI in the higher range.

In this study perceived stress and BMI did not significantly correlate in this study ( $p=0.278$ ). Because only two patients had a normal BMI and the majority of patients were overweight or obese, the p-value may be deemed insignificant. According to a positive association found by Pearson correlation analysis between perceived stress and BMI ( $r=0.127$  and  $p=0.110$ ), individuals with OSA who have higher BMIs also report higher levels of perceived stress. Comparatively being overweight or obese was found to be a strong predictor of the onset of depression by LaGrotte et al.<sup>17</sup> Moreover, their results demonstrated a significant age-dependent component in the association between BMI and depression incidence. According to the study, from early childhood until later adulthood, the risk of depression in overweight women was higher and was constant.<sup>17</sup> Conversely, among obese women, the prevalence of depression increased in early adulthood, held steady in middle age, and declined in later life. On the other hand, there was no discernible correlation between male obesity and the beginning of depression, their findings give some support to the potential effect of psychosocial factors in the development of depression in overweight women vs. men.<sup>17</sup> On the other hand Araghi MH et al<sup>18</sup> observed that in people with excessive obesity, poor sleep quality was strongly correlated with feelings of depression and a lower quality of life. Our results have been supported partially by Bidulescu A et al.<sup>19</sup> who found that stress affected the relationship between obesity and sleep quality across the board for their participant group, with a higher likelihood of obesity seen in the medium stress category.

There are no additional studies of this type to be identified, and this study also possess several limitations like study's sample size was limited. It included most of the overweight cases only two had normal BMIs. However, larger-scale studies are recommended to evaluate the perceived stress of OSA patients based on normal BMI

versus obese in order to clearly explore the relationship between perceived stress and obesity in OSA patients.

## Conclusion

The study revealed a vast majority of study population of OSA falling into the obese category. There was observed a positive correlation between obesity and perceived stress. It has been noted that there is a need for additional large-scale studies and interventions to investigate the impact of BMI on stress among patients of OSA and how potentially influencing overall health and well-being due to the limited data in the literature and some current study limitations regarding such correlation.

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