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Association between Body Mass Index and Obstructive Sleep Apnea Severity: Emphasis on Nocturnal Hypoxemic Burden

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ABSTRACT

Background: Obstructive sleep apnea (OSA) is strongly associated with obesity and increased cardiometabolic risk. However, the relationship between body mass index (BMI) categories and nocturnal hypoxemic burden in OSA remains incompletely understood.

Methods: This cross-sectional observational study included 77 adults undergoing overnight polysomnography or home sleep apnea testing using the Deck Mount Level 3 Sleep Apnea Device at a tertiary care center between September and November 2025. Participants were categorized into normal weight, overweight, and obese groups according to WHO BMI criteria. OSA severity was classified using Apnea-Hypopnea Index (AHI) thresholds based on American Academy of Sleep Medicine guidelines. Oxygen Desaturation Index (ODI) and oxygen saturation parameters were also analyzed. Statistical methods included Kruskal-Wallis, Mann-Whitney U, Spearman correlation, and chi-square tests.

Results: Significant differences in AHI were observed across BMI categories ($H = 8.45$, $p = 0.015$). Severe OSA was more prevalent among overweight and obese individuals than normal-weight participants ($\chi^2 = 12.12$, $p = 0.017$). BMI showed no significant correlation with AHI ($r = 0.169$, $p = 0.142$), but demonstrated a significant positive correlation with ODI ($r = 0.305$, $p = 0.007$). ODI also differed significantly across BMI groups ($H = 13.43$, $p = 0.001$).

Conclusion: BMI category is significantly associated with OSA severity and nocturnal hypoxemia. ODI demonstrated a stronger association with BMI than AHI, suggesting its importance in evaluating obesity-related physiological burden in OSA.

Key-words: Obstructive sleep apnea; Body mass index; Apnea-Hypopnea Index; Oxygen Desaturation Index; Home sleep apnea testing; Obesity

INTRODUCTION

Obstructive sleep apnea (OSA) is a common and potentially serious sleep-related breathing disorder characterized by recurrent episodes of upper airway obstruction during sleep, leading to intermittent hypoxemia, hypercapnia, sleep fragmentation, and excessive daytime sleepiness. [1,2]

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OSA has become a major global public health concern, with recent epidemiological estimates suggesting that nearly 936 million adults worldwide may have varying degrees of sleep-disordered breathing. Beyond impaired sleep quality, OSA is strongly associated with hypertension, cardiovascular disease, stroke, insulin resistance, metabolic syndrome, neurocognitive dysfunction, and increased all-cause mortality. [2,3]

Obesity is widely recognized as the most important modifiable risk factor for OSA. Excess adipose tissue surrounding the pharyngeal airway contributes to increased upper airway collapsibility during sleep, while central obesity reduces functional residual capacity and lung volume, thereby impairing airway stability and

respiratory mechanics. [3,4] Longitudinal studies have demonstrated that even modest weight gain significantly increases the risk and severity of sleep-disordered breathing . [5,6] However, despite the well-established association between obesity and OSA, the relationship between body mass index (BMI) and specific markers of disease severity remains incompletely understood.

The severity of OSA is conventionally assessed using the Apnea-Hypopnea Index (AHI), which measures the number of apnea and hypopnea episodes occurring per hour of sleep. [5,6] According to the American Academy of Sleep Medicine (AASM), OSA is categorized as mild, moderate, or severe based on AHI thresholds. Nevertheless, increasing evidence suggests that the Oxygen Desaturation Index (ODI), which reflects the frequency of oxygen desaturation events during sleep, may provide additional prognostic information beyond AHI alone. [6,7] Hypoxic burden has been shown to independently predict adverse cardiovascular outcomes and mortality in patients with sleep-disordered breathing. [8, 9] Importantly, obese individuals may experience more profound and prolonged nocturnal oxygen desaturation despite comparable AHI values, indicating that BMI may influence the physiological consequences of OSA differently from respiratory event frequency alone. [10, 11]

Advances in portable sleep diagnostic technology have substantially improved the accessibility of OSA screening and diagnosis. Home sleep apnea testing (HSAT) systems now provide reliable alternatives to in-laboratory polysomnography, particularly in resource-limited settings and high-volume clinical populations. [12,13] The Deck Mount Level 3 Sleep Apnea Device is a portable multi-channel HSAT system capable of simultaneously recording oxygen saturation, pulse rate, respiratory rate, airflow, plethysmography, snoring activity, and apnea-related events in real time. Such portable diagnostic platforms facilitate large-scale OSA screening while improving patient convenience and reducing healthcare burden.

Given the increasing prevalence of obesity and the growing burden of sleep-disordered breathing, evaluating the relationship between BMI categories and OSA severity is clinically important for improving risk stratification and early diagnosis. Therefore, the present study aimed to assess the association between BMI categories and OSA severity, with particular emphasis on Apnea-Hypopnea Index (AHI), Oxygen Desaturation Index (ODI), and nocturnal oxygenation parameters in patients undergoing sleep evaluation at a tertiary care center.

MATERIALS AND METHODS

Study Design- This cross-sectional observational study was conducted in the Department of Physiology and Sleep Laboratory at Sri Aurobindo Medical College and P.G. Institute, Indore, Madhya Pradesh, India, between September 2025 and November 2025. The study aimed to evaluate the association between body mass index (BMI) categories and the severity of obstructive sleep apnea (OSA) in patients undergoing sleep evaluation at a tertiary care center.

Study Population- Consecutive adult patients referred for evaluation of suspected sleep-disordered breathing were screened for eligibility. A total of 85 patient records were initially reviewed. After exclusion of one duplicate record and seven records with incomplete anthropometric or sleep study data, 77 patients were included in the final analysis.

Inclusion Criteria

- Age ≥ 18 years
- Patients undergoing overnight polysomnography or home sleep apnea testing
- Apnea-Hypopnea Index (AHI) ≥ 5 events/hour
- Availability of complete demographic and anthropometric data

Exclusion Criteria

- Incomplete sleep study recordings
- Missing BMI or oxygen saturation data
- Duplicate patient records
- Previously diagnosed central sleep apnea or major neurological disorders affecting respiration

Sleep Study Assessment- Sleep evaluation was performed using either standard overnight polysomnography or the Deck Mount Level 3 Sleep Apnea Device for home sleep apnea testing (HSAT). The Deck Mount system is a portable multi-channel sleep monitoring device capable of simultaneously recording oxygen saturation (SpO_2), pulse rate, respiratory rate, airflow, plethysmographic signals, snoring activity, and apnea-related events in real time. The device also enables differentiation between obstructive and central

apnea events with continuous waveform visualization during monitoring. Sleep studies were interpreted according to the American Academy of Sleep Medicine (AASM) scoring criteria. [5]

Fig. 1 and Fig. 2 represent the study device and testing procedure rather than study findings. Therefore, these figures should be shifted from the Results section to the Materials and Methods section under "Sleep Study Assessment" or "Study Device Description". The Results section should only contain figures/tables presenting study outcomes and statistical findings.

Fig. 1: Deck Mount Sleep Sense Device in Use during Home Sleep Apnea Testing

Legend- Patient undergoing home sleep apnea testing using the Deck Mount Sleep Sense Level 3 device with wrist-mounted monitoring unit and finger pulse oximetry (SpO_2) probe for continuous overnight respiratory and oxygen saturation monitoring.

Fig. 2: Portable Deck Mount Sleep Sense Level 3 HSAT Device

Legend- Portable Deck Mount Sleep Sense home sleep apnea testing (HSAT) device used for recording respiratory parameters, pulse rate, oxygen saturation, and apnea-related events during sleep evaluation.

Anthropometric Measurements- Body mass index (BMI) was calculated using standard anthropometric measurements and participants were categorized according to World Health Organization (WHO) BMI classification as:

- Normal weight: BMI < 25 kg/m²
- Overweight: BMI 25.0–29.9 kg/m²
- Obese: BMI ≥ 30 kg/m²

Definitions and Outcome Measures- Obstructive sleep apnea severity was classified according to AASM criteria [5] as:

- Mild OSA: AHI 5–14.9 events/hour
- Moderate OSA: AHI 15–29.9 events/hour
- Severe OSA: AHI ≥ 30 events/hour

The primary outcome measures included Apnea-Hypopnea Index (AHI) and OSA severity category. Secondary outcome measures included Oxygen Desaturation Index (ODI), average oxygen saturation (SpO_2), lowest oxygen saturation during sleep, and snoring index.

Statistical Analysis- Statistical analysis was performed using Python software (SciPy version 1.11 and Pandas version 2.0). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR), while categorical variables were expressed as frequencies and percentages. As AHI and ODI values demonstrated non-normal distribution, non-parametric statistical methods were applied. The Kruskal-Wallis test was used to compare AHI and ODI across BMI categories. Pairwise comparisons were performed using the Mann-Whitney U test with Bonferroni correction (adjusted significance threshold $\alpha = 0.017$). Spearman rank correlation analysis was used to assess the relationship between continuous BMI values and sleep parameters. The chi-square test was used to evaluate the association between BMI categories and OSA severity distribution. A p-value < 0.05 was considered statistically significant.

Ethical Approval- The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) of Sri Aurobindo Institute of Medical Sciences, Indore (IEC No: SAIMS/RC/IEC/170/25). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki, and all patient data were anonymized prior to statistical analysis.

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RESULTS

A total of 77 patients were included in the final analysis after exclusion of one duplicate and seven incomplete records. The mean age of the participants was 49.1 ± 12.7 years, with males comprising 84.4% of the study population. The overall mean body mass index (BMI) was 31.4 ± 5.7 kg/m². According to WHO BMI classification, 13 patients (16.9%) were categorized as normal weight, 20 (26.0%) as overweight, and 44 (57.1%) as obese. Baseline demographic and sleep-related characteristics are summarized in Table 1. Significant differences in BMI, Apnea-Hypopnea Index (AHI), and Oxygen Desaturation Index (ODI) were observed across BMI categories. The overweight group demonstrated the highest mean AHI (32.8 ± 12.7 events/hour), whereas the obese group exhibited the highest ODI values (42.1 ± 13.6 events/hour), indicating greater nocturnal hypoxemic burden. No statistically significant differences were observed in average or lowest oxygen saturation (SpO_2) among BMI groups.

Table 1: Baseline Characteristics by BMI Category

Variable	Normal (n = 13)	Overweight (n = 20)	Obese (n = 44)	p-value
Age (years), mean ± SD	52.4 ± 21.0	50.0 ± 9.4	47.7 ± 10.8	0.64
Male sex, n (%)	11 (84.6%)	17 (85.0%)	37 (84.1%)	0.99
BMI (kg/m²), mean ± SD	23.1 ± 2.2	28.1 ± 1.2	35.0 ± 4.5	<0.001
AHI (events/hour), mean ± SD	20.4 ± 11.3	32.8 ± 12.7	28.9 ± 11.3	0.015*
AHI, median (IQR)	15.0 (13–23)	34.5 (25–43)	30.0 (19–35)	—
ODI (events/hour), mean ± SD	32.0 ± 11.7	28.8 ± 13.8	42.1 ± 13.6	0.001*
Average SpO_2 (%), mean ± SD	93.6 ± 2.3	92.9 ± 2.0	93.1 ± 2.0	0.56
Lowest SpO_2 (%), mean ± SD	64.9 ± 2.8	65.4 ± 3.2	64.5 ± 3.5	0.67

AHI = Apnea-Hypopnea Index; ODI = Oxygen Desaturation Index; SpO_2 = oxygen saturation.
**Kruskal-Wallis test.*

Severe obstructive sleep apnea (OSA) was the most prevalent category, affecting 38 patients (49.4%), followed by moderate OSA in 27 (35.1%) and mild OSA in 12 patients (15.6%). A statistically significant association was observed between BMI category and OSA severity distribution (χ^2 = 12.12, p = 0.017), as shown in Table 2. Normal-weight participants predominantly exhibited mild OSA, whereas severe OSA was more common among overweight and obese individuals, suggesting that increasing BMI is associated with greater OSA severity.

Table 2: Distribution of OSA Severity by BMI Category

BMI Category	Mild OSA n (%)	Moderate OSA n (%)	Severe OSA n (%)	Total
Normal (BMI <25 kg/m²)	6 (46.2%)	4 (30.8%)	3 (23.1%)	13
Overweight (BMI 25–29.9 kg/m²)	2 (10.0%)	6 (30.0%)	12 (60.0%)	20
Obese (BMI ≥30 kg/m²)	4 (9.1%)	17 (38.6%)	23 (52.3%)	44
Total	12 (15.6%)	27 (35.1%)	38 (49.4%)	77

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Non-parametric analysis demonstrated significant differences in Apnea-Hypopnea Index (AHI) across BMI categories (H = 8.45, p = 0.015), as summarized in Table 3. Post-hoc analysis revealed significantly higher AHI values in overweight (p = 0.010) and obese patients (p = 0.016) compared with normal-weight individuals, whereas no significant difference was observed between overweight and obese groups (p = 0.238). Spearman correlation analysis showed no significant correlation between continuous BMI and AHI (r = 0.169, p = 0.142). However, BMI demonstrated a significant positive correlation with Oxygen Desaturation Index (ODI) (r = 0.305, p = 0.007). ODI also differed significantly across BMI categories (H = 13.43, p = 0.001), with the highest ODI values observed in obese patients, indicating greater nocturnal hypoxemic burden with increasing BMI.

Table 3: Summary of Statistical Test Results

Test	Statistic	p-value	Interpretation
Kruskal-Wallis test: AHI across BMI groups	H = 8.45	0.015	Significant
Kruskal-Wallis test: ODI across BMI groups	H = 13.43	0.001	Highly significant
Spearman correlation: BMI vs AHI	r = 0.169	0.142	Not significant
Spearman correlation: BMI vs ODI	r = 0.305	0.007	Significant
Mann-Whitney U test: Obese vs Normal (AHI)	U = 413.5	0.016	Significant
Mann-Whitney U test: Overweight vs Normal (AHI)	U = 200.5	0.010	Significant
Mann-Whitney U test: Obese vs Overweight (AHI)	U = 358.0	0.238	Not significant
Chi-square test: BMI category vs OSA severity	χ^2 = 12.12	0.017	Significant

AHI = Apnea-Hypopnea Index; ODI = Oxygen Desaturation Index.
Mann-Whitney p-values were adjusted using Bonferroni correction (α = 0.017).

DISCUSSION

The present study evaluated the association between body mass index (BMI) categories and obstructive sleep apnea (OSA) severity in a clinically referred population undergoing polysomnography or home sleep apnea testing. The findings demonstrated a significant relationship between BMI category and OSA severity distribution, with severe OSA occurring more frequently among overweight and obese individuals. Furthermore, BMI showed a stronger association with Oxygen Desaturation Index (ODI) than with Apnea-Hypopnea Index (AHI), suggesting that obesity may contribute more substantially to nocturnal hypoxemic burden than to respiratory event frequency alone.

Obesity is widely recognized as the most important modifiable risk factor for OSA, and the present findings are consistent with previous pathophysiological and epidemiological studies. [3,7] Excess adipose tissue surrounding the upper airway promotes pharyngeal narrowing and increases airway collapsibility during sleep. In addition, central obesity reduces lung volume and functional residual capacity, thereby impairing upper airway stability and increasing susceptibility to obstructive respiratory events. [3,7,9] These mechanisms likely explain the higher prevalence of severe OSA observed among overweight and obese participants in the current study. [9,10,14]

A notable finding of this study was the differential relationship between BMI and markers of OSA severity. Although BMI category was significantly associated with AHI distribution, continuous BMI values did not demonstrate a statistically significant linear correlation with AHI. In contrast, BMI showed a significant positive correlation with ODI, indicating that increasing adiposity may be more closely related to nocturnal oxygen

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desaturation severity than to the absolute frequency of respiratory events.

This observation is clinically important because ODI and hypoxic burden have emerged as strong independent predictors of cardiovascular morbidity and mortality in patients with sleep-disordered breathing. [6,9] Trzepizur *et al*. reported that sleep apnea-specific hypoxic burden is independently associated with adverse cardiovascular outcomes beyond conventional AHI measurements. [6,15] Similarly, Punjabi *et al*. demonstrated that nocturnal hypoxemia is strongly associated with long-term mortality risk in OSA patients. [9,16] The present findings support the growing concept that reliance on AHI alone may underestimate the physiological and cardiovascular burden of OSA in obese individuals.

Interestingly, the overweight group demonstrated slightly higher mean AHI values than the obese group, although the difference was not statistically significant. This finding may reflect the contribution of non-obesity-related anatomical and craniofacial factors involved in upper airway obstruction. [10,17] Craniofacial morphology, airway anatomy, neuromuscular responsiveness, and genetic predisposition have all been implicated in OSA pathogenesis independent of BMI. [10,17] Additionally, the relatively smaller sample size of the overweight subgroup may have influenced this observation.

The predominance of male participants in the present cohort is consistent with previous epidemiological studies demonstrating higher prevalence of OSA among men. [11] Hormonal influences, fat distribution patterns, and upper airway anatomical differences are believed to contribute to this sex disparity. [11]

Another important aspect of the present study was the incorporation of portable home sleep apnea testing (HSAT) using the Deck Mount Level 3 Sleep Apnea Device. Advances in portable sleep diagnostic technology have improved access to OSA screening, particularly in resource-limited settings where in-laboratory polysomnography may not be readily available. [12, 13] The Deck Mount system enabled simultaneous multi-channel monitoring of oxygen saturation, airflow, respiratory activity, snoring, and apnea-related events in a portable and patient-friendly format, supporting its utility for large-scale screening and early diagnosis of sleep-disordered breathing.

STRENGTHS

The present study has several strengths. It evaluated both Apnea-Hypopnea Index (AHI) and Oxygen Desaturation Index (ODI), allowing comprehensive assessment of OSA severity and nocturnal hypoxemic burden. The use of portable Level 3 home sleep apnea testing enhanced the practical applicability of the findings in real-world and resource-constrained settings. Additionally, the study utilized standardized AASM criteria and appropriate non-parametric statistical methods, improving the reliability of the results.

LIMITATIONS

The cross-sectional design, single-center setting, modest sample size, and predominance of male participants may limit causal inference and generalizability. Additionally, anthropometric measures such as neck circumference and waist-to-hip ratio were not assessed. Despite these limitations, the study highlights a significant association between obesity and OSA severity, particularly nocturnal hypoxemia. Larger multicenter prospective studies are warranted to validate these findings.

CONCLUSIONS

This study demonstrated a significant association between BMI categories and obstructive sleep apnea (OSA) severity. Overweight and obese individuals showed a higher prevalence of severe OSA and greater nocturnal hypoxemic burden compared with normal-weight participants. Notably, BMI correlated more strongly with Oxygen Desaturation Index (ODI) than with Apnea-Hypopnea Index (AHI), suggesting that obesity may influence oxygen desaturation severity more than respiratory event frequency alone. The findings highlight the importance of incorporating oxygen desaturation parameters alongside AHI in the assessment of OSA severity. Additionally, the Deck Mount Level 3 Sleep Apnea Device proved to be a practical and accessible tool for portable sleep apnea evaluation. Further large-scale multicenter studies are recommended to validate these findings and better understand the impact of obesity on OSA-related cardiovascular risk.

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REFERENCES

[1] Benjafield AV, Ayas NT, Eastwood PR, Heinzer R, Ip MSM, et al. Estimation of the global prevalence and burden of obstructive sleep apnea: a literature-based analysis. Lancet Respir Med., 2019; 7(8): 687-98. doi: 10.1016/S2213-2600(19)30198-5.

[2] Javaheri S, Barbé F, Campos-Rodriguez F, Dempsey JA, Khayat R, et al. Sleep apnea: types, mechanisms, and clinical cardiovascular consequences. J Am Coll Cardiol., 2017; 69(7): 841-58.

[3] Schwartz AR, Patil SP, Laffan AM, Polotsky V, Schneider H, et al. Obesity and obstructive sleep apnea: pathogenic mechanisms and therapeutic approaches. Proc Am Thorac Soc., 2008; 5(2): 185-92.

[4] Owens RL, Malhotra A, Eckert DJ, White DP, Jordan AS. The influence of end-expiratory lung volume on pharyngeal collapsibility in obstructive sleep apnea. J Appl Physiol. 2010; 108(2): 445-51.

[5] Berry RB, Gamaldo CE, Harding SM, Brooks R, Lloyd RM, et al. AASM Scoring Manual Version 2.2 Updates: New Chapters for Scoring Infant Sleep Staging and Home Sleep Apnea Testing. J Clin Sleep Med., 2015; 11(11): 1253-54.

[6] Trzepizur W, Blanchard M, Ganem T, Balusson F, Feuilloy M, et al. Sleep apnea-specific hypoxic burden and risk of cardiovascular events. Am J Respir Crit Care Med., 2022; 205(1): 108-17.

[7] Peppard PE, Young T, Palta M, Dempsey J, Skatrud J. Longitudinal study of moderate weight change and sleep-disordered breathing. JAMA, 2000; 284(23): 3015-21.

[8] Loewen A, Ostrowski M, Laprairie J, Atkar R, Gnitecki J, et al. Determinants of ventilatory instability in obstructive sleep apnea: inherent or acquired? Sleep, 2009; 32(10): 1355-65.

[9] Punjabi NM, Caffo BS, Goodwin JL, Gottlieb DJ, Newman AB, et al. Sleep-disordered breathing and mortality: a prospective cohort study. PLoS Med., 2009; 6(8): e1000132.

[10] Neelapu BC, Kharbanda OP, Sardana HK, Balachandran R, Sardana V, et al. Craniofacial and upper airway morphology in adult obstructive sleep apnea patients: a systematic review and meta-analysis of cephalometric studies. Sleep Med Rev., 2017; 31: 79-90.

[11] Heinzer R, Vat S, Marques-Vidal P, Marti-Soler H, Andries D, et al. Prevalence of sleep-disordered breathing in the general population: the HypnoLaus study. Lancet Respir Med., 2015; 3(4): 310-18.

[12] Kapur VK, Auckley DH, Chowdhuri S, Kuhlmann DC, Mehra R, et al. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med., 2017; 13(3): 479-504.

[13] Collop NA, Anderson WM, Boehlecke B, Claman D, Goldberg R, et al. Clinical guidelines for the use of unattended portable monitors in the diagnosis of obstructive sleep apnea in adult patients. J Clin Sleep Med., 2007; 3(7): 737-47.

[14] Broström A, Ulander M, Nilsen P, Lin CY, Pakpour AH. Development and psychometric evaluation of the Motivation to Use CPAP Scale (MUC-S) using factorial structure and Rasch analysis among patients with obstructive sleep apnea before CPAP treatment is initiated. Sleep Breath, 2021; 25(2): 627-37. doi: 10.1007/s11325-020-02143-9.

doi: 10.21276/SSR-IIJLS.2026.12.4.2

[15]Zhang Y, Zhou L, Zhu S, Zhou Y, Wang Z, et al. Deep Learning for Obstructive Sleep Apnea Detection and Severity Assessment: A Multimodal Signals Fusion Multiscale Transformer Model. Nat Sci Sleep, 2025; 17: 1-15.

[16]Jennum P, Tønnesen P, Ibsen R, Kjellberg J. All-cause mortality from obstructive sleep apnea in male and female patients with and without continuous positive airway pressure treatment: a registry study with 10 years of follow-up. Nat Sci Sleep, 2015; 7: 43-50.

[17]Sonnesen L, Petersson A, Berg S, Svanholt P. Pharyngeal Airway Dimensions and Head Posture in Obstructive Sleep Apnea Patients with and without Morphological Deviations in the Upper Cervical Spine. J Oral Maxillofac Res., 2017; 8(3): e4.

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