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Correlation Between Incidence of Sleep Apnoea and Obesity Using Anthropometric Measures

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ABSTRACT

Background: Sleep apnea, a syndrome characterized by fatigue, morning headaches, and loud snoring, affects individuals of all ages. Its diagnosis relies on identifying episodes of hypopnea or apnea during sleep, often caused by respiratory obstructions. Obesity, particularly visceral fat, heightens the risk. Anthropometric measures aid diagnosis, potentially reducing reliance on costly polysomnography. Ongoing treatment, including thorough patient evaluation, is essential for managing this condition. The aim is to assess the association between obesity and sleep apnea severity using anthropometric measures.

Methods: The study involved analyzing medical records of 100 individuals aged 18 to 60 diagnosed or under examination for obstructive sleep apnea. Anthropometric measures including BMI, waist circumference (WC), and neck circumference (NC) were recorded. Statistical analysis using SPSS version 20.0 included Pearson Correlation Test and ANOVA to assess the relationship between obesity indices and sleep apnea severity.

Results: Analysis revealed a significant correlation between obesity indices (BMI, NC, and WC) and the likelihood of sleep apnea. Specifically, higher values of these measures were associated with an increased risk of the disorder. These findings suggest that anthropometric measures can serve as valuable screening tools to identify obese individuals, who may require further evaluation for sleep apnea.

Conclusion: Obesity correlates with sleep apnea severity, highlighting the importance of early screening and intervention in high-risk populations.

Key-words: Apnea-hypopnea index, Neck circumference, Body mass index, Obstructive sleep apnea, Anthropometric Measures

INTRODUCTION

Sleep apnea syndrome can cause fatigue, headaches in the morning, and loud snoring at any age. While individuals with hypopneas experience episodes longer than or equal to 10 seconds in which breathing continues but ventilation is at least 50% less than baseline, people with apneas experience breathing pauses longer than or equal to 10 seconds. An individual must have five or more episodes of either hypopnea or apnea each hour to be diagnosed with sleep apnea. The term "apnea-hypopnea index" The number of apnea and hypopnea events that happen throughout each hour of sleep is known as the average heart rate. [1,2]

These episodes may result from an obstruction of the respiratory system (obstructive sleep apnea), a combination of these factors (mixed sleep apnea), or a lack of respiratory effort brought on by depression of the

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central chemoreceptors. Daytime sleepiness, depression, hypertension, and diminished alertness, cognitive function, and driving are among the range of symptoms, which change according to the severity and duration of the condition. Throughout the day, one may experience mild to extreme sleepiness. Additional symptoms include nocturia, difficulty focusing, choking during the night, and decreased libido. Partners describe noisy snoring every night in all positions, sometimes with periods of quiet linked to apneas [3-5]. Worldwide, adult patients with sleep apnea range from 4 to 7% [1]. This ailment generates a wide range of symptoms, thus, it's important to address relevant variables, diagnose patients as quickly as feasible, and increase public awareness. Many medical costs can be avoided with early and effective diagnosis and treatment. It's also feasible to reduce mortality and morbidity linked to cardiovascular disease. The prevalence of OSA was three times higher in males than in women in the Indian population [4].

Obesity, especially the presence of visceral fat, is considered to be linked to an increased risk of developing sleep apnea [5]. Research on the problem has demonstrated that obesity is a substantial risk factor for both adult and paediatric OSA. Statistics show that in obese adults, the prevalence of OSA increases to 98% when their body mass index (BMI) is 40 kg/m 2 or more. Most of the time, obesity may be addressed and even reversed with the correct lifestyle modifications. Thus, the capacity to clearly define a link will help medical professionals categorize and stratify patients to conduct further examinations [5]. Polysomnography is an expensive test that requires specialist knowledge, a complicated setup, and accessibility issues.

Easy to collect, anthropometric measures are essential for first evaluating a patient suspected of having sleep apnea. As a result, there may be a significant decrease in the number of patients referred for polysomnography, which would save healthcare costs. Therefore, additional polysomnography testing would be prioritized in individuals with a greater suspicion of illness when using these measures in patients with snoring and those clinically suspected of having sleep apnea [6-8].

Treatment for sleep apnea must be ongoing, and the diagnosis must be confirmed or ruled out with absolute confidence. A thorough sleep history from the patient and their spouse is essential. The physical examination must evaluate blood pressure, upper airway obstruction, obesity, jaw anatomy, and potential predisposing factors such as acromegaly and hypothyroidism. The diagnostic test must demonstrate recurrent breathing pauses during sleep in those with appropriate clinical features. This may be full polysomnography with a recording of multiple respiratory and neurophysiologic signals during sleep.

MATERIALS AND METHODS

Place of study- The study was carried out in the Department of Physiology of the Rajendra Institute of Medical Sciences in Ranchi and the sleep medicine department of the Tata Main Hospital in Jamshedpur. The Institutional Ethics Committee's prior clearance was obtained from both institutions.

Methodology- Information was gathered from the medical records of one hundred individuals diagnosed or undergoing examination for obstructive sleep apnea. Patients aged 18 to 60 years were considered, both males and females. Adults who experience breathing pauses >10 seconds are said to have apnea, while those who experience disturbed breathing episodes > 10 seconds are said to have hypopnea. However, ventilation is decreased from the prior baseline by at least 30% during sleep.

Inclusion criteria- Inclusion criteria included patients who reported to the OPD after obtaining their informed consent. These individuals were assessed in a suitable setting within the hospital.

Exclusion criteria- Exclusion from the research criteria include not providing informed permission, having a tumour or other craniofacial abnormality, having a pacemaker or concurrent cardiac condition, or being extremely elderly (>75 years).

The following factors were evaluated using the BMI of anthropometry: Weight was measured in light clothing and without shoes. To assess height, shoes were not worn. One may calculate their BMI by dividing their weight (kg) by height (m squared).
The waist circumference (WC) (cm) was measured horizontally at the midway point between the iliac crest and costal edge at the mid-axillary line using a plastic tape measure. The subject was standing at the end of a mild expiration. The measurement was taken as 1 mm.

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The patients were asked to stand erect while the neck circumference, or NC, was measured using non-stretchable plastic tape to accurately measure the distance between the mid-cervical spine and the mid-anterior neck. It was a little less prominent when measured in men with laryngeal prominence (Adam's).

Statistical Analysis- The SPSS programme version 20.0 was used to examine and assess the results. The Peasron Correlation Test and ANOVA were used to compare the parameters. The three criteria for predicting apnea were evaluated using a post hoc test.

Ethical Approval- Approval for this study was obtained from the relevant ethical committee, ensuring that all research procedures adhered to ethical standards and guidelines for protecting participants' rights and confidentiality.

RESULTS

Overnight polysomnographic studies defined the presence of sleep apnoea and associated symptoms. The cases with AHI (Apnoea Hypopnoea Index greater than 20) suffered from sleep apnoea). A total 23 cases with no apnoea and 77 cases with apnoea were considered for evaluation. Anova test among these 3 groups of sleep apnoea shows a highly significant relation (p= .000) with BMI, NC and WC, where the significance level is lowest with WC (.007) (Table 1).

Table 1: BMI, NC and WC descriptive data for the various sleep apnea severity categories

Sleep apnoea	Number of cases	BMI(Mean+/- SD)	WC(cm)(Mean+/- SD)	NC(cm)(Mean+/-SD)
Present	77	25.54+/-1.990	86.118+/-5.645	36.26+/-1.907
Absent	23	22.57 ± 1.647	33.57 ± 3.369	83.35 ± 4.802
p-value	-	0.000	0.007	0.000

Based on the findings, WC is the least significant predictor of the association between obesity and apnoea. In contrast, BMI and NC have a high significance in predicting the occurrence of the disease in people with obesity (Table 2).

Table 2: Intra Group Significance Level Of BMI, WC and NC as predictors of sleep apnoea

	BMI	WC	NC
Obesity and apnoea both present	0.000	0.033	0.000
Obesity present but no apnoea	0.004	0.022	0.007
Apnoea present but no obesity	0.003	0.013	0.003
Both obesity and apnoea absent	0.007	0.007	0.005

DISCUSSION

A random selection of one hundred sleep apnea patients who had attended the sleep clinic at Tata Main Hospital in Jamshedpur was made for the study. AHI, or the Apnea-Hypopnea Index, measures the severity of sleep apnea. The AHI is the total number of hypopneas (brief bursts of shallow breathing) and apneas (breathing pauses) that occur on average every hour [9].

For adults, WHO defines overweight and obesity as follows:

Overweight is a BMI greater than or equal to 25, and obesity is a BMI greater than or equal to 30 [10].

In 2022, there were 2.5 billion overweight people over the age of 18, with over 890 million of them being obese. 43% of persons over the age of 18 are overweight (43% of men and 44% of women), which is an increase from 25% of adults over the age of 18 in 1990 [11]. The prevalence of overweight varies by location; the Americas had a 67% prevalence, whereas the WHO South-East Asia and African areas had 31%.

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16% of persons worldwide, who were 18 or older were obese in 2024. Global obesity prevalence increased by more than four times between 1990 and 2024 [6]. It is thought that there is a strong relationship between the severity of the sickness and the body mass index, or BMI. A person's BMI raises their chance of acquiring sleep apnea, according to the results of my research, which are displayed. Truncal and abdominal obesity are thought to be a significant risk factor for the illness [12]. Upper airway collapsibility is essential to the pathogenesis of the disease. Adipokines can alter the behaviour of brain regulatory systems, and obesity alters the mechanical collapsibility of the pharynx [13].

Various previous studies have shown that neck circumference is an important anthropometric trait to predict disease occurrence. About 50% of those with sleep apnea syndrome do not have obesity [13]. It was suggested that non-obese patients with OSA may have different upper airways due to the localized fat buildup around the neck compared to normal individuals with the same body mass [14]. Non-obese people with OSA exhibit notable fat buildup, especially anterolateral to the upper airway, compared to normal individuals [15-18]. A post hoc test incorporating all three measurements was carried out, and their importance was established to predict the incidence of apnea based on AHI. Weight circumference (WC) is a useful tool for assessing the prevalence of apnea in obese individuals who carry the least weight. Previous studies have shown that combined three anthropometric parameters are not particularly reliable markers of apnea severity. A study by Pinto *et al.* [19] found that NC is a more reliable estimate of OSA severity; however, when NC was combined with BMI, WC, or any other anthropometric measure separately, its predictive ability decreased.

CONCLUSIONS

Concomitant conditions are making the hidden epidemic of sleep apnea even worse. Any obese person with a high BMI should be evaluated in any environment; workplaces and other locations where individuals "mostly have a sedentary lifestyle" should be good examples. There is a linear correlation between the two epidemics of obesity and sleep apnea. Healthcare facilities are providing diagnosis, treatment options, and preventative measures as global awareness of this problem increases. Untreated patients put both themselves and society at large in danger since their disease makes it difficult for them to remain focused throughout the day, which raises the possibility of accidents that cause fatalities. Consequently, the knowledge of altering one's lifestyle (food preferences, alcohol consumption, smoking, etc.) thus the first objective for all obese patients who present to OPD with sleep apnea symptoms is to realize the advantages of losing weight.

CONTRIBUTION OF AUTHORS

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