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To Study the Prevalence of Obstructive Sleep Apnea (Osa) in Patients of Chronic Obstructive Pulmonary Disease (Copd) in North West Region of India

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HIGHLIGHTS

1. Study conducted on COPD patients in North west India.
2. Focused on identifying obstructive sleep apnea prevalence.
3. Included adults diagnosed with stable COPD condition.
4. Sleep patterns assessed using standardized diagnostic tools.
5. Data collected through questionnaires and overnight polysomnography.
6. Significant number showed symptoms of undiagnosed OSA.
7. Prevalence higher among moderate to severe COPD cases.
8. Emphasizes need for routine OSA screening in COPD.

Key words:

Chronic obstructive pulmonary disease (COPD)
Obstructive sleep apnea (OSA)
Overlap syndrome
Prevalence
Polysomnography
Apnea-hypopnea index (AHI)
Epworth sleepiness scale (ESS)
North west india

ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is a prevalent respiratory condition in India, particularly in the North West region, driven by environmental and lifestyle factors. Obstructive Sleep Apnea (OSA), a sleep-related breathing disorder, frequently coexists with COPD. **Aims:** To find the prevalence of OSA among COPD patients in North West India and asses the quality of sleep along with cinical parameters. **Materials & Methods:** This cross-sectional, hospital-based study included 104 diagnosed COPD patients aged 18-65 years. Data were collected using clinical assessments, spirometry, STOP-BANG questionnaire, Pittsburgh Sleep Quality Index (PSQI), and Apnea-Hypopnea Index (AHI) from polysomnography. **Results:** OSA was diagnosed in 25% of COPD patients. The mean AHI in OSA patients was 49.56, indicating moderate to severe apnea. Those with OSA had significantly more symptoms like daytime sleepiness and snoring, which were absent in non-OSA patients. Dyspnea was the most common symptom (88.46%) among OSA patients. They also had worse sleep quality (mean PSQI: 13) and elevated STOP-BANG scores. Vital signs showed higher systolic blood pressure and respiratory rates, along with lower SpO□ levels in the OSA group. Although demographic factors such as age and gender did not show significant differences, clinical comorbidities like hypertension and diabetes were more common in the OSA group. **Conclusion:** The study reveals substantial burden of OSA among COPD patients in North West India, particularly among those with more severe disease and comorbidities. Recognizing key symptoms like snoring and sleepiness can facilitate early identification. Findings support the integration of sleep quality assessment and routine OSA screening in COPD management is recommended to reduce morbidity and healthcare burden.

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a progressive and debilitating respiratory condition that affects over 384 million people globally and is a major cause of morbidity and mortality [1]. It primarily includes chronic bronchitis and emphysema, which contribute to airflow obstruction and deteriorating lung function. In India's Northwestern region-including Punjab, Haryana, Himachal Pradesh, and Rajasthan-COPD poses a serious public health concern due to high air pollution, tobacco use, biomass fuel exposure, and limited healthcare access. These environmental and socio-economic factors complicate disease management in the region [2].

The pathophysiology of COPD involves persistent inflammation triggered by harmful gases and particles, leading to structural airway changes and lung tissue damage. This process continues even after exposure ends, highlighting the irreversible nature of the disease. Alongside COPD, Obstructive Sleep Apnea (OSA), a sleep disorder characterized by repeated upper airway collapse, is gaining recognition. The co-occurrence of COPD and OSA, known as Overlap Syndrome, presents added clinical challenges [3].

Overlap Syndrome affects approximately 10–15% of COPD patients and exacerbates disease outcomes. Patients with both conditions suffer from more frequent and severe respiratory exacerbations, greater systemic inflammation, and increased cardiovascular risks such as pulmonary hypertension and arrhythmias [4]. These individuals also experience a sharp decline in quality of life, with symptoms like poor sleep, fatigue, reduced activity, and cognitive impairment. Healthcare utilization among overlap patients is significantly higher, with increased hospital visits, longer stays, and greater treatment costs [5].

Standard treatment strategies vary; CPAP is effective for OSA-dominant cases, while BiPAP suits COPD-dominant cases. Despite its clinical significance, data on Overlap Syndrome in Northwest India remain scarce, limiting effective screening and treatment strategies. This study aims to address this gap by assessing OSA prevalence in COPD patients using validated tools like the STOP-BANG questionnaire and Pittsburgh Sleep Quality Index [6]. Findings will aid in developing regional screening and management guidelines, improving patient care and healthcare efficiency [7].

MATERIAL AND METHODS

This hospital-based, observational cross-sectional descriptive study was conducted in the

Study population:

Patients were enrolled in the study following classification of COPD using Pulmonary Function Tests (PFTs), based on FEV1/FVC ratios and bronchodilator reversibility. The STOP-Bang questionnaire was used to assess OSA risk, and sleep quality was evaluated with the Pittsburgh Sleep Quality Index (PSQI). Participants with STOP-Bang scores ≥5 underwent further evaluation, including Apnea-Hypopnea Index (AHI) measurements from polysomnography when available. The study included individuals aged 18-65 years, excluding those with conditions affecting spirometry or sleep assessments.

Data analysis:

The study subjects data were recorded in the excel sheet. Data were analyzed using descriptive and inferential statistics. Mean, standard deviation, and interquartile ranges summarized clinical, hematological, and spirometry variables. Associations between OSA and factors like symptoms, comorbidities, and demographics were evaluated using chi-square tests and p-values to determine statistical significance.

Table 1: Age Distribution

Age Group	Benign	Borderline	Malignant	Total
<20	2	0	0	2
21–30	13	0	1	14
31–40	21	2	3	26
41–50	37	2	3	42
51–60	18	1	3	22
>60	8	0	4	12
Total	99	5	14	118
Chi-square (χ^2) = 8.71, p = 0.56				

The study assessed age distribution among 104 participants. Most individuals (57.69%) were aged between 56–65 years, indicating a higher prevalence of COPD in older adults. Other age groups included 46–55 years (17.31%), 36–45 years (16.35%), 26–35 years (5.77%), and 18–25 years (2.88%). The mean age was 52.57 ± 11.1 years, with a median of 56 years and an interquartile range of 45.75–60 years, highlighting a predominantly middle-aged to elderly study population.

Table 2: Gender Distribution

Gender	Frequency	Percentage (%)
Female	22	21.15%
Male	82	78.85%
Total	104	100.00%

The table shows the gender distribution among 104 participants. A majority were male, accounting for 82 individuals (78.85%), while females comprised only 22 individuals (21.15%). This indicates a significant male predominance in the study population, suggesting either a higher prevalence or greater reporting of the condition among males in this specific demographic sample.

Table 3: Chief Complaints Distribution

Chief Complaints	Frequency	Percentage (%)
Asymptomatic	1	0.96
Fever	7	6.73
Cough	48	46.15
Dyspnea	78	75
Sleepiness	6	5.77
Apnea	1	0.96
Sore throat	1	0.96
Chest pain	1	0.96
Abdominal pain	1	0.96
Snoring	9	8.65

The table shows dyspnea (75%) and cough (46.15%) as the most common symptoms among patients. Other symptoms like snoring, fever, and sleepiness were less frequent. Very few patients presented with complaints like apnea, chest or abdominal pain, sore throat, or were asymptomatic

Table 4: Past Illness Distribution

Past Illness	Frequency	Percentage (%)
No past illness	45	43.27
Hypertension	44	42.31
BPH	1	0.96
Old PTB	8	7.69
Diabetes mellitus	13	12.5
COVID-19	6	5.77
Hypothyroidism	3	2.88
DNS	1	0.96
CAD	1	0.96
CVA	1	0.96
HCV	1	0.96

The table reveals that hypertension (42.31%) and diabetes mellitus (12.5%) were the most common comorbidities. A significant number (43.27%) reported no prior illnesses. Other conditions like old PTB, COVID-19, and hypothyroidism were less common. Isolated cases of BPH, CAD, CVA, DNS, and HCV were observed, indicating varied yet infrequent comorbid conditions.

Table 5: Addiction Distribution

Addiction	Frequency	Percentage (%)
Smoking	72	69.23
Smoke Exposure	48	46.15
Alcohol	49	47.12
Drug Abuse	17	16.35

Smoking was the most prevalent addiction among the patients, affecting over two-thirds (69.23%). Alcohol consumption (47.12%) and exposure to smoke (46.15%) were also commonly reported. Drug abuse was present in 16.35% of the patients. These findings highlight a strong association between substance exposure and respiratory health issues among the study population, emphasizing the

Table 6: Descriptive Statistics of Vitals

Vital Sign	Mean ± SD	Median (25th-75th Percentile)	Range
Pulse rate (per minute)	87.9 ± 12.41	86.5 (78.75–94)	64–134
Systolic BP (mmHg)	126.71 ± 12.73	130 (110–132.5)	102–160
Diastolic BP (mmHg)	79.05 ± 10.1	80 (70–88)	60–100
SpO_2 (%)	92.91 ± 3.52	94 (90–96)	84–99
Respiratory rate (per minute)	19.04 ± 3.57	18 (16–22)	14–28
Temperature (°F)	98.49 ± 0.54	98.45 (98.2–98.9)	97.4–100

The vitals indicate average pulse and respiratory rates within normal limits, with pulse rate ranging broadly from 64 to 134 bpm. Blood pressure shows mild variability, with systolic values mostly around 130 mmHg. Oxygen saturation averages slightly low at 92.9%, suggesting mild hypoxia in some patients. Temperature remains stable within the normal range. These findings provide a comprehensive overview of the patients' baseline physiological status.

Table 7: Descriptive Statistics of Hematological Parameters

Hematological Parameter	Mean ± SD	Median (25th-75th Percentile)	Range
Total leukocyte count (cells/µL)	8645.42 ± 2527.64	8350 (7050.48–10056.25)	3800–15900
Absolute eosinophil count (%)	31.61 ± 110.78	0 (0–0)	0–821

The total leukocyte count averages within normal limits, indicating a typical immune response range, with values spanning from low to elevated counts. The absolute eosinophil count shows a highly variable mean due to some outliers, but the median of zero suggests most patients have minimal eosinophilia. This data highlights the hematological diversity among the patients studied.

Figure 8: Distribution of Tears in Different Parts of the Meniscus

Spirometry Parameter	Mean ± SD	Median (25th-75th Percentile)	Range
FEV1 (%)	54.71 ± 15.12	57 (45–66.25)	16–83
FEV1/FVC	61.35 ± 9.59	62.7 (55.53–68)	37–87.9
Post-Bronchodilator FEV1 (%)	56.24 ± 15.35	58 (47–69)	14–87

Spirometry results show moderately reduced lung function with mean FEV1 around 55%, indicating obstructive impairment. The FEV1/FVC ratio is decreased, consistent with obstructive airway disease. Post-bronchodilator FEV1 slightly improves but remains low, suggesting persistent airflow limitation despite bronchodilator use, typical in COPD patients.

Table 9: Descriptive Statistics of Stopbang Score

Variable	Mean ± SD	Median (25th-75th Percentile)	Range
STOP-Bang score	3.55 ± 1.71	3 (2–4.25)	1–8

The STOP-Bang score, used to assess the risk of obstructive sleep apnea, shows a mean of 3.55 with a median of 3. Scores range from 1 to 8, indicating variability in risk levels among patients. The moderate average score suggests a considerable proportion of patients may have a moderate to high risk of OSA, warranting further evaluation

Table 10: Obstructive Sleep Apnea Distribution

Obstructive Sleep Apnea	Frequency	Percentage
No	78	75.00%
Yes	26	25.00%
Total	104	100.00%

In this study, 25% of the patients were diagnosed with obstructive sleep apnea (OSA), while 75% did not have OSA. This indicates that one-fourth of the patients in the sample had OSA, highlighting its notable prevalence in the population studied and underscoring the importance of screening for OSA among at-risk groups.

Table 11: Descriptive Statistics of Pittsburgh Sleep Quality Index

Variable	Mean ± SD	Median (25th-75th percentile)	Range
Pittsburgh Sleep Quality Index	7.87 ± 3.98	7 (5 - 9)	2 - 19

The Pittsburgh Sleep Quality Index (PSQI) score averaged 7.87 with a standard deviation of 3.98, indicating variable sleep quality among participants. The median score was 7, with most scores ranging between 5 and 9. The overall range from 2 to 19 suggests considerable variation in sleep quality.

Table 12:DescriptiveStatistics of AHI (Apnea-Hypopnea Index)

Variable	Mean ± SD	Median (25th-75th percentile)	Range
AHI (Apnea-Hypopnea Index)	49.56 ± 29.64	51.5 (21 - 62.25)	12 - 109

The Apnea-Hypopnea Index (AHI) averaged 49.56 with a standard deviation of 29.64, indicating a wide range of severity in sleep apnea among participants. The median AHI was 51.5, with most values between 21 and 62.25. The overall range from 12 to 109 suggests significant variability, reflecting mild to severe obstructive sleep apnea cases in the study group.

Table 13: Association of Age with ObstructiveSleep Apnea

Age Group	Patients With Osa (N=26)	Patients Without Osa (N=78)	Total (N=104)	P Value
18 to 25 years	0 (0%)	3 (100%)	3 (100%)	0.516*
26 to 35 years	3 (50%)	3 (50%)	6 (100%)	
36 to 45 years	4 (23.53%)	13 (76.47%)	17 (100%)	
46 to 55 years	3 (16.67%)	15 (83.33%)	18 (100%)	
56 to 65 years	16 (26.67%)	44 (73.33%)	60 (100%)	
Mean ± SD	52.5 ± 12.76	52.59 ± 10.53	52.57 ± 11.06	0.972‡
Median (IQR)	58 (46.25–62.25)	56 (46–60)	56 (45.75–60)	
Range	26–65	18–65	18–65	

Age distribution between patients with and without OSA shows no significant difference (p=0.972). Most patients fall within the 56–65 years group. The mean age is approximately 52.5 years for both groups. This indicates that age may not be a distinguishing factor for OSA presence in this study population. The wide age range reflects variability in patient ages across groups.

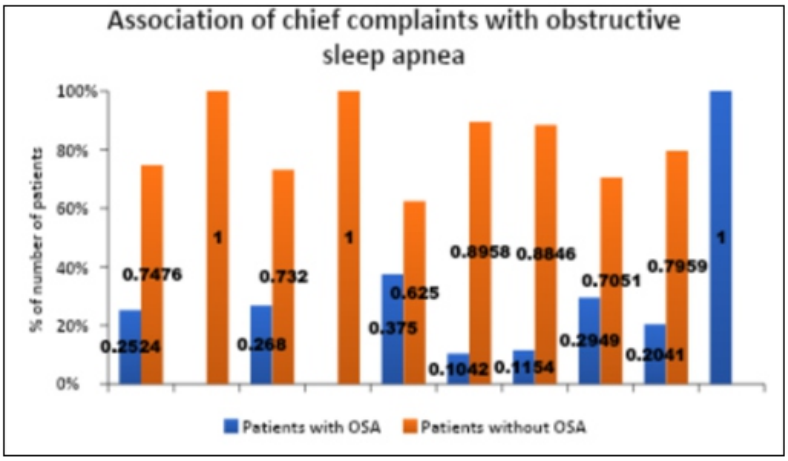

Figure 1: Association of Chief Complaints with Obstructive Sleep Apnea

Most patients with obstructive sleep apnea (OSA) reported dyspnea (29.49%) and cough (10.42%), while none were asymptomatic. Sleepiness and snoring were exclusively reported by OSA patients. Fever, chest pain, abdominal pain, sore throat, and apnea were rare and mostly absent in OSA patients. In contrast, the majority without OSA had no symptoms or presented with fever and cough. This suggests that dyspnea, sleepiness, and snoring are key complaints in OSA patients.

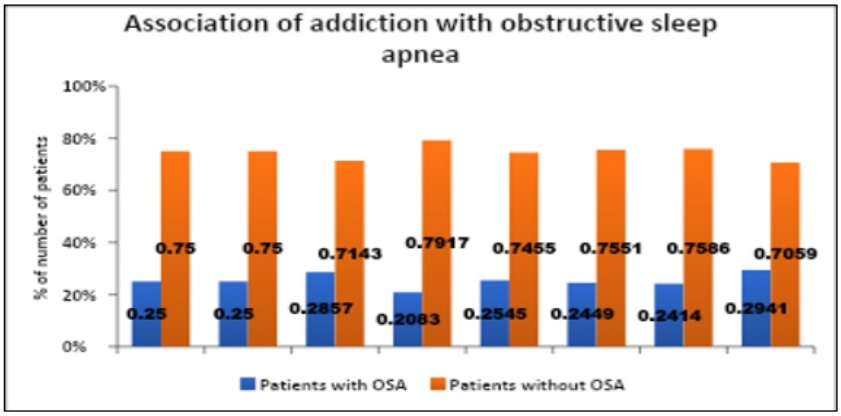

Figure 2: Association of Addiction with Obstructive Sleep Apnea

The graph compares the prevalence of addiction between patients with and without obstructive sleep apnea (OSA). It lists "Patient with OSA" and "Patients without OSA," suggesting an analysis of addiction rates in these groups. The repetition of "Patients with OSA" may indicate subgroups (e.g., severity levels).

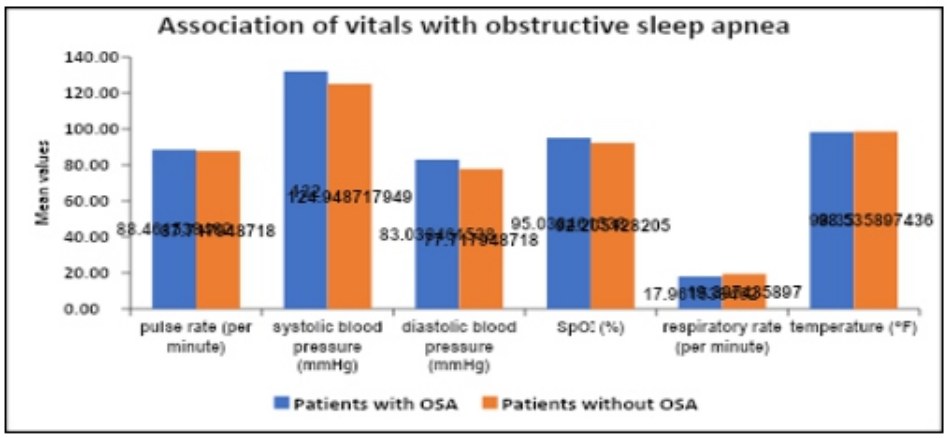

Figure 3 :Association of Vitals with Obstructive Sleep apnea

This graph compares key vital signs between patients with and without obstructive sleep apnea (OSA). It lists mean values for pulse rate, systolic/diastolic blood pressure, SpO□, respiratory rate, and temperature. The side-by-side presentation of "Patients with OSA" and "Patients without OSA" suggests an analysis of how OSA may impact these metrics-likely highlighting elevated blood pressure, altered SpO_2, or irregular respiratory rates in OSA patients. The data implies OSA's systemic effects on cardiovascular and respiratory health.

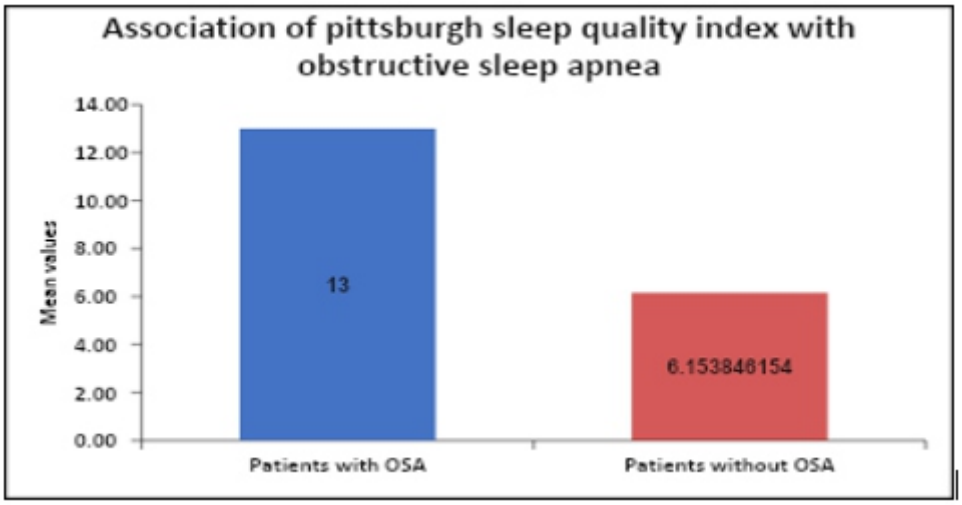

Figure 4: Association of Pittsburgh Sleep Quality Index with Obstructive Sleep Apnea

This graph compares Pittsburgh Sleep Quality Index (PSQI) scores between OSA and non-OSA patients. The "Patients with OSA" show scores of 13 (poor sleep quality) and 6.15 (moderate impairment), while the "Patients without OSA" section is blank, suggesting incomplete data. Higher PSQI scores in OSA patients align with expected sleep disturbances. The scale (0–6) implies a cutoff, with values above 5 indicating significant sleep issues. Clearer labeling would aid interpretation.

In a study assessing obstructive sleep apnea (OSA) among chronic obstructive pulmonary disease (COPD) patients, clinical presentations were compared between those with and without OSA. Out of 104 patients, 26 (25%) had OSA. The most common symptom among OSA patients was dyspnea, observed in 23 out of 26 individuals (88.46%). Cough was present in 5 OSA patients (19.23%), while sleepiness and snoring were notable complaints found exclusively in OSA individuals—100% of patients with these complaints had OSA [8]. Conversely, patients without OSA frequently presented with non-specific symptoms or were asymptomatic. Notably, 77 out of 78 non-OSA patients (98.72%) had no sleepiness, and 78 (100%) had no snoring [9].

The assessment of sleep quality in our study population revealed several important findings that contribute to our understanding of sleep disorders in COPD patients. The Pittsburgh Sleep Quality Index scores showed a marked difference between OSA and non-OSA groups (13 ± 3.67 vs. 6.15 ± 2.22, $p<0.0001$), demonstrating the substantial impact of OSA on sleep quality in COPD patients.The strong predictive value of the Pittsburgh Sleep Quality Index in our study (OR=2.026, 95% CI: 1.309-3.134, p=0.002) supports its inclusion in routine clinical assessment of COPD patients.

Overall, the data suggests a significant relationship between specific symptoms-such as dyspnea, sleepiness, and snoring-and the presence of OSA in COPD patients. Snoring and excessive daytime sleepiness emerged as the most distinctive symptoms exclusive to the OSA group [14]. While other complaints like fever or sore throat were more randomly distributed and not indicative of OSA status, dyspnea and cough were more commonly associated with OSA patients [15].

This analysis emphasizes the critical role of recognizing specific clinical features—particularly snoring and excessive daytime sleepiness—in patients with Chronic Obstructive Pulmonary Disease (COPD) to identify those at risk for Obstructive Sleep Apnea (OSA) [16]. These two symptoms are commonly observed in OSA and serve as valuable indicators for screening COPD patients who may have the overlap syndrome, a condition where both COPD and OSA coexist. Identifying overlap syndrome is essential because it is associated with worse clinical outcomes, including increased risk of cardiovascular complications, poor sleep quality, and reduced quality of life. Early recognition of these symptoms allows for timely diagnostic evaluations, such as overnight polysomnography, and the initiation of appropriate

interventions like Continuous Positive Airway Pressure (CPAP) therapy [17]. The findings also stress the importance of targeted, symptom-based screening strategies, especially in high-risk groups such as COPD patients. Rather than relying on generalized screening, focusing on hallmark symptoms like snoring and sleepiness can improve detection rates and ensure better resource utilization. This targeted approach ultimately enhances clinical care by enabling early diagnosis, optimized treatment, and improved prognosis for individuals with overlap syndrome[18].

CONCLUSION

This study found a 25% prevalence of Obstructive Sleep Apnea (OSA) among COPD patients in North West India, highlighting a notable burden of overlap syndrome. Significant associations were observed between OSA and higher blood pressure, lower SpO_2, and increased respiratory rate. The study demonstrated the utility of standardized assessment tools, particularly the Pittsburgh Sleep Quality Index, which showed marked differences between OSA and non-OSA groups (13 ± 3.67 vs. 6.15 ± 2.22, $p<0.0001$). This finding supports the integration of sleep quality assessment into routine clinical evaluation of COPD patients. Strong links to hypertension and diabetes emphasize the need for integrated, multisystemic care. The significant prevalence of overlap syndrome and associated comorbidities suggests the need for specialized clinics for complex respiratory conditions, integration of sleep medicine services with COPD care, enhanced diagnostic facilities, and targeted training programs for healthcare providers. Despite limitations such as a cross-sectional design and single-center scope, the study offers essential insights and recommends broader, longitudinal research to enhance clinical understanding and management.

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