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Clinical and Polysomnographic Profile of Patients with Sleep Disordered Breathing in a Tertiary Care Hospital

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ABSTRACT

Background: Obstructive sleep apnea (OSA) is a prevalent sleep disorder associated with various health complications, yet it often remains undiagnosed. Understanding its clinical and polysomnographic profiles is crucial for effective management.

Objective

1. To investigate the clinical characteristics, including demographic factors and comorbidities, of patients diagnosed with obstructive sleep apnea (OSA)
2. To analyze the polysomnographic profiles of individuals with OSA, focusing on respiratory events, sleep architecture alterations, and cardiometabolic parameters, to provide insights into the severity and manifestations of the disorder.

Methodology: Data were collected from patients who underwent Level 1 polysomnography at a Sleep Laboratory in Bangalore Medical College and Research Institute from January 2021 to September 2023. Clinical profiles and polysomnographic data were analyzed using IBM SPSS software.

Result: The study included 112 patients with a median age of 52 years and a high median BMI of 33.29. Polysomnographic analysis revealed a mean AHI of 36.709, indicating severe OSA. Respiratory events during REM and NREM sleep showed variations in apnea and hypopnea occurrences. Cardiometabolic parameters indicated potential subclinical cardiac dysfunction and dyslipidemia.

Conclusion: In conclusion, our study demonstrates a strong correlation between obstructive sleep apnea (OSA) and cardiovascular health, characterized by respiratory disturbances and obesity. Notably, elevated pulmonary artery systolic pressure (PASP) highlights the potential risk of pulmonary hypertension in this population, warranting close monitoring and targeted therapies. The findings underscore the importance of multidisciplinary management approaches in addressing OSA and its associated health conditions to improve patient outcomes and quality of life.

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Introduction

Obstructive sleep apnea is a common sleep disorder characterized by repetitive episodes of partial or complete upper airway obstruction leading to intermittent hypoxia, intrathoracic pressure changes and sleep fragmentation [1-2]. Various global epidemiological studies estimated 936 million and 425 million adults between 30 and 69 years' experience mild to severe and moderate to severe Obstructive sleep apnea [3]. The prevalence of Obstructive sleep apnea in India is 13.7% 14.8% among males and 12.9% among females [4].

Despite its profound impact, OSA often lurks undiagnosed in many individuals. This oversight carries profound implications as untreated OSA is associated with an array of deleterious health outcomes. From cardiovascular complications like hypertension, heart failure and arrhythmias to metabolic disturbances such as diabetes mellitus, the ramifications of untreated OSA are far reaching. Furthermore, cognitive impairment, daytime sleepiness and diminished quality of life are common consequences that individuals with OSA often endure.

The majority of patients with OSA are undiagnosed [5]. Understanding the clinical and polysomnographic profiles of individuals with OSA is paramount in addressing this public health challenge effectively. Variations in presentation across different populations underscore the need for comprehensive studies to elucidate the multifaceted nature of this disorder.

Against this backdrop, this retrospective study aims to delve into the clinical and polysomnographic characteristics of patients

with sleep disordered breathing. Through data collected from individuals who underwent Level 1 polysomnography, this study aims to shed light on the diverse manifestations of OSA.

Objectives of the Study

1. To investigate the clinical characteristics, including demographic factors and comorbidities, of patients diagnosed with obstructive sleep apnea (OSA)
2. To analyze the polysomnographic profiles of individuals with OSA, focusing on respiratory events, sleep architecture alterations, and cardiometabolic parameters, to provide insights into the severity and manifestations of the disorder.

Materials and Method

Source of Data

Patients attended Level 1 polysomnography in Sleep Laboratory of Department of Pulmonary Medicine in Bangalore Medical College and Research Institute, Bengaluru.

Study Design: Retrospective Study

Study Period: January 2021 to September 2023

Place of Study: Victoria Hospital, BMCRI

Inclusion Criteria

- Age more than 18 years
- Patients with OSA having AHI>5 diagnosed by level 1 polysomnography
- Patients with BMI>25 kg/m

Exclusion Criteria

- Age below 18 years
- Previous treatment for sleep disordered breathing by continuous positive airway pressure therapy, surgery and or oral device
- Patients with hemodynamically instability who are unfit for polysomnography
- The institutional ethics committee gave its clearance for the project.

Methodology

A retrospective study on a population of patients who attended Level 1 polysomnography in the sleep lab of Bangalore Medical College and Research Institute, Bangalore during the study period from January 2021 to September 2023 are included in the study

Their clinical profile and polysomnographic study details of the study population are collected from the clinical records available in the sleep lab computer system and analysed.

Polysomnography

All patients undergone overnight polysomnography in the sleep laboratory. The standard procedure performed in all patients using Sleepware G3 Philips Respironics software from 10 p.m. to 6 a.m. The physiological signals monitored included electroencephalography (EEG) (C4-M1, F4-M1, O2-M1,backup electrodes F3-M2,C3-M2 and O1-M2,Fz-Cz,Cz-Oz,C4-M1), electrooculography (E1-M2 and E2-M2)(E1 placed 1cm below and 1 cm lateral to the outer canthus of the left eye, E2 placed cm above and lateral to outer canthus of right eye, and submental electromyography (EMG)(one in midline 1cm below mandible, one 2cm below mandible and right of midline and one 2cm below inferior edge of mandible and 2cm to left of mandible). The following will also obtained: ribcage and abdominal effort, measured by respiratory inductive plethysmography (RIP); body position, measured with a calibrated sensor; snoring, measured with a piezoelectric sensor; and oronasal flow, measured with an SpO2 nasal pressure cannula over an average of 3 s. Respiratory events will be manually scored by AASM manual scoring system version 2.6. Apnoea is defined as a cessation of airflow for ≥10 s. Apnoea is classified as obstructive in the presence of continued movement on RIP, and as central in the absence of movement on RIP. Hypopnea is defined as a ≥50% reduction in oronasal flow amplitude for ≥10 s, accompanied by a ≥3% desaturation or arousal. Hypopnea was classified as obstructive, central, or mixed by calibrated respiratory inductance plethysmography. Hypopnea is classified as obstructive in the presence of continued movement on RIP. The oxygen desaturation index (ODI) measured the number of times that the blood oxygen level dropped by ≥3% from baseline per hour of sleep.

Observation and Results

The collected data was analysed using IBM SPSS software ver.20

Note

- Continuous variables are expressed in terms of Mean, standard deviation (SD), Median and interquartile range (IQR).
- Categorical variables are expressed in frequency (n) and percentage (%)

The study population of 112 patients comprised 53 males (47.3%) and 59 females (52.7%) with a median age of 52 years. The median body mass index was notably high at 33.29 indicating a correlation between Obesity and OSA consistent with existing literature

Table 1

	Minimum	Maximum	Mean	SD
Age	18	76	51.94	12.182
BMI	19.5	56.2	33.292	7.4455
Neck circumference (cm)	30.0	49.0	38.684	4.8278

The mean total sleep time in the study population was 337.46 minutes with a median REM sleep duration 35 min and median NREM sleep duration of 300.75 min as given in Table 2.

Table 2

	Minimum	Maximum	Mean	Std. Deviation	Median	IQR
NREM						
DURATION(MIN)	0.0	183.0	43.364	33.3920	35	24.625-55.75
%	0.00	73.10	13.1750	10.85255		
DURATION(MIN)	3.5	445.0	291.746	92.3248	300.75	246.375-359.25
%						
STAGE 1	3.5	120.5	29.879	23.1070	23.8	15.175-34.475
STAGE 2	0.0	228.5	55.174	31.8378	50.9	39.425-58.975
STAGE 3	0.0	136.5	17.996	17.2381	15.25	4.95-26.8

The respiratory events observed in patients with OSA as indicated in tables 3, 4 and 5 provide critical insights into the severity and characteristics of sleep disordered breathing

The mean number of apnea was 97.17 while the mean number of hypopneas per hour was 116.3, with a mean AHI of 36.709

Table 3

	Min	Maximum	Mean	SD	Median	IQR
TOTAL	Median					
APNEA (N0)	IQR	520.0	97.170	125.2551	37	14.25-122
HYPOPNEA(N0)	0.0	523.0	116.330	99.6892	96.5	38.35-165
AHI	0.0	114.7	36.709	26.2465	33.7	12.975-53.8

During REM sleep, the mean AHI was slightly higher at 39.7 compared to 34.423 during REM sleep. Interestingly, while the mean number of hypopneas during NREM sleep was higher compared to REM sleep, the mean number of apneas was slightly lower during NREM sleep.

Table 4

	Min	Maximum	Mean	SD	Median	IQR
REM						
APNEA (NO)	0.0	83.0	14.753	20.2141	5.5	1-23
HYPOPNEA (NO)	0.0	72.0	14.707	15.8017	9.9	3-20
AHI	0.0	375.0	39.719	43.5981	31.75	10.5-55
RERA(NO)	0.0	39.4	1.848	6.6824		
REM INDEX	0.0	93.8	35.603	26.1851	33.8	8.375-54.5

Table 5

	Min	Maximum	Mean	SD	Median	IQR
NREM						
APNEA	0.0	460.0	78.104	110.6750	30	10-103.25
HYPOPNEA	0.0	467.0	98.004	93.4904	68	28-143.25
AHI	0.0	114.6	34.423	26.5011	30.85	11.5-51.2
RERA(NO)	0.0	43.0	4.214	10.0095	0	0
NREM INDEX	0.0	114.7	36.012	26.1042	32.7	13.325-51.475
RERA(REM+NREM)	0.0	58.0	6.027	13.3798	0	0-4.75

The mean total arousal index, indicative of sleep fragmentation was 33.554 with comparable values observed during REM and NREM sleep. The RDI which encompasses apneas, hypopneas and respiratory effort related arousals had a mean of 36.78.

Table 6

	Min	Maximum	Mean	SD	Median	IQR
AROUSAL INDEX	Median					
TOTAL	IQR	403.0	33.554	41.1629	23.25	13.5-45.475
REM	0.0	120.0	28.345	22.4814	23.35	9.3-40.675
NREM	3.2	389.0	31.454	39.6794	21.7	12.625-43.22
RDI	0.0	114.7	36.787	25.9733	33.7	13.525-54.675

During REM sleep, the mean duration of oxygen saturation below baseline levels was 18.347 minutes, with a standard deviation of 28.2278. Similarly, during NREM sleep, the mean duration of oxygen saturation below baseline levels was substantially longer, with a mean of 83.515 minutes and a standard deviation of 97.6020.

Table 7

	Minimum	Maximum	Mean	Std. Deviation	Median	IQR
O2 SATURATION						
REM(DURATION)	0.0	183.5	18.347	28.2278	8.45	0.75-29.1
NREM(DURATION)	0.0	409.5	83.515	97.6020	33.8	5.1-147.6
LOWEST HR	2.0	82.0	55.821	12.6948		

Among the study population, 25.9% of patients were diagnosed with thyroid disorder while 50 % had hypertension. These findings highlight the high prevalence of these comorbidities in individuals with OSA.

Table 8

Thyroid disorder		
	Frequency	Percent
NO	83	74.1
YES	29	25.9
Total	112	100.0

Hypertension		
	Frequency	Percent
NO	56	50
YES	56	50
Total	112	100

The mean EF was 55.089% and the mean PASP was 43.76 mmh. These values fall within normal ranges but may be indicative of subclinical cardiac dysfunction or pulmonary hypertension, which are commonly observed in individuals with OSA

Table 10

	Min	Maximum	Mean	SD
EF (%)	45.0	65.0	55.089	4.3196
PASP	29.0	74.0	43.768	10.9339
HbA1c	4.5	9.6	6.607	1.2620

The mean fasting hyperlipidemia value was 251.036 mg/dl and the mean LDL level was 120.786 mg/dl. These findings indicate dyslipidemia, a common abnormality associated with OSA.

Table 11

	Min	Maximum	Mean	SD
Fasting hyperlipidemia	170.0	420.0	251.036	80.4370
LDL	103.0	158.0	120.786	9.2292

Discussion

Our study offers a comprehensive overview of the clinical and polysomnographic characteristics of patients diagnosed with obstructive sleep apnea (OSA), highlighting key findings that contribute to our understanding of this prevalent sleep disorder.

The demographics of our study population underscored the gender distribution and age range commonly associated with OSA. With 53 males (47.3%) and 59 females (52.7%), our findings align with existing literature indicating a relatively equal prevalence of OSA between genders. Additionally, the median age of 52 years reflects the typical age range at which OSA tends to manifest clinically, further corroborating the demographic profile observed in other epidemiological studies.

Consistent with previous research, our study revealed a strong correlation between obesity and OSA, as evidenced by the notably high median BMI of 33.29 kg/m² among our study participants. Elevated BMI and neck circumference are well-established risk factors for OSA due to their association with increased upper airway collapsibility during sleep. These findings emphasize the importance of weight management and lifestyle interventions in the clinical management of OSA, particularly in individuals with obesity.

Polysomnographic analysis provided valuable insights into the severity and characteristics of sleep-disordered breathing in our study population. The mean apnea-hypopnea index (AHI) of 36.709 indicated a significant burden of respiratory events, with both apneas and hypopneas contributing to the overall disease severity. Interestingly, while the mean number of hypopneas was higher during non-rapid eye movement (NREM) sleep compared to rapid eye movement (REM) sleep, the mean number of apneas was slightly lower during NREM sleep. These findings suggest distinct patterns of respiratory events across different sleep stages, underscoring the importance of comprehensive polysomnographic evaluation in the diagnosis and management of OSA.

Furthermore, our study identified a high prevalence of comorbidities among patients with OSA, including thyroid disorders and hypertension. Approximately 25.9% of patients were diagnosed with thyroid disorder, while 50% had hypertension. These findings highlight the need for integrated care and multidisciplinary management approaches in addressing the complex interplay between OSA and associated comorbidities, such as cardiovascular and endocrine disorders.

Cardiovascular parameters emerged as significant indicators of OSA-related morbidity within our study population, despite mean values falling within normal ranges. Subtle abnormalities in cardiac function, as reflected by the mean ejection fraction (EF) of 55.089% and mean pulmonary artery systolic pressure (PASP) of 43.768 mmHg, may signify underlying cardiac dysfunction or pulmonary hypertension, common comorbidities associated with OSA. These findings underscore the importance of cardiovascular risk assessment and ongoing monitoring in individuals with OSA to mitigate potential adverse cardiac outcomes.

Lastly, dyslipidemia, characterized by elevated levels of fasting hyperlipidemia and low-density lipoprotein (LDL), adds another dimension to the cardiovascular risk profile of patients with OSA. These findings emphasize the need for comprehensive metabolic evaluation and targeted interventions aimed at addressing dyslipidemia and other metabolic disturbances in individuals with OSA.

Conclusion

We have demonstrated that obstructive sleep apnea (OSA) is associated with a complex interplay of respiratory disturbances, obesity, and cardiovascular comorbidities. Through comprehensive polysomnographic analysis and clinical evaluation, our study provides valuable insights into the multifaceted nature of OSA and its implications for cardiovascular health.

The high prevalence of obesity among our study population underscores the importance of weight management strategies in the management of OSA.

Importantly, our study identifies a high prevalence of cardiovascular comorbidities among patients with OSA, including hypertension and subtle cardiac abnormalities.

Of particular note, our study highlights elevated pulmonary artery systolic pressure (PASP) among patients with OSA. Elevated PASP can be indicative of pulmonary hypertension, which is a serious cardiovascular complication associated with OSA. This underscores the need for closer monitoring of pulmonary vascular health in patients with OSA, as well as consideration of targeted therapies to mitigate the risk of pulmonary hypertension and its sequelae.

Furthermore, dyslipidemia, characterized by elevated levels of fasting hyperlipidemia and LDL, adds another layer to the cardiovascular risk profile of patients with OSA.

Our study highlights the complex relationship between OSA and cardiovascular health, underscoring the need for a holistic approach to disease management. By addressing both respiratory and cardiovascular aspects of OSA, we can effectively reduce the overall disease burden and improve outcomes for individuals living with this condition [6-9].

Declarations

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References

1. Ciccone MM, Scicchitano P, Zito A, Cortese F, Boninfante B, et al. (2014) Correlation between inflammatory markers of atherosclerosis and carotid intima-media thickness in obstructive sleep apnea. Molecules 19: 1651-1662.
2. Broaddus VC, Ernst JD, King Jr TE, Lazarus SC, Sarmiento KF, et al. (2021) Murray & Nadel's textbook of respiratory medicine, Elsevier Health Sciences.
3. Chen J, Lin S, Zeng Y (2021) An update on obstructive sleep apnea for atherosclerosis: mechanism, diagnosis, and treatment. Frontiers in Cardiovascular Medicine 8: 647071.
4. Pattanaik S, Rajagopal R, Mohanty N, Panigrahi P, Sahoo Sn (2018) Prevalence of Obstructive Sleep Apnoea in Odisha Population-A Camp Based Questionnaire Survey. Journal of Evolution of Medical and Dental Sciences-Jemds 7: 2664-2667.
5. Platon AL, Stelea CG, Boişteanu O, Patrascanu E, Zetu IN, et al. (2023) An Update on Obstructive Sleep Apnea Syndrome a Literature Review. Medicina 59: 1459.
6. Pokharel M, Shrestha BL, Dhakal A, Rajbhandari P, Shrestha KS, et al. (2021) Clinical Profile and Diagnosis of Obstructive Sleep Apnea Syndrome using Overnight Polysomnography in a Tertiary Care Hospital. Kathmandu University Medical Journal 19: 361-365.
7. Utpat K, Bansal S, Desai U, Joshi J (2019) Clinical profile of obstructive sleep apnea syndrome in a tertiary care hospital in Western India. Indian Sleep Med 14: 1-6.
8. Ghoshal AG, Sarkar S, Roy DJ, Das RK, Ray M (2010) Polysomnographic profile in a sleep laboratory in Kolkata: a retrospective analysis of 714 cases. J Assoc Physicians India 58: 415-419.
9. Ong KC, Clerk AA (1988) Comparison of the severity of sleep-disordered breathing in Asian and Caucasian patients seen at a sleep disorders center. Respiratory medicine 92: 843-848.