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Prevalence of Sleep-related breathing disorders in Patients with Tachyarrhythmia without Heart Failure

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ABSTRACT

Background: Obstructive sleep apnea (OSA) and other sleep-related breathing disorders (SRBD) are becoming more widely co-occurring conditions in patients with cardiac arrhythmias. There is little information on their prevalence in patients with tachyarrhythmias who do not have heart failure, particularly in the South Asian population, despite their well-established link to heart failure.

Objective: To determine the prevalence of sleep-related breathing disorders in patients with tachyarrhythmia without heart failure.

Methodology: The study included 43 adult patients with tachyarrhythmias and no clinical or echocardiographic signs of heart failure (mean age: 54.2 ± 11.6 years; 62.8% male). BMI, neck circumference, comorbidities, and Epworth Sleepiness Score (ESS) were among the baseline clinical and demographic data gathered. To determine whether SRBD was present and how severe it was, each patient had overnight polysomnography based on the apnea-hypopnea index (AHI).

Results: Among study cases, SRBD (AHI ≥5) was identified in 29 (67.4%) patients. The predominant type was obstructive sleep apnea (58.1%), followed by central (7.0%) and mixed (2.3%) apnea. Patients with SRBD had significantly higher Body Mass Index (30.4 ± 3.9 vs. 26.5 ± 4.1 kg/m²), greater ESS (10.1 ± 4.6 vs. 7.1 ± 3.4), and a higher prevalence of hypertension (62.1% vs. 28.6%; p=0.03) compared to those without SRBD.

Conclusion: Even when heart failure was not present, a high prevalence of SRBD was noted in patients who had tachyarrhythmias. These results point out the necessity of routine SRBD screening in this population, especially for those who suffer from obesity, hypertension, and excessive daytime sleepiness.

Keywords: Obstructive Sleep Apnea; Tachyarrhythmia; Hypertension; Cardiac Issues

Introduction

Obstructive sleep apnea (OSA), the most prevalent of an entire set of illnesses known as sleep-related breathing disorders (SRBDs), is characterized by irregular respiration during individual's sleep. These conditions can have a major impact on cardiovascular health since they are linked to frequent arousals, intermittent hypoxia, and variations in intrathoracic pressure. The connection between SRBDs and cardiac arrhythmias, especially tachyarrhythmias rapid heartbeats that originate in either the atrial or ventricular chambers has been reinforced by clinical data.[1]

Tachyarrhythmias are among the most prevalent heart rhythm abnormalities observed in clinical practice, and they include atrial fibrillation (AF), supraventricular tachycardia (SVT), and ventricular tachycardia (VT). In addition to raising morbidity and mortality, these illnesses also have significant financial effects on healthcare because of frequent hospital stays and consequences.[2]

Conventional risk factors for tachyarrhythmias include systemic diseases like diabetes and hypertension, structural heart disease, and electrolyte abnormalities. According to new research, sleep-related conditions specifically, SRBDs may also be crucial to the etiology and development of cardiac arrhythmias.[3]

The pathophysiological connection between tachyarrhythmias and SRBDs is extensive and complicated. Frequent episodes of sleep-related apnea and hypopnea result in systemic inflammation, oxidative stress, elevated sympathetic nervous system activity, intermittent hypoxia, and changes in intrathoracic pressure. As a result of these alterations, patients may be more susceptible to arrhythmogenesis due to atrial remodeling, elevated atrial pressure, and electrical instability. Further raising the risk of arrhythmias, SRBDs are linked to autonomic dysfunction, which can cause nocturnal spikes in blood pressure and heart rate variability.[4]

Patients with moderate to severe OSA are more likely to have atrial fibrillation and other arrhythmias. This link has been confirmed by the Sleep Heart Health Study and other large cohort studies, which found that those with OSA have a much higher risk of incident and recurring atrial fibrillation.[5-8] Additionally, it has been demonstrated that treating OSA with continuous positive airway pressure (CPAP) lowers the likelihood that AF would happen again after cardioversion or ablation therapy. There is, however, a relative lack of information on patients who appear with tachyarrhythmias without structural heart disease or reduced ejection fraction, and these studies have mostly concentrated on populations with pre-existing heart failure.[9]

Cardiovascular disorders are one of the main causes of death in Pakistan, and with the increasing occurrence of risk factors like obesity, diabetes, hypertension, and sedentary lifestyles, arrhythmias are becoming more of a concern. Diagnostic sleep examinations like polysomnography are some, sleep clinics are few, and patients and medical professionals often fail to notice the disease.[10,11] The timely identification and management of sleep disorders in Pakistani people is made more difficult by cultural, social, and healthcare system variables. Symptoms like weariness, palpitations, and poor sleep quality that are common to common cardiovascular illnesses and SRBDs might overlap, which frequently results in misdiagnosis or delayed care. Furthermore, there is a dearth of local data assessing the frequency of SRBDs in individuals with certain cardiovascular disorders, like tachyarrhythmias.

The relationship between SRBDs and tachyarrhythmias needs investigation in Pakistan. The study of SRBDs in patients with tachyarrhythmias who do not have heart failure will create new knowledge about arrhythmia management and risk assessment for this population. The study results will help develop screening protocols for SRBDs in cardiology clinics particularly for patients who experience unexplained or repeated arrhythmic episodes. Additionally, this research may highlight the need for integrating sleep medicine into routine cardiology practice, promoting interdisciplinary collaboration between cardiologists, pulmonologists, and sleep specialists.

Objective

To determine the prevalence of sleep-related breathing disorders in patients with tachyarrhythmia without heart failure.

Methodology

This was a cross-sectional observational study conducted at the Department of Cardiology and Pulmonology at Medical Teaching Institution (MTI), Bannu from January to December 2023. A total of 43 patients were enrolled using non-probability consecutive sampling. All patients presented with documented tachyarrhythmias and met the eligibility criteria. Inclusion Criteria was Adults aged ≥18 years. Diagnosed with tachyarrhythmias, Preserved left ventricular ejection fraction (LVEF ≥50%) on echocardio-gram. No known history of sleep-related breathing disorders and Informed consent provided. Exclusion Criteria were Clinical or echocardiographic evidence of heart failure (LVEF <50%). Structural heart disease, including cardiomyopathies or valvular lesions. Chronic pulmonary diseases (e.g., COPD, asthma, interstitial lung disease) and Prior diagnosis or treatment for obstructive or central sleep apnea.

Detailed patient history and physical examination were recorded. Data collected included: Age, sex, weight, height, BMI, History of hypertension, diabetes, smoking, Duration and type of arrhythmia and Daytime sleepiness

assessed using the Epworth Sleepiness Scale (ESS). Cardiac function was assessed using transthoracic echocardiography, and only those with normal systolic function (LVEF ≥50%) were included in the final analysis.
Initially data were entered into Excell sheet specially designed for study purposes. After completion, all data were transferred into SPSS v 23 for final analysis. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Comparisons were made between patients with and without SRBD: A p-value <0.05 was considered statistically significant.
Ethical certificate (IRB: Ref: 111-21/Rch/MTI-BN) for study was granted from ethical committee of the KGN, Bannu.

Results

A total of 43 patients with documented tachyarrhythmias and preserved left ventricular function (LVEF ≥50%) were included in the study. The mean age of the patients was 54.2 ± 11.6 years, indicating that most participants were middle-aged. Out of the 43 patients, 27 (62.8%) were male and 16 (37.2%) were female, reflecting a male predominance in the sample population. The average Body Mass Index (BMI) was 29.1 ± 4.3 kg/m², placing the cohort in the overweight category, with many possibly falling into the obese range. The mean neck circumference was 39.5 ± 3.2 cm, a value often associated with increased risk of obstructive sleep apnea (OSA), as it may reflect upper airway narrowing. Hypertension was observed in 22 patients (51.2%), while diabetes mellitus was present in 16 patients (37.2%). These comorbidities are common in individuals with cardiovascular risk and may also be independently associated with sleep-related breathing disorders. Smoking history (current or former) was reported in 13 patients (30.2%), which may contribute to both arrhythmia development and respiratory disturbances during sleep. The Epworth Sleepiness Score (ESS) averaged 9.1 ± 4.5, suggesting mild excessive daytime sleepiness in the overall population. While not overtly high, this value may indicate unrecognized sleep fragmentation due to breathing disorders at night. The mean Left Ventricular Ejection Fraction (LVEF) was 58.1 ± 3.6%, confirming that all participants had preserved systolic function and were not in heart failure. This is important because heart failure itself can be an independent cause of central sleep apnea, and its exclusion strengthens the association between tachyarrhythmia and sleep-related breathing disorders (Table 1).
The data highlight notable differences in SRBD occurrence based on the type of arrhythmia. Atrial Fibrillation (AF) was the most common arrhythmia, identified in 17 patients. Among these, 14 patients (82.4%) were found to have SRBD. This represents the highest SRBD prevalence across all arrhythmia subgroups and is consistent with existing evidence linking AF and obstructive sleep apnea (OSA). Atrial flutter was seen in 5 patients, of whom 3 (60.0%) were diagnosed with SRBD. Although the number is small, this

Table 1. Baseline characteristics of study cases

Variable	Mean ± SD / n (%)
Age (years)	54.2 ± 11.6
Male	27 (62.8%)
Female	16 (37.2%)
Body Mass Index (BMI kg/m²)	29.1 ± 4.3
Neck circumference (cm)	39.5 ± 3.2
Hypertension	22 (51.2%)
Diabetes Mellitus	16 (37.2%)
Smoking (current/former)	13 (30.2%)
Epworth Sleepiness Score	9.1 ± 4.5
Mean LVEF (%)	58.1 ± 3.6

prevalence indicates a potentially meaningful association between atrial flutter and SRBD, likely due to shared risk factors with AF, such as obesity, age, and hypertension. Supraventricular Tachycardia (SVT), including AV nodal reentrant tachycardia and other non-AF supraventricular rhythms, was observed in 14 patients. 8 patients (57.1%) in this group had SRBD. Ventricular Tachycardia (VT) was identified in 7 patients, with 4 (57.1%) found to have SRBD (Table 2).

All 43 patients underwent overnight sleep studies to assess the presence and severity of Sleep-Related Breathing Disorders (SRBDs). The mean Apnea-Hypopnea Index (AHI) was 16.8 ± 12.5 events/hour, indicating that the average patient had moderate sleep apnea. Prevalence of SRBD Based on AHI criteria, 14 patients (32.6%) had AHI < 5, indicating no evidence of SRBD. 29 patients (67.4%) had AHI ≥ 5, confirming the presence of SRBD. This represents a high prevalence of sleep-disordered breathing among patients with tachyarrhythmia and normal left ventricular function. Severity Classification: Among those diagnosed with SRBD, 13 patients (30.2%) had mild SRBD (AHI 5–14). 10 patients (23.3%) had moderate SRBD (AHI 15–29) and 6 patients (13.9%) had severe SRBD (AHI ≥ 30). This shows that a substantial number of patients had clinically significant or advanced SRBD, with nearly 14% in the severe category. The majority of patients had Obstructive Sleep Apnea (OSA), which was seen in 25 patients (58.1%). OSA is typically caused by intermittent upper airway obstruction during sleep and is associated with risk factors such as obesity, neck circumference, and male gender all common in this cohort. Central Sleep Apnea (CSA), characterized by reduced central respiratory drive, was observed in 3 patients (7.0%), while Mixed Apnea (a combination of both obstructive and central features) was rare, affecting only 1 patient (2.3%) (Table 3).

Table 2. Prevalence of Arrhythmias and SRBD among Participants

Arrhythmia Type	Total (n)	SRBD Present (n, %)
Atrial Fibrillation (AF)	17	14 (82.4%)
Atrial Flutter	5	3 (60.0%)
Supraventricular Tachycardia (SVT)	14	8 (57.1%)
Ventricular Tachycardia (VT)	7	4 (57.1%)
Total	43	29 (67.4%)

Table 4 presents a comparative analysis of demographic, clinical, and arrhythmia-related variables between patients diagnosed with Sleep-Related Breathing Disorders (SRBD) (n = 29) and those without SRBD (n = 14), based on their Apnea-Hypopnea Index (AHI). The mean age was higher in the SRBD group (56.1 ± 10.8 years) compared to the non-SRBD group (50.4 ± 12.3 years), although the difference did not reach statistical significance (p = 0.07). A greater proportion of patients in the SRBD group were male (69.0%) compared to 50.0% in the non-SRBD group; however, this difference was not statistically significant (p = 0.19). The SRBD group had a significantly higher BMI (30.4 ± 3.9 kg/m^2) than the non-SRBD group (26.5 ± 4.1 kg/m^2), with a statistically significant p-value of 0.002. This finding supports the well-established link between obesity and obstructive sleep apnea (OSA), and it highlights BMI as a key differentiating factor between the two groups. Daytime Sleepiness (Epworth Sleepiness Scale – ESS) Patients with SRBD had significantly higher ESS scores (10.1 ± 4.6) than those without SRBD (7.1 ± 3.4), with a p-value of 0.01. This suggests that individuals with SRBD experienced more excessive daytime sleepiness, which may indicate greater sleep disruption due to apnea events. 62.1% of SRBD patients had hypertension, compared to only 28.6% in the non-SRBD group. This difference was statistically significant (p = 0.03), underscoring the well-known association between SRBD and elevated cardiovascular risk, particularly in relation to blood pressure regulation. Atrial Fibrillation (AF) was more common in the SRBD group (48.3%) compared to the non-SRBD group (21.4%), but this difference approached statistical significance (p = 0.08).

Discussion

Sleep-related breathing disorders (SRBD) including obstructive sleep apnea (OSA) have become major comorbid conditions in cardiovascular disease which show strong connections to various cardiac arrhythmias. The medical community shows increasing interest in tachyarrhythmias which include atrial fibrillation (AF), supraventricular tachycardia (SVT), atrial flutter and ventricular tachycardia (VT), because these conditions often occur together with SRBD.[9,12] This association is

Table 3. Findings of Sleep Study and severity of SRBD among participants

Parameter	Mean ± SD / n (%)
Apnea-Hypopnea Index (AHI)	16.8 ± 12.5
AHI < 5 (No SRBD)	14 (32.6%)
AHI ≥ 5 (Any SRBD)	29 (67.4%)
Mild SRBD (AHI 5–14)	13 (30.2%)
Moderate SRBD (AHI 15–29)	10 (23.3%)
Severe SRBD (AHI ≥30)	6 (13.9%)
Type: Obstructive Sleep Apnea (OSA)	25 (58.1%)
Type: Central Sleep Apnea (CSA)	3 (7.0%)
Type: Mixed Apnea	1 (2.3%)

supported by a significant number of international research, but little is known about particular populations, such as Pakistani individuals, especially when structural heart diseases like heart failure are not present. In order to isolate the potential independent contribution of SRBD to the burden of arrhythmias, this study sought to determine the prevalence and severity of SRBD in patients with different types of tachyarrhythmia, excluding those with heart failure.

The baseline demographic and clinical characteristics of patients in the present study were generally similar to previous studies.[13,14] These all studies demonstrated similar cohort age distributions in patients with AF and sleep apnea, which suggests a comparable risk profile across patients with these conditions. In the present study, males were predominately (62.8%). This is not surprising, as male gender is a recognized independent risk factor for obstructive sleep apnea (OSA), and men are more likely than women to develop AF and other tachyarrhythmias. Padeletti et al. (2014)[15], also suggests that men may be more prone to develop OSA and subsequently the arrhythmogenic effects of sleep-disordered breathing. Our mean BMI of the cohort was 29.1 ± 4.3 kg/m² indicates that the majority of patients in this cohort were overweight or obese, which reflects findings of studies such as Padeletti et al. (2014)[15] and Linz et al. (2015),[16] both of which ascertain that obesity is a modifiable risk factor for OSA and AF. Our data demonstrate the possibility that increased body mass may not only serve to exacerbate the impairment of the airway during sleep but, through inflammation, oxidative stress, and atrial remodeling, may also contribute to an arising substrate for arrhythmia. Neck circumference was 39.5 ± 3.2cm and is a well-known anatomical marker associated with OSA risk. The neck circumference in our study was slightly above thresholds levied in risk calculation methods such as the STOP-BANG questionnaire and align with male populations from studies led by Cizza et al. (2014)[17] where men with a neck circumference >40 cm had high-risk classification for OSA.

Hypertension (51.2%) and diabetes mellitus (37.2%) were prevalent comorbidities in our cohort. Comorbidities are frequently attested to in SRBD populations and are related too and often worsen on the backdrop of untreated sleep apnea. The prevalence in the cohort is within some of the rates noted in the study by Linz et al. (2015)[16] raising interesting considerations on the bi-directional relationship of SRBD and cardiometabolic diseases. Current or paste smoking history was reported in 30.2% of the study cases. Smoking is a known among factors that contribute to endothelial dysfunction and contributes to upper airway inflammation. Though smoking is not always the residence risk factor in OSA, it has been related to arrhythmia burden in studies of hospital populations and in community studies, but this is inconsistent.

The Epworth Sleepiness Score (ESS) was 9.1 ± 4.5, which represents mild daytime sleepiness. Although study by Craig et al., (2022)[18] has demonstrated that ESS would not always be concordant with the objective severity of SRBD, especially among patients with cardiovascular disease, it is still a helpful screening tool and is consistent with moderate subjective symptom burden in our cohort.

Results showed that mean left ventricular ejection fraction (LVEF) was 58.1 ± 3.6%, which demonstrated that systolic function was preserved in all patients. This is an

Table 4. Comparison Between Patients with and Without SRBD

Variable	SRBD Group (n = 29)	No SRBD Group (n = 14)	p-value
Age (years)	56.1 ± 10.8	50.4 ± 12.3	0.07
Male sex (%)	20 (69.0%)	7 (50.0%)	0.19
BMI (kg/m²)	30.4 ± 3.9	26.5 ± 4.1	0.002
ESS Score	10.1 ± 4.6	7.1 ± 3.4	0.01
Hypertension (%)	18 (62.1%)	4 (28.6%)	0.03
Atrial Fibrillation (%)	14 (48.3%)	3 (21.4%)	0.08

important methodological difference since it removes the confounding influence of heart failure and allows for a better evaluation of the direct relationship between sleep-related breathing disorders (SRBD) and tachyarrhythmias. For comparison, a number of studies evaluating the interaction between SRBD, and cardiac arrhythmias have enrolled subjects with decreased or borderline LVEF, potentially overstating the role of structural heart disease in arrhythmia burden. Javaheri et al. (2007)[19] investigated central sleep apnea (CSA) in heart failure patients with an average LVEF of <40% and identified a high correlation between CSA and adverse cardiac outcomes. But these results are not applicable to patients with non-heart failure. In the Sleep Heart Health Study, participants were from a general population cohort, and OSA and atrial fibrillation frequently coexisted with preserved ejection fraction, as in our study. This implies that SRBD independently affects arrhythmia pathogenesis even in structurally normal hearts. Naruse Y et al. (2013)[20] documented greater recurrence of AF after cardioversion in untreated OSA patients, a high proportion of whom had normal LVEF, supporting the assumption that intermittent hypoxia, sympathetic overdrive, and intrathoracic pressure fluctuations are key factors in arrhythmia formation irrespective of systolic dysfunction. Later, Linz et al. (2015)[16] highlighted the arrhythmogenic role of OSA by mechanisms such as atrial stretch and inflammation, irrespective of ventricular function. Their findings are consistent with our emphasis on patients without obvious heart failure in order to demarcate the mechanistic contributions of SRBD.

The present study reported that, out of 43 tachyarrhythmic patients with normal left ventricular function, sleep-related breathing disorders (SRBD) were detected in 67.4% of the patients. The SRBD prevalence breakdown by arrhythmia subtypes offers useful information regarding differential association between SRBD with certain arrhythmias, including obstructive sleep apnea (OSA), which was the most prevalent. Atrial Fibrillation (AF), High SRBD Prevalence, the highest SRBD prevalence occurred in atrial fibrillation (AF) patients (82.4%). This is in line with several studies that have found AF to have a strong association with OSA. For instance: Gami et al. (2007)[13] established that OSA was independently related to the onset of AF with an odds ratio of about 2.2 after controlling for other risk factors. Mehra et al. (2006)[14] from the Sleep Heart Health study described a substantially increased prevalence of AF among persons with severe OSA versus persons without OSA. In a cardioversion trial by Naruse Yet al. (2013)[16], subjects with OSA left untreated presented significantly higher AF recurrence than without OSA (82% vs. 42%), highlighting the importance of SRBD in AF recurrence and perpetuation. The pathophysiologic processes like intermittent hypoxia, sympathetic overdrive, atrial distension, and systemic inflammation can provide reasons for AF strong association with SRBD. These conditions foster atrial remodeling, which enhances arrhythmogenic potential even in patients without structural heart disease.

Atrial Flutter, moderate association among patients with atrial flutter, 60.0% (3 out of 5) presented with SRBD. Although less evidence is available on atrial flutter specifically, some evidence indicates that it could have similar mechanisms to AF. For instance: Mills EW et al. (2023)[21] proposed that sleep apnea could be a contributory factor in the cause and recurrence of typical flutter, especially in its coexistence with AF. This is not withstanding that this relationship is not as well reported in our study, and indeed in others, given that there was a small sample size in both our study and theirs.

Supraventricular Tachycardia (SVT), emerging evidence, in SVT patients, 57.1% (8 out of 14) were diagnosed with SRBD. This is a new interest area in electrophysiology, whereas most of the research has focused on AF and ventricular arrhythmias, there is some evidence that points towards the influence of autonomic imbalance (increased vagal tone followed by rebound sympathetic

surges) in OSA, potentially contributing to initiation of reentrant supraventricular arrhythmias. Research like that conducted by Linz et al., (2015)[16] and Katritsis DG., (2017)[22] supports this idea, though SVT is still a less well-examined rhythm within the realm of SRBD.

Ventricular Tachycardia (VT), Comparable Prevalence, the patients with VT also had a 57.1% (4 out of 7) prevalence of SRBD, which is consistent with results from previous research that have shown an association between SRBD and ventricular arrhythmias, particularly in ischemic heart disease or congestive heart failure patients. But as our study did not include patients with decreased ejection fraction, these finding emphasizes that even in normally structured hearts, SRBD might augment arrhythmogenic potential by mechanisms such as myocardial ischemia, nocturnal hypoxemia, and QT prolongation. Monahan et al. (2009)[23] have reported enhanced nocturnal arrhythmogenicity and sudden cardiac death in OSA patients. In implantable cardioverter defibrillator (ICD) patient studies, OSA has been found to be linked with an increased burden of ventricular arrhythmias.

Our investigation found an SRBD prevalence of 67.4% in tachyarrhythmia patients, as operationally defined by an Apnea-Hypopnea Index (AHI) ≥ 5 events/hour, with a mean AHI of 16.8 ± 12.5, reflecting an overall moderate burden of sleep-disordered breathing. Obstructive sleep apnea (OSA) was the most common type among these patients (58.1%), followed by central sleep apnea (CSA) and mixed apnea (7.0% and 2.3%, respectively). Our SRBD prevalence (67.4%) is in line with that from multiple previous studies of cardiac arrhythmia cohorts. Gami et al. (2007, NEJM)[13] noted 49–70% prevalence of OSA among patients with AF, varying with population factors and mode of screening. Our modestly higher prevalence could be due to population-related factors like increased obesity, hypertension, and lower previous diagnosis of SRBD. In a piece of work by Mehra et al. (2006)[14] from the Sleep Heart Health Study, patients with arrhythmias (AF in particular) had increased AHI scores compared with the normal population, lending weight to our observation of a large SRBD burden in tachyarrhythmia patients, regardless of structural heart failure. Hersi et al. (2012)[24] described heightened sympathetic activity and arrhythmic burden in those with moderate-to-severe OSA, consistent with our finding of 23.3% moderate and 13.9% severe SRBD, indicative of clinically significant sleep-disordered breathing in more than one-third of our population.

Most of the SRBD cases in our cohort were obstructive (58.1%), which is consistent with prior studies that OSA is the most prevalent type of SRBD among non-heart failure patients. Kanagala et al. (2013)[20] reported OSA to be independently linked with the recurrence of AF following cardioversion, and nearly all the SRBD cases in the cohort were obstructive. In a study of the ARIC cohort (2020)[25], OSA was common in patients with arrhythmias and a predictor of increased AF and ventricular arrhythmia risk, even after confounder adjustment. Low rates of CSA (7%) and mixed apnea (2.3%) are also predictable based on the lack of heart failure in our population. CSA is usually more common in populations with decreased ejection fraction and Cheyne-Stokes respiration, as seen in study such as those by Javaheri et al. (2007).[19]

Some parameters presented statistically and clinically significant correlations with SRBD presence in accordance with earlier studies in cardiac and general populations. The mean age of SRBD patients was greater (56.1 ± 10.8 years) compared to that of non-SRBD patients (50.4 ± 12.3), although this was not statistically significant (p = 0.07). Age is a classic risk factor for SRBD, especially OSA. The Sleep Heart Health Study Cizza G et al., (2014)[17] indicated an increase in SRBD prevalence with increasing age, particularly in men aged > 50 years.

A greater percentage of males had SRBD (69%) than among the no-SRBD group (50%), although this difference was not significant (p = 0.19). Most large cohort studies, such as Wisconsin Sleep Cohort Study, report a significant male predominance for OSA prevalence. Gami et al. (2007)[13] also found increased OSA prevalence in men with atrial fibrillation. BMI was also more elevated in the SRBD cohort (30.4 ± 3.9) compared to the non-SRBD cohort (26.5 ± 4.1) (p = 0.002). Obesity is a key risk factor for OSA. The Sleep Heart Health Study and many others (e.g., Georgoulis et al., 2022)[22] show a dose-response relationship between rising BMI and worsening AHI.

Epworth Sleepiness Score (ESS) scores were also significantly higher in the SRBD group (10.1 ± 4.6 vs. 7.1 ± 3.4, p = 0.01). Excessive daytime sleepiness is a frequent complaint among OSA patients. Studies such as Johns (1993)[27] and Friedman et al. (2010)[28] have proven ESS to be a reliable subjective screening measure for OSA. Hypertension was significantly more prevalent in the SRBD group (62.1% vs. 28.6%, p = 0.03). This is supported by a large body of evidence, such as the Wisconsin Sleep Cohort and Bradicich et al. (2020),[29] which demonstrate that OSA independently causes the onset of systemic hypertension through sympathetic overactivity and intermittent hypoxia. Atrial Fibrillation (AF) was more common in the SRBD group (48.3%) than the no-SRBD group (21.4%), although this was not statistically significant (p = 0.08).

Conclusion

This study highlights a notably high prevalence of sleep-related breathing disorders (SRBD) among patients with tachyarrhythmias, even in the absence of heart failure. The findings underscore the importance of routine screening for SRBD in such population, particularly in individuals with elevated body mass index, hypertension, and increased daytime sleepiness. Early identification and management of SRBD may help mitigate cardiovascular risk and improve overall patient outcomes.

References

1. Adegunsoye A, Ramachandran S. Etiopathogenetic Mechanisms of Pulmonary Hypertension in Sleep-Related Breathing Disorders. Pulm Med. 2012;2012 (1):273591. DOI: 10.1155/2012/273591.
2. Correale M, Paolillo S, Mercurio V, Limongelli G, Barilla F, Ruocco G, et al. Comorbidities in chronic heart failure: an update from Italian Society of Cardiology (SIC) Working Group on Heart Failure. Eur J Intern Med. 2020;71:23-31. DOI: 10.1016/j.ejim. 2019.10.008
3. Page RL, Joglar JA, Caldwell MA, Calkins H, Conti JB, Deal BJ, et al. 2015 ACC/AHA/HRS guideline for the management of adult patients with supraventricular tachycardia: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. Journal of the J Am Coll Cardiol. 2016;67(13):e27-115.
4. Mourad S, Wahab NA, Fayed A, Kassem A, Alsayed H. Occurrence of sleep related breathing disorders in Egyptian patients with tachyarrhythmia without heart failure. Egypt J Chest Dis Tuberc. 2017;66(1):127-36. DOI: 10.1016/j.ejcdt.2016.09.005.
5. Kendzerska T, Gershon AS, Atzema C, Dorian P, Mangat I, Hawker G, et al. Sleep apnea increases the risk of new hospitalized atrial fibrillation: a historical cohort study. Chest. 2018;154(6):1330–9. DOI: 10.1016/j.chest.2018.08.1075.
6. Latina JM, Estes NM III, Garlitski AC. The relationship between obstructive sleep apnea and atrial fibrillation: a complex interplay. Pulm Med. 2013;2013(1): 621736. DOI: 10.1155/2013/621736.
7. Cadby G, McArdle N, Briffa T, Hillman DR, Simpson L, Knuiman M, et al. Severity of OSA is an independent predictor of incident atrial fibrillation hospitalization in a large sleep-clinic cohort. Chest. 2015;148(4): 945–52. DOI: 10.1378/chest.15-0229.
8. Newman AB, Nieto FJ, Guidry U, Lind BK, Redline S, Shahar E, et al. Relation of sleep-disordered breathing to cardiovascular disease risk factors: the Sleep Heart Health Study. Am J Epidemiol. 2001;154(1):50–9. DOI: 10.1093/aje/154.1.50.
9. Abumuamar AM, Dorian P, Newman D, Shapiro CM. The prevalence of obstructive sleep apnea in patients with atrial fibrillation. Clin Cardiol. 2018;41(5):601–7. DOI: 10.1002/clc.22933.
10. Barolia R, Sayani AH. Risk factors of cardiovascular disease and its recommendations in Pakistani context. J Pak Med Assoc. 2017;67(11):1723. Available from URL: https://ecommons.aku.edu/pakistan_fhs_son/300.
11. Zubair F, Nawaz SK, Nawaz A, Nangyal H, Amjad N, Khan MS. Prevalence of cardiovascular diseases in Punjab, Pakistan: a cross-sectional study. J Public Health. 2018;26:523–9. DOI: 10.1007/s10389-018-0898-4.
12. Yeghiazarians Y, Jneid H, Tietjens JR, Redline S, Brown DL, El-Sherif N, et al. Obstructive sleep apnea and cardiovascular disease: a scientific statement from the American Heart Association. Circulation. 2021;144(3):e56–67. DOI: 10.1161/CIR.0000000000000988.
13. Gami AS, Hodge DO, Herges RM, Olson EJ, Nykodym J, Kara T, et al. Obstructive sleep apnea, obesity, and the risk of incident atrial fibrillation. J Am Coll Cardiol. 2007;49(5):565–71.
14. Mehra R, Benjamin EJ, Shahar E, Gottlieb DJ, Nawabit R, Kirchner HL, et al. Association of nocturnal arrhythmias with sleep-disordered breathing: The Sleep Heart Health Study. Am J Respir Crit Care Med. 2006;173(8):910–6. DOI: 10.1164/rccm.200509-1442OC.
15. Padeletti M, Zacà V, Mondillo S, Jelic S. Sleep-disordered breathing increases the risk of arrhythmias. J Cardiovasc Med. 2014;15(5):411–6. DOI: 10.2459/JCM.0000000000000019.
16. Linz D, Woehrle H, Bitter T, Fox H, Cowie MR, Böhm M, et al. The importance of sleep-disordered breathing in cardiovascular disease. Clin Res Cardiol. 2015; 104:705–18. DOI: 10.1007/s00392-015-0859-7.
17. Cizza G, de Jonge L, Piaggi P, Mattingly M, Zhao X, Lucassen E, et al. Neck circumference is a predictor of metabolic syndrome and obstructive sleep apnea in short-sleeping obese men and women. Metab Syndr Relat Disord. 2014;12(4):231–41. DOI: 10.1089/met.2013.0093.
18. Craig S, Pépin JL, Randerath W, Caussé C, Verbraecken J, Asin J, et al. Investigation and management of residual sleepiness in CPAP-treated patients with obstructive sleep apnoea: the European view. Eur Respir Rev. 2022;31(164):210230. DOI: 10.1183/16000617.0230-2021.
19. Javaheri S, Shukla R, Zeigler H, Wexler L. Central sleep apnea, right ventricular dysfunction, and low diastolic blood pressure are predictors of mortality in systolic heart failure. J Am Coll Cardiol. 2007;49 (20):2028–34.
20. Naruse Y, Tada H, Satoh M, Yanagihara M, Tsuneoka H, Hirata Y, et al. Concomitant obstructive sleep apnea increases the recurrence of atrial fibrillation following radiofrequency catheter ablation of atrial fibrillation: clinical impact of continuous positive airway pressure therapy. Heart Rhythm. 2013;10(3): 331–7. DOI: 10.1016/j.hrthm.2012.11.015.

21. Mills EW, Antman EM, Javaheri S. Breathless nights and heart flutters: understanding the relationship between obstructive sleep apnea and atrial fibrillation. Heart Rhythm. 2023;20(9):1267–73. DOI: 10.1016/j.hrthm.2023.04.022.

22. Katritsis DG, Boriani G, Cosio FG, Hindricks G, Jais P, Josephson ME, et al. European heart rhythm association (EHRA) consensus document on the management of supraventricular arrhythmias. Europace. 2017;19(3):465–511. DOI: 10.1093/europace/euw301.

23. Monahan K, Storfer-Isser A, Mehra R, Shahar E, Mittleman M, Rottman J, et al. Triggering of nocturnal arrhythmias by sleep-disordered breathing events. J Am Coll Cardiol. 2009;54(19):1797–804.

24. Hersi AS. Sleep-related breathing disorders and cardiac arrhythmia. Cardiac Arrhythmias–New Considerations. 2012;267–88.

25. Gellert KS, Alonso A, Chen LY, Meyer ML, Soliman EZ, Suzuki T, et al. Association of sleep apnea, diagnosed by self-reported physician diagnosis or hospital discharge codes, with atrial fibrillation and ectopy using ambulatory electrocardiogram in the ARIC study. Circ Arrhythm Electrophysiol. 2020;13(4):e007574. DOI: 10.1161/CIRCEP.119.007574.

26. Georgoulis M, Yiannakouris N, Kechribari I, Lamprou K, Perraki E, Vagiakis E, et al. Dose-response relationship between weight loss and improvements in obstructive sleep apnea severity after a diet/lifestyle intervention: secondary analyses of the "MIMOSA" randomized clinical trial. J Clin Sleep Med. 2022;18(5):1251–61. DOI: 10.5664/jcsm.9834.

27. Johns MW. Daytime sleepiness, snoring, and obstructive sleep apnea: the Epworth Sleepiness Scale. Chest. 1993;103(1):30–6.

28. Friedman M, Wilson MN, Pulver T, Pandya H, Joseph NJ, Lin HC, et al. Screening for obstructive sleep apnea/hypopnea syndrome: subjective and objective factors. Otolaryngol Head Neck Surg. 2010;142(4):531–5.

29. Bradicich M, Sievi NA, Grewe FA, Gasperetti A, Kohler M, Schwarz EI. Nocturnal heart rate variability in obstructive sleep apnoea: a cross-sectional analysis of the Sleep Heart Health Study. J Thorac Dis. 2020;12(Suppl 2):S129. DOI: 10.21037/jtd-cus-2020-005.