International Journal of Advances in Medicine
Kulkarni PK et al. Int J Adv Med. 2022 Apr;9(4):456-462
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: https://dx.doi.org/10.18203/2349-3933.ijam20220784

Original Research Article

A single-centre, observational, retrospective study to evaluate coexistence of cardiovascular comorbidities and obstructive sleep apnoea in South Indians using apnea link air home sleep testing device

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Received: 11 February 2022
Accepted: 04 March 2022

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ABSTRACT

Background: The aim of the study was to explore whether there is a relationship between Cardiovascular (CV) comorbidities and the prevalence and severity of Obstructive sleep apnea (OSA).
Methods: Secondary data analysis of 146 patients with suspected sleep-disordered breathing was conducted who were presented to the department of medicine, KIMS Hospital, Hyderabad, from June 2021 to November 2021. Participants aged ≥18 years were included in the analysis. Demographic details, clinical history, comorbidities, medication history, were analyzed. AHI score, ODI (Oxygen desaturation index) score and average O_2 saturation were recorded with the help of a home sleep testing device. Data were entered and analyzed with Epi info 7.
Results: The overall prevalence of OSA was 78.8% in patients with suspected sleep-disordered breathing. Prevalence of mild, moderate, and severe OSA was 28.8%, 15.1%, and 34.9%, respectively. Proportions of diabetes and hypertension were significantly high among patients with obstructive sleep apnea. Correlation analysis revealed a weak positive linear relationship (r=0.14) between the number of risk factors and the AHI score.
Conclusions: This study showed high prevalence of OSA among out patients presented with suspected sleep disordered breathing. Hypertension, diabetes and obesity were highly prevalent CV comorbidities among South Indian patients diagnosed with OSA.

Keywords: Obstructive sleep apnea, Apnea-hypopnea index, Obesity, Hypertension

INTRODUCTION

Atypical respiratory patterns (apnea, hypopnea, or respiratory effort-related arousals) or central sleep apnea-hypopnea syndrome, including Cheyne-Stokes breathing syndrome or central hypoventilation leading to altered gas exchange, are examples of sleep-disordered breathing.[1] Obstructive sleep apnea (OSA) is a sleeping disorder in which the upper airway collapses and becomes obstructed due to over-relaxation of throat muscles. Such pauses in breath occur multiple times throughout the night leading to disrupted and poor-quality sleep.[1,2] OSA may vary from snoring without apneas, hypopneas, or symptoms to severe obstructive disease with apneas, hypopneas, oxygen desaturation, secondary symptoms, and physiologic consequences.[3]

OSA is on the rise globally, with a constant increase in the number of persons affected. OSA has a significant frequency in the general population; according to a literature-based 2019 research, OSA affects 936 million persons aged 30 to 69 years throughout the globe, or around 12% of the worldwide population.[4] According to Young et al the prevalence of OSA in people between the

ages of 30 and 60 ranges from 2% in women to 4% in men.[5] According to Tufik et al OSA affects 32.8 percent of the population of Sao Paulo.[6]

In developing nations like India, OSAS has been identified as a leading cause of morbidity and mortality. OSA frequency in the Indian subcontinent varies according to the study area, with numbers ranging from 1.7-13.7%.[7,8]

A population-based study in North India reported that men are twice prone to OSA as women.[9] (males and females being 4.9% and 2.1%, respectively). According to Prasad et al the prevalence of OSA was 4.4%-19.7% in men and 2.5% to 7.4% in women.[10] According to a recent Bangalore research, the prevalence of OSA was 18 (4.6%) in urban participants and 12 (3.7%) in rural ones.[11]

OSA is linked to metabolic syndrome, a constellation of cardiometabolic symptoms such as central obesity, insulin resistance, hypertension, and dyslipidemia. One of the most significant risk factors for obstructive sleep apnea is being overweight or obese. This is because the fat deposits around the upper airway interfere with breathing.[12,13]

The growing evidence suggests that being obese is linked to an increased risk of having impaired glucose metabolism. This condition is also known to have a negative effect on a person's ability to control their blood sugar.[14] There is evidence that OSA and hypertension[15] and heart failure contribute to high mortality rates from CVD.[16] OSA also adversely affects pre-existing renal disease. Research reported that in non-dialysis CKD patients, the prevalence and incidence of OSA were found to be 28 percent and 88 percent, respectively, and the risk and severity of OSA increased with the development of CKD stages, indicating the need for screening the non-dialysis CKD population.[17]

Sleep apnea is the most common sleep condition, and its severity may lead to serious health problems. Sleep-disordered breathing and cardiovascular disorders share several risk factors and comorbid illnesses, which have additive effects on morbidity and mortality in people. This research aims to see whether there is a link between having cardiovascular comorbidities and the incidence and severity of OSA in the South Indian population.

METHODS

Study design

Secondary data analysis was conducted at KIMS Hospital, Hyderabad. Medical records of the participants presented to the department of Medicine from June 2021 to November 2021 were collected. Participants aged 18 years and above with suspected sleep-disordered breathing were considered the research's eligibility criteria. Records with incomplete information were excluded from the study. A total of 146 participants were analyzed.

Data collection

Data collection from the medical records was started after getting ethical approval. Sociodemographic details like age and sex as well as clinical history were gathered in the present, past, and personal history. The presence of other underlying comorbidities such as diabetes mellitus, renal failure, ischemic heart disease were collected. The patient's medication history was collected with duration and number of medications. Basic anthropometric measurements (BMI) and vital parameters like blood pressure were taken. General and systemic examinations of the participants were also done. Eligible participants were provided apnea link air (a home sleep testing device) for 24 hours and the next day the reading was noted. Obstructive sleep apnea was diagnosed based on the Apnea hyperpnea index (AHI) recorded by apnea link air (home sleep testing device). Apart from the AHI score, ODI score and average O_2 saturation were also recorded with the device. The diagnosis of OSA was made based on the AHI and ODI, which is the number of apneas and hypopneas per hour of sleep

Outcome variables

Incidence and severity of OSA based on AHI score were evaluated. Also, an association of OSA with comorbidities was assessed.

Statistical analysis

Epi info CDC version 7 was used to enter and analyze data. The mean and standard deviation were used to describe continuous variables, whereas percentages were used to represent categorical data. The independent sample t-test was used to examine the association between continuous variables and the chi-square test was used to assess the association between categorical variables. Pearson correlation coefficient was determined to assess the relationship between scale variables, A p value less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the characteristics of the study participants. The mean age of study participants was 51.08±13.0 years. In the present study, 69.2% of participants were males, while 31.8% of participants were females. There was no gender-wise statistically significant difference between mean age, mean systolic and diastolic blood pressure. Comorbidities like obesity, hypertension, diabetes and renal failure were similar among males and females. IHD proportion was significantly higher among males. As shown in Table 1, the AHI, ODI, and average saturation were not significantly different between gender. The overall prevalence of OSA was 78.8% among suspected sleep-related breathing disorders patients. Prevalence of mild, moderate, and severe OSA was 28.8%, 15.1%, and 34.9%, respectively (Table 1). According to Table 1, the

prevalence of OSA among males and females was 80.2% and 75.6%, respectively.

The prevalence of obesity in the present study was 82.9%. Among obese patients, 80.2% had OSA which was clinically significant. However, obesity was not statistically significantly associated with obstructive sleep apnea. In the present study prevalence of hypertension was 94.5%. Among hypertensive patients, 80.4% had OSA. Hypertension was significantly high among the patients with OSA (Table 2). In the present study prevalence of diabetes mellitus was 56.2%. Among people with diabetes, 87.8% had OSA. The association between OSA and diabetes mellitus was statistically significant (Table 3). In the present study prevalence of IHD was 14.4%.

Among patients with IHD, 85.7% had OSA. IHD was not significantly linked with OSA (Table 3). In the present study prevalence of renal failure was 6.8%. Among patients with renal failure, 90% had OSA. Renal failure was not significantly linked with OSA (Table 3).

Figure 1 shows the correlation analysis revealed a weak positive linear relationship (r=0.14) between the number of risk factors and the AHI score and it was statistically insignificant (p=0.095).

Table 1: Characteristics of study participants (N=146).

Variables	Total (N=146)	Male (N=101)	Female (N=45)	P value
Mean age (years)	51.08±13.0	49.5±13.29	53.62	0.12#
Mean systolic BP (mmHg)	140.64±15.87	140.51±15.65	140.91±16.53	0.89#
Mean diastolic BP (mmHg)	89.49±11.38	89.06±12.24	90.47±9.21	0.49#
Obesity				
Healthy	25 (17.1)	20 (19.8)	5 (11.1)	0.36*
Obese	71 (48.6)	46 (45.5)	25 (55.6)	
Overweight	50 (34.2)	35 (34.7)	15 (33.0)	
Hypertension				
Present	138 (94.5)	95 (94.1)	43 (95.6)	0.53*
Absent	08 (5.5)	06 (5.9)	02 (4.4)	
Diabetes				
Present	82 (56.2)	55 (54.5)	27 (60)	0.53*
Absent	64 (43.8)	46 (45.5)	18 (40)	
IHD				
Present	21 (14.4)	09 (8.9)	12 (26.7)	0.004*
Absent	125 (85.6)	92 (91.1)	33 (73.3)	
Renal failure				
Present	10 (6.8)	06 (5.9)	04 (8.9)	0.51*
Absent	136 (93.2)	95 (94.1)	41 (91.1)	
Number of medicines				
0	08 (5.5)	06 (5.9)	02 (4.4)	0.61*
1	68 (46.6)	50 (49.5)	18 40)	
2	53 (36.3)	35 (34.7)	18 (40)	
3	17 (11.6)	10 (9.9)	07 (15.6)	
Grade of OSA				
Normal	31 (21.2)	20 (19.8)	11 (24.4)	0.78*
Mild	42 (28.8)	29 (28.7)	13 (28.9)	
Moderate	22 (15.1)	14 (13.9)	08 (17.8)	
Severe	51 (34.9)	38 (37.60	13 (28.9)	
AHI score	24.76±23.78	26.79±25.52	20.20±18.8	0.12#
ODI	27.15±24.53	28.44±26.10	24.24±20.53	0.34#
Average saturation (%)	92.22±4.15	92.20±3.95	92.27±4.61	0.93#

Note: *-p value by chi-square test, #-p value by independent sample t-test.

Table 2: Relation of severity of OSA with risk factors (N=146).

Variables	Normal (N=31)	Mild (N=42)	Moderate (N=22)	Severe (N=51)	P value
Obesity					
Healthy	07 (22.6)	06 (14.3)	04 (18.2)	08 (15.7)	0.069*
Obese	07 (22.6)	23 (54.8)	11 (50.0)	30 (58.8)	
Overweight	17 (54.8)	13 (31.0)	07 (31.8)	13 (25.5)	
Hypertension					

Continued.

Variables	Normal (N=31)	Mild (N=42)	Moderate (N=22)	Severe (N=51)	P value
Present	27 (87.1)	41 (97.6)	19 (86.4)	51 (100)	0.02*
Absent	04 (12.9)	01 (2.4)	03 (13.6)	00 (0)	
Diabetes					
Present	10 (32.3)	25 (59.5)	10 (45.5)	37 (72.5)	0.003*
Absent	21 (67.7)	17 (40.5)	12 (54.5)	14 (27.5)	
IHD					
Present	03 (9.7)	08 (19.0)	02 (9.1)	08 (15.7)	0.6*
Absent	28 (90.3)	34 9 (81)	20 (90.9)	43 (84.3)	
Renal failure					
Present	01 (3.2)	04 (9.5)	00 (0)	05 (9.8)	0.331*
Absent	30 (96.8)	38 (90.5)	22 (100)	46 (90.2)	

Note: *-p-value by Chi-square test.

Table 3: Relation of OSA with risk factors (N=146).

Variables	OSA present (N=115)	OSA absent (N=31)	P value
Obesity			
Obese	97 (80.2)	24 (19.8)	0.36*
Non-obese	18 (72.0)	07 (28.0)	
Hypertension			
Present	111 (80.4)	27 (19.6)	0.04*
Absent	04 (50)	04 (50)	
Diabetes			
Present	72 (87.8)	10 (12.2)	0.002*
Absent	43 (67.2)	21 (37.8)	
IHD			
Present	18 (85.7)	03 (14.3)	0.4*
Absent	97 (77.6)	28 (22.4)	
Renal failure			
Present	09 (90)	01 (10)	0.36*
Absent	106 (77.9)	30 (22.1)	

Note: *-p-value by Chi-square test.

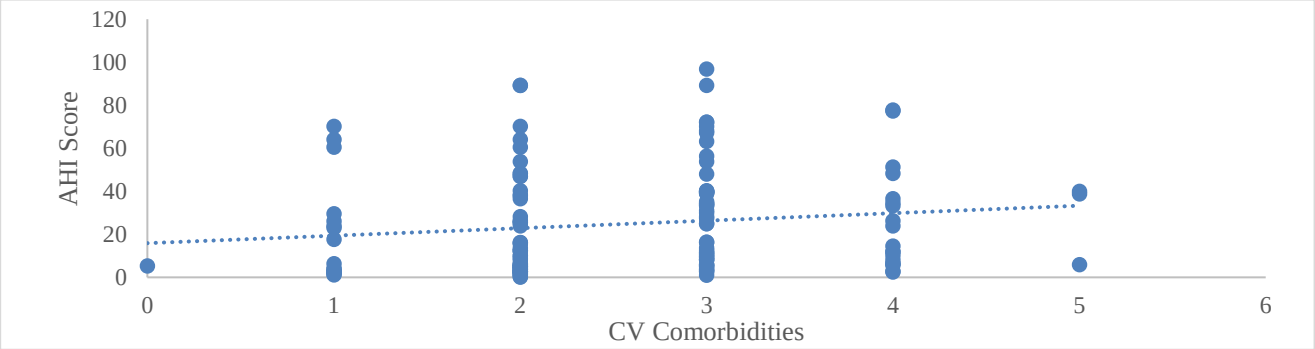

Figure 1: Linear relation of AHI and CVRF among study participants.

Note: Pearson correlation coefficient (r=0.14), p value=0.095; AHI- Apnea hypopnea index, CVRF- Cardiovascular comorbidities.

DISCUSSION

In the present study mean age of the study participants was 51.08±13.0 years. A similar finding was reported by Bhimwal et al in which the mean age of the study population was 54.96±9.35 years.[18] In the present study, the mean AHI score was 24.76±23.78 events per hour. A higher mean AHI score (43.6±26 events/hour) was noted in the study done by Sweed et al.[19] In the present hospital-based study, the overall proportion of OSA was 78.8%. According to reports from throughout the globe, the prevalence of OSA ranges from 4%-70%.[5,20,21] OSAS prevalence was estimated to be 3.6 percent and OSA to be 13.7 percent in population-based research from North India.[9] According to research from South Delhi, the prevalence of OSA is 9.3% and OSAS is 2.8 percent.[8] In

the present study, the proportions of OSA among males and females were 80.2% and 75.6%, respectively. Another hospital-based research from North India estimated the prevalence of OSA and OSAS in men and females to be 4.4 percent and 2.4 percent, respectively.[8] There was no significant difference between gender and OSA gradings in the present study. Also, the Mean AHI score was comparable among males and females. This finding is in agreement with the study done by Gac et al.[22]

Prevalence of mild, moderate, and severe OSA was 28.8%, 15.1%, and 34.9%, respectively. In the study done by Gac et al obstructive sleep apnea was diagnosed in 82.9% of patients, including mild OSA in 21.6%, moderate OSA in 28.4%, and severe OSA in 32.9%.[22] Obesity is unquestionably one of the most critical risk factors for OSA. It is projected that a 1% rise in BMI leads to a 3% increase in the AHI.[23] Because abdominal obesity is the best predictor of OSA; waist circumference is a better indicator of obesity than BMI, linked to the AHI value in scientific research.[24] In the present study prevalence of obesity was 82.9%. Among obese patients, 80.2% had OSA. Gac et al reported that 62.5% of the patients with OSA had obesity.[22] In the present study, the percentage of obesity was high among the patients with OSA; however, it is not statistically significant. Effective interventions aimed at weight reduction have also been shown to reduce AHI values in polysomnography.[25]

Several theories have been proposed to explain the development of hypertension in OSA patients. The most frequently acknowledged reasons include sympathetic activation, inflammation, RAAS activation, oxidative stress, and endothelial dysfunction. OSA is a primary cause of secondary hypertension.[26]

In the present study prevalence of hypertension was 94.5%. Among hypertensive patients, 80.4% had OSA. Gac et al reported that arterial hypertension was observed in 77.3% of the participants.[22] Gac et al documented that in patients with arterial hypertension, moderate or severe OSA was significantly more frequent than in patients with normal blood pressure.[22] Increasingly, the literature indicates that the relationship between OSA and arterial hypertension may be two-way in nature, and high blood pressure values contribute to an increased risk of OSA and its greater severity.[27] OSA is one of the pathogenetic factors in developing arterial hypertension. Both mild, moderate, and severe degrees of OSA is associated with a higher likelihood of primary arterial hypertension, including resistant hypertension.[28]

In the present study prevalence of diabetes mellitus was 56.2%. Among people with diabetes, 87.8% had OSA. Gac et al showed that 21.6% of the OSA patients were diabetics.[22]

According to Katsumata et al the prevalence of OSA was more significant in people with diabetes than in non-diabetics. Chasens et al discovered that individuals with T2DM had a very high rate (65%) of undiagnosed OSA.[29] Elmasry et al also discovered a prevalence rate of OSA of 36% in diabetic individuals compared to 14.5% in normoglycemic control subjects.[30] Punjabi et al found that recent research demonstrates the likelihood of a relationship between OSA and Type 2 DM independent of obesity.[12]

In the present study prevalence of IHD was 14.4%. Among patients with IHD, 85.7% had OSA.

In the research by Mooe et al OSA was linked to a greater probability of mortality, myocardial infarction, and stroke in prospective cohort analysis of >400 patients with stable angina pectoris and CAD verified by coronary angiography, with a follow-up of >5 years.[31]

Lee et al showed a higher incidence of major adverse events in patients with severe OSA after a STEMI.[32] Non-STEMI patients with OSA have also been reported to have poorer in-hospital outcomes. Hagenah et al did not find an association between OSA and recurrent cardiovascular events in CAD patients.[33] Data suggest that OSA may worsen prognosis in all the spectrum of CAD patients, but more research is necessary to determine whether diagnosing and treating OSA may influence the prognosis of patients with CAD.[34]

In the present study prevalence of renal failure was 6.8%. Among patients with renal failure, 90% had OSA. Shanmugam et al revealed the prevalence and incidence of OSA in non-dialysis CKD patients to be 28% and 88%.[17] In that study, there is an increased risk of OSA associated with declining kidney functions in CKD patients. The study by Markou et al showed OSA prevalence at 54.3% in 35 non-dialysis CKD patients.[35]

Limitations

The present study has used a home-based portable device for measuring OSA, while other studies have used polysomnography which is considered a gold standard for measuring obstructive sleep apnea. Obesity is one of the risk factors associated with OSA; however, in the present study, it is not significant, which may be due to device-related. The sample size in the present study is also small to generalize the findings.

CONCLUSION

Our study showed high prevalence of OSA among South Indian patients presented with suspected sleep disordered breathing at OPD clinic. Hypertension, diabetes and obesity were highly prevalent CV comorbidities among South Indian patients diagnosed with OSA.

ACKNOWLEDGEMENTS

Authors would like to acknowledged marketing and medical team of Eris Lifesciences Limited for providing

scientific support, financial support and facilitating the publication of study.

Funding: Eris Lifesciences Limited
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Tsara V, Amfilochiou A, Papagrigorakis MJ, Georgopoulos D, Liolios E. Guidelines for diagnosis and treatment of sleep-related breathing disorders in adults and children. Definition and classification of sleep related breathing disorders in adults: different types and indications for sleep studies (Part 1). Hippokratia. 2009;13(3):187-91.
2. Adeniyi B, Erhabor GE. OBSTRUCTIVE SLEEP APNEA. West Afr J Med. 2020;37(7):713-4.
3. Cumpston E, Chen P. Sleep Apnea Syndrome. StatPearls. 2021.
4. Benjafield AV, Ayas NT, Eastwood PR, Heinzer R, Ip MSM, et al. Estimation of the global prevalence and burden of obstructive sleep apnoea: a literature-based analysis. Lancet Respir Med. 2019;7(8):687-98.
5. Young T, Peppard PE, Gottlieb DJ. Epidemiology of obstructive sleep apnea: a population health perspective. Am J Respir Crit Care Med. 2002;165(9):1217-39.
6. Tufik S, Silva R, Taddei JA, Bittencourt LR. Obstructive sleep apnea syndrome in the Sao Paulo Epidemiologic Sleep Study. Sleep Med. 2010;11(5):441-6.
7. Singh A, Prasad R, Garg R, Kant S, Hosmane GB, Dubey A, et al. A study to estimate prevalence and risk factors of Obstructive Sleep Apnoea Syndrome in a semi-urban Indian population. Monaldi Arch Chest Dis. 2017;87(1):773.
8. Reddy EV, Kadhiravan T, Mishra HK, Sreenivas V, Handa KK, Sinha S, et al. Prevalence and risk factors of obstructive sleep apnea among middle-aged urban Indians: a community-based study. Sleep Med. 2009;10(8):913-8.
9. Sharma SK, Kumpawat S, Banga A, Goel A. Prevalence and risk factors of obstructive sleep apnea syndrome in a population of Delhi, India. Chest. 2006;130(1):149-56.
10. Prasad CN. Obstructive sleep apnea-hypopnea syndrome: Indian scenario. Perspect Med Res. 2013;1:22-5.
11. Veluthat C, Souza GD. Prevalence and Risk Factors for OSA among Urban and Rural Subjects in Bengaluru District, South India: A Cross-sectional Study. Sleep Med. 2021;16(1):5-9.
12. Punjabi NM. The epidemiology of adult obstructive sleep apnea. Proc Am Thorac Soc. 2008;5(2):136-43.
13. Barnes M, Goldsworthy UR, Cary BA, Hill CJ. A diet and exercise program to improve clinical outcomes in patients with obstructive sleep apnea--a feasibility study. J Clin Sleep Med. 2009;5(5):409-15.
14. Kim NH, Cho NH, Yun CH, Lee SK, Yoon DW, Cho HJ, et al. Association of obstructive sleep apnea and glucose metabolism in subjects with or without obesity. Diabetes Care. 2013;36(12):3909-15.
15. Xia W, Huang Y, Peng B, Zhang X, Wu Q, Sang Y, et al. Relationship between obstructive sleep apnoea syndrome and essential hypertension: a dose-response meta-analysis. Sleep Med. 2018;47:11-8.
16. Kishan S, Rao MS, Ramachandran P, Devasia T, Samanth J. Prevalence and Patterns of Sleep-Disordered Breathing in Indian Heart Failure Population. Pulm Med. 2021;2021:9978906.
17. Shanmugam GV, Abraham G, Mathew M, Ilangovan V, Mohapatra M, Singh T. Obstructive sleep apnea in non-dialysis chronic kidney disease patients. Ren Fail. 2015;37(2):214-8.
18. Bhimwal RK, Makwana M, Jangid R, Bhati RL. To study the prevalence of obstructive sleep apnoea in type 2 diabetes patients in Western Rajasthan, India. Int J Adv Med. 2017;4:894.
19. Sweed RA, Hassan S, Wahab NHA, Aref SR, Mahmoud MI. Comorbidities associated with obstructive sleep apnea: a retrospective Egyptian study on 244 patients. Sleep Breath. 2019;23(4):1079-85.
20. Nickerson J, Lee E, Nedelman M, Aurora RN, Krieger A, Horowitz CR. Feasibility of portable sleep monitors to detect obstructive sleep apnea (OSA) in a vulnerable urban population. J Am Board Fam Med. 2015;28(2):257-64.
21. Burgess KR, Havryk A, Newton S, Tsai WH, Whitelaw WA. Targeted case finding for OSA within the primary care setting. J Clin Sleep Med. 2013;9(7):681-6.
22. Gać P, Urbanik D, Macek P, Martynowicz H, Mazur G, Poręba R. Coexistence of cardiovascular risk factors and obstructive sleep apnoea in polysomnography. Respir Physiol Neurobiol. 2022;295:103782.
23. 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.
24. Ogilvie RP, Patel SR. The Epidemiology of Sleep and Diabetes. Curr Diab Rep. 2018;18(10):82.
25. Araghi MH, Chen YF, Jagielski A, Choudhury S, Banerjee D, Hussain S, et al. Effectiveness of lifestyle interventions on obstructive sleep apnea (OSA): systematic review and meta-analysis. Sleep. 2013;36(10):1553-62.
26. Kareem O, Tanvir M, Naqash A, Bader GN. Obstructive Sleep Apnoea: A Risk Factor for Hypertension. Journal of Cardiology and Cardiovascular Sciences. 2018;2(2).
27. Jhamb M, Unruh M. Bidirectional relationship of hypertension with obstructive sleep apnea. Curr Opin Pulm Med. 2014;20(6):558-64.

28. Hou H, Zhao Y, Yu W, Dong H, Xue X, Ding J, et al. Association of obstructive sleep apnea with hypertension: a systematic review and meta-analysis. Journal of global health. 2018;8(1).
29. Chasens ER, Weaver TE, Umlauf MG. Insulin resistance and obstructive sleep apnea: is increased sympathetic stimulation the link? Biol Res Nurs. 2003;5(2):87-96.
30. Elmasry A, Lindberg E, Berne C, Janson C, Gislason T, Tageldin M, et al. Sleep-disordered breathing and glucose metabolism in hypertensive men: a population-based study. J Intern Med. 2001;249(2):153-61.
31. Mooe T, Franklin KA, Holmström K, Rabben T, Wiklund U. Sleep-disordered breathing and coronary artery disease: long-term prognosis. Am J Respir Crit Care Med. 2001;164(10):1910-3.
32. Lee CH, Khoo SM, Chan MY, Wong HB, Low AF, Phua QH, et al. Severe obstructive sleep apnea and outcomes following myocardial infarction. J Clin Sleep Med. 2011;7(6):616-21.
33. Hagenah GC, Gueven E, Andreas S. Influence of obstructive sleep apnoea in coronary artery disease: A 10-year follow-up. Respir Med. 2006;100(1):180-2.
34. Alba F, Gemma D, Romero E, Blas JR, López E, Sendon JL. Obstructive sleep apnea and coronary artery disease: from pathophysiology to clinical implications. Pulm Med. 2013;2013:768064.
35. Markou N, Kanakaki M, Myrianthefs P, Hadjiyanakos D, Vlassopoulos D, Damianos A, et al. Sleep-disordered breathing in nondialyzed patients with chronic renal failure. Lung. 2006;184(1):43-9.

Cite this article as: Kulkarni PK, Prajapati H. A single-centre, observational, retrospective study to evaluate coexistence of cardiovascular comorbidities and obstructive sleep apnoea in South Indians using apnea link air home sleep testing device. Int J Adv Med 2022;9:456-62.