wjpmr, 2021,7(2), 153-157

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

METABOLIC DISORDERS INDUCED OBSTRUCTIVE SLEEP APNOEA

Tesna AliceThomson[1]*, Chinnu Jacob[1] and Dr. S. Haja Sherief[2]

[1]PharmD Interns, Department of Pharmacy Practice, Nandha College of Pharmacy, Erode, Tamilnadu.
[2]Head of Department, Department of Pharmacy Practice, Nandha College of Pharmacy, Erode, Tamilnadu.

***Corresponding Author: Tesna AliceThomson**
PharmD Interns, Department of Pharmacy Practice, Nandha College of Pharmacy, Erode, Tamilnadu.
DOI: https://doi.org/10.17605/OSF.IO/DT2G3

Article Received on 24/11/2020 **Article Revised on 14/12/2020** **Article Accepted on 04/01/2021**

ABSTRACT

Background: Obstructive sleep apnoea is considered as the manifestation of metabolic disorders like diabetes, hypertension, hyperlipidemia, and obesity because of the influence of these abnormalities leading to the chances for a patient to develop habitual sleep restriction. **Objective:** The purpose of this study was to investigate the causal relationship between metabolic disorders and sleep apnoea. **Methods**: This study was done using online questionnaires and forms which was circulated among people irrespective of age through social media. Out of all responses, data of 62 patients that matched with the standards of inclusion criteria such as, presence of metabolic disorders like diabetes, Hypertension, Hyperlipidaemia, and obesity were added in the study. Chi-square test and p-value were calculated. In addition to that, a scoring system providing an appropriate score for each answer with a maximum of 12 for each query. **Results**: Based upon the overall percentage of the score received by each patient, the chances of Obstructive Sleep Apnoea was less likely in 43.54% of the people, probable in 38.72%, and possible in 17.74% of the people. At the same time, there were no definite cases with a maximum scoring of 11-12. **Conclusion:** Within the study, there was a probability of the association of diabetes and obstructive sleep apnoea. That is, the chances of the disorder were noted in the majority of the patients whereas, just above half were noted without any symptoms despite having the disorder.

KEYWORDS: Diabetes, Hypertension, Hyperlipidaemia, Habitual sleep restriction.

INTRODUCTION

Metabolic disorders comprise of a cluster of both cardiovascular and metabolic abnormalities and these conditions include high blood pressure, increased blood sugar, excess body fat around the waist that arises from insulin resistance, abnormal triglyceride levels, and high-density lipoprotein cholesterol (HDL-C).[1] Obstructive sleep apnoea or behavioral sleep curtailment is characterized by complete or partial pharyngeal collapses repeatedly during sleep.[2] These episodes are termed as apnoea's and hypopneas when a reduction in breathing is complete and partial respectively. A high frequency of these collapses may interfere with blood oxygenation, increased respiratory effort, restorative sleep, transitory episodes of hypercapnia, and micro awakenings that end the respiratory event this thought to contribute negative consequences to health and quality of life.[2]

Metabolic disorders usually do not have obvious signs or symptoms but large waist circumference is a visible sign, other than this, the patient may have signs and symptoms of diabetes such as increased thirst and urination, fatigue, and blurred vision. Meanwhile, Obstructive Sleep Apnoea induces daily snoring, diurnal sleepiness, choking or suffocating sensation during sleep, morning headaches, daily fatigue, and nocturia.[2]

Obstructive sleep apnoea and Metabolic disorders are interrelated, shreds of evidence suggesting that sleep apnoea is a manifestation of the metabolic syndrome. Indeed, OSA is strongly associated with obesity, a post-menopausal increase of its prevalence, systemic effects such as diabetes and hypertension, male gender (android-central obesity), and the natural course of symptoms, all these factors are overlapping with the factors related to metabolic syndrome.[3,4] Furthermore, sleep apnoea along with its anatomical role it has a role in the genesis of sleep apnea mainly through its metabolic activity, that is the predominant fat in sleep apnoea which resembles the metabolically active visceral fat in the metabolic syndrome.[5] Moreover, some studies showed an association between severity of sleep apnoea and insulin resistance it points out that obese patients with non-insulin-dependent diabetes mellitus (NIDDM) frequently complain of tiredness with excessive daytime sleepiness or heavy snoring and these features are also characteristically present in patients with obstructive sleep apnea.[6]

Treatment of sleep apnoea among individuals with OSA mainly achieved through a therapeutic method called Continuous positive airway pressure (CPAP). The patient receives a steady stream of pressurized air through a mask that has been fitted by a technician, which helps to maintain airway patency and helps in preventing the collapse of the passageway thus reduce interrupted breathing and diminishing sleep fragmentation.[7] CPAP primarily focuses on an individual's behavior modification and bodyweight As a treatment modality the main objective of CPAP is not only to alleviate physiologic abnormalities like apneic episodes, sleep fragmentation, and oxygen desaturations, but also symptoms such as daytime sleepiness, reducing risk for comorbid conditions and snoring.[8] One clinical study which conducted 8- week CPAP trial showed that patients exhibited with improved insulin sensitivity and improved systemic abnormalities such as total cholesterol and blood pressure.[9]

MATERIALS AND METHODS

The study was conducted with help of online questionnaires and forms. The link to the form was circulated among people of all ages. The relevant cases with metabolic disorders were filtered out and were used in the study. A total of 62 patients were involved in the study with either or all of the inclusion criteria.

Inclusion criteria

Patients with metabolic disorder (hypertension, diabetes mellitus, hyperlipidemia, obesity) and also patients with age above 18 years were included in the study.

Exclusion criteria

Paediatric, breastfeeding, and pregnant women were excluded from the study.

Statistical analysis

All statistical analyses were performed using SPSS 27.0 and Microsoft Excel 2013. The sleep-related questionnaires were assessed using chi-square and the probability was analyzed with the p-value set on 0.5.

DISCUSSION

Obstructive sleep apnea (OSA) is a condition in which there is continuous blockage of the upper airway during sleep. It can result in hypopnea (reduced airflow during sleep) or apnea (complete cessation of airflow during sleep).[10,11] Patients with OSA may also show signs and symptoms like loud snoring, frequent arousals, sleep fragmentation, and daytime sleepiness, which characterize obstructive sleep apnea syndrome.[11,12] These signs and symptoms were reconstructed into different question formats to ask the patients involved in the study. The questions related to the study are given in table 1.

Questions	Possible answers
Do have trouble falling asleep?	YES/ NO/ OCCASIONALLY
Do you snore often?	YES/ NO/ OCCASIONALLY
Do you wake up in the middle of the night?	YES/ NO/ OCCASIONALLY
Do you choke or gasp for air during sleep?	YES/ NO/ OCCASIONALLY
Do you feel fatigued during the day?	YES/ NO/ OCCASIONALLY
Are you taking any sleeping pills?	YES/ NO

The general information's collected were age, gender, weight, and height. The major reason behind collecting age, weight, and height were to determine the body max index. This indicates whether the patient is underweight or overweight. The unwanted accumulation of visceral fat in obese patients is a major risk factor for OSAS. The results obtained from recent studies denoted that obese patients with OSAS have a significantly larger visceral fat area and an increased ratio of visceral to total fat compared with obese patients without OSAS.[13] Therefore, it was relevant to add the BMI criteria to the study.

Many studies have shown that OSA is also associated with increased risks of hypertension, stroke, type 2 diabetes mellitus, and other cardiovascular diseases.[14,15] Due to the limitations of the study to accurately identify the patients with stroke and cardiovascular diseases, it was left out. On the other hand, the cases with TDM, SHT, and hyperlipidemia were set as the main inclusion criteria. The occurrence of hyperglycemia, insulin resistance, and T2DM in patients with OSAS is much greater than the incidence in healthy people. There was a decline in the sleep oxygen saturation levels in patients with high blood glucose concentration and fasting blood glucose level, indicating that the severity of OSAS correlates directly with insulin resistance.[16]

Among the 62 cases collected, 29 were male and 33 were females (fig.1). The age of the patient was categorized into 18-35, 36-55, 56-75, and greater than 75 which included 4, 31, 22, 5 patients respectively (fig.2). Most of the sample was middle-aged and geriatric patients which indicates metabolic disorders are most common among them. Similarly, the height and weight of the patients were obtained to categorize the BMI into

normal, overweight, and underweight (fig.3). Among them, 42 patients had normal weight and 18 were obese which is an important factor of the study. Even though all the samples were having the metabolic disorder, only 22 were on proper and regular medication which shows a lack of medication adherence.

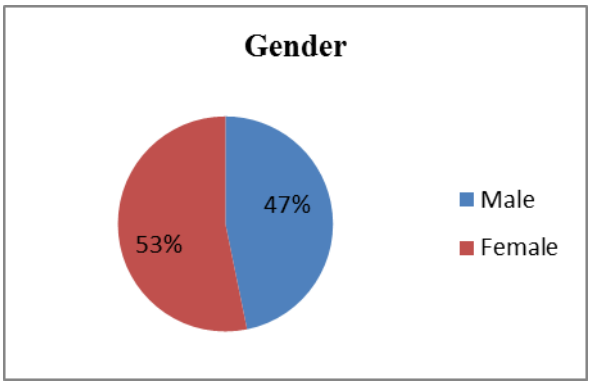

Figure 1:

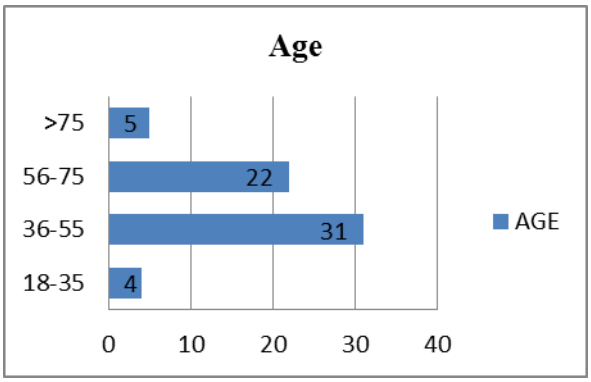

Figure 2:

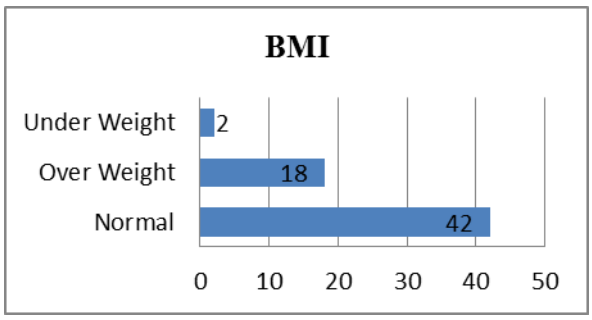

Figure 3:

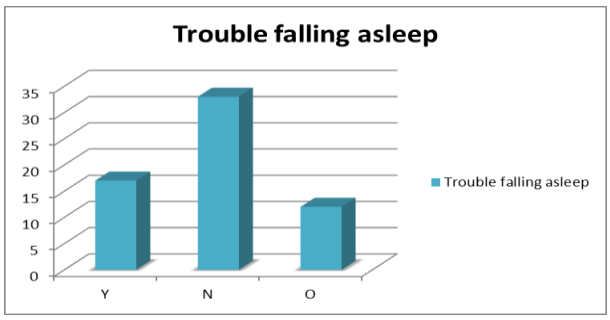

Figure 4:

Furthermore, after the general examination, detailed six questions were asked. The questions were prepared according to the symptoms of sleep apnoea. The answers were simple as either yes, no, or occasionally. Out of the total population, 17 had trouble falling asleep regularly, whereas, 12 had it occasionally (fig. 4). And, about half of the patients (30) had a snoring problem and 16 of them had it occasionally and the rest didn't have snoring (fig.5). In contrast, on the examination of people who wake in the middle of the night, 30 had the issues whilst the remaining 17 and 15 had their sleep disturbed regularly and occasionally respectively (fig.6). As choking or gasping for air one of the main symptoms of the severe condition of sleep apnoea, only 6 and 3 were reported to have frequent and occasional episodes whereas the remained didn't report any (fig.7). Another significant marker of decline in sleep is tiredness during the daytime. The results showed that 21 of the population felt fatigued daily, 14 felt it occasionally and 27 were unaffected (fig.8). The final question was on the administration of sleeping pills, out of which only 3 took the medication. This specific data illustrates that the majority of the patient had sleep apnea, but was never been diagnosed or known to the date.

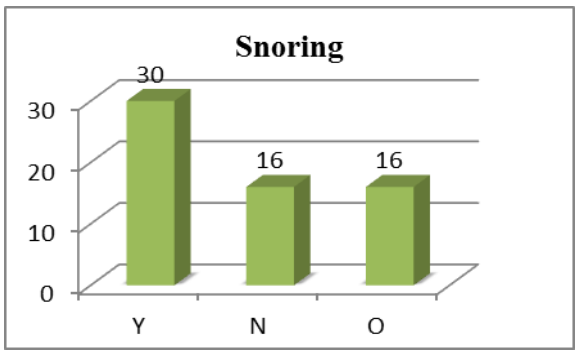

Figure 5

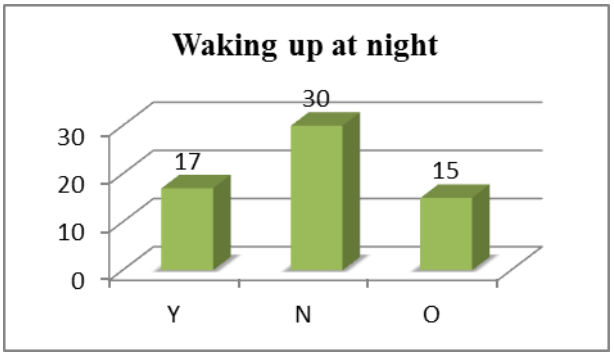

Figure 6

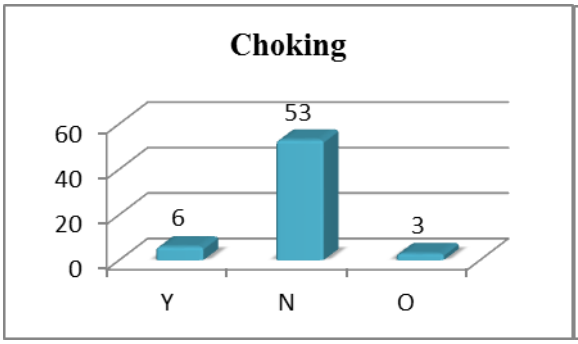

Figure 7

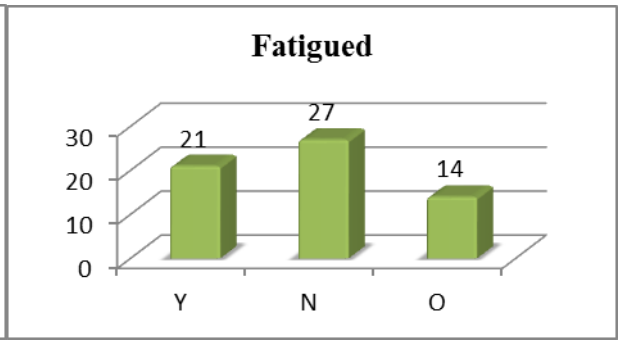

Figure 8

All the questions were multiple choices with answers yes, no, or occasionally. A score was given for all the answers with 2, 0, and 1 respectively. Since there were 6 six questions, the maximum score a query would get is 12. Since there aren't any standard predefined procedure to analyze the symptoms as scores, this value indicates only the chances of having the disorder, but no diagnosis. The score table is provided below (Table 2).

Score	Number of cases achieved	Percentage
0	5	8.06
1	5	8.06
2	13	20.97
3	4	6.45
4	13	20.97
5	4	6.45
6	7	11.29
7	2	3.23
8	5	8.06
9	3	4.83
10	1	1.61
11	0	0.00
12	0	0.00

The study is having some limitations, which might have confounded the results. The cases or the information provided by the patients may not be completely true since there was no direct meeting with the patients. The questionnaire was written in English; it may not be equally suitable in other languages and cultures. Besides, the scoring system introduced in the study is not standardized and was made only for the current study. At the same time, despite these limitations, we were able to find a correlation between obstructive sleep apnoea and metabolic disorders. To be more precise, sleep apnoea can be considered as the manifestation of metabolic syndrome.

RESULT

Over 62 patients were involved in the study that had all or either of the metabolic disorder such as systemic hypertension, diabetes mellitus, hyperlipidemia as well as obesity. The 6 questions made to analyze the patient's OSA condition had a scoring system related to symptoms of the disorder. According to the findings, if all the symptoms persist (score of 12), it is considered as an ideal case of the disorder. The probability of having the disorder increases as the point rises. Therefore, the score was grouped as 0-3, 4-6, 7-10, and 11-12 which is indicated as less likely, probable, possible, and definite cases of sleep apnea. Out of the total percentage, 43.54% of the cases with the metabolic disorder were not likely to have obstructive sleep apnoea but 38.72% had the probability of having the disorder indicating that the patient showed more or less the signs and symptoms of having the disorder or chances of developing into a case of Obstructive sleep apnoea. Whereas, the remaining 17.74% had almost all the symptoms and were possible to be an OSAD. These patients need proper diagnostic confirmation and may have to take medication if needed. None of the cases were indicating the need for proper diagnosis.

CONCLUSION

The study concludes that there is a chance of association between metabolic disorder and OSA. The majority of the patients showed most of the symptoms associated with the disorder even though it wasn't diagnosed before. However, it is not necessary to have OSA if the patient is having any metabolic disorder since almost half of the patient did not show as many symptoms.

ACKNOWLEDGEMENTS

We would like to express our deep sense of gratitude to the assistant professor of the Department of Pharmacy Practice, Nandha College of Pharmacy, Dr. Priscilla

Mary J, who guided and encouraged us to make this project a great success with their valuable comments and to all family members and our peer group who are the stepping stone of this work. Without their co-operation, the goal of this project would not have been achieved.

REFERENCES

1. Castaneda A, Jauregui-Maldonado E, Ratnani I, Varon J, Surani S. Correlation between metabolic syndrome and sleep apnea. World Journal of Diabetes, 2018 Apr 15; 9(4): 66.
2. Borel AL, Tamisier R, Böhme P, Priou P, Avignon A, Benhamou PY, Hanaire H, Pépin JL, Kessler L, Valensi P, Darmon P. Obstructive sleep apnoea syndrome in patients living with diabetes: Which patients should be screened?. Diabetes & metabolism, 2019 Apr 1; 45(2): 91-101.
3. Bixler EO, Vgontzas AN, Ten Have T, Tyson K, Kales A. Effects of age on sleep apnea in men: I. Prevalence and severity. American journal of respiratory and critical care medicine, 1998 Jan 1; 157(1): 144-8.
4. Vgontzas, MD AN, Kales, MD A. Sleep and its disorders. Annual review of medicine, 1999 Feb; 50(1): 387-400.
5. Vgontzas AN, Bixler EO, Chrousos GP. Sleep apnea is a manifestation of the metabolic syndrome. Sleep medicine reviews, 2005 Jun 1; 9(3): 211-24.
6. Brooks BE, Cistulli PA, Borkman MA, Ross GL, McGhee S, Grunstein RR, Sullivan CE, Yue DK. Obstructive sleep apnea in obese noninsulin-dependent diabetic patients: effect of continuous positive airway pressure treatment on insulin responsiveness. The Journal of Clinical Endocrinology & Metabolism, 1994 Dec 1; 79(6): 1681-5.
7. Edinger JD, Hoelscher TJ, Marsh GR, Lipper S, Ionescu-Pioggia M. A cognitive-behavioral therapy for sleep-maintenance insomnia in older adults. Psychology and Aging, 1992 Jun; 7(2): 282.
8. Zizi F, Jean-Louis G, Brown CD, Ogedegbe G, Boutin-Foster C, McFarlane SI. Sleep duration and the risk of diabetes mellitus: epidemiologic evidence and pathophysiologic insights. Current diabetes reports, 2010 Feb 1; 10(1): 43-7.
9. Dorkova Z, Petrasova D, Molcanyiova A, Popovnakova M, Tkacova R. Effects of continuous positive airway pressure on cardiovascular risk profile in patients with severe obstructive sleep apnea and metabolic syndrome. Chest, 2008 Oct 1; 134(4): 686-92.
10. Strollo PJ, Jr, Rogers RM. Obstructive sleep apnea. N Engl J Med, 1996; 334: 99–104. doi: 10.1056/NEJM199601113340207. [PubMed] [CrossRef] [Google Scholar]
11. Malhotra A, White DP. Obstructive sleep apnoea. Lancet, 2002; 360: 237–245. doi: 10.1016/S0140-6736(02)09464-3. [PubMed] [CrossRef] [Google Scholar]
12. De Backer W. Obstructive sleep apnea/hypopnea syndrome. Panminerva Medica, 2013; 55: 191–195. [PubMed] [Google Scholar]
13. L´evy P, Kohler M, McNicholas WT, Barb´e F, McEvoy RD, Somers VK, Lavie L, P´epin JL. Obstructive sleep apnoea syndrome. Nat Rev Dis Primers, 2015; 1: 15015.
14. Pepperell JC, Davies RJ, Stradling JR. Systemic hypertension and obstructive sleep apnoea. Sleep Med Rev., 2002; 6: 157–173. doi: 10.1053/smrv.2001.0189. [PubMed] [CrossRef] [Google Scholar]
15. Loke YK, Brown JW, Kwok CS, Niruban A, Myint PK. Association of obstructive sleep apnea with risk of serious cardiovascular events: a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes, 2012; 5: 720–728. doi: 10.1161/CIRCOUTCOMES.111.964783. [PubMed] [CrossRef] [Google Scholar]
16. De Lima FF, Mazzotti DR, Tufik S, Bittencourt L. The role inflammatory response genes in obstructive sleep apnea syndrome: a review. Sleep Breath, 2016; 20(1): 331–338.