Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

To Assess the Risk of Osa (Obstructive Sleep Apnea in the Population of Urban Areas of Dehradun Particularly in Dm-2 and Different Psychiatric Disorders

[1]Srishti Gosain, [2]Mohit Goyal, [3]Aakarsh Gupta, [4]Manushree Rawat
[1,2,3,4]Department of Pharmacy Practice, School of Pharmaceutical Sciences,
Shri Guru Ram Rai University, Patel Nagar, Dehradun

(Received: 04 August 2023 Revised: 12 September Accepted: 06 October)

KEYWORDS
OSA,
AHI,
T2DM,
Psychiatric Disorders

ABSTRACT:
Background- OSA is a common but occasionally misdiagnosed condition that is characterized by frequent awakening, disrupted sleep, excessive daytime sleepiness, repetitive closure of the upper airway, and repetitive oxygen desaturation. In this study, 385 subjects were included based on inclusion and exclusion criteria.

Result- The study reveals a significant and positive relationship between diabetes and risk of OSA with a p-value of 0.001(80% of diabetic individuals were at high risk of OSA) but a non-significant relationship between psychiatric disorders with risk of OSA with a p-value of 0.54 by applying the STOP-BANG questionnaire.

Conclusion- This study helps to aware healthcare practitioners and community members about the risk of OSA in both diseases (Diabetes and Psychiatric). This study aims to find out the relationship between OSA with T2DM and Psychiatric Diseases.

INTRODUCTION

Obstructive sleep apnea syndrome is a frequently encountered sleep disorder that develops when the pharynx collapses during sleep, obstructing the airway partially or completely. It causes a loud snoring or a choking sound which can be associated with frequent awakenings and disrupted sleep which can lead to excessive daytime sleepiness [1,2]. Due to this condition, there can be reduced inspiratory airflow (Hypopnea) or completely absent airflow (apnea). According to the American Academy of Sleep Medicine Guidelines (AASM), "OSA is defined as five or more episodes of apnoea or hypopnea per hour of sleep with associated symptoms (excessive daytime sleepiness, fatigue or impaired cognition) or 15 or more obstructive apnoea, hypopnea, events per hour of sleep regardless of associated symptoms"[3,4,5].

There are various screening tools for the evaluation of OSA developed by different healthcare providers, examples of some are AHI (Apnea Hypopnea Index), Berlin Questionnaire, ESS (Epworth Sleepiness Scale), and STOP-BANG (6-8). The STOP-Bang Questionnaire was created primarily to serve as a reliable, condensed, and simple screening tool. There are 8 dichotomous questions, and if the total score is >3 out of 8 then the person has moderate OSA. It consists of four demographic (Bang: age, neck circumference, gender, and body mass index; calculated as weight in kilograms divided by height in meters squared) and four self-reporting (STOP: snoring, tiredness, observed apnea, and high blood pressure) questions. The STOP-Bang questionnaire showed a sensitivity of 84%, 93%, and 100% to detect all OSA [9,10].

The pathophysiology of OSA can be attributed 2 major factors i.e,

1. Abnormalities of craniofacial structures. It has been recognized as the primary risk factor associated with OSA.
2. Extraluminal tissue pressure can be raised and the threshold for airway collapse lowered by abnormal tissue deposition or the addition of some bigger soft tissue masses. Due to an increase in tissue pressure airway collapse can occur because of muscle relaxation during sleep. This increase in pressure is the product of

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

extra soft tissue mass/ structural limitation (Abnormality of craniofacial structures).In healthy individuals, pharyngeal dilator muscle activation is necessary for maintaining airway patency. Yet, a problem with the pharyngeal dilator muscle's regulation is what leads to OSA [11]

The correlation between OSA and T2DM is mutual. Both are risk factors for each other. Both are interrelated at the level of obesity. People with prediabetes and morbid obesity are at two times more risk of developing OSA compared to those with morbid obesity with non-diabetic. Complete sleep and hypoxemic episodes that are classically seen in OSA result in several hormonal changes which can lead to activation of the sympathetic nervous system which will eventually increase the levels of catecholamines in the body. In addition to hypoxia, hypercarbia (Increased carbon dioxide) occurs in OSA patients which will result in baroreflex dysfunction, cardiovascular respiration, vasoconstrictor effect of nocturnal endothelin release, and vascular endothelial cell dysfunction. An increase in levels of catecholamines will result in more release of glucose from the liver and insulin sensitivity will also decrease. Another mechanism of impaired glucose metabolism in the case of obesity is that there is stimulation of the hypothalamic-pituitary-adrenal axis which will stimulate cortisol and decrease the insulin release from the pancreas[11,12].

OSA is a sleep-related disorder that results in a lack of sleep due to the fragmentation of sleep and intermittent arousal. According to a common viewpoint, typical mental health symptoms are linked to a variety of diseases and may have an impact on networks of psychiatric issues. The importance of sleep deprivation and disturbance of the circadian rhythm in causing mental health issues was made obvious by the study domain criterion framework. The amount of time spent awake (homeostatic load), the time of day (circadian rhythm), and the degree of arousal are a few factors that can influence sleep. Many neuronal networks, locations, and neurotransmitters operate in the brain to control these interconnected activities[12,13].

METHODOLOGY

Study Design: A Questionaire based study

Study Site: Dehradun

Study Duration: The study was carried out for a period of six months

Sample Size: 385 responses from subjects

Study Criteria:

✓ **Inclusion Criteria:**

- Participants having Diabetes.
- Participants having Psychiatric Illness.

✓ **Exclusion Criteria:**

- Participants who are not willing to participate in the study.
- Participants who are not residents of Dehradun.

Sources of Data: The study data was collected from the following sources:

- Direct collection from the population through a pre-approved printed questionnaire.
- Through different online portals like Google link send in emails or different social media (WhatsApp groups etc).

Study Procedure: This study was carried out after getting the approval from Ethical Committee of Shri Mahant Indiresh Hospital, Students who met the inclusion & exclusion criteria and gave informed consent were chosen for the study. All Participants were explained about the study procedure and the benefit associated with the study were explained. Data collection was done from the participants, which is necessary according to the questionnaire prepared. All required data was gathered in a defined format using the questionnaire form

RESULTS

We enrolled a total of 385 subjects collectively, who were pre-diagnosed with T2DM or any Psychiatric disorder

Gender-wise distribution of subjects:

The number of participants sorted, according to gender-wise distribution where males were more as compared to females numbered 219(56.9% males) and 166 (43.1% females) respectively.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

Table 1: Gender-wise distribution of participants

Gender	No. of People (N)	Percent (%)
Male	219	56.9
Female	166	43.1
Total	385	100

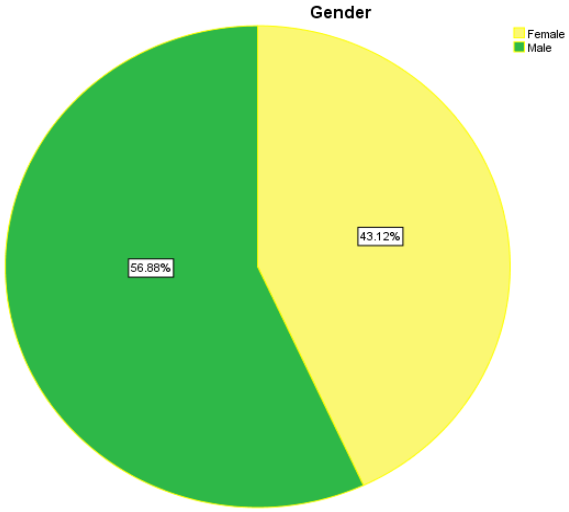

Figure 1:

Gender-wise distribution of participants

Age Wise Distribution

The mean age of the study was found to be 47.77±2, where the majority of subjects lie between the age group 51-60 years (23.9%). Categorization of subjects was done, according to their age such as 18-20yr [11(2.9%)], 21-30yr [57(14.8%)], 31-40yr [61(15.8%)], 41-50yr [83(21.6%)], 61-70yr [51(13.2%)], 71-80yr [24(6.2%)], 81-90yr [6(1.6%)].

Table 2: Age-Wise Distribution of Participants (Year)

Age of Patient (in Years)	Frequency	Percentage
18-20	11	2.9
21-30	57	14.8
31-40	61	15.8
41-50	83	21.6
51-60	92	23.9
61-70	51	13.2
71-80	24	6.2
81-90	6	1.6

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

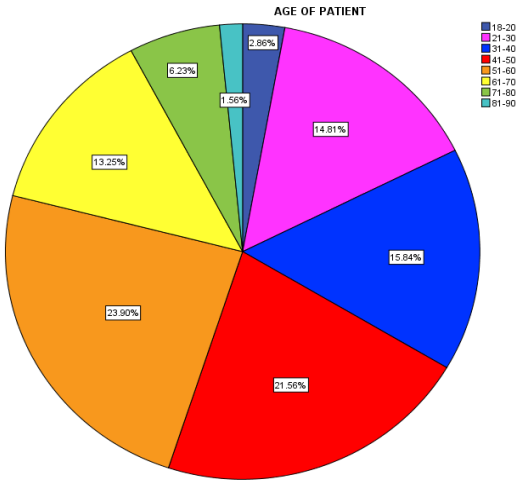

Figure 2: Age-Wise Distribution of Participants (Years)

BMI Wise Distribution

The mean BMI of the participants was found to be 25.7 kg/m^2. The body Mass Index range is categorized into 4 classes and participants are divided according to that which is <18.5kg/m^2 [12(3.1%)], 18.5-24.9kg/m^2 [183(47.5%)], 25-29.9kg/m^2[132(34.3%)] and >30 kg/m^2 [58(15.1%)].

Table 3: BMI-Wise Distribution of Participants

BMI	Range	No. of Participants	Percent (%)
<18.5	Underweight	12	3.1
18.5-24.9	Healthy	183	47.5
25-29.9	Overweight	132	34.3
>30	Obese	58	15.1

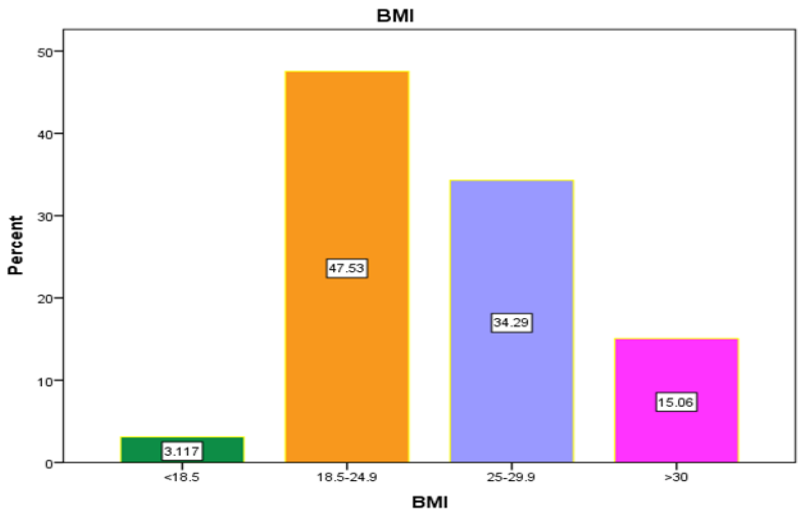

Figure 3: BMI-Wise Distribution of Participants

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

CATEGORISATION ACCORDING TO THE DISEASE

1.) DIABETES

There were 385 participants, and 273 (or 70.9%) were found to have diabetes; the other subjects were non-diabetic.

Table 4: Diabetic Participants

Diabetic	No. of people(N)	Percentage (%)
Yes	273	70.9
No	112	29.1
Total	385	100

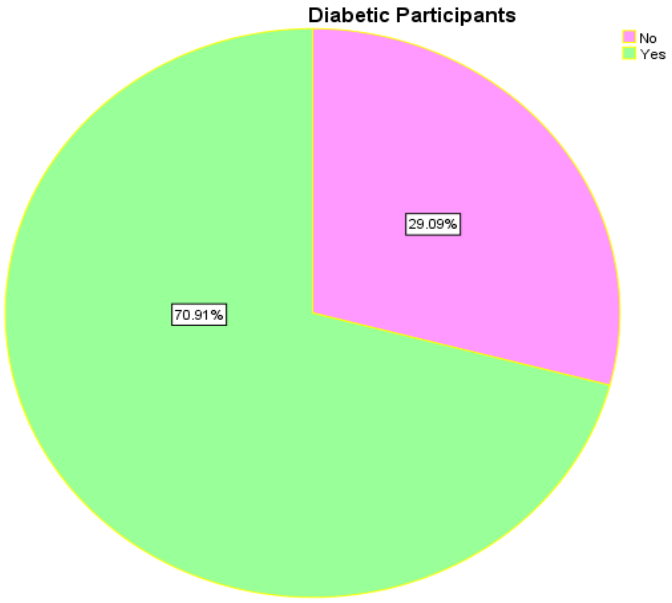

Figure 4: Diabetic Participants

2) Psychiatric Illnesses (Anxiety, Depressions, Schizophrenia)

Out of 385 participants, the number of different psychiatric illnesses patients were Anxiety [83(21.6%)], Depression [52(13.5%)], Schizophrenia [10(2.6%)], Others [83(21.6%)] and 157(40.8%) participants were having no psychiatric illness).

Table 5: Distribution of patients according to Psychiatric Illness

Psychiatric illness	No.of People(N)	Percent (%)
Anxiety	83	21.6
Depression	52	13.5
Schizophrenia	10	2.6
Others	83	21.6
Not any	157	40.8
Total	385	100

Journal of Chemical Health Risks
www.jchr.org
JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

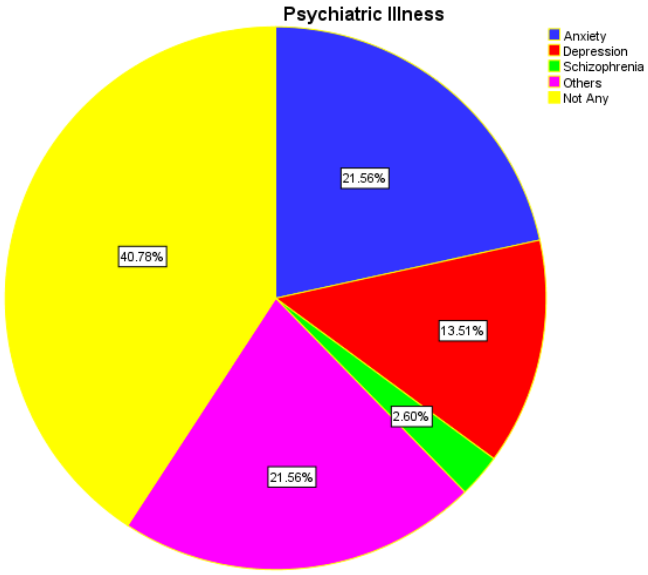

Figure 5: Distribution of patients according to Psychiatric Illnesses

3) Obstructive Sleep Apnoea (OSA)

Out of 385 participants in the study 102 (26.5%) people were at low risk of OSA, 167 (17.4%) people were at intermediate risk of OSA, and 116 (56.1%) people were at high risk of OSA.

Table 6: Risk of OSA in Participants

Risk of OSA	No of people(N)	Percentage (%)
Low risk	102	26.5
Intermediate risk	167	43.4
High risk	116	30.1
Total	385	100

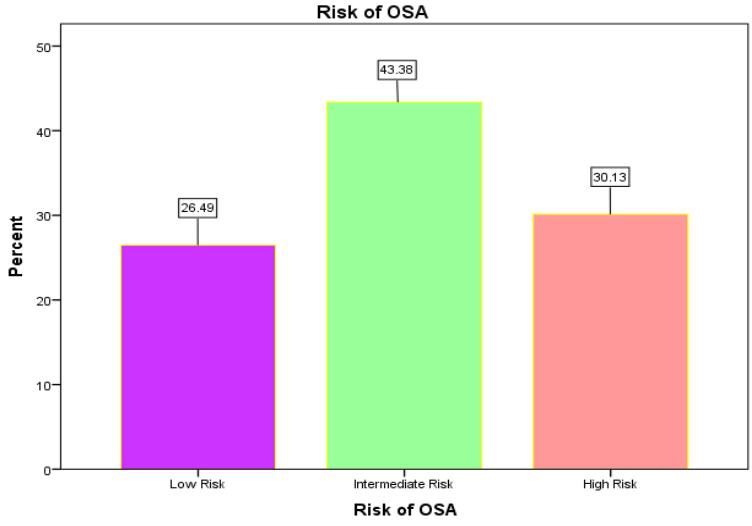

Figure 6: Risk of OSA in Participants

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

Correlation between Diabetes and Risk of OSA

In this study, we enrolled a total of 273 diabetic participants of which 166 were at high risk of developing OSA & 55 were at intermediate risk of OSA, and 51 participants were at lower risk of OSA. To statistically verify this a chi-square test was applied.

A chi-square test of independence was performed to examine the association between risk of OSA, and diabetes. There was a significant association found between the risk of OSA and diabetes with the values **(χ^2=34.396, df= 2, p=0.000)**.

Table 7: Correlation between Diabetes and risk of OSA

Risk of OSA					χ^2	P
Diabetes	**Low**	**Intermediate**	**High**	**Total**	34.396	0.000
Yes	51	55	166	273		
No	50	12	50	112		
Total	101	67	216	385		

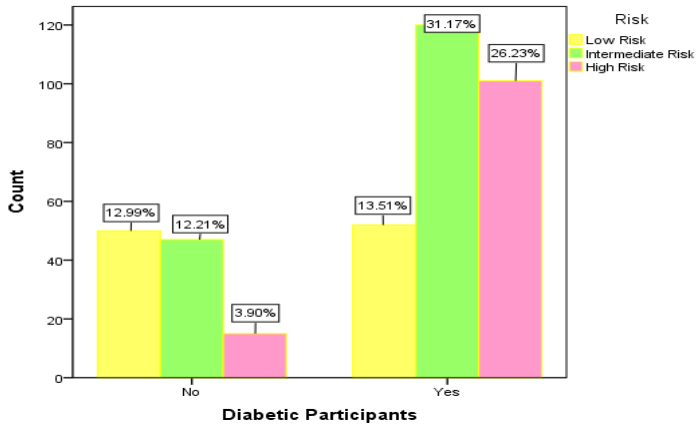

Figure 7: Correlation between Diabetes and risk of OSA

Correlation between Anxiety and risk of OSA

In this study, we enrolled a total of 83 anxious participants of whom 23 were at high risk of developing OSA & 35 were at intermediate risk of developing OSA, whereas 25 participants were at low risk of developing OSA. To statistically verify this a chi-square test was applied.

A chi-square test of independence was performed to examine the association between the risk of OSA, and Anxiety. There was a non-significant association between the risk of OSA and anxiety, as the **p-value is 0.682** and **χ^2=0.766, df=2.**

Table 8: Correlation between Anxiety and risk of OSA

Risk of OSA					χ^2	P
Anxiety	**Low**	**Intermediate**	**High**	**Total**	0.766	0.682
Yes	25	35	23	83		
No	77	132	93	302		
Total	102	167	116	385		

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

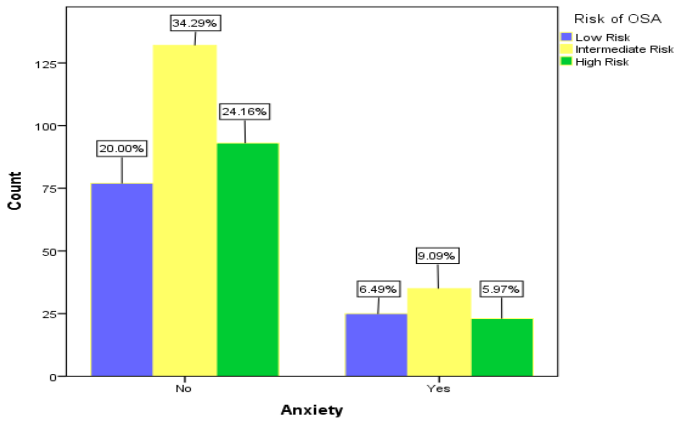

Figure8: Correlation between Anxiety and risk of OSA

Correlation between Depression and Risk of OSA

In this study, we enrolled a total of 52 depressive participants of which 17 were at high risk of developing OSA & 23 were at intermediate risk of developing OSA and 12 participants were at lower risk of developing OSA. To statistically verify this a chi-square test was applied.

A chi-square test of independence was performed to examine the association between risk of OSA, and depression. The likelihood of OSA and depression were shown to be non-significantly correlated, as the **p-value is 0.816** and χ^2**=0.406, df=2.**

Table 9: Correlation between Depression and risk of OSA

Risk of OSA					χ^2	P
Depression	**Low**	**Intermediate**	**High**	**Total**	0.406	0.816
Yes	12	23	17	52		
No	90	144	99	333		
Total	102	167	116	385		

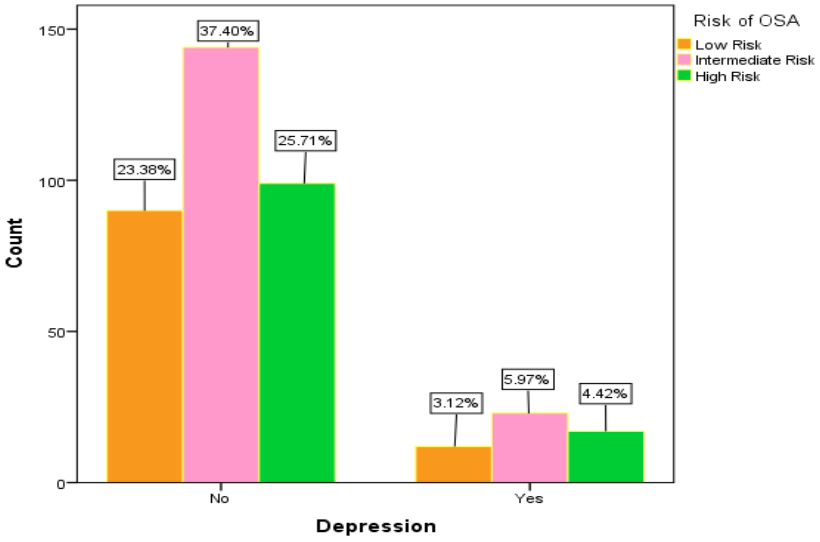

Figure 9: Correlation between Depression and risk of OSA

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

Correlation between Schizophrenia and risk of OSA

In this study, we enrolled a total of 10 schizophrenic participants from which NO participant was at high risk of developing OSA & 5 were at intermediate risk of developing OSA whereas 5 participants were at low risk of OSA. To statistically verify this a chi-square test was applied.

A chi-square test of independence was performed to examine the association between the risk of OSA and, Schizophrenia. There was a non-significant association between the risk of OSA and schizophrenia as the **p-value is 0.069** and χ^2**=5.33, df= 2.**

Table 10: Correlation between Schizophrenia and risk of OSA

Risk of OSA					χ^2	P
Schizophrenia	**Low**	**Intermediate**	**High**	**Total**	5.33	0.069
Yes	5	5	0	10		
No	97	162	116	375		
Total	102	167	116	385		

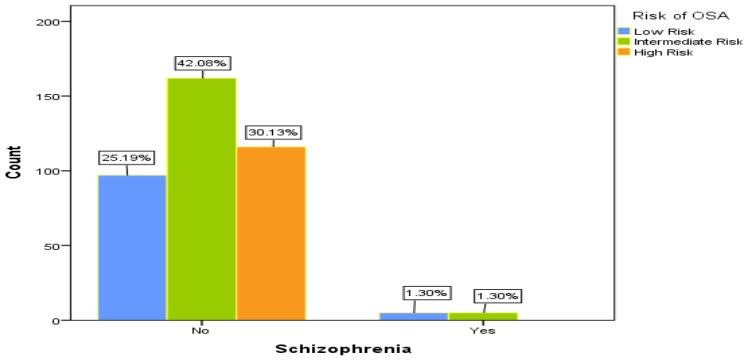

Figure 10: Correlation between Schizophrenia and risk of OSA

Correlation between Other Psychiatric Disorders and risk of OSA

In this study, we enrolled a total of 83 other psychiatrically ill participants of which 27 were at high risk of OSA & 41 were at intermediate risk of OSA and 15 participants were at low risk of developing OSA. To statistically verify this a chi-square test was applied

A chi-square test of independence was performed to examine the association between the risk of OSA associated with other Psychiatric Illnesses. There is a non-significant association between the risk of OSA and, other psychiatric disorders as the **p-value 0.141** and χ^2**=3.91, df=2.**

Table 11: Correlation between Other Psychiatric Disorders and risk of OSA

Risk of OSA					χ^2	P
Other psychiatric disorder	**Low**	**Intermediate**	**High**	**Total**	3.91	0.141
Yes	15	41	27	83		
No	87	126	89	302		
Total	102	167	116	385		

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

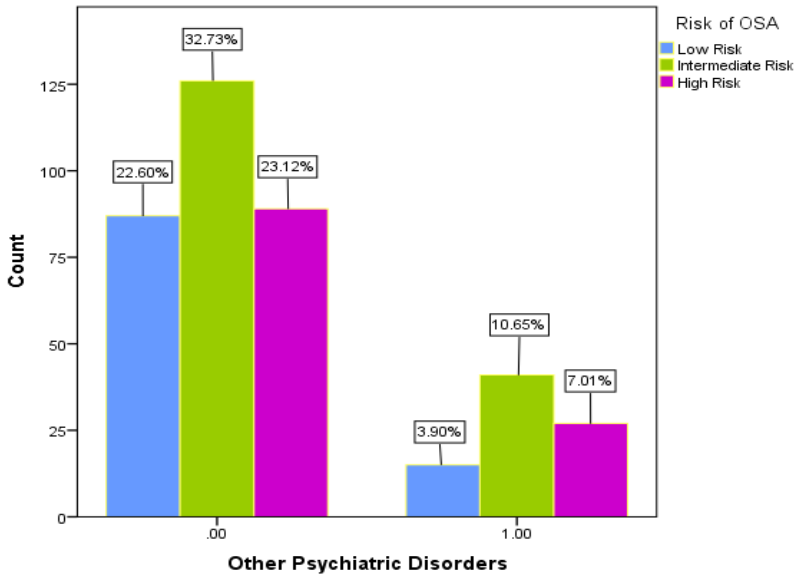

Figure 11: Correlation between Other Psychiatric Disorders and risk of OSA

Correlation between Psychiatric Illness and risk of OSA

In the study, the total number of participants included was 385 out of which 228 participants were found psychiatrically ill. It was found that there was a low risk of OSA in

different psychiatric illnesses patients - Anxiety (25), Depression (12), Schizophrenia (5), and Others (15). The participants at intermediate risk of OSA – Anxiety (18), Depression (7), Schizophrenia (1), and Others (13). Participants at higher risk of OSA were Anxiety (40), Depression (33), Schizophrenia (4), and Other Psychiatric illnesses (55).

To determine the relationship between the risk of OSA and psychiatric disorders, a chi-square test was used. The risk of OSA and psychiatric diseases was shown to be non-significantly correlated with the values (**χ^2=1.22, df=2, p=0.54)**

Table 12: Correlation between Psychiatric Illnesses and risk of OSA

Risk of OSA					**x^2**	**p**
Psychiatric illness	**Low**	**Intermediate**	**High**	**Total**		
Anxiety	25	35	23	83	1.22	0.54
Depression	12	23	17	52		
Schizophrenia	5	5	0	10		
Others	15	41	27	83		
Not any	45	63	49	157		
Total	102	67	216	385		

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

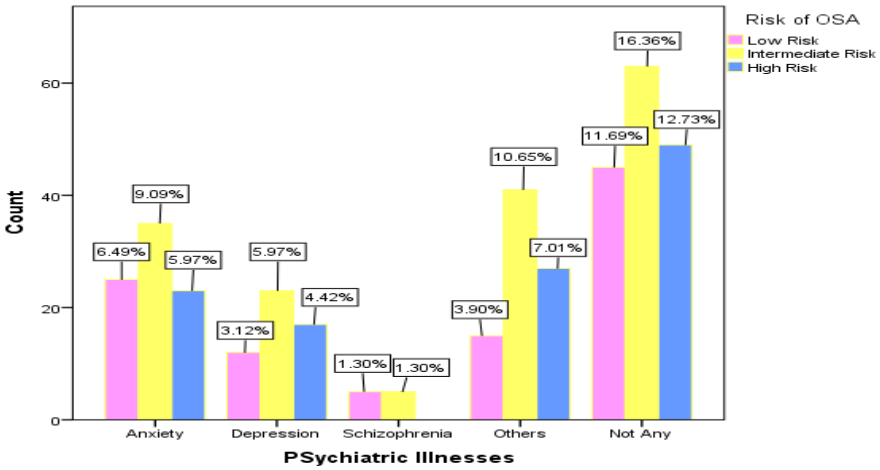

Figure 12: Correlation between Psychiatric Illnesses and risk of OSA

DISCUSSION

OSA is a frequently encountered sleep-related disorder that develops when the pharynx collapses during sleep, obstructing the airway partially or completely. OSA, a persistent sleep disorder that is treatable, is usually present in patients with T2DM. Aberrant glucose metabolism has been linked in laboratory investigations to important features of OSA, including intermittent hypoxemia and fragmented sleep [14]. It is conceivable that there is a two-way interaction between OSA and T2DM.

The purpose of this study was to assess the risk of OSA in Diabetic and Psychiatric individuals. In this study, we can see that 70% of the subjects were Diabetic and 60% of the subjects had some Psychiatric illness. 60% of diabetics were at high risk of developing OSA as they scored >5 on the STOP-BANG survey. A large number of clinical and demographic factors, such as a high BMI, a wide neck circumference, and comorbidity with hypertension, increased the risk of OSA[15]. The presence of a relationship between the presence of diabetes and the risk severity of developing OSA was tested and it was significant with a P value of < 0.001. STOP-BANG surveys were used by Kalakattawi et al. in Taif to evaluate the risk of OSA in individuals with T2DM and reported that 15.2% of patients had a severe risk for OSA, 26.9% of patients had a moderate risk, and 57.9% of patients had a mild risk, and in our study 18% diabetics are at low risk, 20% diabetics are at intermediate risk and 60% diabetics were at high risk of developing OSA. Kalakattawi et al also employed the STOP-BANG survey to determine the likelihood of OSA [16]. Foroughl et al. conducted another extensive study carried out in Iran with a 4,021-person random sample, 239 of whom had diabetes. Foroughl et al. utilized the STOP-BANG questionnaire and revealed that 78.6% of the diabetes patients were at high risk of developing OSA; this figure dropped to 35.1% among participants who did not have diabetes [17]. Aljabr et al. used the Berlin questionnaire in Al-Ahsaa and found that only 30.6% of the 147 participants had diabetes, which increased their chance of getting OSA [18].

In our study 21.6% of participants were anxious and 13.5% of participants were depressive. 27.7% of anxiety patients were at high risk of developing OSA while 30.1% and 42.1% of anxiety were at low and moderate risk of developing OSA respectively. 32.6% of patients with depression were a high possibility of developing OSA but both anxiety and depression show an insignificant association with a high likelihood of developing OSA. Similarly, no correlation between the ODI, also known as the AHI, and depression as determined by the Mini International Neuropsychiatric Interview, was discovered in a study conducted in Iceland by Bjornsdottir et al[19]. The connection between T2DM with OSA was discovered to be directly proportional whereas the association of psychiatric illness with that OSA is non-significant, which has been stated by several authors as well like Kalakatwari et al and Macey et al in their studies[16,20].

Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 455-467 | ISSN:2251-6727

CONCLUSION

We draw the following conclusion from the foregoing talks and findings: OSA is more likely to develop in people with T2DM. Our study's sample of diabetic patients demonstrated a higher risk of OSA, which may be related to the high prevalence of obesity, larger neck circumferences, hypertension, and other factors related to the development and management of diabetes. We advise diabetic individuals to have prompt OSA screenings. We found that there is no conclusive link between patients with various psychiatric disorders and OSA risk or severity.

REFERENCES

1. Peppard PE, Young T, Barnet JH, Palta M, Hagen EW, Hla KM. Increased prevalence of sleep-disordered breathing in adults. American Journal of Epidemiology. 2013 May 1;177(9):1006-14.
2. Berry RB, Budhiraja R, Gottlieb DJ, Gozal D, Iber C, Kapur VK, Marcus CL, Mehra R, Parthasarathy S, Quan SF, Redline S. Rules for scoring respiratory events in sleep: update of the 2007 AASM manual for the scoring of sleep and associated events: deliberations of the sleep apnea definitions task force of the American Academy of Sleep Medicine. Journal of clinical sleep medicine. 2012 Oct 15;8(5):597-619.
3. Eckert DJ, Malhotra A. Pathophysiology of adult obstructive sleep apnea. Proceedings of the American thoracic society. 2008 Feb 15;5(2):144-53.
4. American Academy of Sleep Medicine. International classification of sleep disorders—third edition (ICSD-3). AASM Resour Libr. 2014;281:2313.
5. Kapur VK, Auckley DH, Chowdhuri S, Kuhlmann DC, Mehra R, Ramar K, Harrod CG. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea: an American Academy of Sleep Medicine clinical practice guideline. Journal of Clinical Sleep Medicine. 2017 Mar 15;13(3):479-504.
6. Kubin L. Neural control of the upper airway: respiratory and state-dependent mechanisms. Comprehensive Physiology. 2016 Sep 9;6(4):1801.
7. Owens RL, Malhotra A. Sleep-disordered breathing and COPD: the overlap syndrome. Respiratory care. 2010 Oct 1;55(10):1333-46.
8. Punjabi NM. The epidemiology of adult obstructive sleep apnea. Proceedings of the American Thoracic Society. 2008 Feb 15;5(2):136-43.
9. Nagappa M, Liao P, Wong J, Auckley D, Ramachandran SK, Memtsoudis S, Mokhlesi B, Chung F. Validation of the STOP-Bang questionnaire as a screening tool for obstructive sleep apnea among different populations: a systematic review and meta-analysis. PloS one. 2015 Dec 14;10(12):e0143697.
10. Asghari A, Mohammadi F. Is the apnea-hypopnea index a proper measure for obstructive sleep apnea severity. Med J Islam Repub Iran. 2013 Aug 10;27(3):161-2.
11. Jehan S, Myers AK, Zizi F, Pandi-Perumal SR, Jean-Louis G, McFarlane SI. Obesity, obstructive sleep apnea and type 2 diabetes mellitus: Epidemiology and pathophysiologic insights. Sleep medicine and disorders: international journal. 2018;2(3):52.
12. Song SO, He K, Narla RR, Kang HG, Ryu HU, Boyko EJ. Metabolic consequences of obstructive sleep apnea especially pertaining to diabetes mellitus and insulin sensitivity. Diabetes & metabolism journal. 2019 Apr;43(2):144-55.
13. Knechtle B, Economou NT, Nikolaidis PT, Velentza L, Kallianos A, Steiropoulos P, Koutsompolis D, Rosemann T, Trakada G. Clinical characteristics of obstructive sleep apnea in psychiatric disease. Journal of clinical medicine. 2019 Apr 18;8(4):534.
14. Goyal M, Johnson J. Obstructive sleep apnea diagnosis and management. Missouri medicine. 2017 Mar;114(2):120.
15. Reutrakul S, Mokhlesi B. Obstructive sleep apnea and diabetes: a state of the art review. Chest. 2017 Nov 1;152(5):1070-86.
16. Kalakattawi RM, Kalakattawi AM, Alsuqati FA, Alzhrani SA, Alhamyani AH, Alhamyani AH, Al-Ghamdi AA, Alosaimi IM, Abbas SI, Al-Shehri LA, Alzahrani AA. Risk of obstructive sleep apnea assessment among patients with type 2 diabetes in Taif, Saudi Arabia. Journal of Clinical Medicine Research. 2017 Dec;9(12):1002.

17. Foroughi M, Malekmohammad M, Sharafkhaneh A, Emami H, Adimi P, Khoundabi B. Prevalence of obstructive sleep apnea in a high-risk population using the stop-bang questionnaire in Tehran, Iran. Tanaffos. 2017;16(3):217.
18. Cass AR, Alonso WJ, Islam J, Weller SC. Risk of obstructive sleep apnea in patients with type 2 diabetes mellitus. Fam Med. 2013 Jul 1;45(7):492-500.
19. Bjornsdottir E, Keenan BT, Eysteinsdottir B, Arnardottir ES, Janson C, Gislason T, Sigurdsson JF, Kuna ST, Pack AI, Benediktsdottir B. Quality of life among untreated sleep apnea patients compared with the general population and changes after treatment with positive airway pressure. Journal of sleep research. 2015Jun;24(3):328-38.
20. Macey PM, Woo MA, Kumar R, Cross RL, Harper RM. Relationship between obstructive sleep apnea severity and sleep, depression, and anxiety symptoms in newly-diagnosed patients. PloS one. 2010 Apr 16;5(4):e10211.