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Prevalence of Obstructive Sleep Apnea in Type 2 Diabetes Mellitus in Tertiary Care Centre in Jodhpur

[1]Dr. Naveen Kishoria, Senior Professor and Unit Head, Department of Medicine, Dr. S. N. Medical College, Jodhpur RAJ.

[2]Dr. Parmeshwar Choudhary, Resident Doctor, Department of Medicine, Dr. S. N. Medical College, Jodhpur, RAJ.

[3]Dr. S. L. Mathur, Senior Professor & HOD, Department of Medicine, Dr. S. N. Medical College, Jodhpur, RAJ.

[4]Dr. Nawal Jangir, Resident Doctor, Department of Medicine, Dr. S. N. Medical College, Jodhpur, RAJ.

Corresponding Author: Dr. Parmeshwar Choudhary, Resident Doctor, Department of Medicine, Dr. S. N. Medical College, Jodhpur, RAJ.

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Abstract

Background: The present study was aimed to assess the prevalence of obstructive sleep apnea in type 2 diabetes mellitus patients and find out any association between severity of diabetes mellitus (glycemic control) and obstructive sleep apnea, and find out any association between duration of type 2 DM and severity of obstructive sleep apnea, and find out correlation between glycolated hemoglobin and apnea -hypopnea index (AHI).

Methods: The present study was a cross sectional observational type of study conducted in department of medicine, Mathura das Mathur hospital, Dr. S .N. Medical College, Jodhpur, Rajasthan. A total of 100 subjects that fulfilled the inclusion criteria were enrolled in the study after written and informed consent. All the included subjects were gone through berlin questionnaire and find risk score and then referred to sleep lab of our college where polysomnography (PSG) was conducted to find out Apnea -Hypopnea Index (AHI).

Results: There is a significant correlation between severity of diabetes mellitus (glycemic control) and obstructive sleep apnea. An increased levels of HbA1C (poor glycemic control) was found to be associated with increased severity of OSA (severe AHI). As the levels of HbA1C increases the severity of OSA (AHI) increases, My study suggest that significant correlation exists between HbA1C (glycemic control) and obstructive sleep apnea (AHI), (p=0.011). There is a significant correlation between duration of type 2 DM and severity of obstructive sleep apnea. As there is increase in duration of type 2 diabetes mellitus there is increased severity of obstructive sleep apnea (AHI), My study suggest that there is increase in AHI with duration of diabetes mellitus was found to be statistically significant (< 0.0001).

Conclusion: Our study shows that Increasing OSA severity is associated with increased likelihood of

concomitant T2DM and worse diabetic control in patients with T2DM.

Keywords: OSA, T2DM, AHI

Introduction

Obstructive Sleep Apnea (OSA) affects about 4% of men and 2% of women of middle aged population, as defined by apnea-hypopnea index (AHI)>5 and daytime excessive sleepiness[1].

The prevalence of OSA is high in T2DM patients with a prevalence of 14.1% for mild OSA, 21% for moderate OSA and 28.9% for severe OSA compared to 6.6% in patients without diabetes.[2]

Obstructive sleep apnea is associated with a high frequency of type 2 diabetes and impaired glucose tolerance. The relationship between sleep-disordered breathing and impaired glucose –insulin metabolism is independent of obesity and age[3],Central obesity is commonly seen in patients with insulin resistant T2DM a number of studies have demonstrated abnormal glucose tolerance and hyper insulinemia in patients with OSA[4]

Gold standard for evaluation of sleep and sleep related breathing disorders is the polysomnography (PSG).[5] The gold standard treatment of OSA is implementation of continuous positive airway pressure (CPAP) during sleep via a noninvasive vented mask. CPAP treatment has been shown to reduce road traffic accidents, reduce AHI, Epworth Sleepiness Scale, diurnal systolic and diastolic BP<improvement in cognitive function poststroke and improvement in QoL[6].

These events may include any combination of obstructive apnea, hypopnea, or respiratory effort-relaed arousals. The clinical syndrome of sleep apnea is defined as the presence of abnormal breathing in sleep along with daytime symptoms, particularly excessive daytime sleepiness. OSA is characterized by repeated episodes of upper airway collapse, leading to apnea (cessation of airflow 10 seconds or more) or hypopneas (decrease in airflow 10 seconds associated with either an oxyhaemoglob in desaturation or an arousal detected by electroencephalography[7].

Modified Berlin questionnaire to identify patients at risk for the obstructive sleep apnea syndrome. Questionnaire addressed the presence of frequency of snoring, wake time sleepiness, fatigue, obesity and hypertension. Overnight polysomnography was performed to measure apnea and hypopnea index (AHI)[8]

About one in four diabetic patients with autonomic neuropathy suffers from OSA. Thus, obstructive sleep apnea is more prevalent in diabetic patients with autonomic neuropathy, than in those without[9]

Material and Methods

1. **Site of study**: Dr. Sampurnanand Medical College and Associated Hospitals.
2. **Sample size**: Sample size is calculated at 95% confidential interval and 20% relative allowable error using formula below.

$$N = \frac{Z^2_{1-\alpha/2}\, P(1-P)}{E^2}$$

Where, N = sample size number of individuals to be included in study.

P = prevalence of OSA in type 2 DM.

E = relative allowable error taken as 10%.

Z = standard normal deviation for 95% confidence level, taken as 1.96.

Sample size is calculated to be 92 which was round of 100.

Sample criteria

Inclusion Criteria: All type 2 diabetic patients above the age of 18 years of both gender diagnosed as per American Diabetes Association criteria will include in this study.

Exclusion criteria

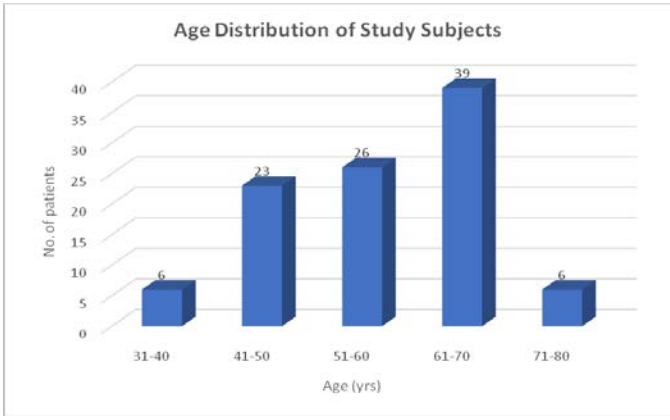
- All patients who are not consenting for sleep study.
- Post operative cases for any reason.
- Patients with known mass occupying lesions in abdomen, chest and cranium.
- Alcoholics.
- Pregnancy
- Critically ill patients, stroke, chronic renal failure.

Type of study: Cross sectional, Institutional based study.

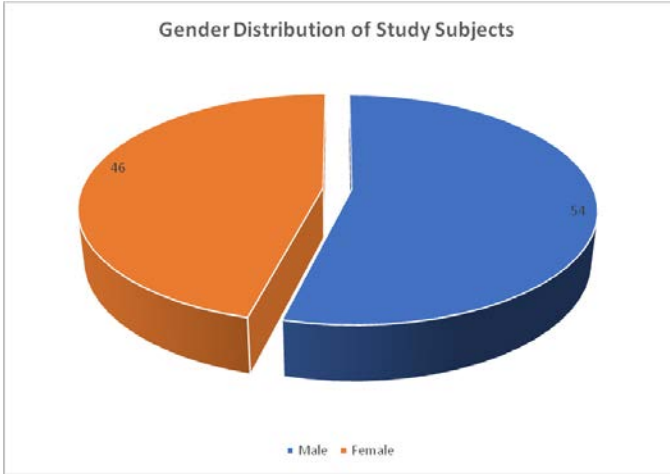
Investigations required for the study:

- Random blood sugar (RBS).
- Fasting blood sugar (FBS).
- Post-Prandial blood sugar (PPBS).
- complete blood count.
- Glycosylated hemoglobin (HbA1c).
- Polysomnography (PSG): using RMS polysomnography machine of 32 channels which includes electroencephalography (EEG), electrocardiography (ECG), electrooculography (EOG), electromyography (EMG), abdominal movement, thoracic movement, limb movement, position, airflow, heart rate, saturation (Spo2).
- Lipid profile.
- Thyroid profile.
- Computed tomography (CT) or Magnetic Resonance Imaging.
- (MRI) of head and neck in selected cases.

Results



This graph shows that most of the study subjects were in 61-70 years age group (39%) followed by 51-60 years age group (26%), followed by 41-50 years age group (23%), 6 subjects in each age group 31-40 and 71-80.



Present graph depicts that most of the diabetic patients were male (54%) and 46% were females.

Table 1: HbA1C in relation with apnea -hypopnea index among study subjects

HbA1C	AHI			
	Normal	Mild	Moderate	Severe
<6.5	5	2	1	3
6.5-8	15	8	11	11
>8	12	4	9	19
Total	32	14	21	33

This table shows that HbA1C less than 6.5 group have 5 patients with normal AHI,2 with mild AHI, 1 With moderate AHI,3 patients with severe AHI.

HbA1C 6.5-8 group have 15 patients with normal AHI, 8 patients with mild AHI, 11 patients with moderate AHI, 11 patients with severe AHI.

HbA1C more than 8 group have 12 patients with normal AHI, 4 patients with mild AHI, 9 patients with moderate AHI, and 19 patients with severe AHI.

Table 2: Duration of diabetes mellitus in relation with Apnea-hypopnea Index

Duration of DM (yrs)	AHI			
	Normal	Mild	Moderate	Severe
≤5	19	7	10	4
6-10	7	3	4	1
11-15	3	3	5	13
16-20	3	1	2	15
Total	32	14	21	33

Duration of diabetes mellitus less than or equal to 5 years have 19 patients with normal AHI, 7 patients with mild AHI, 10 patients with moderate AHI, 4 patients with severe AHI.

Duration of diabetes mellitus with age group 6-10 years have 7 patients with normal AHI, 3 patients with mild AHI, 4 patients with moderate AHI,1 patients with severe AHI.

Duration of diabetes mellitus with age group 11-15 years have 3 patients with normal AHI, 3 patients with mild AHI, 5 patients with moderate AHI, 13 patients with severe AHI.

Duration of Diabetes mellitus with age group 16-20 years have 3 patients with normal AHI, 1 patients with mild AHI,2 patients with moderate AHI, 15 patients with severe AHI.

Table 3: Correlation of Duration of DM with AHI

Correlation	r value	p value
Duration of DM v/s AHI	0.489	<0.0001

This table shows that there is increase in AHI with duration of diabetes mellitus was found to be statistically significant (< 0.0001).

Table 4: Correlation of HbA1C with AHI

Correlation	r value	p value
HbA1C v/s AHI	0.251	0.011

This table shows that there is increase in AHI with HbA1C was found to be statistically significant (p=0.011).

Table 5: Body mass index in relation with apnea - hypopnea index among study subjects

BMI (kg/m2)	Normal	Mild	Moderate	Severe
<18.5	1	0	0	0
18.5-24.9	11	5	7	5
25-29.9	13	6	5	5
≥30	7	3	9	23
Total	32	14	21	33

In above table as BMI increase severity of apnea hypopnea index increases.

Discussion

The present study was a cross sectional observational type of study conducted in department of medicine, Mathura Das Mathur hospital, Dr. S.N. Medical College, Jodhpur, Rajasthan with an aim to assess the prevalence of obstructive sleep apnea in type 2 diabetes mellitus patients and find out any association between severity of diabetes mellitus (glycemic control) and obstructive sleep apnea, and find out any association between duration of type 2 DM and severity of

obstructive sleep apnea, and find out correlation between glycolated hemoglobin and apnea -hypopnea index (AHI).

A total of 100 subjects that fulfilled the inclusion criteria were enrolled in the study after written and informed consent. All the included subjects were gone through Berlin questionnaire and find out risk score and then referred to sleep lab of our college where polysomnography (PSG) was conducted to find out Apnea -Hypopnea Index (AHI).

Obstructive sleep apnea is a independent risk factor of type 2 diabetes mellitus[(108)]. The prevalence of OSA is high in Type 2 DM patients with a prevalence of 14% for mild OSA, 21% for moderate OSA and 33% for severe OSA .this is in conformity with the earlier studies by Kent BD, Grote L, Ryan S, et al[2].

Duration of diabetes mellitus and glycemic control (HbA1C) are two risk factors for the development of obstructive sleep apnea[10,11]

Apnea-hypopnea index (AHI) is the standard metric used to quantitate the severity of obstructive sleep apnea[9].

Majority of study subjects were male patients (54%) and 46% were female, Men tend to get a greater increase in AHI from weight gain than women,[8] this is in conformity in the Sleep Heart Health Study, parallel changes in weight and AHI were found over 5 years of follow-up, but AHI increased more with weight gain than it decreased with weight loss[12].

An increased levels of HbA1C (poor glycemic control) was found to be associated with increased severity of OSA(severe AHI).in my study as the levels of HbA1C increases the severity of OSA(AHI) increases, as HbA1C less than 6.5 group have 5 patients with normal AHI,2 with mild AHI, 1 With moderate AHI,3 patients with severe AHI.HbA1C 6.5-8 group have 15 patients with normal AHI, 8 patients with mild AHI,11 patients with moderate AHI,11 patients with severe AHI.HbA1C more than 8 group have 12 patients with normal AHI, 4 patients with mild AHI, 9 patients with moderate AHI, and 19 patients with severe AHI.

This suggest that significant correlation exists between HbA1C (glycemic control) and obstructive sleep apnea (AHI),(p=0.011).this is in conformity with the earlier studies by In study by Robert Ekka, J C Suri, et al, 325 cases of type 2 diabetes, a higher prevalence of obstructive sleep apnea in patients of type 2 diabetes mellitus as compared to the general population. An increased level of HbA1c was found to be the associated with increased severity of obstructive sleep apnea[10].

As there is increase in duration of type 2 diabetes mellitus there is increased severity of obstructive sleep apnea(AHI), In my study Duration of diabetes mellitus less than or equal to 5 years have 19 patients with normal AHI, 7 patients with mild AHI, 10 patients with moderate AHI, 4 patients with severe AHI. Duration of diabetes mellitus with age group 6-10 years have 7 patients with normal AHI, 3 patients with mild AHI, 4 patients with moderate AHI,1 patients with severe AHI. Duration of diabetes mellitus with age group 11-15 years have 3 patients with normal AHI, 3 patients with mild AHI, 5 patients with moderate AHI, 13 patients with severe AHI. Duration of Diabetes mellitus with age group 16-20 years have 3 patients with normal AHI,1 patients with mild AHI,2 patients with moderate AHI, 15 patients with severe AHI.

This suggest that there is increase in AHI with duration of diabetes mellitus was found to be statistically significant (< 0.0001).

Modified Berlin questionnaire to identify patients at risk for the obstructive sleep apnea syndrome.

Questionnaire addressed the presence of frequency of snoring, wake time sleepiness, fatigue, obesity and hypertension. Overnight polysomnography was performed to measure apnea-hypopnea index(AHI)[12].

As BMI increase severity of apnea hypopnea index increases

Conclusion

Our study shows that OSA is highly prevalent among people with type 2 diabetes with in adequate glycemic control. High rate of OSA observed among our study subjects warrant that people with diabetes should be screened and treated for OSA since the co-existence of these two conditions increase their CVD risk. BMI, neck and waist circumference, male gender, presence of hypertension etc. have been identified as the risk factors contributing to OSA in this population. Prospective studies in this direction are required to know if improving blood pressure control, BMI, neck and waist circumference would reduce the incidence of OSA among people with diabetes.

Our study shows that Increasing OSA severity is associated with increased likelihood of concomitant T2DM and worse diabetic control in patients with T2DM.

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