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Snoring and Sleep Apnoea as Risk Factors for Type 2 Diabetes Mellitus: A Case Control Study among the Patients attending a Tertiary Care Hospital in North Karnataka

Dattatraya D Bant[1], Raghavendra D[1]

[1]Professor and Head, [2]Post-Graduate, Department of Community Medicine, Karnataka Institute of Medical Sciences, Hubballi, Karnataka

Abstract

Background: Type 2 Diabetes Mellitus is a major chronic disease with an alarming rise in the prevalence which may be largely attributed to the epidemic of obesity. Excess weight which is also an important factor for Obstructive Sleep Apnoea (OSA), which if persists for long-term results is an unbelievably bad impact on health. Studies have showed that patients with sleep apnoea had the risk of developing Type 2 Diabetes Mellitus and there are very few evidences of some improvement in blood glucose level on correction of sleep apnoea.

Objectives : To know the association of Snoring and Sleep Apnoea with Type 2 Diabetes Mellitus among the patients attending a tertiary care hospital in North Karnataka.

Methods: A case control study was conducted among 150 patients attending Medicine - Out Patient Department (OPD) of KIMS, Hubli, from 5th May to 4th June 2012. Among them, those with Type 2 Diabetes Mellitus were considered as cases and those without Diabetes were taken as controls. A pretested, semi-structured questionnaire was applied to collect the data from the study participants with the verbal informed consent.

Results: Out of 107 cases and 43 controls, majority of the cases had the history of snoring (69.2%) and daytime symptoms suggestive of sleep apnoea such as daytime sleepiness (59.8%), headache (59.8%), dry mouth (65.4%) and impaired memory (57.9%). Although sleeping duration and Epworth Sleepiness Score was found to be more among the cases compared to controls, there was no statistically significant association.

Conclusion: This study reports that a greater number of patients who have snoring history and presence of symptoms suggestive of sleep apnoea were found to be diagnosed with Type 2 Diabetes Mellitus.

Key Words: *Risk Factors, Snoring, Sleep Apnoea, Type 2 Diabetes Mellitus*

Corresponding author:
Dr Raghavendra D
Post-Graduate, Department of Community Medicine,
Karnataka Institute of Medical Sciences,
Hubballi, Karnataka, Phone (or Mobile)
No.: +91-8050290324,
Email: raghavendra060690@gmail.com

Introduction

Type 2 Diabetes Mellitus is a major chronic disease with high morbidity, mortality, and economic burden. Previously Diabetes Mellitus was just a disease of the middle aged and the elderly, whereas recently escalated to all age groups including adolescents. It has been estimated that every fifth person is a diabetic, therefore

an economic burden.[1] Transition from traditional to modern lifestyle and consumption of diet rich in calories combined with a high level of mental stress has coupled the problem further. There is an alarming rise in the prevalence of Type 2 Diabetes that may be largely attributed to the epidemic of obesity.[2]

Excess weight is also an important factor for Obstructive Sleep Apnoea (OSA), an increasingly common sleep disorder that is characterized by repetitive upper airway obstructions leading to intermittent hypoxia and sleep fragmentation. Sleep apnoea is present in about 1 in 5 adults and more than 50% in Type 2 Diabetic patients, but vast majority of people with sleep apnoea are under diagnosed.[3] People are not aware of the effect of long-term snoring and sleep apnoea on health.

Studies have showed that patient with sleep apnoea had the risk of developing Type 2 Diabetes and there ae few evidences of improvement in blood glucose level on correction of sleep apnoea.[4] This compelled in generating an hypothesis saying "Snoring and Sleep Apnoea are the risk factors for the development of Type 2 Diabetes Mellitus". Therefore, this study was conducted to know the association of snoring and sleep apnoea with Type 2 Diabetes Mellitus among the patients attending a tertiary care hospital in North Karnataka.

Methods

A case control study was conducted for a period of 1 month from 5th May to 4th June 2012, to know the association of snoring and sleep apnoea with Type 2 Diabetes Mellitus among the patients attending Medicine - Out Patient Department (OPD) of Karnataka Institute of Medical Sciences, Hubli.

A convenient sample size of total 150 subjects were included in the study. Among the patients attending the Medicine OPD, with waist size greater than 90 cm in males and 82 cm in females, and above the age of 40 years, those who were diagnosed as Diabetic patients were taken as cases. And those with the same characteristics but not diagnosed as Diabetic patients were taken as Controls.

The data was collected by personal interview of the participants with verbal informed consent. A pre-tested, semi-structured questionnaire was used to collect the demographic information and history of sleep habits and apnoea in cases and controls. In addition, an Epworth Sleepiness Score[5] was used to measure daytime sleepiness as a result of disturbed sleep.

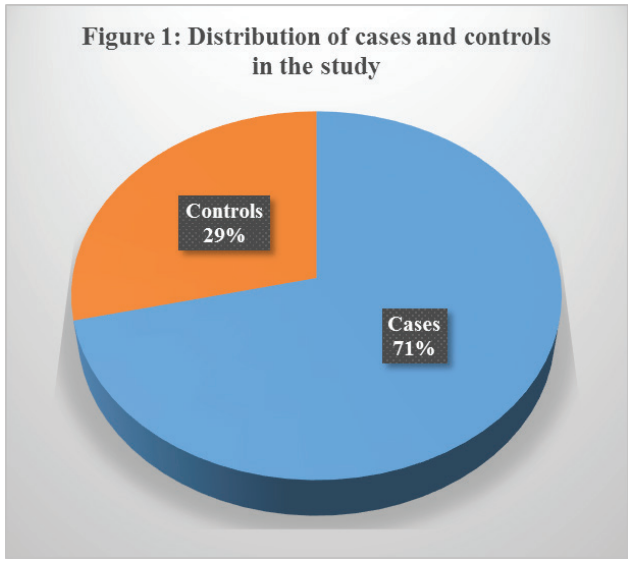
Anthropometric measurements including Height, Weight and Waist Circumference were obtained using standard techniques. Recent fasting blood glucose was obtained from patient records in cases i.e., diabetic patients.

Statistical Analysis

Data was entered in MS-Excel and analysed using SPSS-20 software. The results were expressed in frequencies and percentages in the tables and figures.

Results

Among 150 study participants, about 107 were diagnosed with Type 2 Diabetes Mellitus and hence considered as Cases. Remaining 43 who were not diagnosed with Diabetes, were considered as Controls. (Figure 1)



Among the cases, about 57.9% were Females, whereas among the controls, nearly 53.5% were Males. In case of locality, majority of the participants were from Urban areas among both the cases (77.6%) and the controls (72.1%). (Table 1)

Table 1: Distribution of cases and controls according to gender and locality

Factors		Cases	Controls
Gender	**Male**	45 (42.1%)	**23 (53.5%)**
	Female	**62 (57.9%)**	20 (46.5%)
Locality	Rural	24 (22.4%)	12 (27.9%)
	Urban	**83 (77.6%)**	**31 (72.1%)**

Majority of the cases were Females and majority of the controls were Males. However, most of the study participants were from Urban areas.

In the study, mean age of the cases and controls were 56.68 (±9.28) years and 51.84 (±8.42) years, respectively. Whereas there was not much difference in the mean values of the Anthropometric characteristics such as Height, Weight, Body Mass Index (BMI) and Waist Circumference of both the cases and controls. (Table 2)

Table 2: Mean and Standard Deviation of Age and Anthropometric characteristics of cases and controls in the study

Characteristics		Frequency	Mean	Standard deviation	t-test
Age (years)	Cases	107	56.68	9.28	2.965
	Controls	43	51.84	8.42	3.093
Height (cm)	Cases	107	156.86	15.54	-0.745
	Controls	43	158.70	6.91	-1.002
Weight (kg)	Cases	107	83.65	12.29	-1.679
	Controls	43	87.30	11.35	-1.738
BMI (kg/m2)	Cases	107	33.21	5.47	-1.446
	Controls	43	34.58	4.59	-1.557
Waist Circumference (cm)	Cases	107	102.83	10.28	-1.215
	Controls	43	105.14	11.08	-1.177

There was no statistically significant association with respect to Anthropometric characteristics among the cases and controls.

History of snoring was present in majority of the study participants. However, snoring was more in cases (69.2%) when compared to controls (60.5%). In case of sleep apnoea, majority of cases (57.0%) agreed the presence of it, whereas majority of controls (53.5%) denied its presence. (Table 3)

Table 3: Distribution of cases and controls according to their history of snoring and sleep apnoea

Factors		Cases	Controls	Chi-Square Value
Snoring	Present	74 (69.2%)	26 (60.5%)	1.043
	Absent	33 (30.8%)	17 (39.5%)	
Sleep Apnoea	Present	61 (57.0%)	20 (46.5%)	1.361
	Absent	46 (43.0%)	23 (53.5%)	

Although majority of the cases had the history of snoring and sleep apnoea compared to controls, there was no statistically significant association ($p > 0.05$) with respect to it.

Among the cases, majority had the history of daytime symptoms that are suggestive of sleep apnoea such as daytime sleepiness (59.8%), headache (59.8%), dry mouth (65.4%) and impaired memory (57.9%). In case of controls, dry mouth was the only symptom seen in majority and remaining symptoms were slightly less. (Table 4)

Table 4: Presence of Daytime symptoms suggestive of apnoea among the cases and the controls

Daytime Symptoms	Cases	Controls	Chi-Square Value
Daytime Sleepiness	64 (59.8%)	19 (44.2%)	3.031
Headache	64 (59.8%)	21 (48.8%)	1.500
Dry Mouth	70 (65.4%)	25 (58.1%)	0.704
Impaired Memory	62 (57.9%)	20 (46.5%)	1.618

Although majority of the cases had the history of daytime symptoms suggestive of sleep apnoea compared to controls, there was no statistically significant association ($p > 0.05$) with respect to it.

In the study, mean values of the sleep duration were found to be almost similar among the cases and controls i.e., 6.57 (±1.77) hours and 6.67 (±1.65) hours, respectively. Whereas the Epworth Sleepiness Score was more among the cases (7.73 ±4.07) compared to controls. (Table 5)

Table 5: Mean and Standard Deviation of Sleep Duration and Epworth Sleepiness Score among cases and controls in the study

Characteristics		Frequency	Mean	Standard deviation	t-test
Sleep Duration (hours)	Cases	107	6.57	1.77	-0.331
	Controls	43	6.67	1.65	-0.341
Epworth Sleepiness Score	Cases	107	7.73	4.07	2.214
	Controls	43	6.16	3.40	2.397

There was no statistically significant association with respect to Sleep Duration and Epworth Sleepiness Score among the cases and controls.

Discussion

Many studies indicate that snoring is indirectly associated with risk of developing diabetes. As a boost to this statement, obesity can cause snoring, apnoea & also insulin resistance which in turn lead to diabetes**.** Patho-physiology that has been postulated is that snoring & sleep apnoea leads to disturbed sleep & decreased sleep duration this in turn leads to daytime sleepiness which is a stressed state hence cytokines are released and a pro-inflammatory state occurs this leads to insulin resistance.[6]

This study showed that proportion of diabetic patients with snoring history was found to be 69.2% and with history suggestive of sleep apnoea to be 57%. This resembles the study conducted among Chinese patients by Lam DCL et al[7] where 53.9% of diabetic patients were found to have obstructive sleep apnoea.

The mean Epworth Sleepiness Score was slightly more among the cases (7.73 ±4.07) compared to controls (6.16 ±3.40) in this study. This is similar to the study by Zubair et al[8] where the mean was 6.3 ±5.29 among patients with diabetes and 1.94 ±2.34 for patients without diabetes. But this difference is huge compared to the current study. The study also shows reduced duration of sleep and increased daytime sleepiness among diabetic patients just like our study.

Conclusion

This study reports that a greater number of patients who have snoring history and presence of symptoms suggestive of sleep apnoea were found to be diagnosed with Type 2 Diabetes Mellitus.

Limitations

· In the study, sleep apnoea was assessed using subjective questions like snoring history and breathing pauses during the night, but the exact way of measuring sleep apnoea would be by subjecting them to an overnight polysomnography.

· 107 patients were selected as cases and 43 as controls arbitrarily for the study due to the time restriction.

Assessment of the effect of sleep apnoea on regulation of blood glucose control was not done due to lack of past records.

Recommendations

Recently, snoring & sleep apnoea have been found to be a risk factor for Diabetes. Patients who snore should be evaluated & treated with either inexpensive lubricants to prevent airway obstruction or by continuous positive airway pressure or surgical methods to prevent development or complication of Type 2 Diabetes Mellitus.

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Declaration

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Conflict of Interest: None declared

Ethical approval: Not required

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