

# Daytime Sleepiness and Quality of Sleep in Punjabi Diabetic Population

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## ABSTRACT

**Aims and Objectives:** The study was carried out to examine the daytime sleepiness and quality of sleep in diabetic population sample. The study was carried out at the medicine outpatient department of Punjab institute of medical sciences hospital and medical college Jalandhar.

**Material and Methods:** A total number of 201 T2DM patients aged above 20 years of age were taken. The study included information about socio-demographic characteristics including age, sex, income, education level, occupation, and other parameters like height, weight, BP, fasting blood sugar, lipid profile and physical activity and sleeping habits during the past month. Epworth sleepiness score (ESS) and the Pittsburgh sleep quality index (PSQI) have been used to study sleep quality and daytime sleepiness. Chi-square tests were performed to test for differences in proportions of categorical variables between two or more groups. The level  $p < 0.05$  was considered as the cut-off value for significance. Of the studied diabetic patients 101 were males and 100 were females.

**Results:** Comparison of sleeping quality using Epworth sleepiness scale (ESS) showed that female diabetic patients had significantly high chances of falling asleep during the day time than men; in terms of watching TV ( $p < 0.001$ ), passenger in car ( $p < 0.001$ ), lying down to rest in afternoon ( $p = 0.019$ ), sitting & talking ( $p = 0.027$ ) and car stopped in traffic ( $p < 0.001$ ). However, there existed an insignificant difference between males & females in terms of falling asleep during day while sitting and reading ( $p = 0.206$ ), sitting inactive in public place ( $p = 0.109$ ), sitting quietly after lunch ( $p = 0.28$ ) and ESS score results ( $p = 0.245$ ). Overall 35% of the diabetic patients were very sleepy during the daytime with 49% men and 50% women. Obesity was significantly higher in diabetic women who had higher chances of daytime sleepiness than men ( $p < 0.001$ ). Physical activity was significantly lower in diabetic women with poor sleep compared to men ( $p = 0.001$ ).

**Conclusion:** This study finding showed that sleep quality was bad in diabetic population and also day time sleepiness was observed in diabetic population.

**Key Words:** Diabetes, Daytime sleepiness, PSQI, ESS

## INTRODUCTION

Diabetes is a chronic disease that is becoming more and more prevalent in our society. Poor diet, refined and processed foods, a sedentary lifestyle and a worldwide epidemic of obesity are contributing to the rapidly rising numbers of the disease. According to the World Health Organization (WHO), approximately 150 million people worldwide have diabetes. There is an increasing concern about the effect metabolic disorders, especially diabetes have on health services [1].

Sleep disorders were commonly found in patients with type-2 diabetes [2]. When compared with non-diabetics, patients with diabetes report higher rates of insomnia, excessive daytime sleepiness, and unpleasant sensations in the legs that disturb sleep [2,3]. Therefore, it is not surprising that up to 71% of diabetic population complain of poor sleep quality [4] and high rates of hypnotic use [3]. Chronic sleep loss is associated with the endemic condition of diabetes in our society, and affects about 45% of all adults.

Multiple factors contribute to insomnia complaints in patients with diabetes like rapid changes in glucose levels during sleep, obesity-associated sleep disorders, discomfort or pain associated with peripheral neuropathy [5]. Because the aetiology of poor sleep quality is often multifactorial and may shift over time, a careful evaluation for insomnia, sleep-disordered breathing, and restless legs syndrome should be an integral part of the routine care of patients with diabetes because improving sleep and treatment of sleep disorders can improve glucose control, health, and quality of life.

In a prospective population study of female participants, poor sleep quality was reported by those who had diabetes compared to those who did not [6], and sleep duration and quality were shown to be significant predictors of glycemic control in a cross-sectional study of volunteers with type II diabetes [7]. In a study that was conducted on 220 type-2 diabetics, it was concluded that of type-2 diabetics had reduced sleep and that there is a definite association between blood sugar control and the quality and quantity of sleep [8].

The state of Punjab is a rapidly developing with a change that influenced the lifestyle of the people towards urbanization. As our knowledge goes no study has been conducted to examine the excessive daytime sleepiness and quality of sleep in Punjabi diabetic population. The existence of sleep loss in type-2 DM population is important to study because not only do these 2 chronic disorders co-exist but there is also growing evidence that they exacerbate each other.

Hence this study was aimed to examine the daytime sleepiness and quality of sleep in diabetic Punjabi population residing in Punjab state.

## SUBJECTS AND METHODS

This study was conducted among the adult Punjabi population above 20 years of age residing in state of Punjab. The study was approved by the institutional ethics committee of PIMS. A total no of 201 T2DM patients of which 101 were males and 100 were females were selected from the medicine OPD of Punjab Institute of Medical Sciences Hospital and Medical College, Jalandhar,

Punjab. Each participant was provided with brief information about the study and was assured of strict confidentiality and an informed consent was taken from the subjects.

A well designed questionnaire was used to collect the data. The first part included information about socio-demographic characteristics including age, sex, education level, occupation, height, weight. The second section collected information about medical history, smoking habit and physical activity. The third section included items about sleeping habits during the past month and the Epworth sleepiness scale (ESS) score [9] The Epworth sleepiness scale is a simple and reliable measure used to assess the likelihood that an individual will fall asleep in a series of situations such as watching TV, sitting and reading, sitting in a car etc. The scoring of the answers is 0-3, with 0 being "would never doze", 1 for "slight chance of dozing", 2 for "moderate chance of dozing" and 3 high chance of dozing. A score lower than 6 signifies as getting enough sleep, 7-8 as tends to be sleepy and greater than 9 as very sleepy and they require medical advice. Pittsburgh sleep quality index PSQI [10] was used to check the sleep habits of diabetic patients. For each of the questions of the questionnaire, reply was classified as "not during the last month", less than once a week "Once or twice a week" and "three or more times a week".

## SELECTION OF TYPE-2 DIABETIC (T2DM SUBJECTS)

Subjects with history of T2DM and currently taking oral medications for diabetes were considered to have Diabetes Mellitus. T2DM was defined according to the WHO expert group that is fasting venous blood glucose concentration >7.0mmol/l. A total number of 201 T2DM patients aged above 20 years of age were selected from medicine OPD. These patients were interviewed and questionnaire was completed. Physical examination and measurements were performed by a trained nurse. Height was measured in centimeters. Weight was measured in kilograms. The subjects were asked to stand on the weight scale bare feet with light clothing. BMI was calculated as the ratio of weight (kilogram) to the square of height (meters). Obesity and overweight were classified according to WHO criteria [10, 11]. A person was considered obese if the BMI value was > 30kg/m<sup>2</sup>, overweight if BMI was (25-30kg/m<sup>2</sup>)

Blood pressure measurement was carried out by Nurse according to standardized criteria. Blood pressure was recorded to the nearest millimeter of mercury (mmHg). Systolic blood pressure (SBP) was recorded at the appearance of the first Korotkoff sound and the diastolic blood pressure (DBP) at the disappearance of the fifth Korotkoff sound. The mean value obtained from three readings was used in the analysis. Hypertension was defined according to WHO criteria as SBP > 140mmHg and/or DBP>90 mmHg and /or the use of antihypertensive medication [12]. Fasting blood venous samples were collected from all participants for determination of lipid profile.

Smoking habits were classified in terms of current smoker, ex-smoker and non-smoker. A current smoker was defined as one who regularly smoked at least one cigarette per day, an ex-smoker was one who has given up smoking for at least 6 months, and non-smoker was one who has never smoked regularly. Patients were classified as physically active if they reported participating in walking for more than 30min/day.

Chi-square tests were performed to test for differences in proportions of categorical variables between two or more groups. The level  $p < 0.05$  was considered as the cut-off value for significance.

## RESULTS

Socio-demographic characteristics of the studied diabetic patients showed that of the studied diabetic patients, 50.25% were males and 49.75% were females. Majority of the diabetic patients were in the age group (50-59) years old. A significant difference was observed between males and females in terms of age-group ( $p = 0.006$ ), monthly income ( $P < 0.001$ ), education level ( $P < 0.001$ ) and occupation ( $P = 0.001$ ) [Table/Fig-1].

When comparison in sleeping quality in studied subjects was done using Epworth sleepiness scale (ESS) it was found that female diabetic patients had significantly high chances of falling asleep during the day time than men; in terms of watching TV ( $P = 0.001$ ), passenger in car ( $P = 0.001$ ), lying down to rest in afternoon ( $p = 0.019$ ), sitting & talking ( $p = 0.027$ ) and car stopped in traffic ( $p = 0.001$ ). However, there exists an insignificant difference between males & females in terms of falling sleep during daytime while sitting and reading ( $p = 0.206$ ), sitting inactive in public place ( $p = 0.109$ ), sitting quietly after lunch ( $p = 0.28$ ) and in ESS score results ( $p = 0.245$ ) [Table/Fig-2].

Sleeping quality, excessive day time sleepiness and its patterns in the diabetic population using the PSQI showed that sleep loss was high in diabetic patients (35%). Most of the diabetic patients with sleep disturbances experienced that they cannot get sleep within 30 min ( $p = 0.002$ ) and had to get up to use the bathroom ( $P = 0.001$ ) as compared to their counterparts with good sleep [Table/Fig-3].

Variables	Male (N=101)	Female (N=100)	P Value
Age Group			
<30	1	2	0.006
30-39	1	3	
40-49	14	22	
50-59	34	48	
60 & above	51	25	
Monthly Income			
5000-9999	36	61	P<0.001
10000-14999	36	36	
>15000	29	3	
Education Level			
Illiterate	8	9	P<0.001
Primary	28	27	
Intermediate	20	43	
Secondary	9	1	
University	36	20	
Occupation			
Housewife	0	83	P<0.001
Sedentary & prof.	38	17	
Manual	32	0	
Businessman	24	0	
Army police	7	0	

**[Table/Fig-1]:** Socio-demographic characteristics of the diabetic patients under study (N=201)

Variables	Male (N = 100)	Female (N = 101)	P Value
Sitting and reading			
Never fall asleep	60	47	0.206
Slight chance of falling sleep	34	43	
Medium chance of falling sleep	7	10	
Watching TV			
Never fall sleep	56	42	P<0.001
Slight chance of falling sleep	37	29	
Medium chance of falling sleep	8	11	
High chance of falling sleep	0	18	
Sitting inactive in a public place like a theatre or meeting			
Never fall sleep	70	57	0.109
Slight chance of falling sleep	25	37	
Medium chance of falling sleep	4	6	
High chance of falling sleep	2	0	
As a passenger in a car for an hour without a break			
Never fall sleep	51	66	P<0.001
Slight chance of falling sleep	28	24	
Medium chance of falling sleep	22	4	
High chance of falling sleep	0	6	
Lying down to rest in the afternoon when circumstances permit			
Never fall sleep	31	31	0.019
Slight chance of falling sleep	46	28	
Medium chance of falling sleep	23	36	
High chance of falling sleep	1	5	
Sitting and talking to someone			
Never fall sleep	79	70	0.027
Slight chance of falling sleep	17	30	
Medium chance of falling sleep	3	0	
High chance of falling sleep	2	0	
Sitting quietly after lunch without alcohol			
Never fall sleep	40	42	0.28
Slight chance of falling sleep	27	20	
Medium chance of falling sleep	20	29	
High chance of falling sleep	14	9	
In a car, while stopped for a few minutes in traffic			
Never fall sleep	49	66	P<0.001
Slight chance of falling sleep	35	29	
Medium chance of falling sleep	17	0	
High chance of falling sleep	0	5	
ESS Score results			
Getting enough sleep (1-6)	53	58	0.245
Average (7-8)	13	6	
V. sleepy (9+)	35	36	

**[Table/Fig-2]:** Comparison in sleeping quality using ESS according to gender

Baseline characteristics and risk factors for diabetes according to sleeping status and gender using Epworth Sleepiness Scale (ESS) score revealed that 35% of the diabetic patients were very sleepy during the day time with 49% males and 50% females. Obesity was significantly higher in diabetic women who had higher level of daytime sleepiness than men ( $P=0.001$ ). Physical activity was significantly lower in diabetic women with daytime sleepiness compared to men ( $p=0.001$ ) but there was no significant difference

Variables	Patients with disturbed sleep(N=71)	Patients with good sleep(N=130)	P Value
During the past month, how often have you taken medicine to help you sleep medicine for sleep			
Never	54	106	0.536
Once	9	15	
More than once a week	8	9	
Wake up in the middle of night or early morning			
Never	31	51	0.472
Once	25	57	
More than once a week	15	22	
Cannot go to sleep within 30 min			
Never	27	82	0.002
Once	34	34	
More than once a week	10	14	
Have to get up to use the bathroom			
Never	44	14	P<0.001
Once	20	39	
More than once a week	7	77	
Had bad dreams			
Never	38	58	0.465
Once	26	55	
More than once a week	7	17	
Have pain			
Never	17	35	0.677
Once	25	38	
More than once a week	29	57	
Legs twitching or jerking while you sleep			
Never	65	124	0.274
Once	6	6	
More than once a week			

**[Table/Fig-3]:** Sleeping quality and its patterns in diabetic population using PSQI

as far as risk factors like hypertension, high cholesterol and kidney diseases are concerned, in both males and females with daytime sleepiness [Table/Fig-4].

## DISCUSSION

Type-2 Diabetes accounts for approximately 90% of all diabetes cases worldwide. Diabetes may lead to a number of serious health complications like diabetic retinopathy, cardiovascular disease, kidney failure, neuropathy and diabetic foot disease. In addition to these serious health concerns, a recent study reports that diabetes may negatively affect sleep. Relationship between sleep disorders and diabetes mellitus is less understood and less studied in state of Punjab. The current study is one of the few studies using the Epworth sleepiness scale (ESS) and Pittsburgh sleep quality index (PSQI) to examine the daytime sleepiness and quality of sleep in the diabetic population. The present study showed that there was a strong association between daytime sleepiness and diabetes. This finding suggests that diabetes should be considered whenever a complaint of daytime sleepiness is present in individuals.

The results of the study have demonstrated a sleep loss of 35% in Punjabi diabetic population residing in Punjab. Among the studied diabetic patients female diabetic patients (50%) were likely to have more sleep loss than male (49%) .It was reported in a study by

Variables	Sleeping Status				
	Getting enough and average sleep in night		Very sleepy during the day		
	Male	Female P-value	Male	Female	P-value
BMI					
Over weight (25-30kg/m <sup>2</sup> )	0	4	15	1	–
Obese (30+kg/m <sup>2</sup> )	66	60 (0.039)	20	35	P<0.001
Physical activity	38	27 (0.079)	25	12	0.001
Hypertension	38	34 (0.609)	18	14	0.289
High cholesterol	20	24 (0.386)	7	11	0.614
Kidney disease	7	17 (0.603)	5	7	0.562

**[Table/Fig-4]:** Baseline characteristics and risk factors for diabetes according to sleeping status and gender using Epworth Sleepiness (ESS) (N = 201)

Bener et al [13]. (2010) that disturbed sleep was more prevalent in diabetic population with evidence of sleep loss varying significantly by gender in diabetic patients and more sleep loss was observed in females. In a study conducted by Raman et al [14] (2010) it was found that the prevalence of abnormal sleep pattern was more in subjects with diabetes than with those without diabetes especially in women. Likewise, the prevalence of short duration of sleep was higher in subjects with diabetes compared to those without diabetes. Women subjects with ASP had a higher risk of diabetic neuropathy on both univariate and multivariate analysis. On the contrary, a study by Mallon et al [15] (2005) reported an association between sleep disturbances and diabetes was probably easier to demonstrate in men.

In this present study, diabetic patients (35%) reported high chances of daytime sleepiness. In a study conducted by Sridhar and Madhu [8] (1994) the prevalence of sleep disturbances in 184 persons with diabetes, and 99 controls matched for age and sex was studied and it was found that sleep disorders were more common in diabetics. Patients with sleep disturbances were younger than those with normal sleep, and had onset of diabetes at a younger age. Quality of life was affected and coping with the disease was made difficult by sleep disorders. In another study conducted by Trento et al [16] (2008), it was evaluated that sleep duration and quality was in relation to glycemic control in patients with type-2 diabetes. These findings suggest that type-2 diabetes is associated with sleep disruptions even in the absence of complications or obesity.

Another study done in Japan among male population, Kawakami et al [17] (2004) reported a high incidence of diabetes in male subjects reporting sleeping disturbances after controlling for other factors relevant to type-2DM. These studies identify sleep as a potential factor influencing glucose control in a specific population of patients with type-2 DM.

In this study, quality of sleep varied substantially by gender in diabetic patients. A significant difference was observed between males and females in terms falling asleep during the daytime while watching TV (P=0.001), as a passenger in car for an hour without a break (P=0.001), lying down to rest in the afternoon when circumstances permit (p=0.019), sitting and talking to someone (p=0.027) and in a car, while stopped for a few minutes in traffic

(P=0.001). However there existed an insignificant difference between males and females in terms of daytime sleepiness while sitting and reading (0.206), sitting inactive in a public place like a theatre or meeting, sitting quietly after lunch without alcohol (0.28) and in ESS score results (p=0.245). This is in contrast to another study (13) in which significant difference was observed in ESS score between both genders. Study conducted by Luyster and Dunbar-Jacob [18] (2001) showed that 55% of participants were poor sleepers according to PSQI. Poor sleep quality was associated with worse diabetes. Poor sleep is common in type-2 diabetes and may adversely impact quality of life. Thus, poor diabetes control could contribute both to a higher perceived sleep debt and lower sleep quality.

In the present study, there was a significant association found between poor sleep and different co-morbid factors. Obesity was significantly higher in diabetic women with high chances of falling asleep during the day as compared to men (P=0.001). This result supports the study finding of another study that sleep disorders correlates highly with obesity in diabetic population [13]. Physical activity was significantly less in women as compared to men (p=0.001). Increase in sleep loss among diabetic women could be because of high occurrence of obesity and less physical activity. It was also reported in a study that [13] women with sleep disturbances were more likely to be obese, and less likely to be physically active. Co-morbid factors like hypertension, high cholesterol and kidney disease did not have significant difference between male and female with excessive daytime sleepiness. A strong association also exists between obesity, impaired glucose tolerance, insulin resistance and sleep loss.

## CONCLUSION

It was observed in the present study that disturbed sleep was more prevalent in the diabetic population. Also, daytime sleepiness was observed more in diabetic patients, especially in women. Sleep loss varied according to gender in diabetic patients. A non-significant difference was observed in ESS scores between both genders. Obesity was more common among diabetic women with poor sleep than men, and also physical activity was significantly less in women compared to men.

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