

ASSESSMENT OF SLEEP QUALITY IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A PROSPECTIVE OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTRE

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ABSTRACT

Objective: To evaluate the quality of sleep in patients diagnosed with Type 2 Diabetes Mellitus (T2DM).

Study Design: Prospective observational study.

Place and Duration of Duration: Psychiatry Department and Medicine Ward of Jinnah Postgraduate Medical Centre, Karachi Pakistan, from Apr to Nov 2018.

Methodology: All patients with Type 2 Diabetes Mellitus were included in the study. All cases under age 30, type I diabetes, gestational diabetes and patients with severe illness were excluded. The data of sociodemographic lifestyle factors was collected through a pre-designed semi-structured questionnaire and sleep quality of patients was assessed using Pittsburg Sleep Quality Index (PSQI). The results of the data were analyzed by using SPSS version 24.

Results: Out of 260 patients with Type 2 Diabetes Mellitus, 197 (76%) were female. The mean age of the sample was 55.7 ± 9.89 years, with only 54 (20.8%) having normal body mass index. More than 50% of sample was poor sleepers and educational status was found to be strongly associated with quality of sleep (p -value < 0.05).

Conclusion: The present study indicates that patients with Diabetes Mellitus often experienced sleep irregularities hence poor sleep quality. There is a need to increase the awareness regarding sleep quality among patients and health professionals as well while assessing the patients with Diabetes Mellitus.

Keywords: Diabetes Mellitus Type 2, Glycemic control, Insomnia, Sleep quality.

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INTRODUCTION

Diabetes Mellitus (DM) is one of the most common causes of non-communicable diseases associated with high morbidity and mortality among the patients. It is characterized by hyperglycemia secondary to either defective insulin secretion, resistance or both.¹ The incidence of diabetes is increasing worldwide as in 2009 there was 285 million adults with Diabetes Mellitus which increased to 382 million by 2013.² Pakistan has a rapidly increasing incidence of Diabetes Mellitus having an incidence of 7.1 million adults with DM. At present, Pakistan is at 4th position worldwide comes at 7th position with 7.1 million adults with diabetes and is estimated to reach 13.1 million by climbing to an alarmingly high 4th position worldwide as far as number of diabetic patients are concerned.² In a recently published population-based survey from Pakistan, authored by Aamir *et al* the prevalence of type 2 Diabetes Mellitus was found to be 16.98%.³

Normoglycemia can minimize the development of complications of Diabetes Mellitus. Poor manage-

ment of Diabetes Mellitus can lead to poor prognosis and further complicates the patient's condition. Therefore, it is emphasized that patients with Diabetes Mellitus should not only have an optimum glycemic control but also engage in healthy activities. Evidence has shown that patients with Diabetes Mellitus are prone to poor sleep quality.⁴ Sleep quality is extremely crucial to assess a person's well-being. Every human being requires an adequate amount of sleep to lead a healthy and productive life. National sleep foundation has stressed upon making good sleep a priority as equal as diet and exercise for overall health.⁵ Poor sleep quality has strong association with various diseases and the patients with poor sleep were found to have difficulty with diabetes control.^{4,6} The risk of diabetes increases by 40% in patients with poor quality sleep.⁷ Despite the evidence, assessment of sleep and its quality, it has never remained a priority of the treating clinicians.

Uncontrolled DM results in microvascular and macrovascular complications.^{8,9} These complications not only cause increased morbidity but life-threatening impediments as well. Diabetes control and complication trial (DCCT) found that intensive glycemic control could prevent or slow the progression of diabetic

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complications.¹⁰ Patients having poor quality of sleep can have chances of impaired glycemia hence, play a significant role in the development of chronic complications.

DM in addition to causing direct sleep disturbances has also been associated with several chronic illnesses which can impair sleep and quality of life.¹⁰ Hence, this study was aimed to evaluate sleep quality among the patients with Diabetes Mellitus.

METHODOLOGY

This was a prospective observational study conducted in diabetic clinic of Medical Unit-III of a tertiary care teaching hospital, Jinnah Postgraduate Medical Centre (JPMC), Karachi in collaboration with department of Psychiatry and behavioral science, from April 2018 to November 2018. A non-probability consecutive sampling technique was used to enroll patients in the study after consent approval was obtained.

Inclusion Criteria: All patients with Type-II Diabetes Mellitus (T2DM) were included in the study

Exclusion Criteria: All patients under age 30, Type-I Diabetes, Gestational Diabetes and patients with severe illness were excluded.

The sample size was calculated using computer program "Select Statistics sample size calculator". Taking Diabetes Mellitus type 2 prevalence of 16.98%, confidence level of 95%, a margin of error of 4% and a population of >1 million, a sample size of 260 was obtained.¹¹ After procuring the ethics approval from the Institutional Review Board of JPMC with reference # F.2-81-IRB/2018-GENL/7040/JPMC, data collection was initiated.

The data of sociodemographic lifestyle factors was collected through a pre-designed semi-structured questionnaire and sleep quality of patients was assessed using Pittsburg Sleep Quality Index (PSQI). The questionnaire evaluates seven aspects of sleep quality i.e., subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medications and daytime dysfunction. The data were collected by face-to-face interview after taking an informed written consent from patients.

The data were analyzed by using Statistical Package for the social sciences (SPSS) version 24. The continuous data including the age, body mass index, etc. were presented as mean and standard deviation. The categorical and ordinal data was presented as frequency and percentage. The Pearson's chi-square test of independence was implemented to explore the

association between the dependent variable and the independent variables. The p -value of ≤ 0.05 was considered as statistically significant.

RESULTS

The total number of T2DM patients was 260, with female majority of 198 (76%). Mean age of the patients was 55.7 ± 9.89 with 101 (38.8%) patients above 60 years of age. Majority of the patients were illiterate 146 (56.2%) while 38 (14.6%) were paid workers. About 107 (41.2%) were living as nuclear families while 153 (58.8%) lived in joint family system. Out of 209 (80.4%) of the patients were married while 51 (19.6%) were single/widowed or divorced. The mean BMI of patients was found to be 28.4 ± 5.20 and only 54 (20.8%) participants were normal weighted in response to the question regarding subjective sleep quality, it was fairly good 116 (44.6%), very good 64 (24.6%), fairly bad 46 (17.7%) and very bad 34 (13.1%), with 113 (43.5%) sleeping <5 hours and 49 (18.8%) >7 hours. 88% did not take any medicines to help them sleep, patients with age above 60 were mostly poor sleepers. Among the patients, females were more prone to have poor sleep quality in comparison to males and same was the case with illiterate people as compared to literates. Patients who were married, unpaid and those who were living in joint family system were having their global PSQI to be greater than 5. Educational status was found to be strongly associated with quality of sleep $p=0.021$ shown in Table. Out of 260 patients, the majority of them 180 (69.2%) were poor sleepers, that is their global PSQI score was more than 5 (Figure).

DISCUSSION

Diabetes Mellitus is a metabolic disease with a profound impact on all the systems of the body. It has a direct impact on the quality of life of patients hence, sleep routine is also disturbed.¹¹ The current study showed that more than half of the study population were poor sleepers (PSQI>5). Over thirty percent of the participants claimed that their sleep quality was fairly bad or very bad and about two-fifth of them slept for <5 hours a day. These findings strongly suggest that patients with diabetes experience sleep disturbances.

In accordance with our findings, Keskin *et al* reported similar results with more than three-fifth of the patients with Diabetes labelled as poor sleepers (64.30%) on PSQI. Moreover, the authors further revealed that 54.40% of the study participants suffered from extreme daytime sleepiness.¹¹

Darraj *et al*, revealed that 55.4% of the patients with diabetes experienced poor sleep quality. Further-

Table: Quality of sleep among type 2 diabetics by socio-demographic factors.

Characteristics	PSQI <5 (Good Sleepers) n=80, n (%)	PSQI >5 (Poor Sleepers) n=180, n (%)	p-value
Age Group (Years)			
30-40	1 (1.25)	4 (2.22)	0.294
40-49	21 (26.25)	34 (18.89)	
50-59	33 (41.25)	66 (36.67)	
>60	25 (31.25)	76 (42.4)	
Gender			
Male	26 (32.50)	36 (20)	0.29
Female	54 (67.50)	144 (80)	
Marital Status			
Married	68 (85)	141 (78.33)	0.054
Single/widowed/divorced	12 (15)	39 (21.67)	
Education			
Uneducated	38 (47.50)	108 (60)	0.021
Primary school	9 (11.25)	26 (14.44)	
Secondary school and higher	32 (40.25)	46 (25.56)	
Occupation			
In paid work	16 (20)	22 (12.22)	0.101
Not working	64 (80)	158 (87.78)	
Family Structure			
Nuclear	39 (48.75)	68 (37.78)	0.097
Joint	41 (51.25)	112 (62.22)	
Body Mass Index			
Underweight (<18.5)	1 (1.25)	4 (2.22)	0.876
Normal weight (18.5-24.9)	17 (21.25)	37 (20.56)	
Overweight (25-29.9)	30 (37.50)	74 (41.11)	
Obese (>30)	32 (40)	65 (36.11)	

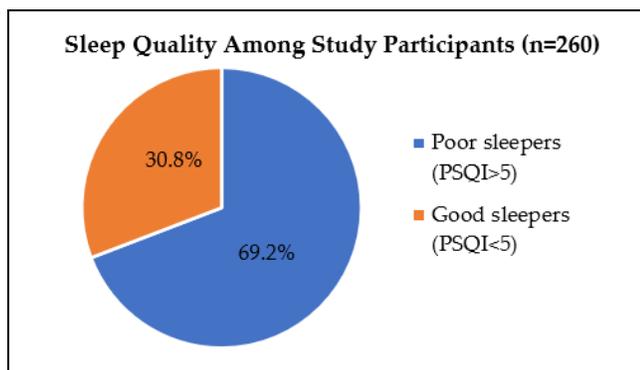


Figure: Sleep quality among study participants (n=260).

more, Darraj and his colleagues analyzed the risk factors associated with poor sleep-in patients with Diabetes Mellitus. The authors observed that female gender was the strongest predictor of poor sleep quality among the patients with an odds ratio of 3.65 ($p < 0.001$).¹² Similar results were shown by Luyster and Dunbar-Jacob indicating that the majority i.e. 55% of the patients with diagnosed T2DM suffered from sleep disorder.¹³ However, some studies on patients with DM have shown inconsistent findings, revealing a

much lower frequency of poor sleepers, that is, 38% and 47.1%.^{14,15} Moreover, Shamshirgaran *et al*, revealed no significant association between poor sleep quality and female gender as well as with elderly population. This finding is in line with the current study i.e., despite the higher frequency of poor sleepers in our study, we could not find statistical association between age and gender.

Previously, Lou *et al* and Nefs *et al*, have shown a higher prevalence of poor sleepers among females, illiterates, unpaid and older patients.^{16,17} Older and unpaid people might have higher PSQI score because being idle and dependent members of society, they have a poor quality of social life and hence are more prone to stress. However significant association of sleep quality was only found to be with educational status ($p=0.021$). Prevalence might be high in illiterates due to their lower quality of life and decreased awareness of importance of adequate sleep and its impact on glycemic controls.

In relation to BMI, our results highlighted poor sleepers as mostly over weighted and obese (41% and 36% respectively). This is in congruence with recent studies by Yucel *et al* and Colbay *et al*, in which it was shown that higher PSQI scores in patients was associated with abnormal BMI.^{18,19} This can be explained by the release of ghrelin, a hormone that is increasingly secreted in person with short sleep duration. Ghrelin promotes appetite which in turn leads to obesity and poor diabetic control.^{20,21}

According to our study larger proportion of patients were having short sleep hours that is less than 5 hours (43.5%). This is in line with a study by Sakamoto *et al*, demonstrating that the mean sleep hours in diabetes patients was lower than 8 hours a day i.e., 6.23 ± 1.42 hours.²² Additionally, Mallon *et al*, has proven that shorter sleep duration is found be a significant risk factor for DM and therefore majority of patients with diabetes have compromised sleep durations.²³

The rate of use of sleep medications among T2DM patients was found to be very low (12%). Another study conducted in China also illustrates lower incidence of use of sleep medications.²⁴ This signifies the fact that assessment and treatment of poor sleep is not the part of treatment protocols of Diabetes Mellitus. Another reason may be the fear of addiction of sleep medication in our population which hinders their use even if prescribed by physicians.

In conclusion, the present study indicated that patients with type 2 Diabetes Mellitus suffered from

poor sleep quality. We found that patients who were married or had higher education status had lesser sleep irregularities. Many studies have explored the relationship between marital status and education status. A study by Bukhsh *et al*, it was reported that sufficient knowledge about Diabetes Mellitus was significantly associated with better self-management of diabetes.²⁵ It is crucial to counsel patients about the disease and how to cope with it according to their education status. Those with no formal education may easily fail to understand the seriousness of their diabetic status, hence, indulge in harmful habits like smoking, consuming non-healthy diet, or non-compliance with the treatment which may worsen their disease and prognosis.

The result of this study provides useful information regarding relation of T2DM and sleep quality to the physicians to enhance the management of diabetes. This study contributes to the needs of the country, as there are no related studies done in Pakistan assessing sleep quality of diabetes patients.

LIMITATION OF STUDY

Few limitations of the study include the unequal study population which was majority females. This study included participants from only one diabetes clinic belonging to public sector (JPMC, Medicine ward III), however, this may not represent entire population. We also did not collect information regarding patients' stress level, quality of life, caffeine intake, medications other than that for diabetes. Due to lack of funds, we were not able to prove diabetes control through patients' HbA1c levels.

CONCLUSION

The present study indicates that patients with Diabetes Mellitus often experienced sleep irregularities hence poor sleep quality. Age, educational, and marital status have association with sleep quality. This, points towards the need to focus on assessment of sleep quality in T2DM patients and increasing awareness among patients concerning the impact of sleep on glycemic control.

Conflict of Interest: None.

Author's Contribution

SRB: Study design & ackquisition, IH: Draft writing, JKD: Supervision & critical reviw, RB: data acquisition & interpretation, SMS: Drafting of manuscript, MIA: Supervision & review.

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