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Research Article

**DIABETIC PATIENTS AND COMPROMISED SLEEP QUALITY
IN CENTRAL SAUDI ARABIA**

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Abstract:

Background: Sleep is one of the most important physiologic cycles. Nearly every metabolic disorder, especially diabetes mellitus, can affect the quality and quantity of sleep. The aim of this study was to investigate the relationship between the quality of sleep and diabetes, using the Pittsburgh sleep quality index questionnaire on patients among the central area of Saudi Arabia. **Methods:** cross sectional study conducted among 188 patients with diabetes mellitus from the central area of Saudi Arabia, during the period from 1 January to 31 May, 2018. We used a predesigned questionnaire to collect the data from the sampled population. We used the Arabic Pittsburg Sleep Quality Index (A-PSQI). Distribution of the questionnaire included a hand-to-hand method and the creation of an online version of the questionnaire, which was published through the web and social media. **Results:** DM was more prevalent among females (66.5%) than males (33.5%). Comorbidities were hypertension in 20.7% of the studied patients, obesity (48.4%), anemia (8%) and chronic heart diseases (4.8%). There was more prevalence of poor sleep quality among diabetic patients (82.4%) and only 17.6% of them had good sleep quality. Poor sleep quality was more in females (69%) than males (31%). There was a statistically significant difference in sleep quality according to the age, educational level and occupation ($P<0.05$). **Conclusion:** According to the results of the study, it seemed important to improve the control of diabetes in order to improve the quality of sleep of diabetic patients.

Keywords: Diabetes Mellitus; PSQI; Sleep quality

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INTRODUCTION:

Diabetes is one of the most important health concerns in societies^[1] due to its high morbidity and mortality and significant loss of quality of life. According to estimates published by the International Federation of Diabetes (IDF), it was showed that there were 415 million adults with diabetes around the globe in 2015, even increasing in the following years^[2]. By the year of 2035, it estimated that 592 million people across the world will live with diabetes^[3]. DM is a group of metabolic disorders characterized by chronic hyperglycemia caused by various pathogenetic processes in glucose homeostasis^[4]. Two major forms of diabetes mellitus exist; Type 1 diabetes is caused primarily by β-cells destruction those results in insulin deficiency, whereas type 2 diabetes, which is the most prevalent form, is characterized by insulin resistance with relative deficient insulin secretion^[5]. There is evidence that approximately one third of people with diabetes suffered from sleep problems whilst it was only 8.2% in control group without DM^[6]. In addition to its numerous clinical implications, DM also exerts a negative effect on patient's sleep quality. Impaired sleep quality disrupts the adequate glycemic control regarded as corner stone in DM management and also lead to many deleterious effects causing a profound impact on health related quality of life^[7].

In a study conducted to investigate the relationship between the quality and quantity of sleep and diabetes using the Pittsburgh sleep quality index questionnaire, it was found that, the duration of sleep, number of nightmares, taking sleeping pills, number of unwanted waking-up ($P \leq 0.0001$) showed a statistically significant association with diabetes^[8].

In south Saudi Arabia, a study carried out in Jazan, to determine the prevalence of poor sleep quality among patients with diabetes using the Pittsburgh Sleep Quality Index (PSQI), it was found that, Poor sleep quality among diabetic patients is a prevalent health problem, the mean score of PSQI was 5.29 ± 2.73 and the prevalence of poor sleep quality was 55.4%^[9]. The aim of this study was to investigate the relationship between the quality of sleep and diabetes, in patients living in the central area of Saudi Arabia using the Pittsburgh sleep quality index questionnaire.

PATIENTS AND METHODS:

Study Design: cross sectional study was conducted among 188 patients with diabetes mellitus from the

central area of Saudi Arabia, during the period from 1 January to 31 May, 2018.

Data collection: We designed a simple questionnaire to collect data from the sampled population. We used the Arabic version of Pittsburg Sleep Quality Index (A-PSQI) which is an effective instrument used to measure the quality and patterns of sleep in adults. Patients were classified into two groups according to PSQI: Poor-sleeper group ($\text{PQSI} > 5$) and good-sleeper group ($\text{PQSI} \leq 5$)^[11]

The questionnaire included the relevant questions to collect data about:

- Socio-demographic characteristics of the participants including age, marital status and educational status .
- If the patient was already physician diagnosed diabetic, height and weight. The BMI was calculated. Normal weight was defined as $\text{BMI} \leq 25 \text{ kg/m}^2$, overweight as $25 < \text{BMI} \leq 30 \text{ kg/m}^2$, and obesity as $\text{BMI} \geq 30 \text{ kg/m}^2$.
- Questions about the comorbidities
- Questions specific to Pittsburg Sleep Quality Index (PSQI) from each diabetic patient.

Most of the questions were in yes/no format; however, some questions provided multiple choices from which to choose a response.

Distribution of the questionnaire included a hand-to-hand method and the creation of an online version of the questionnaire, which was published through the web and social media.

Ethical considerations: Participants were informed that participation is completely voluntary. No names were recorded on the questionnaires and protection of confidentiality and all questionnaires were kept safe.

Statistical analysis: Data was analyzed using IBM SPSS Statistics for Windows version 23.0. Quantitative data was expressed as mean \pm standard deviation, median and range. Qualitative data was expressed as number and percentage. The data were tested for normality using Shapiro-Wilk test. The nonparametric Mann-Whitney test was used for data which wasn't normally distributed. Chi-square (χ^2) test and Fisher's Exact Test were used for comparison regarding qualitative variables as appropriate. A 5% level was chosen as a level of significance in all statistical tests used in the study.

RESULTS:

Table (1) illustrates the distribution of the studied diabetic patients by socio-demographic and anthropometric measures. It is obvious that, DM was more prevalent among females by 66.5% than males

33.5%. It was more prevalent among patients with 40-59 years by 44.1%.

Table (2) shows the distribution of the studied patients suffered by comorbidities. It was found, hypertension prevailed in 20.7% of studied patients, obesity in 48.4%, anemia in 8% and chronic heart diseases in 4.8%.

Table (3) illustrates the distribution of the studied diabetic patients by sleep quality. Our results showed that there was more prevalent of poor sleep quality among diabetic patients (82.4%) and only 17.6% of them had good sleep quality.

Table (4) shows the mean and median of scores of the seven components and the global score of the PSQI.

Table (5) shows the relation between sleep quality and socio-demographic variables and anthropometric measures. Poor sleep quality was more in females (69%) compared to males (31%). There was a statistically significant difference in sleep quality according to the age, educational level and occupation ($P<0.05$).

Table (1): Distribution of the studied diabetic patients by socio-demographic and anthropometric measures (No. =188)

Characteristics	Summary statistics
Gender	
Male	63 (33.5%)
Female	125 (66.5%)
Age	
12-19 years	15 (8 %)
20 -39 years	69 (36.7%)
40- 59 years	83 (44.1%)
\geq 60 years	21 (11.2%)
Education	
Primary	21 (11.2%)
Secondary	52 (27.7%)
University	100 (53.2%)
Non-educated	12 (6.3%)
Intermediate education	3 (1.6%)
Marital status	
Widow	15 (8 %)
Single	63 (33.5%)
Married	107 (56.9%)
Divorced	3 (1.6%)
Occupation	
Not working	106 (56.4%)
Working	82 (43.6%)
Weight (Kg)	
Mean \pm S.D.	75.75 \pm 19.57
Median (Range)	74 (42 – 119)
Height (cm)	
Mean \pm S.D.	161.15 \pm 8.59
Median (Range)	161.5 (137 – 176)
BMI	
Mean \pm S.D.	29.19 \pm 7.79
Median (Range)	28.29 (16.82– 63.4)

Table (2): Distribution of the studied patients suffered comorbidities (No. =188)

Characteristics	Summary statistics
Hypertension	
No	149 (79.3%)
Yes	39 (20.7%)
Obesity	
No	97 (51.6%)
Yes	91 (48.4%)
Anemia	
No	173 (92%)
Yes	15 (8%)
Chronic heart disease	
No	179 (95.2%)
Yes	9 (4.8%)

Table (3): Distribution of the studied diabetic patients by sleep quality (No. =188)

Sleep quality	No. (%)
Good	33 (17.6 %)
Poor	155 (82.4 %)

Table (4): Score of sleep quality

Score of sleep quality	Summary statistics
Component 1	
Mean± S.D.	1.34 ± 0.84
Median (Range)	1 (0 – 3)
Component 2	
Mean± S.D.	1.56 ± 0.98
Median (Range)	2 (0 – 3)
Component 3	
Mean± S.D.	1.21 ± 0.99
Median (Range)	1 (0 – 3)
Component 4	
Mean± S.D.	0.93 ± 1.24
Median (Range)	0 (0 – 3)
Component 5	
Mean± S.D.	1.66 ± 0.59
Median (Range)	2 (1 – 3)
Component 6	
Mean± S.D.	0.32 ± 0.76
Median (Range)	0 (0 – 3)
Component 7	
Mean± S.D.	1.26 ± 0.93
Median (Range)	1 (0 – 3)
Global score	
Mean± S.D.	8.29 ± 3.49
Median (Range)	8 (2 – 15)

Table (5): relation between sleep quality and socio -demographic variables and anthropometric measures

Parameter	Good (N= 33)	Poor (N= 155)	P-value
Gender			0.109
Female	18 (54.5%)	107 (69%)	
Male	15 (45.5%)	48 (31%)	<0.001
Age			
12-19 years	6 (18.1%)	9 (5.8%)	
20 -39 years	12 (36.4%)	57 (36.8%)	
40- 59 years	3 (9.1%)	80 (51.6%)	
\geq 60 years	12 (36.4%)	9 (5.8%)	
Education			<0.001
Primary	3 (9.1%)	18 (11.6%)	
Secondary	15 (45.5%)	37 (23.9%)	
University	9 (27.3%)	91 (58.7%)	
Non-educated	6 (18.1%)	6 (3.9%)	
Marital status			0.095
Widow	6 (18.1%)	9 (5.8%)	
Single	9 (27.3%)	54 (34.8%)	
Married	18 (54.6%)	89 (57.5%)	
Divorced	0 (0.0%)	3 (1.9%)	
Occupation			0.001
Not working	27 (81.9%)	79 (51%)	
Working	6 (18.1%)	76 (49%)	
BMI			0.088*
Mean \pm S.D.	30.28 \pm 13.08	28.96 \pm 6.16	
Median (Range)	24.89 (20.32– 63.4)	29.02 (16.82 – 43.87)	

P-value is calculated by Chi-Square Test

***P-value is calculated by Mann-Whitney U Test**

P-value <0.05 is statistically significant

DISCUSSION:

Sleep is one of the most important physiologic cycles. Nearly every metabolic disorder, especially diabetes mellitus, can affect the quality and duration of sleep. The aim of this study was to investigate the relationship between the quality of sleep and diabetes, using the Arabic Pittsburgh sleep quality index questionnaire in patients living in the central area of Saudi Arabia. It was a cross sectional study conducted among 188 patients with diabetes mellitus living in the central area of Saudi Arabia,

Our study reported that DM was more prevalent among females (66.5%) compared to males(33.5%). it was more prevalent among patients (40-59 years old) by 44.1%. Similar to our results, in USA a study found that 51.5% of diabetic patients were females and 48.5% males with mean age 58.9 years [7].

In a cross-sectional study, data of 3559 participants aged 20 to 70 years were collected from Yazz Health

Study; 13.5 of females and 10% of males had diabetes, the mean age of participants was 45.0 \pm 2.31 years, the lowest rate of diabetes was in people aged between 20 and 29 years (1.7%), and the highest was in those aged 60 to 69 years (29.6%) [8]. However, in Jazan, Saudi Arabia, another study conducted among 307 patients with diabetes with more percent in males 51.7% than female 48% and more prevalent in patients more than 55 years by 48.9% [9]. In Singapore, a study revealed that from patients with diabetes 63.4% were males and 36.6% were females [10].

In our study, we used Pittsburgh Sleep Quality Index (PSQI) which is an effective instrument used to measure the quality and patterns of sleep in adults. Patients were classified into two groups according to PSQI: Poor-sleeper group (PSQI > 5) and good-sleeper group (PSQI \leq 5) [11]. Our results showed that there was more prevalent of poor sleep quality among diabetic patients (82.4%) and only 17.6% of

them had good sleep quality. This conclusion was similar to that of **Colbayet *et al.***[12] who revealed that 77.4% of diabetic patients had poor sleep quality. In a Turkish university hospital, a study conducted among 300 patients; Sleep quality was poor in the majority (67.9 %) (Global PSQI Score > 5) [13]. An analytical cross-sectional study was carried out during the year 2018 on 307 diabetic patients living in in Jazan, Saudi Arabia poor sleep quality was presented in more than half of the participants (55.4%) [9]. This prevalence is similar to the study conducted by **Luysteret *et al.*** [14] who reported that more than half of the participants (55%) were “poor sleepers” according to the Pittsburgh Sleep Quality Index [14]. In São Paulo, Brazil, **Cunha *et al.***[15] reported, that the majority (52%) of subjects had PSQI scores more than 5, indicating poor sleep quality and (48%) had adequate sleep quality. In contrast to these results, in Northwest of Iran a cross-sectional study conducted among 256 diabetic patients indicated that good sleep quality among patients (61.7%) was more than poor sleep quality (38.3%) [16]. Another study carried out among 206 diabetic patients; the results showed higher incidence rate of good sleep quality in patients with diabetes 52.9% than poor sleep quality 47.1% [17]. In Kenya, a cross- sectional descriptive study with a comparative arm and was carried out at the Kenyatta National Hospital (KNH), 223 participants with diabetes and 126 Comparison group (non-diabetic); poor Quality of Sleep (QOS) was detected in 53.4% of cases with a median global QOS score of 6.0 and good sleep quality detected in 46.6%, In the comparison group, 29.5% had poor QOS with a median global QOS score of 4.0 [18]. These results showed that cases with diabetes had significantly higher probability for poor QOS [OR 2.7 (95% CI 1.7–4.4)] than comparison group [18].

As regards distribution of the studied patients suffered comorbidities, this study reported hypertension in 20.7% of studied patients, obesity 48.4%, anemia 8% and chronic heart diseases 4.8%. Another study reported; hyperlipidemia 51.6%, hypertension by 46.5%, cardiovascular diseases 12.7% and anemia 6.1% [10]. Another study reported; hypertension 71.8% and cardiovascular diseases by 27.2% [7]. In Japan a prospective study found that 74% of diabetic patients had dyslipidemia and hypertension reported by 62.3% [19]. A retrospective study carried out in Diabetic Unit at King Khalid Hospital, Hail, Kingdom of Saudi Arabia, about 344 patients with previously diagnosed DM out of 344 DM patients, 50 were diagnosed as having one or more comorbidity; (56%) were found with hypertension, dyslipidemia was identified in (36%) patients, asthma was identified in (16%)

patients and Myocardial infarction was identified in (12%) patients [20]. In Riyadh, another study conducted among 360 diabetic patients; the patients had comorbid complications, such as hypertension (61.4%), dyslipidemia (58.6%) and heart disease (14.4%) [21].

CONCLUSION AND RECOMMENDATIONS:

According to the results of the study, poor sleep quality among diabetic patients is a prevalent health problem. Therefore, we recommend improvement of the control of diabetes in order to improve the quality of sleep of diabetic patients. On the other hand, health care providers may consider routine screening for and address sleep problems among diabetic patients.

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