Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/3070
DOI URL: http://dx.doi.org/10.21474/IJAR01/3070
ISSN NO. 2320-5407

RESEARCH ARTICLE

Sleep Quality among Type 2 Saudi Diabetics.

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Manuscript Info

Manuscript History

Received: 03 December 2016
Final Accepted: 30 December 2016
Published: January 2017

Key words:-
Diabetes, Diabetes Control, Pittsburgh Sleep Quality Index, Sleep quality, Risk factors, Saudi Arabia.

Abstract

Objectives: To explore the relationship between diabetes control among Saudi type 2 diabetics and their quality of sleep.
Patients and Methods: Following a cross-sectional study design, 400 Saudi type-2 diabetics (239 males and 161 females) registered at the Diabetes Center in Abha City, Saudi Arabia were included in this study. An interview questionnaire has been developed by the researchers. It comprised personal characteristics and diabetes-related variables and the Pittsburgh Sleep Quality Index Questionnaire (PSQI).
Results: More than three fourths of participants (77.3%) had uncontrolled diabetes (HbA1c >7%). Almost three fourths of diabetics (72%) had poor sleep quality. Poor quality of sleep was highest among illiterate diabetics (91.7%). Participants with longer duration of diabetes had significantly more prevalence of poor quality of sleep than those with shorter disease duration (75.9% and 66.3%, respectively, p=0.035). Moreover, participants with uncontrolled diabetes had significantly higher prevalence of poor sleep quality than those with controlled diabetes (78.3% and 49.5%, respectively, p<0.001). However, sleep quality among diabetics did not differ significantly according to their age, gender, or smoking status.
Conclusions: Type 2 diabetes is associated with high prevalence of poor quality of sleep. Risk factors for poor quality of sleep include less education, poorly diabetes control and long duration of disease. Detection and treatment of sleep disorders among diabetics is essential.

Introduction:-

Sleep is an active biologic function that is essential for life and is critical for physical, mental and emotional well-being. Any defects in sleep quality and quantity may lead to several complications, including metabolic errors (1).

It is estimated that sleep disorders are among the most common health problems in the general. Nevertheless, sleep disorders are frequently overlooked. About one-third of people in the general population suffer from a chronic disorder of sleep and wakefulness. The critical role of sleep and sleep disturbances in daytime functioning is becoming increasingly apparent (2).

A relation has been recognized between respiratory disorders during sleep, e.g., snoring and sleep apnea, and the early manifestations of diabetes, since sleep apnea and snoring may increase cellular insulin resistance, leading to hyperglycemia and increased difficulty to control blood sugar (3).

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Sleep appears to moderate the neurohormones that regulate blood glucose. Sleep deprivation and sleep disorders contribute to patho-physiological changes associated with the development of type 2 diabetes. In people who already have diabetes, sleep deprivation contributes to elevations of glycosylated hemoglobin (HbA_1c). Symptoms that occur as a result of diabetes, such as nocturia and neuropathic pain, may in turn contribute to sleep disturbance and exacerbate sleep deprivation (4).

Evidence suggests that sleep disorders may contribute to the development of diabetes; and conversely, diabetes may contribute to sleep disorders (4). Sleep is an emotional issue and all diseases particularly chronic diseases, like diabetes, invite emotional reactions which can also affect sleep adversely (1).

Sleep debt leads to harmful effects on carbohydrate metabolism, resulting in impaired glucose tolerance (5). Acute sleep deprivation, whether total or partial, is associated with an alteration in hypothalamo-pituitary-adrenal function on the following day consisting of an elevation of evening cortisol concentration (6). Moreover, it has been well demonstrated that glucose tolerance is markedly better in the morning than in the evening (7).

Gisalason and Almqvist (8) reported that diabetes is associated with difficulty in initiating sleep (21.1%), difficulty in maintaining sleep (21.9%) and excessive day time sleepiness (12.2%). The sleep complaints are often related to the presence of underlying Sleep disordered breathing, nocturia, physical complications of diabetes and underlying depression. Lamond et al. (9) added that diabetics experience several types of sleep problems, e.g., more wakefulness, a high number of awakenings and fragmented sleep.

The ‘‘gold standard’’ for diagnosis of sleep disorders is laboratory polysomnography. However, sleep disorders are far more prevalent than can be handled by the limited number of available sleep laboratories. Therefore, a screening tool is usually applied to screen patients according to their clinical symptoms, their physical examinations, and their risk factors (10).

In clinical practice, detailed sleep history is often missed. Detection and treatment of sleep disorders among diabetics is essential since their treatment is highly rewarding. Moreover, the concurrence of sleep disorders and diabetes necessitates aggressive therapy to treat and control both conditions (11).

This study aimed to explore the relationship between diabetes control among Saudi type 2 diabetics and their quality of sleep.

Patients and Methods:-

This study was conducted during the period from January till June 2014. It followed a cross-sectional analytical comparative design has been followed. This study has been conducted at the Diabetes Center of Abha City, Saudi Arabia.

Following a simple random sampling technique, the researchers interviewed 400 Saudi type 2 diabetics whose diabetes was diagnosed since at least one year. Patients known to have psychiatric disorders or other chronic comorbidities (i.e., malignancy, heart, renal, or liver diseases) in addition to those on psychoactive drugs were excluded. Diabetes control among participants was assessed according to patient's glycosylated hemoglobin (HbA_1c) level. Controlled diabetes was considered at HbA1c $\leq$ 7%, while those with higher HbA1c levels were considered as having uncontrolled diabetes (12).

Data collection tools comprised 2 parts, i.e., the "personal characteristics and diabetes-related variables" and the "Pittsburgh Sleep Quality Index (PSQI) Questionnaire".

The personal characteristics questionnaire was constructed by the researchers. It included the following variables: age, gender, educational level, smoking status, duration of diabetes and HbA_1c levels.

The PSQI is a validated measure of self-reported sleep quality. It comprises 19 items in 7 component scales that assess sleep quality over the past month. The component scores of these scales are summed to yield a “global PSQI score” with a range of 0-21, with higher scores indicating worse sleep quality. A global PSQI score >5 has a

diagnostic sensitivity of 98.3% and specificity of 90.2% in distinguishing normal subjects from patients with sleep quality problems (13).

Data entry and analysis were performed using the Statistical Package for Social Sciences (SPSS version 22.0). Descriptive statistics were calculated in the form of frequency and percentage. **C**hi-square test was applied to test significance of differences between groups. Differences were considered as statistically significant when $p<0.05$.

Results:-

Table (1) shows that 9.8% of participants aged less than 20 years, 66.3% aged 20-60 years and 24% aged more than 60 years. More than half of participants were males (59.8%). About one fifth of participants (21%) were illiterate, 51.3% had school education, while 27.8% were university graduates. Most participants (87%) were nonsmokers. The duration of diabetics among more than half of participants (57%) was 10 years or more. More than three fourths of participants (77.3%) had uncontrolled diabetes (HbA1c >7%)

Figure (1) shows that almost three fourths of diabetics (72%) had poor sleep quality.

Table (2) shows that poor quality of sleep was highest among illiterate diabetics (91.7%) followed by university graduates (68.5%) and school educated (65.4%). Differences in quality of sleep among diabetics according to their educational level were statistically significant ($p<0.001$). Participants with longer duration of diabetes had significantly more prevalence of poor quality of sleep than those with shorter disease duration (75.9% and 66.3%, respectively, $p=0.035$). Moreover, participants with uncontrolled diabetes (i.e., HbA1c level > 7%) had significantly higher prevalence of poor sleep quality than those with controlled diabetes (78.3% and 49.5%, respectively, $p<0.001$). However, sleep quality among diabetics did not differ significantly according to their age, gender, or smoking status.

Discussion:-

Diabetes mellitus is being increasingly recognized as a worldwide significant public health problem (14). Patients with diabetes mellitus, by virtue of its numerous clinical and associated implications, suffer a poor quality of life. It is not surprising that sleep quality among these patients are significantly impaired. Diabetic patients frequently experience challenges to their sleep and wakefulness due to physiological imbalance and co-morbid sleep pathologies (15).

This study aimed to assess the sleep quality of diabetic patients and to identify the impact of diabetes control on patients' quality of sleep.

According to HbA1c level among participants, the current study showed that only 22.7% had controlled diabetes, i.e., with HbA1c level more than 7%. This finding is in agreement with those of Ji et al. (16), who reported that the rate of glycemic control of type 2 diabetes was only 16.8% and Lou et al. (17), who found that the glycemic control rate among diabetic patients was only 17%. However, some studies in USA reported glycemic control levels of 35–59% (18-21).

Results of this study revealed a high prevalence of poor sleep quality among type 2 diabetics.

This finding is in agreement with several studies which emphasized the high prevalence of poor sleep quality among diabetics. Tsai et al. (22) stressed the significant association between poor sleep and worse glycemic control among diabetic patients. Using PSQI >5 as a cutoff, Song et al. (23) reported that the prevalence of poor sleep quality among diabetics was 49.3%. Lou et al. (17) reported that the prevalence of poor sleep among diabetics was 33.6%.

This study showed that prevalence of poor sleep quality differed significantly according to participants' educational level, being highest among illiterate diabetics. However, it did not differ significantly according to their age, gender, or smoking status. Lou et al. (17) reported that diabetics with poor quality of sleep tended to be older, female, and less educated, compared with good sleepers.

The present study also revealed that prevalence of poor sleep quality differed significantly according to disease duration and diabetes control. Diabetics with longer disease duration and/or uncontrolled diabetes (i.e., HbA1c level

>7%) had significantly higher prevalence of poor sleep quality than those with shorter duration of sleep and/or controlled diabetes.

Keinanen-Kiukaanniemi et al. (24) argued that the duration of diabetes is a risk factor for poor quality of sleep. Jin et al. (25) explained this finding by that diabetics with long duration are more likely to suffer from a greater number of diabetes-related complications and poorer glycemic control, which are possibly associated with the poor quality of sleep, rather than the duration of diabetes itself.

Redekop (26) added that maintaining good glycemic control could reduce the risk of complications. Intensified glycemic control is expected as an important way to reduce risk of complications and improve quality of sleep. Sundaram et al. (27) stressed that better glycemic control, as assessed by HbA1c, is associated with lower emotional distress, better well-being, better health status, better quality of life and better sleep quality.

Sleep disturbance is an important health concern, especially among diabetics, as lack of adequate sound sleep interferes with all aspects of person's health and daily living activities (28).

Table 1:- Personal characteristics of study sample.

Personal characteristics	No.	%
Age groups		
• <20 years	39	9.8
• 20-60 years	265	66.3
• >60 years	96	24.0
Gender		
• Male	239	59.8
• Female	161	40.3
Educational level		
• Illiterate	84	21.0
• Primary/Intermediate/Secondary school	205	51.3
• University	111	27.8
Smoking status		
• Smoker	52	13.0
• Non-smoker	348	87.0
Duration of diabetes		
• <10 years	172	43.0
• 10+ years	228	57.0
Glycosylated hemoglobin level		
• ≤7%	91	22.8
• >7%	309	77.3

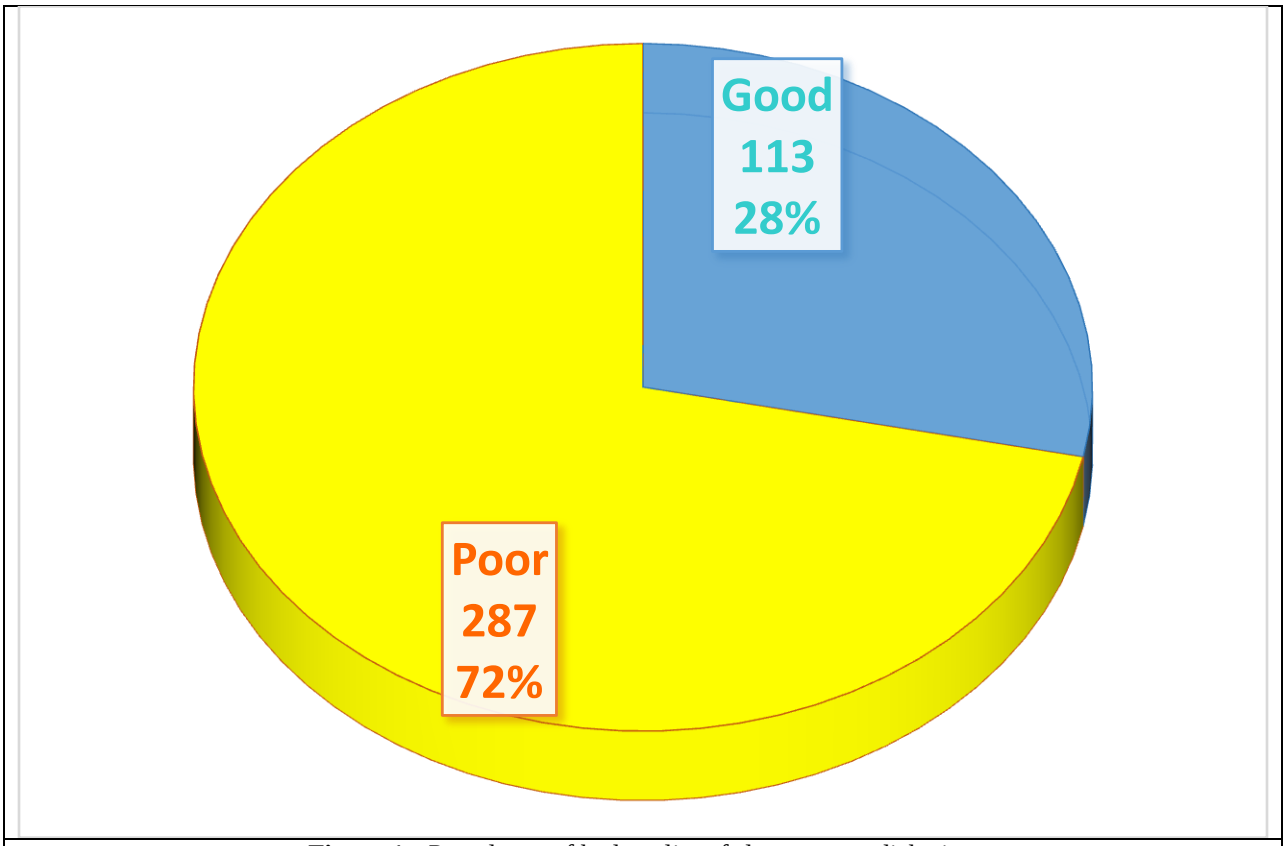

Figure 1:- Prevalence of bad quality of sleep among diabetics.

Table 2:- Participants' sleep quality according to their personal characteristics

	Good Quality		Poor Quality		P value
Personal characteristics	No.	%	No.	%	
Age groups					
• <20 years	16	41.0	23	59.0	
• 20-60 years	71	26.8	194	73.2	
• >60 years	26	27.1	70	72.9	0.175
Gender					
• Male	66	27.6	173	72.4	
• Female	47	29.2	114	70.8	0.731
Educational level					
• Illiterate	7	8.3	77	91.7	
• Primary/intermediate/secondary school	71	34.6	134	65.4	
• University	35	31.5	76	68.5	<0.001
Smoking status					
• Nonsmoker	18	34.6	34	65.4	
• Smoker	95	27.3	253	72.7	0.274
Duration of diabetes					
• <10 years	58	33.7	114	66.3	
• 10+ years	55	24.1	173	75.9	0.035
Glycosylated hemoglobin level					
• ≤7%	46	50.5	45	49.5	
• >7%	67	21.7	242	78.3	<0.001

Conclusion:-

In conclusion, type 2 diabetes is associated with high prevalence of poor quality of sleep. Risk factors for poor quality of sleep include being illiterate, poorly diabetes control (i.e., HbA1c level > 7%) and long duration of disease. Primary health care physicians should monitor the quality of sleep among type 2 diabetics. Early detection and treatment of sleep disorders among diabetics is essential.

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