

# Insomnia, Fatigue, and Some Associated Factors Among Patients with Type 2 Diabetes Mellitus, Tabuk, Saudi Arabia

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## To cite this article:

Hyder Osman Mirghani. Insomnia, Fatigue, and Some Associated Factors Among Patients with Type 2 Diabetes Mellitus, Tabuk, Saudi Arabia. *International Journal of Diabetes and Endocrinology*. Vol. 2, No. 2, 2017, pp. 15-18. doi: 10.11648/j.ijde.20170201.14

Received: February 17, 2017; Accepted: March 14, 2017; Published: March 27, 2017

**Abstract:** Both the quantity and quality of sleep are associated with type 2 diabetes mellitus; sleep has emerged as a novel target for prevention. In the current study, we aimed to assess insomnia and fatigue among patients with type 2 diabetes in Tabuk City, Saudi Arabia. A cross-sectional study conducted among 246 patients with type 2 diabetes during the period from March 2015 to June 2015, they were selected randomly from a diabetes center in Tabuk. Participants were invited to sign a written informed consent, then interviewed using a structured questionnaire based on socio-demographic data, failure to initiate and maintain sleep, non-restorative sleep, and fatigue. The Statistical Package for Social Sciences was used for data analysis; the Chi-square and Pearson correlation were used to test the statistical significance. Out of 246 patients with type 2 diabetes (54.1% females), aged  $46.9 \pm 11.6$  years, fatigue was evident in 23.5%. A significant statistical difference was observed in the HbA1C regarding failure to maintain sleep and duration of sleep  $P < 0.05$ . No differences in the glycated hemoglobin regarding age, sex, duration of sleep, snoring, cough, dyspnea, failure to maintain sleep, and non-restorative sleep  $P > 0.05$ . In conclusion: Patients with poor diabetes control had the failure to maintain sleep and longer duration of diabetes. Measures to implement good sleep hygiene among patients with type 2 diabetes are highly needed.

**Keywords:** Insomnia, Fatigue, Type 2 Diabetes, Saudi Arabia

## 1. Introduction

Diabetes mellitus is prevalent worldwide, currently 285 million people are affected by the disease and the projection for the year 2030 is 438 million., with Asian countries suffering the bulk of the total diabetes epidemic, and the Kingdom of Saudi Arabia is among the countries with the highest prevalence of diabetes mellitus (17.6%) [1, 2].

General fatigue is a common symptom among patients with diabetes mellitus and can be reported in more than half of type 2 diabetes mellitus, the pathophysiology is largely unknown, but many psychological, biological and inflammatory factors (the release of the Tumor Necrosis Factor, interleukins, and increased C-reactive proteins) are to blame. This symptom could increase the diabetes complication, compromise self-management and impacts the patient's quality of life [3].

Interestingly many studied concluded the relationship between the systemic inflammation and the increased risk of developing type 2 diabetes mellitus suggesting that the

inflammatory process may contribute to the pathophysiology of the disease [4].

Chronic fatigue defined as fatigue that persists for six months or more, with impairment of function is different than acute fatigue that fluctuates during the day without functional impairment. Hyperglycemia precipitates fatigue, while pain, depression, and sleep disorders perpetuate it [5-9].

Exercise is a critical factor in weight reduction and diabetes mellitus control. Both dyspnea and fatigue could be substantial factors that limit the physical activity, furthermore stopping the exercise test in patients without heart failure had been associated with poor prognosis [10].

A follow-up survey conducted in Northern California concluded that both pain and non-pain symptoms were common in diabetic patients and commoner among those with short survival, the cohort observed that the physical symptoms like acute pain dyspnea were prevalent among the old age group, while the young age group showed higher rates of insomnia, depressed mood and other psychosocial symptoms [11].

Individuals who sleep more than 8 hours or less than 7

hours per night are at higher risk of developing diabetes mellitus, and at modestly increased cardiovascular disease and all-cause mortality [12]. Physiological studies showed that short-term sleep deprivation could substantially alter endocrine function, leading to increasing sympathetic drive, and counter-regulatory hormones release thus leading to insulin resistance and diabetes mellitus [13].

The literature about fatigue and insomnia among type 2 diabetes in the Kingdom of Saudi Arabia is scarce, to our best of knowledge, this is the first study to assess these serious disorders in Tabuk City. Thus we conducted this research to investigate the effects of fatigue and insomnia on glycemic control.

## 2. Material and Methods

This cross-sectional study was performed at the diabetes center at King Khalid Civil Hospital in Tabuk City from March to June 2015. The diabetes center in King Khalid Hospital a reference center for diabetes care, the center serves diabetic patients referred from primary health centers and other hospitals in Tabuk City. The study included 300 patients with type 2 diabetes; they were approached in a ratio of 2:1. The sample size was calculated using the following formula:  $n = Z^2 P-Q/d^2$  where  $Z = 95\%$  confidence (1.96),  $P =$  prevalence of diabetes in KSA,  $Q=100$ -prevalence, and  $d$ =tolerated error. The sample size was found 283 and was increased to 300 patients to minimize the error.

Participants were asked to sign a written informed consent, then interviewed using a structured questionnaire, the questionnaire was approved by an endocrinologist, community medicine consultant, and a pulmonologist. Patients with chronic disorders that could affect sleep and rheumatic disorders were excluded from the study as were those with psychiatric diseases. Fifty-four patients were excluded after data collection because of the misreported diagnosis of type 1 diabetes mellitus. Information collected include, age, sex, regular snoring, fatigue of more than 6 months duration, that persisted during the day with impairment of function [5, 14], failure to initiate, maintain or difficulty in going back to sleep after night arousal, non-restorative sleep (to assess insomnia), dyspnea, chronic cough (cough that persisted for more than two weeks). And body mass index as calculated from the formula: body mass index = weight in KG/(height in meters)<sup>2</sup>. Ethical clearance was obtained from both the ethical committees of King Khalid Hospital and the University of Tabuk.

We utilized statistical software (SPSS version 20) for data analysis, and the Chi-square test and Pearson correlation were used for determining statistical significance, with a  $p < 0.05$  considered statistically significant.

## 3. Results

Out of 246 patients with type 2 diabetes mellitus, their mean age was  $46.9 \pm 11.6$  years, 108 (43.9%) were overweight, and 87 (35.4%) were obese. Good diabetic control was observed in

58 (23.6%), accepted control in 109 (44.3%, and poor control in 79 (32.1%) Table 1.

Table 2 illustrates sleep characteristics in patients with type 2 diabetes. Snoring was detected in 137 (55.7%) of diabetic patients, non-restorative sleep, and fatigue that persisted during the day was observed in 176 (71.5%), and 58 (23.5%) of patients respectively. Sleeping > than 9 hours/night was evident in 8 (3.3%) of diabetic patients while sleeping less than 6 hours/night was found in 77 (31.3%). Failure to initiate was evident in 180 (73.2%), and to maintain sleep in 59 (23.8%), Chronic cough and dyspnea were reported in 84 (26%), and 30 (12.2%) of patients with diabetes respectively.

In the present study no significant statistical differences were evident between male and females regarding the HbA1c ( $8.05 \pm 1.45$  vs.  $8.35 \pm 1.37$ )  $P$ -value=0.838, the glycated hemoglobin was  $8.10 \pm 1.13$  among patients with regular snoring and  $8.35 \pm 1.53$  among those without  $P$ -value=0.173, the HbA1c was  $8.16 \pm 1.47$  and  $8.36 \pm 1.27$  among patients with and without non-restorative sleep with no significant statistical difference  $P$ -value=0.902, no significant statistical difference was observed between patients with and without fatigue (HbA1c  $8.23 \pm 1.62$  and  $8.21 \pm 1.35$  respectively,  $P$ -value=0.902). Table 3 depicted other sleep parameters relation to HbA1C.

In the present study, a significant statistical correlation was found between the duration of diabetes mellitus and the HbA1c ( $P$ -value=0.034), no correlation was evident between the glycated hemoglobin and the length of sleep and age  $P$ -value=0.926 and 0.234 respectively. Table 4.

**Table 1.** Clinical characteristics of type 2 diabetic patients.

Variable	No%
Age (Mean $\pm$ SD)	46.9 $\pm$ 11.6
BMI	
Overweight	108 (43.9%)
Obese	87 (35.4%)
HbA1c%	
Less than 7	58 (23.6%)
From 7-8.5	109 (44.3%)
> 8.5	79 (32.1%)

**Table 2.** Sleep disorders among type 2 diabetic patients and control subjects.

Character	No%
Males	113 (45.9%)
Females	133 (54.1%)
Snoring	137 (55.7%)
Non-restorative sleep	176 (71.5%)
Fatigue that persisted during the day	58 (23.5%)
> than 9 hours/day	8 (3.3%)
From 6-9 hours	161 (65.4%)
< 6 hours/day	77 (31.3%)
Failure to initiate sleep	180 (73.2%)
Failure to maintain sleep	59 (23.8%)
Chronic cough	84 (26%)
Dyspnea	30 (12.2%)

**Table 3.** Fatigue and insomnia indicators relation to the glycated hemoglobin (HbA1c).

Character	HbA1c	P-value
Sex		
Males	8.05±1.45	0.838
Females	8.35±1.37	
Snoring		
Present	8.10±1.13	0.173
Not present	8.35±1.53	
Fatigue		
Present	8.16±1.47	0.313
Not present	8.36±1.27	
Non-restorative sleep		
Present	8.23±1.62	0.902
Not present	8.21±1.35	
Failure to initiate sleep		
Present	8.02±1.24	0.000
Not present	8.76±1.69	
Failure to maintain sleep		
Present	8.65±1.58	0.008
Not present	8.08±1.33	
Cough		
Present	8.13±1.82	0.689
Not present	8.20±1.35	
Dyspnea		
Present	8.12±1.35	0.536
Not present	8.25±1.44	

**Table 4.** The correlation of the glycated hemoglobin with patients age and the sleep duration and duration of diabetes mellitus.

Character	Pearson correlation	P-value
Age	0.006	0.926
Duration of diabetes	0.136	0.034
Length of sleep	-0.076	0.234

## 4. Discussion

In the present study, a significant statistical difference was found between the glycated hemoglobin and failure to maintain sleep; no differences were evident regarding fatigue, snoring, non-restorative sleep, cough or dyspnea. The HbA1c was correlated with the duration of diabetes, but not with age and the duration of sleep.

Regular snoring had been linked to diabetes mellitus through cytokines release and insulin resistance [15, 16]. In the present study, snoring was concluded in 55.7% of diabetic patients similar to studies conducted in Sudan [17].

In the current study, fatigue was found in 23.5% of patients and in accordance with previous research that observes fatigue in more than one-third of patients with type 2 diabetes [18]. Dyspnea and chronic cough could be pointers to various disorders including heart failure, infections, and gastroesophageal reflux; the current data reported dyspnea in 12.3% of patients with type 2 diabetes and lower than the previous study. Fatigue in patients with diabetes could be due to hypoglycemia, hyperglycemia, diabetes distress or complications. Furthermore, fatigue was found to be associated with increased fasting and postprandial plasma glucose [19]. In the present study, no association was found between glycemic control and fatigue, a plausible explanation could be that we used the glycated hemoglobin to assess the glycemic control.

Different measures for fatigue could explain the discrepancy in the association of fatigue and glycemic control.

Chronic insomnia had been linked to diabetes mellitus [20]. In the current study no significant correlation was found between HbA1c, sleep duration, failure to initiate sleep, and non-restorative sleep, similarly a large study conducted among Hispanic Latinos concluded that the association of the sleep duration and insomnia was attenuated after controlling for the body mass index except for long sleepers without insomnia [21].

Previous literature [22] concluded the strong associations of failure to maintain sleep and diabetes; the current data showed that patients who failed to maintain sleep had higher glycated hemoglobin than their counterparts confirming the previous observation.

## 5. Conclusion

The present study showed that fatigue and insomnia were prevalent among patients with type 2 diabetes, with a higher HbA1c among patients who failed to maintain sleep. No differences were evident between those who failed to initiate sleep, had a cough, snoring, dyspnea or shorter sleep duration. Increasing the awareness of good sleep hygiene could improve glycemic control. Diabetes care management should include not only good cardiometabolic control but also symptom palliation across the disease course [9]. The study had many limitations: the reliance of self-reported questionnaire is prone to subjectivity, the study was conducted at a single diabetes center so generalization cannot be insured, and we could not control for depression and anxiety among different psychiatric disorders.

## References

- [1] International Diabetes Federation, Middle East, and North Africa 2015.
- [2] Khuwaja AK, Lalani S, Dhanani R, Azam IS, Rafique G, White F. Anxiety and depression among outpatients with type 2 diabetes: A multi-centre study of prevalence and associated factors. *DiabetolMetabSyndr*. 2010 Dec 20; 2: 72. doi: 10.1186/1758-5996-2-72.
- [3] Fritschi, C., Quinn, L. Fatigue in patients with diabetes: a review. *J. Psychosom. Res.* 2010; 69: 33–41.
- [4] Lasselin J, Layé S, Dexpert S, Aubert A, Gonzalez C, Gin H, Capuron L. Fatigue symptoms relate to systemic inflammation in patients with type 2 diabetes. *Brain Behav Immun*. 2012 Nov; 26 (8): 1211-9. doi: 10.1016/j.bbi.2012.03.003. Epub 2012 Mar 25.
- [5] Martine M. G, Cees JT, Elles S, Lotte B, Ellen B, and Hans K. Chronic Fatigue in Type 1 Diabetes: Highly Prevalent but Not Explained By Hyperglycemia or Glucose Variability. *Diabetes Care* 2014; 37: 74.
- [6] Fukuda K, Straus SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff A; International Chronic Fatigue Syndrome Study Group. The chronic fatigue syndrome: a comprehensive approach to its definition and study. *Ann Intern Med* 1994; 121: 953–959.

- [7] Reeves WC, Lloyd A, Vernon SD, et al.; International Chronic Fatigue Syndrome Study Group. Identification of ambiguities in the 1994 chronic fatigue syndrome research case definition and recommendations for resolution. *BMC Health Serv Res* 2003; 3: 25.
- [8] Weijman I, Ros WJ, Rutten GE, Schaufeli WB, Schabracq MJ, Winnubst JA. Frequency and perceived burden of diabetes self-management activities in employees with insulin-treated diabetes: relationships with health outcomes. *Diabetes Res Clin Pract*. 2005; 68: 56–64.
- [9] Hewlett S, Chalder T, Choy E, et al. Fatigue in rheumatoid arthritis: time for a conceptual model. *Rheumatology (Oxford)* 2011; 50: 1004–1006.
- [10] Witte KK, Clark AL. Dyspnoea versus fatigue: additional prognostic information from symptoms in chronic heart failure? *Eur J Heart Fail*. 2008 Dec; 10 (12): 1224-8. doi: 10.1016/j.ejheart.2008.09.017. Epub 2008 Nov 7.
- [11] Sudore RL, Karter AJ, Huang ES, Moffet HH, Laiteerapong N, Schenker Y, Adams A, Whitmer RA, Liu JY, Miao Y, John PM, Schillinger D. Symptom burden of adults with type 2 diabetes across the disease course: diabetes & aging study. *J Gen Intern Med*. 2012 Dec; 27 (12): 1674-81. doi: 10.1007/s11606-012-2132-3. Epub 2012 Aug 2.
- [12] Phillips B, Hening W, Britz P, Mannino D. Prevalence, and correlates of restless legs syndrome: results from the 2005 National Sleep Foundation Poll. *Chest* 2006; 129: 76-80.
- [13] Spiegel K, Leproult R, Van Cauter E: Impact of sleep debt on metabolic and endocrine function. *Lancet* 354: 1435–1439, 1999.
- [14] Johns MW. A new method for measuring daytime sleepiness; The Epworth sleepiness scale. *Sleep* 1999; 14: 540-545.
- [15] Scheen AJ, Van Cauter E. The roles of time of day and sleep quality in modulating glucose regulation: clinical implications. *Horm Res* 1998; 49: 191-201.
- [16] Vgontzas AN, Papanicolaou DA, Bixler EO, et al. Sleep apnea and daytime sleepiness and fatigue: relation to visceral obesity, insulin resistance, and hypercytokinemia. *J ClinEndocrinolMetab* 2000; 85: 1151-8.
- [17] [Mirghan HO, Elbadawi AS, Ahmed MA. The daytime sleepiness, snoring, and sleep duration effects on patients with type 2 diabetes; A case- control study *Indian Journal of Basic and Applied Medical Research*; 2016: 5 (2): 464-470.
- [18] Konen JC, Curtis LG, Summerson JH. Symptoms and complications of adult diabetic patients in a family practice. *rch Fam Med*. 1996 Mar; 5 (3): 135-45.
- [19] Jain A, Sharma R, Choudhary PK, Yadav N, Jain G, Maanju M. Study of fatigue, depression, and associated factors in type 2 diabetes mellitus in industrial workers. *Ind Psychiatry J*. 2015 Jul-Dec; 24 (2): 179-84. doi: 10.4103/0972-6748.181731.
- [20] Lewis PE, Emasealu OV, Rohrbeck P, Hu Z. Risk of type II diabetes and hypertension associated with chronic insomnia among active component, U.S. Armed Forces, 1998-2013. *MSMR*. 2014 Oct; 21 (10): 6-13.
- [21] Cespedes EM, Dudley KA, Sotres-Alvarez D, Zee PC, Daviglius ML, Shah NA, Talavera GA, Gallo LC, Mattei J, Qi Q, Ramos AR, Schneiderman N, Espinoza-Giacinto RA, Patel SR. Joint associations of insomnia and sleep duration with prevalent diabetes: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL). *J Diabetes*. 2016 May; 8 (3): 387-97. doi: 10.1111/1753-0407.12308. Epub 2015 Jul 21.
- [22] Cappuccio FP, D'Elia L, Strazzullo P, Miller MA. Quantity and quality of sleep and incidence of type 2 diabetes: a systematic review and meta-analysis. *Diabetes Care*. 2010 Feb; 33 (2): 414-20. doi: 10.2337/dc09-1124. Epub 2009 Nov 12.