

# Postprandial Sleeping in Relation to DM Type 2 and Obesity

<sup>1</sup>Abdulrahman Alshaikh, <sup>2</sup>Omar Fathaldin

King Abdulaziz University Hospital

<sup>1</sup>Corresponding Author Email: [shemmi26@gmail.com](mailto:shemmi26@gmail.com)

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**Abstract:** To determine whether there is a direct relation between postprandial sleeping and the incidence of DM type2. In addition to that, the study explored the relation between the time, length of sleep and the incidence of DM. Also to determine if there is any gender relationship with sleeping habits and to establish the relationship between body mass index (BMI) and sleeping habits.

**Methods:** A multicentric case-control convenience sampling was conducted in several health care centers including primary health care centers, secondary and tertiary as well, among the patients visiting the outpatient clinic.

**Conclusion:** There is a significant relation between blood glucose level and postprandial sleeping. Also there is statistical significance between DM and initiating sleep. Gender has a role in the diabetics sleeping pattern.

**Keywords:** postprandial sleeping, sleeping habits, primary health care centers.

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## 1. INTRODUCTION

Many habits were changed due to modernization and civilization. To cope with these changes we adapted new life styles and broke the balance of nature. One of the most important obvious behavioral changes is our sleeping pattern.

There is no doubt diabetes causes sleeping disorders. Osmotic diuresis, secondary to sustained hyperglycemia when blood glucose level exceeds the renal threshold, forcing the diabetic patient to wake up and urinate is well known. However, the questions does disturbance in sleeping pattern cause DM or not is what this research is attempting to ascertain.

## 2. METHODS AND RESULTS

A multicentric case-control convenience sampling was conducted in several health care centers including primary health care centers, secondary and tertiary centers. It was conducted in King Abdulaziz university hospital in Jeddah, KSA, in primary health care center university, and in Dr Solieman Fageeh hospital.

Patients age 35 or above were included in the study except pregnant women, patients with type 1 diabetes, and women with history of gestational diabetes were excluded.

We will take a representative sample size from each participating center. The sample size will be calculated using EPI Info statistical package, version 6. That will be after knowing the estimated number of visitors during the study period to each center separately.

The 1st strata will be the male versus female, the 2nd diabetic versus healthy subjects and they will be considered the control group.

- An interview questionnaire distributed to a sample of 800 subjects 400 from each sex. Health profession members will carry out the interview. The questionnaire consists of 28 questions divided to 4 main parts. The 1st part will be regarding socio-demographic. The 2nd part will be on the subject of history of DM, when was it diagnosed and the current treatment. The 3rd part will be the core of the study concerning sleeping patterns in relation with meals. The 4th will cover the risk factors and family history of DM.

### 3. DATA ANALYSIS

All the data will be collected and entered to the computer. Data will be analyzed by using SPSS PC software package. Chi-squared test and t-test will be used where appropriate. Moreover, will be considered significant if (P-value where less than 0.05).

#### Ethical aspects:

We will give the participants who will answer the questioner full confidentiality and privacy. The team members will not be able to correlate it later to a certain subject.

<b>Age:</b>	<b>marital status:</b>	married	single	<b>nationality:</b>	Saudi	Non
<b>Gender:</b>	male	female	<b>Occupation:</b>	<b>date:</b>		
<b>Wight:</b> .....kg	<b>height:</b> ..... cm	<b>phone:</b>	<b>mobile:</b>	<b>venue:</b>		
<b>1- Are you a diabetic?</b> Yes No						
<b>2- When were you diagnosed of having DM?</b>						
<b>3- What are the current treatments?</b>						
	Diet	Diet and Oral hypoglycemic	Insulin	None		
	Diet and Insulin	Oral hypoglycemic	Diet and Oral hypoglycemic and Insulin			
<b>4-How many hours do you sleep during the night?</b> 0 1 2 3 4 5 6 7 8 9 10 11 12						
<b>5-How many times do you wake up at night a week?</b> 0 1 2 3 4 5 6 7 8 9 10						
*If yes why      urination      SOB      leg uncomfortable sensations (paresthesias)      others.....						
*If yes do you eat a snack      yes      no						
<b>6-Do you have difficulty on initiating sleep?</b> Yes      no						
*If yes how many time per week .....						
<b>7-Do you feel that you didn't get enough sleeping when you wake up at morning?</b> Yes      no						
*If yes how many time per week .....						
<b>8-Do you sleep after lunch immediately?</b> Yes      no						
.....Times per week      etch time for.....HR						
* If "yes" was it before having DM?      before      after      before and after						
<b>9-Do you sleep after dinner immediately?</b> Yes      no						
.....Times per week      etch time for.....HR						
* If "yes" was it before having DM?      before      after      before and after						
<b>10-At what time do you sleep every day (night)?</b> .....						
<b>11- At what time do you wake every day (morning)?</b> .....						
<b>13- Do you change your sleeping habit frequently?</b> Yes      NO      ..... Per month						
<b>12-Do you carry out exercise regularly or not?</b> Yes      No						
* If "yes"      .....Times per week      each time for.....hr						
<b>13-Is there family history of diabetes?</b> Yes      No						
<b>15-is your meals fixed at a certain time every day?</b> Yes      No						
<b>14-how many meals do you have during the day?</b> 1      2      3      4      5      6						
<b>16-do you eat even if you are not hungry?</b> Yes      No						
<b>17-how many hours do you spend in work a day?</b> ..... is it      1 shift      2 shifts						

#### 4. RESULTS

We have interviewed 400 patients almost 50% male and 50% female. Most of the patients married and 36% Saudi nationality and the remaining from different nationality.

The weight of the patients differ from normal to morbid obesity see figure number 1

62.2% of diabetics have difficulty initiating sleep compared to 37.8% of non diabetic (p value 0.004). (Figure 2). 24.3 % of the diabetics only sleeps after lunch compared to 37.2 %

#### 5. LITERATURE REVIEW

Obesity is a known cause of Obstructive Sleep Apnea. However, recent studies have shown that OSA might have a causal effect in the development of obesity and insulin resistance. These studies suggest that resultant sleep fragmentation and hyper-arousal may promote insulin resistance via activation of the HPA (Hypothalamic-Pituitary-Adrenal) axis (6). Sympathetic nervous system hyperactivity has also been reported in OSA.

Diabetes is more prevalent in OSA and this relationship is independent of other risk factors (1) (4) (5).

Recent epidemiological studies report that reduced sleep duration is associated with increased BMI. Chronic Sleep restriction is also associated with an impairment of carbohydrate tolerance. Nocturnal life and nocturnal hyperphagia (Night Eating Syndrome) were found to be some of the risk factors for obesity and diabetes (2).

In a study, 71% of diabetic patients had a score of > 5 (in Pittsburgh Sleep Quality Index (PSQI)) which is clinically diagnostic for poor sleep indicating that diabetics have reduced sleep and that there is a definite association between glycemic control and both quality and quantity of sleep(9).

Short-term restriction of sleep results in a variety of adverse physiologic effects, including hypertension, activation of the sympathetic nervous system, impairment of glucose control, and increased inflammation.

According to one study, sleep duration of 6 hours or less or 9 hours or more is associated with increased prevalence of DM and IGT(7)(8).

Researchers found that sleep deprivation is accompanied by increased cortisol levels (causing hyperglycemia) in the afternoon and early evening and a shorter quiescent period compared with extended sleep periods. Other studies have found that partial sleep deprivation is associated with decreased plasma concentrations of leptin, the adipocyte peptide hormone regulating fat mass and appetite, and increased concentrations of ghrelin, which increases appetite. Also growth hormone is secreted during slow wave sleep. Growth hormone deficiency in adults has been associated with central adiposity and insulin resistance, but whether sleep deprivation acts through, these mechanisms is not clearly established(3)(6).

#### RATIONALE:

There is a big debate withers sleep pattern disturbance causes DM or not. There are several publications support this theory and other do not. However, we do believe that sleeping pattern can cause DM, but in a different way witch wasn't discussed or even mentioned in all the publications concerned with the same topic (sleeping & DM type two).

Our theory "When a subject sleeps postprandial directly this may facilitate DM type tow in a way or other in those who have already genetic predisposition to have it ". We billed up our theory on the will known fact that muscle activity increases the cell receptors sensitivity to insulin so that less amount of insulin needed to get glucose inside the cells. Adding to that the less known fact that muscle cells can take glucose to some extent with out the help of insulin.

Now when a subject sleeps postprandial he will be in a hypotonic stat. However, he will need a larger amount of insulin to get the same amount of glucose inside the calls than if he would be awake. Pulse the muscles are in hypotonic state in a way it will not be able to tack some of the load by taking some of the glucose molecules with out the help of the insulin so on long term bases the subject cell receptors will be down regulated.

parts. The 1<sup>st</sup> part will be regarding socio-demographic. The 2<sup>nd</sup> part will be on the subject of history of DM, when was it diagnosed and the current treatment. The 3<sup>rd</sup> part will be the core of the study concerning sleeping patterns in relation with meals. The 4<sup>th</sup> will cover the risk factors and family history of DM.

### REFERENCES

- [1] Chasens ER, Weaver TE, Umlauf MG. Insulin resistance and obstructive sleep apnea: is increased sympathetic stimulation the link? Biol Res Nurs. 2003 Oct;5(2):87-96
- [2] Kelly C. Allison, Scott J. Crow, Rebecca R et al. Binge Eating Disorder and Night Eating Syndrome in Adults with Type 2 Diabetes. Obesity.2007; 15: 1287-1293
- [3] Shahradsad Taheri, Ling Lin, Diane Austin, et al. Short Sleep Duration Is Associated with Reduced Leptin, Elevated Ghrelin, and Increased Body Mass Index. PLoS Med 1(3): e62 doi:10.1371/journal.pmed.0010062
- [4] Boethel CD. Sleep and the endocrine system: new associations to old diseases. Curr Opin Pulm Med. 2002 Nov;8(6):502-5.
- [5] Shinya Makino; Hiroshi Handa, et al. Obstructive Sleep Apnoea Syndrome, Plasma Adiponectin Levels, and Insulin Resistance. Clin Endocrinol. 2006;64(1):12-19. ©2006 Blackwell Publishing
- [6] Eve Van Cauter, Kristen Knutson et al. The Impact of Sleep Deprivation on Hormones and Metabolism. Medscape Neurology & Neurosurgery. 2005;7(1) ©2005 Medscape
- [7] Najib T. Ayas, David P. White, et al. A Prospective Study of Self-Reported Sleep Duration and Incident Diabetes in Women. Diabetes Care 26:380-384, 2003
- [8] Daniel J. Gottlieb, Naresh M. Punjabi, et al. Association of Sleep Time With Diabetes Mellitus and Impaired Glucose Tolerance. Arch Intern Med. 2005;165:863-867
- [9] A Vigg, Avanti Vigg, A Vigg. Sleep in Type 2 Diabetes. J Assoc Physicians India. 2003 May;51:479-81

### APPENDIX – A

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