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### RESEARCH ARTICLE

#### RISK OF OBSTRUCTIVE SLEEP APNEA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS.

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##### Key words:-

Diabetes, obstructive sleep apnea.

#### Abstract

**Introduction:** Many studies provided a positive relationship between Obstructive sleep apnea and diabetes mellitus type2. It has been revealed that almost one third of middle aged Saudi population are at risk for OSA. The aim of this study is to compare the risk of OSA between diabetic patients and non-diabetic middle aged Saudi population.

**Materials and Methods:** This was a cross-sectional questionnaire-based study conducted in King Fahad hospital diabetes center in AL-Ahsaa, Saudi Arabia. Saudi patients aged 18 years and above with diabetes type 2 who visited the outpatient clinics in July and August 2015 were engaged in the study. Medical records were reviewed for demographic characteristics, weight, height, body mass index (BMI), blood pressure, glycosylated hemoglobin, and chronic medical conditions. Berlin questionnaire was used to assess the risk of OSA.

**Results:** Based on Berlin questionnaire, 45 out of 147 of sample (30.6%) are at high risk for OSA. 43.4% who have hypertension in high risk of OSA. Also, 33% of patients with BMI above or equal 25 are in high risk for OSA. There is no significant relation between age, gender and HA1C. Contrariwise, there is significant relation between presence of HTN and BMI above or equal 25 with increased risk for OSA.

**Conclusion:** Hypertension, overweight and obesity contribute in high risk of OSA in diabetic patients. There is no difference between diabetic patients and middle aged Saudi population regarding the risk of OSA.

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#### Introduction:-

Obstructive sleep apnea (OSA) is defined as intermittent cessation of breathing during sleep due to episodic collapse pharyngeal air way. The severity of OSA is usually determined using apnea-hypopnea index (AHI) which measures the number of apneic and hypopneic events per hour of sleep. The prevalence of this disorder among middle-aged American population is 24% for men and 9% for women. Unfortunately, the available data about OSA prevalence in Saudi Arabia is not sufficient but it has been revealed that the prevalence of OSA risk and symptoms among middle aged Saudi men and women is 30% and 40% respectively. [1,2]

Obesity, male gender, aging, metabolic disorders such as hypothyroidism and structural abnormalities of the upper airway including (nasal polyps, enlarged tonsils, adenoids and others) are predisposing factors for OSA. Obesity is

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present in 70% of OSA patients which indicate that it's one of the most important risk factors. Age of 65 and older has 2-3 folds higher prevalence of OSA than middle age population. [1,3]

Obstructive sleep apnea has a negative impact on the quality of life and is also associated with cardiovascular disease, stroke, hypertension, motor vehicle accidents and the development of diabetes. [1,4]

Many studies provide a positive relationship between Obstructive sleep apnea and diabetes mellitus type 2. 70% to 90% of patients with diabetes show apnea-hypopnea indices (AHIs) > 5/h, which is a higher prevalence of OSA than general population. Untreated OSA complicates glycemic control and encourages diabetes, which, consecutively, alters respiratory control. [5]

The under-recognition of OSA leads to 10 years delay between symptoms onset and referral to sleep centers in Saudi Arabia that was suggested by many studies caught our attention to this problem and the urgent need to do more researches in this field.[2]

The aim of this study is to compare the risk of OSA between diabetic patients and non-diabetic middle aged Saudi population.

### **Patients And Methods:-**

This was a cross-sectional questionnaire-based study conducted in King Fahad hospital diabetes center in AL-Ahsaa, Saudi Arabia. The consent was obtained from King Fahad Hospital Health Affairs prior conducting the study. The approval of each participant was taken.

Data was collected from Saudi patients who have visited the outpatient clinics during July and August 2015. They were screened for OSA by using an Arabic version of Berlin questionnaire. This questionnaire is a valid tool which is used to screen for OSA. It is classified into three categories. Category 1 includes five questions on apnea and snoring. The second category consists of three questions on wake time somnolence and drowsiness behind the steering wheel. The third category contains diagnosis of high blood pressure and body mass index (BMI). The questionnaire consider the first and second category positive if two or more questions were positive three times/week or more, whereas the third category 3 is positive if contributor have been diagnosed as hypertensive or his BMI was greater than 30 kg/ m<sup>2</sup>. Contributors that fulfilled the criteria in two or more categories were considered as high risk for OSA and others considered low risk for OSA.

Medical records were reviewed for demographic characteristics, weight, height, body mass index (BMI), blood pressure, glycated hemoglobin, and chronic medical conditions. Regarding polysomnography test results, medical records didn't contain enough information.

The patients who were included in the study are adult patients ( $\geq 18$  years old) with established diagnosis of type 2 diabetes and visited the diabetes center during the study period.

The analysis was done using SPSS software, version 20. Proportions and frequencies were used to present qualitative data whereas quantitative data were presented in mean, median, mode and standard deviation. Chi-squared test was used to assess the relation between OSA and the subsequent categories: age, gender, body mass index, duration of diabetes mellitus, medications and presence of hypertension and its duration.

### **Results:-**

Berlin questionnaires were distributed among 160 patients who visited diabetes center at King Fahad hospital, all of the included contributors are Saudi patients who are eighteen years and older, with confirmed diagnosis of type 2 diabetes mellitus. Thirteen questionnaires were excluded due to incomplete data.

Out of 160 questionnaires, 147 were analyzed. The mean age of participants is  $53 \pm 10.79$ . Seventy nine of the contributors are men (53.1%) and sixty eight are women (45.6%) (Table 1). Berlin questionnaire shows that forty five have high risk of OSA (30.6%) and one hundred and two have low risk (69.4%).

There is no significant relation between risk of OSA and age groups (P value = .463) (Table 2). Moreover, no significant relation between risk of OSA and gender (P value= .770).

**Table 1:-** number of men and women and relation to berlin questionnaire.

		Berlin		Total	
		positive	negative		
gender	Male	25		54	79
	Female	20		48	68
Total		45		102	147

**Table 2:-** Age classes and relation to berlin questionnaire.

		Age class				Total
		<=39	40-49	50-59	>=60	
Berlin	positive	3	9	21	12	45
	negative	13	24	35	30	102
Total		16	33	56	42	147

Most of the patients have hypertension 99 (67.3%). From those 99 patients, 76 (76.77%) have hypertension for less than 20 years, 23 (23.23%) have hypertension for 20 years or more.

There is significant relation between risk of OSA and presence of hypertension (P value= .000)(Table 3).

**Table 3:-** Presence of HTN and relation to berlin questionnaire.

		Berlin		Total
		positive	Negative	
HTN	yes	43	56	99
	no	2	46	48
Total		45	102	147

Body mass index was calculated and it was found that no patient underweight (BMI less than 18.5), 17 (11.6%) are normal weight (BMI= 18.5 to 24.9), 43 (29.3%) are overweight (BMI = 25 to 29.9), 40 (27.2%) are obese class I (BMI= 30 to 34.9), 20 (13.6%) are obese II (BMI= 35 to 39.9) and 27 (18.4%) with morbid obesity (BMI more than 40).

There is significant relation between risk of OSA and BMI above or equal 25 (P value= .023) (Table 4).

**Table 4:-** BMI value and relation to berlin questionnaire.

		berlin		Total
		positive	negative	
BMI	<18.5	0	0	0
	18.5-24.9	2	15	17
	25-29.9	9	34	43
	30-34.9	12	28	40
	35-39.9	8	12	20
	>=40	14	13	27
Total		45	102	147

Most of the patients with uncontrolled blood sugar, 110 (74.8%) have HA1C more than 7, 37 (25.2%) have controlled blood sugar (<=7).

There is no relation between risk of OSA and HA1C level (P value= .781) (Table 5).

**Table 5:-** HA1C level and relation to berlin questionnaire.

		HA1C		Total
		<=7	>7	
berlin	positive	12	33	45
	negative	25	77	102
Total		37	110	147

**Discussion:-**

The research revealed that forty five (30.6%) of patients with type two diabetes are at high risk of OSA. In addition, having a body mass index of overweight or obese classes has a significant role in increasing this risk. There is no difference between age groups, males and females regarding the prevalence of OSA, Also having hemoglobin A1C result below seven which is the recommended value for DM type 2 patients according to World Health Organization (WHO) doesn't have a role in increasing the risk.

The gold standard method to diagnose OSA is overnight polysomnography. In this research, berlin questionnaire was used and it's a valid screening tool for OSA that has been used in many previous studies.

The research demonstrated that the prevalence of obstructive sleep apnea among diabetic patient is (30.6%). In other researches a close percentage was shown (48.6%, 27%) respectively [6,7].

In general, questionnaire often has lower sensitivity in assessment compared to sleep study analysis. So, the actual prevalence of sleep disorders and apnea may be higher than reported in this study. [8]

A lot of studies showed that presence of obesity (BMI  $\geq$  30) or prior diagnosis of hypertension increase the risk of OSA, and this study shows similar outcome [9,10,11,12].

A study revealed that a 96.8% of patients with high risk for OSA had a positive third category of berlin questionnaire (BMI greater than 30 and/or presence of hypertension). Other study shows that patients with comorbid obesity (BMI  $>$  40) were 12 times probabilities of having OSA compared with normal weight patients (18.5-24.9) [14, 19].

This study reports that 43.4% of hypertensive patients have high risk for OSA which indicate that it's a significant risk factor ,many previous studies had shown hypertension as a risk factor for OSA. [15,16,17]

Untreated OSA can contribute to the development or progression of other disorders. OSA has now been shown to be a cause for systemic hypertension, and there is some evidence suggesting that it can also cause pulmonary hypertension [20, 21, 22].

Other studies presented that male gender is a strong predictor for OSA, one of them revealed that men twice at higher risk than women for OSA. Meanwhile in this study there was no difference between males and females patients [13,18,19].

As mentioned above obesity is a significant risk factor for OSA, female patients had higher prevalence of obesity (67.65%) than male patients (51.9%). This might has a role in the lack of gender difference in risk shown in this study. This high proportion of obesity in female and the absence of gender difference was also seen in other study [14].

**Conclusion:-**

Overweight, Obesity , hypertension play an important role in increasing the risk of OSA in diabetic patients , the risk of OSA among diabetic patients with the mean age of 53+- 10.79 is 30.6%. Comparing this result with the risk among middle aged Saudi men and women which is 30%, 40% respectively, this will indicate that there is no difference between diabetic patients and middle aged Saudi population regarding the risk of OSA.[1,2]

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23. C. Abbreviations and Acronyms DM: Diabetes mellitus, HTN: Hypertension, OSA: Obstructive sleep apnea, BMI: Body mass index, HA1C: Glycated hemoglobin, AHI: Apnea-hypopnea indices, WHO: World health organization.