

# Effect of Deep Breathing Exercises on Obstructive Sleep Apnea among Type 2 Diabetes Mellitus Patients

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## Annotation

Sleep apnea is considered one of the diseases associated with type 2 diabetes, and its incidence is (83%) for diabetics. Deep breathing exercises have been applied to reduce or improve Obstructive Sleep Apnea. Amis of these Sudy to determine the effectiveness of deep breathing exercises on Obstructive sleep apnea for type II diabetic patients. A quasi-experimental design, non-probability (purposive) samples were conducted on diabetic patients suffering from this condition from (The First of December 2022 to 30<sup>th</sup> May 2023). The study included (65) patients, who were distributed into two groups. who applied deep breathing exercises for 6 weeks, The Berlin questionnaire was used in this study. The percentage of males was the highest in both study groups, with a rate equal to (75%), and the average age ranged from (50-41) years. The results showed There was a statistical significant difference between the two groups regarding post exercise. The significant improvement and effective effect of the program, as it led to a reduction in sleep apnea cases in patients with diabetes, sleep quality, and the ability to exercise, and training can play a major role in promoting health, especially since this type of intervention is a non-pharmacological intervention.

**Keywords:** Obstructive Sleep Apnea, Deep Breathing Exercises, Berlin Questionnaires, Diabetes Mellitus Type 2.

## INTRODUCTION

A chronic metabolic disorder called diabetes mellitus is defined by high blood glucose levels. this condition causes substantial harm to the heart, blood vessels, eyes, kidneys, and nerve cells. Type 2 diabetes is the most prevalent and a significant global health concern [1]. Diabetes management is mostly behavioral and involves taking daily medications, monitoring blood sugar levels, exercising, and making dietary changes that must be constant and applied to every element of living [2]. One of the metabolic diseases to be caused by a deficiency in the amount of insulin released, the way that insulin works, or both is diabetes mellitus, and seen as a worldwide health issue that has to be modified to enhance the quality of life for those who have it, that act one of the non-communicable illnesses that is currently prevalent and becoming a significant cause for public concern [3]. Respiratory problems are associated with mild and moderate symptoms, and they can also be more serious, and this leads to great morbidity and a financial burden on families and society [4]. People with T2DM are more likely than the general population to obtain OSA, making it a significant comorbidity of diabetes [5]. The most prevalent endocrine illness, diabetes mellitus, affects both industrialized and developing nations. In 2012, 336 million people worldwide had diabetes, and that number is expected to rise to 552 million by 2030. 80%

of diabetes cases are found in low- and middle-income nations. In 2030, diabetes will have become the seventh cause of mortality [6]. Obstructive sleep apnea (OSA) is a medical disease that is characterized by repeated upper airway blockages while a person is sleeping, over 90% of old men and 78% of elderly women throughout the world suffer from OSA [7]. The upper airway muscles relax as you sleep, which leads to obstructive sleep apnea (OSA). Deep breathing exercises have been found in clinical trials to help individuals with OSA. Exercises involving deep breathing are extremely important for treating or controlling sleep apnea that act [8, 9]. Demonstrated the effectiveness of deep breathing exercises in improving lung function in participating patients for preventing pulmonary complications after performing open heart surgery. In reality, there is little research on the expansion of OSA at Iraq since persons does not view the condition as a serious health concern. Instead, they see it as a minor issue, and some do not even realize it is a disease [10, 11].

## METHODOLOGY

A quasi- experimental design used in the present study with the application of a pretest/ post-test approach for the study group and control group after implementation of exercise program. Data collection was done at two times: baseline data (before any intervention was

provided to the study group) and 21 days after giving the exercise program (in the study group). The study started at 1 January 2023. The study conducted at The study in Thi Qar Governorate at Diabetes and Endocrinology Center, this center was the designated agency for data collection, because it is a specialized setting that comprise the cases which facilitated the process of data collection. The population of the current study are diabetic patients who were admitted or taking follow up attainment in Specialist Center for Endocrinology Diseases and Diabetes. Who was totally (65) Participants. A non-probability purposive sample

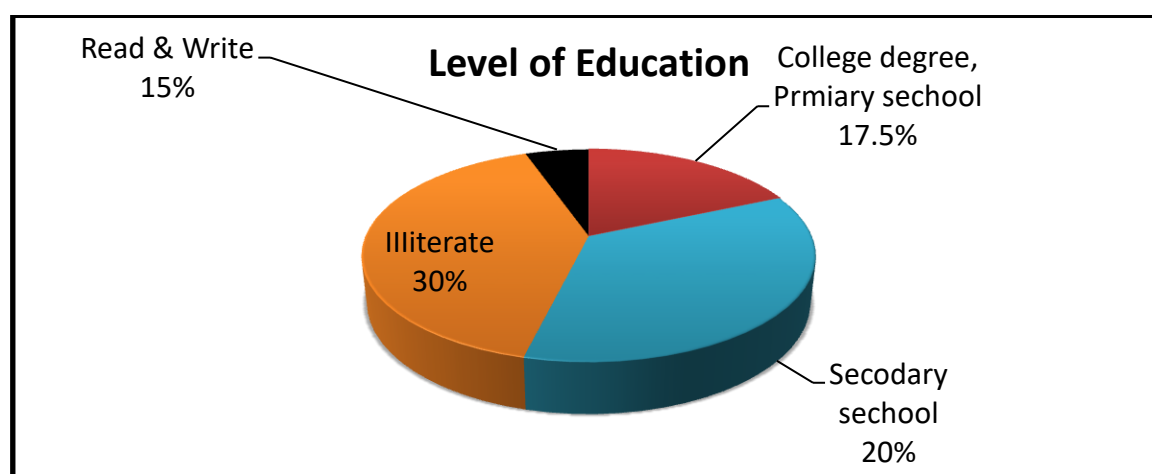
of diabetic patients who were admitted or taking follow up appointments in Specialist Center for Endocrinology Diseases and Diabetes. The sample divided into two groups a study group, control group. The study group was exposed to an exercise program, while the control group was not. Data collection performed through the use of the study instrument and the application of the exercise program. The Implementation was carried out in Specialist Center for Endocrinology Diseases and Diabetes in Thi Qar city, in the period from The First of December 2022 to 30<sup>th</sup> May 2023.

## Results

**Table 1-Distribution of the study samples (Study and control) according to the demographical Data**

Variables	Classification	Study Group		Control Group		Total	
		F	%	F	%	F	%
Age/years	20-30 years	2	10.0	2	10.0	4	10.0
	31-40 years	3	15.0	3	15.0	6	15.0
	41-50 years	8	40.0	8	40.0	16	40.0
	51-60 years	6	30.0	5	25.0	11	27.5
	61 years and more	1	5.0	2	10.0	3	7.5
	Total	20	100.0	20	100.0	40	100.0
	$\bar{x} \pm S.D$	30.5 $\pm$ 1.050		31.0 $\pm$ 1.119		30.7 $\pm$ 1.071	
Gender	Male	15	75.0	15	75.0	30	75.0
	Female	5	25.0	5	25.0	10	25.0
	Total	20	100.0	15	75.0	40	100.0

Freq.=Frequencies, %=Percentages,  $\bar{x} \pm S.D$  =Arithmetic Mean and Std. Dev. (S.D.)



**Fig. 1. level of Education among patients with DM2 they have OSA**

Most of the participants in the study group are Illiterate (n = 9; 45.0 %), followed by those who College degree (n=4; 20.0%), and from secondary and high school that are equal (n = 3; 15%) for each. While the same proportion in the control group, the most of them are Primary (n = 5; 25 %), followed by those who

graduated from secondary (n = 5; 25 %), and who Read and write (n=4; 20.0%) for each. Most of the participants in the study group are married (n = 16; 80.0 %), and it's the same proportion of the married participants in the control group (n = 15; 75.0 %). Most of participants in the study group are Employee (n=7;

35.0%), and almost the same in the control group which is (n=11; 55.0%).

**Table 2- Descriptive Statistic of Sample Clinical and Behavioral characteristics form of Both study and Control Group**

Variables	Classification	Study Group		Control Group		Total	
		F	%	F	%	F	%
Body Mass Index (BMI)	Normal weight = 18.5 - 24.9	3	15.0	3	15.0	6	15.0
	Overweight= 25 - 29.9	5	25.0	5	25.0	10	25.0
	Obese =30 - 34.9	12	60.0	12	60.0	24	60.0
	Total	20	100.0	20	100.0	40	100.0
Do you smoker	Currently	10	50.0	13	65.0	23	61.0
	Never	8	40.0	6	30.0	14	35.0
	Previous	2	10.0	1	5.00	3	4.00
	Total	20	100.0	20	100.0	40	100.0
Do you have another disease?	No	8	35.0	8	40.0	16	34.5
	Hypertension	11	55.0	12	60.0	23	57.5
	Asthma	1	5.0	0	0.00	1	8.0
	Total	20	100.0	20	100.0	40	100.0

**Table 3- Statistically Distribution Between the Two Period (Pre and Post-1Tests) for Patients' knowledge about Berlin questionnaire for the diagnosis of obstructive sleep apnea of the Study Sample (Study Group):**

No.	Items Related to knowledge about Berlin questionnaire	Positive Responses	Pre – test		Post -test	
			Frequency	Percent	Frequency	Percent
1	Do you snore?	Yes	20	100.0	20	90.9
		No			2	9.1
		I don't know				
2	Snore is	Slightly louder than breathing			16	72.7
		speech volume			3	18.2
		Louder than the voice of speech	11	55.0	1	9.1
		So loud it could be heard in the next room	9	45.0		
3	How often do you snore?	almost everyday	15	75.0		
		3-4 times a week	5	25.0		
		1-2 times a week				
		1-2 times a month			10	50.0
		Never or almost never			10	50.0
4	Does the sound of your snoring or snoring bother your husband or wife?	Yes	20	100.0	3	22.7
		No			17	77.3
		I don't know				
5	How often have you or someone noticed that you stopped breathing in your sleep?	almost everyday				
		3-4 times a week	7	35.0		
		1-2 times a week	9	45.0		
		1-2 times a month	4	20.0	4	27.3
		Never or almost never			16	72.7

6	How often do you feel tired or fatigued after you sleep?	almost everyday	20	100.0		
		3-4 times a week			1	13.6
		1-2 times a week				
		1-2 times a month			9	40.9
		Never or almost never			10	45.5
7	Do you feel drowsy while driving?	Yes	8	40.0	3	22.7
		No	8	40.0	17	77.3
		I don't know	4	20.0		
8	If yes, how often does this happen?	almost everyday				
		3-4 times a week	6	30.0		
		1-2 times a week	2	10.0		
		1-2 times a month			3	22.7
		Never or almost never	12	60.0	17	77.3
9	Do you suffer from high blood pressure?	Yes	14	70.0	16	72.7
		No	6	30.0	4	27.3
		I don't know				
10	A BMI of more than 30 kg/m2	Yes	12	60.0	10	50.0
		No	8	40.0	10	50.0

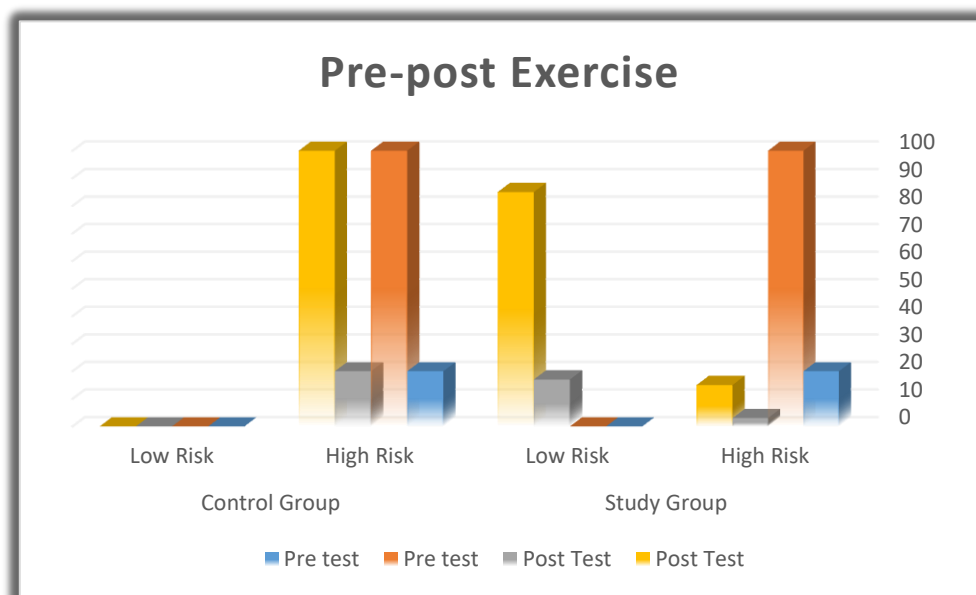
Any response that falls within the boundaries of the box is a correct response. Categories for scoring

Category 1 is favorable when two or more inquiries have favorable replies. 1-5?

Category 2 is favorable when two or more inquiries have favorable replies 6-8?

Category 3 has one response that is favorable 9-10?

Final outcomes A high risk of obstructive sleep apnea is indicated by more than two positive categories.



**Fig. 2. Summary Statistics of the OSA at Pre and Post Application of the Deep Breathing Exercise.**

## Discussion

Most affected age group is the one whose ages range from (41-50 years) and with regard to gender, men

were more than women, and this is consistent with most previous studies, as shown below.

These results are similar to the results obtained by Sabah and Shahad at the University of Baghdad - College of Nursing (2022) in their study which was aimed at knowing patients about therapeutic measures for diabetic foot for patients with type 2 diabetes, as the high percentage of age was from 40-49 years that equal to (46.7%) from study sample [12]. When health care is overwhelmed and individuals' access to health services is limited, this leads to an increase in disease and mortality in society [24]. The likelihood of developing OSA rises with age, probably as a result of the processes listed below: increased fat accumulation around the pharynx, decreased tissue elasticity, lengthened soft palate, and diminished respiratory chemoreceptor responses [13]. The prevailing educational level was illiterate its equal to (45%), because most of the complainants' ages ranged from 45-60 years. When we go back to this period of time, we notice that our country went through many wars and sieges that greatly affected the health and educational levels. These results are similar to the results obtained by Salman and Bakey at the University of Baghdad - College of Nursing (2021) in Their research, which aims to determine the percentage of anxiety in Patients with diabetic feet, as the high percentage of don't read and write was 47 participants that equal to (38%) from study sample [15]. As for the marital status, most of the participants were married and their percentage was (80%) because of their advanced age and because of the customs and traditions that exist in our country. The majority of the population gets married at the age of at most 24 years, and the second reason is that most of the participants are men. These results agree with the results of the study conducted by Aqeel and Mohammed at the University of Baghdad - College of Nursing (2022) which aimed at the effectiveness of the educational program for the early detection of complications associated with diabetes. Where the percentage of married person was the highest percentage of the participants in the study sample, equal to (18%) in both groups [16]. The results of table 2, we notice that the average BMI ( $30-34.9 \text{ Kg/m}^2$ ) and its percentage was (60%) of the sample's body. One of its reasons is the lack of a diet that limits the level of obesity in Iraq, especially in the southern governorates where foods rich in nutrients abound. A study conducted by Sadeq et al., (2022) the most dangerous factor for patients with type 2 diabetes is excess weight or obesity, and that the percentage is more than (89%), and the risk lies in what leads to increased insulin resistance in the body [17]. The majority of individuals who are sent to sleep laboratories for OSA therapy are they have

excessive body weight, which makes them the most significant risk factors for the condition. Clinically speaking, multiple sizable investigations have found a link between weight gain and a rising incidence and severity of OSA [18]. As for the state of smoking, the percentage of smokers in the study sample and the control group was (60%, 65%) respectively, according to what most studies have shown, that smoking is considered one of the risk factors for sleep apnea, as well as heart disease, diabetes, and blood vessels. In both groups, we notice that high blood pressure is dominant at a rate of (55%) in the study sample, and this is consistent with many researches, the latest of which was research conducted Iraq by Faleh and Sadeq (2022) from the University of Baghdad - College of Nursing, where hypertension was the most comorbidities in relation to their research. Which was concerned with the use of the Incentive spirometer before performing the open-heart surgery in order to prevent pulmonary complications after the operation. Upon observing the fifth table, we note that before applying the deep breathing exercises, the risk rate was (100%) in both groups, and after applying the exercises, we notice that there is a significant difference and improvement in the results, as the risk rate was equal to (15%) meaning that the improvement rate was equal to (85%) as the program continued for a period of time 6 weeks [20]. Study conducted in Iraq at the University of Baghdad - College of Nursing by researchers Alwan and Abd Mohsen (2022) as it was a comparative study between the effect of deep breathing exercises and chest physiotherapy on oxygen saturation for Covid 19 patients. According to the results of the research, there was an effective effect of deep breathing exercises on increasing the oxygen saturation of the participants from ( $83.3321 \pm 2.7653$ ) in first day before the application these program to ( $95.5430 \pm 1.38340$ ) in day five after deep breathing exercises of patients with Covid 19 at ( $P < 0.05$ ) [21]. Study concluded that the prevalence rate of OSA was equal to (3%) for women and (12%) for men, where we notice the large and clear difference in the incidence of the disease, which differs according to sex. The study showed that the relationship between age and OSA is a positive linear relationship, that is, the greater the age lead to the greater of severity and rates of OSA. The study showed that the reason for the high percentage of males is that according to the physiological anatomy of men, the pharynx is relatively long and elastic. As well as the lower part of the tongue contains a high amount of fat, and here appears the reason for the high incidence of men [22]. This corresponds to a study conducted by Gabish and Mohammed in their study,

which aimed at the effectiveness of the educational program for diabetic foot care, as the percentage of males was the highest percentage in the study sample and was equal to (60%) [23].

## CONCLUSION

1.The significant improvement and effective effect of the program, as it led to a reduction in sleep apnea cases in patients with diabetes, sleep quality, and the ability to exercise.

2.Training can play a major role in promoting health, especially since this type of intervention is a non-pharmacological intervention.

3. A comparative study is recommended between deep breathing exercises and the continuous positive air pressure device, with a larger sample, to find out which is more effective.

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