

# Effect of Sitting Breathing Exercises on Blood Glucose Level among Patients with Type 2 Diabetes Mellitus

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**Abstract:** there is a noticeable prevalence of type 2 diabetes in Egypt in adults. Traditionally; DM is controlled by dietary modifications, hypoglycemic medications, exercises program, patient education and follow up. Among exercise program to control hyperglycemia are breathing exercises which are simple, effective and economically costless practice. This study aims to: examine the effect of sitting breathing exercises on blood glucose level among patients with type 2 Diabetes Mellitus. Research Design: A quasi-experimental research design one group pre – posttest design was used in this study. Subjects: A purposive sample was used and included sixty patients with type 2 diabetes mellitus in inpatient medical unit of Damanhur National Medical Institute, El-Beheria governorate, Egypt, 2019. Tool: Two tools were used for data collection: Bio-Socio-demographic and clinical data questionnaire and Blood Glucose Level pre and post sitting breathing exercise questionnaire. Results showed that the mean PPG before and after intervention during the second and third visit was reduced less than first visit with statistical significance in both 2<sup>nd</sup> and 3<sup>rd</sup> visits. Conclusion: post prandial blood glucose level can be improved through practicing simple sitting breathing exercise. Recommendations: Provide record sheet to help patient monitor himself periodically and start in-services training program for nursing about applications of sitting breathing exercise.

**Keywords:** DM, breathing exercise, blood glucose level.

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## 1. INTRODUCTION

Diabetes Mellitus (DM) is one of the most prevalent diseases worldwide and continues to increase because of its common predisposing factors, chronicity and implications. Within the next 20 years, the number of people affected by this disease is expected to reach almost 600 million worldwide. The International Diabetes Federation (IDF) listed Egypt among the world top 10 countries in the number of patients with diabetes ( **Guariguata ,. et al 2014**) <sup>(1)</sup>. The prevalence of type 2 diabetes (T2D) in Egypt is around 15.6% of all adults aged 20 to 79 year( **International Diabetes Federation.( 2015)** <sup>(2)</sup>. Type 2 diabetes is accompanied by a host of risk factors including dyslipidemia, hypertension and cardiovascular disease, thus putting a severe burden on global health care systems ( **Long & Dagogo-Jack. (2011)** <sup>(3)</sup>.

Diabetes mellitus is a chronic metabolic disorder characterized by disturbances of carbohydrates, fat and protein metabolism due to absolute deficiency of insulin secretion or inadequate secretion and insulin resistance which in turn leads to chronic hyperglycemia **Olokoba., et al 2012** <sup>(4)</sup>. Common manifestations that accompanied hyperglycemia are polyuria, polydipsia, polyphagia, weight loss, itching and it has many complications such as poor wound healing, obesity

and long-term organ damage (kidneys, eyes, nerves and vascular structure) (**American Diabetes Association. (2013). (Roglic & Gojka, 2016)** <sup>(5,6)</sup>).

There are 3 major types of diabetes: Type 1 (insulin dependent diabetes mellitus) in which beta cells of Langerhans in pancreas does not produce insulin. Type 2 (non-insulin dependent diabetes mellitus) in which the body cells are resistant to the action of insulin that is being produced and over time the production of insulin progressively decreases. Type 3 (Gestational diabetes), it occurs during pregnancy and increases the risk of type 2 diabetes in the mother after delivery ( **American Diabetes Association, 2014**)<sup>(7)</sup>.

There are many blood glucose tests that are used to diagnose and follow up blood glucose level. The most common used tests are; Fasting blood sugar (FBS), Post Prandial blood Glucose Test (PPGT) and urine test for sugar and acetone. Glycosylated hemoglobin (HbA1c) is also used for follow up over period of months where the level of HbA1c >7 (**Oussama (2006), Deiss., et al 2006**) <sup>(8,9)</sup>. Some researchers have defined the fasting blood glucose concentration under normal conditions is greater than or equal to 126 mg/dL (7 mol/L) when a person has consumed no calories for a minimum of 8 hours for diabetic patients. The value of 2-hour blood glucose concentration is greater than or equal to 200 mg/dl (11.1 m.mol/L) during an oral glucose tolerance test (PPGT), while the random blood glucose concentration (any time of day with no regard to the latest meal) is lower than or equal to 200 mg/dL (11.1 m.mol/L) (**Gong ., et al 2018, Cheung & Moses 2018**). <sup>(10, 11)</sup>.

Traditionally; DM is controlled by dietary modifications, hypoglycemic medications, exercises program, patient education and follow up as illustrated by The United Kingdom prospective diabetes study (UKPDS), these elements mainly exercise is very affective among T2D as it improve circulation thus decrease insulin resistance which in turn improved glycemic control and decreasing the rates of different complications including retinopathy, nephropathy and neuropathy (**Srivastava., et al 2014**)<sup>(12)</sup>.

Among exercise program for diabetic patient to control hyperglycemia are breathing exercises which are simple, effective and economically costless practice that is used alongside with medical regimen and can be performed in sitting position for 30 minutes per day anywhere even at home(**Asiya., et al 2019**)<sup>(13)</sup>. When breathing exercises are performed regularly in T2D patients; it promote blood supply to all body parts, stimulate insulin secretions, enhancing insulin receptor expression on muscles leading to increase in the glucose uptake by muscles thus reduce blood glucose level and reduce insulin resistance, maintain average body weight, controls oxidative stress, control mood, reduce stress and depression and promote sleep (**Martarelli., et al 2011), Jyotsna, Viveka, 2012**)<sup>(14, 15)</sup>.

Slow sine (slow) wave breathing (around 6 breaths per minute) triggers parasympathetic nervous system (PNS) response which in turn improves oxygenation by expanding bronchioles pathways in the lungs. Also stimulation of PNS inhibits Sympathetic nervous system thereby reversing insulin resistance thus decreasing blood glucose levels (**Saper., et al 2010**)<sup>(16)</sup>. According to a study published in Indian Journal of Endocrinology and Metabolism (2014) **Jyotsna ., et al 2014**)<sup>(17)</sup>; its results showed that the effect of 6 months practice of breathing program on reducing blood glucose, improving quality of life and preventing progression of cardiac neuropathy.

Breathing exercises have effect on body weight, Body Mass Index (BMI) and waist-hip-ratio through diaphragmatic breathing fills the lungs with fresh oxygen thus improving oxygenation of body cells, which helps in burning excessive body fats thereby controlling body weight and BMI (**Liubaerjijin., et al 2016**)<sup>(18)</sup>. This effect has been published in a study results in the International Journal of Biomedical Research(2018) (**Dinesh., et al 2018**)<sup>(19)</sup>, where 60 days practice of breathing exercises and yoga asana can effectively reduce weight and body mass index.

Breathing exercises controls oxidative stress which is an imbalance between the free radicals and antioxidants. Oxidative stress is a trigger for elevated blood glucose level which induces inflammation and insulin resistance thus, leading to acceleration of short term and long term complication of diabetes **Vinetti ., et al 2015**)<sup>(20)</sup>. Studies have depicted that regular yoga asana practice and breathing exercises can increase level of antioxidants as glutathione, vitamin C and superoxide dismutase(**Sinha., et al 2007, Lim , Cheong, 2015**)<sup>(21, 22)</sup>. These antioxidants have various benefits including control blood glucose level and produce calming effect on mind thus relieve stress which in turn reduces oxidative stress. It also inhibits release of catecholamine inflammatory cytokines, rennin and pro-inflammatory factors which is responsible for increasing oxidative stress, blood pressure and insulin resistance (**Valko ., et al 2007**)<sup>(23)</sup>.

On the other hand, it reduces levels of stress inducing hormones such as adrenaline, nor-adrenaline and cortisol. In addition, it generates relaxation response by reducing lactic acid build-up in muscular tissue and increases production of serotonin and other positive endorphins thus enhancing mood peacefulness (Streeter, et al 2010)<sup>(24)</sup>. Moreover, it stimulates production of a sleep inducing hormone (melatonin) which improves hypothalamic pituitary adrenal axis and controlling sympathetic over activity which in turn decreases the risk of complications of DM (Surwit, et al 2002)<sup>(25)</sup>.

Autonomic nervous system dysfunction, poor heart, obesity and hypertension are co-related with insulin resistance. Breathing exercises have shown significant improvement in cardiac autonomic function with decreasing in heart rate and blood pressure. Central and peripheral nervous system damage which caused by diabetes can be improved by combination of breathing exercises and yoga asana. Also it can reverse conduction velocity of nerves affected by diabetes (Mustonen, et al 2005)<sup>(26)</sup>.

Lung dysfunction is a common complaint of diabetic patients and can cause insulin resistance which in turn increases blood glucose level (Gul, et al 2015)<sup>(27)</sup>. According to Journal of Stress Physiology and Biochemistry (2012) (Beutler, et al 2016)<sup>(28)</sup>; continuous practice of breathing exercises for 15 minutes for 3 months can increase lung volume including forced vital capacity, maximum voluntary ventilation, peak expiratory flow rate and forced expiratory volume which in turn prevents respiratory complications. The above mentioned aspects indicate that breathing exercises may promote significant improvement in several important body functions which subsequently will be very helpful in management of diabetes mellitus and control of its complications.

#### Significance of the study

Breathing exercise is not very common in the context of controlling DM in Egypt, that's why the researchers were interested to conduct a study on this topic in Egypt. Breathing exercises are easy, cost effective modality with no harmful effects for type-2 diabetic patients. These exercises can be practice at home without any cost and this may reduce dose and cost of using oral hypoglycemic drugs and insulin if used side by side with the medical regimen and lifestyle modifications, this may reduce the health expenditure on the management of diabetes. Therefore, the present study was carried out to evaluate the effect of Sitting Breathing Exercise on Blood Glucose Level among Diabetic Patients with Type 2 Diabetes Mellitus.

#### This study aims to:

Examine the effect of sitting breathing exercises on blood glucose level among patients with type 2 Diabetes Mellitus.

#### Research hypothesizes:

1. Type 2 Diabetes Mellitus patients who practicing sitting breathing exercises have more controlled blood glucose level after practicing these exercise
2. There is a significant difference before and after practicing sitting breathing exercises on blood glucose level among type 2 Diabetes Mellitus patients.

#### Research Design:

A quasi-experimental research design one group pre – posttest design was used in this study.

#### Setting:

The study was carried out in the inpatient medical unit of Damanhur National Medical Institute, El-Beheria governorate, Egypt. It is a general central hospital in the capital of El-Beheria governorate, Egypt. It was established to serve El-Beheria governorate and the nearby neighborhoods. It contains different medical and surgical specialties. It continued to develop to help in improving health care for all patients in the inpatient and the outpatient units. This National Medical Institute in Damanhur is the basic clinical training setting for training students of faculty of nursing, Damanhur University where they care of many diabetic patients with uncontrolled blood glucose level.

#### Subjects:

A purposive sample was used in the current study as well; a total number of 60 patients were recruited for the study from both sexes with type 2 diabetes mellitus, aged 20-60 years in the inpatient of medical unit who agreed to participate in this study. The sample size was calculated by statistical power analysis of patients' admitted to the medical unit in Damanhur National Medical Institute. Those patients were free from uncontrolled other medical conditions and able to communicate verbally and follow instructions.

## 2. SUBJECTS ESTIMATION METHOD

G power Program

Medium effect size =0.4

Power= 80%

Alpha error=5%

Minimum required sample size=52.

**Tool:** Two tools were used for data collection based on reviewing the related literature.

### **Tool I: Bio-Socio-demographic and clinical data questionnaire**

It consists of two parts.

**Part I: "Bio-Socio-demographic questionnaire";** to collect information about patients' age, sex, level of education, marital status and area of residence.

**Part II: "patient's Clinical data" which included;** Age at discovering diabetes, associated diseases, family history of diabetes, diabetic medications and exercise habit.

**Tool II: "Blood Glucose Level pre and post sitting breathing exercise"** .This tool was developed by the researchers after review of the relevant literature. It was used to assess improvement in blood glucose level after sitting breathing exercise, this tool was adapted from **Chaipanont, (2008)** <sup>(29)</sup> and they were modified by the researchers according to the Egyptian society.

### **Statistical analysis of the data:**

Data was fed to the computer and analyzed using IBM SPSS software package version 21.0 (Armonk, NY: IBM Corp). Quantitative data was described using number, percent, mean and standard deviation. Significance of the obtained results was judged at the 5% level. The used tests were:

- 1 - Paired t-test for significance of change (Pre-Post) test intervention in blood glucose levels each visit.
- 2- t-test for Equality of Means.

### **Method**

The study was implemented according to the following steps:

#### ▪ **Administrative phase:**

1. An official approval was obtained to conduct the study from the Dean of the Faculty of Nursing, Damanhur University and from the director of Damanhur National Medical Institute and the medical and nursing units.

#### ▪ **Preparation phase:**

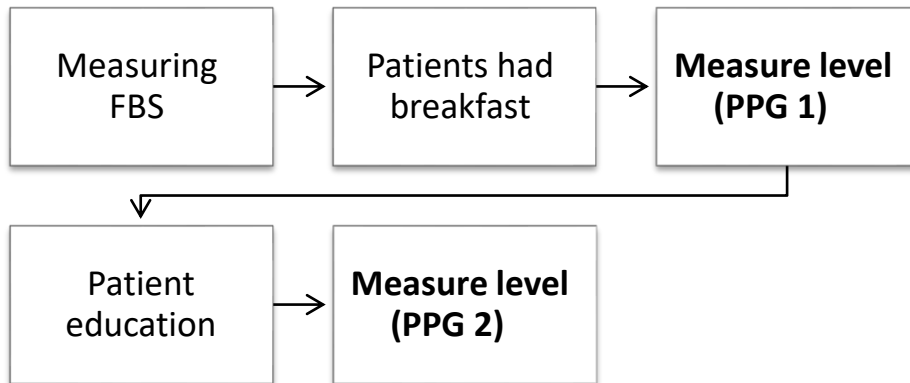
1. Content validity of the tool was tested by a jury of 5 experts in field of Medical Surgical Nursing field, physician and physical therapist and consequently, the necessary modifications were done.
2. Pilot study was conducted on six diabetic patients (10% of the sample and out of the sample) by the researchers to test the clarity and applicability of the tool. Accordingly, the needed modifications were done.

#### ▪ **Data Collection:**

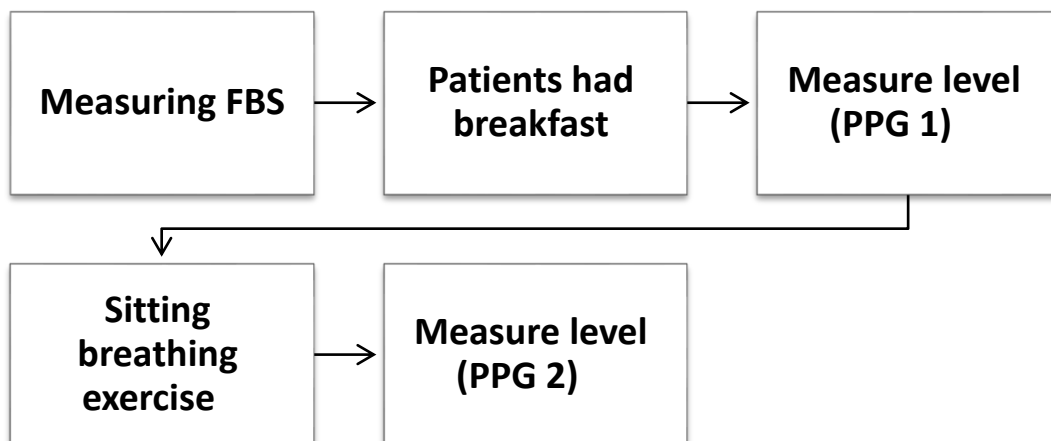
1. Each patient was interviewed individually to collect Bio-socio-demographic and clinical data at the beginning of the first visit .
2. Data was collected through interview questionnaires after orientation for patients about the purpose of the study.
3. Each questionnaire took approximately from 10 to 15 minutes/patient. The researchers collect the data to avoid any misconceptions.

▪ **Implementation phase:**

1. The Sitting breathing exercises technique was illustrated by the researchers after review of relevant literature.
2. At the first visit, the participants' baseline Fasting Blood Glucose (FBG) was checked then they had their breakfast. After half an hour, the researchers took a blood sample for pre-intervention post prandial glucose level (PPG1) and then the health care team educated the participants about routine diabetes self-care. Half an hour later, the researchers took another blood sample for post-intervention to measure post prandial plasma glucose (PPG2).
3. The activity of the first visit was as the following:



4. Sitting breathing exercise is performed as the following:
  - a. The patient takes slow deep breathing (inhalation) while in sitting position.
  - b. At the same time the patient count on his fingers hand 1,2,3, 4 and 5 then slow expiration then hold the breath for moment while counting 1, 2, and 3 on his fingers hand after that a slow long exhale while counting 1, 2, 3, 4 and 5 on his fingers hand until the end of the respiratory( cycle).
5. Each patient was trained by the researchers for practicing breathing exercise in sitting position for 10, 15, 20 and 30 minutes to determine their ability to practice breathing exercise independently.
6. At the second and third visit; each patient was instructed by the researchers to practice breathing exercise in a sitting position then the participants' blood glucose level was checked the same as in the first visit. But Instead of routine diabetes care education, the participants practicing breathing exercises and then their blood glucose level was checked.
7. The participants repeated the breathing exercise for 30 cycles which lasted about 30 minute.
8. The activity of the second and third visit was as the following:



9. After completion of data collection, the necessary statistical analysis was done.

**Ethical Considerations:**

- Participants were informed about the purpose of the study and given clear explanation and informed consent was obtained from each one of them before starting the study.
- Participation was on voluntary basis and every patient has the right to refuse to share or withdraw from the study at any time without any negative drawbacks.
- Data anonymity, confidentiality and privacy were assured.

**Limitation of the study:**

- Some patients fall sleep during intervention and discontinue the exercise; the researcher repeat the intervention for those patients and complete the cycle as illustrated.

**3. RESULTS**

The study was carried out to evaluate the effect of sitting breathing exercises on blood glucose level among sixty patients with type 2 Diabetes Mellitus in the inpatient medical unit of the National Medical Institute in Damanhur, El-Beheria governorate 2019.

**Table (1): Distribution of the studied patients according to Socio-Demographic data**

Socio-demographic data	Total (n = 60)	
	No.	%
<b>Sex</b>		
Male	34	56.7
Female	26	43.3
<b>Age /(years)</b>	Mean± SD. 60.0±10.22	
	t-4.384- p- value=0.000	
<b>Education level</b>		
1. Illiterate	15	25.0%
2. Primary	19	31.7%
3. Diploma	20	33.3%
4. University	6	10.0%
<b>Marital status</b>		
1. Single	7	11.7%
2. Married	46	76.7%
3. Divorced	5	8.3%
4. Widowed	2	3.3%
<b>Area of residence</b>		
1. Rural	45	75.0%
2. Urban	15	25%
<b>Do any exercise at home</b>		
1. Yes	6	10.0
2. No	54	90.0

**Table (1):** Illustrates distribution of the studied patients according to Socio-Demographic data. It can be deduced that, more than half of the studied patients (56.7 %) were male and their age had the mean± SD (60.0±10.22). Regarding level of education, about one third (31.7% and 33.3% respectively) of the studied patients were having primary level and diploma while, the lowest percentage (10 %) was university level. In relation to marital status, more than three quarters (76.7%) of the studied patients were married and 11.7% were single. Regarding area of residence; 75.0% of patients were from rural areas and most of them (90%) didn't practice any exercise at home.

**Table (2): Distribution of the studied patients regarding clinical data**

Clinical data	Total (n = 60)	
	No.	%
<b>Age at discovering diabetes</b>	Mean± SD 57.42±7.477	
<b>Associated diseases</b>		
Yes	15	25.0
No	45	75.0
<b>Family history with diabetes</b>		
Yes	17	28.3
No	43	71.7
<b>Current Medications</b>		
Insulin	25	41.7
Oral	27	45.0
Both	8	13.3

**Table (2):** Represents distribution of the studied patients regarding clinical data, this table shows that mean age of having diabetes was (57.42). Regarding associated diseases three quarters (75.0%) of the studied patients had not any associated disease. And most of them (71.7%) had no family history of diabetes. The table also shows that (45%) of patients uses oral medication as a current medication for diabetes and (41%) use insulin, while (13.3%) of them combined insulin and oral hypoglycemic medication for treatment of diabetes.

**Table (3): Comparison between mean differences of blood glucose levels (pre and post sitting breathing exercise).**

Visits	Blood glucose test	Mean	Std. Deviation	Test of significant Paired t- test	P- value
Visit 1	FBG	248.65	54.677	7.551	0.391
	PPG (pre)	253.37	67.655		
	PPG (post)	305.70	41.799		
Visit 2	FBG	207.37	39.915	8.420	0.000**
	PPG (pre)	290.62	41.209		
	PPG (post)	239.13	44.482		
Visit 3	FBG	213.70	41.985	7.031	0.000**
	PPG (pre)	259.10	63.982		
	PPG (post)	229.03	47.187		

**Table (3):** Represents comparison between mean differences of blood glucose levels among studied patients before and after intervention, this table clears that at the first visit, the mean fasting blood sugar was (248.65) and mean post prandial blood glucose levels, pre and post-diabetes care education (routine care) was recorded as baselines (253.37, 305.70 respectively) and there was no statistical significant differences. In the second visit, the mean fasting blood sugar was (207.37), while the mean pre and post prandial blood glucose levels were (290.62, 239.13) respectively with statistical significant (P=0.000\*\*).

In the third visit, fasting blood sugar was (213.70) and the mean pre and post prandial plasma glucose levels were (259.10, 229.03) respectively with statistical significant (P=0.000\*\*).

**Table (4): Comparison between means and standard deviation of Pre-Post blood glucose levels in each visit.**

Means & Std. Deviation	PPG pre - post		
	1 <sup>st</sup> visit	2 <sup>nd</sup> visit	3 <sup>rd</sup> visit
Mean	57.050	51.483	30.067
Std. Deviation	58.524	47.360	33.123
t- test	7.551	8.420	7.031
Sig. (2-tailed)	0.391	0.000**	0.000**

**Table (4):** Shows comparison between means and standard deviation differences of Pre-Post blood glucose level in each visit. The table illustrated that the mean PPG before and after intervention during the second and third visit (51.483, 30.067 respectively) was reduced less than first visit (57.050) with statistical significance in both 2<sup>nd</sup> and 3<sup>rd</sup> visits (P= 0.000\*\*).

#### 4. DISCUSSION

Diabetes mellitus (DM) is one of the common chronic diseases that may leads to many complications that affect quality of life if not managed correctly. These complications may include retinopathy, nephropathy and neuropathy. Associated diseases such as hypertension, dyslipidemia, coronary heart diseases, obesity and metabolic disorders may also occur. The costs of medical care for DM and its complications are therefore very high (Wilson et al., 2013)<sup>(30)</sup>.

Breathing exercise appears to be beneficial to the whole population and in particularly, individuals with type 2 diabetes, as many studies which examined the effects of breathing exercise, meditation, yoga and other relaxation techniques on patients with type 2 diabetes, they showed hypoglycemic effect, decreased blood pressure and reduced cholesterol levels and enhance cardiovascular function . (Innes, & Selfe, 2016), (Yesmin et al. 2017)<sup>(31,32)</sup>. So, those of low socioeconomic status and those with lower levels of education are more likely to be participating breathing exercise as it is easy costless intervention for managing diabetes and reducing its complication.

The present study revealed that more than half of participated patients were male, married with mean age 60 years. Three quarter of them were lived in rural area, about one third of them had primary or diploma education. Most of the patients didn't practice any exercise at home, this could be justified by their lack of knowledge about the holistic disease management and lack of receiving continuous health education to cope with the disease. Also, their level of education and residence may affect their knowledge about the disease and its relation to exercise. These results were in harmony with the study of Chaiopanont, 2008<sup>(29)</sup> who studied on (Hypoglycemic effect of sitting breathing meditation exercise on type 2 diabetes )found in his study that the mean age was 63.1 years and most of the patients didn't practice exercise. Primary school level of education was in about three quarters of them.

The present study illustrated that the mean age when discovering diabetes was 57.42 years and most of them have no associated disease and without any family history of diabetes mellitus. This may be due to the heredity factor in type 2 DM is not common. These results were in agreement with Chaiopanont, 2008<sup>(29)</sup> who found in his study that, three quarter of patients had no family history of diabetes. On the other hand less than half of them treated with oral diabetic medication or insulin while only about tenth of then treated by both of them. These results may be due to that those patients were starting their treatment with oral medication and because the level of blood glucose increases or not controlled to the average level which may be due to lack of follow up as in rural areas, so those patients need to shift from oral medication to insulin or take both in the advanced conditions to control their blood glucose level.

The present study clears that there is statistical significant differences with reduction of post prandial blood glucose level (PPG2 and PPG3) in the second and third visit. This could be justified as those patients practicing breathing exercise with relaxed manner for half an hour, this may improve ventilation which in turn improve blood supply to all body parts, stimulate insulin secretions, enhancing insulin receptor expression on muscles leading to increase in the glucose uptake by muscles and thus reduce their post prandial blood glucose level. Also breathing exercise may reduce levels of stress inducing hormones such as adrenaline, nor-adrenaline and cortisol which in turn reduce blood glucose level .This result was in consistent with Wilson, et al. (2013)<sup>(30)</sup> who stated that blood glucose at 30 minutes for those practicing a relaxation breathing exercise was reduced which may have been due to improved insulin sensitivity and increased insulin secretion. Also, in accordance with ( Dominik et al., 2017)<sup>(33)</sup> who mentioned that stress can affect blood glucose levels in type 2 diabetes by the effect of stress hormones that include adrenaline and cortisol, relaxation with breathing exercises decrease effects of these hormones as well as it has direct effects on the nerves controlling the pancreas, thus promotes insulin release (Medina et al. 2017), (Sinha et al. 2018), (Buso et al. 2018)<sup>(34,35,36)</sup>.

**Regarding the first hypothesis,** type 2 Diabetes Mellitus patients who practicing sitting breathing exercises have more controlled postprandial blood glucose level after practicing this exercise. As regard pre and post-diabetes care education (routine care) there was no statistical significant difference in both postprandial blood glucose level (PPG1) and (PPG2)



first visit. While there was statistical significant difference after practicing sitting breathing exercise in both postprandial blood glucose level (PPG2) and (PPG3) in the second and third visits.

**As regard the second hypothesis**, there is a significant difference before and after performing sitting breathing exercises on blood glucose level among type 2 Diabetes Mellitus patients in second and third visit. The mean PPG before and after intervention during the second and third visit were reduced less than first visit.

## 5. CONCLUSION

According to the findings of the present study, it can be concluded that post prandial blood glucose level can be improved through practicing simple sitting breathing exercise. There was a significant difference between PPG1 and PPG2 and PPG3 tested before and after intervention during the second and third visit in which mean and standard deviation were 51.483+ 47.360 mg/dl and 30.067+ 33.123 mg/dl respectively.

## 6. RECOMMENDATIONS

**Based on the previous finding the following recommendations are suggested:**

- Develop strategies that increase self-efficacy and motivation of patients with type 2 diabetes toward practicing deep breathing exercise regularly at home with follow up plan with the medical staff. Strategies as self-monitoring and documentation sheet to follow for blood glucose level
- Education of patient is the cornerstone for continuing application of breathing exercise program in a supportive environment.
- Provide record sheet to help patient monitor himself periodically.
- Providing pamphlets, audio or videotapes of the exercises to take home.

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