

Anthropometric Assessment after Slow Breathing Exercise in Type 2 Diabetic Male Patients

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Abstract

Background: Yoga based slow breathing exercise (SBE) has several beneficial effects on physical and mental health.

Objectives: To observe the impact of slow breathing exercise on anthropometric parameters in male patients with type 2 diabetes mellitus (T2DM).

Methods: This prospective interventional study was conducted on sixty (60) male diagnosed T2DM patients aged 45-55 years with duration of disease 5-10 years enrolled from Out Patients Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University, and Dhaka. By simple random technique the subjects were divided into control group (n=30) and study group (n=30). Yoga based slow breathing exercise was practiced by the study group for 30 minutes twice daily for 3 months. Height, weight, body mass index (BMI), waist circumference, hip circumference and waist/hip ratio were assessed at the start of the study and after 3 months. Independent sample and paired t-test were used for statistical analysis and $p < 0.05$ was considered as statistical significance.

Results: In this study the value of mean BMI was significantly ($p < 0.05$) reduced after 3 months of SBE. Again, all the anthropometric parameters were significantly ($p > 0.05$) increased after 3 months in the group who did not undergo SBE.

Conclusion: Anthropometric parameters were improved after slow breathing exercise for 3 months.

Keywords: Type 2 Diabetes Mellitus, Anthropometric Parameters, Slow Breathing Exercise

Introduction

Diabetes mellitus is a metabolic disorder due to absolute or relative deficiency of insulin [1]. Physical inactivity, sedentary lifestyle leads to obesity, which is one of predisposing factor of type 2 diabetes mellitus [2]. It is observed that obesity leads to several metabolic complications like dyslipidemia and type 2 diabetes mellitus [3].

The word yoga comes from Sanskrit word that harmonizes mind, body and spirit. It is observed that yoga is a non-pharmacological tool, which may improve some diseases such as hypertension, cardiovascular diseases and diabetes mellitus. Now-a-days stress is one of health hazard that leads to develop alteration of metabolic parameters. Yoga has been reported to reduce stress and thus improves autonomic functions and metabolic disorders. It has been observed that yoga has effect in inhibition of weight gain, decrement of cholesterol, reduction of blood pressure and improvement of

psychological stress [4-5].

Some researchers noticed that yoga based techniques reduce body mass index (BMI), blood glucose, lipid profile and blood pressure [6]. Another group of researchers also found significant decrease of BMI and serum cholesterol level after yoga practice in obese youth [3].

Among several types of yoga, breathing exercise (pranayama) is preferred because it can practice at home in sitting posture without any cost [2]. On the basis of these backgrounds, this study was designed to observe the effects of SBE on some anthropometric parameters in type 2 diabetes mellitus male patients.

Methods

This prospective interventional study was carried out in the department of Physiology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from March'15 to February'16. Institutional Review Board of BSMMU approved the protocol of this

study. Sixty (60) diagnosed male patients with T2DM aged from 45-55 years with fasting blood glucose 5.9-8.9 mmol/L were recruited by random sampling from Out Patients Department, Endocrinology, and BSMMU. All patients were treated with oral antihyperglycaemic drugs and lifestyle management (diet and exercise). All the patients did not have any history of chronic illness such as renal & heart disease, neurological, psychological and thyroid disorders and smoking.

Sixty patients were divided into two groups. Each subgroup included 30 patients. One subgroup underwent yoga based slow breathing exercise for 3 months. Another subgroup who did not perform SBE was taken as control. The goal, benefits and detailed procedure of the yoga based slow breathing exercise were explained to them who agreed to take slow breathing exercise. Informed written consent was taken from all the subjects. A thorough physical examination of all subjects was done and all information was recorded in a prefixed questionnaire.

Height

Weighing scale with height rod (Seca, Germany) was used to measure the height of all the participants. The participants were instructed to stand in erect posture with flat feet, without shoe, legs straight. Heels, hip, shoulder blades and occiput pressing against the vertical bar, then the slider was brought down from above on the top of the head pressing hair. The arrow indicates the accurate height in centimeters.

Weight

Weighing scale with height rod (Seca, Germany) was used to record weight in kg for all participants. The accuracy of the machine was checked regularly with other weighing machines. All the participants were requested to wear light clothing without footwear. They were asked to stand in erect posture on the footplate.

Body Mass Index (BMI)

BMI is used as indicator of nutritional status of an individual. Quelet formula is used to calculate $BMI = \text{weight in kg} / (\text{height in m})^2$.

Waist- hip circumference ratio (WHR)

Waist circumference was measured at the midpoint between lower costal margin and iliac crest during holding breath at expiration in centimeters by measuring tape. It was carefully observed that the tape was placed horizontally at the back. The hip circumference was measured at level of gluteal region at its maximum girth in centimeters. WHR was calculated by dividing the waist circumference with hip circumference.

Mid upper arm circumference

Mid-Upper Arm Circumference (MUAC) is used for the assessment of nutritional status. MUAC is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromium).

Breathing exercise

After recording Baseline parameters, the steps of alternate nostril breathing form of SBE [7] were explained to them. Seven consecutive

days training on SBE was given to them. The study group was advised to perform SBE for 30 minutes twice daily for three months.

Statistical analysis

Data for all parameters before and after the intervention were recorded in computer Microsoft Excel. Changes in the study group were analyzed by Student's paired t-test. Comparison between the study group and control group was analyzed by Independent sample t-test. The statistical analysis was done at 5% level of significance and $p < 0.05$ was considered as statistically significance.

Results

Comparison of general characteristics and baseline anthropometric parameters between the control and study group is given in Table I and Table II. It was observed that there was no significant ($p > 0.05$) difference in baseline values of all parameters in both group.

Table I: General characteristics in different groups (n=60)

Parameters	Control (n=30)	Study group (n=30)
Age (years)	49.9±0.49	49.86±0.56 δ
Pulse rate (beats/min)	81.47±0.55	82.69±0.84 δ
SBP(mm of Hg)	129±1.13	129.14±1.41 δ
DBP(mm of Hg)	79.83±0.66	80.34±0.89 δ

SBP=systolic blood pressure, DBP=diastolic blood pressure.

Data were expressed as Mean±SE. ***= $p < 0.001$, **= $p < 0.01$, *= $p < 0.05$.

δ= Independent sample 't' test

Table II: The values of baseline anthropometric parameters in different groups (n=60)

Parameters	Control (n=30)	Study group (n=30)
BMI	23.44±0.26	23.29±0.23 δ
WHR	0.94±0.01	0.95±0.01 δ
MUAC	28.29±0.37	28.42±0.32 δ

BMI=body mass index, WHR=waist hip ratio, MUAC=mid upper arm circumference.

Data were expressed as Mean±SE. ***= $p < 0.001$, **= $p < 0.01$, *= $p < 0.05$.

δ= Independent sample 't' test

Table III: Effects of SBE on anthropometric parameters in study group (n=30)

Parameters	pre-exercise	post-exercise
BMI	23.29±0.23	23.14±0.21*ε
WHR	0.95±0.01	0.95±0.02 ε
MUAC	28.42±0.32	28.41±0.32 ε

ε= paired sample 't' test.

Data were expressed as Mean±SE. ***= $p < 0.001$, **= $p < 0.01$, *= $p < 0.05$.

Table IV: Changes of anthropometric parameters in control after 3 months (n=30)

Parameters	Baseline	after 3 months
BMI	23.44±0.26	24.28±0.19* ε
WHR	0.94±0.01	0.96±0.01** ε
MUAC	28.29±0.37	28.69±0.31** ε
MUAC	28.29±0.37	28.69±0.31** ε

ε= paired sample 't' test.

Data were expressed as Mean±SE. ***=p<0.001, **=p<0.01, *=p<0.05.

Table III shows that significant reduction (*=p<0.05) of BMI in type 2 diabetes mellitus patients after 3 months of SBE. Again no significant (p>0.05) change was observed in the values of WHR and MUAC.

Table IV shows that all the parameters were significantly (p<0.05) increased in the group of diabetes mellitus patients who did not perform yoga based slow breathing exercise.

Discussion

In the present study, there was a significant decrease in BMI value in the group who regularly practiced SBE for 3 months. Similar findings were reported by some other group of researchers after yoga-based exercise both in healthy subjects and diseased patients [8-13].

Again there was no significant (p>=0.05) changes observe in the values of WHR and MUAC in the study group after 3 months of SBE. Dinesh et al. also observed non-significant change of WHR in healthy subjects after yoga. The exact mechanism of action of SBE on reduction of weight and BMI are still unknown. The possible mechanism is yoga helps better metabolism by regulating the digestive process [14].

Yoga based exercise reduced stress and anxiety. So patients feel a state of well-being and relaxed. Yoga also altered adrenocortical activity and bring hormonal balance [15]. In SBE inhalation and breath holding steps stretches the lung tissue which firing the inhibitory signals and hyperpolarization current within neuronal and non-neuronal tissue. By this mechanism, synchronization of neural tissue shift autonomic balance towards parasympathetic dominance and improves metabolism in this study [16].

After 3 months of intervention the value of BMI, WHR and MUAC were significantly (p>0.05) increased in non-practiced group. Anthropometric parameters give us the mirror image about physical fitness of an individual. Yoga based techniques helps to maintain physical fitness as well as mental soundness.

Conclusion

Yoga based slow breathing exercise has advantageous effects upon both physical and psychological state in healthy as well as diseased individuals. Regular practice of slow breathing exercise can be advised along with medical treatment in obese patients suffering from type 2 diabetes mellitus.

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