

RESEARCH ARTICLE

Effect of physical therapy on blood glyceimic parameters in women with Type 2 diabetes mellitus

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ABSTRACT

Background: Diabetes mellitus is a group of metabolic complications designated by chronic hyperglycemia due to insulin resistance. Regular exercises are playing a major role in the prevention and therapeutic treatment of diabetes, its related health hazards and control of insulin resistance. **Aims and Objectives:** To evaluate the effect of physical exercise on physiological, anthropological, and biochemical parameters in women with type 2 diabetes mellitus. **Materials and Methods:** A total of 160 women with type 2 diabetes were recruited from the Outpatient Department of Maheshwara Hospital. Based on age, weight, and body mass index (BMI), participants were divided into four groups with 40 participants in each such as Group 1 exposed to yoga, Group 2 undergone with physical exercises, Group 3 undergone with walking, and Group 4 considered as control group. All patients were trained by experts and subjected to regular practice for 6 months. Blood pressure, blood glucose, hemoglobin A1c (HbA1c), BMI, and hip circumference were measured in all the patients. **Results:** Yogic exercises have significant effect on hip circumference and HbA1c among the three groups. Physical exercises would be highly effective in controlling body weight, BMI, blood pressure, pulse rate, and blood sugar level. Walking group showed significant impact on variables such as weight, BMI, and blood sugar. **Conclusion:** The walking and physical exercise groups are found to be better than yoga group in improving variables such as weight, BMI, and blood sugar. Yoga group has a good impact on HbA1c and hip circumference.


KEY WORDS: Type 2 Diabetes Mellitus; Physical Exercise; Yoga; Walking; Blood Glucose

INTRODUCTION

Diabetes mellitus is a metabolic disorder which turned into major health hazard among globally. Evidences showing that physical activities have tremendous impact on increased vigor, cardiorespiratory fitness, lipid profile, blood pressure, and maintenance of weight loss.^[1]

Physical exercise in type 2 diabetes mellitus can improve insulin sensitivity, associated molecular abnormalities, and lower average blood glucose concentrations. Long-term physical activity was associated with effective intervention to modulate glyceimic control, insulin resistance, lipid profile, reduced body weight, visceral fat accumulation, and decreases the risk of developing hypertension.^[2-6] Regular aerobic exercises are good for diabetic and obese patients which helps in weight reduction.^[7] A meta-analysis by Boule *et al.* found that exercise training has an impact on blood glucose control and percentage of hemoglobin A1c (HbA1c).^[8]

Yoga is the most inexpensive physical activity which may enhance metabolic rate, reduce the stress, and alter hypothalamopituitary adrenal axis which acts as neural

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mediators of hyperglycemia.^[9,10] Malhotra *et al.* in his study stated that performing yogic asanas decreases blood glucose levels, insulin levels, and hip circumference.

A few observational studies suggested that there is an inverse association between physical activity and Type 2 diabetes, but most of these studies focused on vigorous activities or physical activity of various intensities combined.^[11,12] With the above literature background, the present study was designed to assess the effect of physical exercise on physiological, anthropological, and biochemical parameters in Type 2 diabetes mellitus women.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology, Maheshwara Medical College and Hospital, Patancheru, Hyderabad, from October 2016 to June 2017. A total of 160 women with Type 2 diabetes were recruited from the Outpatient Department of Maheshwara Hospital. Based on age, weight, body mass index (BMI), and other health conditions, participants were divided into four groups with 40 participants in each such as Group 1 exposed to yoga, Group 2 undergone with physical exercises, Group 3 undergone with walking, and Group 4 considered as control group. Duration of the study was 6 months and training program was divided into three phases.

Anthropometric parameters such as height, weight and hip circumference, BMI, blood glucose levels in fasting, and postprandial; HbA1c and cardiovascular parameters such as pulse rate, systolic blood pressure (SBP), and diastolic blood pressure (DBP) were measured.

Group 1 (yoga group): In the initial phase, warm up for 5 min, followed by yogasana training for 15 min including Surya Namaskara and ended by warm down. In the second phase, duration increased to 30 min and time duration increased to 60–70 min in the third phase. The selected asanas were followed, Padmasana, Bhujangasana Paschimottanasana, Ardha Matsyendrasana, Dhanurasana, Tadasana, Salabhasana, and Savasana.

Group 2 (physical exercises): In the initial phase, exercise session was 15 min, gradually increased to 30 min in the second phase, and finally ended with 45 min in closing phase.

Group 3 (walking group): In the initial phase, all the participants were subjected to walk 15 min, increased duration up to 45 min in the second phase, and in the final phase, it was increased up to 60 min.

Group 4 (control group): Type 2 diabetic patients do not expose to any physical exercises, yoga, and walking.

RESULTS

This study consists of 160 Type 2 diabetes patients, recruited from the Outpatient Department of Maheshwara Hospital. Based on training undergoing, all the participants were divided into four groups, i.e., Yoga group, physical exercise group, walking group, and control group. All participants were between age group 36 and 48 years. The findings of the present study are depicted in Tables 1-3 and Figure 1.

DISCUSSION

The present study was undertaken to evaluate the effect of physical exercise on physiological, anthropological, and biochemical parameters in Type 2 diabetes mellitus women. In the present study, weight and hip circumference was significantly decreased before and after exposing exercise therapy, especially in yoga group [Table 1]. Studies revealed that prevention of obesity in adults may prevent half of the cases of Type 2 diabetes. It is estimated that in 60–90% of cases, disease development and progression occurring by their overweight and obesity.^[13] There was a significant decrease in BMI in diabetic patients before and after treatment in walking and yoga group [Table 1]. A study by Braunstein stated that BMI and physical inactivity are independent predictors of incident diabetes.^[14]

Kumagai *et al.* in his study proposed that insulin resistance was suggested to be independently associated with the resting DBP and SBP response to standardized exercise intensity in Type 2 diabetic patients.^[15] In the present study, physical exercise has a tremendous impact on SBP, DBP, and pulse rate [Table 2].

Yogic practice has a good impact on hemoglobin (Hb) A1c levels [Figure 1]. A study by Mikus *et al.* stated that short-term daily exercise reduces post prandial plasma glucose (PPG) and glycemia variability in Type 2 diabetes patients.^[16] In the present study, blood glucose levels fasting plasma sugar

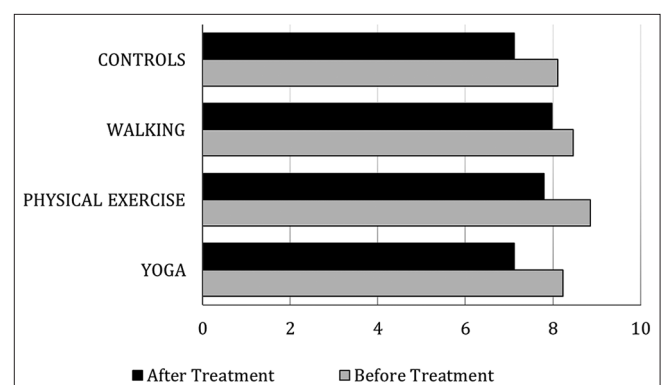


Figure 1: Mean value of HbA1c in Type 2 diabetes patients before and after treatment

Table 1: Mean values of weight, hip circumference, and BMI in Type 2 diabetes patients before and after various exercise therapies

Group	Weight (in kg)		Hip circumference		BMI	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Yoga	67.66±13.29	64.54±13.03	94.10±11.30	90.95±10.47	29.84±5.41	27.71±4.70
Physical exercise	61.48±7.66	57.07±6.88	88.45±9.71	83.40±9.59	26.66±3.72	24.71±3.38
Walking	67.32±11.45	61.78±10.25	95.15±8.52	87.85±9.24	28.59±4.24	26.27±3.71
Controls	64.88±10.42	63.91±10.48	92.35±9.91	91.30±9.66	28.16±3.96	27.73±3.95

BMI: Body mass index

Table 2: Mean values of SBP, DBP, and pulse rate in Type 2 diabetes patients before and after various exercise therapies

Group	SBP		DBP		Pulse rate	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Yoga	118.9±10.8	118.2±5.42	68.4±7.75	66.2±3.38	81.56±2.10	81.36±1.73
Physical exercise	114.8±9.73	115.3±8.22	66.2±9.98	65.7±6.68	80.98±2.56	80.84±1.45
Walking	115.2±7.78	114.7±9.90	66.8±9.83	66.0±9.67	81.48±2.42	80.38±1.27
Controls	115.6±7.3	115.0±10.39	66.5±10.02	66.3±10.54	81.92±2.20	81.08±1.36

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3: Mean values of FBG and PBG in type 2 diabetes patients before and after various exercise therapies

Group	FPG		Postprandial blood glucose (PPG)	
	Before treatment	After treatment	Before treatment	After treatment
Yoga	141.6±19.75	110.5±16.69	228.3±22.20	143.26±20.02
Physical exercise	148.62±22.17	115.3±16.25	231.7±28.0	151.23±18.24
Walking	145.19±21.20	105±17.02	218±28.91	148.5±18.35
Controls	140.02±24.18	118.2±18.56	199.3±32.17	143.8±16.70

FBG: Fasting blood glucose, PBG: Postprandial glucose

(FPG) and PPG were controlled significantly in physical exercise, walking groups after exposing to physical therapy [Table 3]. Boulé *et al.* found intense of exercise showed remarkable improvements in blood glucose and reductions in HbA1c.^[17] A study by Connie *et al.* stated that increased physical activity significantly related to lower fasting insulin and greater insulin sensitivity. In children, there is a reduction in PPG and HbA1c levels after exposing to systematic diet and physical activity.^[18]

CONCLUSION

Regular and systematic practice of walking, physical exercise, and yogic practices increase insulin sensitivity and produce positive changes on anthropological and physiological and biochemical variables of diabetic patients. With the results of present study, it is concluded that the walking group is found to be better than both yogic and physical exercise groups in improving variables such as weight, BMI, and blood sugar. Yoga group has a good impact on HbA1c and hip circumference.

REFERENCES

- Teixeira-Lemos E, Nunes S, Teixeira F, Reis F. Regular physical exercise training assists in preventing Type 2 diabetes development: Focus on its antioxidant and anti-inflammatory properties. *Cardiovasc Diabetol* 2011;10:12.
- Fenicchia LM, Kanaley JA, Azevedo JL Jr, Miller CS, Weinstock RS, Carhart RL, *et al.* Influence of resistance exercise training on glucose control in women with Type 2 diabetes. *Metabolism* 2004;53:284-9.
- Rice B, Janssen I, Hudson R, Ross R. Effects of aerobic or resistance exercise and/or diet on glucose tolerance and plasma insulin levels in obese men. *Diabetes Care* 1999;22:684-91.
- Ross R, Dagnone D, Jones PJ, Smith H, Paddags A, Hudson R, *et al.* Reduction in obesity and related comorbid conditions after diet-induced weight loss or exercise-induced weight loss in men. A randomized, controlled trial. *Ann Intern Med* 2000;133:92-103.
- Department of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General. Atlanta, GA: Department of Health and Human Services; 1996.
- Irwin ML, Yasui Y, Ulrich CM, Bowen D, Rudolph RE, Schwartz RS, *et al.* Effect of exercise on total and intra-abdominal body fat in postmenopausal women: A randomized

- controlled trial. *JAMA* 2003;289:323-30.
7. Zanuso S, Jimenez A, Pugliese G, Corigliano G, Balducci S. Exercise for the management of Type 2 diabetes: A review of the evidence. *Acta Diabetol* 2010;47:15-22.
 8. Adamo KB, Sigal RJ, Williams K, Kenny G, Prud'homme D, Tesson F, *et al.* Influence of pro12Ala peroxisome proliferator-activated receptor Gamma2 polymorphism on glucose response to exercise training in Type 2 diabetes. *Diabetologia* 2005;48:1503-9.
 9. Jyotsna VP. Prediabetes and Type 2 diabetes mellitus: Evidence for effect of yoga. *Indian J Endocrinol Metab* 2014;18:745-9.
 10. Mahajan AS. Role of yoga in hormonal homeostasis. *Int J Clin Exp Physiol* 2014;1:173-8.
 11. Manson JE, Nathan DM, Krolewski AS, Stampfer MJ, Willett WC, Hennekens CH, *et al.* A prospective study of exercise and incidence of diabetes among US male physicians. *JAMA* 1992;268:63-7.
 12. Meisinger C, Löwel H, Thorand B, Döring A. Leisure time physical activity and the risk of Type 2 diabetes in men and women from the general population. The MONICA/KORA augsburg cohort study. *Diabetologia* 2005;48:27-34.
 13. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult treatment panel III). *JAMA* 2001;285:2486-97.
 14. Braunstein JB. Lifestyle activity. Exercise for the masses. *Diabetes Forecast* 2004;57:31-2, 34.
 15. Bijlani RL, Vempati RP, Yadav RK, Ray RB, Gupta V, Sharma R, *et al.* A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. *J Altern Complement Med* 2005;11:267-74.
 16. Mikus CR, Oberlin DJ, Libla J, Boyle LJ, Thyfault JP. Glycaemic control is improved by 7 days of aerobic exercise training in patients with Type 2 diabetes. *Diabetologia* 2012;55:1417-23.
 17. Boulé NG, Kenny GP, Haddad E, Wells GA, Sigal RJ. Meta-analysis of the effect of structured exercise training on cardiorespiratory fitness in Type 2 diabetes mellitus. *Diabetologia* 2003;46:1071-81.
 18. Connie LT, Arlette S, Melinda SS, Alfonso V. Effects of physical activity on diabetes management and lowering risk for Type 2 diabetes. *Am J Health Educ* 2009;40:286-90.

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