J. Dhaka National Med. Coll. Hos. 2022; 28 (02): 07-10

Original Article

Effects of Physical Exercise on Urinary Albumin Level in Type 2 Diabetic Male with Microalbuminuria

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Abstract

Background: Microalbuminuria is a microvascular complication of diabetes mellitus. Physical exercise has effects on urinary albumin level in type 2 diabetic male with microalbuminuria.

Objective: To assess the effects of physical exercise on urinary albumin level in type 2 diabetic male with microalbuminuria.

Methods: This prospective interventional study was carried out in the Department of Physiology, Sir Salimullah Medical College (SSMC), Dhaka between 1st July 2015 and 30th June 2016. Total thirty (30) type 2 diabetic male with newly diagnosed microalbuminuria (urinary albumin-creatinine ratio 30-299 mg/g), age ranged from 45 to 60 years were selected by purposive consecutive sampling from Out Patient Department of Endocrinology, Sir Salimullah Medical College and Mitford Hospital, Dhaka. Previously prescribed oral hypoglycemic and antihypertensive drugs were maintained, and the participants were instructed not to change their diet habits during the study period. All the participants were asked to perform moderate aerobic physical exercise, consisting of 30-40 minutes walking/day, 5 days/week, at an intensity of 50-70% of maximum heart rate (HRmax) for a total duration of 90 days. All the subjects were studied two times: before performing physical exercise i.e. on day-1 (Phase A) and after performing physical exercise for 90 days i.e. on day-91 (Phase B). Urinary albumin level was estimated by immunometric assay method. For statistical analysis, paired sample "t" test was performed.

Results: In this study, urinary albumin level was significantly ($p<0.001$) decreased in type 2 diabetic male with microalbuminuria after performing physical exercise for 90 days in comparison to those of their pre exercise values.

Conclusion: From this study it may be concluded that, physical exercise significantly decreased urinary albumin level in type 2 diabetic male with microalbuminuria.

Keywords: Physical exercise, Type 2 Diabetes Mellitus, Microalbuminuria, Urinary albumin.

Introduction

Diabetes mellitus is a syndrome of impaired carbohydrate, fat and protein metabolism caused by either lack of insulin secretion or decreased sensitivity of the tissues to insulin. Type 2 diabetes, also called non-insulin-dependent diabetes mellitus, is initially caused by decreased sensitivity of target tissues to the metabolic effect of insulin.[1] Diabetes mellitus is characterized by hyperglycaemia. Symptoms of hyperglycemia include thirst, polyuria, weight loss, fatigue, sometimes with polyphagia and blurred vision.[2]

The World Health Organization reports on diabetes prevalence alarmed that diabetes is a serious threat to entire population of the world. Microalbuminuria is one of the most common diabetic microvascular complications. It is the earliest sign of diabetic nephropathy.[3] It is a sign of abnormal vascular function and increased vascular permeability.[4] The prevalence of microalbuminuria is 4.6 % in diabetes mellitus patients.[5] Microalbuminuria may progress to overt nephropathy which is the most common cause of end-stage renal disease and an important cause of morbidity and mortality.

Exercise is planned, structured and repetitive bodily movement performed to improve or maintain one or more components of physical fitness.[6] Physical activity may be associated with less albuminuria and it has protective effects on the vascular endothelium.[7] Exercise reduces albuminuria in diabetic rats. Reduction in albuminuria and maintained podocyte numbers, with improvements in oxidative damage and chronic inflammation, might be the beneficial effects of exercise in diabetic kidney disease.[8]

A small study revealed that microalbuminuria was improved after 6 months of aerobic exercise.[9] In another human study, after one year follow up urinary albumin level were decreased in the physical activity groups. They also found a trend toward reducing albuminuria in the macroalbuminuria group.[10]

There is little information about the effects of exercise on urinary albumin level in type 2 diabetes mellitus patients with microalbuminuria. So, this study has been designed to observe the effects of physical exercise on type 2 diabetic male with microalbuminuria. It is expected that the findings of this study will be beneficial for type 2 diabetic male with microalbuminuria as well as for the physician of faculty of endocrinology for better management of microalbuminuria.

Methods

This prospective interventional study was carried out in the Department of Physiology, Sir Salimullah Medical College (SSMC), Dhaka between 1st July 2015 and 30th June 2016. Total thirty (30) type 2 diabetic male with newly diagnosed microalbuminuria (urinary albumin-creatinine ratio 30-299 mg/g), age ranged from 45 to 60 years were selected by purposive consecutive sampling from Out Patient Department of Endocrinology, Sir Salimullah Medical College and Mitford Hospital, Dhaka. Ethical permission was taken from the Institutional Ethics Committee (IEC) of Sir Salimullah Medical College. After proper counseling, the aim, objectives, risk and the procedure of the study were explained in details to the subjects. Written informed consent was taken from the subjects. Then their general information (personal, medical, family and occupation) and data were collected and all the information were recorded in a prefixed questionnaire. Previously prescribed oral hypoglycemic and antihypertensive drugs were maintained, and the participants were instructed not to change their diet habits during the study period. All the participants were asked to perform moderate aerobic physical exercise, consisting of 30-40 minutes walking/day, 5 days/week, at an intensity of 50-70% of maximum heart rate (HRmax) for a total duration of 90 days. All the subjects were studied two times: before performing physical exercise i.e. on day-1 (Phase A) and after performing physical exercise for 90 days i.e. on day-91 (Phase B). Five (5) ml of first morning urine sample was collected in sterile glass test tube from each participant for estimation of urinary albumin level. Urinary albumin level was estimated by immunometric assay method in the laboratory of the Department of Biochemistry, Sir Salimullah Medical College, Dhaka. Statistical analysis was done by paired sample 't' test. P value ≤ 0.05 was accepted as level of significance. Statistical analysis was performed by using a computer based statistical program SPSS version-22.

Results

In this study, the mean (±SD) urinary albumin level was significantly ($p<0.001$) decreased in phase B in comparison to that of phase A (Table I and Figure-I).

Table-I: Urinary albumin in type 2 diabetic male with microalbuminuria (n=30)

Parameters	Phase-A	Phase-B	P-value
Urinary albumin (mg/L)	63.23±5.09 (55-71)	42.93±5.63 (33-50)	0.000***

Phase A: Before performing physical exercise (Control, on day-1)

Phase B: After performing physical exercise (Study, on day-91)

***= Significant at P<0.001; n= Total number of subjects

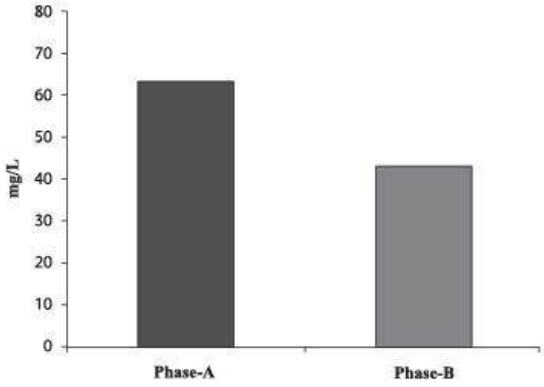

Fig.-I: Urinary albumin Comparison among groups

Discussion

In the present study, mean urinary albumin level was significantly ($p<0.001$) decreased in the subjects after performing physical exercise in comparison to that of before exercise value. This finding is in agreement with others.[11-16] Whereas, some investigators found non-significantly decreased urinary albumin level after performing aerobic exercise.[17]

Though exact mechanisms of these effects could not be revealed directly from the present study, several researchers of different countries proposed various suggestions on these aspects, which might be cause of our present findings. It has been suggested that exercise improves the indices of endothelial function.[18] Again, exercise causes improvement of oxidative damage of the tissue and inflammation, and maintains podocyte numbers. Moreover, exercise induced withdrawal of efferent sympathetic vasoconstrictor activity to kidney contribute to decrease urinary albumin excretion.[15]

Conclusion

From this study it may be concluded that, physical exercise significantly decreased urinary albumin level in type 2 diabetic male with microalbuminuria. Although, further study is needed to elucidate the exact mechanism responsible for these effects.

Acknowledgement

The Authors acknowledge the department of Biochemistry, Sir Salimullah Medical College, Dhaka, for their kind cooperation to carry out the laboratory investigations and also thankful to the study subjects for their active and enthusiastic participation.

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