



Original Article

## A Study on the Effectiveness of Aerobic Exercise in Type II Non-Insulin-Dependent Diabetes Mellitus

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### ABSTRACT

**Background:** Type II Non-Insulin Dependent Diabetes Mellitus (NIDDM) is a common metabolic disorder characterised by chronic hyperglycemia and insulin resistance. Lifestyle modification, particularly regular physical activity, plays an important role in managing diabetes.

**Objective:** To evaluate the effectiveness of aerobic exercise in improving glycemic control among patients with Type II Non-Insulin Dependent Diabetes Mellitus.

**Materials and Methods:** This prospective interventional study was conducted at Jhansi district of Uttar Pradesh from January 2025 to November 2025. A total of 100 patients diagnosed with Type II diabetes mellitus were included in the study. Participants followed a structured aerobic exercise program of moderate-intensity activities, such as brisk walking and cycling, for 30–45 minutes per day, five days per week, over 12 weeks. Baseline and post-intervention parameters, including fasting blood glucose (FBG), post-prandial blood glucose (PPBG), glycated haemoglobin (HbA1c), body weight, and BMI, were recorded and compared.

**Results:** The study showed significant reductions in fasting blood glucose, postprandial blood glucose, and HbA1c following the aerobic exercise program. A decrease in body weight and BMI was also observed among the participants.

**Conclusion:** Regular aerobic exercise significantly improves glycemic control and helps reduce body weight in patients with Type II Non-Insulin Dependent Diabetes Mellitus. Incorporating aerobic exercise into a daily routine is an effective and cost-effective strategy for managing diabetes.

**Keywords:** Type II Diabetes Mellitus, Aerobic Exercise, Glycemic Control, HbA1c, Lifestyle Modification.

### INTRODUCTION

Diabetes mellitus is one of the most common chronic metabolic disorders worldwide and represents a major public health challenge. It is characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Among the different types of diabetes, Type II Diabetes Mellitus (T2DM), also known as non-insulin dependent diabetes mellitus (NIDDM), accounts for nearly 90–95% of all diabetes cases globally. The condition is closely associated with insulin resistance, obesity, sedentary lifestyle, and genetic predisposition (1).

The prevalence of Type II diabetes has been increasing rapidly over the past few decades, particularly in developing countries such as India. Urbanization, lifestyle changes, physical inactivity, and unhealthy dietary habits are major contributors to this rising trend. India is often referred to as the “diabetes capital of the world” due to the large number of people affected by this disease (2). According to the International Diabetes Federation, millions of adults worldwide are living with diabetes, and the number is expected to increase significantly in the coming years (3).

Type II diabetes is associated with several long-term complications including cardiovascular disease, neuropathy, nephropathy, and retinopathy. These complications significantly affect the quality of life and increase morbidity and

mortality among affected individuals. Therefore, effective management strategies are essential to control blood glucose levels and prevent complications (4).

The management of Type II diabetes includes pharmacological treatment along with lifestyle modifications such as diet control, weight management, and regular physical activity. Among lifestyle interventions, aerobic exercise plays a crucial role in improving glucose metabolism and insulin sensitivity. Regular aerobic activities such as brisk walking, jogging, cycling, and swimming help in lowering blood glucose levels and improving overall metabolic health (5).

Aerobic exercise improves glucose uptake by skeletal muscles, enhances insulin sensitivity, and helps reduce body weight and body fat. It also contributes to better cardiovascular fitness and improved lipid profile in patients with Type II diabetes (6). Studies have shown that individuals who engage in regular physical activity have better glycemic control and a lower risk of diabetes-related complications compared to sedentary individuals (7).

Furthermore, exercise has been shown to reduce glycated hemoglobin (HbA1c) levels, which is an important indicator of long-term glycemic control. Even moderate-intensity aerobic exercise performed regularly can significantly improve metabolic parameters in diabetic patients (8). Therefore, incorporating aerobic exercise into daily routine is considered an essential component in the management of Type II diabetes.

Despite the well-established benefits of physical activity, many patients with Type II diabetes remain physically inactive due to lack of awareness, motivation, or proper guidance. Hence, it is important to evaluate the effectiveness of structured aerobic exercise programs in improving glycemic control among diabetic patients (9).

The present study was conducted to assess the effectiveness of aerobic exercise in patients with Type II non-insulin dependent diabetes mellitus. The study aimed to evaluate the impact of regular aerobic exercise on blood glucose levels, glycated haemoglobin, and body mass index among diabetic patients.

## **MATERIALS AND METHODS**

### **Study Design and Setting**

This study was a prospective interventional study conducted at Jhansi district of Uttar Pradesh to evaluate the effectiveness of aerobic exercise in patients with Type II Non-Insulin Dependent Diabetes Mellitus. The study was carried out over a period of **11 months from January 2025 to November 2025**.

### **Study Population and Sample Size**

A total of **100 patients** diagnosed with Type II Non-Insulin Dependent Diabetes Mellitus were included in the study. Participants were selected from patients attending the outpatient department and those admitted to the associated hospital of Jhansi district.

### **Inclusion Criteria**

1. Patients diagnosed with **Type II Non-Insulin Dependent Diabetes Mellitus**.
2. Age group **30–65 years**.
3. Patients willing to participate in the study and provide informed consent.
4. Patients on stable oral hypoglycemic medications for at least three months prior to enrollment.

### **Exclusion Criteria**

4. Patients with **Type I diabetes mellitus** or insulin-dependent diabetes.
5. Patients with severe diabetic complications such as advanced nephropathy, retinopathy, or neuropathy.
6. Patients with cardiovascular diseases, severe hypertension, or physical disabilities preventing exercise.
7. Pregnant women and patients unwilling to participate in the exercise program.

### **Study Procedure**

After obtaining informed consent, demographic details such as age, gender, duration of diabetes, body weight, and body mass index (BMI) were recorded. Baseline clinical and biochemical parameters, including fasting blood glucose (FBG), postprandial blood glucose (PPBG), and glycated haemoglobin (HbA1c), were measured.

Participants were instructed to follow a structured aerobic exercise program, which included activities such as brisk walking, light jogging, and cycling. The exercise regimen consisted of 30–45 minutes of aerobic exercise per day, five days per week, for duration of 12 weeks. The intensity of exercise was maintained at a moderate level under supervision initially, and participants were advised to continue the program regularly.

All participants continued their routine diet and prescribed oral hypoglycemic medications during the study period.

### Follow-Up and Outcome Measures

Participants were monitored periodically during the study. After completion of the exercise intervention, clinical and biochemical parameters, including FBG, PPBG, HbA1c, body weight, and BMI, were reassessed and compared with baseline values to determine the effectiveness of aerobic exercise.

### Statistical Analysis

Data collected were entered into a Microsoft Excel sheet and analysed using appropriate statistical methods. Quantitative variables were expressed as mean and standard deviation. Pre- and post-intervention values were compared using the paired t-test, and a p-value <0.05 was considered statistically significant.

### Ethical Considerations

Written informed consent was obtained from all participants prior to inclusion in the study, and confidentiality of patient information was strictly maintained throughout the study.

## RESULTS AND OBSERVATIONS

A total of 100 patients with Type II Non-Insulin Dependent Diabetes Mellitus were included in the study. All participants completed the aerobic exercise program and follow-up assessments. The results were analysed to determine the effect of aerobic exercise on glycemic control and anthropometric parameters.

**Table 1: Age Distribution of Study Participants (n = 100)**

Age Group (Years)	Number of Patients	Percentage (%)
30–40	18	18%
41–50	32	32%
51–60	35	35%
61–65	15	15%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Observation:** Most patients (35%) belonged to the 51–60 years age group.

**Table 2: Gender Distribution of Study Participants**

Gender	Number of Patients	Percentage (%)
Male	58	58%
Female	42	42%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Observation:** Male patients (58%) were slightly more than female patients (42%).

**Table 3: Duration of Diabetes Among Participants**

Duration of Diabetes	Number of Patients	Percentage (%)
< 5 Years	40	40%
5–10 Years	38	38%
>10 Years	22	22%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Observation:** Majority of patients (40%) had diabetes for less than 5 years.

**Table 4: Comparison of Mean Biochemical Parameters Before and After Aerobic Exercise**

Parameter	Before Exercise (Mean ± SD)	After Exercise (Mean ± SD)	p-value
Fasting Blood Glucose (mg/dl)	162.5 ± 18.4	132.6 ± 15.2	<0.05
Post-Prandial Blood Glucose (mg/dl)	245.8 ± 26.3	198.4 ± 20.7	<0.05
HbA1c (%)	8.6 ± 0.9	7.4 ± 0.7	<0.05

**Observation:** There was a statistically significant reduction in fasting blood glucose, post-prandial blood glucose, and HbA1c levels after the aerobic exercise program.

**Table 5: Comparison of Anthropometric Parameters Before and After Exercise**

Parameter	Before Exercise (Mean ± SD)	After Exercise (Mean ± SD)
Body Weight (kg)	74.2 ± 8.5	70.8 ± 7.9
BMI (kg/m <sup>2</sup> )	28.1 ± 2.6	26.7 ± 2.3

**Observation:** A reduction in body weight and BMI was observed after completion of the aerobic exercise program.

## DISCUSSION

Type II Non-Insulin Dependent Diabetes Mellitus (NIDDM) is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance and impaired insulin secretion. Lifestyle modification, particularly regular

physical activity, plays a crucial role in the management of diabetes. The present study was conducted to evaluate the effectiveness of aerobic exercise in improving glycemic control among patients with Type II diabetes mellitus.

In the present study, the majority of patients belonged to the 51–60 years age group (35%), followed by 41–50 years. This finding is consistent with previous studies which reported that Type II diabetes is more prevalent in middle-aged and older adults due to increasing insulin resistance and reduced physical activity with age (10). Similar age distribution has been reported in epidemiological studies conducted in developing countries where the burden of diabetes is rising rapidly.

Gender distribution in the present study showed that male patients (58%) were slightly higher than female patients (42%). This observation is comparable to other studies which have reported a higher prevalence of diabetes among men, possibly due to differences in lifestyle factors, occupational stress, and physical inactivity (11).

The results of the present study demonstrated a significant reduction in fasting blood glucose, post-prandial blood glucose, and HbA1c levels after the aerobic exercise program. These findings support the role of regular aerobic exercise as an effective non-pharmacological intervention in the management of Type II diabetes. Aerobic exercise increases glucose uptake by skeletal muscles through insulin-independent mechanisms and improves overall insulin sensitivity (12).

In this study, the mean fasting blood glucose level decreased from 162.5 mg/dl before exercise to 132.6 mg/dl after the intervention, while the post-prandial blood glucose level decreased from 245.8 mg/dl to 198.4 mg/dl. These results are consistent with the findings of Boulé et al., who reported that structured aerobic exercise significantly improves glycemic control in patients with Type II diabetes (6).

Similarly, a notable reduction in HbA1c levels from 8.6% to 7.4% was observed in the present study. HbA1c is an important marker of long-term glycemic control, and even a small reduction in HbA1c can significantly reduce the risk of diabetes-related complications. Umpierre et al. reported that structured exercise programs can significantly reduce HbA1c levels and improve metabolic outcomes in diabetic patients (8).

The study also observed a reduction in body weight and body mass index (BMI) following regular aerobic exercise. Weight reduction is an important factor in improving insulin sensitivity and reducing insulin resistance in patients with Type II diabetes (13). Regular aerobic activities such as brisk walking and cycling help in increasing energy expenditure and promoting weight loss.

Physical activity has also been shown to improve cardiovascular fitness, lipid metabolism, and overall metabolic health. Colberg et al. emphasized that aerobic exercise not only improves glycemic control but also reduces the risk of cardiovascular complications, which are the leading cause of mortality in diabetic patients (5).

The findings of the present study highlight the importance of incorporating regular aerobic exercise as part of the routine management of Type II diabetes mellitus. Exercise programs are simple, cost-effective, and can significantly improve the quality of life of diabetic patients. However, patient education and motivation are essential to ensure adherence to regular physical activity.

Overall, the results of this study support the existing evidence that aerobic exercise plays a significant role in improving glycemic control and reducing body weight in patients with Type II Non-Insulin Dependent Diabetes Mellitus. Therefore, healthcare providers should encourage diabetic patients to adopt regular aerobic exercise as an important component of diabetes management.

## CONCLUSION

The present study demonstrated that regular aerobic exercise significantly improves glycemic control in patients with Type II Non-Insulin Dependent Diabetes Mellitus. A reduction in fasting blood glucose, post-prandial blood glucose, HbA1c levels, body weight, and BMI was observed after the exercise intervention.

Therefore, aerobic exercise is an effective and cost-effective adjunct to medical therapy and should be encouraged as an important component of lifestyle modification in the management of Type II diabetes mellitus.

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