

Effects Of Brisk Walking Versus Nordic Walking on Blood Glucose Level Among Type 2 Diabetes Mellitus

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ABSTRACT OBJECTIVE:

The main purpose of the study is to compare the effectiveness of Brisk walking versus Nordic walking on blood glucose levels among Type 2 Diabetes Mellitus.

BACKGROUND:

DIABETES MELLITUS TYPE 2:

Due to population growth, ageing, urbanisation, and increasing prevalence of obesity and physical inactivity, leads to the increase in the number of people with diabetes mellitus.

On estimation with the prevalence of diabetes at a higher rate, which reduces the quality of life, in order to reduce the effects of diabetes, brisk walking and Nordic walking will be implemented as a management for the people with type 2 diabetes mellitus.

METHODOLOGY: This study is a pre and post-comparative type. 20 subjects were randomly selected. The study setting is in the Outpatient Physiotherapy Department, ACS Medical College and hospital. The Study duration is about 8 weeks. The inclusion criteria include Subjects with no respiratory disorder and cardiovascular diseases in the age group of 40-50 years. The exclusion criteria were uncooperative Subject, recent surgeries, Subjects unwilling to participate in the program.

PROCEDURE: In this study, 20 type-2 diabetes mellitus patients has been included based on the selection criteria and they were randomly divided into 2 groups. Group A which is composed of 10 patients underwent for brisk walking and group B, which is composed of 10 patients, underwent for the Nordic walking. At the end of the interventions both groups were assessed for post-test values of blood glucose level

RESULT: On comparing the post-test mean values of HbA1c level and Borg's Scale score between Group A (Brisk walking) and Group B (Nordic walking) respectively, showed a significant difference. Hence the post-test mean values of HbA1c level and Borg's scale score showed that Group B (Nordic Walking) is more effective than Group A (Brisk Walking); the alternate hypothesis is accepted. Hence, the Group A and Group B showed significant differences in post-test mean value of HbA1c level and Borg's scale score, the null hypothesis is rejected.

KEYWORDS: Type 2 Diabetes Mellitus, Brisk walking, Nordic walking, blood glucose level, Blood pressure

How to cite this article: Kumar RK, Aravind S. Effects of Brisk Walking Versus Nordic Walking on Blood Glucose Level Among Type 2 Diabetes Mellitus. *Int J Drug Deliv Technol.* 2026;16(18s): 42-49. DOI: 10.25258/ijddt.16.18s.54.

INTRODUCTION

Type 2 Diabetes mellitus is an adult onset and non-insulin dependent Insulin resistance- insulin do not bind with the special receptor on cell surface. Impaired insulin secretion- insulin secreting glands release irregular amount of insulin^[1].

Type 2 DM combination of insulin resistance and Beta cell dysfunction. Due to population growth, aging, urbanization and increasing prevalence of obesity and physical inactivity leads to the increase the number of people with diabetes mellitus. The primary cause is excessive body weight and lack of regular exercise^[2] On estimation with the prevalence of diabetes at a higher rate which reduces the quality of life in order to reduce the effects of diabetes the brisk walking and the Nordic walking will be implemented as a management for the people with type 2 diabetes mellitus^[3].

Approximately 50% of all glucose use occurs in the brain, which is insulin- independent and becomes saturated at a plasma glucose concentration of approximately 40 mg/dL [10]. Another 25% of glucose disposal occurs in the splanchnic area (liver plus gastrointestinal tissues), which is also insulin-independent. The remaining 25% of glucose use in the post absorptive state takes place in insulin- dependent tissues, primarily muscle, and to a lesser extent adipose tissue. Basal glucose use, approximately 2.0 mg/kg/min, is precisely matched by the rate of endogenous glucose production. Approximately 85% of endogenous glucose production is derived from the liver, and the remaining 15% is produced by the kidney. Glycogenolysis and gluconeogenesis contribute equally to the basal rate of hepatic glucose production^[4].

Diabetes mellitus is a metabolic disorder resulting

from defective insulin secretion, insulin action, or both. A consequence of this is chronic hyperglycaemia (that is elevated levels of plasma glucose) with disturbances of carbohydrate, fat and protein metabolism. Long-term complications of diabetes mellitus include retinopathy, nephropathy and neuropathy and increased risk of cardiovascular disease [5].

Exercise is recognized as a cornerstone for T2DM prevention and treatment due to its ability to regulate blood sugar levels, with minimal undesired side effects. Along with glycemic control, exercise has a large number of benefits, such as improving aerobic capacity, muscular strength, body composition and endothelial function [6].

Recent evidence suggests that a combination of aerobic and resistance training (combined exercise) is more beneficial than either training modality alone. It is postulated that while aerobic exercise enhances insulin sensitivity, resistance training improves blood glucose uptake by increasing muscle mass and Glut-4 expression, and that these mechanisms appear to be synergistic [7].

Walking is an excellent tool for controlling the type 2 diabetes mellitus and improving the health of people with diabetes. Brisk walking and Nordic walking will be implemented to find the effects in lowering the blood glucose level. Brisk walking is 100 steps per minute or 3.5 miles or hour on a treadmill and can benefit your physical, mental and emotional health. Techniques of brisk walking is keep your head up, looking forward, not down. Relax your neck, shoulders, and back, but don't slouch or lean forward. Keep your back straight, and engage your abdominal muscles. Walk with a steady gait, rolling your foot from heel to toe [8].

Loosely swing your arms or pump your arms a little with each stride. Nordic walking is a type of walking with the help of long poles resembling ski sticks. More than 50% of patients with diabetes require 2 or more medications to achieve glycemic control. Clinical practice guidelines should ideally support patients and providers in making these complicated decisions, reduce inappropriate variation in treatment, and ultimately improve the quality of diabetes care [9].
and lowers fat mass [10].

Walking is a popular and readily accessible form of moderate intensity physical activity, suitable for almost all the sedentary population. Epidemiological studies show that regular walking, independent of participation in more vigorous exercise, is associated with a lower risk of coronary events and type II diabetes [11].

Structured exercise intervention programmes have been reported to be as effective as pharmaceutical strategies in improving glycemic control and/or cardiovascular risk profile in type 2 diabetes patients. In general, exercise intervention studies implement endurance and resistance type exercise, supervised by a physical therapist [12].

Brisk walking exercise has been proposed as a less expensive alternative, with a good clinical outcome when patients are frequently counselled by motivated, supportive physicians. However, brisk walking programs mainly consist of endurance type exercise activities [13]. As combined endurance and resistance type exercise training has been reported to be of greater clinical benefit, it is conceivable that the long-term efficacy of a medical fitness programme is greater than that of a brisk walking programme [14].

Hence the blood glucose level can be controlled among the type 2 diabetes patients by using brisk walking and Nordic walking.

METHODOLOGY

1. STUDY DESIGN:

- Comparative design

2. STUDY TYPE:

- This study was a Pre and post-comparative type.

3. STUDY DURATION:

- This study is about 8 weeks.

4. STUDY SETTING:

- Outpatient Physiotherapy Department, ACS Medical College.

5. STUDY SAMPLE SIZE:

- 20 Subjects

6. SAMPLING METHOD:

- Random sampling

7. INCLUSION CRITERIA:

- 40 – 50 Years of age.
- Both male and female.
- Normal blood pressure.
- Patient with no respiratory disorder and cardiovascular diseases.

8. EXCLUSION CRITERIA:

- Non-co-operative patient.
- Migraine.
- Nausea in daily life.
- Hypertension.
- Carcinoma
- Physical weakness.

9. MATERIALS USED:

- Nordic Walking Pole.

10. OUTCOME SCALE:

- HbA1c.
- Blood pressure will be checked before and after intervention.

Procedure

Based on the inclusion criteria, 20 subjects were selected randomly. Approval and clearance from the institutional ethics committee was obtained before starting the study. The selected 20 subjects were given a brief details about the study, purpose, and the written informed consent was obtained from them in the prescribed format in English.

Subject recruitment:

This study was done at Out patient Physiotherapy Department, ACS Medical College and hospital . The subjects of age group between 40-50 years were recruited and subjects were excluded according to the exclusion criteria.

Base line data:

Assessment sheet which includes name, age, gender, occupation, along with subject’s medical history were collected.

The subjects were then allocated into two Groups (Group A and Group B). Group A will be trained with **BRISK WALKING**.

Group B will be trained with **NORDIC WALKING**.

Procedure:

Before starting the treatment protocol both group subjects were tested for HbA1c level and Borg’s test to ensure the activity intensity. Subjects those who fulfil inclusion criteria for Training were included in the program. As the standard protocol of the program, time was given to familiarize with the walking program for all the subjects. Same as at the end of treatment protocol both group subjects were tested for improvement by testing the HbA1c level and with Borg’s scale.

HbA1C LEVEL:

A **hemoglobin A1c (HbA1c)** test measures the amount of blood sugar (glucose) attached to hemoglobin. Hemoglobin is the part of your red blood cells that carries oxygen from your lungs to the rest of your body. Blood sample taken from the patient's arm, and used to

produce a reading. This test measures recent average blood sugar (glucose) level of the patient.

GROUP A:

- **BRISK WALKING PROGRAM:**

Patient is instructed to keep head up then asked to look forward and notdown and relax neck, shoulders and back but not to slouch or lean forward, patient then asked to keep his back straight and engage abdominal muscles. Patient asked to warm up by walking slowly and walk with a steady gait, rolling foot from head to toe, then instructed to loosely swing the arms a little with each stride, then increase speed to Brisk walking that is walking fast enough to raise heart rate while still being able to speak and breathe easily. Then at last patient asked to cool down by slowing the pace.

GROUP B:

- **NORDIC WALKING PROGRAM:**

Patient asked to stand staring by facing forward and not downward, by holding the nordic walking poles in hand patient asked to place the feet forward, then followed by heel strike and toe-off. Patient instructed to keep abdominal muscles tight and lean slightly forward, asked to look straight ahead and keep shoulders down and relaxed. The upper body slightly rotates as the patient walks, patient then asked to keep light grip and open the hand at end of the stride.

After the completion of 8 weeks, post test data’s of Borg’s test from both thegroups were collected. These post test data’s were compared with their respective pre test data’s of both the groups.

1. DATA ANALYSIS

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

TABLE-1 COMPARISON OF HbA1c LEVEL BETWEEN GROUP – A AND GROUP - B IN PRE AND POST TEST

#TEST	#GROUP - A		#GROUP - B		t - TEST	df	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D			

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PRE TEST	7.99	.179	7.91	.218	.896	18	.382*
POST TEST	7.35	.263	6.88	.301	3.71	18	.000***

(*- P > 0.05), (**- P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and p-value between (Group A) & (Group B) in pre test and post test weeks.

This table shows that there is no significant difference in pre test values between Group A & Group B (*P > 0.05).

This table shows that statistically highly significant difference in post test values between Group A& Group B (***- P ≤ 0.001)

GRAPH – COMPARISON OF HbA1c LEVEL BETWEEN GROUP A AND GROUP B IN PRE AND POST TEST

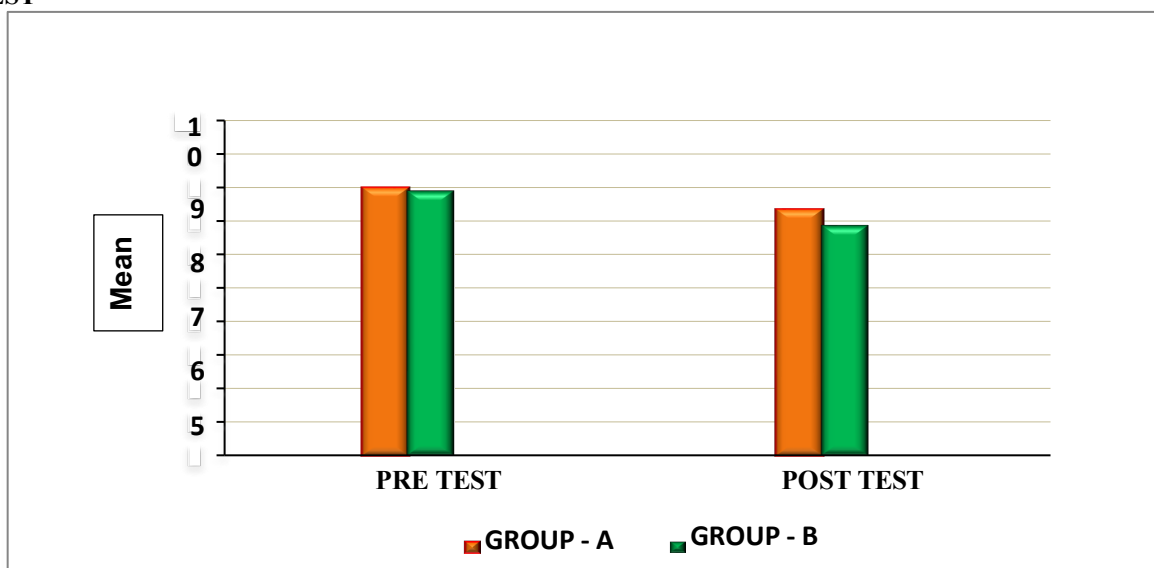


TABLE-2 COMPARISON OF BORG RATE OF PERCEIVED EXERTION LEVEL BETWEEN GROUP A AND GROUP B IN PRE AND POST TEST

#TEST	#GROUP - A		#GROUP - B		t - TEST	df	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D			
PRE TEST	17.70	1.88	17.50	1.84	.240	18	.813*
POST TEST	11.90	2.02	7.30	1.15	6.23	18	.000***

(*- P > 0.05), (***- P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and p-value between (Group A) & (Group B) in pre test and post test weeks.

This table shows that there is no significant difference in pre test values between Group A & Group B (*P > 0.05).

This table shows that statistically significant difference in post test values between Group A& Group B (***- P ≤ 0.001)

GRAPH – I COMPARISON OF BORG RATE OF PERCEIVED EXERTION LEVEL BETWEEN GROUP A AND GROUP B IN PRE AND POST TEST

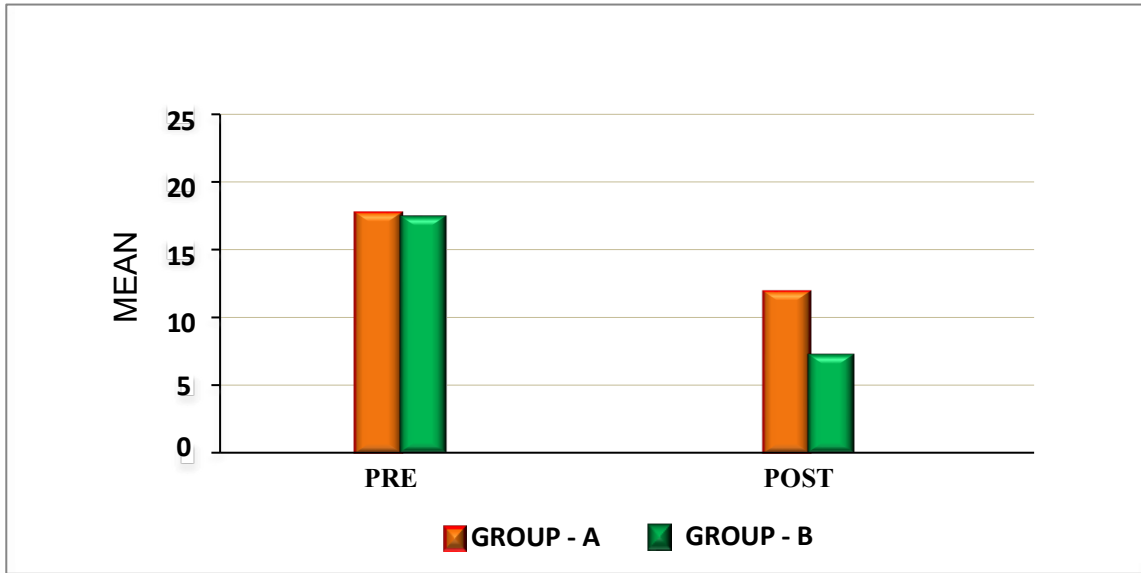


TABLE – 3 COMPARISON OF HbA1c LEVEL WITHIN GROUP – A & GROUP – B BETWEEN PRE & POST TEST VALUES

#GROUP	PRE TEST		POST TEST		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
GROUP- A	7.99	.179	7.35	.263	11.81	.000***
GROUP- B	7.91	.218	6.88	.301	24.35	.000***

(***- P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre- test and post-test within Group A & Group B

There is a statistically highly significant difference between the pre test and post test values within Group A and Group B (***- P ≤ 0.001).

GRAPH – III COMPARISON OF HbA1c LEVEL WITHIN GROUP – A & GROUP – B BETWEEN PRE & POST TEST VALUES.

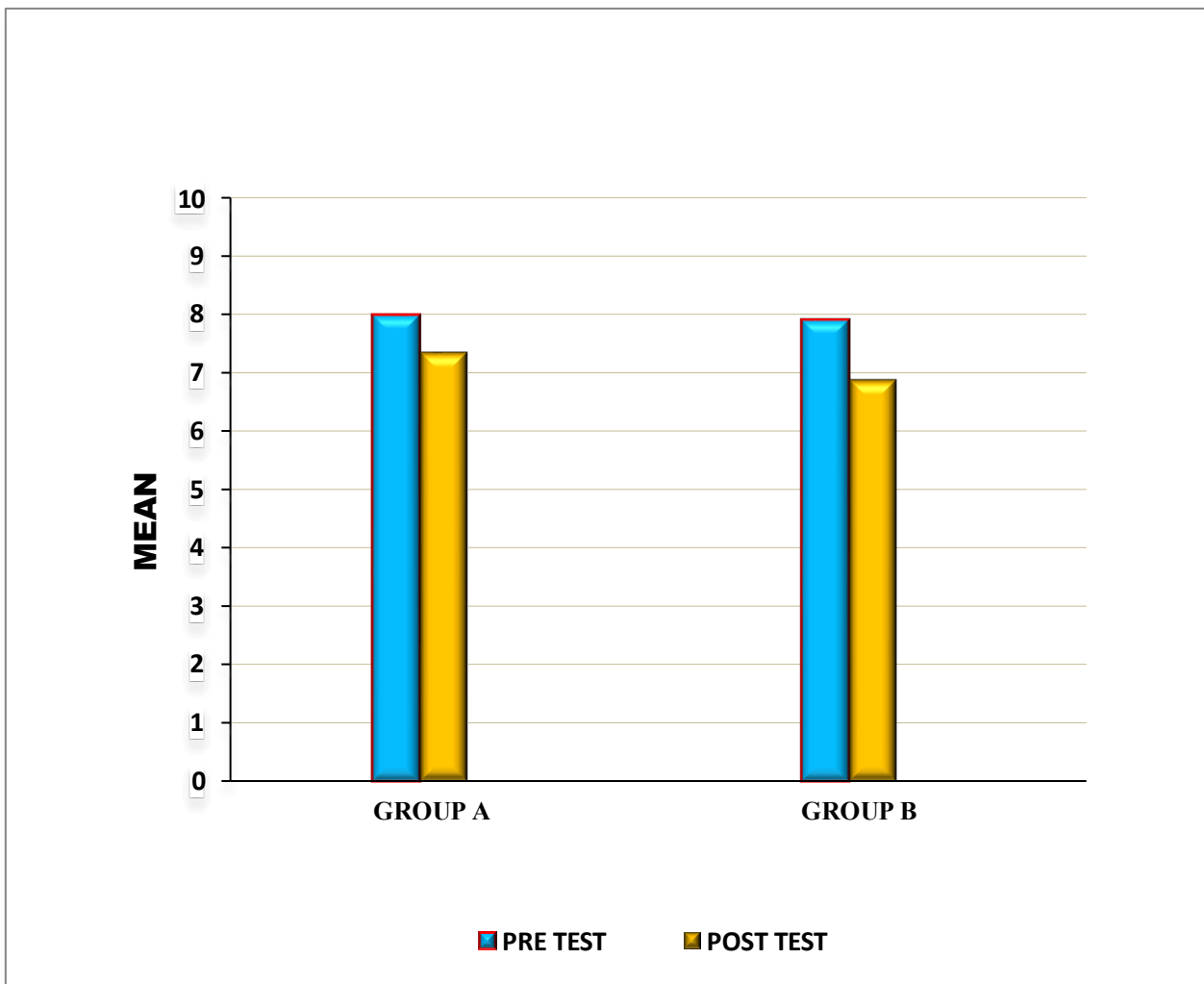


TABLE – 4 COMPARISON OF BORG RATE OF PERCEIVED EXERTION LEVEL WITHIN GROUP – A & GROUP – B BETWEEN PRE & POST TEST VALUES

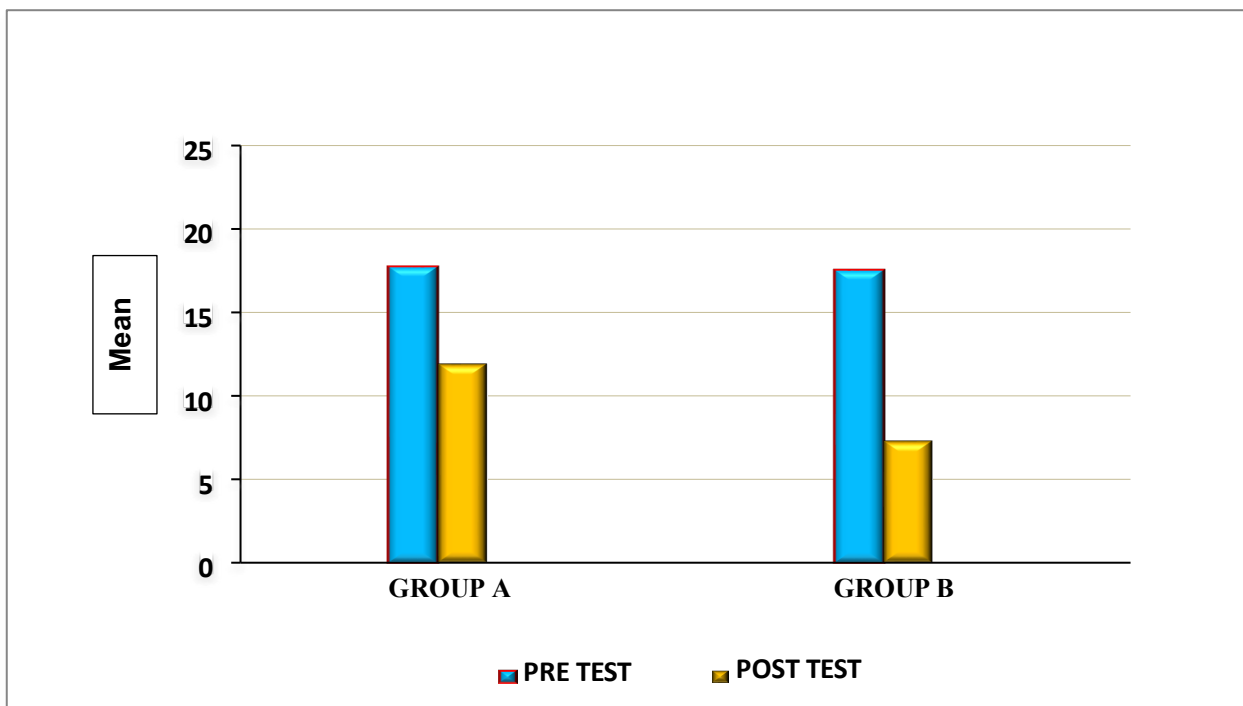
#GROUP	PRE TEST		POST TEST		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
GROUP- A	17.70	1.88	11.90	2.02	7.01	.000***
GROUP- B	17.50	1.84	7.30	1.15	11.94	.000***

(***- P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre- test and post-test within Group – A & Group – B

There is a statistically highly significant difference between the pre test and post test values within Group A and Group

GRAPH - IV COMPARISON OF BORG RATE OF PERCEIVED EXERTION SCORE WITHIN GROUP – A & GROUP – B BETWEEN PRE & POST TEST VALUES



RESULT

2. RESULTS

On comparing the mean values of Group A & Group B on HbA1c level, it shows a significant decrease in the post test mean values, but (Group B - Nordic Walking) which has the lower mean value, is more effective than (Group A - Brisk Walking) at $P \leq 0.001$. Hence the Null Hypothesis is rejected. On comparing the mean values of Group A & Group B on Borg Rating of Perceived Exertion level, it shows

3. DISCUSSION

Diabetes mellitus type-2 is characterized by high levels of sugar in the blood and it is considered to be one of the chronic disease. Due to ageing and population growth there is an increased prevalence of obesity and decreased physical activity, which leads to an increase in type-2 diabetes mellitus.

The present study compares the effectiveness of brisk walking and Nordic walking on blood glucose level among type-2 diabetes mellitus. In this study totally 20 subjects with type-2 diabetes mellitus were selected and included as per the inclusion criteria and they were divided into 2 groups by simple random sampling method and underwent for the pre-test and post-test by measuring the HbA1c level and Borg’s score.

Patients in Group A were treated with brisk walking and Group B with Nordic walking. In Group A patients who underwent for brisk walking shows the glucose control by preventing the muscles to absorb blood sugar from building up in the blood stream. Brisk walking is easy to perform and it can be done

a significant decrease in the post-test mean values, but (Group B - Nordic Walking), which has the lower mean value, is more effective than (Group A - Brisk Walking) at $P \leq 0.001$. Hence, the Null Hypothesis is rejected. On comparing the pretest and post-test within Group A & Group B on HbA1c level and Borg Rating of Perceived Exertion Scale shows highly significant difference in Mean values at $P \leq 0.001$.

DISCUSSION

practically anywhere and it also shows the effect on controlling the weight which in turn can reduce the health risks.

In Group B patients who underwent for Nordic walking which can be performed by Nordic poles and it is considered to be a whole body exercise. Walking with the poles can activates the muscles of upper body also which promotes the cardiovascular fitness which is an important benefit for the people with type-2 diabetes mellitus.

This technique potentially showed the high metabolic demands than the normal walking.it is majorly used for controlling the impaired glucose tolerance in the type-2 diabetes mellitus patients.

Nordic walking has been also associated with the reduction in the fat mass and bad cholesterol and exerts a beneficial effect on heart rate, blood pressure, physical activities, maximal oxygen consumption and improving the quality of life which are all the demanded aspects for the people with type-2 diabetes mellitus.

In this study, on comparing the post mean values of

HbA1c Group B (Nordic walking) shows 6.88 which is higher in Group A (Brisk walking) Group B (Nordic walking) shows the significant decrease in controlling the blood glucose level when compared to Group A (Brisk walking) which shows the moderate changes. Group A (Brisk walking) also shows the control of blood glucose level but not significant as Group B (Nordic walking).

This study shows that there is significant difference between 2 groups and based on the results that the alternative hypothesis is accepted and the null hypothesis is rejected.

CONCLUSION

In this study, both brisk walking and Nordic walking shows changes in controlling the blood glucose level in which the Nordic walking shows significant improvement in controlling the blood glucose level than the patient who receives brisk walking. Hence these findings suggests that Nordic walking controls the blood glucose level by lowering the HbA1c value and borg's scale score.

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