

A STUDY TO ASSESS THE EFFECTIVENESS OF BUERGER ALLEN EXERCISE ON FOOT PERFUSION AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN SELECTED URBAN COMMUNITY OF GUWAHATI, ASSAM

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Abstract : Background: Type 2 Diabetes Mellitus is one of the leading chronic illnesses contributing to peripheral vascular complications such as reduced foot perfusion, which predisposes patients to ulcer formation and delayed wound healing. Buerger Allen Exercise is a cost-effective, non-invasive method shown to enhance peripheral blood flow and can be easily implemented in the community setting. This study aims to study the effectiveness of Buerger Allen Exercise on foot perfusion among patients with Type 2 Diabetes Mellitus. 40 Type 2 Diabetes Mellitus clients were selected to carry out the study.

Objectives: To find out effectiveness of Buerger Allen Exercise on foot perfusion among patients with Type 2 Diabetes Mellitus in selected urban community of Guwahati, Assam.

Result : The effectiveness of Buerger Allen exercise on foot perfusion among patients with type 2 diabetes mellitus was tested by using paired t test. After analysis result on right leg revealed that mean post-test score was 0.95 ± 0.02 higher than pre-test mean score 0.91 ± 0.02 with mean difference of 0.04 with calculated value ($t=10.88$ at $df=39$, $p=0.001$) was statistically significant. Result on left leg revealed that mean post-test score was 0.96 ± 0.02 higher than pre-test mean score 0.92 ± 0.02 with mean difference of 0.03 with calculated value ($t=11.27$ at $df=39$, $p=0.001$) was statistically significant. The chi squares value revealed Age in years , Gender, Educational qualification, Marital status, Occupation, Income(per year), Dietary habits, Physical activity, Family history of Type 2 Diabetes mellitus, Duration of Type 2 diabetes mellitus, Specific habits were found to be statistically non significant with effectiveness of Buerger Allen Exercise on foot perfusion in left leg and right leg with demographic variables.

Conclusion : Study findings revealed that Buerger Allen exercise was effective in foot perfusion among type 2 Diabetes mellitus in post test as compared to pre-test by using ABI scale.

Key words: Foot perfusion, Buerger Allen exercise, Type 2 Diabetes Mellitus, effectiveness

INTRODUCTION

Diabetes mellitus type II is a metabolic condition marked by elevated blood glucose levels, arising from either a decrease in the effectiveness of insulin, known as insulin resistance, or a decline in the production of insulin by the pancreatic beta cells.¹

Arteries and veins of small to medium size located in the farthest parts of the upper and lower extremities are affected by Buerger's disease, also known as thromboangiitis obliterans [TAO], an inflammatory occlusive vascular condition. The afflicted arteries recanalise and thrombosis occurs in this non-atherosclerotic inflammatory illness. Men are more frequently impacted by the disease, which typically manifests between the ages of 40 and 45. Although the exact cause of this illness is unknown, smoking is closely linked to the development and progression of the condition.²

Buerger-Allen Exercises (BAE) are a series of leg exercises that can improve circulation in patients with peripheral arterial disease or diabetic foot problems. The Buerger exercise, initially introduced by Buerger in 1926, was later refined by Allen in 1930 with the goal of improving circulation in the legs and feet.³

Buerger exercises use posture adjustments to empty engorged arteries and muscular contractions and gravity modulation to promote peripheral circulation and alleviate symptoms in patients with lower limb arterial insufficiency.⁴

NEED OF THE STUDY.

Diabetes mellitus increases the risk of complications, with one common complication being peripheral vascular diseases that lead to decreased foot perfusion in patients. Patients with diabetes mellitus may develop peripheral vascular disorders as a result of peripheral artery endothelial and smooth muscle cell dysfunction. Patients with diabetes mellitus can benefit from Buerger's exercise as a straightforward intervention to increase peripheral circulation.⁵

The Buerger Allen Exercise provides physiological and confidential elements of degrees of arterial insufficiency for the diagnosis of occlusive arterial disease at any level of the extremities. It should be remembered that most cases result from a combination of the obliterating arteriopathy of the lower extremity with various metabolic disorders like diabetes mellitus.⁶

The Buerger-Allen exercise is intended to determine the presence and extent of peripheral vascular disease of the lower extremity. This exercise increases the volume of distal blood flow, aggravating the arterial insufficiency created by the occlusion of the aortic blood flow. The results are evaluated based on the patient's pain reaction in response to the increased metabolic need of the muscles of the compromised extremity. This exercise should not be performed when the subject is lying down because the hydrostatic pressure diminishes the venous return, which provides incomplete volumes and therefore emits an inferior demand for blood.⁶ As many researchers have found, diabetic patients often neglect proper foot care, leading to complications such as foot ulcers and amputations. As a researcher, I felt that there is a need for a study to raise awareness for individuals with Type 2 Diabetes Mellitus, the significance of properly caring for their feet and to inform them about the effectiveness of the Buerger Allen exercise to improve foot perfusion.

OBJECTIVES

GENERAL OBJECTIVE

- To find out effectiveness of Buerger Allen Exercise on foot perfusion among patients with Type 2 Diabetes Mellitus.

SPECIFIC OBJECTIVE

- To assess the foot perfusion among Type 2 Diabetes Mellitus before Burger Allen Exercise by using ABI scale.
- To find out the effectiveness of Buerger Allen Exercise on foot perfusion among patients with Type 2 Diabetes Mellitus.
- To find out association between effectiveness of Buerger Allen Exercise on foot perfusion with demographic variables.

HYPOTHESIS

- H₁: There is a significant effect of Buerger Allen Exercise on foot perfusion among Type 2 Diabetes Mellitus patients.
 H₂: There is significant association between Buerger Allen Exercise with selected demographic variables.

RESEARCH METHODOLOGY

The research approach selected for the study was Quantitative research approach and research design was Pre-experimental one group pre-test post-test design.

Population and sample-40 Type 2 Diabetes Mellitus patients who have fulfilled the inclusion criteria were chosen.

Study area- The study was conducted in area under Basistha Mandir urban PHC, Guwahati, Assam.

Theoretical Framework-The conceptual framework chosen for the study is based on General System Theory.

Description of the tool:

Section I: Demographic proforma

ABI Value	Possible indication	Right leg		Left leg	
		Pre-test	Post -test	Pre-test	Post -test
>1.2	Falsely elevated, arterial disease, diabetes				
1.19-0.95	Normal				
0.94-0.75	Mild arterial disease, +intermittent claudication				
0.74-0.50	Moderate arterial disease, +rest pain				
<0.50	Severe arterial disease				

Section II: Ankle-Brachial Index Scale

Descriptive Statistics-Frequency and percentage distribution have been applied to classify samples according to demographic proforma, Foot perfusion among Type 2 Diabetes Mellitus before and after Buerger Allen Exercise using ABI scale, mean and standard deviation were used to assess foot perfusion scoring of patients.

Inferential Statistics-Paired t test and Chi square test were used to assess effectiveness of Buerger-Allen Exercise.

Result

Analysis of the collected data was done using SPSS software.

Table 1: Frequency and percentage distribution of the Socio-demographic variables

n=40

Sl. No	Socio-Demographic variables	Frequency	Percentage
1	Age in years		
a	20 to 30	0	0
b	31 to 40	1	2.5
c	41 to 50	20	50
d	More than 50	19	47.5
2	Gender		
a	Male	13	32.5
b	Female	27	67.5

3	Educational qualification		
a	Primary school	0	0
b	Middle school	1	2.5
c	High school	3	7.5
d	Higher secondary	24	60
e	Graduate and above	12	30
4	Marital status		
a	Married	30	75
b	Unmarried	6	15
c	Divorced	0	0
d	Widowed	4	10
5	Occupation		
a	Unemployed	0	0
b	Home maker	18	45
c	Government employee	8	20
d	Private employee	8	20
e	Others	6	15
6	Income (per year)		
a	≥ 1,46,104	16	40
b	73,054 – 1,09,579	18	45
c	63,854 – 59,251	6	15
d	54,651 – 59,251	0	0
e	36,527 – 45,588	0	0
f	7,316 – 21,913	0	0
g	≤ 7,315	0	0
7	Dietary habits		
a	Vegetarian	3	7.5
b	Non vegetarian	37	92.5
8	Physical activity		
a	Sedentary	7	17.5
b	Low activity	32	80
c	Moderate activity	1	2.5
d	High activity	0	0
9	Family history of type 2 DM		
a	Yes, immediate family	9	22.5
b	Yes, extended family	11	27.5
c	No, family history	13	32.5
d	Not sure	7	17.5
10	Duration of type 2 DM		
a	1-5 years	25	62.5
b	6-10 years	13	32.5
c	Above 10 years	2	5
11	Specific habits		
a	Alcohol	3	7.5
b	Smoking	5	12.5
c	Both	3	7.5
d	None	29	72.5

Research Through Innovation

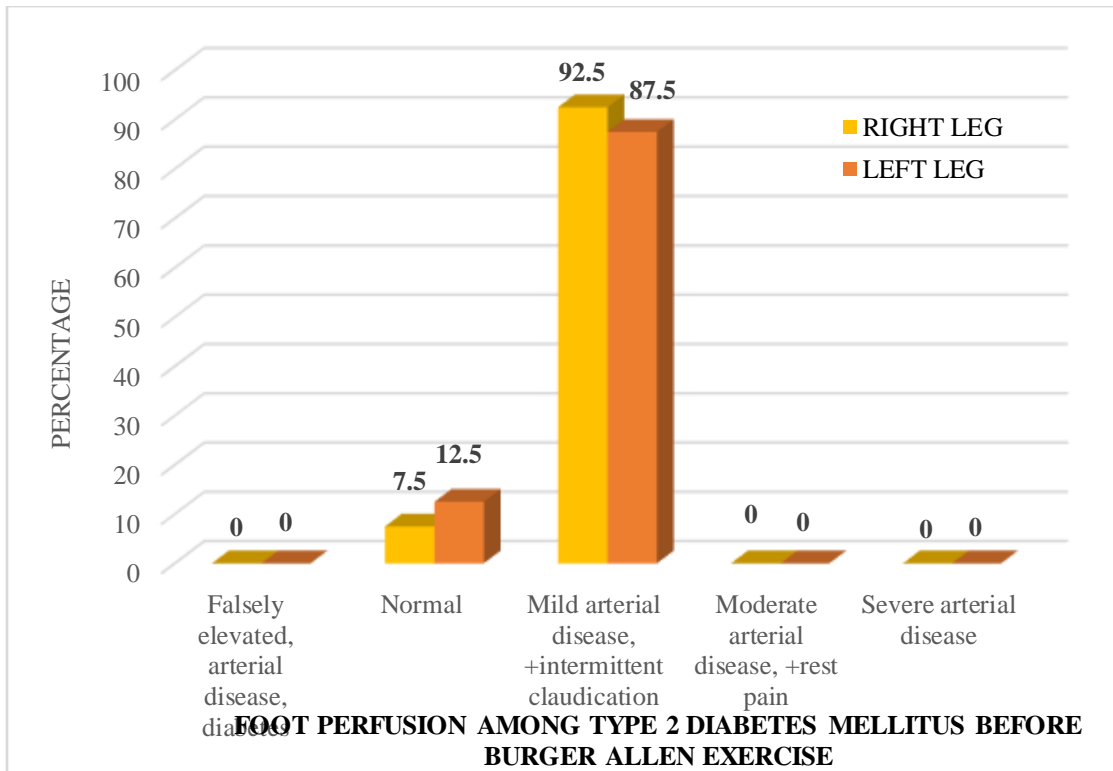


Fig 1: Frequency and Percentage distribution of foot perfusion among Type 2 Diabetes Mellitus before Burger Allen exercise by using ABI scale

Fig 2: Frequency and Percentage distribution of foot perfusion among Type 2 Diabetes Mellitus after Burger Allen exercise by using ABI scale

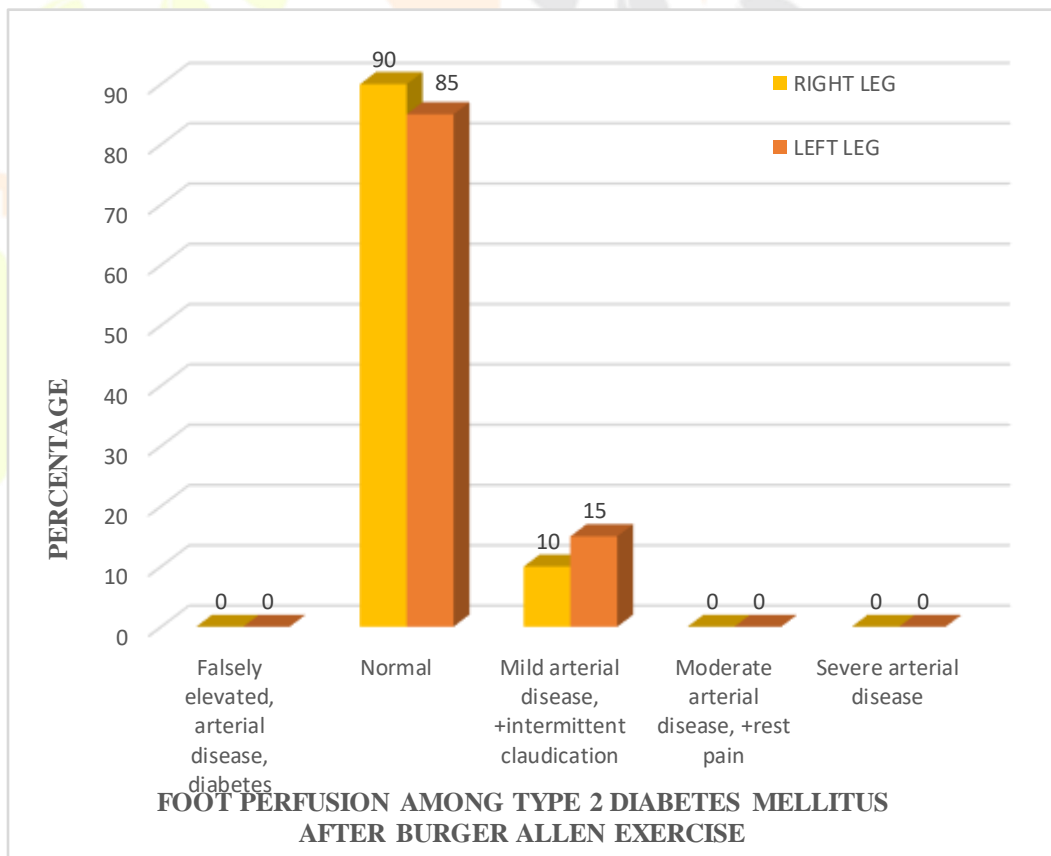


Table 2: Effectiveness of Buerger Allen Exercise on foot perfusion among patients with Type 2 Diabetes Mellitus

n=40

Comparison	Pre-test Mean±SD	Post-test Mean±SD	Mean D	t value	df	p value
Right leg	0.91±0.02	0.95±0.02	0.04	10.88	39	0.001*
Left leg	0.92±0.02	0.96±0.02	0.03	11.27	39	0.001*

*P<0.05 level of significance NS-Non significance

Table 2 illustrates the effectiveness of Buerger Allen Exercise on foot perfusion among patients with type 2 Diabetes Mellitus which was tested by using paired t test.

Result on right leg revealed that mean post-test score was 0.95±0.02 higher than pre-test mean score 0.91±0.02 with mean difference of 0.04 with calculated value (t=10.88 at df=39, p=0.001) was statistically significant.

Result on left leg revealed that mean post-test score was 0.96±0.02 higher than pre-test mean score 0.92±0.02 with mean difference of 0.03 with calculated value (t=11.27 at df=39, p=0.001) was statistically significant.

Findings showed that Buerger Allen Exercise was effective in improving the foot perfusion among patients with Type 2 Diabetes Mellitus.

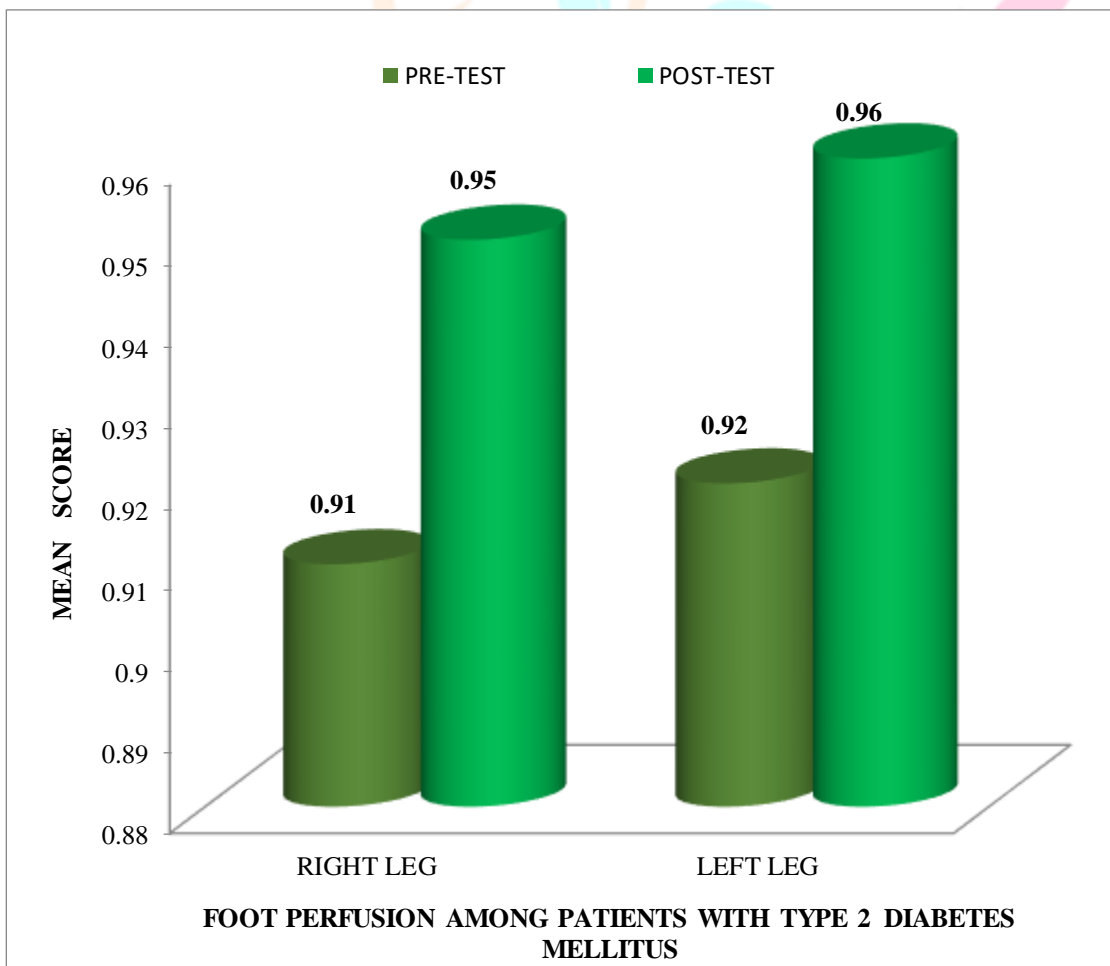


Fig 3: Mean pre-test and post-test score of foot perfusion among patients with Type 2 Diabetes Mellitus

Table 3: Association between effectiveness of Buerger Allen Exercise on foot perfusion in right leg with demographic variables.

n=40

Sl. No	Demographic variables	Right leg		χ^2 value	df	P value
		Normal	Mild arterial disease			
1	Age in years					
a	20 to 30	--	--	0.957	2	0.943 ^{NS}
b	31 to 40	1	0			
c	41 to 50	18	2			
d	More than 50	17	2			
2	Gender					
a	Male	13	0	3.355	1	0.067 ^{NS}
b	Female	23	4			
3	Educational qualification					
a	Primary school	--	--			
b	Middle school	1	0	4.060	3	0.310 ^{NS}
c	High school	2	1			
d	Higher secondary	21	3			
e	Graduate and above	12	0			
4	Marital status					
a	Married	27	3	1.705	2	0.434 ^{NS}
b	Unmarried	6	0			
c	Divorced	--	--			
d	Widowed	3	1			
5	Occupation					
a	Unemployed	--	--			
b	Home maker	16	2	2.679	3	0.460 ^{NS}
c	Government employee	8	0			
d	Private employee	6	2			
e	Others	6	0			
6	Income (per year)					
a	≥ 1,46,104	15	1	1.031	2	0.799 ^{NS}
b	73,054 – 1,09,579	16	2			
c	63,854 – 59,251	5	1			
d	54,651 – 59,251	--	--			
e	36,527 – 45,588	--	--			
f	7,316 – 21,913	--	--			
g	≤ 7,315	--	--			
7	Dietary habits					
a	Vegetarian	3	0	0.659	1	0.723 ^{NS}
b	Non vegetarian	33	4			

8	Physical activity					
a	Sedentary	7	0	1.283	2	1.000 ^{NS}
b	Low activity	28	4			
c	Moderate activity	1	0			
d	High activity	--	--			
9	Family history of type 2 DM					
a	Yes, immediate family	9	0	4.336	3	0.122 ^{NS}
b	Yes, extended family	11	0			
c	No, family history	11	2			
d	Not sure	5	2			
10	Duration of type 2 DM					
a	1-5 years	23	2	1.077	2	0.673 ^{NS}
b	6-10 years	11	2			
c	Above 10 years	2	0			
11	Specific habits					
a	Alcohol	3	0			
b	Smoking	5	0	0.920	3	1.000 ^{NS}
c	Both	3	0			
d	None	25	4			

*p<0.05 level of significance

NS - Non significant

Table 4: Association between effectiveness of Buerger Allen Exercise on foot perfusion in left leg with demographic variables.

N=40

Sl. No	Demographic variables	Left leg		χ ² value	df	P value
		Normal	Mild arterial disease			
1	Age in years					
a	20 to 30	--	--	0.683	2	0.846 ^{NS}
b	31 to 40	1	0			
c	41 to 50	17	3			
d	More than 50	16	3			
2	Gender					
a	Male	12	1	0.891	1	0.345 ^{NS}
b	Female	22	5			
3	Educational qualification					
a	Primary school	--	--			
b	Middle school	1	0	0.992	3	0.711 ^{NS}
c	High school	3	0			
d	Higher secondary	20	4			
e	Graduate and above	10	2			
4	Marital status					
a	Married	25	5	1.367	2	0.451 ^{NS}

b	Unmarried	6	0			
c	Divorced	--	--			
d	Widowed	3	1			
5	Occupation					
a	Unemployed	--	--			
b	Home maker	15	3	1.602	3	0.760 ^{NS}
c	Government employee	6	2			
d	Private employee	7	1			
e	Others	6	0			
6	Income (per year)					
a	≥ 1,46,104	12	4	2.621	2	0.277 ^{NS}
b	73,054 – 1,09,579	17	1			
c	63,854 – 59,251	5	1			
d	54,651 – 59,251	--	--			
e	36,527 – 45,588	--	--			
f	7,316 – 21,913	--	--			
g	≤ 7,315	--	--			
8	Dietary habits					
a	Vegetarian	3	0	1.017	1	0.313 ^{NS}
b	Non vegetarian	31	6			
9	Physical activity					
a	Sedentary	6	1	0.724	2	0.845 ^{NS}
b	Low activity	27	5			
c	Moderate activity	1	0			
d	High activity	--	--			
9	Family history of type 2 DM					
a	Yes, immediate family	8	1	4.874	3	0.137 ^{NS}
b	Yes, extended family	8	3			
c	No, family history	13	0			
d	Not sure	5	2			
10	Duration of type 2 DM					
a	1-5 years	21	4	0.372	2	0.715 ^{NS}
b	6-10 years	11	2			
c	Above 10 years	2	0			
11	Specific habits					
a	Alcohol	2	1			
b	Smoking	5	0	1.934	3	0.722 ^{NS}
c	Both	3	0			
d	None	24	5			

*p<0.05 level of significance

NS - Non significant

DISCUSSION

- In this study, during the pre-test phase, a majority of type 2 Diabetes Mellitus patients, specifically 37 (92.5%) and 35 (87.5%), exhibited mild arterial disease, characterized by reduced foot perfusion. However, in the post-test phase, the majority, 36 (90%) and 34 (85%), showed normal foot perfusion in the right and left extremities, respectively, indicating the effectiveness of Buerger Allen exercises on foot perfusion among these patients. The present study finding supported by the study conducted by Hafid MA, Ilhamsyah I(2021) on Impact of Buerger Allen Exercises on Peripheral Circulation in the Lower Limbs of Patients with Type 2 Diabetes. The study utilized a pre-experimental research design without a control group and involved 5 respondents from a health center in Gowa Regency. The sampling technique used was non-probability sampling with an accidental sampling approach. The Wilcoxon Signed Rank Test results showed a p-value of 0.043 for the ABI value in the right limb and 0.025 for the ABI value in the left limb, both of which were less than 0.05, indicating a significant difference in peripheral circulation before and after the intervention. These results suggest that BAE has a positive effect on improving peripheral circulation in diabetic patients.
- In the present study, the result shows the effectiveness of Buerger Allen exercise on foot perfusion on type 2 Diabetes Mellitus patients. Result showed that post-test mean foot perfusion on right leg and left leg were 0.95 ± 0.02 , 0.96 ± 0.02 respectively were higher than pre-test mean foot perfusion on right leg and left leg were 0.91 ± 0.02 , 0.92 ± 0.02 respectively with mean difference 0.04, 0.03 respectively. The effectiveness was tested using paired t test with obtained ($t=10.88$ on right leg, $t=11.27$ on left leg) at $df=39$ was statistically significant at $p < 0.05$ level. Findings showed The Buerger Allen Exercise proved to be effective in enhancing foot blood flow in individuals with Type 2 Diabetes Mellitus. The results of this study are consistent with those reported by Patel D.S. D. (2023), who conducted A quasi-experimental study aimed at evaluating the impact of Buerger Allen exercises on enhancing peripheral circulation in the lower limbs of individuals with type 2 diabetes mellitus in certain rural areas of Gujarat. The study involved sixty participants, who were evenly divided into an experimental group and a control group, chosen through a non-probability purposive sampling technique.. Data were collected by using demographic variables, structured assessment tool and ankle brachial index scale. The data shows that in both the tool in experimental group the t value is more than the calculated value while in control group its lesser than the calculated value. Thus, there is a significant effect of the The Buerger Allen exercise is used to enhance blood flow in the lower limbs of individuals with type 2 diabetes mellitus.
- In the present study, the association between effectiveness of Buerger Allen Exercise on foot perfusion with demographic variables with their demographic variables which was tested using chi-square test. The chi squares value revealed Age, Gender, Educational qualification, Marital status, Occupation, Income(per year), Dietary habits, Physical activity, Family history of type 2 DM, Duration of type 2 DM, Specific habits were found to be statistically non significant with effectiveness of Buerger Allen Exercise on foot perfusion with demographic variables.

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