SJIF Impact Factor (2023): 8.574| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 8 | Issue: 9 | September 2023 - Peer Reviewed Journal

A STUDY TO ASSESS THE EFFECTIVENESS OF BUERGER ALLEN EXERCISE ON LOWER EXTREMITY PERFUSION AND REDUCING PERIPHERAL NEUROPATHY SYMPTOMS AMONG DIABETES MELLITUS PATIENT IN SELECTED COMMUNITY AREAS OF BHOPAL, M.P.

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ABSTRACT

The Buerger-Allen Exercise (BAE) is a targeted intervention aimed at improving lower extremity blood flow and alleviating Peripheral Neuropathy (PNS) symptoms in Diabetes Mellitus (DM) patients. This research employs an Evaluative approach to conduct a Pre experimental research design; involving a purposive sample of fifty DM patients aged 30 to 75, encompassing both genders. The study encompasses structured knowledge questionnaires, self-reported demographic data, manual Ankle-Brachial Index (ABI) scale measurements for Lower Extremity Perfusion (LEP), and Michigan Neuropathy Screening Instrument (MNSI) 15 items questionnaire was used for PNS assessment. Over four days, comprehensive BAE demonstrations and instruction were provided, with a post-test on the fifth day using the same assessment tools. The majority of participants (75%) fell within the 60–69 age brackets, with 98% having received education up to the primary school level. Approximately 62% had diabetes, and 20% had a history of peripheral arterial disease. Before the intervention, 56% exhibited mildly impaired perfusion, and over 60% displayed signs of abnormal neuropathy, both of which showed significant reductions following BAE implementation for both right and left LEP ($t49 = 7.5$, $p < 0.001$) and left LEP ($t49 = 7.46$, $p < 0.001$). In conclusion, this study suggests that educating DM patients about BAE can effectively enhance Lower Extremity Perfusion and mitigate PNS, making it a viable practice within both hospital and home care settings.

KEYWORDS: *Buerger-Allen Exercise (BAE), Lower Extremity Perfusion (LEP), Peripheral Neuropathy (PNS), Diabetes Mellitus (DM), Blood Flow Enhancement, Lower Extremity Circulation, Neuropathic Symptoms, Diabetic Patients, Effectiveness Assessment*

INTRODUCTION

Diabetes mellitus (DM) stands as a significant challenge within healthcare systems, presenting a worldwide public health concern that has seen a sharp escalation over the last two decades. Epidemiological research reveals a stark progression: in 1985, DM affected around 30 million individuals; by 2000, this figure had surged to 177 million; by 2010, it reached 285 million; and with current trends, the projected estimate for 2030 surpasses 360 million cases.[1, 2]

Among the myriad complications affecting patients with DM, diabetic foot ulcer (DFU) emerges as a prominent issue. The incidence of DFU, a common complication of DM, has displayed an upward trajectory in recent decades. [3, 4]

The Buerger-Allen Exercise (BAE) is a targeted physical activity aimed at improving Lower Extremity Perfusion (LEP) and reducing Peripheral Neuropathy Symptoms (PNS) in Diabetes Mellitus (DM) patients. BAE utilizes gravity-assisted postural movements to enhance blood vessel function, thus preventing Peripheral Vascular Diseases and promoting collateral circulation in the lower extremities. Our study aimed to identify at-risk diabetic individuals and promote health improvements through structured exercise interventions.[5, 6]

STATEMENT OF THE PROBLEM

A study to assess the effectiveness of buerger allen exercise on lower extremity perfusion and reducing peripheral neuropathy symptoms among diabetes mellitus patient in selected community area of Bhopal, M.P.

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OBJECTIVES

- To assess the levels of lower extremity perfusion and peripheral Neuropathy symptoms before Buerger Allen Exercise among diabetes mellitus patients in selected community areas.
- To assess the effectiveness of Buerger Allen Exercise on levels lower extremity perfusion and reducing Peripheral Neuropathy Symptoms (PNS) among diabetes mellitus patients with selected community areas.
- To associate the post-test levels of lower extremity perfusion and reducing Peripheral Neuropathy Symptoms (PNS) among diabetes mellitus patients with selected demographic variables.

METHOD

The pre-experimental study was conducted during May-June 2022 at Rural Community Health Centre, Bhopal, with a focus on the effects of Buerger-Allen Exercise (BAE) on Lower Extremity Perfusion (LEP) and Peripheral Neuropathy Symptoms (PNS) among Diabetes Mellitus (DM) patients. The sample size was 50 and purposive sampling was used to select DM patients aged 30 to 75, and willing to participate. Patients with severe cardiac conditions, grade-IV foot ulcers, gangrene, and critical illness were excluded. LEP was assessed using the manual Ankle-Brachial Index (ABI), and Michigan Neuropathy Screening Instrument (MNSI) 15 item questionnaires was employed to evaluate PNS.

The intervention was administered, involving demonstration and teaching of the exercise's definition, purpose, and steps. Participants were asked to perform BAE four -five times daily for four days. They were reminded through communication media regarding exercise.

Data analysis was conducted using SPSS. Descriptive statistics were used. Paired t-tests and correlation coefficients were employed for inferential analysis, comparing pre-intervention and post-intervention data. A significance level of $p < 0.05$ was adopted.

RESULTS

The study analyzed a sample population with notable characteristics. The majority (over 65%) of participants were aged 60 to 69 or above, and 75% of them were male. Educationally, 89% had attained at least primary school level. In terms of diabetes, 62% had a history of diabetes for more than a decade, and 25% had a family history of peripheral arterial disease. Significant portions (56%) were non-alcoholic, while 65% were non-smokers among diabetic patients.

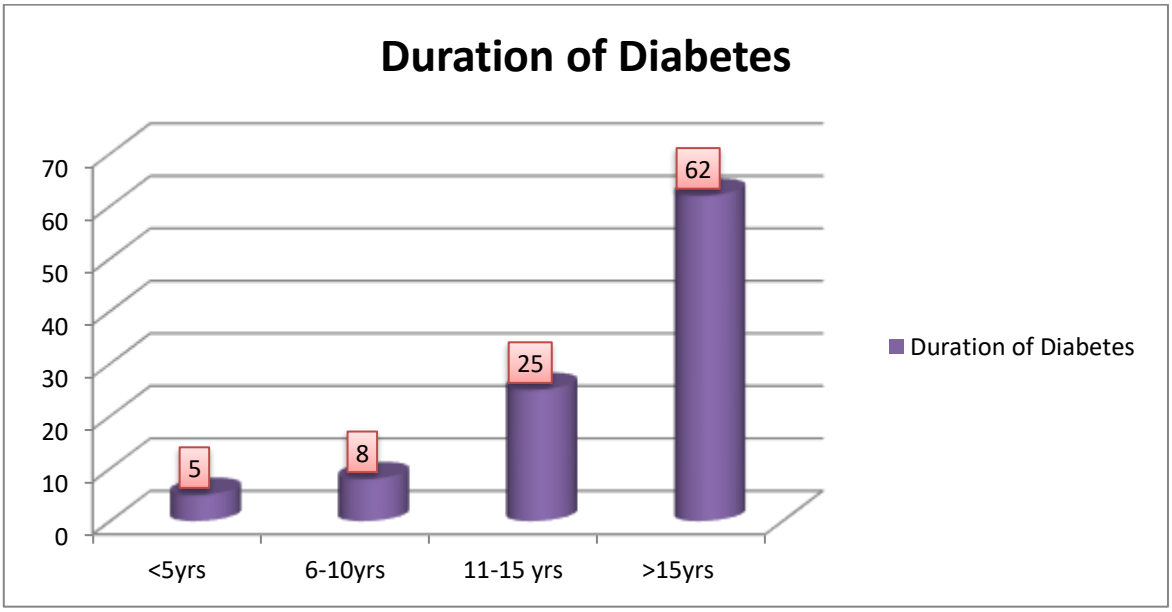

Figure 1: Cylindrical Graph shows percentage distribution of patients with duration of diabetes.

Initial assessments revealed that over 36% of participants exhibited mildly impaired perfusion during the Pre-test, and approximately 40% had severe perfusion in both right and left limbs. Post test results indicated a decrease in mildly impaired perfusion and an increase in normal perfusion, reaching 10-36%. The neuropathy screening version designed for medical examinations consistently detected fewer cases of both normal and abnormal neuropathy in comparison to the patient-oriented version, both prior to and following an intervention.

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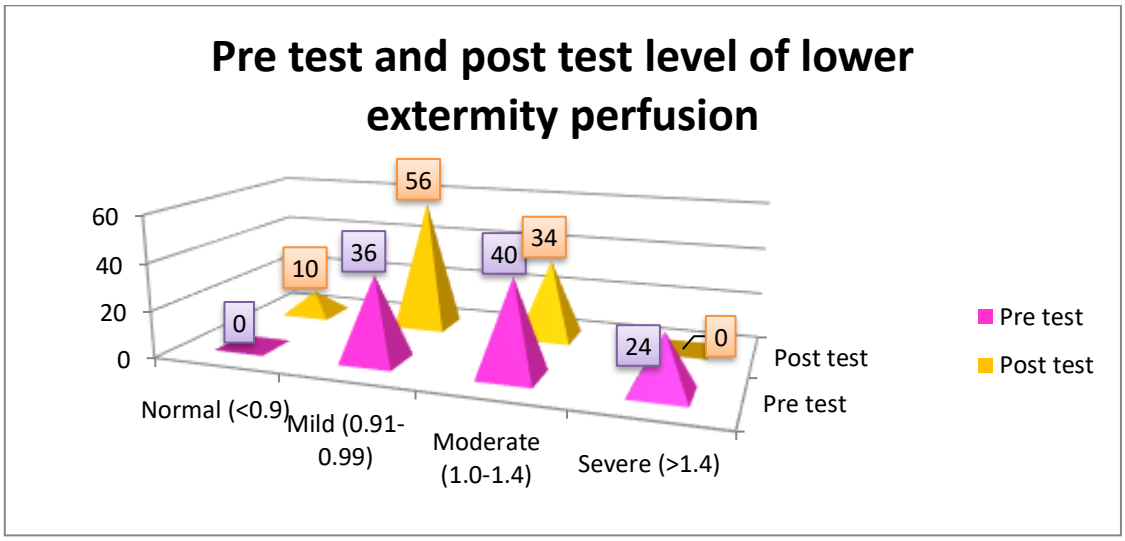

Figure II: Frequency & Percentage distribution of pre and post test levels of lower extremity perfusion among type II diabetes patients measured by ABI.

Statistical analysis demonstrated a significant enhancement in mean Lower Extremity Perfusion (LEP) scores from pre-test Mean 1.2 ($t49=7.5$, $p < 0.001$) to post-test Mean 1.03 ($t49=7.46$, $p < 0.001$) due to the Buerger-Allen Exercise (BAE). There was a significant increase in knowledge regarding BAE exercise and results showed a positive impact on the Mean Peripheral Neuropathy Symptoms (PNS) scores also displayed improvement, decreasing from 8.02 to 7.36 in the patient-version questionnaire.

Table 1. Shows the level of peripheral Neuropathy Symptoms in diabetes patient.

Variable	Pre Test	Post test
	Patient version questionnaire F(%)	Patient version questionnaire F(%)
No significant PNS 1-5	8(16%)	20(40%)
Mild Significant PNS 6-9	12(24%)	25(50%)
Positively significant [PNS]) 10-15	30 (60%)	5(10%)

Table II illustrate the Pre-test and post-test risk regarding Peripheral Neuropathy Symptoms in patients with diabetes.

Variable	Pre Test	Post test
	Clinical version questionnaire F(%)	Clinical version questionnaire F(%)
No significant clinical Sign PNS 1-2	5(10%)	18(36%)
Mild Significant PNS 3-5	25 (50%)	27 (54%)
Positively significant [PNS]) 6-10	20 (40%)	5(10%)

A noteworthy association was identified between post-test PNS (patient-version questionnaire) and gender using Chi-Square (X^2) and the value calculated was 13.22 (X^2 table value at df2=10.597, p =0.005), as well as type of job ($p < 0.005$) among DM patients. However, no statistically significant correlation was established between PNS scores (assessment version) and demographic variables among patients with DM. In conclusion, the study showcased considerable improvements in both LEP and PNS due to the BAE intervention, emphasizing its potential benefits for individuals with diabetes.

DISCUSSION

Gill et al. (2014) conducted a comprehensive study to evaluate the efficacy of an exercise program on glucose control and risk factors for complications in patients with type II Diabetes Mellitus (DM). The program encompassed three distinct modes of

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training: aerobic, resistance, and combined. Spanning over a period of >12 weeks, the study engaged 1,003 type II DM patients. The outcomes indicated that the exercise programs, akin to dietary adjustments, drug therapy, and insulin treatment, significantly contributed to blood glucose management, underscoring their clinical significance.[10]

In this study, we observed improved lower extremity perfusion in type II diabetes mellitus (DM) patients following intervention. Statistical analysis revealed a significant impact of exercise on Lower Extremity Perfusion (LEP) ($p < 0.001$), accompanied by a notable decrease in Peripheral Neuropathy Symptoms (PNS) among DM patients.

The study further established a noteworthy association between PNS and both left and right LEP levels, signifying a significant correlation ($p < 0.01$ and $p < 0.05$, respectively). The findings highlight positive influence of the parameters among type II DM patients.

Effectiveness of BAE was analyzed in a few studies in improving the peripheral circulation among clients with DM and study revealed that post-test mean score was statistically significant and on comparison of pre- and post-test findings showed that the mean score of lower extremity pain reduced with BAE on LEP. [11]

Limitation: Regarding, the limitations the self-report method utilized to collect data on PNS via questionnaire might have posed potential issues concerning the accuracy of the information.

Nursing Implication

Nursing Practice

Health education plays a crucial role in nursing practice. Both hospital and community-based nurses can provide information and guidance on Buerger Allen Exercise to help individuals with Diabetes understand its impact and manage the risk of Peripheral Vascular Disease. Promoting evidence-based practice is essential when incorporating Buerger Allen Exercise into nursing care.

Nursing Education

Nurse educators can train student nurses to incorporate Buerger Allen Exercise into patient care, particularly for those with Non-Communicable Diseases like Diabetes Mellitus and Hypertension.

Encouraging students to undertake projects related to Buerger Allen Exercise in various settings and organizing group activities and educational programs to explore different aspects of Buerger Allen Exercise.

Nursing Administration

Nurse administrators can participate in developing protocols for health education programs that emphasize the effectiveness of Buerger Allen Exercise.

Developing a standardized protocol for patients at risk of diabetes-related lower extremity perfusion issues.

Nursing Research

Nurse researchers can encourage clinical nurses to integrate research findings into their daily nursing care practices. Promoting evidence-based practice in nursing research, especially concerning the use of Buerger Allen Exercise.

Recommendation

- The study can be replicated by using a large samples there by findings can be generalized.
- A comparative study may be conducted to evaluate the effectiveness of Buerger Allen Exercise with other non-pharmacological measures for improving the level of lower extremity perfusion.
- A descriptive study can be conducted to assess the knowledge and attitude of nurses towards various type of exercise for peripheral vascular disease.
- The study can be conducted for different samples and in different settings there by findings can be generalized.

Conclusion

Buerger Allen Exercise is a non-pharmacological intervention which can be carried out independently in the field of nursing. In this study, the participants expressed that they felt easy to remember and perform the BAE at home setting without any observation.

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