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RESEARCH ARTICLE
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EFFECTIVENESS OF BUERGER-ALLEN EXERCISES IN IMPROVING LOWER EXTREMITY PERFUSION AMONG PATIENTS WITH TYPE-2 DIABETES MELLITUS: A RANDOMIZED CONTROLLED TRIAL IN PUNJAB, INDIA

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Abstract

Background: Type-2 diabetes mellitus (T2DM) is a progressive metabolic disorder frequently complicated by peripheral arterial disease (PAD), microvascular dysfunction, and diabetic foot, resulting in significant morbidity and healthcare costs. While pharmacological management of diabetes has been extensively studied, there is limited evidence on non-pharmacologic, nurse-led interventions that can improve lower limb perfusion.

Objective: To evaluate the effectiveness of Buerger-Allen exercises in improving lower extremity perfusion among hospitalized T2DM patients in Punjab, India.

Methods: A randomized controlled trial was conducted among 60 T2DM patients with ankle-brachial index (ABI) <1. Participants were randomly assigned to an intervention group (n=30), who performed Buerger-Allen exercises three times daily for three consecutive days, or a control group (n=30), who received standard diabetic care. Outcomes included ABI measurement and a clinical perfusion checklist (capillary refill time, peripheral pulses, skin color, temperature, and edema). Patient satisfaction was also assessed. Statistical analysis was performed using SPSS v21; significance was set at $p < 0.05$.

Results: The intervention group showed significantly higher mean ABI improvement (1.20 ± 0.25) compared to controls (0.94 ± 0.21; $t=4.0$, $p<0.05$). Clinical perfusion parameters also improved, including reduced capillary refill times, enhanced peripheral pulses, and normalized skin temperature. Patient satisfaction was high, with most expressing willingness to continue exercises post-discharge.

Conclusion: Buerger-Allen exercises are an effective, low-cost, and practical nursing intervention to enhance peripheral circulation in T2DM patients. When integrated into routine care, these exercises may prevent progression of diabetic foot complications.

Keywords: Buerger-Allen exercise; Type-2 diabetes mellitus; Ankle Brachial Index; Peripheral circulation; Diabetic foot prevention

Introduction

Type-2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance, impaired insulin secretion, and progressive hyperglycemia. According to the International Diabetes Federation (IDF), an estimated 537 million adults worldwide were living

with diabetes in 2021, with numbers projected to rise sharply by 2045 (Ogurtsova et al., 2017). India ranks second globally in diabetes prevalence, with an increasing burden of vascular complications.

Peripheral arterial disease (PAD) and diabetic foot are among the most disabling complications, contributing to recurrent hospitalizations, amputations, and mortality. Early detection and preventive interventions for impaired lower limb perfusion are therefore critical.

Pharmacological interventions form the cornerstone of diabetes care, yet they may not fully prevent vascular complications, particularly in resource-limited settings. Non-pharmacologic, nurse-led interventions can provide low-cost and sustainable strategies to improve circulation.

Buerger-Allen exercises, first described in vascular rehabilitation literature, are simple postural maneuvers involving alternating leg elevation, dependency, and rest phases. These exercises promote collateral circulation, enhance venous return, and potentially improve peripheral perfusion. While some nursing studies have documented positive outcomes (Wahyuni et al., 2022; Latha & Gifty, 2019), rigorous randomized trials remain limited, especially within Indian hospital contexts.

This study therefore aimed to evaluate the effectiveness of Buerger-Allen exercises in improving lower extremity perfusion among T2DM patients in Punjab, India.

Review of Literature

Several studies have highlighted the vascular burden in T2DM patients. Wahyuni et al. (2022) demonstrated that Buerger-Allen exercises improved blood circulation and reduced ischemic symptoms in Indonesian diabetic patients. Patel et al. (2022) reported improved ABI values among Indian patients who engaged in the exercises for two weeks. Similarly, Latha and Gifty (2019) confirmed improved skin temperature and peripheral pulse volume among patients in a nursing trial.

However, most available studies were quasi-experimental or limited to small samples. Randomized controlled trials (RCTs) with standardized interventions are scarce. Given the high prevalence of diabetic foot complications in India, RCT-based evidence could strengthen recommendations for integrating such non-pharmacologic interventions into hospital nursing protocols.

Materials and Methods

Study Design and Setting

A randomized controlled trial (parallel-group design) was conducted between January and March 2024 at two tertiary hospitals in Mohali, Punjab: Civil Hospital (Phase-6) and Indus Healthsure Hospital.

Participants

Inclusion criteria:

- Adults aged 40–70 years diagnosed with T2DM for ≥5 years
- ABI <1 (suggestive of compromised perfusion)
- No active foot ulcers or gangrene

Exclusion criteria:

- Severe cardiac or renal impairment
- Recent lower limb surgery
- Unwillingness to participate

Sample Size

Sixty eligible participants were enrolled and randomized equally into intervention (n=30) and control (n=30) groups using a computer-generated random number sequence.

Intervention

The intervention group performed **Buerger-Allen exercises** three times daily for three consecutive days. Each session included:

1. **Leg elevation** at 45° for 2–3 minutes
2. **Leg dependency** (dangling position) for 5–10 minutes until skin turned red
3. **Supine rest** for 10 minutes

The control group received only standard diabetic care (medications, diet advice, and routine physiotherapy as per hospital policy).

Outcome Measures

1. **Primary outcome:** Ankle Brachial Index (ABI), measured using aneroid sphygmomanometer and handheld Doppler.
2. **Secondary outcomes:** Clinical perfusion checklist (skin color, temperature, capillary refill time, presence of edema, and palpability of peripheral pulses).
3. **Patient satisfaction:** Assessed using a 5-point Likert scale questionnaire.

Ethical Considerations

The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants.

Data Analysis

Data were analyzed using **SPSS v21**. Continuous variables were expressed as mean ± SD. Independent t-tests compared ABI values between groups. Mann-Whitney U tests compared non-parametric variables. A p-value <0.05 was considered statistically significant.

Results

Baseline Characteristics

Both groups were comparable in terms of age, gender distribution, diabetes duration, and baseline ABI values.

Primary Outcome

The mean post-intervention ABI was significantly higher in the intervention group (1.20 ± 0.25) compared to the control group (0.94 ± 0.21; $t=4.0$, $p<0.05$).

Secondary Outcomes

- Capillary refill time reduced from >3 seconds to <2 seconds in 80% of intervention patients.
- Peripheral pulses improved from weak to palpable in 70% of cases.
- Skin color and temperature normalized in most intervention patients, while minimal change was noted in controls.

Patient Satisfaction

Most participants in the intervention group rated the exercises as “useful” or “very useful.” Willingness to continue the exercises at home was reported by 90%.

Discussion

The findings demonstrate that Buerger-Allen exercises significantly improve lower extremity perfusion in T2DM patients, as evidenced by increased ABI values and improved clinical signs. These results are consistent with Wahyuni et al. (2022) and Patel et al. (2022), reinforcing that simple postural exercises can enhance vascular function.

Compared to complex physiotherapy regimens or invasive interventions, Buerger-Allen exercises are cost-free, non-invasive, and require minimal supervision. This makes them highly suitable for resource-limited hospital settings and community health programs.

Strengths of this study include its randomized design, hospital-based implementation, and inclusion of both objective (ABI) and subjective (clinical checklist, satisfaction) outcomes. Limitations include the short intervention duration (3 days), relatively small sample size, and lack of long-term follow-up. Future studies should explore the sustained effects of these exercises and their impact on preventing diabetic foot ulcers and amputations.

Conclusion

Buerger-Allen exercises significantly enhance lower extremity perfusion among T2DM patients, representing a safe, simple, and cost-effective adjunct to standard diabetes care. Nurses can effectively implement this intervention to prevent diabetic foot complications.

Implications for Nursing Practice

- Nurses should be trained to administer and teach Buerger-Allen exercises to hospitalized patients.
- Hospitals should incorporate exercise protocols into diabetes management programs.
- Patient education materials should emphasize home-based continuation of exercises post-discharge.
- Further large-scale RCTs with long-term follow-up are needed to validate sustainability of benefits.

References

1. Ogurtsova K, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence. *Diabetes Res Clin Pract.* 2017.
2. Wahyuni NT, et al. Effect of Buerger Allen Exercise on lower extremity circulation in T2DM patients. *J Nurs Pract.* 2022.
3. Patel R, et al. Buerger Allen exercise and peripheral circulation in diabetes patients. *Indian J Nurs Stud.* 2022.
4. Latha H, Gifty VF. Effectiveness of Buerger Allen exercise on lower extremity perfusion in T2DM. *Int J Nurs Res.* 2019.