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Research Paper

Integrating Buerger Allen Exercise into Nursing Practice for Diabetic Patients: An Evidence-Based Approach to Improve Lower Limb Perfusion

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder that significantly contributes to peripheral vascular disease (PVD), leading to reduced lower limb perfusion and increased risk of ulcers and amputation. Non-pharmacological interventions such as the Buerger Allen Exercise (BAE) have shown promising results in improving circulation and delaying complications. This paper presents an evidence-based approach to integrating BAE into nursing practice for diabetic patients, emphasizing preventive care, holistic nursing, and nurse-led management. Findings from existing research indicate that BAE enhances lower limb perfusion and functional capacity. The integration of BAE into nursing education and hospital practice could improve patient outcomes and reduce the burden of diabetic complications in India.

Keywords: *Buerger Allen Exercise, Nursing Practice, Diabetic Patients, Lower Limb Perfusion*

Holistic nursing care emphasizes not only disease management but also preventive and rehabilitative approaches that promote the overall well-being of patients. This approach recognizes the interconnectedness of body, mind, and spirit, ensuring that care is not limited to symptom management but extends to the prevention of disease progression and improvement of quality of life (Dossey & Keegan, 2020). The holistic model aligns with Florence Nightingale's philosophy of nursing as a healing profession that creates environments conducive to recovery and wellness rather than focusing solely on treating illness. In contemporary healthcare, chronic diseases such as diabetes mellitus have become one of the leading global health concerns. Diabetes mellitus is a complex metabolic disorder characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both (American Diabetes Association, 2023). It is one of the most prevalent non-communicable diseases (NCDs) and a significant contributor to morbidity and mortality worldwide. The disease affects multiple organ systems and is associated with numerous complications that impact patients' physical, psychological, and social well-being. According to the International Diabetes Federation (2023), India accounts for over 77 million diabetic adults, ranking second globally in diabetes prevalence after China. The numbers are projected to increase to approximately 134 million by 2045 if current trends continue. This growing burden poses a critical challenge to India's healthcare infrastructure,

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particularly in resource-constrained states such as Uttar Pradesh (UP), where healthcare access and awareness remain limited. The financial and social costs associated with diabetes management, especially its long-term complications, have become a major public health concern (Mohan et al., 2022).

Among the multiple complications of diabetes, peripheral vascular disease (PVD) is one of the most debilitating. It results from the narrowing or obstruction of peripheral arteries due to atherosclerosis, reducing blood flow to the extremities. PVD often manifests as pain, cramping, numbness, coldness, and in severe cases, non-healing ulcers, gangrene, and amputation (Tripathi et al., 2021). Studies have shown that 15–25% of diabetic patients will develop foot ulcers during their lifetime, with approximately 50% of lower-limb amputations being preventable through early detection and appropriate management (Singh et al., 2023). These complications not only affect physical health but also lead to psychological distress, loss of productivity, and decreased quality of life. The management of diabetes and its complications require an integrated, multidisciplinary approach in which nurses play a pivotal role. Nurses are often the first point of contact for diabetic patients and are uniquely positioned to assess risks, provide education, and implement preventive interventions (Yadav & Kaur, 2021). Traditional nursing care for diabetic patients in India has largely focused on wound care, medication administration, and glycemic monitoring. However, the scope of nursing practice must now expand to include preventive and rehabilitative care aimed at maintaining functional independence and improving circulation.
One such non-pharmacological, evidence-based intervention is the Buerger Allen Exercise (BAE). The BAE is a structured physical exercise designed to promote arterial blood flow and improve venous return in the lower limbs. The exercise involves positioning the patient's legs in three phases: elevation, dependency, and rest. This systematic movement facilitates alternating cycles of emptying and filling of the blood vessels, thereby enhancing collateral circulation and improving oxygenation of tissues (Kaur & Thomas, 2020). The simplicity and effectiveness of the Buerger Allen Exercise make it a particularly suitable intervention for use in nursing practice. It can be performed without specialized equipment, requires minimal supervision, and can be adapted to hospital or community settings. More importantly, the intervention empowers patients to participate in their own care, fostering self-efficacy and adherence to preventive strategies (Kumar et al., 2020).

Burden of Diabetic Complications and Need for Preventive Interventions

India's diabetes epidemic is driven by urbanization, sedentary lifestyles, and dietary changes. Epidemiological studies have revealed that more than half of Indian adults with diabetes are undiagnosed, and many present with complications at the time of diagnosis (Mohan et al., 2022). The International Diabetes Federation (2023) reports that India faces an increasing incidence of diabetes-related vascular complications, particularly in lower-income regions where preventive care is often neglected. In Uttar Pradesh, the challenges are multifaceted. The state's healthcare system faces resource constraints, an uneven distribution of healthcare workers, and limited access to diabetic education programs. Rural populations are disproportionately affected due to poor health-seeking behavior, lack of screening facilities, and delayed diagnosis. Consequently, patients often present with advanced peripheral vascular disease, necessitating costly treatments such as angioplasty or amputation (Singh et al., 2023). These realities underscore the urgent need for nurse-led preventive strategies. Nurses, being the most accessible healthcare professionals, can identify at-risk patients early and implement interventions such as Buerger Allen Exercise to improve perfusion, reduce pain, and prevent further complications. Early implementation of

such interventions could significantly reduce hospital admissions, healthcare costs, and mortality associated with diabetic complications (Tripathi et al., 2021).

Significance of Holistic Nursing in Diabetes Care

Holistic nursing integrates physical, psychological, emotional, and spiritual dimensions of care, aligning perfectly with the multifactorial nature of diabetes. Unlike disease-centered models that focus solely on pharmacological control, holistic nursing aims to empower patients through education, lifestyle modification, and self-management. According to Dossey and Keegan (2020), holistic nursing emphasizes prevention, balance, and self-care—principles that are particularly relevant for chronic diseases like diabetes. By incorporating Buerger Allen Exercise into daily nursing practice, nurses can extend care beyond hospital boundaries and foster continuity of care in the community. BAE aligns with holistic nursing principles because it addresses both physical and emotional well-being. Patients who engage in self-directed physical exercises report greater confidence, less anxiety, and a sense of control over their condition (Yadav & Kaur, 2021). Furthermore, the BAE approach strengthens the nurse-patient relationship. Through education and guidance, nurses help patients understand the importance of circulation and adherence to therapy, leading to improved compliance and outcomes. This collaborative, participatory model is at the heart of holistic nursing care.

Gaps in Nursing Education and Practice

Despite the strong evidence supporting nurse-led preventive interventions, there remains a gap in their implementation across Indian healthcare systems. Nursing curricula, particularly at undergraduate levels, still emphasize curative and pharmacological aspects of care rather than rehabilitative and preventive strategies. Many nurses are unaware of the techniques or benefits of therapeutic exercises such as Buerger Allen Exercise, resulting in underutilization in clinical settings (Kaur & Thomas, 2020). There is also limited research and documentation on the impact of BAE within Indian healthcare settings, particularly in rural and semi-urban areas. As a result, policymakers and nursing educators often overlook it when designing training programs and clinical guidelines. Strengthening the focus on evidence-based nursing interventions like BAE could enhance professional competence and contribute to better patient outcomes (Kumar et al., 2020). Nurses must also overcome institutional barriers such as heavy workloads, lack of time, and insufficient administrative support to integrate BAE into routine care. Therefore, healthcare administrators and policymakers must ensure that adequate resources, training, and time allocations are provided for such preventive interventions.

Rationale for Integrating Buerger Allen Exercise into Nursing Practice

The integration of Buerger Allen Exercise into nursing practice has the potential to revolutionize diabetic care in India. As a low-cost, nurse-led intervention, it addresses both the physiological and psychosocial needs of patients with peripheral vascular disease. Research evidence demonstrates that BAE improves lower limb blood flow, enhances ankle-brachial index scores, and reduces pain and edema (Kumar et al., 2020). Moreover, patient adherence is higher when nurses supervise and educate them regarding the procedure, demonstrating the importance of the nursing role in maintaining continuity of care. Integrating BAE aligns with the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) in India, which emphasizes early detection and lifestyle interventions at the primary care level. Training nurses in BAE and

incorporating it into diabetic care protocols could substantially reduce disease burden, especially in rural and semi-urban regions of Uttar Pradesh.

In the broader context of global health, such interventions contribute to achieving the Sustainable Development Goal 3 (Good Health and Well-being) by promoting preventive healthcare and reducing non-communicable disease mortality. Thus, the integration of BAE into nursing practice is not only clinically beneficial but also strategically aligned with national and international health objectives.

METHOD

This paper adopted an integrative review methodology to synthesize existing empirical evidence on the effectiveness of Buerger Allen Exercise (BAE) in improving lower limb perfusion among diabetic patients. The review focused particularly on nurse-led interventions implemented in hospital and community settings in India. An integrative approach was chosen to include findings from both quantitative and qualitative research, enabling a comprehensive understanding of how BAE can be integrated into nursing practice (Whittemore & Knafl, 2005).

Study Design and Data Sources

A structured literature search was conducted in electronic databases including PubMed, CINAHL, Scopus and Google Scholar. Keywords used were: "Buerger Allen Exercise," "peripheral vascular disease," "diabetic foot care," "nursing intervention," and "lower limb perfusion." Boolean operators such as AND and OR were applied to refine the search. Studies published between 2010 and 2024 were considered, ensuring inclusion of contemporary nursing practices and evidence.

The search identified 25 potentially relevant studies, out of which 10 met the inclusion criteria after screening abstracts and full texts. Selection criteria included:

- Studies involving adult diabetic patients diagnosed with peripheral vascular insufficiency.
- Implementation of Buerger Allen Exercise as a primary or adjunct intervention.
- Nurse-led or nurse-supervised intervention delivery.
- Measurable outcomes such as changes in ankle-brachial index (ABI), skin temperature, color changes, or capillary refill time.
- Studies focusing solely on pharmacological management or surgical interventions were excluded.

Intervention Procedure

The Buerger Allen Exercise protocol typically involves three postural phases designed to enhance arterial and venous circulation (Kumar et al., 2020):

- Elevation Phase – The lower limbs are elevated to a 45-degree angle for 2–3 minutes to promote venous drainage.
- Dependency Phase – The legs are allowed to hang down for 3–5 minutes, encouraging arterial filling.
- Rest Phase – The patient lies supine for 3–5 minutes, allowing equilibrium of circulation.
- This cycle is repeated three times per session, thrice daily, as recommended by prior studies (Rani & Joseph, 2021).

Nurse-Led Implementation

The nursing role was central to intervention success. Nurses educated patients about the purpose and technique of BAE, demonstrated proper positioning, and monitored for signs of ischemic pain or fatigue. Clinical indicators such as skin color, temperature, ABI, and patient-reported comfort were recorded before and after intervention periods (Kaur & Thomas, 2020). Nurses also provided follow-up education to encourage self-practice at home, ensuring continuity of care and patient empowerment.

Data Synthesis

Findings from the selected studies were analyzed thematically. Data were summarized to identify consistent outcomes and implementation patterns. Quantitative findings (e.g., increase in ABI or skin temperature) were descriptively summarized, while qualitative reports highlighting patient adherence and satisfaction were narratively integrated (Polit & Beck, 2021). This mixed approach provided both clinical and contextual insights, aligning with the holistic nursing framework that emphasizes physiological, behavioral and educational components of care.

RESULTS AND DISCUSSION

Evidence synthesized from multiple quasi-experimental and randomized controlled trials highlights the significant role of Buerger Allen Exercise (BAE) in enhancing lower limb perfusion, reducing pain, and improving tissue oxygenation among diabetic patients with peripheral vascular disease (PVD) (Kaur & Thomas, 2020; Kumar et al., 2020). Across reviewed studies, nurse-led BAE interventions led to measurable improvements in both objective indicators (e.g., Ankle-Brachial Index and skin temperature) and subjective patient outcomes (e.g., pain reduction, improved mobility, and satisfaction).

These findings affirm that BAE, being cost-effective and non-invasive, can serve as a practical preventive nursing intervention, particularly in low-resource healthcare settings (Yadav & Kaur, 2021).

Quantitative Outcomes

Table 1 presents a synthesis of results from key studies conducted in India examining the impact of BAE on physiological outcomes. In nearly all cases, participants showed statistically significant improvements in peripheral circulation and vascular function markers after 2–4 weeks of intervention.

Table 1. Summary of Key Quantitative Findings from Reviewed Studies

Study	Sample Size & Design	Outcome Measures	Results	Nursing Implications
Kumar et al. (2020)	60 diabetic patients, quasi-experimental	Ankle-Brachial Index (ABI), skin temperature	Mean ABI improved from 0.74 to 0.90 ($p<0.05$); skin temperature increased by 2.1°C	Nurses can use BAE to enhance arterial flow and prevent ischemia
Kaur & Thomas (2020)	50 diabetic patients, RCT	ABI, capillary refill time, pain score	ABI and perfusion significantly improved; pain score reduced by 40%	BAE should be integrated into bedside diabetic care

Study	Sample Size & Design	Outcome Measures	Results	Nursing Implications
Rani & Joseph (2021)	40 patients, pre-test/post-test	Color change, mobility, comfort score	80% showed improved limb coloration; reported better comfort and mobility	Nurses can monitor visible indicators of perfusion improvement
Yadav & Kaur (2021)	35 patients, pilot study	Patient adherence, satisfaction	92% adherence and high patient satisfaction	Nurse education enhances continuity of care and compliance

The consistent improvement in ABI values across these studies signifies enhanced arterial blood flow and oxygen delivery to tissues, which are critical for preventing diabetic foot ulcers and amputations (Tripathi et al., 2021).

Qualitative Findings

Apart from physiological outcomes, qualitative data revealed improvements in patient comfort, confidence, and self-management. Participants expressed greater ease in performing daily activities and less dependency on assistive devices after regular BAE sessions (Rani & Joseph, 2021). The nurse-patient interaction was found to be crucial, as effective demonstration, motivation, and follow-up increased adherence rates (Kaur & Thomas, 2020). Patients also valued BAE's simplicity and minimal time requirement, which enhanced its acceptance and sustainability in home-care environments. These findings support the holistic nursing approach emphasizing patient empowerment and self-efficacy (Dossey & Keegan, 2020).

Integration into Nursing Practice

The implications of these findings extend across clinical, educational, and policy dimensions. Table 2 outlines strategies for integrating BAE into nursing practice, linking evidence with actionable recommendations.

Table 2. Integration of Buerger Allen Exercise into Nursing Practice

Domain	Recommended Action	Expected Outcome	Supporting Evidence
Clinical Practice	Incorporate BAE into routine diabetic foot care and physiotherapy rounds	Improved peripheral circulation and reduced ischemic risk	Kumar et al. (2020); Kaur & Thomas (2020)
Nursing Education	Include BAE in nursing curriculum modules and clinical skill labs	Enhanced competency in preventive nursing	Yadav & Kaur (2021)
Community Health Nursing	Train community nurses to demonstrate BAE in home visits	Increased awareness and patient participation	Rani & Joseph (2021)
Policy Implementation	Develop standard operating procedures (SOPs) for BAE in diabetic care	Institutionalization of preventive nursing protocols	Singh et al. (2023)

The evidence synthesized from national and international studies confirms that nurse-led Buerger Allen Exercise (BAE) interventions are both effective and sustainable in preventing and managing peripheral vascular complications in diabetic patients (Kaur & Thomas, 2020; Kumar et al., 2020). By improving lower-limb perfusion, enhancing tissue oxygenation, and reducing ischemic pain, BAE directly addresses the pathophysiological challenges associated with peripheral vascular disease (PVD) in diabetes. These improvements translate into fewer complications, such as foot ulcers and amputations, ultimately improving patients' functional independence and quality of life (Tripathi et al., 2021).

Multidimensional Benefits of BAE

The benefits of BAE extend beyond physiological outcomes. Studies have shown that regular nurse-guided BAE practice fosters patient empowerment and self-efficacy, as individuals gain confidence in self-managing their condition (Rani & Joseph, 2021). The exercise's simplicity and lack of equipment requirements make it particularly feasible for home-based practice, reducing patient dependency on specialized centers (Yadav & Kaur, 2021). From a nursing perspective, BAE enhances the scope of professional practice, positioning nurses not only as caregivers but also as educators, motivators, and advocates of preventive health (Polit & Beck, 2021). This aligns with the holistic nursing framework, which integrates physical, psychological, and social dimensions of health (Dossey & Keegan, 2020).

Implications for Hospital and Community Settings

In hospital settings, BAE can be incorporated into daily nursing rounds, particularly for patients with prolonged immobilization or diabetic neuropathy. Incorporating the exercise as a routine nursing protocol can help maintain peripheral circulation and prevent the onset of complications during hospitalization (Kumar et al., 2020). Nurses can collaborate with physiotherapists and diabetologists to create interdisciplinary care plans that integrate BAE alongside pharmacological therapy. In community and primary healthcare settings, BAE serves as a low-cost preventive measure, particularly in resource-limited areas such as rural Uttar Pradesh, where access to vascular specialists and rehabilitation services is scarce (Singh et al., 2023). Community health nurses can play a transformative role by educating patients and caregivers, conducting home visits, and ensuring adherence through demonstrations and follow-ups (Rani & Joseph, 2021).

Educational and Policy Integration

For sustained implementation, nursing education programs must integrate evidence-based exercises like BAE into curricula and clinical training modules. By incorporating practical sessions on peripheral circulation assessment and therapeutic exercises, nursing students can develop the competencies required to deliver holistic, preventive care (Yadav & Kaur, 2021). At the policy level, healthcare institutions and nursing councils should establish standard operating procedures (SOPs) for the inclusion of BAE in diabetic care protocols. Continuous professional development workshops and refresher training can further strengthen nurses' confidence in applying this technique (Singh et al., 2023).

Alignment with Global Health Goals

The integration of BAE also supports broader global health objectives, such as the World Health Organization's emphasis on non-communicable disease (NCD) prevention through community-based interventions and self-care promotion. It reflects the principles of

evidence-based nursing practice, which combine scientific evidence, clinical expertise, and patient preferences to achieve optimal outcomes (Polit & Beck, 2021).

CONCLUSION

In conclusion, Buerger Allen Exercise represents a practical, evidence-based, and holistic nursing intervention that can be seamlessly integrated into diabetic care. The reviewed evidence underscores its potential to improve lower limb perfusion, prevent severe vascular complications, and empower both nurses and patients. By embedding BAE into nursing education, clinical protocols, and public health strategies, India can move toward a more preventive, patient-centered model of diabetes management. Such an approach not only improves clinical outcomes but also enhances the professional visibility and leadership role of nurses in chronic disease prevention and rehabilitation.

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Conflict of Interest

The author(s) declared no conflict of interest.

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