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Innovation Of A Holistic And Integrated Approach To Improve The Quality Of Life Of Diabetic Neuropathy Patients

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ABSTRACT

Diabetic neuropathy is a serious complication of diabetes mellitus that can lead to a decline in patients' quality of life. This study aimed to evaluate the effectiveness of various approaches to diabetic neuropathy care, including nutrition, digital technology, clinical simulation, and traditional protocols. A systematic literature review (SLR) was used, analyzing six primary articles published between 2015 and 2025. The results showed that nutritional approaches such as Metanx can significantly reduce neuropathy symptoms and improve patients' quality of life. Digital technology approaches have also been shown to improve patients' self-efficacy and self-care behaviors, while virtual simulation can improve nurses' clinical skills. The conclusion of this study is that a more holistic and integrated approach is needed to improve the quality of life of diabetic neuropathy patients. Future research should include a more robust study design with an adequate control group to ensure the validity of the findings .

Keywords: Diabetic Neuropathy, Holistic Care, Quality of Life

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease with increasing prevalence globally. According to research by Zhao et al. (2025), DM is a major cause of serious complications, including diabetic neuropathy, which can significantly reduce patients' quality of life (Zhao et al., 2025) . Diabetic neuropathy is characterized by nerve damage caused by chronic hyperglycemia, which can affect sensory, motor, and autonomic functions (Schwarzkopf et al., 2017) .

Symptoms of diabetic neuropathy include pain, tingling, and muscle weakness, which substantially interfere with the patient's daily activities and increase the risk of more serious complications, such as diabetic foot ulcers and amputation. (Teigland et al., 2024) . Thus, effective treatment for diabetic neuropathy is crucial to prevent further complications and improve patients' quality of life.

In addition to physical impacts, diabetic neuropathy also impacts the psychological and social aspects of patients. Shaban et al. (2024) highlighted the importance of digital technology-based care in improving self-efficacy and self-care behaviors in diabetic neuropathy patients (Shaban et al., 2024) . This approach allows patients to be more involved in managing their condition, which in turn can improve clinical outcomes and reduce the burden of long-term care (Xu et al., 2025) .

However, the effectiveness of this approach still needs to be further evaluated, especially in the context of long-term implementation and various factors that influence patient adherence to the treatment protocol (Trippe et al., 2016) .

This study aims to evaluate the effectiveness of various diabetic neuropathy treatment approaches, including nutrition, digital technology, clinical simulation, and traditional

protocols, identify the advantages and limitations of each approach to improve the quality of life of diabetic neuropathy patients, analyze the effect of digital technology in improving self-efficacy and quality of life of patients, and develop evidence-based recommendations for the development of a more holistic and integrated care model.

METHODS

This study used a *systematic literature review* (SLR) design to identify, evaluate, and synthesize research findings related to diabetic neuropathy care. This systematic review was conducted by analyzing six research articles covering various approaches to the care of diabetic patients with neuropathy, including traditional medicine, digital interventions, nutrition-based approaches, and simulation training. The articles analyzed included studies from various countries such as China, Egypt, Germany, the United States, and Norway, with diverse study designs including randomized controlled trials, quasi-experimental trials, and observational studies. Data were evaluated based on intervention effectiveness, quality of life improvement, and neuropathic pain management.

The research sample includes six primary articles published between 2015 and 2025, covering various treatment approaches such as nutrition, digital technology, clinical simulation, and traditional protocols. In writing this systematic review using 8 articles with keywords Diabetic Neuropathy, Holistic Care, Digital Technology, Nutrition, Clinical Simulation, Self-Efficacy. Research articles are obtained from international databases namely Pubmed, Scopus, Medline. Furthermore, the selection of articles is carried out based on inclusion criteria, namely research articles published from 2015 to 2025, articles indexed by Scopus Q1 to Q4, duplicate articles are removed, and are original research.

The research instrument consisted of a content analysis of selected articles, focusing on intervention effectiveness, quality of life improvement, and neuropathic pain management. Data collection was conducted by searching for relevant articles in international journal databases and then filtering them based on inclusion criteria such as research topic, research method, and study population.

Data were analyzed descriptively to identify patterns, trends, and the strengths and weaknesses of each treatment approach. The results of this analysis were then used to identify research gaps and develop recommendations for the development of a more holistic and integrated care model for patients with diabetic neuropathy.

RESULT

The results of this study indicate that there is variation in the effectiveness of various treatment approaches for diabetic neuropathy patients. For example, Trippe et al.'s (2015) study found that the use of nutritional supplements such as Metanx or L-methylfolate-methylcobalamin-pyridoxal-5-phosphate (LMF-MC-PP, Metanx*) given to 544 patients with diabetic neuropathy with *Neuropathy Total Symptom Score-6* (NTSS-6) using *the Diabetic Neuropathy Symptom* (DNS) scoring instrument , can significantly reduce neuropathy symptoms and improve patients' quality of life, although this study has limitations in its design without a strong control group. Meanwhile Digital technology-based interventions significantly improved patient self-efficacy and self-care behaviors, although the short duration of the intervention was a major limitation of this study (Shaban et al., 2024) . Furthermore, virtual simulation treatment can enhance nurses' clinical skills and improve the quality of care provided to diabetic neuropathy patients, although this study was limited to a single training center (Teigland et al., 2024) .

The following is a Prisma diagram of the predictive model selection process for compiling SLR

articles:

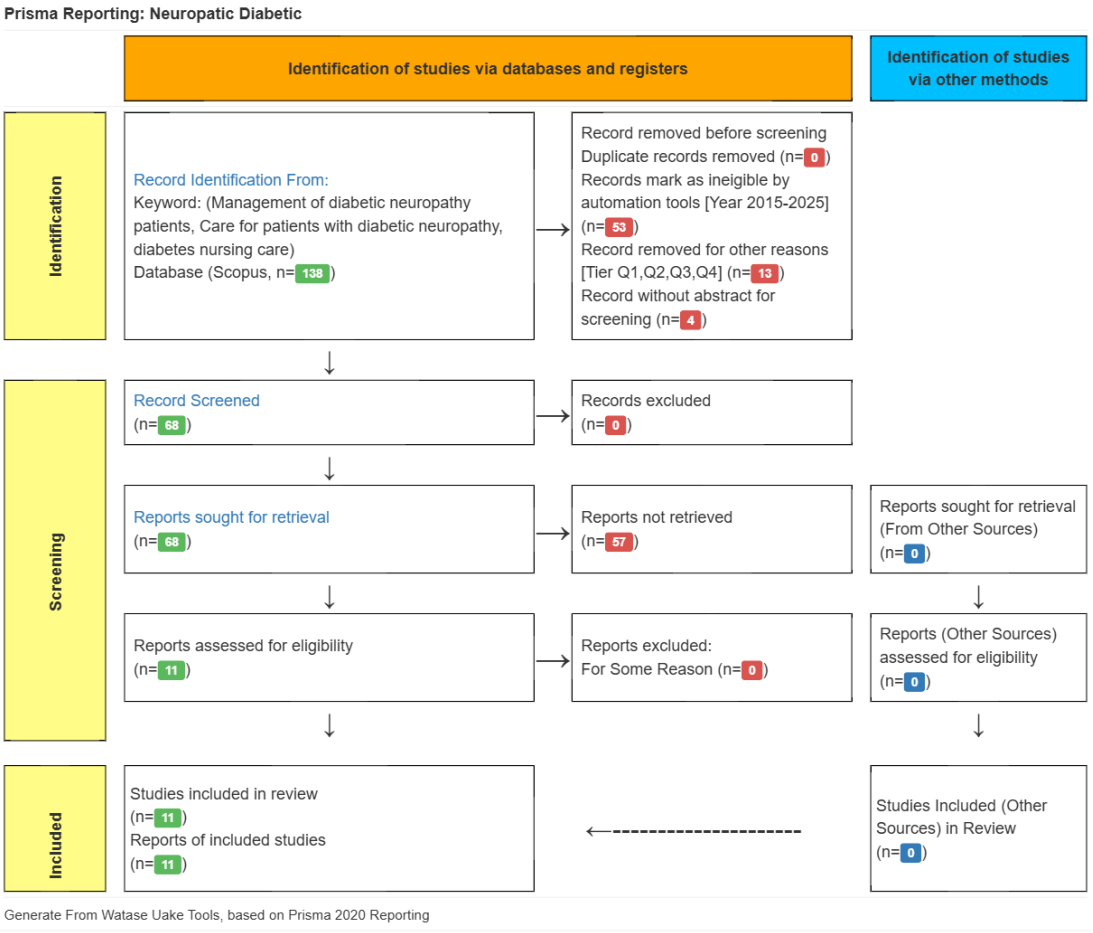

Figure 1: Prism diagram of the process of selecting a predictive model of the effectiveness of various diabetic neuropathy treatments in improving the quality of life of patients.

Table 1: Presents a summary of the main results of each study:

No	Research Title	Author Name and Year of Publication	Journal Name	Theory Used	Research methods	Research result	Limitations
1	Nutritional Management of Patients with Diabetic Peripheral Neuropathy with Metanx	Trippe, B.S., Barrentine, L.W., Curole, M.V., & Tipa, E. , 2015	Current Medical Research and Opinion	Administration of Vitamin B6, B12, and folic acid can improve neuropathy symptoms and reduce pain in DM patients through the following mechanisms: L-methylfolate (LMF) or 5-methyltetrahydrofolate (5-MTHF) is the active form of folic acid. LMF functions to evaluate endothelial function, restoring endothelium-dependent vasodilation in hypercholesterolemic patients.	True Experiment with a sample of 544 patients experiencing diabetic neuropathy , given LMF-MC-PP treatment for 12 weeks.	Patients who were given *L-methylfolate-methylcobalamin-pyridoxal-5-phosphate* (LMF-MC-PP) therapy experienced significant improvement in neuropathy as seen from the results of the NTSS (*Neuropathy Total Symptom Score-6),* decreased pain and quality of life of patients.	This study used a survey instrument to collect data on patient outcomes and there was no control group.
2	Effect of digital-based nursing intervention on knowledge of self-care behaviors and self-efficacy of adult clients with diabetes. Egypt.	Shaban, MM, Sharaa, HM, Amer, FGM, & Shaban, M. , 2024	BMC Nursing	Self-Efficacy Theory	Quasi-experimental, pretest-posttest . The intervention group received a digital-based nursing intervention, which included access to a mobile app specifically designed for diabetes self-management. The app provided personalized educational content on self-care behaviors, medication adherence, dietary recommendations, and physical activity. It also featured real-time glucose monitoring, interactive self-assessment quizzes, and a peer	Providing digital-based nursing interventions can improve knowledge, self-care behavior and *self-efficacy* in patients with diabetes mellitus.	Short intervention duration, sample from one clinic

					support forum for group discussions.		
3	Physiotherapy Management in Diabetic Peripheral Neuropathy Patients Using the Sensorimotor Exercise Method	Muhammad Fadli1 , Wahyuni, Farid Rahman , 2021	Ahmar Metastasis Health Journal	Sensorimotor training works to improve sensory input and proper recruitment patterns of various muscles in maintaining joint stability, regulating movement through the central nervous system (CNS).	research method with case report approach	After being given exercise therapy using the sensory motor exercise method, the results were obtained in the form of increased sensitivity of sensory input, increased static balance and increased dynamic balance as well as an increase in the patient's functional abilities in the form of better walking patterns.	This case study report research only used 1 patient so generalizations cannot be made.
4	Psychological Aspects of Managing Diabetic Neuropathy Pain	Twiddy, H., et al ., 2021	Diabetes Therapy	Cognitive Behavioral Theory	Qualitative study, in-depth interviews	Understanding the role of psychology in neuropathic pain management	Small sample, no longitudinal data
5	Evaluation of the Clinical Nursing Effects of a Traditional Chinese Medicine Nursing Program Based on Care Pathways for Patients With Type 2 Diabetes	Yanchun Zhao, Ting Huang, Yanli Chen, Songmei Li, Juan Zhao, Xu Han, Qing Ni, Ning Su .,2025	Jmir Research Protocols	Pathway-based TCM Nursing	Prospective, randomized, single-blind, parallel-controlled Interventions: TCM techniques, syndrome differentiation-based diet therapy, exercise and health practices, herbal prescriptions, and emotional regulation.	Improve quality of life, reduce medical costs, and increase patient satisfaction	There is no statistical analysis yet as the study is still ongoing.
6	Influence of Continuous 4C Nursing on Quality of Life in Diabetic Patients	Wufuer, A., et al .,2024	JMIR Research Protocols	Patient-Centered Care	Observational study	Improved quality of life and patient compliance	Focuses only on diabetic retinopathy patients, does not cover neuropathy
7	Analysis Of Nursing Care In Diabetes Mellitus	Kusuma Wijaya Ridi Putra, Dilla Riksa	Husada Health Literacy:	Diabetic Foot Exercise Intervention to Improve Blood Circulation	Descriptive case study	The results of the study showed improvements in peripheral blood circulation,	Leg exercises were only done for 3 days so the impact

	Through Patients Diabetic Foot Exercise Intervention For Blood Circulation Improvement In Teratai Room, IHC Rsu Wonolangan Probolinggo	Choirunnisak, Fakhrun Nisa' Fiddaroini, Enny Puspita , 2024	Journal of Health Science Informatio n			indicated by Ankle Brachial Index (ABI) scores in the mild obstruction range after consistent leg exercise.	on improving blood circulation was not optimal.
8	Associations between diabetes and risk of short-term and long-term nursing home stays among older people receiving home care services	Tonje Teigland, Jannicke Iglan, Marit Graue1, Kjersti M. Blytt1, Johannes Haltbakk1, Grethe S. Tell, Kåre I. Birkeland, Truls stbye, Marit Kirkevold and Marjolein M. Iversen	BMC Geriatrics	Based on the Anatomical Therapeutic Chemical (ATC **) code**	Observational study	People with diabetes have a lower long-term NHS risk than those without diabetes.	Although the long-term NHS risk was lower in older adults with diabetes, we found an increased short-term NHS risk in people with diabetes who were on insulin therapy, living at home, and receiving HCS.

DISCUSSION

Based on the results of the review of the 11 articles above, a discussion can be conducted based on State of the Art, Research Gap, Novelty and Originality, Correlation between them and Research.

State of the Art

Based on the literature analyzed, approaches to diabetic neuropathy care have evolved rapidly. Digital-based interventions, such as those conducted by Shaban et al. (2024) in Egypt, have shown that digital technology can significantly improve patient self-efficacy and self-care behaviors in patients with diabetes mellitus.

Research Gap

Although numerous studies have evaluated the effectiveness of various interventions, there is still a lack of understanding of the long-term effects of these interventions on the quality of life of patients with diabetic neuropathy. For example, Xu et al.'s (2025) study on virtual simulation for clinical training showed positive results, but it was conducted at only one training center and did not consider long-term aspects (Xu et al., 2025).

Novelty and Originality

Digital technology-based approaches, such as digital interventions and virtual simulations, are the latest innovations in diabetic neuropathy care. These approaches offer more personalized and interactive solutions than conventional approaches, such as TCM-based protocols (Zhao et al., 2025), which still focus on traditional approaches. This approach opens up new opportunities to increase patient engagement in self-care.

Correlation between with Research.

This research is highly relevant to the care of diabetic patients with neuropathy, particularly in the context of pain management and improving quality of life. Approaches such as nutritional interventions (Trippe et al., 2015) and virtual simulation (Xu et al., 2025) can be combined to create a more holistic and integrated care model tailored to the needs of patients with diabetic neuropathy.

Effective treatment for patients with diabetes mellitus who experience neuropathy. Based on an analysis of the available literature, the most effective treatment for diabetic patients with neuropathy involves a holistic and integrated approach. This approach includes:

a. **Nutritional Approach** : As shown by Trippe et al. (2015), the use of nutritional supplements such as Metanx can significantly reduce neuropathy symptoms and improve the quality of life of patients.

b. **Digital Interventions** : Digital technology-based interventions, such as those conducted by Shaban et al. (2024), can improve patients' self-efficacy and self-care behaviors, which are important for long-term neuropathy management .

c. **Virtual Simulation** : This approach, as developed by Xu et al. (2025), can enhance nurses' clinical skills and improve the quality of care provided to diabetic neuropathy patients.

d. **Traditional Approach** : TCM-based protocols, such as those developed by Zhao et al. (2025), offer a holistic approach that can help improve patients' quality of life at a lower cost.

e. **Home care** : Elderly people with diabetes mellitus should receive care at home or through *a home care service* (HCS) rather than in a nursing home. Home care can help maintain stable blood glucose levels, providing greater support from loved ones or healthcare professionals (Teigland et al., 2024) .

f. **Physiotherapy Management** : Diabetic Peripheral Neuropathy Patients require physiotherapy to improve sensory, balance, and functional abilities using the sensorimotor exercise method. This exercise emphasizes the function of the sensorimotor system as a unit, and works to improve sensory input and proper recruitment patterns of various muscles in maintaining joint stability, regulating movement through the central nervous system (CNS). Physiotherapy treatment with sensorimotor and gait training methods in cases of diabetes mellitus with diabetic peripheral neuropathy (DPN) can increase sensory input sensitivity, improve lower extremity functional abilities, improve static and dynamic balance, and improve gait patterns (Fadli et al., 2021) . Research conducted by Kusuma Wijaya et al., 2024 stated that Diabetic Foot Exercise Intervention can Increase Blood Circulation as indicated by the Ankle Brachial Index (ABI) score in the mild obstruction range after consistent foot exercise (Wijaya et al., 2024) .

CONCLUSION

Overall , the reviewed studies suggest that a more holistic and integrated approach is needed to improve the quality of life for patients with diabetic neuropathy. Digital technology-based approaches, clinical pathways, nutritional support, family support, and foot physiotherapy exercises have significant potential to improve outcomes, but further research is needed to evaluate their long-term effectiveness and psychosocial impact .

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