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Comparison of Immediate Effects of Kinesio-taping Versus Sham Taping on Functional Mobility Among Diabetic Neuropathy Patients – A Single Blinded Randomized Control Study

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Abstract

Background: Diabetes Mellitus (DM) is a major health issue, with Diabetic Peripheral Neuropathy (DPN) causing nerve damage, numbness, and balance problems, increasing fall risk. Conventional physical therapy may not suffice for older adults with severe DPN. Kinesio-taping has shown potential in enhancing proprioception and balance by stimulating skin receptors.

Aim: This study aimed to compare the immediate effects of Kinesio-taping versus sham taping on functional mobility in individuals with diabetic neuropathy.

Methods: The study included 22 individuals with diabetic neuropathy, mean age 60.27±5.159 years in the experimental group and 59.27±4.735 years in the control group. Kinesio-tape with 50% stretch was applied to the experimental group, while the control group received sham taping. Timed Up and Go (TUG) test scores were recorded pre- and post-intervention.

Results: A significant (p=0.014) improvement in TUG scores was observed post-taping in the experimental group compared to the control group.

Conclusion: Kinesio-tape with 50% stretch on the lower legs improves functional mobility, dynamic balance, and reduces fall risk in individuals with diabetic neuropathy.

Keywords: Diabetes Mellitus; Diabetic Neuropathy; Falls; Dynamic Balance; Kinesio-Taping

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Introduction

Diabetes Mellitus (DM) has become a major health challenge in the 21st century, with more people being diagnosed and treatment costs soaring. India ranks second worldwide in the number of diabetic patients, with 74.9 million individuals aged 20-79 affected in 2021 [1]. Diabetic peripheral neuropathy (DPN) stands out among various diabetes complications [2]. DPN is characterized by symptoms and/or signs of peripheral nerve damage arising due to long periods of hyperglycemia and metabolic abnormalities that touch on both microvascular and metabolic functions [3]. Between 50%-66% of people having diabetes will develop DPN at some point, with those having type 2 diabetes being more predisposed compared to their counterparts with type-1 diabetes according to research [4]. It is a painful sensory condition that starts from sensory changes in lower limbs resulting in significant morbidity like numbness or loss of sensation, weakness in muscles, and burning sensations. Excessive blood glucose levels stimulate cellular stress and insulin resistance that cause inflammation leading to nerve injury because they also trigger poor blood supply as well as impaired regeneration process. At first small C-fibers start burning causing hypersensitivity followed by impairment myelin sheath which results into slow degeneration of nerves thus gradual loss or absence for feeling beginning from toes [5].

DPN can cause disability such as foot ulcers, amputations, gait issues and a high risk of falling with an incidence reaching 40%. DPN patients have impaired balance and are more likely to be

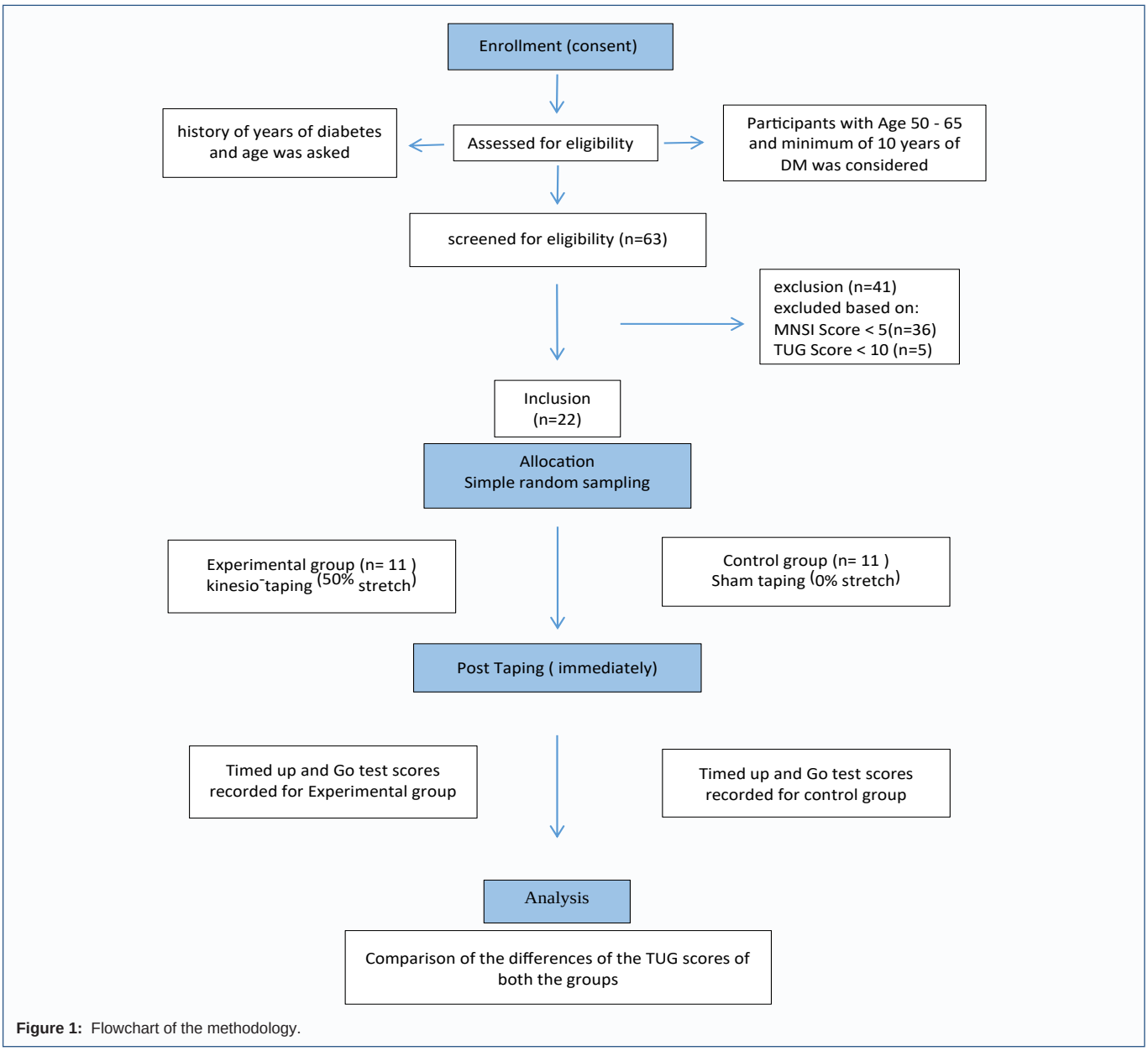

Figure 1: Flowchart of the methodology.

involved in falls. Auditory and vestibular side effects of drugs used for diabetes mellitus could also influence balance, with visual impairment being the most common presentation [11]. Balance is dependent upon sensory input from the legs and feet; however, peripheral neuropathy impairs this function increasing fall risk. Light fingertip contact offers passive sensory feedback that could reduce postural sway. This is done by Kinesio-taping which mimics human skin which when applied with stretch, that enhances sensory feedback from legs by sensorimotor stimulation and improves circulation [13]. The purpose of this examination was to determine if Kinesio-taping has immediate effects on functional mobility using TUG test in DPN patients. It is aimed at assessing whether Kinesio-taping may lower fall risk and increase quality of life among these individuals.

Materials And Methods

This study was carried out over a period of one year from July 2023 to June 2024 at M.S. Ramaiah Teaching Hospital and Endocrine OPD, Ramaiah Memorial Hospital in Bangalore. The ethical clearance was obtained from the Institutional Ethics committee was obtained (MSRMC/EC/PG-08/06-2023). The aim was to achieve similar balance changes observed previously by selecting 22 participants, assuming alpha=5% and power=80%.

Inclusion Criteria was participants' age between 50-65 years, duration of diabetes more than or equal to ten years, MNSI score ≥5 and TUG score ≥10 seconds were included. Exclusion Criteria was individuals with orthopedic abnormalities, MNSI<2 scores, gait disturbances due to other neurologic conditions, use of walking aids like crutches or wheel chair or had skin allergies/rashes were excluded.

Data collection was done after obtaining the ethical clearance from the Institutional Ethical committee. All the participants were explained about the study and informed consent was taken.

Materials

The study worked with measuring tape, chair, tuning fork (128 Hz), monofilament, Kinesio-tape, knee hammer, scissors and

Figure 2.1: Sham taping.
Figure 2.2: Kinesio-taping

stationary objects.

Outcome Measure: The Timed Up and Go (TUG) test had an accuracy rate of 88.9%.

Screening Instrument: The Michigan Neuropathy Screening Instrument has sensitivity of 87.5% as well as specificity of 93.6% (Figure 1).

Procedure: Participants were recruited based on their scores above two using the MNSI for screening purposes in relation to DPN. Those with TUG scores >10 s were included whereas those below that range were excluded from the study population They were then randomized into control and experimental groups respectively where; Kinesio-tape with 50% stretch was applied to the posterior side of both legs above the lateral malleolus of the experimental group, whereas sham taping was done for the control group. Mobility changes after taping were evaluated using TUG test. The results were recorded and analyzed by outcome assessors who had no knowledge about group allocation and type of taping. This research work has sought to investigate how Kinesio-taping is able to cause a momentary effect on functional mobility in DPN patients thereby minimizing fall risk and improving general well-being (Figure 2.1 and 2.2).

Results

Collected data from all the 22 participants were analysed using SPSS 27.0. Demographics, experimental groups and control group were described in terms of descriptive statistics. The data was measured for normality by use of Shapiro-Wilk test. Non-parametric test (Mann-Whitney U test) was used to compare the two groups because the data was not normally distributed. There were 7 male and 4 female in experimental group (N=11) and 6 male and 5 female in control group (N=11).

Discussion

This study looked at how Kinesio-taping affects mobility in people with diabetic neuropathy. Kinesio-tape was applied with about 50% stretch on the lower leg, just above the ankle. This placement aimed to Improve sensory feedback about body position and movement during activities like standing up, walking, and turning. The findings showed a significant difference (p=0.014) in the Timed Up and Go (TUG) scores. The experimental group did better than the control group, indicating that Kinesio taping improved mobility.

One explanation for this improvement could be increased

Table 1.1: Mean and Standard deviation of descriptive data of both the groups (n=22).

	Experimental_group Mean±SD	Control_group Mean±SD
Age (in years)	60.27±5.159	59.27±4.735
DM (in Years)	19±4.858	16.09±5.375

Table 1.2: Median and IQR of the difference of TUG scores between groups (n=22).

Group	Pre-Post TUG score (in secs) Median (IQR)
Experimental group	2.11 (1.14, 3.20)
Control group	0.65 (0.39, 0.93)

Table 1.3: Comparison of the difference of the TUG scores between the groups (n=22).

Mann-Whitney U	23.000
Asymp. Sig. (2-tailed)	P=0.014
Exact Sig. [2*(1-tailed Sig.)]	0.013[b]

stimulation of mechanoreceptors. Mechanoreceptors are sensory receptors that respond to mechanical stimuli like stretch, pressure, and vibration. They provide key information about body position and movement. More stimulation of these receptors might give the central nervous system additional sensory input, helping to make up for the reduced feedback linked to peripheral neuropathy. This extra sensory input could enhance proprioception and postural control in people with diabetic peripheral neuropathy.

Previous research has shown that extra sensory feedback can help balance when plantar sensation decreases. For instance, studies found that when sensory input from the soles of the feet is low, individuals tend to sway more. However, their balance improves when they receive extra sensory input from other parts of the leg or trunk. The current study supports these findings, as Kinesio-taping may have delivered extra sensory stimulation that led to better balance and mobility, as seen in the improved TUG results. Moreover, studies on vibration and gentle touch have shown improved balance in people with diabetic neuropathy. The results of this study align with these findings, suggesting that increased sensory feedback could significantly aid postural control. Evidence from studies involving healthy individuals shows that light touches can greatly reduce swaying by providing the central nervous system with more sensory data.

These results imply that the central nervous system can combine various sensory inputs to maintain stability. In this study, the stretching from Kinesio-taping may have consistently stimulated skin receptors, allowing participants to continuously get information about their leg position and movement. This could help with proper foot placement and better movement during the TUG test. Thus, the mechanical stimulation from Kinesio-taping may be a beneficial addition for people with diabetic peripheral neuropathy. By Improving feedback from healthy skin receptors, this method might help compensate for poor peripheral sensation, leading to improved coordination, mobility, and balance. Ultimately, this could lower the risk of falls and enhance the quality of life for those with diabetic neuropathy.

Limitations of the study include small sample size, short-term focus and failure to evaluate combined therapy. Future studies should consider using larger samples sizes, long term assessments as well as

gait analysis as an objective measure to understand better Kinesio-tape's effect.

Conclusion

This research found that Kinesio-tape (50%) significantly improved functional mobility in diabetic neuropathy patients by decreasing TUG test times through enhanced sensory input. The use of Kinesio-tape which compensated for a decreased sensory input resulted into an improvement in balance and proprioception. These findings suggest a practical intervention like Kinesio tape to improve mobility among neuropathy patients.

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Clinical Trial Registration

Clinical trial registration was done from Clinical Trials Registry -India (CTRI), National Institute of Medical Statistics, ICMR New Delhi (Trial REF/2023/10/074273).

Ethical approval

The study was approved by the Ethical Review Board (MSRMC/EC/PG-08/06-2023) of the Ramaiah medical College, Bangalore.

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