RESEARCH PAPER

Effects of Core Stabilization versus Aerobic Exercises on Core Strength, Functional Mobility and Psychological Well-being in Female Domestic Workers with Diabetic Peripheral Neuropathy: A Randomized Controlled Trial.

Dr. Logeshwari Selvaraj[1]*, Dr. P. Senthil selvam[2] and Dr. P.Lakshmikanth[3]

[1]M.P.T (Neuro), (Ph.D), research scholar, School of Physiotherapy, Vels Institute of Science, Technology and Advanced Sciences (VISTAS), Pallavaram, Chennai, Tamil Nadu, India
[2]M.P.T (Ortho), Ph. D, HOD & Professor, School of Physiotherapy, Vels Institute of Science, Technology and Advanced Sciences (VISTAS), Pallavaram, Chennai, Tamil Nadu, India.
[3]Ph.D, Professor & Principal, Sir Issac Newton College of Physiotherapy, Nagapattinam, Dr. R. Raja4, Ph.D, Professor& Principal, Kempogowda Institute of Physiotherapy, Bangalore
[1]ORCID: 0000-0003-4911-5979

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ABSTRACT

Background: Female domestic workers frequently perform repetitive physical tasks such as prolonged standing, walking, bending, lifting, and household activities, which place considerable stress on the musculoskeletal and nervous systems. In women with diabetic peripheral neuropathy (DPN), progressive nerve damage can lead to impaired balance, reduced mobility, functional limitations, and a significant decline in overall quality of life. The occupational demands associated with domestic work may further aggravate symptoms such as pain, sensory disturbances, balance impairment, and reduced functional independence.

Objective: To know the effects of Core Stabilization versus Aerobic Exercises on Core Strength, Functional Mobility, and Psychological Well-being in Female Domestic Workers with Diabetic Peripheral Neuropathy.

Methodology: A comparative study was conducted for 20 female domestic workers with Diabetic Peripheral Neuropathy with age group of 45-75. The patients were divided into two groups using lot method into Group A (core strengthening using PNF, n=10) & Group B (Aerobic exercise, n=10). The subjects were followed for the period of 8 weeks with intervention duration of 40 mins for 5 days per week for 8 weeks. The pre and post test valve were measured with the help of pressure biofeedback for core strength, Timed Up and Go Test (TUG) for functional mobility and depression for mental domainDASS 21 for Psychological Well-being domain, pre-test and post-test assessments were performed for all outcome variables.

Results: The results demonstrated significant improvement in Group A compared to Group B. The patients in group A (core strengthening using PNF techniques) improved significantly in core strength, functional mobility and Psychological Well-being than Group B

Conclusion: Thus, this study concludes that there was significant effect of core strengthening exercises using PNF techniques in improving core strength, functional mobility and reducing the depression in Group A. Hence core strengthening using PNF has improved their Core Strength, Functional Mobility, and Psychological Well-being in Female Domestic Workers with Diabetic Peripheral Neuropathy.

Keywords: *Domestic Female Workers, Core strength, Timed Up and Go Test (TUG), functional mobility, DASS 21, Diabetic Peripheral Neuropathy*
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INTRODUCTION

Domestic female workers with diabetic peripheral neuropathy (DPN) often experience greater difficulty in managing their daily responsibilities due to the combined effects of neuropathic symptoms and continuous domestic workload. Unlike formally employed individuals,

**Author for Correspondence: Dr. Logeshwari Selvaraj*

household workers rarely have structured rest periods, ergonomic support, or physical assistance, leading to persistent strain on the affected limbs. Symptoms such as pain, impaired sensation, and reduced balance increase the risk of falls and limit their ability to perform routine activities efficiently.

Diabetic peripheral neuropathy (DPN) is one of the most common and disabling chronic complications of diabetes mellitus, characterized by progressive nerve damage resulting from prolonged hyperglycemia[1]. It primarily affects the peripheral nerves of the lower limbs and presents with symptoms such as pain, numbness, tingling, burning sensations, and reduced sensory perception[2]. These symptoms significantly interfere with functional mobility, daily activities, and overall quality of life. Among various populations, women engaged in domestic work represent a particularly vulnerable group, as they are continuously exposed to physical strain through activities such as cleaning, cooking, caregiving, prolonged standing, and walking, which may further aggravate neuropathic symptoms. These functional limitations not only affect physical health but also contribute to emotional stress, reduced social participation, and decreased overall well-being.

Core stabilization exercises play an important role in improving trunk stability, postural control, balance, and functional movement. Weakness of the core musculature can further compromise stability and mobility in individuals with DPN, thereby increasing the risk of falls and reducing functional independence[3]. Strengthening the core muscles may enhance neuromuscular control, improve balance, and facilitate efficient performance of daily activities, especially among female domestic workers who depend heavily on physical endurance and postural stability during household tasks.

Psychological Well-being is an important outcome measure in individuals with DPN, as chronic pain, reduced mobility, fatigue, and functional dependence can negatively influence both physical and psychological health. Limitations in performing occupational and household responsibilities may also lead to reduced confidence, social withdrawal, and emotional distress. Therefore, interventions aimed at improving physical function and reducing symptoms are essential for enhancing overall well-being and promoting independence in daily life.

Therefore, assessing the impact of therapeutic interventions on functional mobility and quality of life in this population is essential. Physiotherapy-based interventions such as stretching exercises, aerobic exercises, strengthening exercises, breathing exercises, proprioceptive neuromuscular facilitation (PNF) techniques, and core stabilization exercises may play a significant role in reducing symptoms, improving mobility, and enhancing functional independence. This study focuses on evaluating the effects of core stabilization exercises versus aerobic exercises on core strength, functional mobility, and depression among female domestic workers with diabetic peripheral neuropathy.

METHODOLOGY

A randomized control study was conducted for 20 female domestic workers with Diabetic Peripheral Neuropathy were selected based upon Inclusion criteria: Patients clinically diagnosed with Diabetic Neuropathy, co-operative patients able to understand and follow the instruction, HbA1c 7.0% – 8.0%, Age 45 – 75 years, BMI ≥ 30 (Obese), POMA score - 19-23, Borg scale – 40% to 60%, Patients able to walk without support and Exclusion criteria: Un co-operative patients, Uncontrolled hypertension, Severe Diabetic Peripheral Neuropathy (advanced stage), Any other Neurological Deficits like Stroke, Parkinsonism, etc, Recent Lower limb Trauma, Recent surgeries in Abdomen, Spine, Lower limb, Any other Cardiovascular Deficits Like CAD, MI, Any Respiratory disorders Like Asthma, COPD. Severe cardiac conditions, Severe balance disorders. The patients were divided into two groups using lot method into Group A (core strengthening using PNF, n=10) & Group B (Aerobic exercise, n=10). The subjects were followed for the period of 8 weeks with intervention duration of 45 mins for 5 days per week for 8 weeks. The pre and post test valve were measured with the help of pressure biofeedback for core strength, Timed Up and Go Test (TUG) for functional mobility and DASS 16 mental domains and pre-test and post-test assessments were performed for all outcome variables.

PROCEDURE

The willing subjects who fulfilled the inclusion criteria and exclusion criteria were included for the study and informed consent was obtained from them. Subjects demographic data, onset duration and treatment duration was noted. 20 female domestic workers diagnosed with diabetic peripheral neuropathy participated in this study. They were randomly assigned to two groups using lottery method Group A (n=10) Core PNF training and Group B (n=10) Aerobic Exercises was trained for moderate intensity interval training. Both the group were informed that they have to do the exercise regularly and can withdraw from the study if they have any difficulty.

Warm up exercises : 5 mins

Cool down exercises : 5 mins

Warm-Up (5 min)

- Deep breathing
- Gentle trunk movements
- Ankle pumps

Group A (Core PNF training)

Using Proprioceptive Neuromuscular Facilitation principles:

A. Rhythmic Stabilization:

Duration: 5–10 seconds hold × 5 reps

B. Pelvic Anterior Elevation (PNF Pattern)
8–10 repetitions

C. Stabilizing Reversals: Core PNF Training (20 min)

1. Rhythmic Stabilization
- Position: Sitting
- Therapist applies multidirectional resistance at shoulders
- Patient resists without movement
- 5–10 sec hold × 5 reps

2. Stabilizing Reversals
- Position: Sitting
- Alternate resistance (forward & backward) 10 reps

3. Pelvic Anterior Elevation
- Position: Side-lying
- Movement: pelvis upward and forward 10 reps × 2 sets

- **Group B (Aerobic exercises)** : **Moderate Intensity Interval Training** aerobic exercises [heart rate reserve (HRR) 40-60%] exercise programme

Brisk Walking: 30 mins

The follow up was done and pressure biofeedback**,** TUG and DASS 21 test values was noted before and after the treatment session for Diabetic Neuropathy patients, analyzation was done

DATA ANALYSIS

Statistical analyses were performed by using IBM SPSS for windows version 20(IBM SPSS statistics for windows, version 20.0 IBM corp. A26.0 IBM corp. Armonk, NY, USA). The level of significance was set at alpha = 0.05. Intra-group comparisons (pre- test vs post-test) within each group were analyzed using the Paired T-test. The means and standard deviation (SD) were used as continuous data.

TABLE 1: Analyses of Pre-Test And Post-Test Values of Pressure Biofeedback Within Group A

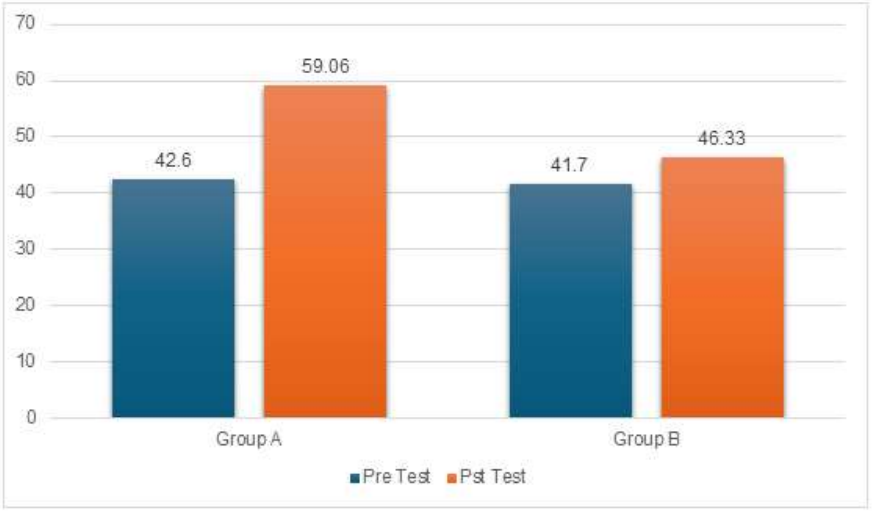
Pressure Biofeedback	N	Mean	SD	Std. Error Mean	Mean Diff	df	t value	P
Pre-test	10	42.60	4.32	1.12	16.46	9	3.148	*
Post-test	10	59.06	2.88	0.78				

*Significant difference

TABLE 2: Analyses of Pre-Test And Post-Test Values of Pressure Biofeedback Within Group B

Pressure Biofeedback	N	Mean	SD	Std. Error Mean	Mean Diff	Df	t value	P
Pre-test	10	41.70	4.32	1.12	4.63	9	1.007	*
Post-test	10	46.33	2.88	0.78				

*Significant difference



GRAPH 1: Analyses of Pre-Test and Post-Test Values of Pressure Biofeedback within Group A

TABLE 3: Analyses of Pre-Test and Post-Test Values of Tug Within Group A

	N	Mean	SD	Std. Error Mean	Mean Diff	df	t value	P
Pre-test	10	17.25	0.80	0.23	1.21	9	80.494	*
Post-test	10	12.12	0.71	0.23				

*Significant difference

TABLE 4: Analyses of Pre-Test and Post-Test Values of Tug Within Group B

TUG	N	Mean	SD	Std. Error Mean	Mean Diff	Df	t value	P
Pre-test	10	17.14	0.77	0.16	3.49	9	51.915	*
Post-test	10	16.12	0.65	0.53				

*Significant difference

GRAPH 2: Analyses of Pre-Test and Post-Test Values of Tug between Group A and Group B

TABLE 5: Analyses f Pre-Test and Post-Test Values of Dass 21 Within Group A

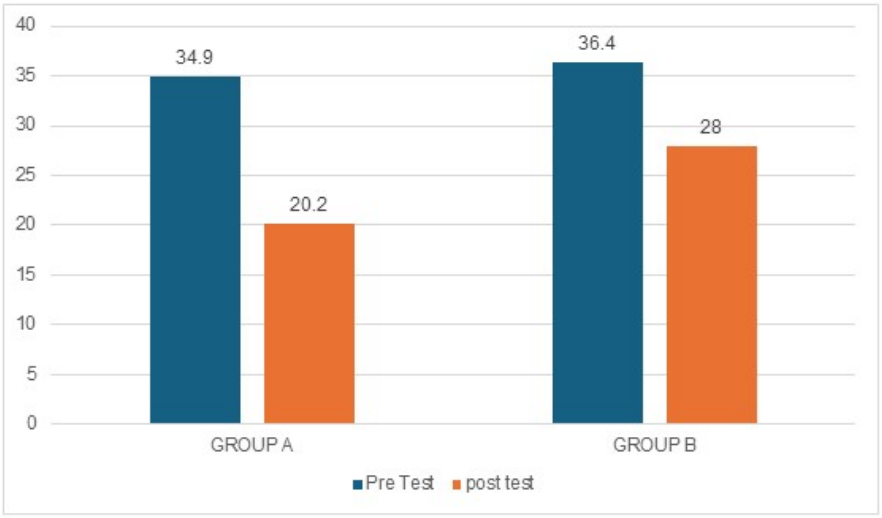
DASS 21	N	Mean	SD	Std. Error Mean	Mean Diff	Df	t value	P
Pre-test	10	34.9	3.75	0.68	14.7	9	21.49	*
Post-test	10	20.2	4.3	0.332				

*Significant difference

TABLE 6: Analyses of Pre-Test and Post-Test Values of Dass 21 Within Group B

DASS 21	N	Mean	SD	Std. Error Mean	Mean Diff	df	t value	P
Pre-test	10	36.4	4.14	1.69	8.40	9	4.657	*
Post-test	10	28.0	4.24	0.29				

*Significant difference



GRAPH 3: Analyses of Pre-Test and Post-Test Values of Dass 21 Between Group A and Group B

RESULT

There was a significant effect on Pressure Biofeedback, TUG and DASS 21 between groups and within the groups ($p<0.05$)

Table 1: Shows the pre and post mean ± SD value of Pressure Biofeedback in group A 42.60±4.32 & 59.06±2.88 respectively

Table 2: Shows the pre and post mean ± SD value of Pressure Biofeedback in group B 41.70±4.32 & 46.33±2.88 respectively

Table 3: Shows the pre and post mean ± SD value of TUG in group A 17.25±0.80 & 12.12±0.71 respectively

Table 4: Shows the pre and post mean ± SD value of TUG in group B 17.14±0.77 & 16.12±0.65 respectively

Table 5: Shows the pre and post mean ± SD value of DASS 21 in group A 36.44±4.14 & 28.0±4.24 respectively

Table 6: Shows the pre and post mean ± SD value of DASS 21 in group B 36.44±4.14 & 28.0±4.24 respectively

DISCUSSION

The present study was conducted to compare the effects of core stabilization exercises and aerobic exercises on core strength, functional mobility, and psychological well-being in female domestic workers with Diabetic Peripheral Neuropathy using Pressure Biofeedback, Timed Up and Go (TUG) test, and DASS-21 as outcome measures.

The findings of the study demonstrated improvement in both groups following the intervention period. However, the core stabilization exercise group A showed greater improvement in core strength and functional mobility, whereas the aerobic exercise group demonstrated comparatively greater improvement in psychological well-being than Group B.

The improvement in core strength observed through Pressure Biofeedback may be attributed to activation and strengthening of deep core muscles such as the transversus abdominis, multifidus, pelvic floor muscles, and deep spinal stabilizers. Core stabilization exercises improve neuromuscular control, trunk stability, posture, and balance, thereby enhancing spinal support and functional efficiency. Female domestic workers frequently perform activities involving bending, lifting, prolonged standing, and repetitive household movements, which may contribute to trunk muscle fatigue and reduced postural stability. Strengthening the core musculature may therefore improve body mechanics and reduce functional limitations.

Improvement in functional mobility, as measured by the Timed Up and Go (TUG) test, was observed in both groups. However, greater improvement was noted in the core stabilization group, which may be attributed to enhanced trunk control, postural alignment, balance, and coordination. These are essential components for performing sit-to-stand activities, walking, and turning movements assessed during the TUG test. In patients with Diabetic Peripheral Neuropathy, sensory deficits and muscle weakness commonly impair gait and mobility. Core stabilization exercises may help compensate for these impairments by improving proximal stability, neuromuscular control, and efficient movement patterns. Strengthening the core musculature also provides better spinal and pelvic stability, thereby improving functional performance and reducing the risk of balance-related difficulties during mobility tasks.

The aerobic exercise group also demonstrated significant improvement in functional mobility. The improvement following aerobic exercises such as walking attributed to enhanced cardiovascular endurance, improved circulation, better muscle oxygenation, and reduced fatigue following regular aerobic activity. These exercises may further improve lower limb endurance and overall physical activity tolerance in individuals with Diabetic Peripheral Neuropathy.

Psychological well-being, assessed using DASS-21, showed improvement in both groups, with a comparatively greater reduction in depression, anxiety, and stress scores observed in group A. Exercise has been shown to positively influence psychological health through the release of endorphins, reduction in stress hormone levels, improved sleep quality, and enhancement of self-confidence. Core stabilization exercises has also contributed to psychological well-being by improving physical confidence, functional independence, posture, and overall body control, thereby helping individuals perform daily activities with greater ease and reduced fear of movement. Exercise has been shown to positively influence psychological health through release of endorphins, reduction in stress hormone levels, improved sleep quality, and enhancement of self-confidence. Several studies have demonstrated that aerobic exercises, owing to their rhythmic and continuous nature, can effectively promote relaxation and enhance emotional stability.

Female domestic workers with Diabetic Peripheral Neuropathy may experience increased physical workload, fatigue, reduced mobility, occupational stress, and emotional burden, all of which can negatively affect psychological health. Participation in structured exercise programs may improve independence, confidence, and quality of life, thereby reducing psychological distress.

This findings of the present study are consistent with previous literature reporting that both core stabilization and aerobic exercises are beneficial in improving physical and psychological outcomes in patients with diabetic neuropathy and other musculoskeletal or neurological conditions. Core stabilization exercises primarily improve trunk stability and functional performance and psychological well-being. Core stabilization exercises primarily improve trunk stability and functional performance, whereas aerobic exercises are more effective in improving endurance and psychological well-being.

Overall, both interventions were found to be effective in improving core strength, functional mobility, and

psychological well-being among female domestic workers with Diabetic Peripheral Neuropathy. However, core stabilization exercises appeared more beneficial for improving core muscle performance, mobility and psychological status.

Therefore, the study concludes that both core stabilization and aerobic exercises can be effectively incorporated into physiotherapy rehabilitation programs for female domestic workers with Diabetic Peripheral Neuropathy to improve physical function and psychological health.

LIMITATIONS

- Small sample size
- Long term follow up
- Targeted only the proximal kinetic chain through core stabilization that creates a more stable functional foundation for workers in physically demanding occupations.
- Lower limb PNF or strengthening exercises were not considered.

RECOMMENDATIONS

- Long-term follow-up assessments.
- Further research can compare different intensities, frequencies, and durations of exercise programs to identify the most effective rehabilitation protocol.
- Additional outcome measures such as balance assessment, gait analysis, quality of life scales, and neuropathic pain evaluation for a more comprehensive understanding of patient improvement.
- Including male participants and individuals from different occupational groups may help assess whether the findings are applicable to a broader diabetic population.
- Advanced assessment tools such as electromyography, motion analysis systems, and ultrasound imaging of core muscles can be incorporated to obtain more objective measurements of muscular performance.
- Community-based rehabilitation and home exercise programs should be explored to improve accessibility and adherence among working women with Diabetic Peripheral Neuropathy.

CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

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19. larger sample size to improve the generalizability of the findings among female domestic workers with Diabetic Peripheral Neuropathy.