

Original Article

Effect of Home-Based Exercise on Functional Performance and Risk of Fall in Diabetic Neuropathy Patients

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ABSTRACT

Objectives: Diabetic neuropathy (DN) significantly impairs mobility and increases fall risk. While supervised exercise benefits are well documented, home-based protocols aligned with international guidelines and targeting functional outcomes remain underexplored, particularly in rural settings.

Material and Methods: This study aimed to evaluate the effectiveness of a structured, evidence-based, home exercise protocol on functional performance and fall risk in participants with diabetic peripheral neuropathy (DPN) living in rural India. A total of 56 participants with DPN (mean age 57.4 ± 12.6 years, mean Michigan diabetic neuropathy score (MDNS) 9.29) performed a 4-week structured home exercise program targeting lower extremity strength, balance, and gait. Functional performance was assessed using the short physical performance battery (SPPB) and fall risk using the dynamic gait index (DGI). Glycaemic parameters (Fasting blood sugar [FBS], postprandial blood sugar [PPBS], and glycated haemoglobin [HbA1C]) were also analysed.

Results: The data were analysed using Systat Sigma Plot software. A $p \leq 0.05$ was considered statistically significant. Significant post-intervention improvements were observed in SPPB by 2.04 points and DGI by 3.37 points ($p < 0.001$). These improvements were accompanied by significant reductions in FBS and PPBS - FBS: 167.98 ± 42.77 to 144.55 ± 30.46 mg/dL; PPBS: 253.30 ± 54.48 to 202.20 ± 37.97 mg/dL. Significant improvements were observed, particularly a shift from high-risk to moderate fall risk category.

Conclusion: This prospective interventional study demonstrates that a structured, home-based exercise protocol can meaningfully improve functional performance and reduce fall risk in participants with DPN. Its feasibility and impact in a rural Indian cohort underscore its potential for scalable implementation in low-resource settings.

Keywords: Diabetic neuropathy, Fall risk, Functional mobility, Home-based exercise, Short physical performance battery

INTRODUCTION

Diabetes mellitus (DM) continues to pose a significant public health challenge worldwide. According to global estimates, the number of participants with diabetes is projected to reach 578 million by 2030 and 700 million by 2045, marking an increase of ~25-51%.^[1] The International Diabetes Federation reports that the South-East Asian region alone accounts for 88 million people living with diabetes; notably, India contributes 77 million cases as of 2019, ranking 2nd globally.^[2]

A major complication associated with diabetes is diabetic peripheral neuropathy (DPN), a condition characterised by progressive nerve damage that affects up to 50% of diabetic

individuals over time.^[3] Its development is associated with factors such as the duration of diabetes, poor glycaemic control, hypertension, cardiovascular disease, and depression.^[4] DPN often leads to sensory loss, pain, and motor dysfunction, primarily in the lower extremities. These impairments contribute to balance deficits and alter gait, significantly increasing the risk of falls.

Epidemiological studies have reported that the prevalence of DPN varies widely across populations. For instance, a longitudinal study reported a DPN prevalence of 26.7%^[4] while studies among individuals with type 1 diabetes have shown prevalence rates ranging from 8.2% in youth to up to 58% in adults.^[5] The prevalence is consistently higher in those

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with type 2 diabetes, with values ranging from 26-51%.^[6,7] Additionally, community-based research in India has shown DPN prevalence ranging from 25-41% in coastal Karnataka^[8] and around 26% in urban South India.^[9]

DPN not only reduces quality of life but also leads to serious complications such as foot ulcers and amputations.^[10] One-third of participants experience neuropathic pain, burning, tingling, and electric shock-like sensations, which may coexist with or without sensory deficits.^[11] These symptoms, coupled with muscle weakness and diminished proprioception, impair daily activities and heighten fall risk.

Despite the growing burden of DPN in India, especially in rural populations, there is a relative scarcity of research addressing its functional consequences and the role of physiotherapeutic interventions. While pharmacological options offer limited relief, physical therapy has shown promise in improving strength, balance, and proprioception in participants with DPN.^[12]

Given the chronic nature of DPN and the barriers many participants face in accessing in-person physiotherapy, especially in rural and resource-limited settings, home-based exercise interventions represent a practical and scalable alternative. Structured programmes aligned with evidence-based guidelines from organisations such as the American Diabetes Association (ADA) and American College of Sports Medicine (ACSM) can offer functional benefits while reducing logistical burdens.

Although some prior studies have explored home-based programmes using educational booklets,^[13,14] few have rigorously examined the impact of such interventions on validated functional outcomes like the short physical performance battery (SPPB) and dynamic gait index (DGI), particularly in the Indian context.

Therefore, the present study aimed to evaluate the effect of a structured, expert-validated, home-based therapeutic exercise program on balance, risk of falls, and functional performance in participants with diabetic neuropathy (DN) attending a rural hospital in India.

MATERIAL AND METHODS

Study design

This prospective interventional study was conducted to evaluate the effects of a structured home-based exercise program on balance, gait function, and fall risk in individuals with DPN. The study was approved by the Institutional Ethics Committee (Approval No: SDUAHER/KLR/CEC/170/2019-20) and registered under the Clinical Trial Registry of India (CTRI/2021/01/030588). Written informed consent was

obtained from all participants in English or Kannada, in adherence with ethical standards.

Participant recruitment

Participants were recruited using a convenience sampling method from a tertiary care hospital. A total of 154 participants with DM were screened. Of these, 56 participants with DPN were recruited based on the following criteria: age between 40 and 70 years, confirmed type 2 diabetes, and a clinical diagnosis of DPN established by a consulting physician, among which 4 participants dropped out at the end of 1st week and hence 56 participants only completed the study. Subsequently, participants were further included if they presented with a Michigan diabetic neuropathy score (MDNS) ≥ 7 , which indicated significant neuropathic symptoms among the study population, and possessed the ability to stand and walk (with or without assistance). Participants were excluded if they had cognitive impairment, severe neurological or musculoskeletal conditions, vision loss, postural hypotension, foot ulcers or amputations, peripheral vascular disease, or if they had received rehabilitation treatment within the past 6 months.

Sample size estimation

The sample size was calculated using power analysis with a type I error of 0.05 and 80% power. Based on an expected mean difference of 0.85 and SD of 2.65 for the primary outcome measure SPPB, a clinically meaningful difference of 1 point was anticipated. The required sample size was 58, and it was rounded to 60 to accommodate a 10% dropout rate.

Outcome measures

Demographic data, diabetes duration, comorbidities (e.g., hypertension, cardiopulmonary diseases, arthritis), and BMI were collected. Primary outcomes included balance, gait, and fall risk assessed using the SPPB and the DGI. Secondary outcomes included fasting blood sugar (FBS), postprandial blood sugar (PPBS), and glycated haemoglobin (HbA1C). FBS and PPBS were measured at baseline and after 4 weeks, while HbA1C was assessed at baseline and 3 months post-intervention.

Intervention protocol

A structured home-based exercise module was developed based on recommendations from the ACSM and ADA.^[12] The protocol included exercises targeting lower limb strength, flexibility, coordination, and balance [Table 1] and was validated by a panel of physiotherapy and diabetic care experts.

Table 1: Evidence-based home exercise for DPN

Exercise type	Specific activity	Intensity/Load	Frequency	Sets	Repetitions/Duration/ Others
Aerobic	Walking/Static cycling	Moderate; 20-30 minutes/session	4 times/week	N/A	Continuous, 20-30 minutes
Mobility	Sit-to-stand, wall squatting, and forward and side lunge exercises.	Body weight initially	3 times/week	1-3 sets (Weeks 1-2), 3-5 sets (Weeks 3-4)	6-15 reps (Weeks 1-2), 15-30 reps (Weeks 3-4)
Resistance	Resisted lower limb exercises (e.g., cuff weights)	2 kg for each lower limb	3 times/week	1-3 sets (Weeks 1-2), 3-5 sets (Weeks 3-4)	8-15 reps per joint action
Balance	Forward and side reaching in normal stance, tandem standing, forward/side reaching in tandem stance, tandem walking for at least 10m. Standing and walking on a mattress at a comfortable pace for at least 10 minutes.	N/A	3 times/week	1-3 sets (Weeks 1-2), 3-5 sets (Weeks 3-4)	15-30 seconds or 10-15 minutes

DPN: Diabetic peripheral neuropathy, N/A: Not applicable.

Each exercise session lasted 30-45 min. The program was implemented for 4 weeks (12 sessions per participant). Frequency, sets, and repetitions were increased after the initial 2 weeks as tolerated.

Participants received 1 week of supervised bedside instruction followed by 3 weeks of independent home-based exercise. Each participant was provided with an illustrated booklet and guided to perform exercises safely. Telephone follow-up was conducted weekly to monitor adherence and address concerns. Participants were advised to monitor their blood glucose levels before and after exercising and were instructed to stop in case of breathlessness, cramps, dizziness, or changes in foot coloration. Four participants dropped out in the first week due to health or logistical reasons.

RESULTS

The baseline characteristics of the study participants are as follows. The mean age was 57 years, with an average diabetes duration of approximately 5 years. Of the total 56 participants, 32 were female (57%), while 24 were male (43%). The mean MDNS score was 9.29 ± 2.01 , indicating significant neuropathic symptoms among the study population. The mean age of the individuals was 57.43 ± 12.63 years, the average height recorded was 158.9 ± 4.30 cm, and the mean weight was observed to be 69.67 ± 5.86 kg.

The statistical analysis was performed using Systat Sigma Plot software. Prior to selecting statistical tests, the normality of data distribution for each outcome measure was assessed using the Shapiro-Wilk test. For variables where the assumption of normality for the differences between pre- and post-intervention measurements was met, paired t-tests were

employed for FBS, PPBS, and HbA1C levels. For outcomes that did not meet the normality assumption, such as the SPPB and DGI, Wilcoxon signed-rank tests were utilised for pre- and post-test comparisons. A p -value <0.05 was considered statistically significant. Descriptive statistics for mean $\pm$ SD are reported.

Glycaemic parameters

FBS significantly decreased from 167.98 ± 42.77 mg/dL to 144.55 ± 30.46 mg/dL. PPBS reduced from 253.30 ± 54.48 mg/dL to 202.20 ± 37.97 mg/dL. These changes suggest improved glucose regulation following the 4-week home exercise program.

Functional outcomes

The SPPB score increased by a mean of 2.04 points, surpassing the minimal clinically important difference (MCID) of 1 point. Similarly, DGI improved by 3.37 points, exceeding the established MCID of 1.9 points and indicating improved gait stability and reduced fall risk. Participants progressed from a high-risk to a moderate fall risk category based on DGI scores.

These findings demonstrate both statistically significant and notable improvements in functional mobility and fall risk among individuals with DPN who participated in the home-based exercise intervention.

DISCUSSION

DPN is a common and debilitating complication of diabetes, significantly impacting quality of life through

symptoms such as muscle weakness, pain, and reduced mobility.^[15] Given the growing burden of DPN in India, particularly in rural populations where access to supervised physiotherapy is limited, our study's primary contribution is the development and evaluation of a structured, evidence-based, home-based exercise program. This protocol, aligned with recommendations from the ADA and ACSM, was validated by experts and applied in a rural Indian cohort. The method is notably enhanced by the use of dual validated outcome measures, SPPB and DGI, to comprehensively assess functional changes and fall risk, distinguishing it from prior studies that often relied on generic educational booklets or single-domain outcomes.

Functional performance and fall risk improvement

The findings of the current study demonstrate statistically significant improvements in functional performance and a reduction in fall risk among participants with DPN following the 4-week home-based exercise intervention. The observed improvement on the SPPB surpassed the MCID of 1 point, signifying enhanced mobility and balance with potentially meaningful reductions in fall risk for daily life in participants with DPN. This reflects a tangible enhancement in tasks such as balance, gait speed, and chair stand ability, which are directly associated with peripheral nerve function in diabetic individuals. The marked increase in DGI scores exceeding its established MCID of 1.9 points indicates that these gains reflect substantial improvements in gait stability and transitions from high to moderate fall risk categories, which have practical implications for participant safety. These positive changes underscore the program's effectiveness in improving balance, gait stability, and overall functional mobility, key predictors of fall risk in participants with DPN.

Importantly, the average improvement in SPPB signifies that these gains are not just statistically significant but highly relevant for real-world function. For participants with DPN, crossing this threshold means a genuine reduction in fall risk and greater independence in everyday tasks. Similarly, changes in DGI parameters suggest that the intervention provides substantial benefit against falls, as participants shifted from high to moderate risk categories. These findings support the practical value of home-based exercise, particularly in rural and low-resource settings where access to supervised therapy is limited. The protocol's success aligns with ADA and ACSM recommendations, facilitating integration into routine care. Prior interventions using booklets or focusing only on foot-ankle exercises were less effective in altering validated measures of balance and gait, highlighting the comprehensive advantage of this structured approach. Future research should further explore

its durability over longer periods and directly compare its impact with standard supervised treatments.

Glycaemic control outcomes

Beyond functional gains, the home-based exercise protocol also yielded positive effects on glycaemic parameters. We observed significant reductions in both FBS from 167.98 to 144.55 mg/dL and PPBS from 253.30 to 202.20 mg/dL. These improvements suggest enhanced glucose regulation, which is vital for managing diabetes and mitigating the progression of neuropathic complications. While the HbA1C assessment was conducted at 3 months post-intervention, the immediate changes in FBS and PPBS highlight the acute metabolic benefits of regular exercise. This finding is consistent with other studies that have reported improvements in glycaemic control after exercise interventions in diabetic populations.

Feasibility in resource-limited settings

This study showed the feasibility and impact of a structured, home-based exercise program in a rural Indian cohort. Given the chronic nature of DPN and the substantial barriers many participants face in accessing in-person physiotherapy, particularly in resource-limited environments, our home-based model presents a practical and scalable alternative. Participants received initial supervised instruction for 1 week, followed by 3 weeks of independent home exercise supported by an illustrated booklet and weekly telephonic follow-ups to monitor adherence. The low dropout rate of 4 participants in the first week further supports the exercise programme's feasibility and acceptability. This participant-centred approach empowered participants to actively manage their condition within their home environment, underscoring the potential for integrating such programmes into primary care pathways.

Comparison with existing literature

Our findings have been substantiated with existing literature on exercise interventions for DPN. Prior studies explored the feasibility of home-based programs using educational booklets for foot and ankle exercises in participants with DPN.^[13,14] While a study reported preliminary improvements in DPN severity and foot-ankle kinematics,^[14] another study using an 8-week home-based foot-ankle exercise program with an educational booklet could not significantly modify risk factors related to foot ulcers or show significant changes in foot muscle strength, dynamic balance, DPN symptoms, plantar pressure distribution, or lower extremity biomechanics during gait.^[16] In contrast, our structured home-based protocol achieved significant functional

Table 2: Comparison of pre- and post-test measures of glucose levels, physical performance, and risk of falls in participants with DPN

Parameters		Mean $\pm$ SD	Value	p value
FBS (mg/dL)	Pre	167.98 $\pm$ 42.77	*t = 6.8	<0.001*
	Post	144.55 $\pm$ 30.46		
PPBS (mg/dL)	Pre	253.30 $\pm$ 54.48	*t = 10.56	<0.001*
	Post	202.20 $\pm$ 37.97		
HbA1C (%)	Pre	10.74 $\pm$ 2.39	*t = 7.816	<0.001*
	Post	8.67 $\pm$ 1.50		
SPPB	Pre	7.82 $\pm$ 1.54	Z = 6.024	<0.001*
	Post	9.86 $\pm$ 1.96		
DGI	Pre	10.88 $\pm$ 2.50	Z = 5.922	<0.001*
	Post	14.25 $\pm$ 2.91		

*paired t test, Wilcoxon signed rank test; *p < 0.05 considered significant, n = 56. SD: Standard deviation, FBS: Fasting blood sugar, PPBS: Postprandial blood sugar, HbA1C: Glycated haemoglobin, SPPB: Short Physical Performance Battery, DGI: Dynamic Gait Index.

outcomes as measured by SPPB and DGI, directly addressing gait and balance deficits.

A randomised controlled trial on home-based hand and foot mobility exercises reported decreased neuropathic disability but failed to show any significance in functional outcomes on balance and lower limb function in participants with DPN.^[17] The success of this exercise program in improving balance and lower limb function (demonstrated by SPPB and DGI scores), therefore, highlights the effectiveness of its specific structured components [Table 2]. A 12-week home-based aerobic and resistance exercise program produced significant improvements in glycaemic control, body composition, lipid profile, and quality of life in women with type 2 diabetes, but changes in these outcomes were not related to balance and walking performances.^[18] Our study not only established significant reductions in the fasting and postprandial glucose levels (FBS: 167.98 $\pm$ 42.77 to 144.55 $\pm$ 30.46 mg/dL; PPBS: 253.30 $\pm$ 54.48 to 202.20 $\pm$ 37.97 mg/dL) but also showed marked improvements in balance and gait, addressing both metabolic and functional aspects of DPN. This suggests a more comprehensive benefit of our program design.

Our findings are consistent with other research supporting the benefits of exercise for DPN. A study on supervised aerobic and resistance exercise showed improvements in neuropathic symptoms, nerve conduction velocity, and cutaneous functions.^[19] Similarly, another study demonstrated that 3-week Swiss ball-based static and dynamic balance exercises improved postural stability and balance among participants with DPN, supporting the inclusion of balance components

in our protocol.^[20] Low-intensity resistance and lower limb exercises have also been reported to improve balance, pain, and tingling, while reducing inflammation and improving physiological conditions in participants with DPN. Low-intensity resistance and aerobic exercises improved lower limb muscle strength, DPN symptoms, and enhanced quality of life more effectively than moderate intensity recommendations, reinforcing the suitability of the low to moderate intensity adopted in our program [Table 1].^[21] Furthermore, aerobic exercise has been shown to improve DPN symptoms and promote the re-growth of cutaneous fibres, potentially restoring peripheral nerve function.

Limitations

The primary limitation of this study is the absence of a control group, which limits causal inference. Additionally, the short 4-week duration and follow-up may not capture long-term adherence or sustained effects. The lack of blinding of participants and outcome assessors may have introduced bias, and adherence data relied on self-report via telephone follow-up, which may affect accuracy. The relatively small sample size also restricts generalisability. Future research should include longer follow-up, larger samples, and direct comparisons with supervised physiotherapy to assess effectiveness and cost-efficiency better.

CONCLUSION

In conclusion, this study significantly contributes to the growing body of literature by demonstrating that a low-cost, structured, home-based exercise protocol can lead to functional improvements in balance and gait, key predictors of fall risk, alongside improved glycaemic control in participants with DPN. Designed in accordance with ADA and ACSM guidelines and tailored to the needs of a rural Indian population, the program proved to be both feasible and effective. This approach not only empowers participants to take an active role in managing their condition. It also underscores the potential of home-based programs as a scalable, cost-effective strategy in the continuum of diabetes care, particularly suitable for integration into primary care pathways in resource-limited environments.

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Ethical approval: The research/study approved by the Institutional Review Board at Sri Devaraj Urs Academy of Higher Education and Research, number SDUAHER/KLR/CEC/170/2019-20, dated 23rd March 2020.

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Declaration of patient consent: The authors certify that they have obtained all appropriate participant consent forms. In the form, the participants have given their consent for their clinical information to be reported in the journal. The participants understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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REFERENCES

- Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, *et al.* Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract* 2019;157:107843.
- Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. *Diabetes Res Clin Pract* 2011;94:311-21.
- Pirart J. Diabetes mellitus and its degenerative complications: a prospective study of 4,400 patients observed between 1947 and 1973 (3rd and last part). *Diabete Metab* 1977;3:173-82.
- Lu Y, Xing P, Cai X, Luo D, Li R, Lloyd C, *et al.* Prevalence and risk factors for diabetic peripheral neuropathy in type 2 diabetic patients from 14 countries: Estimates of the INTERPRET-DD study. *Front Public Health* 2020;8:534372.
- Jaiswal M, Lauer A, Martin CL, Bell RA, Divers J, Dabelea D, *et al.* Peripheral neuropathy in adolescents and young adults with type 1 and type 2 diabetes from the SEARCH for diabetes in youth follow-up cohort: A pilot study. *Diabetes Care* 2013;36:3903-8.
- Ismail-Beigi F, Craven T, Banerji MA, Basile J, Calles J, Cohen RM, *et al.* Effect of intensive treatment of hyperglycaemia on microvascular outcomes in type 2 diabetes: An analysis of the ACCORD randomised trial. *Lancet* 2010;376:419-30.
- Pop-Busui R, Lu J, Lopes N, Jones TL. Prevalence of diabetic peripheral neuropathy and relation to glycemic control therapies at baseline in the BARI 2D cohort. *J Peripher Nerv Syst* 2009;14:1-13.
- Gogia S, Rao CR. Prevalence and risk factors for peripheral neuropathy among type 2 diabetes mellitus patients at a tertiary care hospital in Coastal Karnataka. *Indian J Endocrinol Metab* 2017;21:665-9.
- Pradeepa R, Rema M, Vignesh J, Deepa M, Deepa R, Mohan V. Prevalence and risk factors for diabetic neuropathy in an urban south Indian population: The Chennai urban rural epidemiology study (CURES-55). *Diabet Med* 2008;25:407-12.
- Boulton AJ. The pathway to foot ulceration in diabetes. *Med Clin North Am* 2013;97:775-90.
- Abbott CA, Malik RA, van Ross ER, Kulkarni J, Boulton AJ. Prevalence and characteristics of painful diabetic neuropathy in a large community-based diabetic population in the U.K. *Diabetes Care* 2011;34:2220-4.
- Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, *et al.* Physical activity/exercise and diabetes: A position statement of the American Diabetes Association. *Diabetes Care* 2016;39:2065-79.
- Verissimo JL, Sacco ICN, de Almeida MHM, Sartor CD, Suda EY. Development of a customized booklet of foot-ankle exercises for people with diabetes mellitus as a management and prevention tool for musculoskeletal complications. *Braz J Phys Ther* 2022;26:100402.
- Silva ÉQ, Santos DP, Beteli RI, Monteiro RL, Ferreira JSSP, Cruvinel-Junior RH, *et al.* Feasibility of a home-based foot-ankle exercise programme for musculoskeletal dysfunctions in people with diabetes: Randomised controlled FOotCARE (FOCA) Trial II. *Sci Rep* 2021;11:12404.
- Jahantigh Akbari N, Hosseini M, Naimi SS, Mikaili S, Rahbar S. The efficacy of physiotherapy interventions in mitigating the symptoms and complications of diabetic peripheral neuropathy: A systematic review. *J Diabetes Metab Disord* 2020;19:1995-2004.
- Silva ÉQ, Verissimo JL, Ferreira JSSP, Cruvinel-Júnior RH, Monteiro RL, Suda EY, *et al.* Effects of a home-based foot-ankle exercise program with educational booklet for foot dysfunctions in people with diabetic neuropathy: results of the FOCA-II randomized controlled clinical trial. *Appl Sci (Switzerland)*. 2023;13.
- Win MMTM, Fukai K, Nyunt HH, Linn KZ. Hand and foot exercises for diabetic peripheral neuropathy: A randomized controlled trial. *Nurs Health Sci* 2020;22:416-2.
- Dadgostar H, Firouzinezhad S, Ansari M, Younespour S, Mahmoudpour A, Khamseh ME. Supervised group-exercise therapy versus home-based exercise therapy: Their effects on Quality of Life and cardiovascular risk factors in women with type 2 diabetes. *Diabetes Metab Syndr* 2016;10:S30-6.
- Kluding PM, Pasnoor M, Singh R, Jernigan S, Farmer K, Rucker J, *et al.* The effect of exercise on neuropathic symptoms, nerve function, and cutaneous innervation in people with diabetic peripheral neuropathy. *J Diabetes Complications* 2012;26:424-9.
- Rojhani-Shirazi Z, Barzintaj F, Salimifard MR. Comparison the effects of two types of therapeutic exercises Frenkele vs Swiss ball on the clinical balance measures in patients with type II diabetic neuropathy. *Diabetes Metab Syndr* 2017;11:S29-32.
- Johnson CE, Takemoto JK. A review of beneficial low-intensity exercises in diabetic peripheral neuropathy patients. *J Pharm Pharm Sci* 2019;22:22-7.

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