

Effect of Selective Physical Therapy Program on Quality of Life in Diabetic Polyneuropathy Patient

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ABSTRACT

Background: Patients with diabetes mellitus commonly experience a diminished quality of life. The adoption of a sedentary lifestyle is well recognized as a risk factor that can be altered for the development of type 2 diabetes, as well as an independent indicator that predicts a diminished quality of life. Exercise plays a crucial role in the management of individuals having diabetes. **Purpose:** The objective of this investigation was to evaluate the impact of a selected physical therapy intervention on the quality of life among patients diagnosed with diabetic polyneuropathy. **Subjects and methods:** Twenty patients were given selected physical therapy program for a total of 36 sessions spread out over 12 weeks at a rate of 3 sessions per week for a duration of 40 minutes each. All patients were evaluated with the Quality of Life scale (QoLS). The study was done in Outpatient Clinics of Faculty of Physical Therapy, Deraya University.

Result: There was a substantial improvement in quality of life after treatment in the study group contrasted with that before treatment ($p < 0.001$).

Conclusion: The findings of this study showed improvement of quality of life in patients that were given a selected physical therapy program (proprioceptive training, stretching as well as strengthening exercises for arm and leg muscles).

Key words: Diabetic polyneuropathy, Selected physical therapy program, Quality of life scale (QoLS).

INTRODUCTION

Neuropathies are the one more common complications of diabetes with prevalence of approximately 8–45% of the patient with type 2 diabetes. Typical symptoms include sensations of numbness, tingling, pain, as well as/or weakness that originate in the distal regions of the lower limbs. Diabetes has been widely recognized as the primary metabolic risk factor accompanying with neuropathy. However, it is noteworthy that the management of hyperglycemia alone is not sufficient in the prevention of neuropathy among individuals diagnosed with type 2 diabetes ⁽¹⁾. Diabetic polyneuropathy (DPN) is widely recognized as the prevailing manifestation of diabetic neuropathy, characterized by sensorimotor polyneuropathy that affects length and is persistent and symmetrical ⁽²⁾.

DPN is a sensory-dominant neuropathy which result in initial ulcers and foot gangrene, which can cause pain, poor sleep, an increased risk of falling due to weakness, as well as an increased risk of extremities amputation ⁽³⁾. Neuropathic pain (PN) occurs in around 67% of people with PN, making it quite prevalent, and varies little between etiological classifications. It is also widely recognized as among the most debilitating neuropathy symptoms, negatively impacting patients' mental health as well as resulting in a low quality of life (QoL) ⁽⁴⁾.

Given its influence on the long-term prognosis as well as financial burden, QoL is one of the most crucial components of patients' lives influenced by diabetes. Those with painful DPN have a deteriorated QoL, particularly with regard to their reduced levels of physical activity. Individuals who reported higher pain intensity had the most significant deterioration in QoL, a finding that is consistent with previous studies investigating the impact of pain on QoL ⁽⁵⁾.

This investigation was conducted to figure out the therapeutic impact of the selected physical therapy program (proprioceptive training, stretching as well as strengthening exercises for arm and leg muscles), on the quality of life in people experiencing diabetic polyneuropathy.

MATERIALS AND METHODS

Sample size: G POWER was utilized to determine the optimal sample size (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany) based on quality-of-life data derived from Venkataraman *et al.* ⁽⁶⁾ and found that 20 participants in the study group would be optimal for carrying out the research.

Calculation is made with $\alpha = 0.05$, power = 90% and effect size = 1.1. Study was performed with approval from the Faculty of Physical Therapy at Cairo University (No.

P.T.REC/012/003779).

Patients' selection:

Selected from one group contain twenty patients each patient was given a selected physical therapy program (ten min. proprioception training on a Wobble board, ten min strengthening exercises, ten min. flexibility stretching exercises as well as ten min. rest) for forty minutes. For 36 sessions every other day, each session for 40 minutes.

MATERIALS:

1- Quality of Life Scale (QoLS): It was used to assess improvement of QoL before as well as after treatment.

Procedures:

Preceding starting of this investigation, all patients were given an informed consent form and given information about the study's procedures according to the protocol.

Evaluation procedures:

1. Quality of Life Scale (QoLS): It is a seven-point scale anchored with the phrase "delighted" as well as "terrible" it permits a wider range of affective responses to QoL items. The seven responses were "delighted" (7), "pleased" (6), "mostly satisfied" (5), "mixed" (4), "mostly dissatisfied" (3), "unhappy" (2), "terrible" (1). The total score for the instrument is calculated by adding up all of the individual scores. All items should be completed, even if the subject is not actively focusing on them (7).

Treatment procedures:

Received a selected physical therapy program (10 min. proprioception training on a Wobble board, 10 min strengthening exercises, 10 min. flexibility stretching exercises as well as 10 min. rest) for 40 minutes. For 36 sessions every other day, each session for 40 minutes.

Ethical consideration: A written informed consents were taken from the patients with explanation of the procedure, possible hazards. Ethical Committee of Faculty of Physical Therapy, Cairo University approved the study (number P.T.REC/012/003779). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical analysis

The data were checked for normality using the Shapiro-Wilk test. In order to assess homogeneity, the researchers conducted Levene's test for homogeneity of variances. To evaluate differences in mean quality of life scores, an unpaired t-test was performed. When comparing before as well as after treatment, a paired t-test was conducted. Significance in all statistical tests was

determined using a p-value threshold of ≤ 0.05 . The Windows version of the SPSS statistical software version 25 (IBM SPSS, Chicago, IL, USA) was used for all analyses.

RESULTS

- Subject characteristics: Table (1) presented the study group's subject characteristics. There were no substantial differences observed in terms of age, weight, height, as well as duration of illness (years) ($p > 0.05$). Distribution ($p > 0.05$).

Table (1): Mean values of general characteristics in study group

Item	Study group	t-value	p value
	Mean \pm S D		
1- Age (years)	51.46 \pm 4.51	0.31	0.756
2- Height (Cm.)	163.50 \pm 4.41	0.21	0.838
3- Weight (Kg.)	87.50 \pm 7.87	1.83	0.083
4-Duration of illness / (years)	8.25 \pm 1.28	0.87	0.399

SD: standard deviation P > 0.05 = Non-significant P \leq 0.05 = significant* P \leq 0.01 = highly significant**

Effect of treatment on quality of life scale: There was a substantial improvement in QoLs after treatment contrasted with before treatment in study group ($p < 0.001$). The mean values of **Quality of life Index (ODI)** scale before and after treatment for study group were 99.80 \pm 8.87 and after treatment it was improved substantially to 110.73 \pm 8.72 (Z -value was 1.68 as well as p value was **0.015.**) as shown in table (2).

Table (2): Comparison of mean values of **Quality of life Index (ODI)** scale in study group before and after treatment

Descriptive results	Quality of life Index (ODI)	
	Study group	
	Pretreatment	Post-treatment
Mean \pm SD	99.80 \pm 8.87	110.73 \pm 8.72
Median	100.00	100.00
Minimum	80.00	84.00
Maximum	112.00	112.00
Z-value	1.68	
Statistical p-value post treatment	0.015	

DISCUSSION

Diabetic sensorimotor polyneuropathy (DSPN) is observed in approximately 33% of individuals diagnosed with diabetes. The prevalence of painful DSPN may reach up to 25% in individuals with diabetes. Symptoms associated with DSPN commonly include the presence of pain, paresthesia, as well as numbness in the lower extremities, specifically in the distal regions ⁽⁸⁾.

The outcomes of the recent study are in line with **Girash et al.** ⁽⁹⁾ who stated that the QoL is a crucial factor in the lives of patients suffering from diabetes. This is attributed to its impact on both the long-term prognosis as well as the cost implications associated with the disease. Consequently, alleviation of neuropathic pain as well as prevention of foot ulcerations could significantly enhance QoL of diabetic patients.

The implementation of physical activity is being regarded as a therapeutic technique with the aim of improving postural instability. Numerous studies have been conducted to examine the impact of proprioceptive training programs on patients diagnosed with diabetes. **Richardson et al.** ⁽¹⁰⁾ reported that peripheral afference can be increased to improve balance as well as postural stability, resulting in fewer falls caused by sensory impairments. Postural control is the result of how the vestibular, visual, as well as sensory systems work together. Any change in one or more of these systems, which includes loss of feeling in the feet, can cause instability in posture. The observed enhancements in tactile sensitivity as well as reductions in AP oscillations following the training program may be attributable to the multi-sensory stimulation given by the intervention. The study demonstrated the efficacy of particular exercise regimen in improving clinical indicators of postural stability as well as confidence among individuals diagnosed suffering from peripheral neuropathy.

Premrajan et al. ⁽¹¹⁾ assert that proprioception exercises primarily target the perception of joint position, which aids in the preservation of joint stability and posture. These exercises also contribute to the enhancement of the somatosensory system, which is known to be impaired in individuals with diabetic neuropathy. **El-Wishy et al.** ⁽¹²⁾ arguing that the absence of precise proprioceptive information from the lower limbs among individuals having DN has led to instability in maintaining posture during both static as well as dynamic, particularly when the body experiences unanticipated changes in posture. Proprioceptive training facilitates the augmentation of proprioceptive firing arising from the cutaneous receptors situated in the feet as well as from the mechanoreceptors present in the muscles during contraction elicited by the swaying motion.

Therefore, it enhances both balance as well as QoL in individuals suffering from diabetic neuropathy.

CONCLUSION

From the obtained statistical results of the present study, there was improvement of quality of life among patients that received a selected physical therapy program.

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