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EFFECTIVENESS OF STRETCH BAND RESISTANCE EXERCISE ON BALANCE, MOBILITY AND GAIT AMONG PATIENTS WITH NEUROMUSCULAR DISORDERS IN A TERTIARY CARE HOSPITAL: A PROSPECTIVE EXPERIMENTAL STUDY.

Nursing

Mrs. Vidya K S

Mrs. Padminiamma P

Mrs. Jayarani R S

ABSTRACT

The present study investigated the effectiveness of stretch band resistance exercise on balance, mobility and gait among patients with neuromuscular disorders admitted in Government Medical College Hospital, Kottayam. A quantitative research approach was used for the study. The study was theoretically supported by the framework based on Betty Neuman's system model. A total of 60 patients, 30 each in control and experimental group, were selected for the study using non probability purposive sampling technique. The data were collected using socio personal data sheet, clinical data sheet, Burg's balance scale and Dynamic gait index.The pretest was conducted for both control and experimental group on first day of admission. Stretch band resistance exercises was provided to patients with lower limb weakness of muscle strength 2 to 4. The investigator demonstrated the exercise to the experimental group on the first day of admission and a leaflet also was given to the experimental group for continuing the exercise in home after discharge. The Posttest was conducted on 21 st day for both experimental and control group. The data were analyzed using descriptive and inferential statistics. Study findings revealed that there is statistically significant difference in the post test scores of balance, mobility and gait between the control group and experimental group. It is interpreted that stretch band resistance exercise is beneficial for improving balance, mobility and gait among patients with neuromuscular disorders. There was a positive correlation between balance, and mobility and gait among patients with neuromuscular disorders ($p<0.01$). There was a significant association between balance and muscle strength of right and left lower limbs and duration of illness ($p<0.05$).

KEYWORDS

Stretch band resistance exercise, balance, mobility and gait, patients with neuromuscular disorders.

INTRODUCTION

Neuromuscular diseases are those that affects the muscles and their direct neurons system control. Problems with central neuron control can cause either spasticity or some degree of paralysis. Most conditions are progressive, causing the muscle to gradually weaken over time. People's mobility is affected and most conditions leads to some sort of disability. Incidence of impaired mobility in neuromuscular disease is 160 per 100,000 persons worldwide and prevalence rates between 1 and 10 per 100,000 population.[1]

Some symptoms common to neuromuscular disorders include muscle weakness, muscle loss, movement issues, balance problems, numbness, tingling or painful sensations and gait problems. There are over 150 different types of neuromuscular disorders and more are being discovered every year. Some of the NMD which affects balance mobility and gait are multiple sclerosis, Guillain-Barre syndrome, peripheral neuropathies, myasthenia gravis, and lumbar radiculopathy. Treating symptoms, delaying disease progression and enhancing quality of life for patients is accomplished with medications, physical therapy, occupational therapy and, when necessary, surgery.[2]

An article published in Lancet global health is the most comprehensive data on the prevalence of neurological disorders across India to date, regarding the burden of neurological disorders across the states of India. The global burden of disease study 1990-2019 shows that around 18% of the world's population live in India and like other nations they also have a significant level of morbidity related to those with neurological disorders. The prevalence of MS in India in 2019 was 106,600, common in women and increasing after adolescence. The disorder peaked at 50-54 years old. For most of the neurological disorders, there was an increase in prevalence or incidence from 1990 to 2019. Multiple sclerosis was more prevalent among females in 2019. The study concluded that there was overall increase in disease burden in India which demands awareness, early identification, treatment and rehabilitation[3]

Symptoms of neuromuscular disease vary according to the condition and may be mild, moderate or life threatening, some of the symptoms are muscle weakness, muscle wastage, muscular cramps and muscle spasticity. Exercise has long been adopted as an effective mode for improving strength and endurance in both normal and patient populations and serves as a basis for rehabilitation programs. Exercise in neuromuscular disease is safe, although for some metabolic myopathies there is a contra indication for strenuous exercise. Low intensity strength training (10 to 15 repetitions) may be beneficial for persons with sufficient muscle strength. Low physical activity levels may lead to even greater weakness and atrophy of skeletal muscles, which cause a vicious circle of disuse and weakness.[4]

In previously conducted studies, stretch band resistance exercise showed influence on balance and gait. Researchers selected 45 patients, divided them into 2 groups. One group was treated with both general physical therapy and stretch band resistance exercise (23 patients) and other group was treated with only general physical therapy (22 patients). The exercise composed of 8 movements of lower extremity joints. It is performed for 30 minutes during 4 weeks with a frequency of 3 times per week. In the study both groups showed significant improvement in balance, gait and flexibility. And group performed stretch band resistance exercise showed more improvement in balance and gait compared to control group.[5]

OBJECTIVES

1. To determine the effectiveness of stretch band resistance exercise on balance among patients with neuromuscular disorders.
2. To evaluate the effectiveness of stretch band resistance exercise on mobility and gait among patients with neuromuscular disorders.
3. To find out the correlation between balance and mobility and gait among patients with neuromuscular disorders.

MATERIALS AND METHOD

A quantitave approach was used in this study . the study design selected was quasi experimental pre test post test control group design . Non probability purposive sampling was used to select the 60 subjects with neuromuscular disorders at Govt medical college hospital Kottayam .All subjects in this study were with neuromuscular disorders having lower limb weakness with muscle strength 2 to 4 as per MRC grading , with duration of disease more than 6 months , willing to participate in the study and able to comprehend and communicate Malayalam .Those Excluded from the study were age less than 20 years ,restriction of activity or exercise , kinesiophobic , spinal cord injuries and musculoskeletal disorders such as fractures , bone malignancies etc.

The intervention was stretch band resistance exercise is a group of leg strengthening exercises by using stretch band for improving the balance, mobility and gait of patients with neuromuscular disorders. Stretch band resistance exercise consists of 8 steps which include hip flexion, hip extension, hip abduction, hip adduction, knee flexion, knee extension, plantar flexion and dorsiflexion. Order of the exercise is

from proximal to distal and total duration is 20 minutes.

Initially patient is asked to perform possible ROM exercises of lower limb including flexion, extension, abduction, adduction of each limb for 10 times which has to be completed in 2 minutes. Then stretch band exercises are performed and for each movement patient has to hold the limb for 10 sec in the same position. Altogether the whole exercise programme takes about 20 minutes to complete.

The investigator demonstrates and provides sufficient explanation of method of exercises to the patient and caregiver on the first day of admission and thereafter the patient performs the exercises with the help of leaflet under the supervision of investigator daily till discharge. Then the patient performs the exercise in their home under the supervision of caregiver for three consecutive weeks. To sociopersonal and clinical data were asses using sociopersonal and clinical data sheet . Burgs balance scale was used to assess the balance and Dynamic gait index was used to assess mobility and gait of the subjects . The researcher demonstrated the intervention to the experimental group and care giver on the 1st day of admission and patient will continue the exercise till discharge under the supervision of researcher .frequency of intervention is one sessions per day for 3 consecutive weeks .a leaflet including detailed instruction regarding the exercise is given to patients so that they can continue the exercise after discharge .post test was conducted for both control and experimental group on the 21 st day of intervention .The obtained datawere tabulated and analysed in terms of objectives of the study using descriptive and inferential statitics .

RESULTS

Finding Related To Sample Characteristics

The data indicated that more than half of the subjects in control (50.1 %) and experimental group (56.7 %) belongs to 51 to 60 years. In control group 23.3% subjects belongs to 41-50 years where as in experimental group 23.3 % subjects belongs to 31-40 years. Male and female with control group were 50%each. More than half (70%) of subjects in the experimental group were females, and only 30 %subjects were males. More than half of (53.7%) subjects in control group and majority (73.7%) of subjects in experimental group had support from spouse. The data showed that 40% subjects in the control group and half of the subjects (50%) in experimental group had primary education.

Findings related To effectiveness of stretch band resistance exercise on balance, mobility and gait among patients with neuromuscular disorders

Table 1: Mean rank, sum of ranks and U values of post test scores of balance among patients with neuromuscular disorders in control and experimental group (n=60)

Group	Balance		
	Mean rank	Sum of rank	U
Control (n=30)	25.32	759.50	294.5*
Experimental (n=30)	35.68	1070.50	

*Significant at 0.05 level

The table 1 shows that the mean rank of post test scores of balance among patients with neuromuscular disorders in control group is 25.32 and in experimental group is 35.68. The obtained U value is significant at 0.05 level. This shows that there was a significant difference in in the post test balance scores between control and experimental group. Hence the null hypothesis was rejected. Thus it can be inferred that stretch band resistance exercise was effective in improving balance of patients with neuromuscular disorders.

Table 2: Mean rank, sum of ranks and U values of post test scores of mobility and gait among patient with neuromuscular disorders in control and experimental group (n=60)

Group	Mobility &gait		
	Mean rank	sum of rank	U
Control (n=30)	19.92	597.50	132.5*
Experimental(n=30)	41.08	1232.50	

*Significant at 0.05 level

Table 2 shows that the mean rank of post test scores of mobility and gait among patient with neuromuscular disorders in the control group is 19.92 and experimental group is 41.08. The obtained U value is significant at 0.05 level. Hence the null hypothesis was rejected. Thus, it can be inferred that stretch band resistance exercise was effective in improving mobility and gait of the patients with neuromuscular disorders.

Findings related to corelation between balance mobility and gait of patients with neuromuscular disorders

Table 3: Correlation between balance and mobility and gait of patients with neuromuscular disorders (n=60)

Variables	p
Balance	0.820**
Mobility and gait	

**Significant at 0.01 level

Table 3 depicts that the correlation between balance and mobility and gait is 0.820. The increased scores in balance indicates increase in mobility and gait among patients with neuromuscular disorders. The value obtained was statistically significant at 0.01 level, hence null hypothesis was rejected. There was a positive correlation between balance and mobility.

DISCUSSION

The present study showed that 30 % subjects in the control group and 33.3% subjects in experimental group belongs to peripheral neuropathy. These are consistent with a study conducted regarding balance, mobility assessment for ruling out the peripheral neuropathy of lower limbs which showed that 36% of participants had peripheral neuropathy of lower limbs and it is an important cause of balance and mobility impairment[.6]These are consistent with another study conducted to evaluate balance ability in lumbosacral radiculopathy showed that subjects with lumbosacral radiculopathy have decreased postural balance[.7]

The present study showed that there is significant difference in balance scores among patients with neuromuscular disorders before and after the stretch band resistance exercise. The mean rank of post test scores of balances among patients with neuromuscular disorders in control group is 25.32 and in experimental group is 35.68. The obtained U value is significant at 0.05 level. Thus, it can be inferred that stretch band resistance exercise was effective in improving balance of patients with neuromuscular disorders.

These are consistent with another study carried out to review the short-term effect of an exercise-based rehabilitation intervention on balance, mobility, falls and injuries among elderly in U. S. Findings showed intervention can improve balance and mobility.[8]

The study observed that there was a significant difference in BBS and DGI scores among patients with neuromuscular disorders before and after stretch band resistance exercise. The mean rank of post test scores of mobility and gait among patient with neuromuscular disorders in the control group is 19.92 and experimental group is 41.08. The obtained U value significant at 0.05 level. Thus, it can be inferred that stretch band resistance exercise was effective in improving mobility and gait of the patients with neuromuscular disorders.

It was supported by another study to evaluate the effects of home-based resistance exercise on balance, power, and mobility in adults with multiple sclerosis. Twenty-nine women (age, 50.3±8.5y) and 8 men (age, 51.1±7.1y) were stratified by disability level and age and were randomized into exercise (n=19) and control (n=17) groups. The exercise group had lower-extremity resistance training 3 times a week . The study concluded that the home-based resistance program was well tolerated by participants and offered a practical means to improve leg extensor power in a short period of time.[9]

The study observed that the increased scores in balance indicates increase in mobility and gait among patients with neuromuscular disorders. The value(132.5) obtained was statistically significant at 0.01 level. There was a positive correlation between balance and mobility.

These are consistent with another study carried out to identify the relationship between sitting balance and mobility outcome in stroke in Australia 1994 shows that assessment of static sitting balance in the acute stroke patient was found to be positively correlated with gait outcome.[10]

CONCLUSION

Based on the above findings it can be concluded that the stretch band resistanc exercise is effective for improving the muscle strength of lower limbs , there by improving the balance , mobility and gait among patients with neuromuscular disorders .

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