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Neural Mobilization and Carpal Tunnel Syndrome in Sudan

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Abstract:

Introduction: *Carpal Tunnel Syndrome (CTS) is a collection of symptoms occurs after compression of Median Nerve and the Carpal Tunnel [1]. Median Nerve mobilization is one of the interventions used in the treatment of CTS [1]. Several studies reported optimum results with the use of neurodynamic mobilization as a conservative treatment for CTS patients [1]. The aim of this study was to investigate the effectiveness of the neural mobilization of the median nerve in the management of carpal tunnel syndrome.*

Methodology: *Analytical case control was used in the study to assist the neural mobilization of the median nerve at physiotherapy clinics in Khartoum, Sudan. There were 30 participants diagnosed with CTS participated in the study and divided to control and experimental groups including 15 participants in each. Data collections used questionnaires and standard data sheet. Data analysis used Special Package for Social Sciences (SPSS) version 21. All ethical consideration for approval and confidence been obtained.*

Results: *Each control and experimental group showed significant differences between pre and post treatment and p=value were less than (0.05). No significant differences were found between control and experimental groups in the study.*

Conclusion: *Using Ultrasound, Exercise, and Neural Mobilization of Median Nerve for CTS gave significant positive rehabilitation effect. No significant differences between control and experimental group in this study.*

Keywords: *Carpal Tunnel Syndrome (CTS), Nural Mobilization, Physiotherapy, Khartoum, Sudan.*

1. INTRODUCTION:

In the United States, about 2.7 million doctors' visits/year are related to patients complaining about finger, hand or wrist symptoms [2]. The most common cause among them is Carpal Tunnel Syndrome (CTS), which accounts for 90% of all entrapment neuropathies [3]

Carpal Tunnel Syndrome CTS can cause different complications effecting functions of the hand such as hand tingling, weakness, pain, and loss of feeling. Carpal Tunnel is a narrow passageway in the wrist towards the palm side. On the other hand, carpal bones and the flexor retinaculum forms the roof of the tunnel. These boundaries are very rigid, which leads to little capacity of stretch in the carpal tunnel while the median nerve and nine flexor tendons to the fingers pass through the carpal tunnel. When pressure on the Median Nerve occurs, the diagnosis known as CTS.

The carpal tunnel is a narrow passageway in the wrist in the palm side, about an inch wide. The carpal bones in the floor and sides of the tunnel form it and the flexor retinaculum forms the roof of the tunnel. These boundaries are very rigid, which leads to little capacity of stretch in the carpal tunnel [4]. The Median Nerve and nine flexor tendons to the fingers pass through the carpal tunnel [4]. Physiotherapy treatments considered as one of the conservative treatments of CTS. Several studies reported optimum results with the use of neurodynamic mobilization as a conservative

treatment for CTS patients [1]. Neural Mobilization is one of the physiotherapy treatments which has been investigated in this study.

Sudan located in East North Africa and considered one of the developing countries [5,6]. Physiotherapy field of rehabilitation is progressing with little challenging regarding the low socioeconomic status of the country which leads to limited healthcare system in the region [7]. Even that physiotherapy services started in early 80s, but physiotherapy education programs started in 2000s [8].

This study was conducted to assess the effect of Neural Mobilization in CTS in Sudan as no previous similar studies been done in Sudan. Few studies investigated physiotherapy techniques for Rheumatoid Arthritis (RA) and sport injuries in Sudan [5,6,9].

2. METHODOLOGY:

The study was an analytical prospective case control study conducted to assess the neural mobilization of the median nerve. It is conducted in Khartoum, Sudan includes physiotherapy clinics in Ibn Sina University, Police hospital, and Alsudani center for physiotherapy.

All participants were diagnosed with CTS. Sample of the study included 30 cases divided simultaneously in 2 groups, control and experimental; 15 patients in each group. The control group treated by ultrasound and exercises; on other hand; the experimental group treated using ultrasound, exercises and neural mobilization of median nerve. Both control and experimental groups got total of 12 treatment sessions, 3 sessions per week for four weeks.

Ultrasound applied to both control and experimental groups three times per week for four weeks (12 sessions). Dosage used was 1 MHz, pulsed ultrasound for 15 minutes each session with a frequency 1 Hz in the palmar side of the wrist joint. Exercises includes strengthen and stretching exercises to the wrist and fingers. Strengthen and stretching exercises were in form of wrist flexion and extension, fingers flexion and extension, fingers abduction and adduction, thumb flexion and extension, and wrist ulnar and radial deviation. Participants were instructed to perform these exercises 10 times, 5 times a day. Neural Mobilization of Median Nerve applied for experimental group only. Participant was in sitting position with the shoulder abducted to 90 degrees with full elbow extension and supination; the mobilization of the median nerve is done by changing the wrist and neck positions which when the participant do wrist extension the neck will be in neutral position and when the wrist goes in flexion the neck will bend to the opposite side; and the therapist was in front of the patient to make sure of doing it right; also participant instructed to continue doing it at home with the other exercises.

Assessment was done before treatment sessions and at the end of the treatment sessions. Visual Analogue Scale (VAS) used to assess pain and hand dynamometer for hand grip. Boston Carpal Tunnel Questionnaire (BCTQ) used specifically; Symptoms Severity Scale (SSS) for CTS severity and Functional Status Scale (FSS) for hand function. Data was collected using questionnaire for demographic data.

Data was analyzed using excel Microsoft program and SPSS version 21.0 using paired sample T-test to compare the difference in the mean values of control and experimental group at confidence level equal to 95% and P-value equal or less 0.05.

Permission from all physiotherapy centers been guaranteed and written consent was obtained from the participants before participating in the study. The data were kept in personal computer with personal password. All participants had the right to withdraw from the study at any time.

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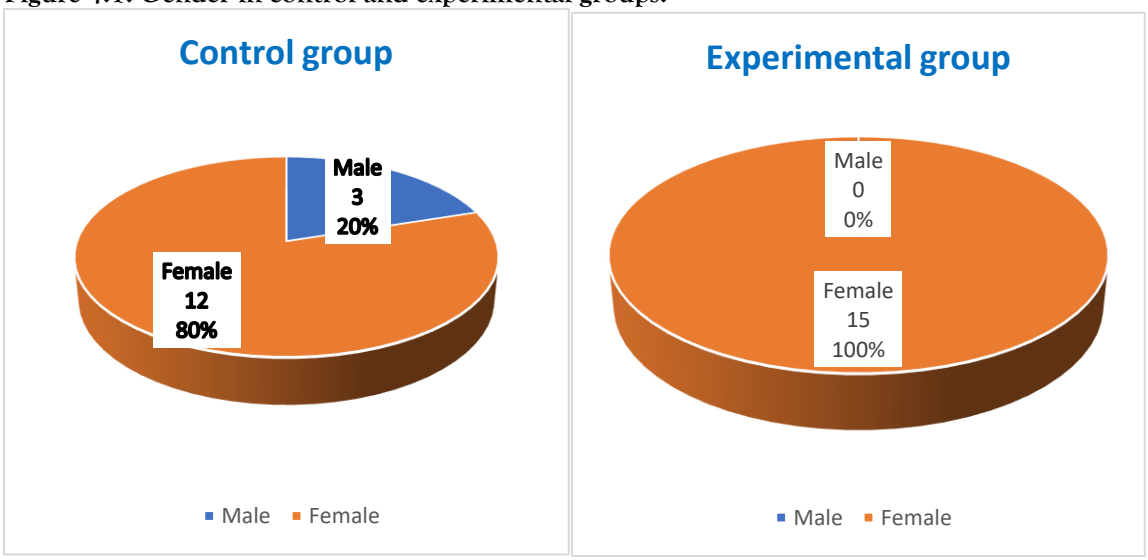
3. RESULTS:

Table 4.1: Age and weight in control and experimental groups:

	Number	Minimum	Maximum	Mean
Age	30	24	75	53
Weight	30	47	90	73

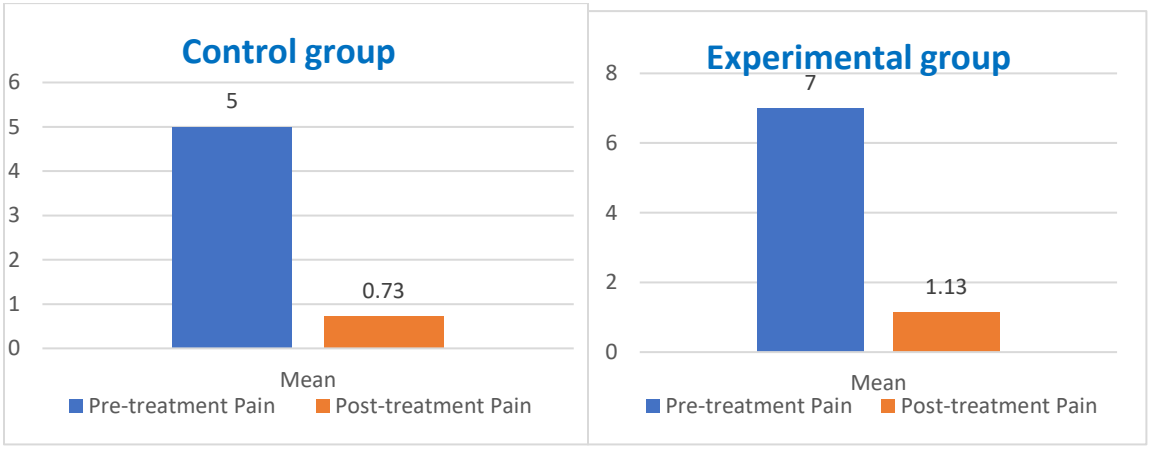
Table 4.1. shows that age mean in both groups is 53 years old and the weight mean in both groups is 73kg.

Figure 4.1. Gender in control and experimental groups:



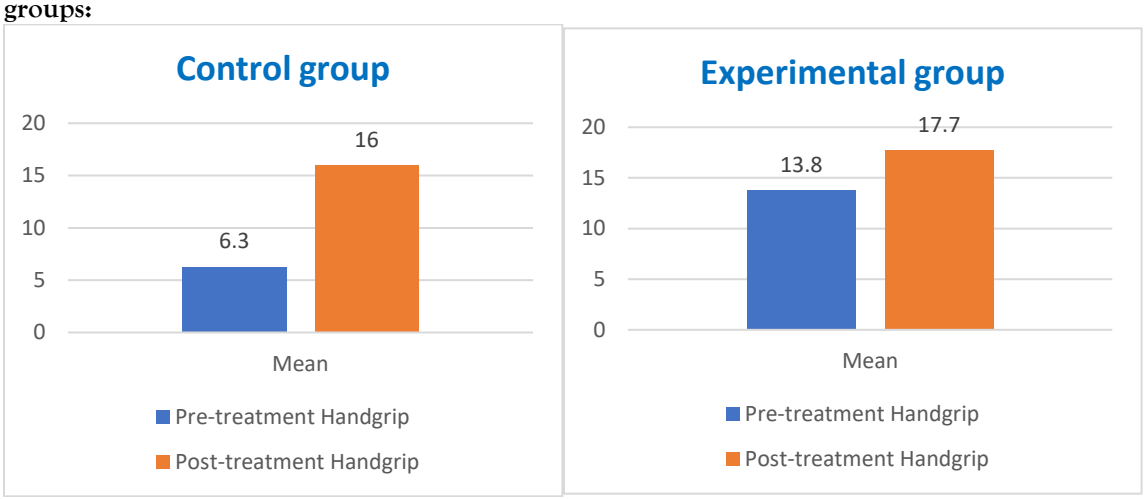
There were 20% (3/15) males and 80% (12/15) females in the control group while all participants were females in the experimental group as shown in figure 4.1.

Figure 4.2: Statistical analysis of pre and post treatment of pain in control and experimental groups:



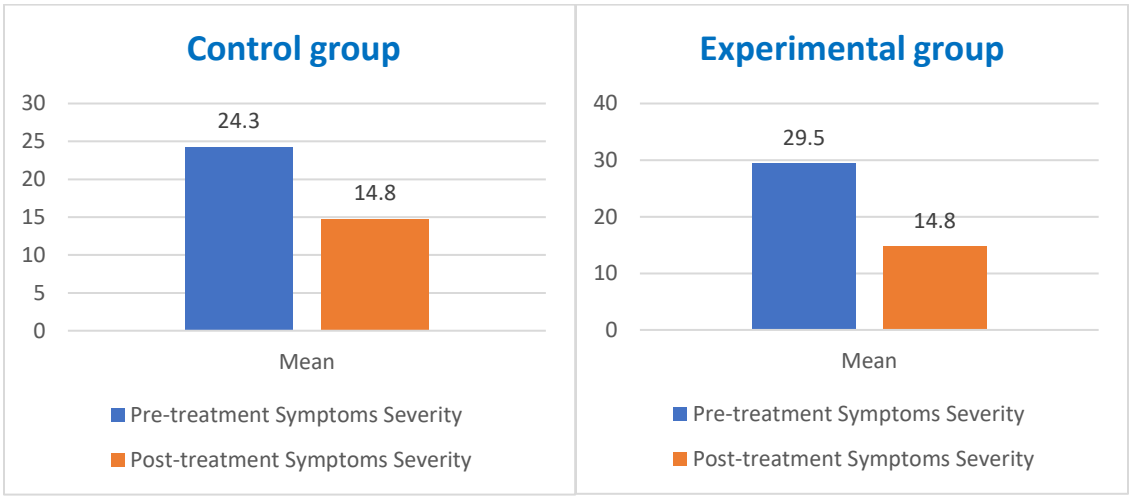
As shown in figure 4.2. both groups showed a significant improvement pre and post treatment regarding pain control. In control group, the mean reduces from score 5 into score 0.73 using VAS pain scale. This gave a significant different between pre and post treatment with p=value (0.000). In experimental group, the mean reduces from score 7 into score 1.13 using VAS pain scale. This gave a significant different between pre and post treatment with p=value (0.000).

Figure 4.3: Statistical analysis of pre and post treatment of hand grip in control and experimental groups:



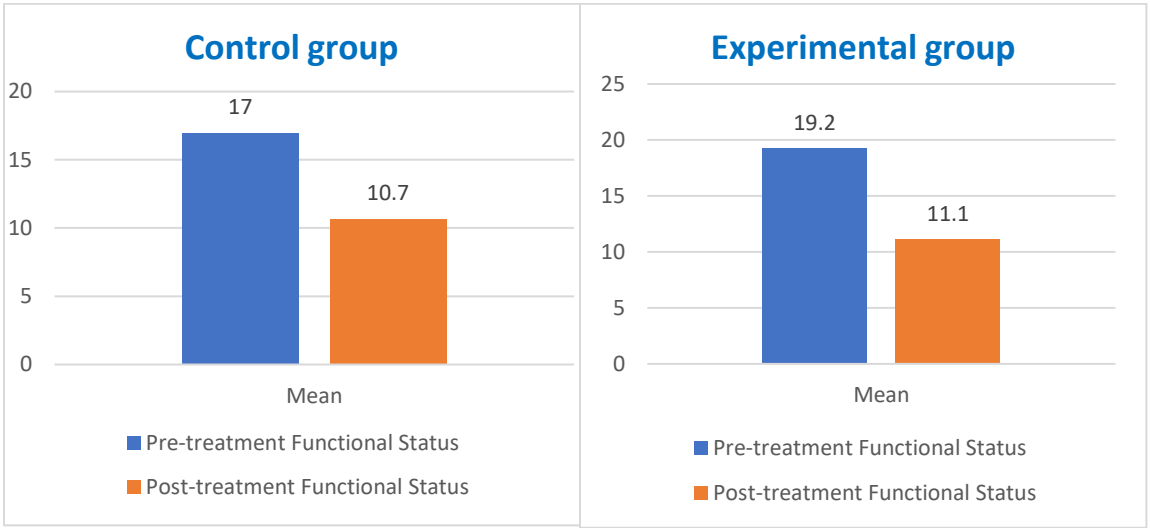
As shown in figure 4.3. both groups showed a significant improvement pre and post treatment regarding hand grip. In control group, the mean increased from score 6.3 into score 16 using hand dynamometer for hand grip. This gave a significant different between pre and post treatment with p=value (0.001). In experimental group, the mean increased from score 13.8 into score 17.7 using hand dynamometer for hand grip. This gave a significant different between pre and post treatment with p=value (0.048).

Figure 4.4: Statistical analysis of pre and post treatment of Symptom severity scale in control and experimental groups:



As shown in figure 4.4. both groups showed a significant improvement pre and post treatment regarding symptom severity. In control group, the mean decreased from score 24.3 into score 14.8 using SSS for symptoms severity. This gave a significant different between pre and post treatment with p=value (0.000). In experimental group, the mean decreased from score 29.5 into score 14.8 using SSS for symptoms severity. This gave a significant different between pre and post treatment with p=value (0.000).

Figure 4.5: Statistical analysis of pre and post treatment of functional status scale in control and experimental groups:



As shown in figure 4.5. both groups showed a significant improvement pre and post treatment regarding functional status. In control group, the mean decreased from score 17 into score 10.7 using FSS for functional status. This gave a significant different between pre and post treatment with p=value (0.001). In experimental group, the mean decreased from score 19.2 into score 11.1 using FSS for functional status. This gave a significant different between pre and post treatment with p=value (0.000).

Table 4.2: Statistical relationship of post treatment between control and experimental groups:

	Mean	SD	P. Value	Significance
Pain control.	.40	1.5	.320	Non sig
Hand grip.	1.68	14.6	.663	Non sig
Symptoms Severity.	.06	6.6	.970	Non sig
Functional Status.	.4	6.3	.810	Non sig

As shown in table 4.2. no significant relationship found between control and experimental group regarding pain control, hand grip, symptoms severity, and functional status.

4. DISCUSSION:

A total of 30 participants were involved in study. Participants divided into two groups each group included 15 participants. Age mean for both groups is 53 years old. The study of Hashimoto *et al* (2020) [10], in Japan found that CTS affecting population aged more than 50 years old. The same study found positive correlation between CTS and female. In this study, female participation were higher in both groups as shown in the previous chapter. The weight mean in both groups was 73kgs. This agrees with the study of Eslamian *et al* (2024) [11], which found the weight mean is 83kgs with a variation of ±11.71.

There were a significant improvement regarding pain reduction in pre and post treatments for both groups at this study. This agrees with the study of Bittencourt *et al* (2024), which found that the impact of neural mobilization on pain reduction is clear in CTS patients [12]. It effect positively both the sensory conduction velocity and the motor conduction velocity. Therefore, neural mobilization should be integrated into the physical therapy management.

Regarding hand grip, significant improvement found in pre and post treatments for both groups. This is aligned with what mentioned earlier regarding the impact on motor conduction velocity [12, 13]. Carpal bone mobilization technique was effective in improving grip strength while managing the participants with chronic CTS. In addition, the tendon gliding exercises contributed as a beneficial, effect-enhancing adjunct to the neurodynamic technique and carpal bone mobilization technique.

Regarding Symptom severity, significant improvement found in pre and post treatments for both groups. The study of Syed *et al* (2023), concluded that neural mobilization treatment was effective in symptom severity of CTS [13]. This is exactly similar to our discussion regarding the improvement of the hand grip. In other words, Carpal bone mobilization technique were effective in reducing symptoms severity while managing the participants with chronic CTS and the tendon gliding exercises contributed as a beneficial, effect-enhancing adjunct to the neurodynamic technique and carpal bone mobilization technique.

Regarding Functional status, significant improvement found in pre and post treatments for both groups. The study of Syed *et al* (2023), concluded that neural mobilization treatment was effective in symptom severity and hand function for patient with CTS [13].

No significant relationship found between control and experimental group regarding pain control, hand grip, symptoms severity, and functional status. No clear reason showing the reason. Therefore, the significant out come pre and post treatment showed the effect of the neural mobilization showed significant effect in treating CTS patients.

5. CONCLUSION:

The study revealed that the neural mobilization showed significant effect in treating CTS patients. This positive effect showed directly in pain, symptoms severity, and functional status. Although more research on the topic is necessary to determine the effectiveness of neural mobilization on CTS patients.

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