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RESEARCH ARTICLE

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Effect of Combination of Electrotherapy and Exercise Therapy on Functional Activities of Low Back Pain Patients

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ABSTRACT

Low back pain is one of the main health problems experienced by humans. Microwave diathermy, bugnet exercise, and William flexion exercise are physiotherapy modalities that can be used to treat lower back pain, but their scientific effectiveness is uncertain. This study aims to evaluate the effect of pain reduction and degree of disability after being given a combination therapy of microwave diathermy, bugnet exercise, and William flexion exercise in patients with low back pain. This research was a pre-experimental study with a one-group pretest-posttest design which was carried out at dr. Tadjuddin Chalid Makassar with a population of 30 subjects who met the inclusion requirements. The sample was obtained by 26 subjects obtained using the Lemesow formula. Sampling was done by simple random sampling technique into one treatment group to measure the degree of disability using the Oswestry Disability Index (ODI) before and after the intervention. The results of data analysis with the Wilcoxon test obtained a pretest value of 39.80 + 4.64 and a posttest of 20.80 + 2.90 with a p-value of 0.005. Thus it can be concluded that the provision of Microwave diathermy, bugnet exercise, and william flexion exercise can have an effect on the functional activities of low back pain patients.

Keywords: electrotherapy; exercise therapy; oswestry disability index; physiotherapy; low back pain

INTRODUCTION

Low back pain (LBP) is a symptom, not a diagnosis, which is characterized by the main complaint being non-specific pain and movement disorders in the lower back. Low back pain is a problem that is not uncommon in the community, ranging from the mildest problem to a fairly severe problem, depending on the type and location of the disorder. Approximately 10% of adults experience LBP from all physical disorders⁽¹⁾. Generally, low back pain is caused by a disturbance in the neuromusculoskeletal system which has an impact in the form of pain and inflammation which often ends in impaired mobility and limited movement function⁽²⁾. This case is one of the most common health problems experienced by workers in the industry, which is a common cause of disability in people under 40 years old and causes degenerative changes in older people⁽³⁾. The prognosis for LBP is 60-70% recovery within 6 weeks and 80-90% within 12 weeks⁽¹⁾.

Low back pain is a common condition that affects a person's life activities⁽⁴⁾. It is estimated that between 5-10% of cases of low back pain will develop into chronic low back pain which results in high medical costs, higher leave from work, and increasing health problems faced⁽⁵⁾. The results of studies on the prevalence of low back pain (LBP) varied between studies, where it was reported that the incidence ranged from 19 – 37% and the lifetime prevalence was between 40 – 86%. In developed countries, it is reported that throughout human life the incidence of low back pain is around 80%^{(6), (7)}. In America for 14 years, chronic nonspecific low back pain tends to increase by 6.3% without any change in the severity of symptoms⁽⁸⁾. Therefore, it is necessary to determine the incidence of LBP by using the level of disability to predict disability so that it can provide information to develop treatment.

Various efforts have been made to overcome the problems caused by the LBP situation, but they have not been fully overcome to the maximum. Multidisciplinary functional rehabilitation interventions can increase the

Oswestry disability index in patients with LBP⁽¹⁾. The action of providing a fitness program aims to prevent LBP from becoming chronic, giving analgesics and muscle relaxation to reduce pain and can improve and maintain function. Manual therapy can reduce pain and maintain and restore function in acute LBP⁽⁹⁾. Physiotherapy with the e-exercise method can affect physical activity and pain intensity⁽¹⁰⁾. McGill stabilization exercises and conventional physiotherapy have an effect on pain, functional impairment, and active range of motion in the back⁽¹¹⁾. These efforts have provided extensive progress in dealing with problems that arise due to non-specific low back pain, but until now these problems have not been able to be overcome comprehensively, so researchers have made new therapeutic efforts to overcome the problems caused by LBP. This study was conducted to overcome the problems that arise due to LBP, namely overcoming pain and functional limitations in the lumbar spine. The researchers' efforts in carrying out a new method of therapy are by doing a combination of electrotherapy in the form of microwave diathermy with bugnet exercises and William flexion. The researchers used this effort because the provision of microwave diathermy is expected to provide relaxation to the back muscles that experience spasms and decrease the actuality of pain^{(8), (12)}. Likewise, the addition of bugnet and William flexion exercises will provide a stabilizing, strength, and relaxation effect after the application of the exercise^{(12), (13)}.

In connection with the above explanation, this research is very important to do considering the increasing number of cases of acute non-specific low back pain to chronic non-specific LBP and the increasing extent of human activity at work so that it is possible to increase the incidence of non-specific LBP as one of the cases that most common in society.

METHODS

This research was a pre-experimental study with a one-group pretest-posttest design, which was carried out at dr. Tadjuddin Chalid Makassar. The population was LBP patients who meet the criteria for experiencing non-specific LBP, a minimum ODI score of moderate disability, aged 25-50 years, and neuromusculoskeletal disorders that can interfere with the research process so that a population of 30 subjects was obtained. The determination of the sample size was carried out using the Lemesow formula so that a sample size of 26 subjects was determined. Sampling was done by simple random sampling technique into one treatment group.

Data were collected before and after the intervention of a combination of microwave diathermy, bugnet exercise, and William flexion exercise. The data used in this study were pain actuality data and lumbar functional ability as measured using the Oswestry disability index (ODI). ODI score criteria include minimal disability (0-20%), moderate disability (21-40%), severe disability (41-60%), crippling back pain (61-80%), and bed-related symptoms accompanied by excessive (81-100%). Data were analyzed by the Wilcoxon statistical test.

This research has been approved by the Health Research Ethics Commission of the Health Polytechnic of the Ministry of Health Makassar Number 095/KEPK-PTKMKS/IV/2021

RESULTS

Based on the results of measurements of the characteristics of the sample in this study, can be seen in table 1.

Table 1. The Characteristics of non-specific LBP patients

Variable	Frequency	Percentage
Age (years)		
25 – 30	3	11.54
31 – 35	5	19.23
36 – 40	6	23.08
41 – 45	8	30.77
46 – 50	4	15.38
Sex		
Male	12	46.15
Female	14	53.85

The results of the characteristic analysis showed that the highest cases were in subjects aged 41-45 years as many as 8 subjects or 23.77% and the lowest cases at the age of 25-30 years, namely as many as 25-30 years or 11.54%. Similarly, for the sex factor, the results showed that more women experienced non-specific LBP than male subjects. Thus, it can be concluded that the incidence of non-specific LBP is strongly influenced by the age of a person's productivity, meaning that the more active a person is in activities, the higher the incidence

of non-specific LBP. In the female gender, it is more common because of the many types of activities and the high frequency of daily activities that can cause non-specific LBP compared to men.

Analysis of the ODI score data on research subjects obtained results before the intervention, namely 16 subjects with scores of severe disability (41-60%) and 10 subjects with scores of moderate disability (21-40%). After the intervention, the ODI score was obtained, namely 3 subjects with a disability severity score (41-60%), 18 subjects with a moderate disability score (21-40%), and 5 subjects with a minimum disability score (0 – 20%). More details can be seen in table 2.

Table 2. Analysis of ODI score percentage distribution before and after intervention

Before intervention			After intervention		
Score ODI	n	Category	Score ODI	n	Category
0 – 20%	0	Minimal disability	0 – 20%	5	Minimal disability
21 – 40%	10	Moderate disability	21 – 40%	18	Moderate disability
41 – 60%	16	Severity of disability	41 – 60%	3	Severity of disability

The results of the analysis showed that there was a change in the percentage of ODI scores before and after being given a combination therapy of microwave diathermy, bugnet exercises, and William flexion, whereas many as 23 subjects experienced a decrease in the percentage of ODI scores to minimal disability and moderate disability, while 3 people did not experience a change. Thus, it can be concluded that the combination therapy of microwave diathermy, bugnet exercises, and William flexion can reduce the percentage of ODI scores in non-specific low back pain patients.

The results of measuring the ODI score before and after combination therapy with microwave diathermy, bugnet exercise, and William flexion on research subjects obtained an average value before therapy of 39.80 ± 4.64 while after being given combination therapy of microwave diathermy, bugnet exercise, and William flexion, the score was obtained. the average ODI score is 20.80 ± 2.90 with an average difference of 19.00 ± 1.74 . More details can be seen in table 3.

Table 3 Analysis of ODI score values before and after intervention

Before intervention		After intervention		Difference		Z	p
mean	SD	Mean	SD	Mean	SD		
39.80	4.64	20.80	2.90	19.00	1.74	-2.816	0.005

The results of data analysis with the Wilcoxon test obtained a pretest value of 39.80 ± 4.64 and a posttest of 20.80 ± 2.90 with a p-value of 0.005 ($p < 0.05$). This means that the combination therapy of microwave diathermy, bugnet exercise, and William flexion can significantly reduce the ODI score of non-specific LBP patients. Thus, it can be concluded that the combination therapy of microwave diathermy, bugnet exercise, and William flexion has an effect on the functional activity of non-specific LBP patients.

DISCUSSION

Based on the results of measuring the characteristics and degrees of disability or functional activity ability using the ODI questionnaire on 26 subjects in this study, several research findings were obtained. The results of the analysis of the characteristics of the subject indicate that the incidence of non-specific LBP is strongly influenced by the age of a person's productivity, meaning that the more active a person is in activities, the higher the incidence of non-specific LBP. This can happen because someone at a productive age, someone will carry out activities with more types and frequencies so that it is possible for abnormal movements to occur as a triggering factor for non-specific LBP. In addition, age is an internal factor as one of the predisposing factors for non-specific LBP, where the incidence increases in line with increasing age, especially the productive age, where most adults experience LBP, where the global population is 37%, where the peak is in middle age⁽¹⁴⁾. In addition to the age factor, non-specific LBP also occurs due to the frequency of repetitive activities at work which is related to a person's productive age⁽¹⁵⁾. In addition to the age factor, non-specific LBP also affects female subjects more than male subjects regardless of age⁽¹⁶⁾. This can happen because women, especially women who work only as housewives, have daily activities such as sweeping, washing clothes, washing dishes, carrying out lifting and transporting activities at home, all of which carry out uncontrolled and repetitive movements throughout the day, as well as the ability to carry out daily activities. The strength of the spinal extensor and flexor muscles in women is lower than in women, thus facilitating the occurrence of non-specific LBP^{(17), (18)}.

The combination therapy of microwave diathermy, bugnet exercise, and William flexion affects the functional activity of non-specific LBP patients. This is evidenced by the decrease in the ODI score in the subject group before and after the intervention, where before the intervention the subject's ODI score was in the moderate and severity category of disability and after the intervention the subject group had an ODI score in the minimal, moderate and severity categories, but at The level of disability severity and moderate category of the subject decreased after the intervention. This can happen because with the combination therapy, there will be a mechanism of relaxation in muscle tissue, shortening of muscle stretching, and stability of weak muscles so that pain will decrease, mobility and joint stability will improve. Giving microwave diathermy has a pain-reducing effect⁽³⁾, and stimulates the neurophysiological system causing pain reduction⁽⁸⁾. Microwave diathermy therapy produces heat which has a physiological effect in the form of improving local blood circulation, changes in sensory nerve responses, increasing nerve conduction velocity, and decreasing the actuality of pain^{(19), (20), (21)}.

Giving bugnet and William flexion exercises has an impact in the form of reducing pain and improving function because these two exercises have an effect on sensory activity and reflex mechanisms as well as flexibility mechanisms in the musculoskeletal system. This happens because giving bugnet training it will cause maximum muscle contraction followed by relaxation⁽²²⁾. Exercise can also increase trunk muscle endurance⁽¹⁾ and additive effects⁽²³⁾. The existence of a post isometric relaxation mechanism causes a decrease in tone in the agonist's muscle after isometric contraction as a reaction to the Golgi tendon organ⁽¹²⁾. Bugnet and William's flexion exercises are aimed at preventing weakness in the trunk muscles as a result of immobility and increasing activity tolerance to improve the patient's functional ability⁽²⁴⁾. Exercise has a pain-reducing effect through the process of stability in the lumbar segment, namely the retention of simultaneous contractions precisely in the trunk and abdominal muscles^{(13), (25), (26)}. Giving rhythmic stabilization, such as in bugnet training, causes stimulation of A-beta afferent input in muscles and joints so that it can reduce the activity of A-delta and C nociceptors so that pain can be reduced so that non-specific LBP patients can perform activities more optimally and reduce the disability experienced previously. Rhythmic stabilization can improve muscle stability thereby reducing disability in non-specific LBP patients⁽¹²⁾.

CONCLUSION

Based on the results of the analysis of the data obtained, it can be concluded that the combination therapy of electrotherapy and exercise therapy can have the effect of reducing pain and increasing the functional ability of patients with low back pain. Handling that is not optimal for patients with low back pain will have a more severe impact, so there is a need for prompt and appropriate intervention according to the location of the disorder.

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