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EFFECT OF AQUATIC VERSUS CONVENTIONAL THERAPY IN TREATMENT OF CHRONIC LOW BACK PAIN

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ABSTRACT

Background: Chronic LBP a frequent sign of back dysfunction. The recent literature recorded that up to 90% of the world's population complain from LBP which cause disability in people. This study conducted to compare the efficacy of aquatic and conventional therapy on pain level, functional limitation and lumbar ROM in subjects with CLBP.

Methods: Forty CLBP were divided into two groups (A) control 20 subjects received conventional therapy. (B) experimental received 20 subjects received aquatic therapy the treatment was given for six weeks.

Results: Mixed MANOVA test showed statistically significant enhancement in values of post-treatment in either group compared with pre-treatment in pain enhancement for group A was 54.86% and 57.74% for group B (P=0.0001), functional limitation enhancement for group A was 55.46% and 58.95% for group B (p=0.0001), and lumbar ROM enhancement for group A was 46.63%, 18.79%, for lumbar flexion, and extension, and for group B was 46.96%, 22.85% (p=0.0001).

Conclusion: It is concluded that aquatic and conventional therapies have a similar result in reducing pain severity, functional limitation, and enhancing lumbar ROM in CLBP patients.

Keywords: Aquatic therapy, Conventional therapy, CLBP, Functional limitation, Inclinometer, Visual analogue scale.

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INTRODUCTION

Low back pain (LBP) is outlined as pain or tenderness in one or either side of backs lumbar region, finally irradiating to buttocks. It is categorized as primary, secondary (< 10 % of cases), idiopathic, or simply LBP [1]. Back pain is the main common reason for referral to physiotherapy clinic, and a chief reason for people complains [2]. Physiotherapy is the main frequent modality used to maintain conservative treatment which uses different modalities to lessen ache, regain ROM and function, and strengthen, stabilize the spine as manual therapy, electrotherapy, bracing, and therapeutic exercises [3]. Hydrotherapy is known as underwater exercises. It is a frequent treatment for subjects suffer any painful neurologic or musculoskeletal problems [4] at earlier periods aquatic therapy used in treating musculoskeletal problems as LBP. Water immersion with its buoyancy effect reduces the axial load of the spine that permits the movements which are difficult or impossible on land [5]. Water has several special characteristics that make it a suitable medium for exercises resulting in that choice of aquatic therapy program has favorable advantages relatively than common modalities [6]. The warmness and resilience of water acting on thermoreceptors and mechanical receptors result in block nociception. As a result, influence segmental spinal mechanisms [7], [8]. There was enough evidence to recommend that aquatic therapy is probably beneficial to subjects complain from constant LBP and pregnancy-allied LBP. Much literature recommended the necessity for trials with higher quality to support the benefits of therapeutic aquatic exercise in a clinical background [9]. The point of this study is to compare the effect of Hydro and conventional therapy on pain level, functional limitations and lumbar ROM in chronic LBP patients.

METHODOLOGY

This study was done in Arab Contractor Medical Center, Cairo, Egypt. This study presented to compare the effect of aquatic and conventional therapy on CLBP.

Design of study

A Randomized Controlled Trial compared different effects of therapies (Aquatic and Conventional) on pain, functional limitation, and lumbar mobility in CLBP.

Subjects

A sample of forty CLBP was assigned randomly using a random sequence generator to a single group of the two study groups, concealed allocation by thick sealed covers. Faculty of Physical Therapy ethical committee approved the study, Cairo University all patients presented written informed consent. Subjects were included if their age ranged from thirty-fifty years, whatever their gender. Subjects in the control group (A) twenty subjects had conventional physical therapy treatment whereas subjects in the experimental group (B) twenty subjects had aquatic therapy. Subjects were excluded with any previous back surgery, a neuromuscular disease like multiple sclerosis, spondylolisthesis, hip arthrosis, symptoms of vertigo or dizziness, cardiopulmonary disorders with reduced activity tolerance, pregnant women, any sensory disturbance and acute infection, uncontrolled blood pressure and unstable epilepsy [10].

Instrumentations

Patient's weight & height calculated just before and the following intervention. The assessment procedures contain these items.

Visual Analogue Scale:

Valid and reliable scale that give continuous data analysis and apply a ten-centimeter line where 0 (no pain) and 10 (worse pain). Examiner requires patients to place a sign along the line to determine pain level [11, 12].

Oswestry Disability Index

Calculates functional limitation level. It is separated into ten sections selected from a group of experimental questionnaire seeks to estimate the limitation of various ADL. Every sector includes six statements. Seven sections evaluate ADL, one section for pain, one for sex life (if applicable), and one for social life. Scores (0 -5), where 0 is an optimum level of function and five least level of function. The higher the score, the higher the degree of disability. Patients completed the ODI (score out of 50) limitations were recorded by the patient caused by their back pain [13].

Measuring lumbar ROM:

The inclinometer was utilized to calculate lumbar spine ROM. It is a pendulum-based goniometry containing a 360-degree scale protractor with a counterweighted pointer maintained in a constant vertical position. It is valid and reliable means for estimating spinal motion [14].

Lumbar flexion

The patient was asked to stand upright, his feet shoulders' width apart. Examiner determine two points on the spine S1, and T12 palpated (fifteen centimeters above it). The inclinometer was set at zero degrees and positioned on the S1 (base palpation point). The patient was asked to slowly bend forward to the end of the range within the limit of pain while maintaining knees fully extended; flexion ROM was recorded. Then move inclinometer to a second point on T12 (superior palpation point) flexion ROM also recorded. The inclinometer on (T12) calculates total flexion and on (S1) calculates sacral flexion. Total flexion minus sacral flexion is true flexion [15].

Lumbar extension:

Repeat flexion protocol for an extension having the patient extends back for full extension or can use one inclinometer in mid of L3.

Treatment:

Group A: Conventional Therapy

Subjects in a group (A) were treated with Ultrasound waves, Infrared, Interferential current, and Therapeutic exercises.

Application of Ultrasound:

Using US device present in the medical center was Enraf-Nonius – Model: Sonopuls 490U [Made in the Netherlands]. The patient will relax in prone position and back free from clothes. It was done in the lower paraspinal back muscles at the maximum tender area. The output frequency set at 1 Hz, continuous mode of application 1.5w/cm2,

duration of treatment 8 min/session estimated for each patient using Grey's formula [16].

Application of Infrared radiation

Patient prone and the infrared lamp was above the patient back the distance of Infrared adjusted between 45-60 cm according to patient tolerance, for 15 minutes/session [17].

Application of IF current

The device used was Enraf- NoniusEndomed, B.V., PO Box 810 [Made in the Netherlands]. Patient prone, the electrodes placed on lumbosacral area giving IFT paravertebral. The output frequency set at 90 - 100 Hz and current intensity differ from patient to another, duration of treatment for 20 min/ session [10].

Therapeutic exercises

The program of treatment adapted from [10].First: Warm up ex's as: Flexion trunk exercises (sit-up exercises) and Extension trunk from prone exercise repetitions were ten times withhold for 6 seconds at the end of the range. Second: Stretching exercises as Raising leg ex's, Double knee to chest, Fingers to toes, repetitions was three times withhold for thirty seconds. Third: Strengthening exercises for Back muscles as Bridging ex's and Push-up, Lift one arm with opposite leg alternatively exercise, for Abdominal muscle as Posterior pelvic tilt exercise repetitions were three times withhold for 6 seconds.

Group B: Aquatic Therapy

Subjects in the experimental group (B) performed the underwater exercise with the examiner supervision in a comfortably heated pool by using.

Hubbard Tank: F Series 270 Gallon Stationary Full Body Immersion Tank

F-270-S is designed for treatment of upper and lower limbs allowing patients for full body immersion, motion, and exercise. This Hubbard tank style with figure ''8" shape allows therapists to observe patient performance. Tank capacity is 270gallons; the water was heated to 34º to 36º C with duration of treatment 60 min/session. Every session contains 3 phases of exercises:

Phase (1) Warm up ex's: ROM exes and relaxation for 5 min (Forward, backward, and sideways walking).

Phase (2)Progressive aquatic ex's for 50 min (Range of motion of the joints of upper and lower extremities each ex's done 10 repetitions, Stretching exercises each ex's detained for twenty seconds then relaxed and repeated 3 times, and Strengthening exercises for back, abdominal muscles, upper and lower limb).

Phase (3) Cool down exes for 5 min (Slow walking forward, sideways, and backward).

Statistical methods:

Descriptive statistics and t-test were done to measure the mean age, weight, and height of groups. Mixed MANOVA was done to examine treatment effect by Visual Analogue Scale, Oswestry Disability Index, and lumbar ROM.

RESULTS

No difference between groups regarding physical characteristics concerning age, weight, and height, As P>0.05. MANOVA revealed no significant differences in general characteristics of the participants in the mean ages, heights, and weights, between two groups (p>0.05) table (1).

Table 1: Comparison of the mean age, weight, and height between group A and B:

	Group A	Group B	t-value	p-value	Sig
	$\overline{X}$ ±SD	$\overline{X}$ ±SD			
Age (years)	39.2 ± 3.42	40.45 ± 3.66	-1.11	0.27	NS
Weight (kg)	82.15 ± 6.13	81.25 ± 8.67	0.37	0.7	NS
Height (cm)	172.45 ± 4.59	172.15 ± 6.22	0.17	0.86	NS

$\overline{X}$: Mean MD : Mean difference p value : Probability value
SD : Standard deviation t value : Unpaired t value NS : Non significant

Effect of aquatic and conventional therapy on VAS:

There was a significant reduction in the mean VAS following treatment in comparison with before treatment in both groups. Also, there was no significant difference in the mean values of the VAS pre & post treatment between group A and B Table (2)

Table 2: Effect of treatment on VAS.

VAS	Pre-treatment	Post- treatment	MD	% of change	p-value
	$\overline{X}$ ±SD	$\overline{X}$ ±SD			
Group A	7.2 ± 1.05	3.25 ± 1.33	3.95	54.86	0.0001***
Group B	7.1 ± 1.02	3 ± 1.07	4.1	57.74	0.0001***
MD	0.1	0.25			
p-value	0.76	0.51			

$\overline{X}$: Mean SD: Standard Deviation MD: Mean difference
P: Probability *Significant (P<0.05) % : Percentage

Effect of aquatic and conventional therapy on ODI:

There was a significant reduction in the mean ODI post-treatment compared with pretreatment in both groups. Also, there was no significant difference in the mean values of the ODI pre& post treatment between group A and B Table (3).

Table 3: Effect of treatment on ODI.

ODI	Pre-treatment	Post-treatment	MD	% of change	p-value
	$\overline{X}$ ±SD	$\overline{X}$ ±SD			
Group A	30.65 ±4.05	13.65± 5.38	17	55.46	0.0001***
Group B	29.6 ± 5.83	12.15 ±4.97	17.45	58.95	0.0001***
MD	1.05	1.5			
p-value	0.51	0.36			

$\overline{X}$: Mean SD: Standard Deviation MD: Mean difference
P: Probability *Significant (P<0.05) % : Percentage

Effect of aquatic and conventional therapy on lumbar flexion ROM:

There was a significant rise in the mean lumbar flexion ROM post-treatment. Also, there was no significant difference in the mean values of the lumbar flexion ROM pre& post treatment between group A and B Table (4).

Table 4: Effect of treatment on lumbar flexion ROM

Lumbar flexion ROM	Pre-treatment	Post-treatment	MD	% of change	p-value
	$\overline{X}$ ±SD	$\overline{X}$ ±SD			
Group A	27.45 ±3.41	40.25± 4.79	-12.8	46.63	0.0001***
Group B	26.4 ± 4.21	38.8 ±5.46	-12.4	46.96	0.0001***
MD	1.05	1.45			
p-value	0.39	0.37			

$\overline{X}$: Mean SD: Standard Deviation MD: Mean difference

P: Probability *Significant (P<0.05) % :Percentage

Effect of aquatic and conventional therapy on lumbar extension ROM:

There was a significant increase in the mean lumbar extension ROM post-treatment. Also, there was no significant difference in the mean values of the lumbar extension ROM pre& post treatment between group A and B Table (5)

Table 5: Effect of treatment on lumbar extension ROM.

Lumbar flexion ROM	Pre-treatment	Post- treatment	MD	% of change	p-value
	$\overline{X}$ ±SD	$\overline{X}$ ±SD			
Group A	13.3 ± 2.4	15.8 ± 2.94	-2.5	46.63	0.0001***
Group B	12.25 ± 2	15.05 ±2.85	2.8	46.96	0.0001***
MD	1.05	1.45			
p-value	0.39	0.37			

$\overline{X}$: Mean SD: Standard Deviation MD: Mean difference

P: Probability *Significant (P<0.05) % :Percentage

DISCUSSION

In the current study, conventional therapy treatment was efficient to decrease pain severity of CLBP. Pain reduction possibly related to infrared which was used as heat source. Also through increased endorphins will increase sensory responses, this could affect the pain gate mechanism [18]. Heat application had been proofed to be of use in decreasing pain, muscle spasm & functional limitation in acute and chronic (LBP) [19].

Following the usage of ultrasonic waves increase the threshold of pressure produced by pain receptors, increase conduction velocity of (A beta) nerve fibers, and decrease conduction velocity of (A delta) nerve fibers which are responsible for pain [20]. The ultrasonic result is increasing tissue heats that change the visco-elasticity characteristics of connective tissue making it precede extensible [16].

Spinal stability that reduces pain can be accomplished by increasing the strength of weak back muscles [21, 22].

In the current study stretching exercises for back muscles came out effectual on the reduction of pain level as reflected by the outcomes acquired. This conclusion concurs previously reported studies [23]. Proved that slump stretching the lead to enhancement in pain level in LBP patients than patients not receiving slump stretching.

Regarding the ROM of the lumbar region from the statistical analysis of previous to subsequent values, a noticeable increase in lumbar ROM was found at the conventional group.

Improved ROM was accompanied with symptoms of relief in subjects suffer chronic back problem after flexibility program [24,25]. Moreover, by increasing flexibility and mobility of the trunk will lead to increase flexion ROM after using flexion and extension exercises [26].

Also, the exercise program aimed to increase individuals' trust in the use of their spine and get over the worry of physical activity [27]. Also, there was remarkable advancement in functional activities resulting from the application of stretching exercises for back muscles [28]. This advancement was due to the improvement of back muscles strength, increase ROM and reduction of pain. By comparing between 2 groups, the results acquired in this study showed a noticeable advancement in active lumbar ROM, lessening ache, and functional disability. The analgesic efficacy of aquatic therapy suggests that water atmosphere is probably useful for patients with LBP.

These results are similar to a study [29,30] they found a decrease in pain levels and remarkable enhancement in thoraco-lumbar mobility in four directions following hydrotherapy treatment for CLBP patients.

Moreover, it was found that aquatic exercise seems to be secure and useful treatment mode for patients who complain from LBP [31]. In contrast, it was found that no significant difference after hydrotherapy measures as McGill Pain Questionnaire, lumbar flexion, extension ROM, strength, light touch, reflexes, and SLR but they reported remarkable enhancement in function (ODQ) happened in the individuals in the hydrotherapy group for patient with CLBP and leg pain [32].

However, these previous studies analyzed that an aquatic therapy effect is an option in the treatment of CLBP patients. Both aquatic and land group revealed a decrease in pain, the ability for walking farther, and Oswestry scores revealed major enhance in functional capability, but no major difference between them in all measurements [33]. This study gives considerable data supporting the two types as helpful treatments for LBP. These outcomes are recommending exercise therapy. Also, data was ineffective to show if the exercise medium, land or water, had any effect on patient results. A different study searched for any significant result of exercise environment on treatment success [34, 35]. The conclusions couldn't explore any significant difference among treatment groups. The two of them reported increase distances of walking, counts dynamical sit-up, the flexibility of the spine, and isometric trunk exercises also reduced pain levels, and a slight body fat distribution.

This higher enhancement in the aquatic group could be due to low management level of a free land-based therapy program. This study encourages that aquatic therapy is more effectual in improving physical components of life quality than free land-based therapy program. The results were proven that aquatic therapy an effective treatment for reducing ache, and enhancing patient functional ADL in the short term [36]. However, in the long run, land-based body weight rehabilitation therapy was proven to be more helpful in treating pain and disability due to LBP. The last study failed to show any difference in results between

aquatic and land-based therapy a study conducted by Nemcic et al.,2013 [10] compared the effectiveness of underwater exercise in thermal mineral water and land-based exercise, outcomes showed statistically significant progress in two groups concerning both initially results in measures for lumbar spine motion using flexible tape (standardized measures), and using the Physical Disability Index to measure physical disability.

CONCLUSION

It was concluded that in CLBP patients, aquatic therapy decreased pain severity, level of functional limitation, and enhance lumbar flexion and extension ROM. However, the comparison between aquatic therapy and conventional therapy wasn't able to find any significantly different result.

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Non

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