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Original research article

A comparative study on aquatic exercises and land-based exercises for obese low back ache population (Ramdomized Controlled Trail)

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Abstract

Background: Low back pain (LBP) is One of the most common conditions in clinical medicine. It affects the region that is between the gluteal folds and the lower rib cage. the lumbar region is the most often affected location. Between 65 and 80 percent of people are predicted to suffer from LBP at some point in their lives. It is also the second most common cause to see a doctor and the third most common reason for surgery. There are many reasons that can cause the low back pain, in that obesity also is the main reason for the low back ache Sedentary lifestyles and obesity are risk factors that lead to the development of persistent low back ache. Obesity is defined as a BMI of 30 kg/m2 or higher. In the adult population worldwide, 13% of people over the age of 18 were obese in 2016 (11% of men and 15% of women). Between 1975 and 2016, the prevalence of obesity nearly tripled world-wide. Obesity and overweight are linked to higher overall mortality as well as death. The For people who are obese and have chronic low back pain, it's often hard to stay active and manage pain in everyday life because of physical challenges and discomfort. (LBP). Regular exercise has a good impact on a number of variables, such as body composition, functional capacity, QOL, musculoskeletal discomfort, and feelings of disability from pain. Several exercise regimens, including yoga-Pilates, resistance training, aerobics, manual therapy, thermotherapy, electrotherapy used to reduce pain. current study was compared the effects of aquatic exercises and land-based exercises for low back pain obese patients.

Methods: comparative study was undertaken on 40 obese patients with back pain based on gender differentiation, age group was 30 to 60, class I obesity BMI is 30.0 to 34.9, and depends on site of pain. Aquatic group has 20 patients, land-based group has 20 patients both groups were received their exercise program for 6 weeks Analysis of data with in group and between the groups of the pre and post treatment values of function and pain was done using pair t test and independent t test.

Results: Both groups showed significant improvement in Oswestry low back disability questionnaire and visual analogue scale but group A i.e. aquatic group shows effective results then group B (land based) in the statistical analysis. there was a significant difference between the two groups (group A and group B) i.e. $p < 0.005$.

Conclusion: Group A displayed greater progress than Group B. When compared to the baseline, all outcome markers revealed statistically significant gains in both groups. In terms of physical function, role limitations brought on by physical functioning, and the modified Oswestry Low Back Pain Disability scale, the water exercise group shown more improvement.

Keywords: Low back pain, obesity, aquatic exercises, land-based exercises, Oswestry low back disability questionnaire, visual analogue scale

Introduction

Low back pain (LBP) One of the most prevalent disease in clinical medicine. It affects the region that is between the gluteal folds and the lower rib cage. the lumbar region is the most often affected location.

Based on how long it last One can categorize an episode of back pain as acute, subacute, or chronic. A dull aching, a burning sensation, or a sharp or piercing pain are some possible descriptions of the discomfort. Between 65 and 80 percent of people are predicted to suffer from LBP at some point in their lives. It is also the second most common cause to see a doctor and the third most common reason for

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surgery.

Back Pain Associated with Obesity

The key factors that can turn temporary back pain into a long-term issue include your level of physical activity, age, weight, and the nature of your job. Those with higher body weight are more likely to experience back pain that lasts.

Obesity is defined as a BMI of 30 kg/m2 or higher. In the adult population worldwide, 13% of people over the age of 18 were obese in 2016 (11% of men and 15% of women). Between 1975 and 2016, the prevalence of obesity nearly tripled worldwide. Obesity and overweight are linked to higher overall mortality as well as death. Back discomfort is more common in those who are obese. Gaining too much weight can also make it take longer to recover from back pain episode. Individuals who exhibit obesity and/or a high body fat percentage include: A 33% increased risk of low back discomfort 35% more likely to feel excruciating, severe pain A 43% increased risk of developing persistent low back discomfort Men are up to 50% more likely than women to be disabled or have functional limitations. Regular exercise has a good impact on a number of variables, such as body composition, functional capacity, QOL, musculoskeletal discomfort, and feelings of disability from pain. Several exercise regimens, including yoga-Pilates, resistance training, aquatic exercise, and aerobic exercise, were evaluated for their effectiveness in reducing the symptoms of low back pain as well as at least one additional outcome, such as perceived disability, quality of life, physical function, and body composition.

Aquatic Therapy

Aquatic therapy is defined as "a physiotherapy program utilizing the properties of water" This treatment involves doing various water-based exercises in a warm, specially designed pool with the help of certified therapists. It's often used by people who are overweight and have lower back pain. Many patients find that it helps them become stronger, more flexible, and more mobile, while also reducing their pain.

Unique Properties of Water

Density of Water: The human body can float because the density of the water cancels out the effects of gravity. Because of the buoyancy effect, joints are less affected. This is helpful for rehabilitation because it enables patients to exercise with less joint loading while they are in pain. Furthermore, Buoyancy helps by making it easier to manage how the body moves downward in the water. This means that less effort is needed to control the body's descent, making movements smoother and less stressful on the body.

Water's Resistance: Water's density and viscosity give it a built-in resistance. This makes it possible to effectively strengthen throughout sessions of rehabilitation therapy.

Water as a Compressor: A patient experiences hydrostatic pressure while they are submerged in water. The body feels the impacts of this pressure. For instance, improved circulation and blood flow. This enables increased muscle oxygen delivery and relaxation

Temperature: Temperature of hydrotherapy pools is between 28 and 32 degrees Celsius. This heated pool's temperature helps improve range of motion and blood flow when submerged.

Need of this Study: Shows that water exercises can be particularly beneficial for people with obesity and back pain. Water exercises help improve strength, flexibility, and mobility while reducing pain, compared to land-based exercises, water therapy is popular because it reduces joint stress and allows for easier movement. This makes it a good option for those with lower back pain, as the buoyancy of the water helps to lessen the impact on the joints and supports better rehabilitation.

Aim of this Study: Is to the benefits of aquatic exercises for obese individuals pain discomfort in terms of improved mobility, increased flexibility, and reduced pain. When it compared with land based excercises water based excercises was showed better results.

Methodology

Type of Study: Comparative analysis.

Study Area: Pacific Medical University's Department of Physiotherapy's for land-based exercises and Hydrotherapy Pool for aquatic exercises near by rehabilitation center.

Study Design: An investigational study plan.

Study Population: Obese individuals with low back pain who are at least 30 to 60 years old.

Study Time: Six weeks Convenient sampling technique is the type of sampling. 40 subjects total-20 for aquatic exercises and 20 for land-based workouts-make up the sample size.

Length of Study: For six weeks, patients received training six times a week.

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Ethics Consideration
Permission from the institutional ethical committee will be acquired. Since there will be direct patient interaction and personal patient information, written informed consent is necessary.

Inclusion Criteria
Mean age of 30 to 60 years.
obese patients BMI in between 30to 34.
Sciatica.
Disc herniation.
Functionally active obese patinets.
Signed informed consent to take part in the study, attend integrative treatment sessions for six weeks, and complete follow-up evaluations.

Exclusion Criteria
Other methods of treating sciatica and/or back pain (such as nerve blocks, surgery, and analgesic drugs).
Non-spine or soft tissue issues (such as pregnancy, rheumatoid arthritis, or spinal tumors) that may be linked to sciatica or back pain history of spinal operations, severe neurological deficits or symptoms (such as cauda equina syndrome).
A vertebral fracture or dislocation.
Those who have had recent surgery on their lower limbs.
People who recently had lower limb fractures.

Procedure
Based on the inclusion criteria, 40 subjects will be recruited for the study after receiving approval from the institutional ethical committee. The details of the study protocol will be sent to all eligible individuals. Prior to randomization, all individuals will provide written informed consent. Through the use of the envelope sampling method, the subjects will be divided into two groups, Group A and Group B, each with twenty members. Group B is regarded as the control group, and Group A as the experimental group.
Intial assessment was done on the both the groups their pain grades in the lower back, muscle tightness, postural changes, gait analysis. And BMI.
Group A: Participants in aquatic exercises (20 patients).
Group B: Participants are in land-based exercises (20 patients).

In the group A physiotherapist suggests aquatic exercises for 6 weeks that is Static Walk, stretching exercise, deep breathing technique Forward lunges, Side lunges, Lie down with your hips and knees bent, prone posture with pedaling legs, prone posture plus cycling, hold buoyant discs with a diameter of 12.5 cm in each arm, fully extended on the right and close to the body Pose with your arms at your sides, Bend the knees to a squat and bring the arms together to just below the surface of the water. prone posture with pedaling legs prone posture plus cycling, Transverse abduction and adduction of the shoulder extension and flexion Mobility, Perform hip extension maintaining the lower limb in a neutral position, Pool plank (with woggle), Wall push up,
Group B land-based exercises for 6 weeks it consists of Spinal extension, Stretchings for hamstrings, Extension of legs: 3 x 10 Camel and cat Three sets of ten leg curls Bench Press: 12 times.
Row: 12 x 3, Crunches in the abdomen: 4 x 10 Single knee to chest, Side crunches: 4x 10 Back extensions: 3x10 Double knee to chest Piriformis stretch, heat pack over the back for 10 minutes.

Intervention
The 60-minute sessions of the intervention were conducted six times a week. The findings indicated that individuals with chronic low back pain may experience a considerable reduction in pain intensity and an improvement in their functional level with therapeutic aquatic exercise. Our results, which were in line with these outcomes, demonstrated that There was a statistically and clinically significant improvement in pain and functioning in the therapeutic aquatic exercise group. Therapeutic aquatic exercise significantly improved the patients' overall quality of life, degree of dysfunction, and pain intensity. Patients who underwent therapeutic aquatic exercise and had chronic low back pain also reported feeling less anxious.

Outcome Measurements
Oswestry low back disability questionnaire.
Visual analogue scale.

Data Analysis and Interpretation with Results
Categorical variables were expressed as percentages, whereas continuous variables were expressed as

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mean ± standard deviation. A paired t-test was used to assess the mean difference of two continuous variables belonging to the same group in order to ascertain the p-value (p-value <0.05 = significant). For the data analysis SPSS 24 version was used.

Table 1: Sample observation of two groups

Gender	Aquatic Excercises	Land Based	Total
Male	10 (50%)	11 (55%)	21 (52%)
Female	10 (50%)	9 (45%)	19 (47.5%)
Total	20 (100%)	20 (100%)	40 (100%)

The table presents data on participation in aquatic and land-based exercises, segmented by gender. Among the male and female participants, equal percentage (50%) of male and female collected in the aquatic exercise group. In Land-Based Exercises 55% of the male belongs to land-based exercise group and 45% of the female are belongs land-based exercise group.

Table 2: Sample of respondents with respect to age

Age in Yeas	Aquatic Excercises	Land Based	Total
30-45	10 (50%)	9 (45%)	19 (47.5%)
46-60	10 (50%)	11 (55%)	21 (52.5%)
Total	20 (100%)	20 (100%)	40 (100%)

The table provides data on participation in aquatic and land-based exercises, segmented by age group. In Aquatic Exercises 50% of the respondents belongs to 30-45 age and 50% of the respondents were taken 46-60 age group. In Land-Based Exercises 45% of the respondents belongs to 30-45 age and 55% of the respondents belongs to 46-60 age.

H_0: There is no significant difference between Backpain of pre and post values among the respondents in land-based exercise.

Paired Samples Statistics						
	Mean	N	Std. Deviation	t-value	df	p-value
Oswestry Low Back Pain Pré	48.80	20	5.578	11.235	19	.000
Oswestry Low Back Pain Post	32.15	20	4.671			

The tables you provided are from a paired samples t-test, which is used to determine if there is a statistically significant difference between the means of two related groups. In this case, the test is comparing the levels of back pain before and after an intervention or treatment.

This is the average difference between the pre-treatment and post-treatment scores, which is 16.65. It indicates that, on average, the back pain scores decreased by 16.65 points after the treatment. The p-value, which tests the null hypothesis that the true mean difference is zero. A p-value of .000 indicates that the difference is statistically significant at the conventional levels (typically $p < .05$). Therefore, there is strong evidence to suggest that the treatment significantly reduced back pain.

H_0: There is no significant difference between Visual analogue scale of pre and post values among the respondents in land based exercise.

Paired Samples Statistics						
	Mean	N	Std. Deviation	T	Df	P-Value
Visual analogue scale Pre	7.85	20	1.182	11.38	19	.000
Visual analogue scale Post	4.30	20	.923			

The table presents statistics from a paired samples t-test conducted on "Visual Pre" and "Visual Post" scores, with the aim of comparing the two sets of scores to see if there is a significant difference between them. The p-value is .000, which indicates a very strong level of statistical significance. The mean score decreased from 7.85 (pre-test) to 4.30 (post-test), suggesting a substantial change after the intervention. The high t-value of 11.38 and the very low p-value (.000) indicate that the difference between the pre-test and post-test scores is statistically significant. This suggests that the intervention had a significant effect on reducing the scores. Since the p-value is less than 0.05, we reject the null hypothesis and conclude that there is a significant difference between the Visual Pre and Visual Post scores.

H_0: There is no significant difference between Oswestry Low Back Pain of pre and post values among the respondents in Aquatic Exercises.

Paired Samples Statistics						
	Mean	N	Std. Deviation	T	df	P-value
Oswestry Low Back Pain Pré	48.95	20	4.628	10.518	19	.000
Oswestry Low Back Pain Post	28.85	20	6.268			

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The table provides statistics from a paired samples t-test comparing "Oswestry low Back pain questionnaire Pre" and "Oswestry low Backpain questionnaire Post" scores. This test is used to determine whether there is a significant difference in back pain levels before and after an intervention. The p-value is .000, indicating a highly statistically significant difference between the pre-test and post-test scores. The decrease in the mean score from 48.95 to 28.85 suggests a significant reduction in back pain after the intervention. The high t-value (10.518) combined with the very low p-value (.000) indicates that the observed reduction in back pain scores is statistically significant. The analysis indicates that the intervention significantly reduced back pain, as evidenced by the substantial drop in mean scores and the statistical significance of the results. This suggests the intervention was effective in alleviating back pain for the participants.

H_0: There is no significant difference between Visual analogue scale of pre and post values among the respondents in Aquatic Exercises.

Paired Samples Statistics						
	Mean	N	Std. Deviation	t	Df	p-value
Visual analogue scale Pre	7.0	20	1.41	15.253	19	.000
Visual analogue scale Post	2.7	20	1.45			

The table provides data from a paired samples t-test that compares "Visual Pre" and "Visual Post" scores to determine if there is a statistically significant difference before and after an intervention. The p-value is .000, indicating a very strong level of statistical significance. The mean score decreased from 7.0 to 2.7, suggesting a significant improvement in whatever is being measured by the "Visual" scores after the intervention. The high t-value (15.253) and the extremely low p-value (.000) indicate a statistically significant difference between the pre-test and post-test scores. It can be suggested that the intervention had a significant positive impact, as shown by the substantial reduction in mean scores and the strong statistical significance. This implies the intervention was effective in improving the outcomes measured by the "Visual" scores for the participants.

H0: There is no significant difference between land-based exercise and aquatic exercise among the Oswestry Low Back Pain.

	Group	N	Mean	Std. Deviation	t	df	P-value
Oswestry Low Back Pain	Land based	20	16.65	6.63	1.427	38	.162
	Aquatic	20	20.10	8.55			

The table presents data from a group comparison study that examines Oswestry low back disability questionnaire scores for two different types of exercise interventions: land-based and aquatic. A t-test is used to determine if there is a significant difference in back pain scores between these two groups. The p-value is .162, which is above the common significance threshold of 0.05. The t-value (1.427) and the p-value (.162) indicate that the difference between the groups is not statistically significant. Since the p-value is greater than 0.05, we fail to reject the null hypothesis, suggesting that there is no significant difference in back pain scores between the land-based and aquatic exercise groups

H0: There is no significant difference between land based exercise and aquatic exercise among the Visual analog scale.

	Group	N	Mean	Std. Deviation	T	df	p-value
Visual Analog Scale	Land based	20	3.55	1.394	-1.784	38	.082
	Aquatic	20	4.30	1.260			

The table presents data from a study comparing visual scores between two exercise groups: land-based and aquatic. A t-test is conducted to determine if there is a statistically significant difference between the visual scores of these two groups. The p-value is .082, which is above the common significance threshold of 0.05. The aquatic group has a higher mean visual score (4.30) than the land-based group (3.55), suggesting that aquatic exercise might be associated with better visual outcomes. The t-value (-1.784) and the p-value (.082) indicate that the difference between the groups is not statistically significant. Since the p-value is greater than 0.05, we fail to reject the null hypothesis, suggesting that there is no significant difference in visual scores between the land-based and aquatic exercise groups.

Results

The statistical data analysis results revealed There was a noticeable difference between groups A and B before and after the intervention. However, when Group A and B's mean values were compared, Group A displayed greater progress than Group B.

When compared to the baseline, all outcome markers revealed statistically significant gains in both groups. In terms of physical function, role limitations brought on by physical functioning,

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modified Oswestry Low Back Pain Disability scale, the water exercise group shown more improvement.in different functional activities.
In the visual analouge scale shows better reduction of pain intensity in aquatic treatment mentods.

Discussion

This study was out to assess the effects of water exercise on obese people's body composition and non-specific low back pain. According to study, there was a notable improvement in BMI, trunk muscle mass, and low back discomfort after the intervention. Research found that low back pain improved after working out in the water, which is in line with the documented association between low back pain and obesity and overweight. This shows that the improvement in low back pain may have been influenced by the participants' changed body composition.
The trunk muscle improved by as much as 4.1%, according to our results, following six weeks of water exercise. The current study showed that aquatic exercise-induced improvements in body composition had a beneficial impact on nonspecific low back pain.
When comparing physical therapy modalities vs therapeutic aquatic exercise for chronic low back pain, intention-to-treat analysis were conducted. The results indicated that participants in the therapeutic aquatic exercise group improved in their disability at a significantly higher and more clinically meaningful rate than those in the physical therapy modalities group.
The therapeutic aquatic exercise program lasted for six weeks. The 40-minute sessions of the intervention were conducted FOUR to SIX times a week. The findings indicated that individuals with chronic low back pain may experience a considerable reduction in pain intensity and an improvement in their functional level with therapeutic aquatic exercise.
persons with chronic low back pain may benefit more from a rehabilitation program that combines therapeutic water exercise with land-based exercises; this approach is popular in certain rehabilitation facilities. A three-group comparison could be created by future research. it was not practicable to blind participants or interventionists. it was unclear whether the two treatment approaches' medical expenditures and productivity losses differed; socioeconomic data can be included for research in future works.

Conclusion

In the conclusion, when assessing within-group data before and after the treatment, the study discovered that both the aquatic and land-based exercise groups had statistically significant effects on improvements in pain, trunk range of motion, body mass index, and functional disability in subjects with non-specific low back pain in obese patients. Of the two regimens, the aquatic exercise group is clinically more effective and shows a higher percentage of progress as compared to land-based exercises alone.
A statistically significant difference was seen between the groups, and all hydrotherapy workout outcome measures showed improved performance.

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