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ORIGINAL RESEARCH

Role of aquatic workout for obese associated low back pain population: An observational study

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ABSTRACT

Back ground: Obesity is a major health issue worldwide, as of recent statistics, approximately 39% of adults worldwide are classified as obese, that meansthey have a body mass index (BMI) of 30 or higher.and it frequently contributes to back pain. For obese patients with low back pain, Aquatic exercises are more beneficial for dealing with pain,Improved Strength, increase Flexibility.This study aims to evaluate thetherapeutic effects of aquatic exercises for low back pain in obese population.**Methods:**A observational study was conducted for 80 obese patients with history of low back pain. Patients age was between 30 to 60. and population was selected under grade I BMI i.e. 30 to 34.9, participants were assigned to either two groups depends on pain scales. Demographic data, pre intervention readings and post intervention readings were collected with help of pain scales. Pain scales included Oswestrylow back disability questionnaire and visual analogue scale, these scales will help to find out the outcomes of pain and flexibility, and functional activities.**Results:**The study included80 obese individuals, evenly distributed between two groups, that is40 low back pain obese populationrandomly selectedfor Oswestry low back disability questionnaire and 40 patients for the visual analogue scale,initial measurements collected. Post intervention the aquatic exercises theshowed significant improvement in the both the pain grading scales, in the Oswestry low back disability questionnaire in pre intervention 95% population was severe disability shifted to mild or moderate disability category.Where as in the visual analogue scale drastically decreased pain scores severe to mild pain level.**Conclusion:**Both the scales after calculating pain scores significantly improved in the pain scores, The Chi-Square test shows a statistically significant difference between the Pre and Post intervention groups (p<0.05), with a p-value of.000. with in the both pain scales. This indicates that the decreasespain levels significantly about 48% anaverage.That means aquatic exercises are significantly showed the pain decreasing levels.

Key words:aquatic exercises,obese people,visual analogue scale, low back pain, Oswestry low back disability questionnaire

INTRODUCTION

Obesity is a condition where a person has excess body fat that can affect their health.Globally Incidence ofObesity rates have been rising steadily. As of the latest data, more than 2.5 billion adults are estimated to be overweight, with over 650 million classified as obese.Approximately 39% of adults globally are obese.It is usually measured using the Body Mass Index (BMI), with a BMI of 30 or higher indicating obesity. Obesity can lead to various health problems, such as heart disease, diabetes, and joint issues. Obesity and back pain often go hand in hand due to the additional strain excess weight places on the spine and surrounding muscles. obesity causes the back pain because of Increased Stress on the Spine, Muscle Strain, Excess weight, higher levels of inflammation,Reduced Mobility, Reducing back pain in obese patients involves a combination of lifestyle changes and targeted interventions like Gradual weight reduction through a balanced diet and regular exercise includes Engaging in low-impact exercises, such as swimming or walking, strengthen the core muscles and stretch the back can improve posture and reduce pain.

traditional exercises challenging for the reduction of the back pain in obese patients Aquatic therapy is a

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highly effective treatment for back pain, especially for those dealing with obesity.Aquatic therapy is defined as a physiotherapy program utilizing the properties of water.Water has several properties that make it beneficial for managing back pain: Water's buoyancy reduces the weight of the body, decreasing the load on the spine and joints. Hydrostatic pressure exerted by water helps reduce swelling and improve circulation. Resistance of Water provides natural resistance during movement, which helps strengthen muscles and improve core stability, Warm water can help relax muscles and soothe pain. Heat from the water can increase blood flow and reduce muscle tension, providing relief from back pain,Water's supportive environment allows for more comfortable and controlled movements. This can enhance flexibility and range of motion while minimizing the risk of injury or aggravating existing pain.The soft, cushioning effect of water minimizes the impact on the back.Previousresearch on the effects of aquatic exercises for theorthopedic conditions shows effective improvement pain and functional activities.For example, a study by Fariba Hossein Abadi, MohansundarSankaravel, Fairus Fariza Zainuddin, Gunathevan Elumalai, Azira IqlimaRazli (2019) conducted study on the effect of aquatic exercise program on low-back pain disability in obese women This study aimed to investigate the effect of aquatic exercise on LBP disability among obese women.However, other research such as An-Hua Huang *et al.* Sci Rep. (2023) conducted study on Effects of early aquatic exercise intervention on trunk strength and functional recovery of patients with lumbar fusion.Suggests that the evidence for aquatic exercises in the obese population with back pain.

This study addresses by the investigating the effects of aquatic exercises as observational group by the randomized controlled trail design,we aim to provide high quality evidence on the efficacy of aquatic exercises in this context.

MATERIALS AND METHODS

STUDY DESIGN AND PARTICIPANTS

This comparative study involved 80 obese patients with low back painaged 30-60 years, BMI in between 30 to 34.9, permission was taken from the ethical committee,Participants were randomly assigned to either Group A 40 patients assessed by the Oswestry low back disability questionnaireor Group B, with 40assessed by the visual analogue scale for the pre and post interventions. Informed consent was obtained from all participants. For six weeks patients received a treatment 6 times a week.

INCLUSIONCRITERIA

Age between 30 to 60 years.
BMI between30 to 34.9.
Participants should be able to perform basic movements.
Participants should be mentally prepared for an exercise program and have the psychological resilience to handle discomfort during exercise.
Pain should not be so severe that it prohibits participation.
Patients should be motivated and willing to adoptthe program, as commitment is essential for managing low back pain.
Sciatica onsetbelow 6 months.
Intervertebral Disc herniation.
Low back pain should be stable enough not to pose immediate risks during exercise.

EXCLUSION CRITERIA

alternative treatment regarding back pain and/or sciatica (e.g. surgery, nerve blocks, analgesic medication)non-spine related or soft tissue problems potentially associated with back pain or sciatica (e.g. pregnancy, spinal tumour, rheumatoid arthritis)history of spinal operation, vertebral fracture or dislocation severe neurological deficit or symptoms (e.g. cauda equina syndrome).
Patientswith recent lower limb surgeries.
Patientswith recent fractures in lower limb.
Obesity-related Complications such as severe joint issues or cardiovascular problems. Inability to Perform Exercises Safely.
Hydrophobia.
Skin diseases.

PROCEDURE

Based on the inclusion criteria, 80 subjects will be selectedfor the study after receiving approval from the institutional ethical committee.

The details of the study protocol will be sent to all eligible individuals.all individuals will provide written informed consent. Through the use of the envelope sampling method, the subjects will be divided into two groups,

The aquatic exercise was performed in shallow water, or chest deep, with depths ranging from 120 to 150 cm, under the supervision of an aquatic exercise therapist. The last exercises included statically stretching the muscles of the hamstrings, calf, upper and lower back, walking for 10-25 meters in front, back, and sideways, jogging for 10-25 meters in front, cycling for 15-20 meters at a self-selected speed, self-selected repetition.

In every session, each exercise was performed three times. Over the following 3rd week, the exercise frequency and intensity were progressively increased, and after week 3rd, the aquatic exercise was also done in a 150 cm-deep pool.

Using swimming woggles as assistance, the subjects engaged in walking, running, peddling, kicking, and relaxing exercises at this depth of water. The intensity of their conditioning was deemed to be 13-17 Borg-Scale (60-70%) of their maximum heart rate. The weather fluctuations meant that the pool could not

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maintain the desired temperature, even though all sessions took place between 5pm and 6 PM.
Group A participants in the Oswestry disability low back questionnaire (40 patients).
Group B participants for the visual analogue scale(40 patients) both the groups performed aquatic exercises separately.

The intervention was a six-week water exercise program consisting ofsixty-minute sessions per day.

AQUATIC EXERCISE PROTOCOL

INITIAL EVALUATION: The patients assessed pain level,posture,gait,muscle tightness and systemic examination.

EXERCISE	**INTENSITY**
Water walking/jogging	Self-selected speed10meter's ×4
Lunges forward	Self-selected rpm ×3
Side Lunges	Self-selected speed ×4
Prone posture with pedaling legs	Self-selected speed ×3
Prone posture plus cycling	Self-selected rpmx3
Transverse abduction and adduction of the shoulder	
Extension and flexion	Self-selected rpmx3
Mobility of the upper body (with a kickboard)	Repeated slowly ×3
Arm pendulum (various intensities)	Self-selected rpm ×3
Deep water cycling (with woggle)	Repeated slowly ×3
Plank for swimming pool (with woggle)	Self-selected rpm ×3
Pushing up walls	Self-selected ->3

MEASUREMENT OF OUTCOMES

Oswestry low back disability questionnaire:
Visual analogue scale

STATISTICAL DATA

OSWESTRY LOWBACK DISABILITYQUESTIONNAIRE(GROUP A)

The sample responses ofthe distribution of a population according to their scores on the Oswestry Low Back Pain Disability Questionnaire, which measures the level of disability related to low back pain. The majority of the individuals fall into either the moderate or severe disability categories, each comprising 47.5% of the total population. Only a small fraction (5%) of individuals report minimal disability. There is a significant portion (47.5%) of the population with severe disability, indicating a potentially high impact of low back pain in this group. The distribution is fairly balanced between moderate and severe disability, suggesting that the population is almost equally split between these two levels of disability severity. This suggests that interventions targeting moderate to severe disability might be particularly important for this group.

Group A: Oswestry Low Back Pain Disability Questionnaire Demographic Data

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Minimal Disability	2	5.0	5.0	5.0
Moderate Disability	19	47.5	47.5	52.5
Severe Disability	19	47.5	47.5	100.0
Total	40	100.0	100.0	

VISUAL ANALOGUE SCALE GROUP B

Below The table provided summarizes the distribution of a population based on the severity of pain experienced in an aquatic context. Indicating that 25% of the population experiences horrible pain. 20.0% of the respondents from total population came under Measurable Pain. Among the respondents 20% of candidates came under Mild Pain. Only 2.5% 0f the respondents came under No Pain category. Among the respondents Troublesome Pain, there are 25% respondents fall under this category. And Unbearable Pain there are 7.5% 0f the respondents came under this. A significant portion of the population reports experiencing high levels of pain:The majority of individuals experience moderate to severe pain, with only a small percentage reporting mild or nopain. This indicates a generally high level of discomfort in the population, with significant implications for their aquatic activities or related treatments. Addressing the causes of this pain could be a priority for improving overall well-being.

Visual Analogue Scale Demographic Data

Pain Scores (0 to10)	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Horrible Pain(8)	10	25.0	25.0	25.0
Measurable Pain(6-7)	8	20.0	20.0	45.0
Mild Pain(2-3)	8	20.0	20.0	70.0

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No Pain(0)	1	2.5	2.5	72.5
Troublesome Pain(4)	10	25.0	25.0	97.5
Unbearable Pain(10)	3	7.5	7.5	100.0
Total	40	100.0	100.0	

Group A: Oswestry Low Back Disability Questionnaire Comparison of Pre and Post Values

			Oswestry Low Back Disability Scale			Total
			Minimal Disability	Moderate Disability	Severe Disability	
Group	Pre	Count	0	1	19	20
		Percent	0.0%	5.0%	95.0%	100.0%
	Post	Count	2	18	0	20
		Percent	10.0%	90.0%	0.0%	100.0%
Total		Count	2	19	19	40
		Percent	5.0%	47.5%	47.5%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.211[a]	2	.000
Likelihood Ratio	47.616	2	.000
N of Valid Cases	40		

a) 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.00.

The table provided presents data on the Oswestry Low Back Pain Disability scores for a group of individuals, comparing their levels of disability before (Pre) and after (Post) some intervention. Additionally, the Chi-Square test results are provided to assess the statistical significance of changes between the Pre and Post conditions.

In Pre-Intervention, a vast majority (95%) of the group were in the Severe Disability category, with only one person in the Moderate Disability category, and none in the Minimal Disability category. In post-intervention, after the intervention, there is a notable shift, 90% of individuals moved to the Moderate Disability category. 10% of individuals moved to the Minimal Disability category. No individuals remained in the Severe Disability category. In Effectiveness of Intervention, the intervention seems highly effective, with all participants improving their disability scores. Specifically, 95% of the individuals originally in the Severe Disability category shifted to either Moderate or Minimal Disability categories after the intervention.

The Chi-Square test result shows a statistically significant difference between the Pre and Post intervention groups ($p < 0.05$), with a p-value of.000. This suggests that the observed changes in disability levels after the intervention are not due to random chance, but rather reflect a real effect of the intervention.

Group B: Visual Analogue Scale Pre and Post Interventions Competition

		Visual Analogue Scale							Total
		Horrible Pain	Measurable Pain	Measurable pain	Mild Pain	No Pain	Troublesome Pain	Unbearable Pain	
Pre	Count	10	6	0	0	0	1	3	20
	Percent	50.0%	30.0%	0.0%	0.0%	0.0%	5.0%	15.0%	100.0%
Post	Count	0	0	2	8	1	9	0	20
	Percent	0.0%	0.0%	10.0%	40.0%	5.0%	45.0%	0.0%	100.0%
Total	Count	10	6	2	8	1	10	3	40
	Percent	25.0%	15.0%	5.0%	20.0%	2.5%	25.0%	7.5%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.400[a]	6	.000
Likelihood Ratio	48.950	6	.000
N of Valid Cases	40		

a) 10 cells (71.4%) have expected count less than 5. The minimum expected count is .50.

The table provided compares the severity of pain experienced by a group of individuals in an aquatic context before (Pre) and after (Post) an intervention. Additionally, the Chi-Square test results are given to assess the statistical significance of the observed changes. Before the intervention (Pre-Intervention),

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half of the individuals (50%) experienced with Horrible Pain, 30% experiencedwith Measurable Pain, and 15% experiencedwith Unbearable Pain. Only 5% reported with Troublesome Pain, with no individuals reporting with Mild Pain or No Pain. After the intervention (post-intervention), there was a significant improvement, the Horrible Pain and Unbearable Pain were completely eliminated. The largest category became Troublesome Pain (45%), followed by Mild Pain (40%). A small number of individuals reported was Measurable Pain (10%) or No Pain was (5%).

In the Effectiveness of Intervention, the intervention appears to have significantly reduced the severity of pain, with the most severe categories Horrible Pain and Unbearable Pain being eliminated. The shift towards Mild Pain and Troublesome Pain suggests that while pain was not entirely eradicated, it was substantially reduced in intensity.

The Chi-Square test shows a statistically significant difference between the Pre and Post intervention groups (p<0.05), with a p-value of .000.This indicates that the changes in pain levels after the intervention are not due to chance, but reflect a genuine effect of the intervention.

RESULTS

The pain scale that is the Oswestry low back disability questionnaire appied for 40 patients that is considered as group A,categorically patientsdivided by the different pain percentages, majority of people falled either moderate to severe disability,comparing the of disability pre and post intervention, the chi -square test provided for the significance of changes between pre and post intervention. In the pre intervention 95% population comes under severe disability after aquatic post intervention 90% obese population shifted to the moderate disability,10% population moved to the minimal disability category. The Chi-Square test result shows a statistically significant difference between the Pre and Post intervention groups (p<0.05), with a p-value of .000. This suggests that the observed changes in disability levels after the intervention are not due to random chance, but rather reflect a real effect of the intervention.

Group Bobese population that is about 40 patients who are suffering from the back pain observed by the visual analogue scale that is 10 pointpain grading scale 4o patients divided by the different categories based pain scores, the majority of population experienced the moderate to severe pain. After the intervention (post-intervention), there was a significant improvement, the Horrible Pain and Unbearable Pain were completely eliminated.In the Effectiveness ofaquatic Intervention, the intervention appears to have significantly reduced the severity of pain The shift towards Mild Pain and Troublesome Pain suggests that while pain was not entirely eradicated, it was substantially reduced in intensity.The Chi-Square test shows a statistically significant difference between the Pre and Post intervention groups (p<0.05), with a p-value of .000.This indicates that the changes in pain levels after the intervention are not due to chance, but reflect a genuine effect of the intervention.

DISCUSSION

The results of the study indicates that aquatic exercises significantly improves frompain, increases functional mobility aquatic exercises showed more substantialeffects in the both Oswestry low back disability questionnaire and visual analoguepain scales in the both the chi -square tests 47.616 in the Oswestry low back disability questionnaire and 48.950 ratio andthere is a significantly visible improvements we can observe the in post intervention.

EFFECTS OF AQUATIC EXERCISES

This study aimed to see how water exercise affects obese people's body composition and lower back pain.Improvement in Body and Pain After six weeks of water exercise, participants showed significant improvements. Their Body Mass Index (BMI) and trunk muscle mass increased, and their lower back pain (both physical and emotional) got better. The improvement in back pain might be related to changes in body composition and stronger abdominal muscles.Effectiveness ofExercising in water helps improve the range of motion for both upper and lower body parts while reducing stress on the joints. This can enhance body composition and reduce lower back pain. The study showed that water exercise positively impacted body composition and reduced nonspecific lower back pain. When compared to conventional therapy alone, water exercise was more effective. Participants who did water exercises experienced greater improvements in their disability and overall condition. They reported better pain relief, improved quality of life, better sleep, and less fear of movement compared to those who only did traditional physical therapy. Research supports that water exercise can greatly enhance quality of life, reduce pain severity, and improve functionality. It was more effective than conventional exercises, with participants experiencing less pain and better overall benefits.Comparison with Other Treatments: Water exercise was found to be more effective than conventional physical therapy methods for chronic low back pain. Combining water exercise with other treatments led to even better results for those suffering from persistent back pain. In summary, water exercise appears to be a highly effective treatment for obese individuals with chronic low back pain, providing significant benefits over traditional physical therapy approaches.

Drawbacks of the conventional exercise treatment are the Conventional exercises can be effective for managing low back pain, but they come with specific drawbacks when applied to obese individuals. These issome potential limitationsare Conventional

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exercises, particularly high-impact activities, can place additional stress on weight-bearing joints for obese individuals, this added stress can exacerbate low back pain rather than alleviate it. High-impact exercises or improper technique can increase the risk of injury which can worsen back pain, Obesity can limit the range of motion and flexibility, making it challenging to perform certain exercises correctly and safely. This can hinder the effectiveness of conventional exercise routines, Exercises that require bending, twisting, or reaching may be difficult or uncomfortable, leading to poor exercise adherence. Obese individuals might experience more physical discomfort or fatigue during conventional exercises, which can lead to decreased motivation and adherenpotentially leading to less effective or even counterproductive outcomes, General exercise routines might not address individual needs related to low back pain, such as strengthening specific muscle groups or improving posture. Exercises that require balance or coordination might be more challenging, increasing the risk of falls or accidents. Obese individuals might have lower cardiovascular endurance, making sustained physical activity more difficult and less enjoyable, building cardiovascular fitness may require a slower, more gradual approach, which can be discouraging if immediate results are not visible.

COMPARISON WITH PREVIOUS STUDIES

The results of this study corroborate previous research highlighting the benefits of aquatic exercises as An-Hua Huang *et al*. Sci Rep. (2023) conducted study on Effects of early aquatic exercise intervention on trunk strength and functional recovery of patients with lumbar fusionand Benjamin Waller *et al*. Clin Rehabil. 2009 Jan. Therapeutic aquatic exercise in the treatment of low back pain,however,our study provides a specific focus on obese patients with backpain.By addressing this gap,our study findings offer valuable insights into the aquatic exercise protocol in obese population.

LIMITATIONS AND RECOMMENDATIONS

Limitations arethe study only included participants with a BMI between 30 and 35, and the age range was 30to 60. Future studies should include a wider range of BMIs and ages, The self-reported pain levels were relatively low, so it's unclear if those with more severe low back pain would benefit similarly. More research is needed to see if aquatic exercise is effective for those with severe pain, it's not clear if the benefits were due to the water environment or just physical exercise. Future studies should compare aquatic exercise with conventional exercise to see if similar benefits can be achieved on land, combining aquatic exercise with land-based exercises might be more effective for some people. Future studies could test this combined approach, Participants and interventionists could not be blinded to the type of exercise being performed, which could introduce bias,we didn't look into how medical costs and productivity losses compared between the two treatments. Future research should include this data.
Recommendations for Future studies should involve a larger number of people, To confirm the long-term benefits of aquatic exercise, follow-up studies are needed,research should include participants with different BMIs and ages,Explore how different fitness programs might affect outcomes.

CONCLUSION

In the conclusion, aquatic exercises significantly enhances pain level, Both the pain scales aquatic exercise group shows significant improvements in pain, trunk range of motion, body mass index (BMI), and functional impairment. Aquatic exercises were more beneficial and led to a higher percentage of progress, there were clear differences between the two pain scalegroups, in the boththe Oswestrylow back disability questionnaire and visual analoguescale group showing better performance in all measured outcomes after the post intervention.

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