

The Effectiveness of Aquatic Therapy in the Management and Improvement of Lumbar Disc Herniation: A Systematic Review

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Abstract

Introduction: Lumbar intervertebral disc herniation is one of the most common causes of low back pain and radicular pain, imposing a significant financial and social burden on society. Aquatic therapy (hydrotherapy), as a non-invasive intervention utilizing the physical properties of water, has found a special place in rehabilitation protocols. This review study aimed to investigate the existing evidence regarding the benefits of aquatic therapy for patients with lumbar disc herniation.

Methods: In this systematic review, a search was conducted in Google Scholar, SID, Magiran, PubMed, and Scopus databases using the keywords "Aquatic Therapy," "Hydrotherapy," "Lumbar Disc Herniation," "Low Back Pain," and their Persian equivalents. Articles published between and (2011 to 2023) were reviewed.

Results: The findings indicate that aquatic therapy, through multiple mechanisms including reduced load on the discs due to buoyancy, increased local blood circulation from hydrostatic pressure, relaxation of spasmodic muscles, and improved range of motion, leads to a significant reduction in pain, improved physical function, and enhanced quality of life in patients.

Discussion and Conclusion: It appears that aquatic therapy can be used as a safe, effective, and complementary intervention alongside other conservative treatment methods for patients with lumbar disc herniation. Designing specific and standardized programs based on each patient's condition is essential for achieving maximum effectiveness.

Keywords: aquatic therapy; lumbar disc herniation; low back pain; hydrotherapy; rehabilitation

Introduction

Low back pain is considered one of the most disabling and costly musculoskeletal problems worldwide [1]. Among the various causes of low back pain, lumbar intervertebral disc herniation accounts for a major share. This condition occurs when the nucleus pulposus of the disc protrudes through a weakened part of the annulus fibrosus and compresses the adjacent nerve roots, resulting in localized low back pain, radiating pain to the lower extremities (sciatica), numbness, tingling, and even muscle weakness [2]. The treatment for this condition ranges from conservative methods (such as relative rest, pharmacotherapy, physiotherapy) to invasive procedures (epidural injections and ultimately surgery). However, the conservative approach is always considered the first line of treatment, with its main goals being pain reduction, functional improvement, and prevention of disease recurrence [3]. Among these, exercise therapy is recognized as the

cornerstone of rehabilitation. However, performing many land-based exercises is difficult or impossible for patients due to severe pain and kinesiophobia (fear of movement).

Aquatic therapy (hydrotherapy), by utilizing the unique physical properties of water, provides an ideal environment for initiating the rehabilitation process [4]. Features such as buoyancy, which reduces weight and load on the vertebrae and discs; hydrostatic pressure, which leads to reduced edema and improved blood circulation; viscosity, which creates natural and safe resistance for strengthening muscles; and the suitable water temperature, which is usually warm and aids in muscle relaxation and spasm reduction, are among these advantages [5]. This review study was conducted to compile and analyze the existing scientific evidence regarding the role and

mechanisms of the effectiveness of aquatic therapy in managing patients with lumbar disc herniation.

Methods

Included all research articles published in the field of the effect of aquatic therapy on lumbar disc herniation. The inclusion criteria for the articles were: 1) Articles published between (2011 to 2023), 2) Access to the full text of the article, 3) Direct relevance of the title and abstract to the research topic, 4) Articles in Persian or English, and 5) Studies conducted on human subjects.

A systematic search was performed in domestic scientific databases, including the Scientific Information Database (SID) and Magiran, as well as international databases such as Google Scholar, PubMed, and Scopus using Persian and English keywords including "Lumbar Disc Herniation", "Low

Back Pain", "Aquatic Therapy", "Hydrotherapy", and their combinations. After the search, the titles and abstracts of the articles were reviewed by the researcher, and articles that met the inclusion criteria were selected. Finally, data related to sampling, intervention methods, assessment tools (such as the Visual Analogue Scale (VAS) for pain, Oswestry Disability Index (ODI), SF-36 Quality of Life Questionnaire), and key findings were extracted from these articles and qualitatively analyzed and synthesized.

Results

In this section, the key findings from the reviewed articles are presented under different topics:

1. Pain Reduction: In most of the reviewed studies, the use of aquatic therapy protocols led to a significant reduction in pain intensity in patients. For example, in a study conducted by **Rahmani et al. (2019)**, the average pain score (based on VAS) in the group undergoing aquatic therapy showed a greater reduction compared to the control group that only performed land-based exercises [6]. This pain reduction is mainly attributed to the decreased pressure on the nerve roots due to relative weightlessness in water, as well as the reduction of muscle spasm around the spine.

2. Improvement of Physical Function and Reduction of Disability: One of the most important indicators evaluated in the studies was the Oswestry Disability Index (ODI). **Khanjari et al. (2021)** in their research compared the effect of aquatic therapy and land-based therapeutic exercises. Their findings showed that although both groups improved, the improvement in the ODI index, as well as lumbar flexion and extension range of motion, was significantly greater in the aquatic therapy group [7]. These researchers stated that the safe environment of water allows patients to perform simulated activities such as walking, bending, and trunk rotation with more confidence and a greater range of motion, leading to faster improvement in daily function.

3. Strengthening Core Stabilizing Muscles: The deep muscles of the lumbar and pelvic regions play a key role in supporting the spine. Weakness of these muscles can be a risk factor for the onset and recurrence of lumbar disc herniation. The natural resistance of water provides an excellent tool for strengthening these muscles without applying excessive pressure on the discs. Exercises such as walking in water, flutter kicks, and resistance exercises using equipment like noodles or water dumbbells effectively engage the transverse abdominis, multifidus, and pelvic muscles. **Khanjari et al. (2021)** in their study concluded that the aquatic therapy group showed a greater increase in strength in the lumbar extensor and abdominal muscles [7].

4. Improvement in Quality of Life: Chronic low back pain caused by disc herniation has a devastating effect on various dimensions of quality of life, including physical, psychological, and social functioning. In a study conducted by **Nouri et al. (2020)**, the total score of the Quality-of-Life questionnaire (SF-36) in the group that received aquatic therapy showed a statistically significant improvement compared to the control group [8]. Pain reduction and increased independence in performing daily activities were reported as the most important reasons for this improvement.

5. Effectiveness in Specific Populations: Evidence shows that the benefits of aquatic therapy are also evident in specific patient groups. For example, a study titled "The Effects of Aquatic Exercise on Low Back Pain as for Herniated Disc in Elderly Men" published by **Khanjari et al. (2022)**, specifically investigated the effects of aquatic therapy on elderly men with disc herniation [12]. The findings of this research indicated that a regular aquatic exercise program not only led to reduced pain and disability in this population but also resulted in improved balance and reduced kinesiophobia, which are common challenges among the elderly.

6. Psychological Benefits: In addition to physical benefits, the relaxing environment of water and the ability to move with less pain can lead to reduced stress, anxiety, and fear of movement in patients. This significantly increases patients' motivation to continue the treatment process and participate actively in exercises [9].

Discussion

The findings of this review clearly show that aquatic therapy is an effective intervention within the framework of conservative treatment for patients with lumbar disc herniation. Its mechanisms of action are also well aligned with the biomechanical and physiological principles of disc injury.

A key point highlighted in research such as the study by **Khanjari et al. (2021)** is that aquatic therapy acts not as a replacement, but as a very powerful **complement and initial platform** for rehabilitation exercises [7]. Many patients in the acute or subacute phases are unable to perform land-based exercises correctly and effectively due to severe pain. Aquatic therapy fills this therapeutic gap and allows patients to start their rehabilitation process earlier and with greater safety. This can shorten the recovery period and prevent the chronicity of pain and disability.

The buoyancy property of water drastically reduces the vertical load on the intervertebral discs. Studies have shown that during neck-level immersion, the pressure on the lumbar discs can be reduced by 70-80% [10]. This pressure reduction creates more space for the retraction or resorption of the herniated disc portion and relieves pressure on the nerve root, the direct result of which is a reduction in radicular pain.

Furthermore, hydrostatic pressure has a gentle massaging effect on the body, aiding in lymphatic drainage and reducing potential swelling around the nerve root. The warmth of the water (usually set between 30°C and 34°C for rehabilitation purposes) causes vasodilation, increased blood flow to injured tissues, and relaxation of spasmodic muscles [5].

The study by **Khanjari et al. (2022)** also clearly shows that these benefits are not limited to the general population and are clearly observable even in sensitive groups such as the elderly [12]. The improvement in balance reported in that study is a very important point because it indicates that aquatic therapy, in addition to addressing the primary cause (disc herniation), also tackles a very common and dangerous condition in the elderly—impaired balance and risk of falling. This finding adds to the clinical richness of this treatment method.

Practical Considerations: To achieve maximum effectiveness, an aquatic therapy program should be designed individually and under the supervision of an experienced physiotherapist or exercise specialist. The program should start with simple exercises and a small range of motion and gradually progress towards more complex exercises with greater resistance. The duration of each session is usually recommended to be between 30 to 45 minutes, with a frequency of 2 to 3 sessions per week [11].

Study Limitations: Among the limitations of this review study are the heterogeneity in the aquatic therapy protocols used in different studies and the relatively small sample size in some domestic research. Therefore, to determine a gold standard and standardized protocol, conducting clinical trials with larger sample sizes and long-term follow-ups seems necessary.

Conclusion

Based on the current scientific evidence, it can be concluded that aquatic therapy, due to its utilization of the unique physical properties of water, is a safe, effective, and acceptable method for reducing pain, improving physical

function, strengthening core stabilizing muscles, and enhancing the quality of life in patients with lumbar disc herniation. This method can be used as an integral and complementary component in the comprehensive rehabilitation program of these patients. It is suggested that further studies be conducted to design and promote more specific programs for different patient subgroups (based on the severity of herniation, age, and fitness level).

References

1. Hoy, D., et al. (2014). The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. *Annals of the Rheumatic Diseases*, 73(6), 968-974.
2. Deyo, R. A., & Weinstein, J. N. (2001). Low back pain. *New England Journal of Medicine*, 344(5), 363-370.
3. Kreiner, D. S., et al. (2014). An evidence-based clinical guideline for the diagnosis and treatment of lumbar disc herniation with radiculopathy. *The Spine Journal*, 14(1), 180-191.
4. Kamioka, H., et al. (2010). Effectiveness of aquatic exercise and balneotherapy: a summary of systematic reviews based on randomized controlled trials of water immersion therapies. *Journal of Epidemiology*, 20(1), 2-12.
5. Becker, B. E. (2009). Aquatic therapy: scientific foundations and clinical rehabilitation applications. *PM&R*, 1(9), 859-872.
6. Rahmani, A., Eslami, A., & Mohammadi, R. (2019). Comparison of the effect of aquatic therapy and land-based therapeutic exercises on pain and function in patients with lumbar disc herniation. *Journal of Iranian Physiotherapy*, 10(2), 45-56. [In Persian].
7. Khanjari, Y., Fallahi, B., & Hosseini, S. A. (2021). The effect of eight weeks of aquatic therapy on disability, muscle strength, and range of motion in male patients with lumbar disc herniation. *Journal of Research in Medical Sciences*, 25(3), 177-189. [In Persian].
8. Nouri, Z., Ghafari, H., & Mousavi, S. M. (2020). The effect of water exercises on health-related quality of life in women with chronic low back pain due to disc herniation. *Journal of Sabzevar University of Medical Sciences*, 27(4), 442-450. [in Persian]
9. Barker, A. L., Talevski, J., Morello, R. T., Brand, C. A., Rahmann, A. E., & Urquhart, D. M. (2014). Effectiveness of aquatic exercise for musculoskeletal conditions: a meta-analysis. *Archives of Physical Medicine and Rehabilitation*, 95(9), 1776-1786.
10. Harrison, R. A., & Hillman, M. (1999). The effect of immersion on intradiscal pressure. *Journal of Anatomy*, 195(Pt 3), 455.
11. Waller, B., Lambeck, J., & Daly, D. (2009). Therapeutic aquatic exercise in the treatment of low back pain: a systematic review. *Clinical Rehabilitation*, 23(1), 3-14.
12. Khanjari, Y., et al. (2022). The Effects of Aquatic Exercise on Low Back Pain as for Herniated Disc in Elderly Men. *Journal of Sports and Movement Therapy*, 15(2), 112-120.

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