ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 6| June 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

# EFFECTIVENESS OF AQUATIC THERAPY ON PAIN RELIEF AND FUNCTIONAL MOBILITY IN KNEE OSTEOARTHRITIS: A NARRATIVE REVIEW

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**Article DOI:** https://doi.org/10.36713/epra22855
**DOI No: 10.36713/epra22855**

## ABSTRACT

***Background:*** *Knee osteoarthritis (OA) is a degenerative joint disease causing pain, stiffness, and functional limitations, particularly in older adults. Aquatic therapy is emerging as a promising non-pharmacological intervention due to water's unique properties that reduce joint loading and facilitate exercise.*

***Aim:*** *To review the effectiveness of aquatic therapy on pain relief and functional mobility in individuals with knee osteoarthritis.*

***Methods:*** *A review was conducted analyzing five recent, high-quality randomized controlled trials and systematic reviews published within the last 10 years. Studies were identified through databases such as PubMed and Google Scholar and evaluated for methodological rigor and clinical relevance.*

***Results:*** *Evidence consistently demonstrates that aquatic therapy significantly reduces pain, improves physical function, muscle strength, and balance in knee OA patients. Aquatic cycling and hydrotherapy were particularly effective. Patient adherence and satisfaction exceeded those reported for land-based exercise, making aquatic therapy a viable rehabilitation option.*

***Conclusion:*** *Aquatic therapy is an effective and safe intervention for managing symptoms of knee OA, enhancing quality of life through improved mobility and reduced pain. Future research should focus on long-term outcomes and standardized aquatic protocols.*

**KEYWORDS:** *Aquatic Therapy, Knee Osteoarthritis, Pain Relief, Functional Mobility, Hydrotherapy, Rehabilitation*

## INTRODUCTION

Knee osteoarthritis (OA) is a prevalent degenerative joint disorder characterized by progressive cartilage degradation, pain, stiffness, and functional impairment, severely impacting quality of life, especially among elderly individuals. While pharmacological and land-based exercise treatments are common, pain and reduced mobility often limit adherence and effectiveness. Aquatic therapy offers a low-impact alternative, using water buoyancy, hydrostatic pressure, and resistance to reduce joint load and facilitate exercise. This review synthesizes current evidence on aquatic therapy's efficacy in reducing pain and improving function in knee OA.

## REVIEW

This narrative review synthesizes findings from twelve relevant studies evaluating the effectiveness of various aquatic therapy modalities in managing symptoms of knee osteoarthritis (OA):
Dong et al. (2018) conducted a systematic review and meta-analysis comparing aquatic and land-based exercises, concluding that aquatic therapy significantly improves pain, stiffness, and functional mobility. Higher adherence rates were noted for aquatic exercise programs.

Dias et al. (2017) found that hydrotherapy significantly improved pain and physical function in older women with knee OA. The six-week intervention led to improvements in muscle strength and functional outcomes.

Rewald et al. (2020) evaluated a 12-week aquatic cycling program and reported significant reductions in knee pain and enhancements in physical function. KOOS scores improved, and adherence rates reached 80%, indicating the feasibility and tolerability of aquatic cycling.

Kunduracilar et al. (2018) compared two aquatic protocols and identified that the inclusion of trunk and upper limb exercises resulted in superior outcomes in pain reduction, balance, and functional ability.
Garbi et al. (2021) demonstrated that aquatic physiotherapy improved functional capacity and mobility in elderly individuals with knee OA. The intervention was well tolerated and showed promise in geriatric rehabilitation.
Lim et al. (2010) assessed the impact of aquatic therapy on obese individuals with knee OA. Results showed improvements in functional fitness, joint function, and pain interference in daily activities, supporting aquatic therapy's utility in this population.

Wyatt et al. (2001) compared aquatic and traditional exercise programs and found similar physical improvements in both groups. However, the aquatic group experienced greater pain relief, reinforcing its advantage in symptomatic management.

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Karimi et al. (2023) conducted a randomized trial assessing an eight-week aqua therapy program in women with knee OA. Results included marked reductions in pain (VAS) and improved lower limb performance across multiple functional tests.

Noor et al. (2023) reviewed 10 RCTs and concluded that aquatic therapy significantly enhances balance and mobility. Though less impact was seen on gait, overall findings supported aquatic exercise as an initial OA intervention.

Amras and Kamalakannan (2023) presented a narrative review emphasizing aquatic therapy's role in reducing joint stress, improving circulation, and enhancing recovery. Their analysis underlined its integration into standard OA rehabilitation protocols.

Rewald et al. (2016) described the protocol for a randomized controlled trial comparing aqua-cycling with usual care. The study framework highlighted expected improvements in pain, strength, and mobility.

Wang et al. (2011) showed that aquatic and land-based exercises both improved pain and function in knee OA, with aquatic therapy offering a more tolerable option for those with greater movement limitations.

All studies utilized validated outcome measures such as VAS, WOMAC, KOOS, 6MWT, and TUG to ensure reliable assessment of therapeutic efficacy.

**Summary of Key Studies on Aquatic Therapy in Knee Osteoarthritis**

| Author(s) & Year | Study Design | Sample Size & Population | Intervention | Outcome Measures | Key Findings |
|---|---|---|---|---|---|
| Dong et al., 2018 | Systematic Review & Meta-analysis | Multiple RCTs | Aquatic vs. land-based exercise | VAS, WOMAC | Reduced pain, improved function, higher adherence |
| Dias et al., 2017 | RCT | 73 elderly women | Hydrotherapy, 6 weeks | WOMAC, strength | Pain, function, strength improved |
| Rewald et al., 2020 | RCT | 111 adults | Aquatic cycling, 12 weeks | KOOS, physical function | Reduced pain, improved mobility, high adherence |
| Kunduracilar et al., 2018 | RCT | Female patients | 2 aquatic protocols | VAS, WOMAC, balance | Core+limb group had better outcomes |
| Garbi et al., 2021 | RCT | Elderly individuals | Aquatic physiotherapy | 6MWT, TUG | Improved functional mobility |
| Lim et al., 2010 | RCT | 75 obese adults | AQE vs. LBE vs. control | QOL, knee function, BMI | Pain relief and tolerability better in AQE |
| Wyatt et al., 2001 | RCT | 46 participants | AQE vs. LBE | ROM, pain, 1-mile walk | AQE reduced pain more effectively |
| Karimi et al., 2023 | RCT | 60 women | Aqua therapy, 8 weeks | VAS, TUG, 30-S-CS, 40MW | Pain and performance significantly improved |
| Noor et al., 2023 | Systematic Review | 10 RCTs, 531 participants | Aquatic exercise | Balance, mobility, posture | Significant balance and mobility gains |
| Amras & Kamalakannan, 2023 | Narrative Review | Multiple studies | General aquatic therapy | Pain, circulation, recovery | Advocated clinical integration |
| Rewald et al., 2016 | Study Protocol | N/A | Aqua-cycling vs. usual care | KOOS, QOL, strength | Anticipated benefit in mild-moderate OA |
| Wang et al., 2011 | RCT | 84 participants | AQE vs. LBE | KOOS, ROM | Both improved, AQE more tolerable |

## METHODOLOGY

This narrative review was conducted by systematically retrieving peer-reviewed literature from databases including PubMed, Google Scholar, and ScienceDirect. Studies published between 2010 and 2023 were considered. Keywords included "aquatic therapy," "hydrotherapy," "knee osteoarthritis," "pain relief," and "functional mobility."

**Inclusion criteria:** Participants aged ≥45 years with radiologically or clinically confirmed knee OA, aquatic therapy as the primary intervention, reported outcomes on pain and physical function, and randomized controlled trials or systematic reviews.

**Exclusion criteria:** Recent knee surgery (<6 months), intra-articular injections, significant comorbidities limiting mobility,

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cognitive impairment, or concurrent therapies affecting aquatic intervention outcomes.

Data were extracted on study design, participant demographics, intervention characteristics, outcome measures, and results. Methodological quality was assessed using PEDro scores where available.

**Outcome Measures and Effectiveness of Aquatic Therapy in Knee OA**

| Outcome Domain | Measurement Tools | Effect of Aquatic Therapy | Clinical Implication |
|---|---|---|---|
| Pain | VAS, WOMAC | Significant reductions in pain intensity | Enhanced exercise participation and comfort |
| Physical Function | KOOS, TUG, 6MWT, WOMAC | Improved walking speed, mobility, daily function | Increased independence and quality of life |
| Muscle Strength | Sit-to-Stand Test, Isokinetic testing | Greater knee extensor/flexor strength | Joint stabilization and reduced fatigue |
| Balance & Posture | SLS Test, Balance scales | Improved postural control and gait stability | Reduced fall risk in elderly populations |
| Adherence & Satisfaction | Attendance logs, surveys | Higher adherence vs. land-based exercises | Better long-term outcomes and motivation |

## RESULTS

Analysis of the included studies consistently showed:

1. Substantial improvements in pain, functional mobility, muscle strength, and balance.
2. Higher adherence and satisfaction in aquatic therapy groups compared to land-based.
3. Effectiveness across diverse protocols including hydrotherapy, aqua-cycling, and combined trunk-limb exercises.
4. Strong evidence in special populations (e.g., elderly, obese, postmenopausal women).
5. Favorable safety profile with no reported serious adverse events.

**Summary of Selected Studies on Aquatic Therapy for Knee Osteoarthritis**

| Study | Method | Participants | Intervention | Outcomes |
|---|---|---|---|---|
| **Dong et al., 2018** | Systematic review and meta-analysis of 8 RCTs | 579 adults with knee OA | Aquatic vs. land-based exercises | Significant reduction in pain, stiffness, and improved function; higher adherence than land-based. |
| **Dias et al., 2017** | RCT; parallel group, 6-week intervention | 73 elderly women (≥65 years) with knee OA | Hydrotherapy twice/week in heated pool + education | Significant improvements in pain, function (WOMAC), and muscle strength. |
| **Rewald et al., 2020** | Single-blind RCT; 12-week aquatic cycling | 111 adults (aged 50–70) with mild-to-moderate knee OA | Aquatic cycling: 45 min, 2x/week | KOOS improvements in pain and function; high adherence (80%). |
| **Kunduracilar et al., 2018** | RCT with 3 groups (2 aquatic + control) | 89 women with bilateral grade 2–3 knee OA | Group 1: LE aquatic; Group 2: full body aquatic; Control: conventional therapy | Group 2 showed best improvements in function, stiffness, and balance. |
| **Garbi et al., 2021** | RCT (methodological details limited) | Elderly individuals with knee OA | Aquatic physiotherapy (frequency not specified) | Improved mobility and functional capacity; well-tolerated. |
| **Lim et al., 2010** | RCT | 75 obese adults (>50 years, BMI >25 kg/m²) with OA | AQE vs. LBE vs. control | AQE reduced pain interference in daily activities; similar improvements in fitness and function. |
| **Wyatt et al., 2001** | RCT | 46 participants aged 45–70 with knee OA | Aquatic vs. land-based exercises | Both groups improved, but aquatic group had lower pain levels post-intervention. |
| **Karimi et al., 2023** | RCT; 8-week intervention | 60 women with knee OA | Aqua therapy 3x/week | Pain decreased; performance improved (TUG, 30-S-CS, 40MW). |
| **Noor et al., 2023** | Systematic review of 10 RCTs | 531 participants (457 females, 74 males) aged ≥40 | Aquatic exercises (2–5x/week for 3–12 weeks) | Improved balance, postural control, and mobility; mixed |

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|---|---|---|---|---|
| | | | | results for gait/postural sway. |
| **Amras & Kamalakannan, 2023** | Narrative review | Multiple studies (2006–2022) | Aquatic therapy in rehabilitation programs | Reduced pain, improved joint function and recovery; supports inclusion in rehabilitation. |
| **Rewald et al., 2016** | RCT study protocol | Adults with mild-to-moderate knee OA (planned sample) | Aqua-cycling 2x/week for 12 weeks vs. usual care | Aimed to assess knee pain and function, muscle strength, QOL. |
| **Wang et al., 2011** | RCT; 12-week comparative trial | 84 participants with knee OA | Aquatic vs. land-based exercises | Both groups improved in pain, ROM, and function; aquatic was more tolerable for some participants. |

## DISCUSSION

The evidence supports aquatic therapy as a safe, accessible, and effective treatment for individuals with knee OA, particularly for those unable to tolerate traditional land-based programs. The reduced mechanical load in water environments allows patients to engage in exercise with less discomfort, fostering higher participation rates.

Studies incorporating upper body and core exercises showed enhanced outcomes in balance and functional performance. Aqua-cycling provided cardiovascular and musculoskeletal benefits, and was particularly beneficial in obese individuals or those with joint sensitivity.

The psychological impact—including reduced stress and enhanced enjoyment—further supports aquatic therapy's integration into comprehensive OA management plans. Despite methodological variation across studies, the overall direction of evidence is consistent and robust.

Future studies should address protocol standardization, long-term follow-up, and inclusion of broader demographic populations.

## CONCLUSION

Aquatic therapy consistently demonstrates clinical value in managing knee osteoarthritis by alleviating pain, improving physical function, and enhancing quality of life. Its low-impact nature, combined with its adaptability and acceptability, makes it a compelling alternative or adjunct to conventional therapy. Based on current evidence, aquatic therapy should be actively considered in treatment planning for older adults and patients with mobility limitations. Ongoing research is needed to establish long-term outcomes and optimize protocol design.

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