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Improving Function and Mobility in Ankylosing Spondylitis through Physiotherapy: A Comprehensive Review

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ABSTRACT

Background: Ankylosing spondylitis (AS) is a chronic inflammatory disease primarily affecting the spine and sacroiliac joints, often leading to pain, stiffness, and decreased mobility. Physiotherapy is widely recommended for AS management, aiming to alleviate symptoms, maintain mobility, and improve overall quality of life.

Purpose: This review explores the role of physiotherapy in enhancing the quality of life for patients with ankylosing spondylitis, examining its effectiveness in reducing pain, improving physical function, and promoting daily activity engagement.

Materials and Methods: A narrative review was conducted by analyzing recent studies on physiotherapy interventions for ankylosing spondylitis. Research articles, systematic reviews, and clinical trials published in the last decade were selected from medical databases. Key physiotherapy modalities, including exercise therapy, stretching, hydrotherapy, and posture training, were evaluated for their outcomes on pain relief, spinal flexibility, and patient-reported quality of life.

Results: Evidence suggests that regular physiotherapy can significantly benefit AS patients. Exercise programs, particularly those focused on stretching, aerobic conditioning, and postural training, effectively reduce pain, increase spinal mobility, and prevent postural deformities. Hydrotherapy and supervised group exercises were particularly impactful, promoting social interaction and adherence. Patients reported notable improvements in functional capacity, mental health, and overall life satisfaction.

Conclusion: Physiotherapy is a valuable, non-pharmacological intervention for ankylosing spondylitis, offering improvements in pain management, mobility, and quality of life. Regular, individualized physiotherapy programs tailored to patient needs can be instrumental in managing AS symptoms and enabling patients to lead more active, fulfilling lives. Further research is needed to standardize physiotherapy protocols and maximize their therapeutic potential in AS management.

Keywords: Ankylosing Spondylitis, Physiotherapy, Pain management, Spinal mobility, Exercise therapy, Quality of life, Hydrotherapy, Functional capacity, Posture training.

INTRODUCTION

Ankylosing spondylitis (AS) is a chronic, progressive, and often debilitating inflammatory disease primarily targeting the spine and sacroiliac joints, affecting between 0.1–1.4% of the global population.

It is classified within the group of spondyloarthropathies, conditions marked by chronic inflammation and enthesitis, the inflammation at ligament or tendon insertion sites. AS predominantly affects young adults aged 20–40, with a male-to-female prevalence ratio ranging from 2:1 to 3:1. The disease typically follows a gradual onset, with patients initially experiencing pain and stiffness in the lower back and hips, which can progressively extend to other regions of the spine, chest, and even peripheral joints.

The etiology of AS is complex, involving both genetic and environmental influences. The human leukocyte antigen (HLA)-B27 gene is a major genetic factor, present in approximately 90% of AS patients, although the exact mechanism linking HLA-B27 to disease onset is still under investigation. Additional genetic markers, such as ERAP1 and IL23R, and environmental triggers, such as gastrointestinal infections, have been shown to contribute to disease pathogenesis in susceptible individuals.

The inflammatory processes in AS lead to fibrosis and new bone formation, resulting in restricted mobility, spinal deformities, and a gradual fusion of vertebrae, known as ankylosis, which manifests as a "bamboo spine" appearance on radiographic imaging. These structural changes can severely impact daily functioning, social participation, and overall quality of life. Pharmacological treatments, including nonsteroidal anti-inflammatory drugs (NSAIDs), biologics (like tumor necrosis factor inhibitors and interleukin-17 inhibitors), and disease-modifying antirheumatic drugs (DMARDs), are commonly prescribed to alleviate pain and slow disease progression. However, these treatments primarily address inflammation and do not directly improve the physical limitations or functional capacity imposed by the disease.

Physiotherapy has emerged as a critical adjunctive treatment for AS, focusing on non-pharmacological strategies that address physical impairment. The aim of this review is to examine the role and effectiveness of physiotherapy in the holistic management of ankylosing spondylitis. Specifically, it investigates how structured physiotherapy interventions - including exercises to improve spinal flexibility, postural alignment training, hydrotherapy, respiratory exercises, and strength training - can reduce pain, enhance mobility, and promote functional independence in AS patients. Hydrotherapy, in particular, offers a supportive environment that reduces joint strain and enhances exercise adherence, making it especially beneficial for individuals with severe physical limitations.

The objectives of physiotherapy in AS management are multifaceted: to maintain and improve spinal and joint flexibility, reduce pain and muscle stiffness, prevent or correct postural deformities, and support cardiovascular and respiratory health. Regular physiotherapy can also aid in reducing the psychosocial burdens associated with AS by fostering social interaction, mental well-being, and self-efficacy. By empowering patients to participate actively in their treatment and maintain physical function, physiotherapy contributes significantly to improving quality of life, enabling AS patients to achieve greater independence and engage in daily activities with reduced discomfort and limitations.

MATERIALS & METHODS

This narrative review aimed to assess the role and effectiveness of physiotherapy in managing ankylosing spondylitis (AS), focusing on its impact on pain relief, mobility, functional capacity, and quality of life. The study involved a comprehensive literature search across multiple medical and scientific databases, including PubMed, MEDLINE, Scopus, and the Cochrane Library, to identify relevant studies published from 2010 to 2023. Search terms included "ankylosing spondylitis," "physiotherapy," "exercise therapy," "hydrotherapy," "pain management," "quality of life," "functional outcomes," and

"spinal mobility." Articles were included based on relevance to the management of AS symptoms through physiotherapy.

Inclusion criteria focused on studies with adult AS patients that implemented physiotherapy as part of treatment. Selected studies included randomized controlled trials (RCTs), observational studies, meta-analyses, and systematic reviews, specifically those that evaluated physiotherapy's effects on pain reduction, flexibility, and physical function. Exclusion criteria removed studies solely on pharmacological interventions or those focusing on non-AS populations to ensure a targeted assessment of physiotherapy's role in AS.

The main physiotherapy interventions examined were:

1. **Exercise Therapy**: This involved structured exercise programs such as stretching, aerobic conditioning, strengthening exercises, and routines to improve spinal and joint flexibility. Many studies emphasized specific exercises targeting core stability and flexibility to mitigate AS-related pain and enhance range of motion.
2. **Hydrotherapy**: Aquatic-based therapy in a buoyant, low-impact environment to decrease joint strain while promoting muscle relaxation, strength, and endurance. Hydrotherapy also supports posture correction and can encourage adherence due to its enjoyable and socially engaging nature.
3. **Posture and Respiratory Training**: Designed to improve alignment and respiratory capacity, these exercises target the chest and upper back to counteract AS-related forward stooping and limited chest expansion, thereby improving pulmonary function.
4. **Home-Based vs. Supervised Programs**: A comparison of patient outcomes from structured supervised sessions versus home-based exercise regimens. This distinction provided insight into adherence rates, patient motivation, and the benefits of guidance and accountability in physiotherapy programs.

Each study's outcomes were assessed using standard metrics, including the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) for measuring disease activity, the Bath Ankylosing Spondylitis Functional Index (BASFI) for assessing functional limitations, visual analog scales (VAS) for pain assessment, and quality of life scales such as the Short Form-36 (SF-36). Data were extracted and reviewed qualitatively to identify key trends, while quantitative data (e.g., percentage improvements in pain, BASDAI, and BASFI scores) were analyzed to establish the clinical significance of physiotherapy interventions.

Main Findings

The review revealed several significant findings on physiotherapy's role in managing AS, with notable improvements across multiple areas:

- **Pain Reduction**: Physiotherapy interventions, especially those emphasizing stretching, aerobic exercises, and core strengthening, resulted in marked pain reduction. Studies documented reductions in pain scores, with some RCTs indicating up to a 50% improvement in VAS pain ratings for patients engaging in regular exercise regimens.
- **Increased Mobility and Function**: Regular engagement in physiotherapy significantly improved spinal and joint mobility, as well as physical function. Many studies highlighted the effectiveness of spinal mobility exercises, with BASFI scores showing up to 30–40% improvement from baseline in mobility and physical tasks. Patients also reported enhanced functionality in daily activities, attributed to sustained improvements in flexibility and movement coordination.
- **Enhanced Postural and Respiratory Function**: Given AS's impact on posture and chest expansion, postural and respiratory training yielded

measurable improvements. These exercises helped mitigate forward-stooping posture and increased chest expansion, supporting lung function and reducing the risk of respiratory complications, particularly in advanced AS stages.

- **Hydrotherapy's Unique Benefits**: Hydrotherapy provided additional benefits for AS patients, especially those with severe physical restrictions or pain. This water-based therapy was associated with reduced joint strain, pain relief, and enhanced range of motion due to the buoyancy and resistance properties of water. Patients participating in hydrotherapy also reported improved psychological well-being and social engagement, highlighting the importance of supportive environments.
- **Quality of Life Improvements**: Both supervised and home-based physiotherapy programs contributed positively to quality of life as measured by SF-36 and similar scales. Supervised physiotherapy, in particular, demonstrated superior outcomes in adherence and pain management, while home-based programs offered patients more flexibility. Improvements in physical health, mental well-being, and social interaction contributed to a higher quality of life, with physiotherapy providing consistent, holistic support for AS patients.

In conclusion, the findings affirm that physiotherapy is a vital, non-pharmacological treatment option for ankylosing spondylitis, offering substantial improvements in pain relief, mobility, and overall quality of life. Physiotherapy modalities tailored to AS patients' unique needs—whether through supervised sessions, home-based exercises, or supportive aquatic environments—empower them to better manage symptoms, maintain an active lifestyle, and achieve greater independence. Further studies to standardize physiotherapy protocols for AS could strengthen its impact, promoting wider adoption as an essential aspect of comprehensive AS care.

Table 1: Outcome Measures Used in Studies on Physiotherapy for Ankylosing Spondylitis

Outcome Measure	Purpose	Measurement Tool	Typical Use in Studies	Authors Who Used This Scale
BASDAI (Bath Ankylosing Spondylitis Disease Activity Index)	Disease activity and inflammation	10-item questionnaire, scored 0–10	Used to assess overall disease activity and symptom severity.	van der Heijde et al. (2011), Sieper et al. (2019), Gorman et al. (2018)
BASFI (Bath Ankylosing Spondylitis Functional Index)	Functional limitations in daily activities	10-item questionnaire, scored 0–10	Measures physical function, such as mobility, dressing, and self-care.	van der Heijde et al. (2011), Gorman et al. (2018), Lee et al. (2019)
VAS (Visual Analog Scale)	Pain assessment	0–10 scale (0 = no pain, 10 = extreme pain)	Used to track pain levels in patients before and after interventions.	van der Heijde et al. (2011), Gorman et al. (2018), Haibel et al. (2016)
SF-36 (Short Form-36)	Quality of life measure	36 questions (physical and mental health)	Measures physical and mental health components, overall well-being.	Gorman et al. (2018), Haibel et al. (2016), Sharma et al. (2020)
Spinal Mobility Measures	Range of motion and spinal flexibility	Modified Schober test, occiput-to-wall distance	Measures spinal flexibility and range of motion in the lumbar and thoracic spine.	Haibel et al. (2016), Gorman et al. (2018), Cakar et al. (2014)
Chest Expansion (CE)	Respiratory function and chest mobility	Measured in centimeters (cm)	Assesses thoracic expansion to evaluate respiratory function in AS patients.	Gorman et al. (2018), Haibel et al. (2016), van der Heijde et al. (2011)

Explanation:

- **BASDAI** and **BASFI**: These indices are commonly used in studies that evaluate disease activity and functional limitations in AS patients. Several authors, such as van der Heijde et al. (2011) and Gorman et al. (2018), have applied these tools to assess the impact of physiotherapy and other treatments on disease progression and physical function.
- **VAS**: This pain scale is a simple and widely used tool to measure pain intensity in clinical studies. Many studies, including those by Haibel et al. (2016) and Gorman et al. (2018), utilized VAS to track changes in pain levels after physiotherapy interventions.
- **SF-36**: A comprehensive measure of health-related quality of life, this scale is widely used in AS studies to assess physical and mental health components. Researchers like Sharma et al. (2020) and Gorman et al. (2018) have used SF-36 to assess improvements in quality of life with physiotherapy.
- **Spinal Mobility Measures and Chest Expansion (CE)**: These specific tests are integral in understanding how physiotherapy affects the spinal mobility and respiratory function of AS patients. Cakar et al. (2014) and van der Heijde et al. (2011) have used these measures to quantify mobility improvements and evaluate chest expansion, which are crucial aspects of managing AS.

These scales were essential tools for evaluating the impact of physiotherapy interventions and are widely used in the literature to assess treatment outcomes in AS patients. The authors listed above are among those who have integrated these measures into their research on AS.

Proposed Exercise Model for AS Patients

Based on the findings from multiple studies, we propose the following exercise model aimed at improving pain management, mobility, and quality of life in AS patients. The proposed model focuses on regular, structured exercises combined with physiotherapy modalities suited to the patient's stage and severity of the disease.

Exercise Type	Description	Frequency	Duration	Goal
1. Stretching Exercises	Focus on spinal flexibility, hip flexors, hamstrings, and chest expansion.	Daily	15–20 minutes	Improve spinal mobility, prevent deformities, increase range of motion.
2. Aerobic Exercises	Low-impact activities like walking, cycling, or swimming.	3–5 times/week	20–30 minutes/session	Improve cardiovascular fitness, reduce stiffness, and maintain mobility.
3. Strengthening Exercises	Focus on core, back, and lower extremity strengthening.	2–3 times/week	20–30 minutes/session	Improve posture, spinal support, and muscle endurance.
4. Postural Training	Exercises to reduce kyphosis (forward stooping), such as wall slides or postural alignment drills.	2–3 times/week	10–15 minutes/session	Enhance posture, prevent deformities, and increase balance.
5. Hydrotherapy	Aquatic exercises to support movement while reducing joint load.	2–3 times/week	20–30 minutes/session	Reduce pain, improve flexibility, strengthen muscles with minimal joint stress.
6. Respiratory Exercises	Diaphragmatic breathing and chest expansion exercises.	Daily	10–15 minutes	Improve chest expansion, increase lung capacity, reduce respiratory complications.
7. Flexibility and Mobility Exercises	Targeting the spine, shoulders, hips, and lower back with gentle stretches.	Daily	15–30 minutes	Increase overall flexibility and decrease pain and stiffness.

Note: Each exercise should be personalized based on the individual patient's needs, limitations, and disease severity. Supervision by a trained physiotherapist is recommended, especially for those who are new to exercise or have advanced disease stages. Hydrotherapy, for example, is particularly beneficial for patients who struggle with weight-bearing exercises due to pain or stiffness.

Main Findings

The systematic review of selected studies revealed several key outcomes related to the impact of physiotherapy on ankylosing spondylitis patients:

1. Pain Reduction

Physiotherapy significantly reduced pain levels in AS patients, especially with the incorporation of exercises focusing on spinal mobility, stretching, and strengthening. Studies reported reductions in pain scores on the VAS by up to 50% in patients who adhered to consistent physiotherapy programs, particularly those involving exercise therapy and hydrotherapy.

2. Improved Mobility and Function

Patients demonstrated substantial improvements in both spinal flexibility and overall functional capacity. The BASFI scores improved by 30–40% in individuals who regularly engaged in structured exercise programs. Those participating in hydrotherapy also reported significant benefits, with up to a 20% increase in range of motion and spinal mobility.

3. Postural and Respiratory Benefits

Postural training and respiratory exercises proved effective in preventing forward stooping (kyphosis) and improving chest expansion, which is commonly restricted in AS patients. Spinal mobility tests showed improvements in both the occiput-to-wall distance and the Modified Schober Test after incorporating postural and stretching exercises into daily routines.

4. Quality of Life

Quality of life, as measured by the SF-36, improved significantly with regular physiotherapy. Improvements were noted in both the physical and mental health domains, with participants reporting better social interaction, reduced anxiety, and greater engagement in daily activities. Hydrotherapy contributed positively to mental well-being, offering a supportive and social environment while relieving pain.

5. Hydrotherapy's Specific Benefits

Hydrotherapy emerged as particularly beneficial for patients with advanced AS or those experiencing severe mobility limitations. The buoyant, low-impact nature of aquatic exercises reduced joint strain while promoting flexibility, strength, and endurance. Patients reported both physical and psychological benefits, including improved mood and reduced fatigue.

6. Adherence and Effectiveness of Supervised vs. Home-Based Programs

While both supervised and home-based programs were effective, supervised sessions demonstrated better adherence rates and more significant improvements in functional outcomes, particularly for patients new to exercise or those with more advanced AS. These sessions helped ensure proper technique and progression, leading to higher levels of engagement and better results.

RESULT

This narrative review aimed to evaluate the effectiveness of physiotherapy interventions in ankylosing spondylitis (AS) patients by reviewing multiple studies published between 2010 and 2023. The studies primarily focused on the effects of various physiotherapy approaches such as exercise therapy, hydrotherapy, postural and respiratory training, and comparisons between home-based and supervised programs.

Pain Reduction and Disease Activity

Physiotherapy was found to significantly reduce pain and disease activity in AS patients. The Visual Analog Scale (VAS) scores, a common measure of pain, showed consistent reductions in pain levels in patients undergoing structured physiotherapy programs. In some studies,

pain scores decreased by up to 50%, particularly in patients who engaged in regular exercise programs such as stretching and strengthening routines. The BASDAI scores, which assess disease activity, also indicated a reduction in disease-related inflammation and stiffness following physiotherapy interventions.

Improvement in Mobility and Function

Significant improvements in spinal mobility and functional capacity were observed in patients who participated in physiotherapy programs. The BASFI scores, which assess physical function, improved by 30–40% in many studies. Additionally, patients reported enhanced spinal mobility as measured by the Modified Schober test and chest expansion measurements, with improvements of up to 20%. These changes were linked to a combination of stretching, strengthening, and postural exercises aimed at counteracting the spinal stiffness associated with AS.

Quality of Life

Quality of life, as measured by the **SF-36** scale, improved significantly in patients who engaged in regular physiotherapy. Increases were reported in both physical and mental health domains, indicating not only a reduction in disease symptoms but also better social interaction, reduced psychological stress, and improved overall well-being. Hydrotherapy, in particular, had a positive impact on mental health, reducing stress and improving mood in patients with advanced AS who had more severe mobility restrictions.

Hydrotherapy

Hydrotherapy emerged as particularly beneficial for AS patients with severe mobility impairments or advanced disease. Studies showed that hydrotherapy helped improve flexibility, reduce pain, and increase range of motion. The buoyant, low-impact nature of water-based therapy was key in providing relief from joint strain while allowing patients to engage in strengthening exercises they might not otherwise tolerate.

Supervised vs. Home-Based Programs

Supervised physiotherapy sessions were shown to result in better adherence and more significant improvements in pain reduction and functional outcomes compared to home-based programs. Supervised sessions helped ensure proper exercise techniques, motivating patients to continue their exercise routines. However, home-based physiotherapy programs still proved beneficial for patients who had access to clear instructions and remained motivated to follow the exercises on their own.

DISCUSSION

The results of this review support the idea that physiotherapy plays a crucial role in managing ankylosing spondylitis (AS) by addressing key symptoms such as pain, stiffness, and limited mobility. Physiotherapy interventions, such as exercise therapy, hydrotherapy, and postural training, have shown consistent benefits in reducing pain and improving function, mobility, and quality of life for AS patients.

The reduction in pain and disease activity observed in the studies is likely due to the multifaceted nature of physiotherapy, which not only targets the spine and joints but also addresses muscle imbalances and poor posture, which are often aggravated in AS patients. Exercises that focus on spinal mobility and strengthening help maintain proper alignment and prevent deformities, such as kyphosis (forward stooping), that can worsen the progression of the disease.

Furthermore, hydrotherapy was particularly beneficial for patients with advanced AS, as the buoyancy of water reduces the load on the joints, allowing individuals to perform strengthening exercises with less pain and risk of injury. The positive impact of hydrotherapy on psychological well-being underscores the importance of providing a holistic approach to AS care, addressing both physical and emotional needs.

Another key finding is the importance of supervision in physiotherapy. While home-based programs offer convenience and

flexibility, they tend to result in lower adherence rates compared to supervised sessions. This may be because patients in supervised programs benefit from tailored guidance, motivation, and progression adjustments, ensuring they are performing exercises correctly and safely.

CONCLUSION

This review highlights the significant benefits of physiotherapy for ankylosing spondylitis (AS) patients. Physiotherapy interventions, including exercise therapy, hydrotherapy, and postural training, not only reduce pain and inflammation but also improve spinal mobility, functional capacity, and quality of life. Regular physiotherapy, particularly when supervised, can help mitigate the disease's effects on daily function, reduce the risk of deformities, and improve both physical and psychological well-being.

In conclusion, physiotherapy should be a key component of comprehensive AS management. While home-based programs are valuable for patient convenience, supervised physiotherapy provides additional benefits in terms of adherence and outcome improvements. Future research should focus on optimizing physiotherapy protocols, exploring the long-term effects of different interventions, and evaluating the impact of combined physiotherapy approaches (e.g., exercise, hydrotherapy, postural training) on AS progression and quality of life.

Declaration by Author

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