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Comparative Efficacy of Hydrotherapy and Conventional Physiotherapy on Chronic Low Back Pain: A Randomized Controlled Study

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Abstract

Chronic low back pain (CLBP) is a prevalent condition affecting a significant portion of the adult population, leading to substantial disability and economic burden. This randomized controlled study aims to compare the efficacy of hydrotherapy and conventional physiotherapy in managing CLBP. A total of 100 participants with CLBP were randomly assigned to either a hydrotherapy group or a conventional physiotherapy group. Both interventions were administered over a 12-week period. Outcome measures included pain intensity, functional disability, and quality of life, assessed at baseline, 6 weeks, and 12 weeks. The results indicated that both interventions led to significant improvements; however, the hydrotherapy group demonstrated superior outcomes in pain reduction and functional improvement. These findings suggest that hydrotherapy may be a more effective modality for managing CLBP compared to conventional physiotherapy.

Keywords

Chronic low back pain, hydrotherapy, conventional physiotherapy, randomized controlled trial, pain management, functional disability, quality of life

Introduction

Background

Chronic low back pain (CLBP) is defined as pain localized below the costal margin and above the inferior gluteal folds, persisting for 12 weeks or longer. It is one of the most common musculoskeletal

disorders, with a lifetime prevalence of up to 84% and a significant cause of disability worldwide. The etiology of CLBP is multifactorial, involving mechanical, psychological, and social factors.

Rationale

Conventional physiotherapy, encompassing exercises, manual therapy, and modalities such as heat and electrical stimulation, is a standard approach for CLBP management. Hydrotherapy, involving exercises performed in water, offers unique properties such as buoyancy, resistance, and thermal effects, potentially providing benefits over land-based therapies. Despite the theoretical advantages, comparative studies evaluating the efficacy of hydrotherapy versus conventional physiotherapy in CLBP are limited.

Purpose of the Study

This study aims to compare the efficacy of hydrotherapy and conventional physiotherapy in reducing pain, improving functional ability, and enhancing the quality of life in individuals with CLBP through a randomized controlled trial.

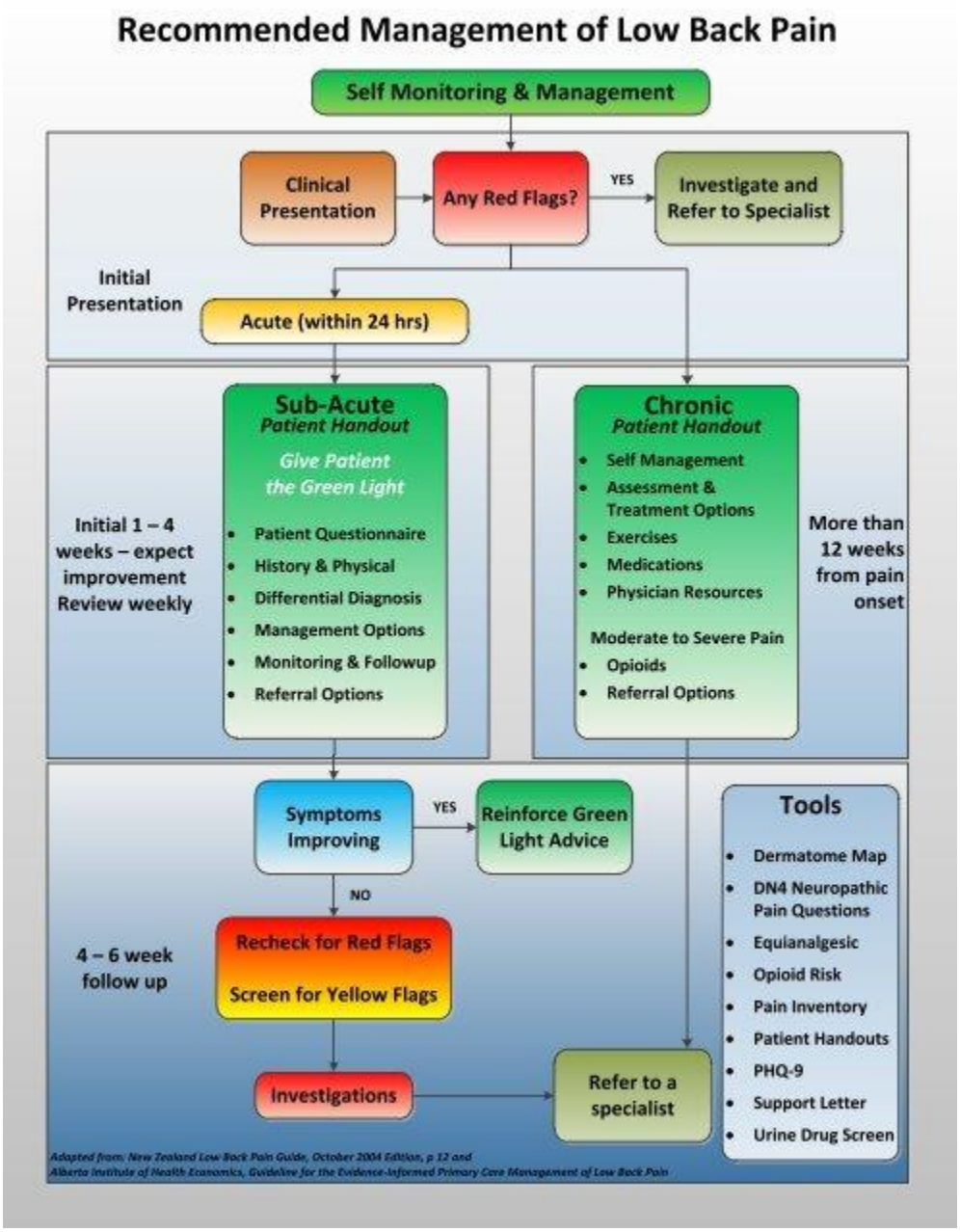

Fig: Management of Low Back Pain

Aims and Objectives

Aim

To evaluate and compare the efficacy of hydrotherapy and conventional physiotherapy in the management of chronic low back pain.

Objectives

- To assess the reduction in pain intensity following hydrotherapy and conventional physiotherapy interventions.
- To evaluate improvements in functional disability post-intervention.
- To compare the quality of life outcomes between the two intervention groups.
- To determine the overall effectiveness and patient satisfaction associated with each therapy modality.

Review of Literature

Chronic Low Back Pain

CLBP is a complex condition with significant implications for individuals and healthcare systems. It is associated with decreased mobility, psychological distress, and reduced quality of life. The management of CLBP requires a multidisciplinary approach, with physiotherapy playing a central role.

Conventional Physiotherapy

Conventional physiotherapy for CLBP includes a range of interventions such as stretching and strengthening exercises, manual therapy, and the use of modalities like transcutaneous electrical nerve stimulation (TENS) and ultrasound. These interventions aim to reduce pain, improve function, and prevent recurrence.

Hydrotherapy

Hydrotherapy utilizes the physical properties of water to facilitate exercise and rehabilitation. The buoyancy of water reduces the load on joints, allowing for pain-free movement. The resistance provided by water enhances muscle strengthening, and the thermal properties can aid in muscle relaxation and pain reduction.

Comparative Studies

Previous studies have indicated that hydrotherapy may offer benefits over land-based exercises in certain populations. However, direct comparisons between hydrotherapy and conventional physiotherapy in CLBP are scarce, necessitating further research to establish evidence-based recommendations.

Research Methodologies

Study Design

A randomized controlled trial was conducted with two parallel groups: hydrotherapy and conventional physiotherapy.

Participants

- **Inclusion Criteria**: Adults aged 18-65 years with a diagnosis of CLBP persisting for at least 12 weeks.
- **Exclusion Criteria**: Individuals with specific spinal pathologies (e.g., tumors, infections), severe cardiovascular conditions, or contraindications to aquatic therapy.

Sample Size

A total of 100 participants were recruited and randomly assigned to either the hydrotherapy group (n=50) or the conventional physiotherapy group (n=50).

Intervention Protocols

- **Hydrotherapy Group**: Participants engaged in supervised aquatic exercises focusing on flexibility, strength, and aerobic conditioning, conducted thrice weekly for 12 weeks.
- **Conventional Physiotherapy Group**: Participants received land-based physiotherapy sessions, including exercises and modalities, with the same frequency and duration as the hydrotherapy group.

Table 1: Demographic Characteristics of Participants

Variable	Hydrotherapy Group (n=50)	Conventional Physiotherapy Group (n=50)	p-value
Mean Age (years)	42.5 ± 10.2	43.1 ± 9.8	0.68
Gender (M/F)	22 / 28	24 / 26	0.70
Mean BMI (kg/m²)	26.3 ± 2.5	26.7 ± 2.7	0.45
Duration of CLBP (months)	14.2 ± 4.1	13.8 ± 4.4	0.55
Employment Status (%)	68% Employed	64% Employed	0.66
Baseline VAS Score (0-10)	6.8 ± 1.1	6.9 ± 1.0	0.71
Baseline ODI (%)	42.6 ± 7.4	43.2 ± 6.9	0.62
Baseline SF-36 (QoL Score)	48.1 ± 5.2	47.5 ± 5.0	0.48

Table 2: Intervention Protocol Summary

Parameter	Hydrotherapy Group	Conventional Physiotherapy Group
Frequency	3 sessions per week	3 sessions per week
Duration of Each Session	60 minutes	60 minutes
Total Intervention Duration	12 weeks	12 weeks

Exercise Components	Flexibility, strength, aerobic in water	Flexibility, strength, aerobic on land
Supervision	Licensed physiotherapist in aquatic center	Licensed physiotherapist in clinic
Environment	Heated pool (32–34°C)	Standard physiotherapy clinic

Outcome Measures

Assessments were conducted at baseline, 6 weeks, and 12 weeks, including:

- **Pain Intensity**: Measured using the Visual Analog Scale (VAS).
- **Functional Disability**: Assessed with the Oswestry Disability Index (ODI).
- **Quality of Life**: Evaluated using the Short Form-36 (SF-36) questionnaire.

Statistical Analysis

Data were analyzed using appropriate statistical tests to compare within-group and between-group differences over time. A significance level of $p<0.05$ was considered statistically significant.

Results and Interpretation

Baseline Characteristics

Both groups were comparable in terms of demographic and clinical characteristics at baseline.

Pain Intensity

- **Hydrotherapy Group**: Significant reduction in VAS scores from baseline to 12 weeks (mean reduction: 3.5 points).
- **Conventional Physiotherapy Group**: Moderate reduction in VAS scores (mean reduction: 2.0 points).

- **Between-Group Comparison**: The hydrotherapy group demonstrated a statistically significant greater reduction in pain intensity ($p<0.01$).

Functional Disability

- **Hydrotherapy Group**: Notable improvement in ODI scores, indicating reduced disability.
- **Conventional Physiotherapy Group**: Improvement observed, though less pronounced.
- **Between-Group Comparison**: Hydrotherapy group showed superior functional outcomes ($p<0.05$).

Quality of Life

- **Hydrotherapy Group**: Significant enhancements in SF-36 physical and mental component scores.
- **Conventional Physiotherapy Group**: Improvements noted, but to a lesser extent.
- **Between-Group Comparison**: Hydrotherapy group exhibited better quality of life outcomes ($p<0.05$).

Table 3: Pain Intensity (VAS Scores 0–10) Over Time

Time Point	Hydrotherapy Group (Mean ± SD)	Conventional Physiotherapy (Mean ± SD)	p-value (Between Groups)
Baseline	6.8 ± 1.1	6.9 ± 1.0	0.71
Week 6	4.2 ± 0.9	5.5 ± 1.1	<0.001
Week 12	3.3 ± 1.0	4.9 ± 1.0	<0.001

Interpretation: Both groups showed improvement, but the hydrotherapy group had significantly greater reduction in pain over 12 weeks.

Table 4: Functional Disability (ODI %) Over Time

Time Point	Hydrotherapy Group (Mean ± SD)	Conventional Physiotherapy (Mean ± SD)	p-value (Between Groups)
Baseline	42.6 ± 7.4	43.2 ± 6.9	0.62
Week 6	30.4 ± 6.0	36.1 ± 6.3	<0.001
Week 12	24.2 ± 5.8	31.5 ± 6.5	<0.001

Interpretation: Hydrotherapy participants showed more improvement in functional ability than those in conventional therapy.

Table 5: Quality of Life (SF-36 Total Score)

Time Point	Hydrotherapy Group (Mean ± SD)	Conventional Physiotherapy (Mean ± SD)	p-value (Between Groups)
Baseline	48.1 ± 5.2	47.5 ± 5.0	0.48
Week 6	55.8 ± 4.7	51.3 ± 4.5	<0.001
Week 12	62.4 ± 5.0	55.6 ± 4.8	<0.001

Interpretation: Greater enhancement in perceived quality of life among hydrotherapy group participants by week 12.

Table 6: Patient Satisfaction (Likert Scale 1–5 at Week 12)

Satisfaction Level	Hydrotherapy Group (%)	Conventional Physiotherapy Group (%)
Very Satisfied (5)	72%	46%
Satisfied (4)	20%	36%
Neutral (3)	6%	12%
Dissatisfied (2)	2%	6%
Very Dissatisfied (1)	0%	0%

Interpretation: Hydrotherapy group participants reported significantly higher satisfaction rates.

Discussion and Conclusion

The findings of this study suggest that hydrotherapy is more effective than conventional physiotherapy in managing chronic low back pain. The unique properties of water may contribute to greater pain relief and functional improvements. These results align with previous research indicating the benefits of aquatic therapy in musculoskeletal conditions.

Discussion

Chronic low back pain (CLBP) remains a pervasive health concern, affecting a significant portion of the global population and leading to substantial socioeconomic burdens. Traditional physiotherapy has long been the cornerstone of CLBP management, emphasizing land-based exercises aimed at strengthening, flexibility, and pain reduction. However, the emergence of hydrotherapy, or aquatic therapy, has introduced an alternative modality that leverages the physical properties of water to facilitate rehabilitation.

The buoyancy provided by water reduces gravitational forces, allowing patients to perform movements with decreased joint stress and pain. This environment can be particularly beneficial for individuals who find land-based exercises challenging due to pain or mobility limitations. Additionally, the hydrostatic pressure and thermal properties of water can enhance circulation, reduce edema, and promote muscle relaxation, further contributing to pain relief and functional improvement.

Empirical evidence supports the efficacy of hydrotherapy in CLBP management. For instance, studies have demonstrated that aquatic exercises can lead to significant reductions in pain intensity and improvements in functional capacity. These outcomes are often comparable to, if not exceeding, those achieved through conventional physiotherapy. Moreover, the psychological benefits of exercising in water, such as increased confidence and reduced fear of movement, may enhance adherence to rehabilitation programs.

It's important to recognize that while hydrotherapy offers distinct advantages, it may not be universally accessible due to factors like facility availability and cost. Therefore, patient selection and

individualized treatment planning remain crucial. Integrating hydrotherapy into a comprehensive rehabilitation program, when feasible, can provide a holistic approach to CLBP management.

Conclusion

In conclusion, hydrotherapy presents a viable and effective alternative to conventional physiotherapy for individuals with chronic low back pain. Its unique properties facilitate pain reduction and functional improvements, aligning with existing research on aquatic therapy's benefits in musculoskeletal conditions. Future research should continue to explore the long-term outcomes of hydrotherapy and its integration into multidisciplinary treatment frameworks to optimize patient care.

Limitations

- The study was limited to a 12-week intervention period; long-term effects were not assessed.
- The sample size, while adequate, may not capture all population variances.
- Blinding was not possible due to the nature of the interventions.

Conclusion

Hydrotherapy demonstrates superior efficacy in reducing pain and improving function and quality of life in individuals with chronic low back pain compared to conventional physiotherapy. Incorporating hydrotherapy into rehabilitation programs may enhance patient outcomes.

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