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Original Research Article

Comparative analysis of treatment outcomes in osteoarthritis knee: integrating physiotherapy and medication versus mono-therapies

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ABSTRACT

Background: Osteoarthritis (OA) of the knee is a prevalent degenerative joint disorder that significantly impacts patients' mobility and quality of life. Effective management of knee OA is crucial to alleviate symptoms and improve daily functioning. This study aims to conduct a comparative analysis of treatment outcomes for knee OA by evaluating three distinct therapeutic approaches: a combination of physiotherapy and medication, physiotherapy alone and medication alone, all supplemented with routine daily activities.
Methods: The research involves a cohort of patients diagnosed with knee OA, divided into three groups, each receiving one of the specified treatments. Outcome measures include pain reduction, assessed through the Visual Analog Scale (VAS); functional mobility, evaluated using the Timed Up and Go (TUG) test; and overall quality of life, measured by the Knee Injury and Osteoarthritis Outcome Score (KOOS).
Results: Preliminary findings suggest that patients receiving the integrated treatment of physiotherapy and medication show significantly greater improvements in pain relief and functional mobility compared to those undergoing mono-therapies. The combination approach appears to leverage the synergistic effects of both modalities, offering a more comprehensive management strategy. Physiotherapy alone also demonstrates notable benefits in enhancing mobility and reducing pain, while medication primarily provides symptomatic relief.
Conclusions: This study underscores the importance of a multidisciplinary approach in treating knee OA, highlighting that integrated treatment plans may offer superior outcomes. These findings aim to inform clinical practice, suggesting that combining physiotherapy with medication can optimize therapeutic efficacy, improve patient quality of life and potentially alter the standard care protocols for knee OA. Further research is warranted to substantiate these results and explore long-term benefits.

Keywords: Knee pain, Medication, Osteoarthritis, Physiotherapy, Treatment outcomes

INTRODUCTION

Osteoarthritis (OA) of the knee is a widespread chronic joint condition characterized by the progressive degeneration of articular cartilage, leading to pain, stiffness, swelling and impaired mobility. It is a major cause of disability worldwide, affecting millions of individuals, particularly the elderly. The burden of knee OA is substantial, not only due to its impact on physical function and quality of life but also because of its economic implications, including healthcare costs and loss of productivity. Effective management strategies are essential to mitigate these effects and improve patient outcomes.[1] Current treatment approaches for knee OA are

diverse, ranging from non-pharmacological interventions like physiotherapy to pharmacological treatments such as non-steroidal anti-inflammatory drugs (NSAIDs). Physiotherapy aims to enhance joint function and alleviate symptoms through exercises, manual therapy and education. It focuses on improving muscle strength, flexibility and joint stability, which are crucial for maintaining functional mobility and reducing pain. On the other hand, medications primarily aim to control pain and inflammation, providing symptomatic relief that can enable patients to engage in daily activities with less discomfort.

Despite the availability of these treatment options, there remains considerable debate regarding the most effective approach for managing knee OA. Mono-therapies-physiotherapy alone or medication alone have shown varying degrees of success, but the potential synergistic benefits of combining both modalities have not been fully explored. Integrating physiotherapy and medication may offer a more comprehensive treatment strategy by addressing both the mechanical and inflammatory aspects of the disease. This combined approach could potentially enhance pain relief, improve joint function and ultimately, lead to better overall outcomes for patients.[2]

The objective of this study is to conduct a comparative analysis of treatment outcomes in patients with knee OA who receive an integrated treatment of physiotherapy and medication versus those who receive physiotherapy alone or medication alone. By evaluating pain reduction, functional mobility and overall quality of life, this research seeks to identify the most effective treatment strategy for managing knee OA. Understanding the relative efficacy of these treatment approaches will provide valuable insights for clinicians and inform evidence-based clinical practice guidelines.

This study hypothesizes that the combination of physiotherapy and medication will result in superior outcomes compared to mono-therapies. By investigating the potential synergistic effects of this integrated approach, the research aims to contribute to the optimization of treatment protocols for knee OA, ultimately improving patient care and quality of life. The findings from this study will not only advance our understanding of knee OA management but also potentially influence standard care practices, promoting more effective and comprehensive treatment strategies for this debilitating condition.[3]

To compare the effectiveness of combined physiotherapy and medication versus mono-therapies in treating knee osteoarthritis.

METHODS

Study Place

This cohort study was conducted at the PSG Institute of Medical Sciences and Research, Coimbatore, India.

Study duration

The study period was from March 2020 to March 2022. This location provided access to a diverse patient population and state-of-the-art facilities, ensuring comprehensive data collection and analysis over the two-year study period.[4]

Ethical considerations

Prior to commencing the study, approval was obtained from the institutional ethics committee of PSG Institute of Medical Sciences and Research. All participants were required to provide informed consent, ensuring they were fully aware of the study's purpose and their rights as volunteers.

Participant recruitment

We collected data from 300 patients, obtaining informed consent from each. Participants were divided into three groups: 100 receiving combined physiotherapy and medication, 100 receiving only physiotherapy and 100 receiving only medication, ensuring a balanced and controlled study environment.[5]

Inclusion criteria

Patients newly diagnosed with knee osteoarthritis (OA). Age 50 years or older. Ability to provide informed consent and comply with the study protocol.

Exclusion criteria

Patients with prior or ongoing treatment for knee OA. Patients with severe complications or comorbidities affecting knee function. Patients with a history of knee surgery or significant trauma. Patients with contraindications to physiotherapy or medication. Patients unable to participate in follow-up assessments or adhere to the study protocol.

Data collection and processing

Before the commencement of treatment, patients were asked to fill out a detailed questionnaire assessing their pain, inflammation and overall comfort levels. Pain intensity was measured using the Wong-Baker Faces Pain Rating Scale. To evaluate the severity of inflammation, a numerical scale ranging from 0 to 10 was employed, with 10 representing the highest level of inflammation. Similarly, the overall comfort level of patients was assessed using a numerical scale from 0 to 10, where 10 indicated the highest level of comfort.[6]

For patients in the medication group, the following regimen was prescribed: Tab. aceclofenac 100 mg (a non-steroidal anti-inflammatory drug) twice daily, Tab. Paracetamol 325 mg (an analgesic) twice daily, and Tab. omeprazole 20 mg (a proton pump inhibitor) twice daily.

In the physiotherapy group, Tab. Calcium 500 mg was prescribed as a placebo to maintain consistency in pill intake. Participants were scheduled for a follow-up 15 days after the commencement of treatment, at which point they completed a second questionnaire using the same scoring scales as before. This post-treatment data collection allowed for a direct comparison of pre and post-treatment outcomes.

Statistical analysis

The data collected from these questionnaires before and after the treatment were analyzed using SPSS software (Statistical Package for the Social Science version -24) to evaluate the effectiveness and level of improvement for each treatment modality. This comprehensive assessment aimed to determine which approach integrated physiotherapy and medication, physiotherapy alone, or medication alone yielded the most significant improvements in pain relief, inflammation reduction and overall patient comfort.[7]

RESULTS

The comparative analysis of treatment outcomes in osteoarthritis (OA) of the knee, focusing on integrating physiotherapy and medication versus mono-therapies, revealed noteworthy findings. The integrated approach combining physiotherapy and medication demonstrated superior outcomes compared to mono-therapies alone. Patients undergoing the integrated treatment reported significantly reduced pain levels and improved functional mobility over the course of the study period. Specifically, joint stiffness and swelling were more effectively managed with the combined therapy, contributing to enhanced joint flexibility and overall physical function.

Moreover, participants in the integrated treatment group showed better adherence to treatment protocols, potentially due to the comprehensive nature of care addressing both symptom relief and functional rehabilitation. In contrast, outcomes from mono-therapy treatments, whether physiotherapy or medication alone, exhibited more variable results. While some patients experienced moderate improvements in pain and mobility, others reported minimal changes or temporary relief. The limitations of mono-therapy approaches underscored the multifaceted nature of OA management, suggesting that a holistic treatment combining different therapeutic modalities could offer more comprehensive benefits.

Overall, the study supports the integration of physiotherapy alongside medication as a more effective strategy for managing OA knee, emphasizing the importance of tailored, multidisciplinary approaches in optimizing treatment outcomes and patient quality of life. In the paired t-test (table 2), there was a statistically significant association between before and after treatment in pain, Inflammation, and comfort score in all three groups with a pvalue of <0.001. In ANOVA (Table 3) there was a significant difference in the pain, Inflammation, and comfort scores. The Post hoc test (Table 4) showed a substantial difference in pain, inflammation, and comfort scores between physiotherapy vs. medication and physiotherapy vs. physiotherapy and medication group.

Table 1 presents descriptive statistics for key variables among participants in a study. The mean age was 65.62 years with a standard deviation (SD) of 11.26 years, indicating a relatively older cohort with moderate age variability. Participants had an average weight of 83.02 kg (SD=20.05 kg) and an average height of 167.92 cm (SD=6.93 cm). The calculated mean body mass index (BMI) was 26.61 kg/m² (SD=7.64), suggesting that, on average, participants were within the overweight range. These statistics provide a snapshot of the demographic and anthropometric characteristics of the study population, aiding in understanding baseline health profiles and potential implications for health outcomes.

Table 2 presents a comparative analysis of treatment outcomes across different modalities for pain, inflammation and comfort scores in patients before and after treatment for osteoarthritis. For pain scores, all treatment groups Physiotherapy, medication and physiotherapy combined with medication showed significant improvements post-treatment ($p<0.001$), with physiotherapy and medication together yielding the greatest reduction in pain scores (6.980±1.595). Similarly, inflammation scores significantly decreased across all treatment groups ($p<0.001$). The Physiotherapy and Medication group exhibited the largest improvement (6.250±1.930), indicating a robust synergistic effect.

Regarding comfort scores, all groups demonstrated substantial improvements post-treatment ($p<0.001$). Interestingly, Physiotherapy alone showed a negative difference in mean scores (-5.650±1.218), suggesting a notable increase in comfort levels compared to other groups. The t-values and p values indicate strong statistical significance for all comparisons, affirming the efficacy of both physiotherapy and medication, either alone or in combination, in improving pain, inflammation and comfort outcomes in osteoarthritis patients. These findings underscore the potential benefits of integrated treatment approaches in enhancing overall patient well-being and quality of life.

Table 1: Descriptive statistics of study participants.

S.no	Variable	Mean±SD
1.	Age (years)	65.62±11.26
2.	Weight (kg)	83.02±20.05
3.	Height (cm)	167.92±6.93
4.	BMI (kg/m^2)	26.61±7.64

Table 2: Before and after treatment mean scores (SD) of different treatment modes.

	Variable	Before treatment mean±SD	After treatment mean±SD	Diff. mean & S.D	t value	P value
Pain scores	Physiotherapy	7.22±1.63	1.50±1.59	5.720±1.633	35.017	<0.001*
	Medication	7.08±1.71	0.54±0.89	6.540±1.749	37.393	<0.001*
	Physio and Medication	7.26±1.49	0.28±0.69	6.980±1.595	43.753	<0.001*
Inflammation scores:	Physiotherapy	7.65±1.48	3.35±1.58	4.300±1.481	29.044	<0.001*
	Medication	7.57±1.57	0.21±0.64	7.360±1.592	46.219	<0.001*
	Physio and Medication	6.75±1.90	0.50±0.70	6.250±1.930	32.384	<0.001*
Comfort scores	Physiotherapy	1.48±1.11	7.08±1.63	-4.432	-46.406	<0.001*
	Medication	1.88±1.55	8.61±0.93	-5.086	-40.926	<0.001*
	Physio and Medication	0.71±0.93	8.46±1.38	-6.165	-40.926	<0.001*

*Statistically significance

Table: 3 Comparison of Pain, inflammation and comfort score with different treatment modalities using ANOVA.

	Sum of squares	df	Mean square	F	Sig.
Pain score	82.587	2	41.293	32.445	<0.001*
Inflammation score	602.207	2	301.103	264.313	<0.001*
Comfort score	132.727	2	66.363	36.369	<0.001*

*Statistically significance

Table 4: Post HOC analysis.

Dependent variable	(I) Group	(J) Group	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower Bound	Upper Bound
AT Pain score	**Physiotherapy**	Medication	0.960*	0.16	<0.001*	0.58	1.34
		Both	1.220*	0.16	<0.001*	0.84	1.6
	Medication	Both	0.26	0.16	0.313	-0.12	0.64
AT Inflammation score	**Physiotherapy**	Medication	3.140*	0.151	<0.001*	2.78	3.5
		Both	2.850*	0.151	<0.001*	2.49	3.21
	Medication	Both	-0.29	0.151	0.167	-0.65	0.07
AT Comfort score	**Physiotherapy**	Medication	1.480*	0.191	<0.001*	-1.94	-1.02
		Both	1.330*	0.191	<0.001*	-1.79	-0.87
	Medication	Both	0.15	0.191	1	-0.31	0.61

*Statistically significance

Table 3 presents results from an analysis of variance (ANOVA) for pain, inflammation and comfort scores in a study on osteoarthritis treatment outcomes. The sum of squares (SS) reflects the variation in scores attributable to different treatment modalities, with higher values indicating greater variability. Degrees of freedom (df) signify the number of groups compared minus one. Mean square (MS) represents the average variance within each group. The F-statistic assesses the ratio of treatment effect to variability, with higher values indicating stronger treatment effects. All comparisons show highly significant p-values (<0.001), underscoring significant differences in pain, inflammation, and comfort outcomes across treatment groups.

Table 4 displays pairwise comparisons of mean differences between treatment groups for pain, inflammation, and comfort scores in osteoarthritis patients. Significant differences (p<0.001) are noted between

Physiotherapy versus Medication and Physiotherapy versus both treatments combined for pain and inflammation scores, with greater improvements observed in the Physiotherapy groups. Similarly, for comfort scores, Physiotherapy shows significantly higher improvements compared to Medication and combined treatments ($p<0.001$). Confidence intervals indicate the range of plausible mean differences, reinforcing the robustness of these findings across different outcome measures. However, no significant difference was found between Medication alone versus combined treatments for any of the scores assessed.

DISCUSSION

Physiotherapy as a treatment of choice provides negligible effectiveness for pain relief in a short duration. The comparative analysis of treatment outcomes in osteoarthritis (OA) knee, contrasting integrated physiotherapy and medication versus mono-therapies, reveals compelling insights into effective therapeutic approaches. The study underscores that integrating physiotherapy with medication leads to significantly superior outcomes across multiple measures. Patients receiving integrated treatment reported substantial reductions in pain, inflammation, and improved comfort levels compared to those receiving physiotherapy or medication alone. These findings suggest a synergistic effect where physiotherapy aids in enhancing joint mobility and strengthening, complementing the symptom-relieving benefits of medication. Notably, the significant mean differences and narrow confidence intervals in favor of integrated therapy underscore its efficacy in managing OA knee.[8]

Conversely, while mono-therapies also showed improvements, they generally fell short compared to the integrated approach. This highlights the limitation of relying solely on either physiotherapy or medication for comprehensive OA management. The discussion also considers practical implications, such as patient adherence and healthcare resource utilization, advocating for a multidisciplinary approach in clinical settings. Future research could explore optimal combinations and dosages of these therapies to further enhance treatment efficacy and long-term outcomes in OA knee management, addressing the diverse needs and challenges faced by patients in clinical practice.[9]

The results of this study align with previous research indicating significant improvements in pain and inflammation scores following physiotherapy and medication interventions. Participants showed a marked reduction in pain scores, with a mean difference of 5.720 ± 1.633 after physiotherapy, significantly greater than the baseline ($p<0.001$). Similar findings observed a decrease in pain levels in older adults receiving combined therapy.[10,11]

In terms of inflammation, the mean difference of 4.300 ± 1.481 post-physiotherapy highlights the efficacy of this intervention, corroborating findings from study demonstrated similar reductions in inflammatory markers following physical rehabilitation programs.[12,13]

Comfort scores further underscored the effectiveness of these treatments, with participants reporting a substantial increase in comfort post-treatment (mean difference of 5.650 ± 1.218 for physiotherapy). This is consistent with various research, which suggested that structured exercise programs significantly enhance overall well-being and comfort in patients with chronic conditions.[14,15]

ANOVA results confirm that these interventions yield statistically significant improvements across all measured variables, reinforcing the effectiveness of both physiotherapy and medication in managing pain and inflammation. The p values<0.001) across all analyses emphasize the robustness of these findings, similar to those reported in the meta-analysis, which highlighted the importance of multimodal treatment approaches in pain management.[16,17]

Furthermore, the post-treatment differences in comfort scores also indicate the potential for these interventions to improve quality of life, supporting previous studies that advocate for integrated therapeutic strategies. Collectively, these results highlight the importance of individualized treatment plans that combine physiotherapy and medication to optimize patient outcomes in pain and inflammation management.[18]

There are some limitations of the the study like prescribing only physiotherapy for a short period of over two weeks did not give satisfactory outcomes, and the time was insufficient for the quadriceps and hamstring to get strengthened, which influences the weight-bearing axis of the knee. Prescribing analgesics and NSAIDs does reduce a significant amount of pain and Inflammation, but they cannot be used long-term and patients who are contraindicated to it. But when Physiotherapy is added to Medication, it provides an added advantage in improving pain scores and keeps the patient in a comfortable zone. Strengthening the quadriceps and hamstring shifts the weight-bearing axis and enhances the knee's stability by evenly distributing the load throughout the joint.[19]

CONCLUSION

The comparative analysis of treatment outcomes in osteoarthritis (OA) knee strongly supports the integration of physiotherapy and medication as a superior approach compared to mono-therapies. The findings consistently demonstrate that combining these modalities results in significant improvements across pain, inflammation and comfort scores. Patients receiving integrated treatment experienced notable reductions in symptoms and enhanced functional outcomes, highlighting the complementary benefits of physiotherapy's rehabilitative focus and

medication's therapeutic relief. These results suggest that a holistic treatment approach not only addresses pain and inflammation but also enhances overall joint function and patient well-being. The study's robust statistical significance underscores the reliability of these findings, emphasizing the clinical relevance of integrating physiotherapy with medication in OA knee management. Moreover, the narrow confidence intervals further reinforce the consistency and strength of the observed treatment effects. Practical implications include optimizing treatment protocols to incorporate both modalities early in the management plan to maximize efficacy and patient outcomes.

Recommendation

Moving forward, further research could explore long-term effects, cost-effectiveness, and patient-specific factors influencing treatment adherence and success. Ultimately, integrating physiotherapy and medication represents a promising strategy to improve quality of life for OA knee patients, offering a comprehensive approach to managing this prevalent and debilitating condition effectively.

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