RESEARCH PAPER

Effect of a Multimodal Pharmacological and Non-pharmacological Intervention on Pain and Quality of Life in Chronic Gouty Arthritis: A Prospective Controlled Study

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ABSTRACT

Background: Gouty arthritis is a chronic inflammatory musculoskeletal disorder characterized by recurrent joint pain, inflammation, stiffness, and functional limitations, which can substantially affect patients' physical, psychological, and social well-being. Conventional management primarily relies on pharmacological therapy; however, a comprehensive approach incorporating non-pharmacological strategies may provide better pain control and improve overall quality of life. The integration of optimized pharmacological therapy with physical therapy, lifestyle modification, dietary counselling, and mind-body interventions may offer a more effective approach to the long-term management of chronic gouty arthritis. ***Objectives:*** The study aims to evaluate the effectiveness of combined pharmacological and non-pharmacological interventions in reducing chronic pain among patients with gouty arthritis and to compare their outcomes with conventional treatment and improvements in quality of life. ***Methods:*** A prospective, randomized, controlled interventional study was conducted over a period of six months among 100 patients aged 30–80 years diagnosed with gouty arthritis and experiencing chronic pain. The intervention group received optimized pharmacological therapy along with structured physical therapy, lifestyle modification, dietary counselling, and mind-body interventions such as yoga and relaxation techniques, while the control group received conventional pharmacological treatment and routine physiotherapy. Pain intensity and quality of life were assessed at baseline and after six months using VAS and SF-36, respectively. ***Results:*** At baseline, the mean VAS pain scores were comparable between the intervention and control groups (7.2 ± 1.1 and 7.0 ± 1.3, respectively). After six months, the intervention group demonstrated a marked reduction in pain score from 7.2 ± 1.1 to 2.8 ± 1.0, representing a 61% reduction ($p < 0.001$), whereas the control group showed a reduction from 7.0 ± 1.3 to 4.9 ± 1.2, representing a 30% reduction ($p < 0.05$). The between-group difference was statistically highly significant ($p < 0.001$). Quality of life also improved substantially in the intervention group, with SF-36 scores increasing from 42.5 ± 6.3 to 72.8 ± 5.9, representing a 71% improvement ($p <0.001$). In comparison, the control group improved from 43.1 ± 5.8 to 58.6 ± 6.4, representing a 36% improvement ($p < 0.05$). The difference in quality-of-life improvement between the groups was highly significant ($p < 0.001$). ***Conclusion:*** This study demonstrates that combined pharmacological and non-pharmacological interventions are significantly more effective than conventional treatment in reducing chronic pain and improving quality of life among patients with gouty arthritis.

Keywords: Chronic Pain, Quality of Life, Gouty Arthritis, Innovative.

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1. INTRODUCTION

Gouty arthritis is a chronic inflammatory disease caused by monosodium urate crystal deposition in joints and surrounding tissues. Recurrent attacks can evolve into persistent pain, stiffness, impaired mobility, and functional limitation, with consequences for physical and psychosocial well-being. The global burden of gout has increased substantially, emphasizing the need for treatment strategies that address both disease activity and patient-reported outcomes [1,2].

At the biological level, monosodium urate crystals activate innate immune pathways, including the NLRP3 inflammasome, and promote the release of pro-inflammatory mediators. Pain is also influenced by neuroimmune signalling; inflammatory mediators can sensitize nociceptive neurons, providing a mechanistic basis for persistent pain beyond the immediate inflammatory episode [3,4].

Established management combines anti-inflammatory treatment for flares with urate-lowering therapy and lifestyle measures. Current guidelines emphasize sustained urate control, appropriate anti-inflammatory therapy, patient education, and individualized management according to comorbidities and treatment risk [5,6]. Nevertheless, pain and impaired quality of life

may persist despite conventional care, supporting interest in multimodal management [7,8].

Non-pharmacological measures such as dietary counselling, physical activity, rehabilitation, and self-management support can complement pharmacological treatment. Emerging technologies, including targeted nanomedicine and multifunctional delivery systems, are also being investigated for gout and inflammatory disorders, but most remain experimental and should not be equated with established clinical care [9-14].

The present study focused on a pragmatic multimodal clinical strategy combining optimized pharmacological therapy with structured physical therapy, lifestyle and dietary counselling, and mind-body interventions. The primary outcomes were change in pain intensity and health-related quality of life, assessed using the Visual Analogue Scale (VAS) and the 36-Item Short Form Health Survey (SF-36), respectively [15,16].

The objective was to determine whether the combined intervention produced greater improvement in chronic pain and quality of life over six months than conventional treatment and routine physiotherapy. This approach evaluated the overall clinical effect of coordinated care rather than attributing benefit to any single intervention component.

2. MATERIALS AND METHODS

2.1 Study Design

This study was a prospective, controlled intervention study conducted to evaluate the effectiveness of combined pharmacological and non-pharmacological interventions in improving chronic pain management and quality of life among patients with gouty arthritis.

2.2 Study Setting

This study was conducted in the Orthopaedics and Rheumatology Outpatient Department of a tertiary care hospital in the location of Salem District of Tamil Nadu.

2.3 Study Period

The study was conducted over a period of 6 months, which includes patient recruitment, baseline assessment, implementation of interventions, and regular follow-up to assess pain reduction and improvement in quality of life.

2.4 Study Population

The study included 100 patients aged 30–80 years diagnosed with gouty arthritis and experiencing chronic pain, attending the Orthopaedics and Rheumatology outpatient departments [17].

2.5 Sampling and Group Allocation

A purposive sampling technique was used to recruit eligible participants who meet the inclusion criteria. After obtaining written informed consent, participants will be randomly allocated into two equal groups:

Intervention Group (n = 50)

Participants will receive a combined innovative intervention, which includes [2,3]:

a) Optimized pharmacological therapy (urate-lowering agents and biologics where indicated) [3,7,10].
b) Structured physical therapy program [8].
c) Lifestyle modification and dietary counselling. [9,11,28].
d) Mind-body interventions such as yoga and relaxation techniques [10].

Control Group (n = 50)

Participants will receive standard conventional care, including:

a) Pharmacological management (NSAIDs, colchicine, corticosteroids, allopurinol/febuxostat).
b) Routine physiotherapy as prescribed by the physician.

2.6 Eligibility Criteria

Inclusion Criteria

Patients fulfilling all of the following criteria will be included in the study:

1. Patients aged 30–80 years.
2. Patients clinically diagnosed with gouty arthritis as per standard diagnostic criteria [1].
3. Patients experiencing chronic joint pain (pain duration ≥ 3 months).
4. Patients attending the Orthopaedics & Rheumatology Outpatient Department of the study hospital.
5. Patients willing to participate and providing written informed consent.

Exclusion Criteria

Patients meeting any of the following criteria will be excluded from the study:

1. Patients with acute gout flare requiring emergency management at the time of enrolment.
2. Patients diagnosed with other inflammatory or autoimmune joint disorders such as rheumatoid arthritis, psoriatic arthritis or lupus [8,11,12].
3. Patients with severe renal failure, hepatic disease, or uncontrolled cardiovascular illness.
4. Patients receiving long-term opioid therapy for pain management.
5. Pregnant or lactating women.
6. Patients with psychiatric illness or cognitive impairment that interferes with participation.
7. Patients unwilling or unable to provide informed consent.

2.7 Outcome Assessment

Quantitative Assessment: Data will be collected at baseline (pre-intervention) and post-intervention (end of 6 months) using validated tools:

Pain intensity: Visual Analog Scale (VAS) [16].

Quality of Life: Short Form-36 (SF-36) questionnaire. [14,15].

Qualitative Assessment

A subset of participants from both groups was selected using purposive sampling for semi-structured interviews after completion of the intervention period to assess:

Treatment satisfaction

Perceived effectiveness

Acceptability of interventions

2.8 Statistical Analysis

Quantitative Data

Descriptive statistics (mean, standard deviation, frequency, percentage)

Paired t-test for within-group comparisons

Independent t-test or Mann–Whitney U test for

between-group comparisons

Repeated measures ANOVA for assessing changes over time

Statistical significance will be set at $p < 0.05$ [18].

Qualitative Data

Thematic analysis was performed on interview transcripts to identify key themes related to pain relief, quality of life, and patient.

2.9 Ethical Considerations

Ethical approval was obtained from the Thangam Hospital institutional Ethics Committee (EC/NEW/INST/2023/TN/028/)

3. RESULTS

3.1 Baseline Characteristics of the Study Groups

Table 1. Age distribution of participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
<40	5 (10%)	6 (12%)	0.89
40–50	12 (24%)	11 (22%)	
50–60	22 (44%)	23 (46%)	
>60	11 (22%)	10 (20%)	

The age-wise distribution of patients with gouty arthritis in both the intervention and control groups is presented in Table 1. The majority of participants in both groups belonged to the 50–60 years age category, accounting for 44% (n=22) in the intervention group and 46% (n=23) in the control group. Patients aged 40–50 years constituted 24% (n=12) in the intervention group and 22% (n=11) in the control group.

A smaller proportion of participants were observed in the >60 years category, with 22% (n=11) in the intervention group and 20% (n=10) in the control group. The least number of patients were in the <40 years age group, comprising 10% (n=5) and 12% (n=6) in the intervention and control groups, respectively.

Statistical analysis showed no significant difference in age distribution between the two groups ($p = 0.89$), indicating that both groups were comparable at baseline with respect to age.

Table 2. Sex distribution of participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Male	38 (76%)	36 (72%)	0.64
Female	12 (24%)	14 (28%)	

The gender distribution of study participants showed a predominance of male patients in both groups. In the intervention group (n = 50), 38 participants (76%) were male and 12 (24%) were female. Similarly, in the control group (n = 50), 36 participants (72%) were male and 14 (28%) were female.

Statistical analysis revealed no significant difference in gender distribution between the intervention and control groups ($p = 0.64$), indicating that both groups were comparable with respect to gender at baseline.

Table 3. Comorbidities among participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Hypertension	15 (30%)	14 (28%)	0.92
Diabetes Mellitus	10 (20%)	11 (22%)	
Both (HTN + DM)	12 (24%)	13 (26%)	
None	13 (26%)	12 (24%)	

The distribution of co-morbidities among the study participants in both the intervention and control groups is presented in Table 03. In the intervention group (n = 50), 15 patients (30%) had hypertension, 10 patients (20%) had diabetes mellitus, and 12 patients (24%) had both hypertension and diabetes mellitus. The remaining 13 patients (26%) had no co-morbid conditions.

Similarly, in the control group (n = 50), 14 patients (28%) had hypertension, 11 patients (22%) had diabetes mellitus, and 13 patients (26%) had both conditions. A total of 12 patients (24%) in the control group had no co-morbidities.

The two groups showed no statistically significant difference in the distribution of comorbidities ($p = 0.92$), indicating that both groups were comparable at baseline with respect to co-morbid conditions.

Table 4. Occupational status of participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Sedentary	26 (52%)	25 (50%)	0.87
Moderate	15 (30%)	16 (32%)	
Heavy	9 (18%)	9 (18%)	

The occupational status of study participants showed a similar distribution between the intervention and control groups. The majority of patients in both groups were engaged in sedentary occupations, accounting for 26 (52%) in the intervention group and 25 (50%) in the control group. Participants with moderate occupational activity constituted 15 (30%) in the intervention group and 16 (32%) in the control group. A smaller proportion of patients were involved in heavy work, with 9 (18%) participants in each group. Statistical analysis revealed no significant difference in occupational distribution between the two groups ($p = 0.87$).

Table 5. Dietary patterns among participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Vegetarian	14 (28%)	13 (26%)	0.82
Mixed Diet	36 (72%)	37 (74%)	

The distribution of food habits among the study participants showed that the majority of patients in both groups followed a mixed diet. In the intervention group, 36 (72%) patients consumed a mixed diet, while 14 (28%) were vegetarians. Similarly, in the control group, 37 (74%) participants followed a mixed diet and 13 (26%) were vegetarians.

There was no statistically significant difference in food habits between the intervention and control groups ($p = 0.82$).

Table 6. Alternative medicine use among participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Yes	18 (36%)	17 (34%)	0.84
No	32 (64%)	33 (66%)	

In the present study, the use of alternative medicine was assessed among participants in both the intervention and control groups. In the intervention group, 18 patients (36%) reported using alternative medicine, whereas 32 patients (64%) did not. Similarly, in the control group, 17 patients (34%) were found to use alternative medicine, while 33 patients (66%) reported no such use. Statistical analysis revealed that there was no significant difference between the two groups with respect to alternative medicine use ($p = 0.84$), indicating that both groups were comparable at baseline for this parameter.

Table 7. Social habits among participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Smoking	10 (20%)	11 (22%)	0.91
Alcohol	14 (28%)	13 (26%)	
Both	8 (16%)	7 (14%)	
None	18 (36%)	19 (38%)	

The distribution of social habits among the study participants is presented in Table No 7. In the intervention group, 10 patients (20%) were smokers compared to 11 patients (22%) in the control group. Alcohol consumption was reported by 14 patients (28%) in the intervention group and 13 patients (26%) in the control group.

A combination of both smoking and alcohol use was observed in 8 patients (16%) in the intervention group and 7 patients (14%) in the control group. Participants with no social habits constituted 18 (36%) in the intervention group and 19 (38%) in the control group. Statistical analysis revealed no significant difference in social habits between the two groups ($p = 0.91$), indicating that both groups were respect to lifestyle-related factors.

Table 8. Place of residence among participants in the intervention and control groups.

Variable	Intervention group	Control group	P-value
Urban	28 (56%)	27 (54%)	0.84
Rural	22 (44%)	23 (46%)	

The distribution of residence was comparable between the intervention and control groups. Urban residence was reported for 28 (56%) participants in the intervention group and 27 (54%) in the control group, while rural residence was reported for 22 (44%) and 23 (46%), respectively. There was no statistically significant difference between groups ($p = 0.84$).

3.2 Effect on Pain Intensity

Pain intensity is a primary clinical outcome in patients with gouty arthritis, reflecting both disease severity and therapeutic effectiveness. In the present study, pain reduction was assessed using the Visual Analogue Scale (VAS), a validated and widely accepted tool for measuring subjective pain intensity. The VAS scores were recorded at baseline and after a 6-month intervention period for both the intervention and control groups.

At baseline, the mean VAS scores in the intervention group (7.2 ± 1.1) and the control group (7.0 ± 1.3) were found to be comparable. Statistical analysis revealed no significant difference between the two groups ($p > 0.05$), indicating homogeneity in baseline pain levels. This comparability confirms that both groups started with similar pain severity, thereby ensuring that any observed differences in post-intervention outcomes can be attributed to the implemented interventions rather than baseline variability.

Following the 6-month intervention period, a marked reduction in pain scores was observed in both groups; however, the magnitude of reduction differed significantly. The intervention group demonstrated a substantial decrease in mean VAS score from 7.2 ± 1.1 to 2.8 ± 1.0. This reduction was highly statistically significant ($p < 0.001$), indicating a strong effect of the combined pharmacological and non-pharmacological interventions in alleviating pain among patients with gouty arthritis. The reduction in pain by approximately 61% from baseline highlights the clinical relevance and effectiveness of the intervention strategy.

In contrast, the control group also exhibited a reduction in mean VAS score from 7.0 ± 1.3 to 4.9 ± 1.2 after 6 months. Although this reduction was statistically significant ($p < 0.05$), the magnitude of improvement was comparatively modest, representing approximately a 30% decrease from baseline. This improvement in the control group may be attributed to standard treatment protocols and routine care; however, it was notably less pronounced than that observed in the intervention group.

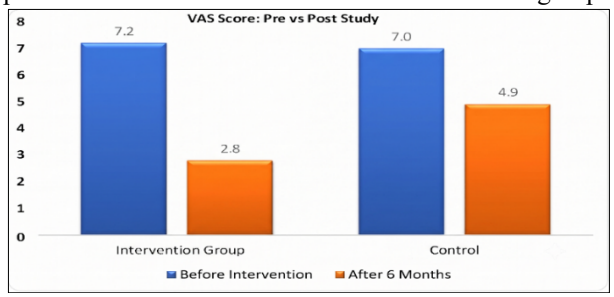

Figure 1. VAS pain scores at baseline and after 6 months

A between-group comparison of post-intervention VAS scores further emphasized the superiority of the intervention. The difference in mean pain reduction between the intervention and control groups was found to be statistically highly significant ($p < 0.001$). This indicates that patients receiving the innovative combined intervention experienced significantly greater pain relief compared to those receiving standard care alone.

The findings clearly demonstrate that the intervention not only reduced pain intensity effectively but also provided a clinically meaningful improvement in patient outcomes. The substantial decline in VAS scores in the intervention group suggests enhanced control over inflammatory processes and improved pain management,

which are critical in chronic conditions like gouty arthritis. Furthermore, the greater reduction in pain scores in the intervention group may be attributed to the synergistic effect of combined therapeutic strategies, which likely addressed multiple dimensions of pain, including inflammation, joint function, and patient adherence to treatment. These results are consistent with the growing body of evidence supporting multimodal approaches in chronic pain management, particularly in inflammatory arthropathies.

In addition, the reduction of pain to near-mild levels (VAS score ~2.8) in the intervention group indicates a transition from severe pain at baseline to manageable pain levels post-intervention. This has significant implications for improving patient's functional ability, daily activities, and overall quality of life. Conversely, the control group, despite showing improvement, remained within the moderate pain range, suggesting incomplete pain control.

3.3 Effect on Health-Related Quality of Life

Quality of life (QoL) is a crucial outcome measure in chronic diseases such as gouty arthritis, as it reflects the overall physical, mental and social well-being of patients. In the present study, QoL was assessed using the Short Form-36 (SF-36) questionnaire, a widely validated and comprehensive tool that evaluates both physical and mental health components. The SF-36 score ranges from 0 to 100, with higher scores indicating better quality of life.

At baseline, the mean SF-36 scores of the intervention group (42.5 ± 6.3) and the control group (43.1 ± 5.8) were found to be comparable. Statistical analysis showed no significant difference between the two groups ($p > 0.05$), indicating homogeneity in quality of life prior to the initiation of the intervention. This similarity at baseline ensures that both groups were equivalent in terms of their initial health status, thereby strengthening the internal validity of the study. It also confirms that any observed changes in post-intervention QoL can be attributed primarily to the effect of the intervention rather than pre-existing differences.

Following the 6-month intervention period, a substantial improvement in SF-36 scores was observed in both groups; however, the degree of improvement varied significantly between them. The intervention group exhibited a marked and statistically highly significant increase in overall SF-36 score from 42.5 ± 6.3 at baseline to 72.8 ± 5.9 post intervention ($p < 0.001$). This represents an approximate 71% improvement from baseline, indicating a profound enhancement in patients' overall quality of life.

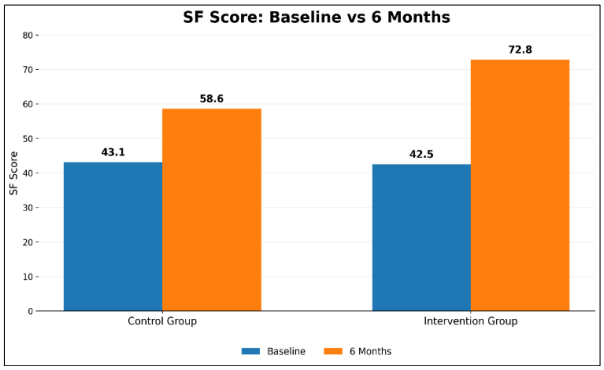

Figure 2. SF-36 scores at baseline and after 6 months.

The improvement observed in the intervention group encompassed both the physical and mental health domains of the SF-36. Patients reported better physical functioning, reduced bodily pain, improved role limitations due to physical health, and enhanced general health perception. Additionally, significant gains were noted in mental health parameters, including emotional well-being, social functioning, and vitality. This suggests that the intervention not only addressed the physical symptoms of gouty arthritis but also positively influenced psychological and social aspects of health. In contrast, the control group also demonstrated an improvement in SF-36 scores, increasing from 43.1 ± 5.8 at baseline to 58.6 ± 6.4 after 6 months. This change was statistically significant ($p < 0.05$); however, the magnitude of improvement was moderate, corresponding to approximately a 36% increase from baseline. While standard treatment and routine care contributed to some enhancement in quality of life, the improvement was notably less pronounced compared to the intervention group.

4. DISCUSSION

The principal finding was the greater improvement in both pain intensity and health-related quality of life among participants receiving the multimodal intervention. Mean VAS pain decreased from 7.2 ± 1.1 to 2.8 ± 1.0 in the intervention group, compared with 7.0 ± 1.3 to 4.9 ± 1.2 in the control group; the between-group difference was highly significant ($p < 0.001$). This finding is clinically relevant because pain is a major determinant of functional limitation and health-related quality of life in gout [26,27].

The greater reduction in pain is consistent with the rationale for combining pharmacological treatment with rehabilitation and behavioural strategies. Urate-lowering and anti-inflammatory treatment address core disease mechanisms, while physical rehabilitation, dietary counselling and self-management strategies target functional and behavioural contributors. The present findings should therefore be interpreted as the effect of a coordinated care package rather than evidence for the superiority of any single component. Current gout recommendations similarly emphasize individualized urate-lowering therapy, flare management, lifestyle measures and patient education [28-30].

The SF-36 results indicate that the benefit extended beyond pain intensity. Scores increased from 42.5 ± 6.3 to 72.8 ± 5.9 in the intervention group, compared with 43.1 ± 5.8 to 58.6 ± 6.4 in the control group, with a significant between-group difference ($p < 0.001$). This is important because gout affects physical functioning and broader health-related quality of life, and SF-36 is among the most frequently used generic measures in gout research [23,27]. Recent evidence also indicates that patient-reported health status can improve with effective urate-lowering treatment [31].

The control group also improved in both outcomes, although the magnitude of change was smaller. This is consistent with the established effectiveness of conventional pharmacological management and routine supportive care. The between-group findings therefore suggest an incremental benefit from coordinated multimodal management rather than a lack of efficacy of standard treatment. Non-pharmacological interventions have also been shown to influence pain and quality of life in people with gout [32,33].

The findings support a patient-centred model in which medication management is combined with repeated education, adherence support, lifestyle counselling and functional rehabilitation. For pharmacy practice, this provides opportunities for medication review, identification of drug-related problems, reinforcement of adherence and monitoring of treatment tolerability. Importantly, pain and quality of life can be incorporated into follow-up alongside serum urate and flare history, consistent with contemporary treat-to-target care [28,31].

The study has several limitations. It was conducted at a single tertiary-care centre, included 100 participants and followed patients for six months. The multimodal intervention also prevents separation of the independent effects of its individual components. Outcomes were predominantly self-reported, and the available analysis did not provide confidence intervals or objective adherence measures. Future multicentre trials should use standardized intervention protocols, longer follow-up, predefined adherence measures, serum urate and flare outcomes, and effect estimates with 95% confidence intervals. Reporting of allocation and participant flow should follow CONSORT principles [25].

5. CONCLUSION

Larger multicentre studies with longer follow-up and standardized intervention components are warranted to confirm the durability, generalizability and component-specific contribution of this approach.

In this prospective randomized controlled study, a six-month multimodal intervention produced greater reductions in pain and greater improvements in health-related quality of life than conventional care among patients with chronic gouty arthritis. The findings support integrating pharmacological management with structured rehabilitation, lifestyle counselling and patient-centred self-management rather than relying on pharmacotherapy alone.

Conflict of Interest: The authors declare no conflict of interest.

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