RESEARCH PAPER

# Comparative Evaluation of Analgesic Therapy in the Management of Pain and Functional Disability in Patients with Early Knee Osteoarthritis

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**ABSTRACT**
**Background:** Early knee osteoarthritis (KOA) is associated with pain, stiffness, and functional disability that can interfere with daily activities and quality of life. Analgesic therapy is commonly used to relieve symptoms; however, its comparative effectiveness and tolerability may vary across treatment regimens.
**Objective:** To comparatively evaluate the effectiveness of different analgesic regimens in reducing pain and improving functional disability among patients with early knee osteoarthritis.
**Methods:** A prospective, comparative, observational study was conducted among 100 patients with early knee osteoarthritis attending the Department of Orthopedics, MNR Hospital, Fasalwadi, Sangareddy, Telangana, India. Patients received analgesic therapy according to routine clinical practice. Demographic and clinical characteristics, prescribed medications, treatment adherence, and adverse events were documented. Pain intensity was assessed using the Visual Analogue Scale (VAS), while functional disability was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Changes in outcome scores between baseline and follow-up were planned for statistical analysis, with $p < 0.05$ considered statistically significant.
**Conclusion:** This study provides a framework for evaluating the comparative effectiveness and tolerability of analgesic regimens in early knee osteoarthritis. Final conclusions regarding treatment superiority require analysis of the observed VAS and WOMAC scores and documented safety outcomes.
**Keywords:** Knee osteoarthritis; analgesics; pain management; Visual Analogue Scale; WOMAC; functional disability.
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## INTRODUCTION

Knee osteoarthritis (KOA) is a progressive musculoskeletal disorder characterized by structural and functional alterations involving articular cartilage, subchondral bone, synovium, and other components of the knee joint. It represents a major cause of chronic pain and mobility-related disability, particularly among middle-aged and older adults [1,2]. The clinical burden of KOA extends beyond joint symptoms because persistent pain and impaired mobility can restrict daily activities, reduce participation in physical exercise, and adversely affect health-related quality of life [3].

Early knee osteoarthritis (EKOA) represents an important stage of the disease in which patients may experience activity-related pain, stiffness, and early functional limitations despite relatively modest structural abnormalities [4]. Intervention during this stage is clinically relevant because adequate symptom management may help patients maintain mobility, preserve muscle strength, and continue routine physical activities. Pain is particularly important in this context, as increasing discomfort may lead to avoidance of movement, reduced physical activity, muscle weakness, and subsequent deterioration of functional capacity [5].

Pharmacological pain management remains an integral component of conservative treatment for symptomatic KOA. Commonly employed therapeutic options include paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs), cyclooxygenase-2 (COX-2) selective inhibitors, topical NSAIDs, and other adjunctive analgesic agents [6]. Although these therapies are primarily intended to reduce pain, they differ in their mechanisms of action, magnitude of clinical response, tolerability, and potential for adverse effects. Consequently, analgesic

## MATERIALS AND METHODS

### Study Design and Setting

A prospective, comparative, observational study was conducted to assess the effectiveness of analgesic

therapy in reducing pain and improving functional disability among patients diagnosed with early knee osteoarthritis. The study was carried out in the Department of Orthopedics, MNR Hospital, Fasalwadi, Sangareddy, Telangana, India. Patients attending the Orthopedics outpatient department during the specified study period were screened for eligibility and enrolled according to the predefined inclusion and exclusion criteria.

**Study Population and Sample Size**

A total of **100 patients (n = 100)** diagnosed with early knee osteoarthritis were included in the study. Patients who satisfied the eligibility criteria and provided written informed consent were enrolled. Relevant demographic, clinical, and treatment-related information was collected using a structured patient data collection form.

**Inclusion Criteria**

Adult patients diagnosed with early knee osteoarthritis on the basis of clinical assessment and available radiological findings were considered eligible. Patients presenting with knee pain requiring analgesic treatment, having sufficient ability to participate in pain and functional assessments, and providing written informed consent were included.

**Exclusion Criteria**

Patients with advanced knee osteoarthritis, rheumatoid arthritis, gout or other inflammatory joint diseases, previous major knee surgery, significant recent knee trauma, or neurological and musculoskeletal disorders that could independently influence lower-limb function were excluded. Patients with known contraindications to the prescribed analgesics, pregnant or lactating women, and patients unable to complete the required follow-up assessments were also excluded.

**Clinical Assessment**

At enrollment, demographic and clinical information including age, sex, body mass index, duration of knee pain, affected knee, duration of osteoarthritis, associated medical conditions, concomitant medications, and previous treatment history was documented. Clinical examination of the affected knee was performed, and available radiographic findings were reviewed to determine the stage of osteoarthritis.

**Analgesic Therapy**

Analgesic treatment was prescribed by the treating orthopedic physician according to the patient's clinical condition and routine clinical practice. Patients were categorized according to the analgesic regimen received to facilitate comparative evaluation. Information regarding the drug prescribed, dose, route of administration, frequency, duration of treatment, and concomitant medications was documented throughout the study.

**Assessment of Pain**

Pain severity was assessed using the Visual Analogue Scale (VAS). Patients rated their knee pain on a numerical scale ranging from 0 to 10, where 0 indicated the absence of pain and 10 represented the worst imaginable pain. VAS scores were recorded at baseline and at the predetermined follow-up assessment. The reduction in VAS score from baseline was considered an indicator of improvement in pain.

**Assessment of Functional Disability**

Functional impairment was assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). The instrument evaluated the principal domains of pain, stiffness, and physical function associated with knee osteoarthritis. WOMAC scores were recorded at baseline and following treatment. Changes in the overall score and individual domains were used to determine the extent of functional improvement associated with analgesic therapy.

**Outcome Measures**

The primary outcome measures were reduction in pain intensity and improvement in functional disability following analgesic treatment. Changes in VAS and WOMAC scores between baseline and follow-up were used to determine therapeutic effectiveness. Secondary outcomes included treatment tolerability, adherence, and the occurrence of suspected adverse drug reactions.

**Safety Assessment**

Patients were monitored for adverse effects associated with analgesic therapy during the study period. Any gastrointestinal, renal, cardiovascular, hypersensitivity, neurological, or other suspected treatment-related adverse events were documented. The nature, severity, management, and clinical outcome of reported adverse reactions were recorded whenever applicable.

**Ethical Considerations**

The study was conducted after obtaining approval from the Institutional Ethics Committee of MNR Hospital/MNR College of Pharmacy, Sangareddy, Telangana, India. Written informed consent was obtained from all participants before enrollment. Patient confidentiality was maintained throughout data collection, analysis, and reporting. The study was performed in accordance with applicable ethical principles for research involving human participants.

**Statistical Analysis**

The collected data were entered into Microsoft Excel and subsequently analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Changes in VAS and WOMAC scores from baseline to follow-up were assessed using an appropriate paired statistical test. Comparisons between independent analgesic treatment groups were performed

using the independent Student's t-test or an appropriate non-parametric equivalent. When more than two treatment groups were compared, analysis of variance (ANOVA) was applied where the assumptions for parametric analysis were satisfied. Categorical variables were evaluated using the chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

## RESULTS

### Pain intensity during the early postoperative period

pain scores were lower in the NSAID-treated group than in the group managed without NSAIDs. At 24 hours, the mean visual analogue scale (VAS) score was 1.8 ± 0.6 in the NSAID group compared with 2.8 ± 1.3 in the non-NSAID group (p = 0.001). At 48 hours, the corresponding values were 1.3 ± 0.5 and 2.1 ± 0.7 (p < 0.001), while at 72 hours they were 0.9 ± 0.5 and 1.8 ± 0.6 (p < 0.001). These findings indicate better early postoperative pain control with the NSAID-containing regimen in that surgical population.

| Postoperative time | NSAID group (mean ± SD) | Non-NSAID group (mean ± SD) | Reported significance |
|---|---|---|---|
| 24 hours | 1.8 ± 0.6 | 2.8 ± 1.3 | p = 0.001 |
| 48 hours | 1.3 ± 0.5 | 2.1 ± 0.7 | p < 0.001 |
| 72 hours | 0.9 ± 0.5 | 1.8 ± 0.6 | p < 0.001 |

### Functional outcomes during follow-up

The study reported a higher mean clinical KSS in the NSAID group at one month (63.4 ± 4.4) than in the non-NSAID group (58.5 ± 5.5), with a statistically significant difference (p = 0.0005). Differences in clinical KSS were not statistically significant at three months (76.1 ± 3.8 versus 74.9 ± 2.9; p = 0.1873) or six months (93.3 ± 2.9 versus 91.7 ± 3.0; p = 0.0556). Functional KSS values also did not differ significantly between groups at one, three, or six months.

| Assessment | NSAID group (mean ± SD) | Non-NSAID group (mean ± SD) | p-value |
|---|---|---|---|
| Clinical KSS, 1 month | 63.4 ± 4.4 | 58.5 ± 5.5 | 0.0005 |
| Clinical KSS, 3 months | 76.1 ± 3.8 | 74.9 ± 2.9 | 0.1873 |
| Clinical KSS, 6 months | 93.3 ± 2.9 | 91.7 ± 3.0 | 0.0556 |
| Functional KSS, 1 month | 45.7 ± 6.0 | 42.8 ± 7.2 | 0.1024 |
| Functional KSS, 3 months | 71.8 ± 6.7 | 69.3 ± 6.4 | 0.1593 |
| Functional KSS, 6 months | 93.9 ± 5.0 | 92.3 ± 5.0 | 0.2305 |

### Oxford Knee Score findings

The mean OKS was higher in the NSAID group at one month (28.0 ± 1.3) than in the non-NSAID group (26.8 ± 0.6; p = 0.00002). A similar difference was reported at three months (38.3 ± 1.7 versus 36.6 ± 1.0; p = 0.00003). At six months, the group means were 45.7 ± 1.2 and 46.2 ± 0.9, respectively, and the difference was not statistically significant (p = 0.08081). Thus, the between-group difference observed earlier was not maintained at the six-month assessment.

| Assessment | NSAID group (mean ± SD) | Non-NSAID group (mean ± SD) | p-value |
|---|---|---|---|
| OKS, 1 month | 28.0 ± 1.3 | 26.8 ± 0.6 | 0.00002 |
| OKS, 3 months | 38.3 ± 1.7 | 36.6 ± 1.0 | 0.00003 |
| OKS, 6 months | 45.7 ± 1.2 | 46.2 ± 0.9 | 0.08081 |

## DISCUSSION

Knee osteoarthritis is associated with persistent pain, stiffness, and limitations in physical function. The clinical value of analgesic treatment should therefore be considered not only in terms of pain reduction, but also in relation to functional improvement, tolerability, and the patient's ability to maintain everyday activities. Examined analgesic outcomes in patients undergoing total knee arthroplasty and reported lower postoperative VAS scores in the group receiving an NSAID-containing regimen than in the group treated without NSAIDs. The reported differences were present at 24, 48, and 72 hours after surgery, suggesting better pain control during the immediate postoperative period with the NSAID-containing regimen. The study also reported between-group differences in selected early functional assessments. However, most differences in Knee Society Score outcomes were not statistically significant at later follow-up, and the Oxford Knee Score difference seen at one and three months was not statistically significant at six months.

These findings provide background evidence that the contribution of NSAIDs to multimodal analgesia may vary according to the outcome measured and the time point assessed. Nevertheless, the findings should not be transferred directly to patients with early knee osteoarthritis who have not undergone surgery. Postoperative pain after arthroplasty differs in its origin, intensity, and clinical course from the chronic or

activity-related symptoms commonly experienced in early KOA. In addition, the external study used the Knee Society Score and Oxford Knee Score, whereas the present study protocol specifies the Visual Analogue Scale (VAS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). These instruments assess related but non-identical outcomes.

The present manuscript describes a 100-patient prospective comparative observational study at MNR Hospital, Fasalwadi, Sangareddy. Because the actual baseline and follow-up VAS and WOMAC data for these 100 participants were not supplied in the document, it is not appropriate to state that one analgesic regimen was superior in the present cohort or to assign numerical improvements or statistical significance. The final interpretation should be based on the study's own analyzed data, including between-group changes in VAS and WOMAC, treatment adherence, and recorded adverse events. As treatment was prescribed during routine clinical practice rather than randomly allocated, potential differences in baseline characteristics and prescribing decisions should also be considered when interpreting any observed group differences.

## CONCLUSION

Reported better pain control during the first 72 hours in patients receiving an NSAID-containing analgesic regimen, while several functional differences were not sustained or were not statistically significant at later follow-up [16]. These findings may inform the background discussion of analgesic therapy but cannot establish the comparative effectiveness of analgesics in early knee osteoarthritis. For the present 100-patient study, a defensible conclusion must be drawn from the observed changes in VAS and WOMAC scores, together with treatment tolerability and adverse-event data. Until those results are inserted and analyzed, no specific analgesic regimen should be declared superior for this cohort.

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