

Original Research Article

Evaluation of drug utilization and prescribing practices in osteoarthritis patients: insights from a prospective observational study

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ABSTRACT

Background: Osteoarthritis (OA) is a common chronic musculoskeletal disorder associated with pain, disability, and frequent medication use. Objective of the study was to evaluate prescribing patterns, WHO prescribing indicators, comorbidities, and treatment practices in OA patients.

Methods: A six-month prospective observational study included 270 OA patients at a tertiary care hospital in Gujarat, India. Demographic, clinical, and prescribing data were analyzed using WHO prescribing indicators and two-way ANOVA.

Results: Females constituted 73.7% of patients, and knee OA was most common (90.7%). Combination therapy (66.2%) was prescribed more often than monotherapy. Oral NSAIDs were the most frequently used drugs, followed by tramadol-acetaminophen. Hypertension was the leading comorbidity. BMI and comorbidities were significantly associated with OA severity ($p=0.0091$ and $p=0.0003$, respectively). Generic prescribing (3.62%) and essential medicine use (4.69%) were low.

Conclusions: NSAIDs remain the primary treatment, but high polypharmacy and poor adherence to rational prescribing indicators emphasize the need for guideline-based prescribing to improve patient outcomes.

Keywords: Osteoarthritis, Prescribing patterns, Drug utilization, Polypharmacy, NSAIDs, WHO prescribing indicators, Rational drug use

INTRODUCTION

Osteoarthritis (OA) is the most common musculoskeletal disorder. It is characterized by degeneration of cartilage in joints. It primarily affects joints such as knees, hips, spine, hands, shoulders and others. The OA involve progressive destruction of articular cartilage and entire diarthrodial joint, including articular cartilage, synovial, capsule and subchondral bone, with surrounding ligaments and muscles. OA presents with a constellation of symptoms, including joint pain, tenderness, limited mobility, stiffness,

joint instability and disability affecting overall quality of life.¹⁻⁴

The pathogenesis of OA involves complex interactions between mechanical stress, inflammatory mediators, and metabolic factors, leading to cartilage breakdown and structural joint changes.^{2,3} Several risk factors, including aging, obesity, genetic predisposition, and previous joint injury, contribute to disease development and progression.^{2,3,8} In addition, osteoarthritis frequently coexists with comorbid conditions such as hypertension

and diabetes mellitus, which can further complicate management.⁵⁻⁷

Pharmacological management of OA is primarily aimed at symptom relief and improvement of functional status.^{9,10} Commonly used medications include acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, and intra-articular corticosteroids.^{3,9,10} However, long-term use of multiple medications often results in polypharmacy, increasing the risk of adverse drug reactions, drug interactions, and economic burden on patients.¹¹⁻¹³

Drug utilization studies play a crucial role in evaluating prescribing trends, identifying irrational drug use, and promoting evidence-based practice.¹²⁻¹⁴ Assessing prescribing patterns in relation to established guidelines and essential medicine lists is important for ensuring rational therapy and optimizing patient outcomes.^{9,13,15}

Objectives

Primary objective of the study was to evaluate the prescribing patterns of drugs used in the management of osteoarthritis in a tertiary care setting.

Secondary objectives were to assess drug utilization using WHO prescribing indicators, to analyze the prevalence and pattern of comorbidities among osteoarthritis patients, to evaluate the association between demographic factors (age, gender, BMI) and prescribing patterns, to examine adherence of prescribed therapy to established clinical guidelines, to assess the utilization of drugs listed in the National List of Essential Medicines (NLEM), and to evaluate changes in medication usage in patients undergoing surgical intervention.

METHODS

Study design and setting

A prospective observational study was conducted in the Department of Orthopedics at a tertiary care hospital in Borsad, Gujarat, India. The study was carried out over a period of six months after obtaining approval from the Institutional Ethics Committee.

Study population and sample size

A total of 270 patients diagnosed with osteoarthritis were included in the study. The sample size was determined using the formula given, with a 95% confidence level and 5% margin of error.

$$n = Z^2pq/E^2$$

Inclusion criteria

Patients aged 18 years and above diagnosed with osteoarthritis, receiving treatment in the study setting, with

complete prescription and clinical data, and patients willing to participate in the study were included.

Exclusion criteria

Patients with incomplete medical records, with other forms of arthritis (non-osteoarthritis), pregnant women, and patients with contraindications to standard OA therapy were excluded.

Data collection

Data were collected using a structured case record form. The following information was recorded: demographic details (age, gender, BMI), clinical characteristics (affected joint, disease stage), comorbid conditions, prescribed medications including drug name, class, route, and therapy type, and pre- and post-operative medication details (where applicable).

Drug utilization evaluation

Drug utilization was assessed using WHO prescribing indicators, including: average number of drugs per encounter, percentage of drugs prescribed by generic name, percentage of encounters with antibiotics, percentage of encounters with injections, and percentage of drugs prescribed from the essential medicines list.

Comparative assessment

Prescribing patterns were evaluated with reference to established clinical guidelines (ACR) and the National List of Essential Medicines (NLEM) to assess alignment with recommended practices.

Statistical analysis

Data were analyzed using descriptive and inferential statistics. Two-way ANOVA was applied to assess associations between variables such as age, BMI, comorbidities, and prescribing patterns. Tukey's post-hoc test was used for multiple comparisons. A p value <0.05 was considered statistically significant.

RESULTS

Demographic characteristics

A total of 270 patients with osteoarthritis were included in the study. Females constituted the majority (73.7%, n=199), while males accounted for 26.3% (n=71). The highest proportion of patients belonged to the 40–59 years age group (52.6%, n=142), followed by ≥60 years (34.44%, n=93) and 18–39 years (12.96%, n=35). Regarding body mass index (BMI), 42.96% (n=116) of patients had normal BMI, while 31.11% (n=84) were overweight and 23.71% (n=64) were obese. Underweight individuals accounted for 2.22% (n=6).

Table 1: Demographic characteristics of study population.

Characteristics	Number (N)	Percentage (%)
Gender distribution		
Male	71	26.3
Female	199	73.7
Total	270	100
Age-wise distribution (years)		
18-39	35	12.96
40-59	142	52.6
≥60	93	34.44
Total	270	100
BMI-wise distribution		
Underweight (<18.5)	6	2.22
Normal (18.5-24.9)	116	42.96
Overweight (25-29.9)	84	31.11
Obese class I (30-34.9)	43	15.93
Obese class II (35-39.9)	16	5.93
Obese class III (≥40)	5	1.85
Total	270	100

Comorbidity distribution

Comorbid conditions were present in 25.19% (n=68) of patients, while 74.81% (n=202) had no comorbidities. Among patients with comorbidities, hypertension was the most common (36.23%, n=25), followed by type II diabetes mellitus (17.38%, n=12). The most frequent comorbidity combination was hypertension with diabetes mellitus (17.39%, n=11).

Joint involvement

Knee osteoarthritis was the most prevalent, affecting 90.73% (n=245) of patients. Among these, 47.4% (n=126) had early-stage disease and 43.33% (n=117) had advanced-stage disease. Other joints such as hip, shoulder, ankle, wrist, foot, hand, and elbow were less frequently involved.

Drug utilization pattern

It is represented in Table 4.

Pharmaceutical formulations by route of administration

A total of 1,299 drugs were prescribed. Oral formulations accounted for the majority (91.5%, n=1188), followed by injectable (5.98%, n=76) and topical (2.52%, n=35) preparations.

Monotherapy versus combination therapy distribution

The average number of drugs per prescription was 5.17, indicating polypharmacy. Combination therapy was

prescribed in 66.15% (n=179) of patients, whereas monotherapy was used in 33.85% (n=91).

Table 2: Comorbidity distribution in study population.

Comorbidity status	Number (N)	Percentage (%)
Overall comorbidity prevalence		
Patients with comorbidities	68	25.19
Patients without comorbidities	202	74.81
Total	270	100
Single comorbidities (n=49)		
Hypertension	25	36.23
Diabetes mellitus type II	12	17.38
Hypothyroidism	5	7.25
Asthma	2	2.9
Rheumatoid arthritis	2	2.9
COPD	1	1.45
Cerebrovascular stroke	1	1.45
Spondylosis	1	1.45
Multiple comorbidities (n=19)		
HTN + DM type II	11	17.39
DM type II + RA	3	4.35
DM type II + hypothyroidism	1	1.45
HTN + RA	1	1.45
HTN + DM type II + IHD	1	1.45
HTN + hypothyroidism	1	1.45
HTN + Parkinson's disease	1	1.45

Table 3: Joint involvement distribution.

Affected joint	Number (N)	Percentage (%)
Knee (early stage)	126	47.4
Knee (advanced stage)	117	43.33
Hip	9	3.33
Shoulder	6	2.23
Ankle	3	1.11
Wrist	3	1.11
Foot	2	0.74
Hand	2	0.74
Elbow	2	0.74
Total	270	100

Monotherapy NSAIDs distribution

Among NSAID monotherapy (n=274), Etoricoxib was the most commonly prescribed drug (59.8%), indicating a strong preference for COX-2 selective agents due to better safety. This was followed by Diclofenac + Paracetamol + Serratiopeptidase (13.5%), while Naproxen (9.45%) and Paracetamol (8.76%) showed moderate use. Other NSAIDs were prescribed less frequently.

Combination NSAIDs distribution

In combination therapy (n=260), Tramadol + Acetaminophen predominated (74.23%), reflecting a preference for multimodal analgesia in moderate to severe pain. Other combinations such as Methocarbamol + Paracetamol (6.54%) and Aceclofenac + Thiocolchicoside (3.08%) were used less commonly.

Table 4: Drug utilization pattern.

Parameters	Number (N)	Percentage (%)
Route of administration		
Oral	1188	91.5
Injectable	76	5.98
Topical	35	2.52
Total	1299	100
Therapy type		
Monotherapy	91	33.85
Combination therapy	179	66.15
Total	270	100
NSAID monotherapy agent		
Etoricoxib	164	59.8
Diclofenac-Paracetamol-Serratiopeptidase	37	13.5
Naproxen Sodium	26	9.45
Paracetamol	24	8.76
Piroxicam	10	3.65
Lornoxicam	5	1.82
Etodolac	4	1.46
Ketorolac	3	1.5
Indomethacin	1	0.36
Total	274	100
Combination therapy		
Tramadol-Acetaminophen	193	74.23
Methocarbamol-Paracetamol	17	6.54
Aceclofenac-Thiocolchicoside	8	3.08
Tramadol-Diclofenac	2	0.77
Rabeprazole-Acetaminophen	2	0.77
Other combinations	28	14.61
Total	260	100

WHO prescribing indicators

It is represented in Table 5.

Steroid utilization in knee osteoarthritis

There is a high dependence on steroids for knee OA management, particularly targeting inflammation in weight-bearing joints.

This raises concerns regarding potential long-term adverse effects.

Nutritional supplementation pattern

Supplementation practices emphasize bone health in females, especially in middle age. However, the low use of vitamin D (cholecalciferol) suggests a possible gap in comprehensive management.

Table 5: WHO prescribing indicators.

S. no.	Parameters	Indications
1	Average number of drugs prescribed per encounter	5-6
2	Percentage of encounter with an antibiotic prescribed	1.23%
3	Percentage of drugs prescribed by generic name	3.62%
4	Percentage of encounter with an injection prescribed	6.4%
5	Percentage of drugs prescribed from essential drug list or formulary	4.69%

Table 6: Steroid utilization in knee osteoarthritis.

Parameters	Value
Oral steroid use	90% (knee OA cases)
Injectable steroid use	83.07% (knee OA cases)
Commonly used steroid	Methylprednisolone

Table 7: Nutritional supplementation pattern.

Parameters	Value
Calcium-vitamin supplementation	Higher than cholecalciferol
Female prescriptions	36
Male prescriptions	12
Most affected age group	40-59 years
Cholecalciferol prescriptions	7

Comparison with ACR guidelines

The predominance of oral NSAIDs (43.42%) aligns with ACR first-line recommendations. However, several deviations were noted: underutilization of topical NSAIDs (2.52% versus recommended first-line for elderly and GI-comorbid patients), high prevalence of combination therapy (66.15% versus recommended sequential monotherapy escalation), and limited use of alternative agents like duloxetine (2.7%) for knee OA despite ACR recommendations.

Statistical analysis of study variables

Two-way ANOVA demonstrated a significant association between BMI and stages of knee OA ($p=0.0091$). A significant association was also observed between comorbidities and disease severity ($p=0.0003$).

Additionally, variation in drug class prescribing across age groups was statistically significant ($p=0.0024$).

Table 8: Comparison with ACR guidelines.

Drugs according to ACR	No. of drugs used in hospital	Percentage (%)
Topical NSAIDs	35	5.55
Oral NSAIDs	274	43.42
IA glucocorticoid inj.	65	10.3
Duloxetine	17	2.7
Colchicine	11	1.74
Vit. D	7	1.11
Hydroxychloroquine	1	0.16
Methotrexate	4	0.63
Tramadol	0	0
Acetaminophen	24	3.8
Tramadol + acetaminophen	193	30.59

Table 9: Statistical analysis of study variables.

Parameters analyzed	Statistic-al test	P value	Interpreta-tion
BMI versus stages of knee OA	Two-way ANOVA	0.0091	Significant association observed
Comorbidities versus disease severity	Two-way ANOVA	0.0003	Highly significant association
Drug class versus age groups	Two-way ANOVA	0.0024	Significant variation across age groups

DISCUSSION

The present study showed a higher prevalence of OA among females (73.7%) than males (26.3%), which is consistent with the findings of Ummat et al. OA was most common in the 40–59 years age group, supporting previous reports that OA prevalence increases with age.¹⁶ Comorbidities were present in 25.19% of patients, which was lower than the 65.6% reported by Shah et al. Similar to Marshall et al, hypertension and type II diabetes mellitus were the most common comorbidities, highlighting the association between OA and metabolic disorders.^{2,5} The knee was the most frequently affected joint, accounting for approximately 90% of cases, comparable to the 87.33% prevalence reported by Ummat et al, confirming that OA predominantly affects weight-bearing joints.¹⁶

Oral administration was the preferred route of drug delivery (91.5%), higher than that reported by Abhilash et al. Polypharmacy was common, with five-drug prescriptions being most frequent, consistent with the findings of Shah et al.¹¹ NSAIDs prescribing patterns differed from previous studies. While Ummat et al.

reported acetaminophen and diclofenac as the most commonly prescribed drugs, etoricoxib was the predominant NSAID in the present study. Tramadol + acetaminophen was the most commonly prescribed combination therapy, indicating a preference for multimodal pain management.¹⁶

Statistical analysis demonstrated significant associations between drug classes and age groups, BMI and stages of knee OA, and comorbidities and disease severity. Evaluation of WHO prescribing indicators revealed low generic prescribing and limited use of essential medicines, indicating a need for improved rational prescribing practices. Surgical intervention was associated with reduced medication requirements in selected patients.

CONCLUSION

This study provides important insights into prescribing practices and drug utilization patterns in osteoarthritis management at a tertiary care center. The findings indicate that NSAIDs are the most frequently used medications, with a high prevalence of combination therapy and polypharmacy.

The observed associations between BMI, comorbidities, and disease severity highlight the need for a comprehensive approach to patient management. However, the low rate of generic prescribing and limited use of essential medicines suggest suboptimal adherence to rational prescribing principles.

The results emphasize the importance of promoting guideline-based therapy, minimizing unnecessary polypharmacy, and encouraging cost-effective prescribing practices. Optimizing these aspects can improve treatment outcomes, reduce medication-related risks, and enhance overall quality of care in osteoarthritis patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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