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Comprehensive Analysis of Prescription Management in Rheumatoid Arthritis and Osteoarthritis: A Prospective Observational Study.

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ABSTRACT

Objective: This study seeks to conduct a comprehensive analysis of prescription management for rheumatoid arthritis (RA) and osteoarthritis (OA), revealing prevalent prescription patterns, drug classes, and adherence to WHO guidelines.

Method: A prospective observational study conducted at the Department of Orthopedics in MMISR Hospital, Mullana, Ambala, over six months, involved 100 patients diagnosed with either RA or OA, aged 20 to 80 years. Excluded were patients below 20 and above 80 years, pregnant or lactating women, and those receiving alternative arthritic therapies. Data collected included gender, age, disease symptoms, and drug class, analyzed using the WHO prescription pattern.

Result: The study comprised 36% RA patients and 64% OA patients. For RA patients, Disease-Modifying Antirheumatic Drugs (DMARDs) were frequently prescribed, with a combination of sulfasalazine and methotrexate being the most common. Conventional DMARDs and NSAIDs were also prescribed. OA patients received prescriptions for NSAIDs, vitamin-mineral supplements, and Undenatured Collagen Type 2. WHO prescription analysis revealed 547 drugs prescribed, including 137 over-the-counter drugs, 76 generic drugs, 471 brand-name drugs, 8 injections, and a 44.05% prescription rate from the essential drug list.

Conclusion: This study sheds light on prevalent prescription patterns for rheumatoid arthritis (RA) and osteoarthritis (OA), emphasizing the frequent use of Disease-Modifying Antirheumatic Drugs (DMARDs) in RA management and the various drug classes prescribed for both conditions, providing valuable insights into adherence to WHO prescription guidelines.

Keywords: Rheumatoid Arthritis, Osteoarthritis, Disease- modifying antirheumatic drugs, world Health Organization Tools.

INTRODUCTION

A prescription is not just a clinical directive; it embodies the art of conveying a physician's approach to treating an ailment and the role of medication. It offers insights into the fundamental principles of healthcare delivery, encompassing the examination and assessment of prescription drug patterns, trends, and statistics by healthcare practitioners, researchers, and academic organizations to comprehend various facets of prescriptions and their impact on patients' well-being, public health, and the broader healthcare system [1][2].

Rheumatoid Arthritis, an autoimmune inflammatory joint disease affecting symmetrical joints, is marked by synovial inflammation leading to joint swelling, stiffness, tenderness, and bone erosion [3][4].

Clinical manifestations vary across stages and encompass symptoms like morning stiffness, pain, joint tenderness, fatigue, swelling, and warmth [5]. The Disease Activity Score with 28-joint count (DAS28) method is commonly employed to assess disease severity, [6] especially in rheumatoid arthritis cases. It involves evaluating 28 joints (10 PIPs, 10 MCPs, 2 wrists, 2 elbows, 2 shoulders, and 2 knees) alongside relevant laboratory data to aid healthcare professionals in understanding disease activity and tailoring treatment plans accordingly [7].

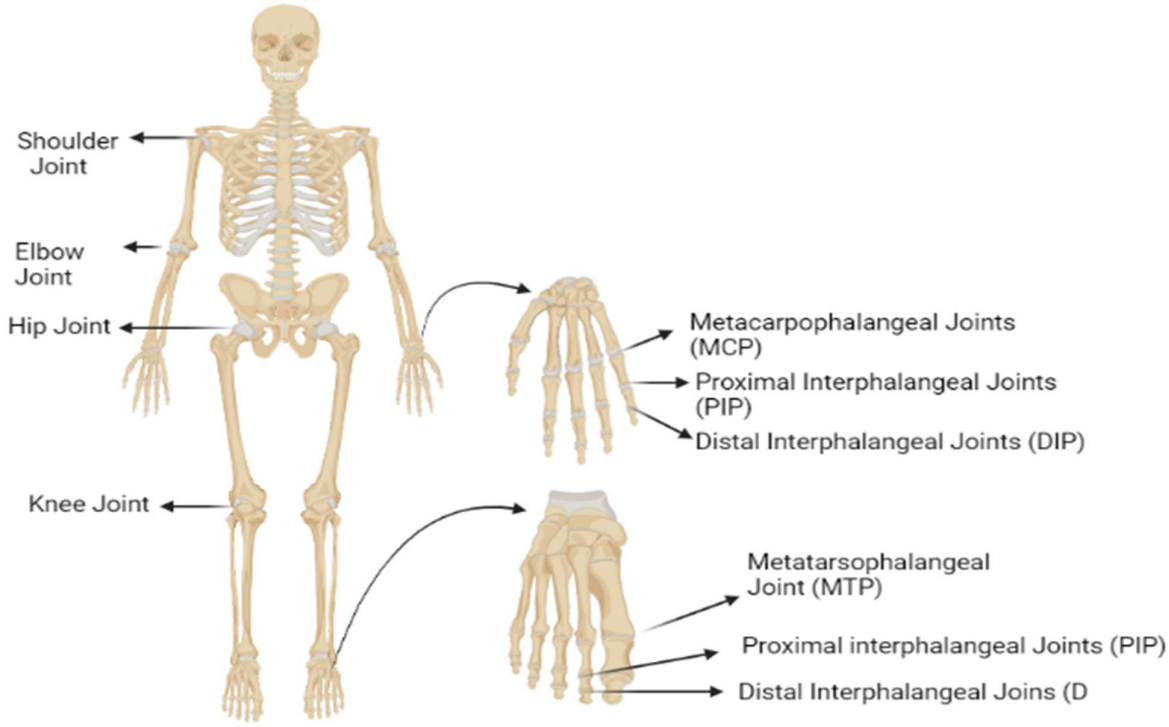

Fig. 1. Demonstrate the joints are involving in the Das 28 scoring. And these joints involving the affecting of patients.

Osteoarthritis is a prevalent degenerative condition characterized by articular cartilage loss, increased bone density near joint borders, subchondral sclerosis, and a variety of biochemical and morphological changes within the synovial membrane and joint capsule. In its advanced stages, osteoarthritis presents evidence of articular surface ulceration, entailing softening and localized disintegration [8]. The most commonly affected joints are the knees and spinal joints, which are typically large and weight-bearing. Symptoms include sharp pain, swelling, and mobility challenges. Diagnosis relies on radiological examinations, such as X-rays and MRIs, while classification is often based on the Kellgren and Lawrence grading system, consisting of five grades:

- Grade 0 (none): No X-ray findings indicative of osteoarthritis.

- Grade 1 (doubtful): Possible osteophyte formation and uncertain joint space narrowing.

- Grade 2 (mild): Presence of osteophytes and potential joint space restriction.

- Grade 3 (moderate): Significant osteoarthritis with evident joint space reduction, some sclerosis, and potential bone end deformities.

- Grade 4 (severe): Prominent osteophytes, severe sclerosis, and clear bone end deformities [9].

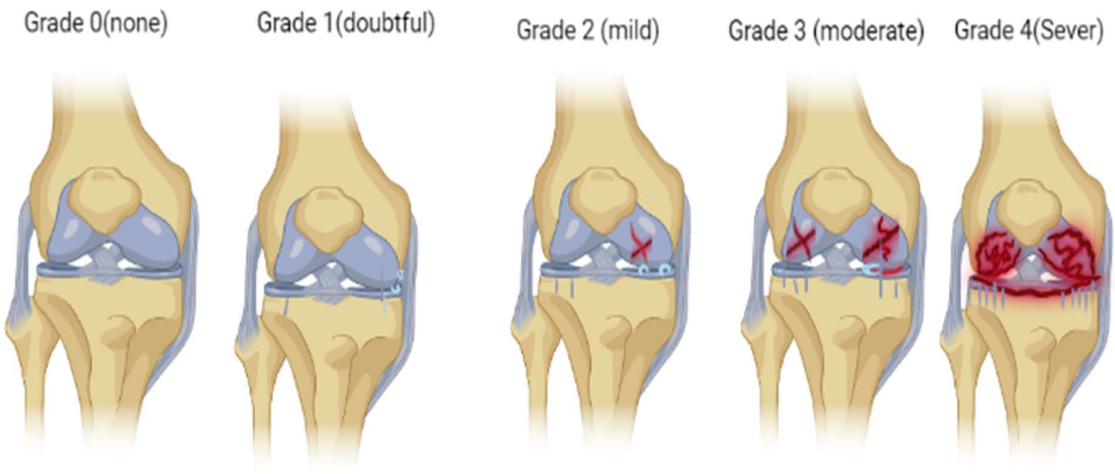

Fig. 2. Classification of osteoarthritis on bases of Kellgren and Lawrence systems.

Pharmaceutical Analysis:

a) Assess the gravity of the patient's health conditions and verify the alignment of prescribed medications with the patient's requirements and treatment goals.
b) Scrutinize the efficacy and suitability of the treatment regimen for each patient.
c) Identify and attend to any concurrent health conditions that could be ameliorated through appropriate interventions.
d) Oversee medication management, encompassing prescription precision and patient education.
e) Continuously observe patients and evaluate the results of their treatment.
f) When essential, convey any pertinent health, well-being, or social service concerns of patients to their physician or the appropriate healthcare professional.

Methods

The prospective observational study was conducted at the Department of Orthopedics (IPD/OPD) of Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR) Hospital, Mullana-Ambala, Haryana. The study spanned a duration of six months, during which 100 patients were enrolled. These patients were either registered once or admitted to the MMISR Hospital, Mullana-Ambala.

Study procedure

The observational study was conducted over a 6-month duration, encompassing both inpatients and outpatients from the Orthopedics department and general medical wards. A total of 100 cases, including male and female patients aged 20 to 80, undergoing treatment for RA and OA arthritis, were enrolled. Exclusions comprised patients under 20 years of age, pregnant or lactating women, and those on alternative arthritis therapies. Data collection encompassed gender, age, symptoms, disease distribution, and drug class.

The prescription analysis employed the WHO parametric tool, involving various processes:

a) Total Number of Drugs Prescribed: Calculating the total drugs per encounter.
b) Drugs by Generic or Brand Name: Identifying prescriptions by generic or brand names.
c) Total Injections Administered: Quantifying the injections given.
d) Percentage of Essential Drug List Prescriptions: Determining the percentage of drugs from the

WHO-recommended essential drug list.

Statistical Analysis

Leveraging SPSS software and employing descriptive statistical techniques, the study computed the mean and standard deviation for the study's participant cohort. Descriptive data analysis was conducted by segregating the data based on treatment groups. The mean and standard deviation (SD) were employed to describe continuous variables, whereas categorical variables were summarized using aggregate values across categories. Percentages were utilized to depict cumulative incidence proportions.

Results

Over the course of the six month data collection period, 100 patients with the diagnoses of RA and OA attended the (IPD OPD) orthopedic department. The following demographic information was acquired after analyzing the prescription of all 100 patients.

Table 1

Gender and Disease Distribution

Gender	No. of RA Patients (n=36)	No. of (OA) Patients (n=64)
Male	7(19.45%)	22(34.38%)
Female	29 (80.55%)	42(65.62%)
Total	36(100%)	64(100)

The distribution of patients within the study cohort of 100 individuals is characterized by both disease and gender. Among these patients, 36 have received a diagnosis of RA, comprising 7 males (19.45%) and 29 females (80.55%). Furthermore, 64 patients have been diagnosed with Osteoarthritis (OA), including 22 males (34.38%) and 42 females (65.62%).

Table: 2

Age distribution

Age	No. of RA Patients (n=36)	No. of OA Patients (n=64
20-30	2	2
31-40	4	9
41-50	10	25
51-60	13	16
61-70	5	9
71-80	2	3
Total	36	64

This observation indicates that there is a variation in the age distribution between individuals with Rheumatoid Arthritis (RA) and Osteoarthritis (OA). Specifically, RA is more prevalent among individuals aged 51-60, with 13 patients falling into this age group. On the other hand, OA is more common among individuals in the 41-50 age group, with 25 patients falling within this range.

Table 3
Disease distribution OA

Disease Distribution	No. of Patients (64)	Percentage (%)
Knee	48	75%
Spine	9	14.06%
Shoulder	1	1.56%
Knee with Spine	6	9.38%

In the research conducted on a group of 64 patients diagnosed with osteoarthritis (OA), it was noted that the majority of these patients experienced joint problems primarily in their knees. Specifically, 48 out of the 64 patients, accounting for 75% of the OA cases, presented issues related to their knee joints.

Table 4
Distribution based on route of Administration

Route	No. of Drugs in RA (235)	No. of Drugs in OA (312)	Total No. of Drugs (547)	Percentage (100%)
Oral	227	308	535	97.80%
Injectable	8	0	8	1.46%
Topical	0	4	4	0.73%

The total number of prescribed drugs amounted to 547, encompassing medications for both Rheumatoid Arthritis (RA) and Osteoarthritis (OA). Specifically, among these medications, 235 were prescribed for RA, with 227 of them being administered orally and 8 delivered via injection. For OA, 312 drugs were prescribed, with the majority, 308, being administered orally, while 4 were applied topically.

Table 5
WHO Pattern Analysis

WHO Parameter	No. of Drug prescribed	Percentage (%)
Total No. of drug prescribed	547	
Total No. of over-the-counter drugs	137	25.04
Drugs given by generic name	76	13.89
Drugs given by brand name	471	86.10
Total No. of injection prescribed	08	1.46

Percentage of written from essential drug list	241	44.05

Table 07. presents an analysis of the prescribed drugs using the WHO guidelines. The World Health Organization (WHO) provides recommendations for the appropriate prescription of drugs to individual patients. In this specific case, only 8 injections were administered as per WHO guidelines out of the total 547 drugs prescribed.

Among these prescribed drugs, 137 were categorized as over-the-counter medications. Interestingly, a substantial proportion, 471 drugs, were prescribed by their brand names rather than generic names, which accounted for only 76 of the total drugs, making up just 13.89% of the prescriptions. Notably, a significant number of drugs, precisely 241, were included in the essential list of medicines as outlined by the WHO, underscoring their importance and relevance in healthcare practice.

Table 6

Details regarding of drug prescribed in RA Patients

Drug Salt Name	Drug Class Name	No. of Prescribed Patients
Ethyl Prednisolone, Deflazacort, Methylprednisolone Acetate, Prednisolone, Prednisolone Acetate	Steroid	19
Methotrexate, Sulfasalazine, Hydroxychloroquine	DMards	36
Folic Acid, Neurobion -Fort	Vitamin B-Complex	36
Pantoprazole, Esnoprazole, Rabiprazole, Pantoprazole +Domperidine, Domperidine +Rabiprazole	proton pump inhibitors	31
Aceclofanac + Paracetamol, Aceclofanac + Paracetamol, Aceclofenac +Paracetamol +Serratiopeptidase, Etoricoxib, Naproxen, Ibuprofen + Paracetamol, Etoricoxib +Thiocolchicoside, Paracetamol/Acetaminophen +Tramadol	NSAIDs	33
Calcium citrate Malate+ Vitt.D3+ Folic Acid	Calcium &vitamin Supplement	14
Vitamin D3	Vitamin D3	17
Undenatured Collagen Type II	Undenatured Collagen Type II	1
Calcitriol +Calcium Carbonate + Zinc Sulfate	Multivitamin	2
Allopurinol	Xanthine Oxidase inhibitors	1
Gabapentin +Nortriptyline	anti Convulsants	2

In the presented table, we outline the drugs prescribed to patients with Rheumatoid Arthritis (RA) categorized by different drug classes. The majority of prescribed medications belong to the Disease-Modifying Antirheumatic Drugs (DMARDs) category, totaling 36 instances. Additionally, Vitamin B Complex supplements were prescribed in the same quantity, also numbering 36. To address pain and inflammation, patients were prescribed Steroids in 19 cases and NSAIDs in 33 cases. For enhancing bone strength, patients received prescriptions for Calcium and Vitamin supplements in 14 instances, Vitamin D3 in 17 instances, and Undenatured Collagen Type II in 1 case.

Table 7
Details regarding of drug prescribed in OA Patients

Drug salt name	Drug Class name	NO. of Prescribed Patients
Etoricoxib, Aceclofenac (100mg) + Paracetamol (325mg), Aceclofenac (100mg) + Thiocolchicoside (4mg), Aceclofenac (100mg), Diclofenac Sodium, Aceclofenac (100mg) + Paracetamol (325mg) + Serratiopeptidase (15mg), Paracetamol (650mg), Etoricoxib (60mg) + Thiocolchicoside (4mg), Paracetamol/Acetaminophen (325mg) +Tramadol (37.5MG)	NSAIDs	64
Glucosamine (750mg) +Diacerin (50mg) +Methyl Sulfonyl Methane(250mg), Glucosamine (750mg) +Diacerin (50mg) +Methyl Sulfonyl Methane(250mg),	Anti-Inflammatory Agents	27
Calcium Citrate Malate (250mg) +Vitamin D3 (100IU) +Folic Acid (50mcg),	Calcium &vitamin Supplement	55
vitamin - D3		53
Diacerin	Anthraquinones	2
Pregabalin (75mg) +Nortriptyline (10mg),	ANTI Depressant	7
Undenatured Collagen Type 2 Capsules, Aflapin (Boswellia serrta extract 20%) and Undenatured Collagen Type 2 capsules,	Undenatured Collagen Type 2 Capsules	13
Vitt. B Complex	Vitt. B Derivatives	5
Methylcoballmin, Methylcoballmin (750mcg) +Pregabalin (75mg)	Anticonvulsant	13
Glucosamine +Diacerein + Astaxanthin	Proteoglycan Synthesis stimulators	3
Multivitamin	Nutritional Supplement	3
Pantoprazole, Pantoprazole (20mg) + Domperidon (10mg)	proton pump inhibitors	62

The provided table outlines the drug prescriptions for patients diagnosed with osteoarthritis (OA). These prescribed medications are aimed at addressing various aspects of OA management. To alleviate pain and reduce inflammation, a significant number of patients received prescriptions for Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), totaling 64 instances, as well as Anti-Inflammatory Agents, which were prescribed in 27 cases. In addition to pain relief, several patients were prescribed medications to enhance bone strength and support joint health. This includes the prescription of Calcium and Vitamin supplements in 55 cases, Anthraquinons in 53 cases, and Undenatured Collagen Type 2 Capsules in 13 cases. To manage symptoms and improve overall well-being, patients were also prescribed Vitamin B Derivatives in 5 instances, Anticonvulsants in 13 instances, and Proteoglycan Synthesis stimulators in 3 instances. Furthermore, to protect against gastritis and related issues, Proton Pump Inhibitors were prescribed to 62 patients. These prescriptions are tailored to address the specific needs of OA patients and aim to provide comprehensive care and symptom management.

Table 8
Distribution of combination of Cs DMARDs

Combination of Cs DMARDs	No. of Patients
Methotrexate	3
Sulfasalazine	0
Methotrexate + Sulfasalazine	22
Methotrexate + Sulfasalazine + Hydroxychloquine	3
Methotrexate + Hydroxychloquine	7
Hydroxychloquine	1

The presented table outlines the prescription patterns of conventional synthetic disease-modifying antirheumatic drugs (CS DMARDs) for patients with rheumatoid arthritis (RA). These medications are pivotal in managing the condition.

The majority of the prescribed drugs involve the combination of Methotrexate and Sulfasalazine, with 22 patients receiving this combination therapy. In addition, some patients receive combinations of Methotrexate and Hydroxychloroquine (7 instances), and Methotrexate, Sulfasalazine, and Hydroxychloroquine (3 instances). Furthermore, single DMARDs are also prescribed, specifically Methotrexate in 3 cases and Hydroxychloroquine in 1 case. These treatment options are tailored to address the specific needs of RA patients and may involve different combinations of CS DMARDs to effectively manage their condition.

Table 9

Cost evaluation in RA patients (n=36)

Visit	Prescription writing drugs price	Avg. Cost of Per prescription
1st Visit	18625	517.3611
2nd Visit	13940	387.2222
Total	32565	904.5833

When assessing drug costs for patients with rheumatoid arthritis (RA), it's significant to recognize that during the initial visit, the total cost of the prescribed medications was 18,625, with an average cost of 517.36 per prescription. On the second visit, the prescribed drugs had a total cost of 13,940, and the average cost per prescription was 387.22. This information highlights the financial implications of the prescribed drug regimens for RA patients during their initial and subsequent visits, aiding in understanding the economic aspects of their treatment.

Table 10

Cost evaluation in OA patients (n=64)

Visit	Prescription writing drugs price	Avg. Cost of Per prescription
1st Visit	45210	706.40625
Follow-up / 2nd Visit	43660	682.1875
Total	88870	1388.59375

In the context of assessing drug costs for patients with osteoarthritis (OA), it's important to consider the pricing of prescribed medications during the 1st and Follow-up / 2nd Visits:

1st Visit: The prescribed drugs had a total cost of 45,210, with an average cost of 706.41 per prescription.

Follow-up / 2nd Visit: The prescribed drugs were priced at 43,660, with an average cost of 682.19 per prescription.

This information provides insight into the financial aspects of the prescribed drug treatments for OA patients during their initial and subsequent visits, illustrating any cost variations and considerations in managing the condition.

Table 11

Most costly drugs with MRP (in Rs)

Drugs Name (Rs)	MRP	Generic Price	Difference
Tablet. CCM	495.00	279.00	216.00
Tablet. MTX	135.00	97.00	38.00
Tablet. Cartigen	362.00	153.00	209.00
Tablet. Collasmart -A	549.00	355.00	194.00
Tablet Sulfasalazine	67.00	37.00	30.00

Tablet. Rabiprazole	242.00	59.00	183.00
Injection. Meth. Prednisolone	1500.00	994.00	506.00
Total	3350	1924	1376

The table highlights the drugs that are the most expensive, focusing on the Maximum Retail Price (MRP) and the price difference between the branded (MRP) and generic versions. This information helps identify the medications with the highest cost disparities between the brand-name and generic options, which can be important for both patients and healthcare providers when making drug-related decisions.

Discussion

The study's findings indicate a gender-based observation among the 100 patients included. It was noted that in both disorders, rheumatoid arthritis (RA) and osteoarthritis (OA), women exhibited a higher prevalence. In the case of RA, there were only 7 male patients compared to 29 female patients with the disorder. Similarly, for OA, approximately 66% of females were affected by the disease, while males constituted only about 34% of the cases. This gender-based difference in disease prevalence underscores the importance of understanding how these conditions impact different demographic groups. The study's conclusions are drawn from the research conducted by Haseeb Mohammed A. R et al and Gauri Mittal et al. [10][11].

The study revealed variations in the age distribution of patients with rheumatoid arthritis (RA) and osteoarthritis (OA). In the case of RA, it was more common among individuals aged 51 to 60, with 13 patients falling within this age group. Conversely, for OA, the highest frequency was observed in the 41-50 age group, comprising 25 patients. These findings highlight the differences in the age demographics affected by these two distinct types of arthritis, providing valuable insights for understanding the diseases and tailoring treatment strategies [14].

The observation regarding the disease pattern in osteoarthritis (OA) revealed that the majority of patients, approximately 75%, had OA primarily affecting their knee joints. This was the most common form of OA in the study. Spinal OA was found to be present in about 14% of the population, while a smaller percentage, approximately 9%, had both knee and spine involvement. In contrast, shoulder OA was the least prevalent, occurring in only around 2% of the patients.

These findings indicate that knee OA is the dominant pattern in this group of OA patients, followed by spine involvement, with knee and spine OA being less common. This information is derived from the research conducted by Lokesh V. Patil et al and Rohini Gupta et al. Understanding these disease patterns is crucial for tailoring treatment and care strategies for OA patients [12] [13].

The data indicates the distribution of prescribed drugs based on their route of administration in the study's total population, where a total of 547 drugs were prescribed. Notably, the majority of these drugs, around 97%, were administered in oral forms, indicating that oral medications were the predominant mode of treatment.

When comparing the two disorders, osteoarthritis (OA) had a higher number of prescribed drugs, totaling 308, as opposed to rheumatoid arthritis (RA), which had 235 prescribed drugs. Injectable drugs were only given to RA patients, while drugs administered in other forms were exclusively prescribed for the other disorder, suggesting distinct treatment approaches for these conditions. This information is based on the research conducted by Shrikant B. Lahamate et al. Understanding the prevalence of different drug administration routes can help tailor treatment strategies for patients with specific conditions [14].

WHO Pattern Analysis: There were 547 drugs were provided to the patients, 86% of drugs were given by their brand names as per the WHO parameter whereas approx. 44% of drugs were prescribed from essential list of drugs. 25% of drugs were found to be the over the counter drugs more than the drugs given by generic names about 14% only and only 1.46% of injections were written on the prescriptions for the patient's treatment. This study was done by on base of the Nagla, A., Wadagbalkar, P et al. [15].

Combination Therapy: The drugs in RA were given in combination and only the conventional DMARD's were prescribed. Methotrexate and sulfasalazine were mostly prescribed by the physicians to the patients in comparison to other DMARD combination therapy. In only 7 no. of patients Methotrexate and Hdroxychloroquinine therapy was provided more than the triple combination therapy of MTX, SAAZ

and HCQ. This study was done by on base of the Yashashri C Shetty [16].

Cost Evaluation: From the Table 9-11 the evaluation of the cost is demonstrated and it was done by adding some generic drug prices to the prescriptions in place of costly branded drugs. The avg. cost per prescription was carried out of both the disorders. The avg. cost of OA was found to be 1388Rs of two visits by the patients and of that of RA it was found to be 904 Rs. per prescription. There were total 7 drugs based on the WHO tool which were found to be costlier and can be replaced with effective and low cost generic drugs which were added theoretically to the prescription of the patient. The difference between the MRP of branded and the generic drug was a good amount of money that can be saved by the patient and it can play vital role in the patient's financial life condition so that he/she could afford long term treatment of the disease like RA and Both RA and OA patients are prescribed a variety of medications, including NSAIDs, proton pump inhibitors, vitamins, opioids, nutritional supplements, calcium supplements, multivitamins, anticonvulsants, and other drugs, depending on their specific needs. OA. This study was done by on base of the Yashashri C Shetty [16].

Conclusion

The extensive range of treatment regimens discussed in this study sheds light on the use of various medications for managing rheumatoid arthritis (RA) and osteoarthritis (OA). Disease-modifying antirheumatic drugs (DMARDs), steroids, and xanthine oxidase inhibitors are prominent choices for RA treatment, with DMARDs such as Methotrexate being a key component.

Notably, NSAIDs are predominantly prescribed for OA patients, and Anthraquinons are commonly included in the treatment regimen for OA patients. According to the WHO tool, a total of 547 drugs were prescribed, with a notable proportion being over-the-counter drugs (25.04%). Generic name prescriptions accounted for 13.89% of the total, while injections were prescribed in 1.46% of cases. A significant portion of drugs (44.05%) was listed in the essential drug list recommended by the WHO, and a substantial majority (86.10%) were prescribed by brand names.

In conclusion, this study provides valuable insights into the diverse medication regimens used to manage RA and OA, highlighting the prevalence of specific drug classes and the adherence to WHO guidelines. Understanding the prescription patterns and drug choices is essential for optimizing the treatment of these chronic joint disorders.

Funding

None

Ethical approval

Ethical Committee approved, Project no-IEC- 2346.

Data sharing statement

Data sharing for this study, 'Comprehensive Analysis of Prescription Management in Rheumatoid Arthritis and Osteoarthritis: A Prospective Observational Study,' is available upon request. The dataset comprises information collected from 100 patients diagnosed with either rheumatoid arthritis (RA) or osteoarthritis (OA), including demographic details, disease symptoms, drug prescriptions, and adherence to WHO guidelines for prescription patterns. Interested parties may reach out to [Ankit Kumar Patel and Seva Singh] at [Department of Orthopedics in MMISR Hospital, Mullana, Ambala] to request access to the anonymized dataset for research or academic purposes, subject to ethical and legal considerations.

Credit authorship contribution statement

Ankit Kumar Patel: Conceptualization, data collection, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

Seva Singh: Conceptualization, data collection, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

Omveer Singh: Conceptualization, Supervision, Writing – review & editing

Declaration of Competing Interest

None

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