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Prescription Patterns of Antibiotics, Nonsteroidal Anti-Inflammatory Drugs, and Anti-ulcer Drugs: A Prospective Cross-Sectional Observational Study

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Abstract:

Objective: The study of prescription patterns of antibiotics, nonsteroidal anti-inflammatory drugs (NSAIDs), and anti-ulcer drugs is crucial, as these combinations are widely used in managing diseases with overlapping needs. In infections with inflammatory components, these drugs treat infection, pain, and inflammation. Post-surgical care uses them to prevent infections, manage pain, and reduce NSAID-induced gastrointestinal risks. In chronic conditions like arthritis, long-term NSAIDs and infections require anti-ulcer drugs to prevent complications. Studying these patterns ensures rational use and minimizes risks. Analyzing these patterns ensures rational use, minimizes adverse effects, and optimizes therapeutic outcomes.

Material and Methods: One hundred prescriptions were analyzed, documenting patient demographics, diagnosis, drug regimens, and prescribing patterns within 6 months.

Result: Among 29 antibiotics, 71% were prescribed in combination therapy, with 64.98% via the intravenous (IV) route. Ceftriaxone 1000 mg was the most common dose (65%) and the most prescribed antibiotic (37.57%). Seven NSAIDs were mainly prescribed as monotherapy (79%) and orally (89.06%), with paracetamol, 650mg, being the most common (39.84%). Eight anti-ulcer drugs were mostly monotherapy (89%), often IV for proton pump inhibitors (PPIs) (67.77%), with pantoprazole the most common (80.49%).

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Conclusion: The study identified a predominance of male patients (41–50 years). Combination therapy and brand-name prescriptions were frequent for antibiotics, while NSAIDs and anti-ulcer drugs favoured monotherapy and brand names. IV administration was prevalent for antibiotics and anti-ulcer drugs, contrasting with oral NSAID administration. Ceftriaxone, paracetamol, and pantoprazole emerged as the most prescribed drugs in their respective categories.

Keywords: antibiotic, anti-ulcer, NSAID, observational study, prescribing pattern, prospective

Introduction

The prescribing pattern of antibiotics varies depending on the type of infection, patient age, and co-morbidities. The most frequently prescribed antibiotics include fluoroquinolones, macrolides, cephalosporins, and penicillin. A patient with a minor illness would just need oral antibiotics, a patient with a severe infection might need antibiotics given via IV[1]. NSAIDs are known to cause GI adverse effects such as dyspepsia, gastric ulcers, and bleeding. To prevent these side effects, physicians frequently give anti-ulcer medications such as PPI and histamine H2 receptor antagonists (H_2RA) in various dosages and dosing forms. The duration of NSAID therapy varies depending on the type of condition being treated[2]. To treat stomach ulcers and gastroesophageal reflux disease (GERD), as well as to mitigate the gastrointestinal (GI) side effects of NSAIDs, anti-ulcer medications like PPI and H_2RA are frequently used. The PPIs omeprazole, lansoprazole, pantoprazole, and esomeprazole are the most often prescribed medications. Ranitidine and famotidine are two of the H_2RAs that are frequently used. The severity of the disease, the patient's age, and any co-morbid conditions all affect the dosage and dosing form of anti-ulcer medications.

For example, while a patient with a moderate (GI) ulcer would only need a low dose of PPI or an H_2RA, a patient with a severe GI ulcer might need large doses of the medication[3]. Bactericidal action depends on either concentration or duration. The duration of the effective concentration of penicillin and tetracyclines influences their bactericidal action since they are time-dependent[4].

NSAIDs are a drug class FDA-approved for use as antipyretic, anti-inflammatory, and analgesic agents[5]. They are frequently given to relieve pain and inflammation caused by a variety of diseases, including menstrual cramps, rheumatoid arthritis, and osteoarthritis. Ibuprofen, naproxen, diclofenac, and celecoxib are the NSAIDs that are most frequently prescribed. Due to these characteristics, NSAIDs can be used to treat a variety of illnesses, including migraines, gout, pyrexia, dysmenorrhea, arthritic conditions, and pain in the muscles[6–8]. NSAIDs are typically divided into groups based on their chemical structure and selectivity: acetylated salicylates (aspirin), non-acetylated salicylates (diflunisal), propionic acids naproxen, ibuprofen, acetic acids (diclofenac, indomethacin), enolic acids (meloxicam, piroxicam) anthranilic acids (meclofenamate, mefenamic acid), naphthyl alanine (nabumetone), and selective cyclooxygenase-2 (COX-2) inhibitors (celecoxib, etoricoxib). Additionally, topical NSAIDs (diclofenac gel) are available for the treatment of soft tissue injuries, ankle sprains, and acute tenosynovitis[9–11].

The digestive tract lesion known as a peptic ulcer is caused by acid and typically develops in the stomach or proximal duodenum. It is characterized by denuded mucosa with the defect spreading into the submucosa or muscularis propria[12]. Although recent epidemiological studies

have demonstrated a decrease in the incidence, rates of hospital admissions, and death associated with peptic ulcer[13,14]. The estimated prevalence of peptic ulcer disease in the general population is 5–10%[15]. The advent of new treatments and enhanced hygiene practices, which led to a decrease in Helicobacter pylori (H. pylori) infections, is most likely a secondary cause of this. The traditional theory is that dietary variables, stress, and an environment that is hypersecretory and acidic cause mucosal disturbance in people with acid-peptic illness.

H. pylori infection, alcohol and cigarette usage, use of non-steroidal anti-inflammatory medicines (NSAIDs), and Zollinger-Ellison syndrome are risk factors for developing peptic ulcers[16]. H. pylori infection and NSAID usage are the primary risk factors for both gastric and duodenal ulcers. Peptic ulcer disease only affects a tiny percentage of those with H. pylori infection or taking NSAIDs, indicating that individual susceptibility is crucial at the start of mucosal damage[17]. The study of prescription patterns involving antibiotics, NSAIDs, and anti-ulcer drugs is crucial due to their widespread use in managing various diseases and conditions. These combinations are frequently employed in clinical settings, such as infections with inflammatory components, post-surgical or post-procedural care, and chronic inflammatory conditions, necessitating a thorough understanding of their rational use. In infections with inflammatory components, such as respiratory or gastrointestinal infections, antibiotics are prescribed to treat the underlying infection, while NSAIDs are used to alleviate pain and inflammation. However, NSAIDs can cause gastrointestinal complications, prompting the co-prescription of anti-ulcer drugs to mitigate these risks. Similarly, in post-surgical or post-procedural care, antibiotics are often prescribed to prevent infections, NSAIDs to manage pain, and anti-ulcer drugs to protect against NSAID-induced gastrointestinal complications. In chronic inflammatory conditions like rheumatoid arthritis or osteoarthritis, long-term NSAID use is common to control inflammation and pain, but this increases the risk of gastrointestinal side effects, making anti-ulcer drugs essential. Additionally, infections may coexist in these patients, further necessitating antibiotic use. Studying these prescription patterns is vital to ensure appropriate and rational drug use, minimize adverse drug reactions, and prevent antibiotic resistance. It also helps identify potential overuse or misuse of these medications, particularly anti-ulcer drugs, which are often overprescribed. By analyzing these patterns, healthcare providers can optimize therapeutic outcomes, reduce healthcare costs, and improve patient safety in the management of these complex conditions. This prophylactic co-prescription is common, but real-world usage patterns and their appropriateness are poorly documented. This study was therefore conducted to prospectively analyze these prescription trends in actual clinical practice.

Prescribing patterns and challenges

The prescribing patterns of antibiotics, NSAIDs, and anti-ulcer medicines vary depending on the geographic location, the healthcare setting, and the prevailing disease prevalence. In general, antibiotic and NSAID prescription rates are typically greater in developed countries than in developing countries[18]. However, the inappropriate use of antibiotics and NSAIDs is a common problem worldwide, leading to the emergence of antibiotic-resistant bacteria and GI adverse effects. The prescribing pattern of anti-ulcer medicines is also influenced by the prescribing pattern of antibiotics and NSAIDs. For example, a patient who is prescribed high doses of antibiotics and NSAIDs is more likely to require anti-ulcer medicines in higher doses and for longer durations[19]. This may increase the risk of adverse effects such as drug interactions, infections, and GI complications. Moreover, taking numerous drugs raises the chance of medication mistakes, which can result in significant side effects or even death. Before prescribing

any drug, clinicians should thoroughly review the patient's medical history, allergies, and co-morbidities to minimize the risk of medication errors. Finally, antibiotics, NSAIDs, and anti-ulcer medications are prescribed differently based on disease prevalence, geographic area, and healthcare environment. The severity of the disease, patient age, and co-morbidities have an impact on the dose and dosing type of these drugs. Physicians should thoroughly analyze the patient's medical history and administer the right drug in the proper dose and dosage form to reduce the risk of medication errors and adverse responses. Additionally, patients need to be educated on the correct usage of medications, as well as the potential side effects associated with their use. Overall, to achieve the best treatment outcomes while decreasing the potential of adverse reactions, a balanced strategy is required[20,21].

Material and Methods

A prospective, cross-sectional, non-experimental (observational) study was conducted in various inpatient (IPD) and outpatient departments (OPD) at the Integral Institute of Medical Sciences and Research (IIMS&R), Lucknow, India, over a 6-month period (Sep 2023-March 2024). During our study, a total of 100 prescriptions were analyzed. The patient demographic details, like name, age, sex, place, and weight, were noted in a specially designed daily patient data collection form. Diagnosis, patient complaints, number of drugs prescribed, social history, generic name, and brand name were recorded using the daily patient data collection form.

Inclusion criteria

1. Prescriptions containing at least one antibiotic, NSAID, or anti-ulcer drug.
2. Prescriptions for patients of all age groups and genders.
3. Prescriptions for patients with diagnoses requiring antibiotics, NSAIDs, or anti-ulcer drugs (e.g., infections, inflammatory conditions, post-surgical care, or chronic diseases like arthritis).
4. Prescriptions issued within the 6-month study period.
5. Prescriptions with drugs administered via any route (oral, intravenous, etc.).
6. Both monotherapy (single drug) and combination therapy (multiple drugs) prescriptions.

Exclusion criteria

1. Incomplete prescriptions (missing drug name, dose, route of administration, or diagnosis).
2. Prescriptions that did not include antibiotics, NSAIDs, or anti-ulcer drugs.
3. Repeat prescriptions for the same patient within the study period.
4. Prescriptions containing experimental or unapproved drugs.
5. Prescriptions intended for veterinary or non-human use.
6. Outpatient prescriptions without follow-up data or outcomes.

Parameters assessed

The following parameters were evaluated:

1. Gender distribution.
2. Types of Antibiotics, NSAIDs, and antiulcer drugs prescribed.
3. Average number of antibiotics, NSAIDs, and antiulcer drugs per prescription.
4. Average age range of patients utilizing antibiotics, NSAIDs, and antiulcer drugs.
5. Comparison of antibiotics, NSAIDs, and antiulcer drugs prescribed in monotherapy vs combination therapy.
6. Comparison of antibiotics, NSAIDs, and antiulcer drugs prescribing by generic vs brand name.

7. Mode of administration of drugs.

8. Different doses of antibiotics, NSAIDs, and antiulcer drugs prescribed in prescriptions.

9. Most commonly used agents of a particular class.

Data analysis

Microsoft Excel was used to feed and maintain the research study data. The graphs and tables were plotted using Microsoft Excel.

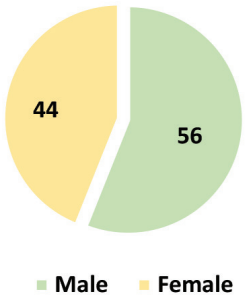

Figure 1 Gender distributions

Results

Antibiotics

Antibiotics are critical medications used in hospitals to treat bacterial infections. They work by killing bacteria or inhibiting their growth. Hospitals use a wide range of antibiotics, depending on the type of infection, severity, and bacterial resistance patterns.

1. Gender distribution: Out of 100 patients, 56 (56%) were males and 44 (44%) were females. Gender distribution plays a significant role in patient surveys, influencing response patterns, healthcare experiences, and the interpretation of results (Figure 1).

2. Types of antibiotics prescribed: A total of 29 different types of antibiotics were prescribed in 100 prescriptions. A total of 226 drugs were prescribed: the most common were ceftriaxone (67) (29.65%), azithromycin (27) (11.95%), metronidazole (21) (9.29%), rifaximin (18) (7.96%), amoxicillin (16) (7.08%), clavulanic acid (16) (7.08%), piperacillin (8) (3.54%), and tazobactam (8) (3.54%) (Figure 2).

3. Average number of antibiotics: An average of 2.16 antibiotics was prescribed per prescription.

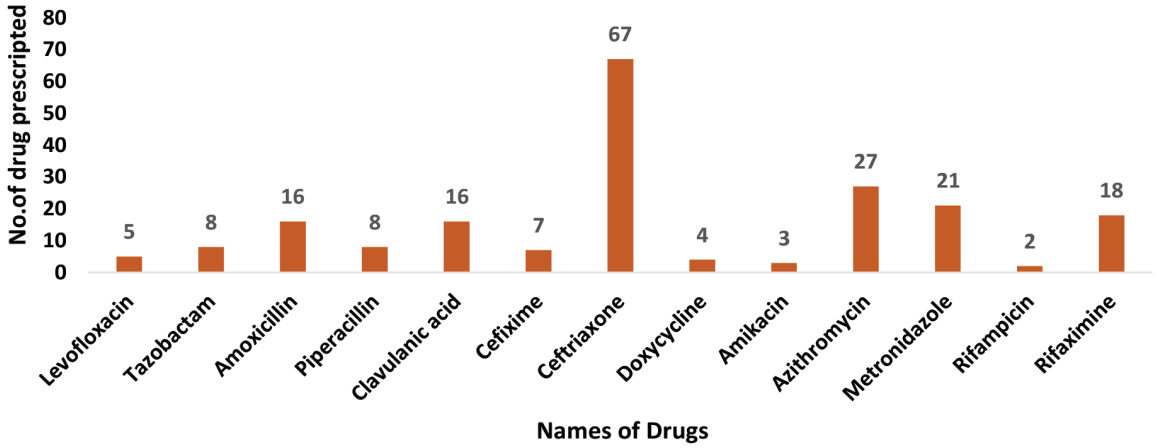

Figure 2 Types of antibiotics prescribed

4. Age distribution: Antibiotics were prescribed across various age groups, with the highest proportion of patients aged 41–50 years (22%), followed by those aged 21–30 years (19%), 51–60 years (18%), 31–40 years (16%), 71–80 years (8%), 61–70 years (7%), 11–20 years (6%), 1–10 years (3%), and 81–90 years (1%) (Figure 3).

5. Comparison of antibiotics prescribed in monotherapy vs combination therapy: Most of the antibiotics were prescribed by combination therapy (71) (71%) compared to monotherapy (29) (29%) (Figure 4).

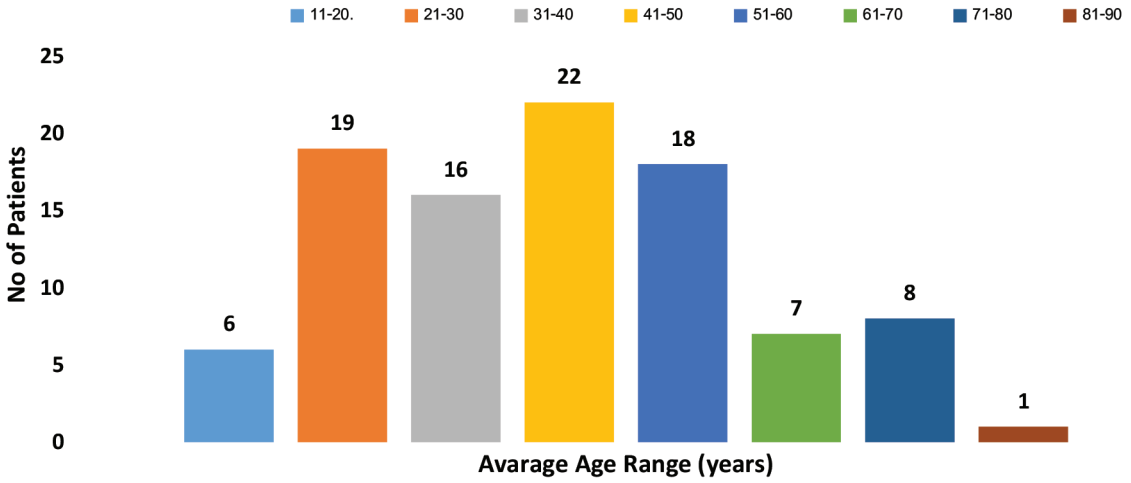

Figure 3 Average age range of patients utilizing antibiotics

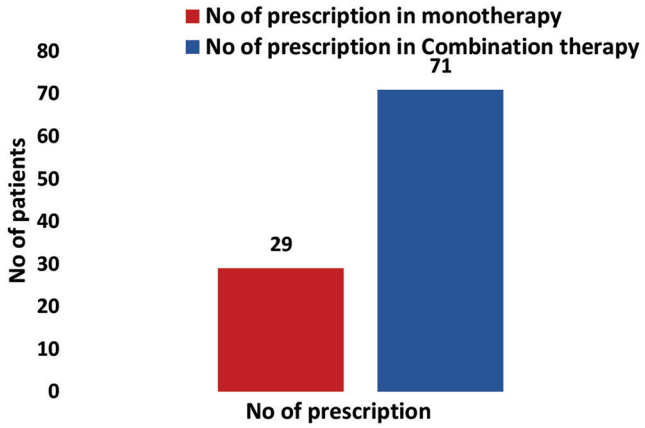

Figure 4 Monotherapy vs combination therapy of antibiotics

6. Comparison of antibiotic prescribing by generic vs brand name: Most of the antibiotics were prescribed by brand names (89) (89%) compared to generic names 11 (11%) (Figure 5).

7. Mode of administration of drugs: Most of the antibiotics were prescribed by IV route 141 (64.98%) [ceftriaxone 66 (30.88%), metronidazole 17 (9.68%), amoxicillin 13 (7.37%), clavulanic acid 13 (7.37%), piperacillin 8 (3.39%), tazobactam 8 (3.39%)], oral route 75 (34.10%) [azithromycin 27 (12.44%), rifaximin 7 (93.69%), cefixime 6 (3.23%), doxycycline 4 (1.84%), levofloxacin 4 (1.84%), metronidazole 4 (1.84%)], IM route 1 (0.46%) [Streptomycin 1 (0.46%)] and topical route 1 (0.46%) [moxifloxacin 1 (0.46%)] (Figure 6).

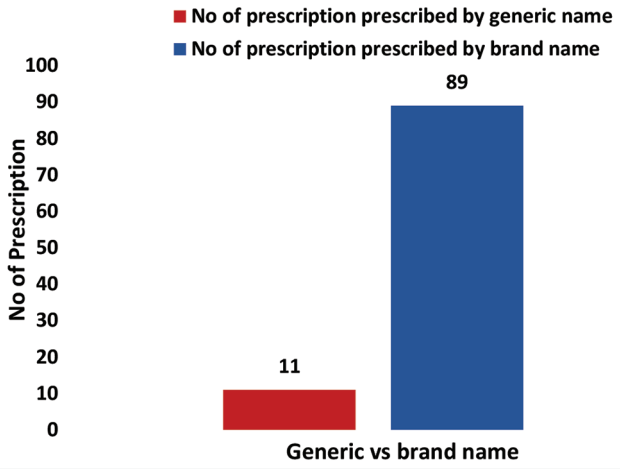

Figure 5 Generic vs brand name

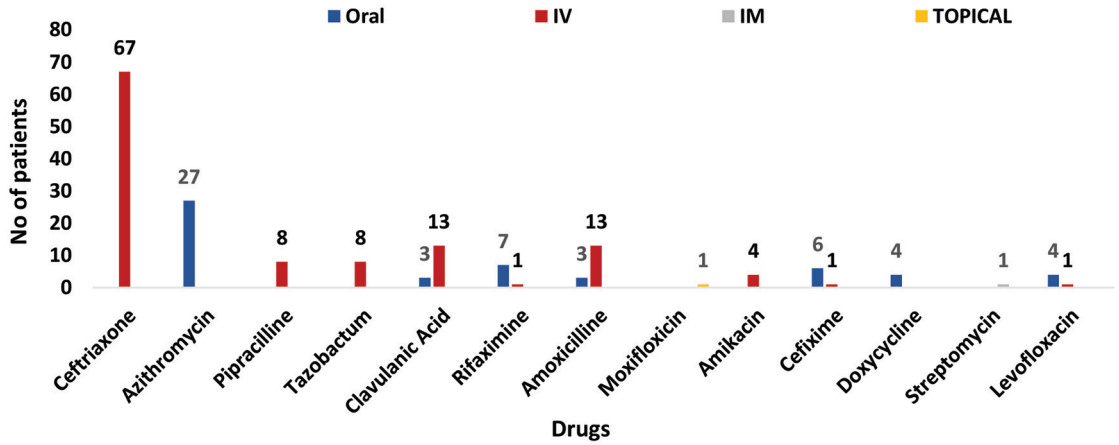

Figure 6 Mode of administration of antibiotic drugs

8. Different doses of antibiotics prescribed in prescription: The most common dosage of antibiotics prescribed was ceftriaxone at 1000 mg, 65 (29.95%), azithromycin at 500 mg, 27 (12.44%), metronidazole at 500 mg, 21 (9.68%), amoxicillin 1000 mg, 13 (5.99%), clavulanic acid 200 mg 13 (5.99%), Rifaximin 550 mg, 7 (3.23%) (Figure 7).

9. Most commonly used agents of a particular class: Ceftriaxone (68) (37.57%), azithromycin (29) (16.02%), metronidazole (21) (11.60%), amoxicillin (8) (8.84%) and clavulanic acid (8) (8.84%), where the most common agents of particular classes were prescribed in 100 patients (Figure 8).

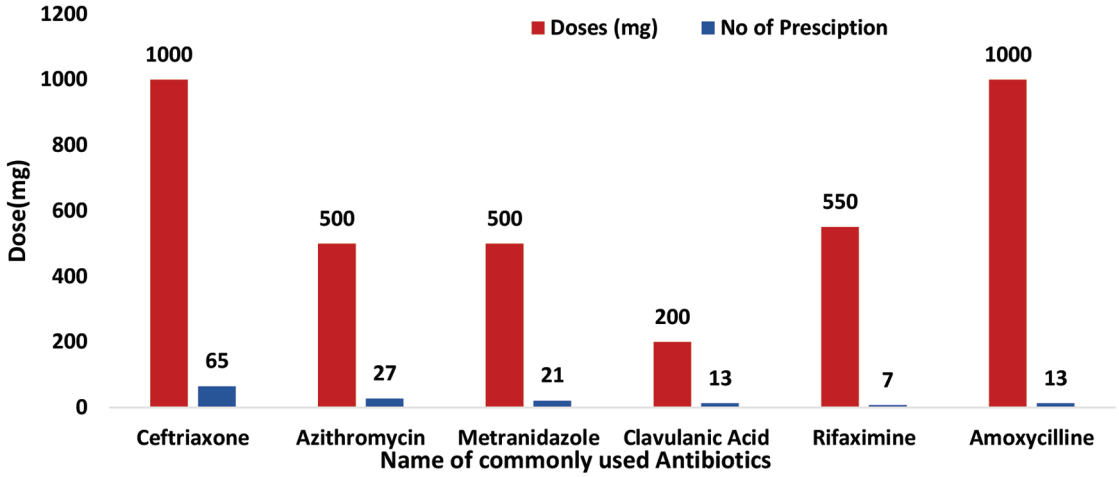

Figure 7 Dose of antibiotics

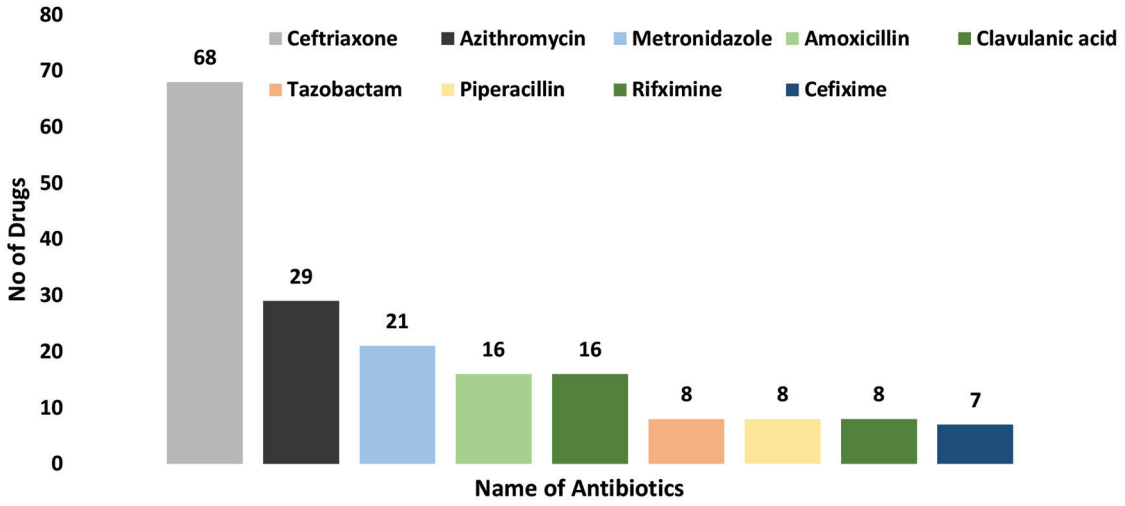

Figure 8 Most commonly used agents of a particular class

Discussion

The prescription patterns of antibiotics, non-steroidal anti-inflammatory drugs (NSAIDs), and anti-ulcer drugs are critical to study due to their widespread use in managing various diseases with overlapping therapeutic needs. These drug combinations are commonly prescribed for infections with inflammatory components, post-surgical care, and chronic conditions like arthritis. However, there is a significant research gap in understanding the rational use, appropriateness, and potential risks associated with these combinations. Existing studies often focus on individual drug classes, leaving a lack of comprehensive data on how these drugs are prescribed together, their administration routes, and the prevalence of monotherapy versus combination therapy. There is limited information on the demographic trends and prescribing practices in specific populations, which is essential for optimizing therapeutic outcomes and minimizing adverse effects.

This prospective cross-sectional observational study aimed to address these gaps by documenting patient demographics, diagnoses, drug regimens, and prescribing patterns. By focusing on the interplay between antibiotics, NSAIDs, and anti-ulcer drugs, the study provides insights into the frequency of combination therapy, preferred routes of administration, and the most commonly prescribed drugs in each category. It also highlights the demographic profile of patients receiving these medications, ensuring a better understanding of prescribing trends in real-world clinical settings[22].

Out of 100 patients, 56 (56%) were males and 44 (44%) were females. This study is not aligned with another study carried out, revealing that more females (60.9%) received prescriptions with antibiotics than males (39.1%)[23]. A total of 29 different types of antibiotics were prescribed in 100 prescriptions. A total of 226 drugs were prescribed, mostly ceftriaxone (67) (29.65%), azithromycin (27) (11.95%), metronidazole (21) (9.29%), rifaximin (18) (7.96%), amoxicillin (16) (7.08%), clavulanic acid (16) (7.08%), piperacillin (8) (3.54%), tazobactam (8) (3.54%)[23,24]. In this study, the most often prescribed were metronidazole, amoxicillin, and co-amoxiclav. The study found that ceftriaxone (61.2%) was the most frequently prescribed antibiotic, followed by metronidazole (29.9%). An average of 2.16 antibiotics was prescribed per prescription[25]. Patients aged between (41- 50) 22 (22%), (21-30) 19 (19%), (51-60) 18 (18%), (31-40) 16 (16%), (71-80) 8 (8%), (61-70) 7 (7%), (11-20) 6 (6%), (01-10) 3 (3%) and (81-90) 1 (1%) antibiotic were prescribed. This is a similar study carried out by, in this study, children under one year old (1.1%), children between 1 and 14 years (16.3%), ages 45-64 years (15.8%), and patients 65 years or older (9.2%). Most of the antibiotics were prescribed by combination therapy (71) (71%) compared to monotherapy (29) (29%)[26].

Most of the antibiotics were prescribed by IV route 141 (64.98%) [ceftriaxone 66 (30.88%), metronidazole 17 (9.68%), amoxicillin 13 (7.37%), clavulanic acid 13 (7.37%), piperacillin 8 (3.39%), tazobactam 8 (3.39%)], oral route 75 (34.10%) [azithromycin 27 (12.44%), rifaximin 7, metronidazole 4 (1.84%)], IM route 1 (0.46%) [streptomycin 1 (0.46%)] and topical route 1 (0.46%) [moxifloxacin 1 (0.46%)]. There is a similar study carried out by[27], which states that most antibiotics were prescribed by the IV route rather than the oral, intramuscular, and topical routes. The most common dosage of antibiotics prescribed was ceftriaxone at 1000 mg (65) (29.95%), azithromycin at 500 mg (27) (12.44%), metronidazole at 500 mg (21) (9.68%), amoxicillin at 1000 mg (13) (5.99%), clavulanic acid at 200mg (13) (5.99%), rifaximin 550mg (7) (3.23%). In this study, the three most frequently used antibiotics were ceftriaxone, azithromycin, and metronidazole, 31.25%, 26.56%, and 13.28% of total prescribed antibiotics, respectively[28].

During this study, it was found that 7 types of NSAIDs were prescribed. The most often prescribed medicine was paracetamol, which was prescribed in around 90 (72%)

prescriptions. The physician must evaluate effectiveness, possible toxicity due to concurrent medicines and patient characteristics, and cost when selecting an NSAID for a specific patient. The structural and pharmacodynamic characteristics of NSAIDs differ, but their routes of action are comparable. The principal pharmacological activity of these compounds is to inhibit cyclooxygenase (COX)[29].

Older age groups (particularly those over 70): a history of peptic ulceration, and the first three months of NSAID medication are all high-risk factors for NSAID-related gastrointestinal injury. Smoking, underlying respiratory or cardiovascular illness, and concurrent medication usage, notably corticosteroids, aspirin, and anticoagulants, are other risk factors. Clinicians prescribe drugs with brand names in 82% of cases and generic names in 18% of cases. An average of 1.22% of NSAIDs are administered in all prescriptions[30].

Male patients are more likely to use NSAIDs, with an average age range of 41-50. NSAIDs are more prone to cause harmful gastrointestinal and renal consequences in the elderly. The increasing risk of cardiovascular illness in elderly people raises worries about a faster heart attack or stroke[31,32]. This study revealed that 79% of drugs were prescribed in monotherapy, and 21% of drugs were prescribed in combination therapy. In 100 cases, 74.56% of the medicines were taken orally. Numerous studies have been conducted to assess the efficiency of common NSAIDs such as diclofenac, ibuprofen, meloxicam, piroxicam, and ketorolac, which are all nonselective for COX-2 inhibition, as well as valdecoxib, celecoxib, rofecoxib, and etoricoxib, which are all selective for COX-2 inhibition. NSAIDs were administered in all of these studies[33]. In this study, paracetamol with a dose of 650 mg (39.84%) was prescribed mostly. The medication that is most frequently prescribed (72%), i.e., paracetamol, belongs to the family of analgesic-antipyretics but has a poor anti-inflammatory effect. The two identified isoenzymes of prostaglandin G/H synthase, commonly known as cyclo-oxygenase (COX), known as COX-1 and COX-2, are inhibited by non-steroidal anti-inflammatory medications (NSAIDs) that have analgesic and anti-inflammatory characteristics[34,35].

The production of COX-2, an inducible isoform, is elevated at the sites of inflammation. However, there have been a lot of questions raised about these medications. Despite being pricey, there is evidence that COX-2 is already gaining popularity in several nations[36].

In this study, patients who visited OPDs and IPDs of the hospital were examined to determine the prescribing trends of these gastro-protective medications. We discovered 100 prescriptions that contained these gastro-protectives, of which 8 were written individually or in conjunction with other medications. There were 8 prescriptions for different brands of medications in all; however, there was only one generic medicine prescribed. We observed a pattern whereby physicians were prescribing fixed-dose combinations with similar frequency, as they were single medications. Out of 100 patients who received anti-peptic ulcer medication, 79 patients (79%) displayed no current symptoms of acid peptic illness[37]. As can be seen from the prescriptions, NSAIDs and antimicrobials were the two most often prescribed types of medication alongside gastro-protective medicines. Multivitamins, haematinics, cough and cold medications, enzyme preparations, and other unrelated medications were also recommended together with these gastro-protectants. The prescription reveals that paracetamol was the most frequently prescribed NSAID since it is frequently suggested as one of the initial therapies for pain and has few negative effects. Gastro-protectants were co-administered next, followed by aceclofenac. Etoricoxib, aspirin, diclofenac, mefenamic acid, and among the gastro-protectants, PPIs were more frequently observed (79.66%), followed by pantoprazole (32.7%) and aluminium hydroxide (5.93%). Only 4.24% of patients received a prescription for ranitidine[38].

Most of the antiulcer drugs were prescribed by monotherapy (89%) compared to combination therapy (11%). Some abnormalities in the stomach and oesophagus are treated with pantoprazole. PPIs, in contrast, produce more acid suppression than H2 blockers. The stomach produces acid in response to various triggers, not just histamine. Because H2 blockers only work on histamine receptors, they are less comprehensive than drugs like pantoprazole, which directly inhibit acid production and are often preferred for their efficacy. Pantoprazole may be used by adults and children 12 years of age and older. Pantoprazole works by blocking the stomach's proton pumps, which reduces acid production[39]. Patient age between (41–50) 22 (22%), (21–30) 19 (19%), (51–60) 18 (18%), (31–40) 16 (16%), (71–80) 8 (8%), (61–70) 7 (7%), (11–20) 6 (6%), (01– 10) 3 (3%) and (81–90) 1 (1%) antibiotic were prescribed. Most of the anti-ulcer drugs were prescribed by monotherapy (89%), compared to combination therapy (11%). Most of the antiulcer medicines were prescribed by brand names (100%), compared to generic names (0%). Doctors often prescribe brand-name drugs because they receive no financial incentive for prescribing government-supplied generics. However, it is the patient's responsibility to request from their physician affordable generic medications. The majority of antiulcer medications were prescribed through IV route, 82 (67.77%) [pantoprazole 77 (93.90%) and ranitidine, 5 (6.10%)], as well as by the oral route, 39 (31.40%) [pantoprazole 20 (52.63%), aluminium hydroxide, 7 (18.42%), and magnesium hydroxide, 7 (18.42%)]. It has been demonstrated that intravenous pantoprazole may sustain acid suppression in patients who have switched from oral PPIs; therefore, there is no need to adjust the dosage while changing from one formulation to another[40].

The research goal of optimizing treatment results while decreasing the risk of adverse effects was achieved through this study by systematically analyzing the prescription patterns of antibiotics, NSAIDs, and anti-ulcer drugs, which are commonly used in combination for managing various diseases. This study identifies trends in drug use, administration routes, and combination therapies, providing insights into current prescribing practices. For instance, the high prevalence of combination therapy for antibiotics (71%) and the frequent use of IV administration (64.98%) highlight the need for careful monitoring to prevent antibiotic resistance and ensure appropriate use. The study also reveals that NSAIDs are predominantly prescribed as a monotherapy (79%) and orally (89.06%), with paracetamol being the most common, suggesting a focus on minimizing the gastrointestinal risks associated with NSAIDs. Additionally, the frequent use of anti-ulcer drugs like pantoprazole (80.49%) in monotherapy, often via IV (67.77%), underscores their role in mitigating NSAID-induced gastrointestinal complications. By identifying these patterns, the study emphasizes the importance of rational drug use, appropriate route selection, and the need for tailored therapies to enhance efficacy while reducing adverse effects. This analysis ultimately guides healthcare providers in optimizing treatment strategies, ensuring patient safety, and improving therapeutic outcomes.

Conclusion

During the six-month study, 100 prescriptions were observed. Among these patients, it was noted that the majority were male, accounting for 56% of the total patients. The highest number of patients fell into the age group of 41–50 years, making up 22% of the total patients. In terms of antibiotics, there were a total of 29 different types of antibiotics prescribed during the study period. On average, each prescription included 2.16 antibiotics. Furthermore, 89% of the antibiotics were prescribed using brand names. The intravenous (IV) route was the most common route of administration for antibiotics, with 64.98% of prescriptions utilizing this method. Among the different antibiotics, ceftriaxone at a dose of 1000mg was the most

commonly prescribed, representing 65% of the cases, and overall, ceftriaxone accounted for 37.57% of the total antibiotics prescribed. Regarding NSAIDs, the majority of NSAIDs were prescribed as monotherapy, comprising 79% of the cases. The oral route of administration was the most common, accounting for 89.06% of the prescriptions. The most commonly prescribed dosage of NSAIDs was paracetamol at 650 mg, representing 39.84% of the cases. In the case of antiulcer drugs, there were a total of 8 different types prescribed during the study period. The IV route was the most common route of administration, accounting for 67.77% of the prescriptions. The most commonly prescribed antiulcer drug was pantoprazole, representing 80.49% of the cases. It is worth noting that specific agents of particular classes were not mentioned in the provided information. Overall, this information provides an overview of the prescribing patterns observed during the study. It highlights the predominance of male patients and patients in the 41–50 age group. It also indicates a high frequency of combination therapy for antibiotics; a brand name used for both antibiotics and NSAIDs, and a preference for the IV route for antibiotics and antiulcer drugs. The most commonly prescribed antibiotic was ceftriaxone, while paracetamol at 650 mg was the most commonly prescribed NSAID, and pantoprazole was the most commonly prescribed antiulcer drug. The findings of this study will contribute to promoting rational drug use, reducing the risk of adverse drug reactions, and optimizing therapeutic outcomes. By addressing the research gap, this study provides valuable data for healthcare providers and policymakers to improve prescribing practices and patient care.

Ethics approval and consent to participate

The study was approved by the Institutional Ethics Committee (IEC), IIMS&R, with the approval number: IEC/IIMS&R/2023/57.

Authors contribution

MSD: Data Collection & Writing the manuscript; NKN: Data Collection & Formatting; DA: Data Collection & Editing; NBK: Data Collection & Prepared Table & Graph; FA: Conceptualization; KK: Clinical supervision; SB: Software; TM: Resources.

Informed consent statement

Informed consent statements were explained to each patient, and all entries were filled out by the patients.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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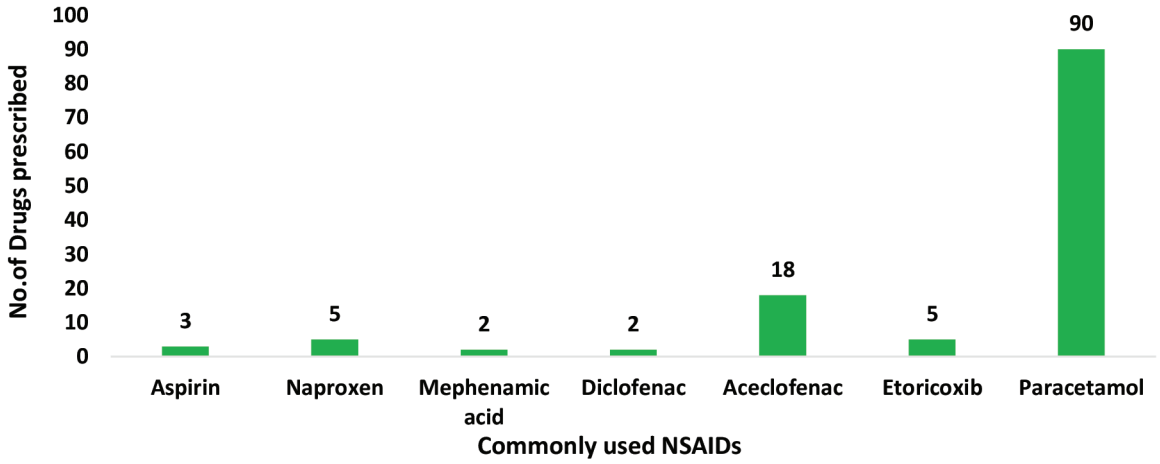
Appendix

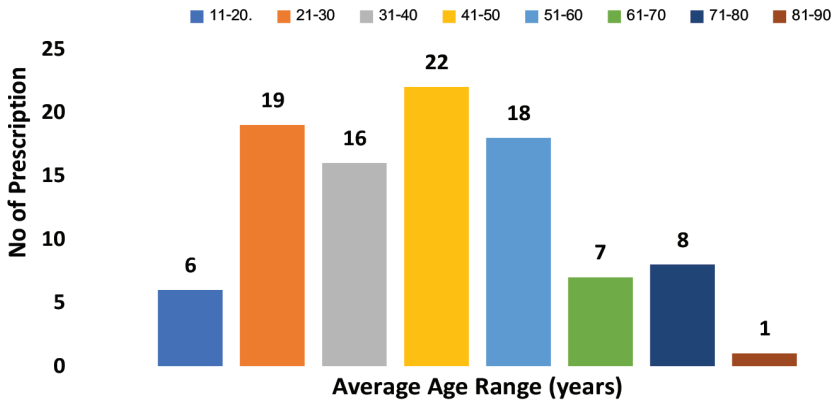
Types of NSAIDs prescribed: A total of 7 different types of NSAIDs were prescribed in 100 prescriptions. A total of 125 drugs were prescribed; mostly paracetamol (90) (72%), aceclofenac (18) (14.40%), naproxen (5) (4%), and etoricoxib (5) (4%) were prescribed (Appendix Figure 1).



Appendix Figure 1 Types of NSAIDs prescribed

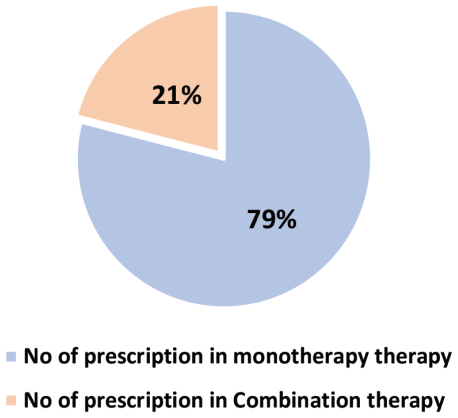
Average number of NSAIDs per prescription: An average of 1.22 NSAIDs was prescribed per prescription.

Average age range of patients utilizing NSAIDs: NSAIDs were prescribed to patients across various age groups, with the highest proportion in the 41–50 age group (22%), followed by 21–30 (19%), 51–60 (18%), 31–40 (16%), 71–80 (8%), 61–70 (7%), 11–20 (6%), 1–10 (3%), and 81–90 (1%) (Appendix Figure 2).



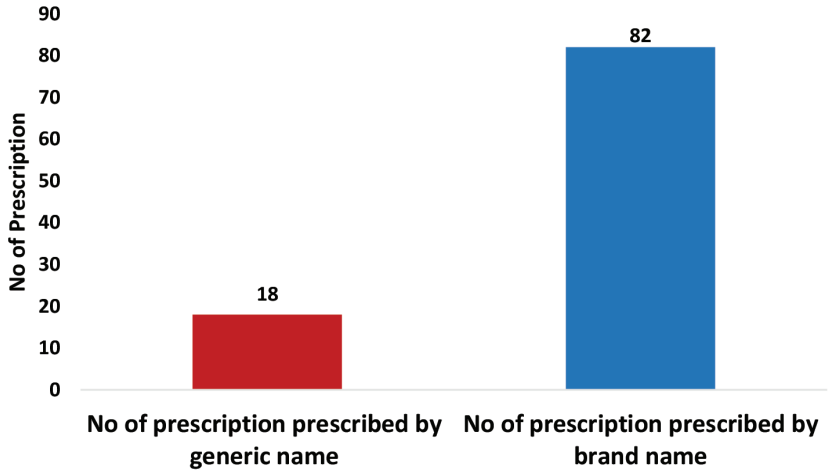
Appendix Figure 2 Average age range of patients utilizing NSAIDs

Comparison of NSAIDs prescribed in monotherapy vs combination therapy: Most of the NSAIDs were prescribed by monotherapy (79) (79%) or combination therapy (21) (21%) (Appendix Figure 3).



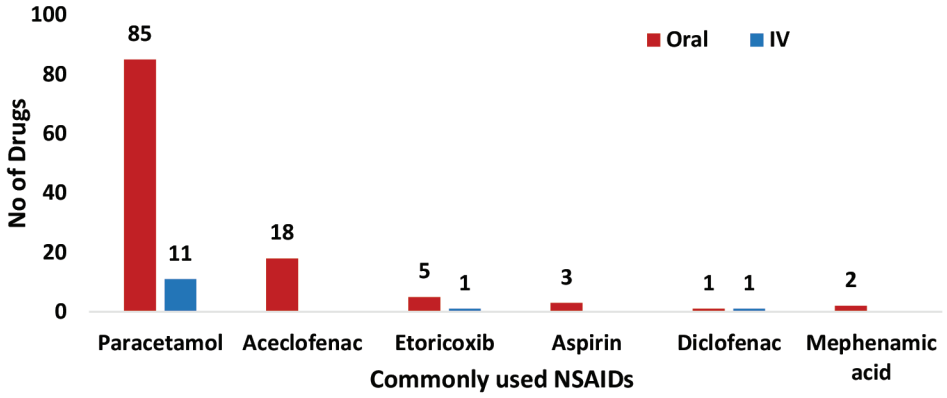
Appendix Figure 3 Monotherapy vs combination therapy

Comparison of NSAIDs prescribing by generic vs brand name: Most of the NSAIDs were prescribed by brand names (82) (82%) compared to generic names (18) (18%) (Appendix Figure 4).



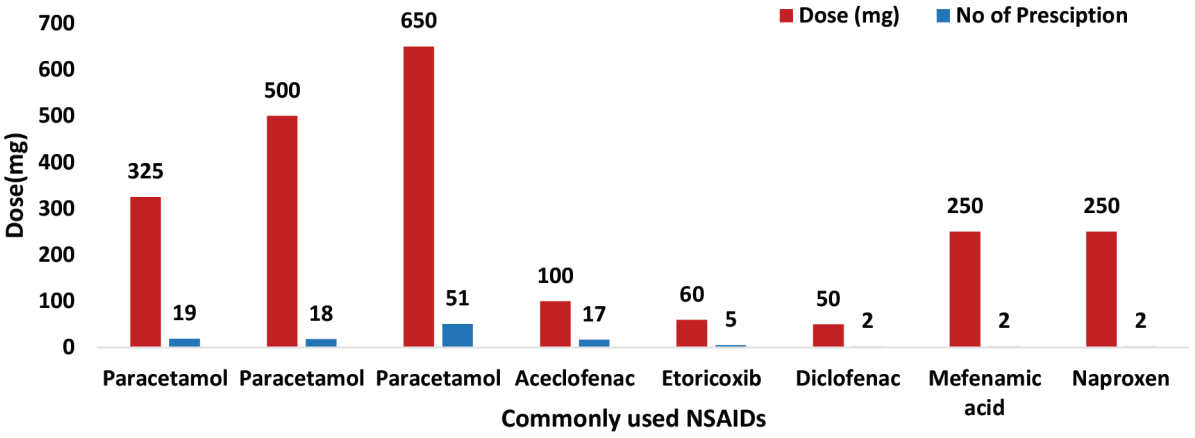
Appendix Figure 4 Generic vs brand name

Mode of administration: Most of NSAIDs were prescribed by oral route (114) (89.06%) [paracetamol (85) (74.56%), aceclofenac (18) (15.79%) and etoricoxib (5) (4.39%)] and IV route (13) (10.16) [paracetamol (11) (84.62%)] (Appendix Figure 5).



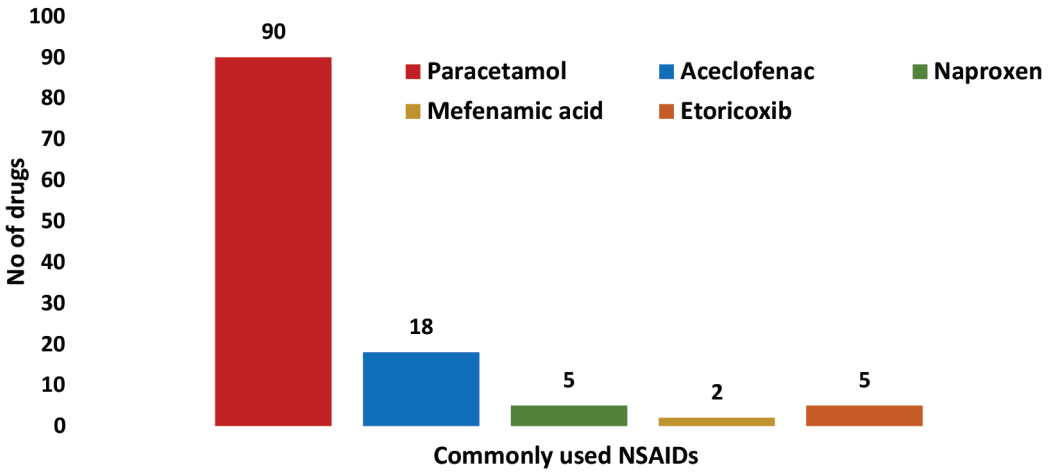
Appendix Figure 5 Mode of administration of NSAIDs

Different doses of NSAIDs prescribed in prescriptions: The most common dosage of NSAIDs prescribed was paracetamol 650 mg (51) (39.84%), paracetamol 352mg (19) (14.84%), paracetamol 500mg (18) (14.06%), aceclofenac 100mg (17) (13.28%) and etoricoxib (5) (3.91%) (Appendix Figure 6).



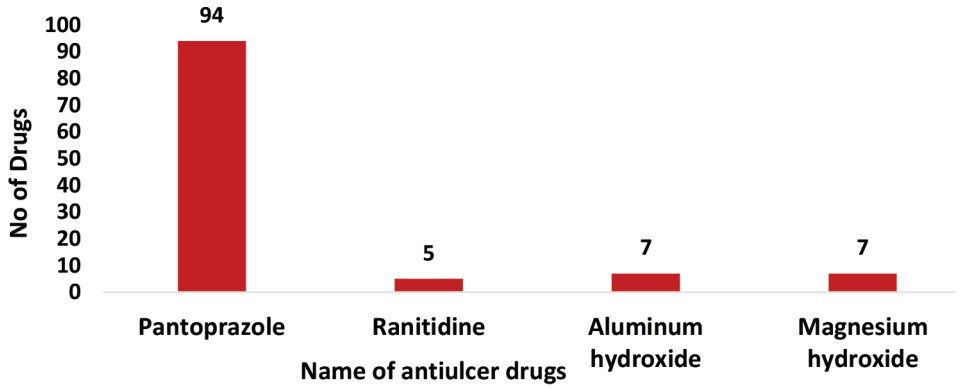
Appendix Figure 6 Dose of NSAIDs

Most commonly used agents of a particular class: Most commonly prescribed NSAIDs were paracetamol (90) (75%), aceclofenac (18) (15%), naproxen (5) (4.17%), etoricoxib (5) (4.17%) (Appendix Figure 7).



Appendix Figure 7 Most commonly used agents of NSAIDs

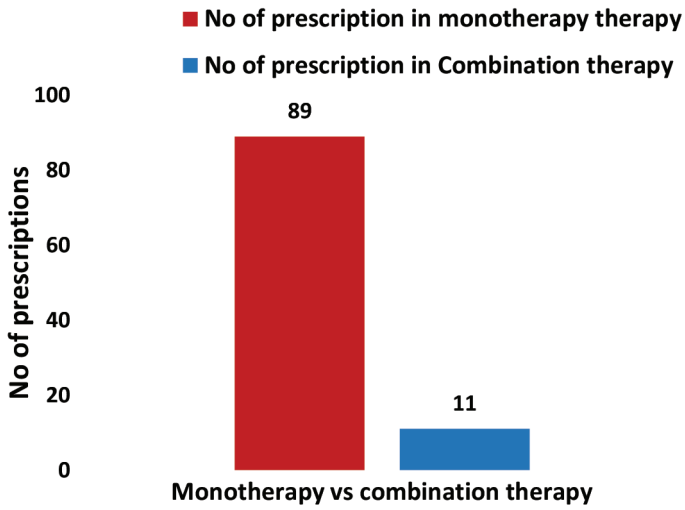
Types of antiulcer drugs prescribed: There were a total of 8 different types of anti-ulcer drugs prescribed in 100 prescriptions. A total of 118 drugs were prescribed; mostly pantoprazole (94) (79.66%), aluminium hydroxide (7) (5.93%), magnesium hydroxide (7) (5.93%), and ranitidine (5) (4.24%) were prescribed (Appendix Figure 8).



Appendix Figure 8 Types of antiulcer drugs prescribed

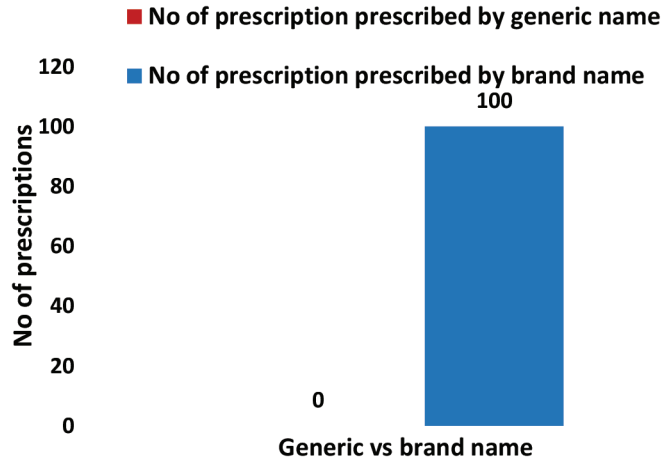
Average number of NSAIDs per prescription: Average 1.16 antiulcer drugs prescribed per prescription.

Comparison of anti-ulcer drugs prescribed in monotherapy vs combination therapy: Most of the anti-ulcer drugs were prescribed by monotherapy (89) (89%) compared to combination therapy (11) (11%) (Appendix Figure 9).



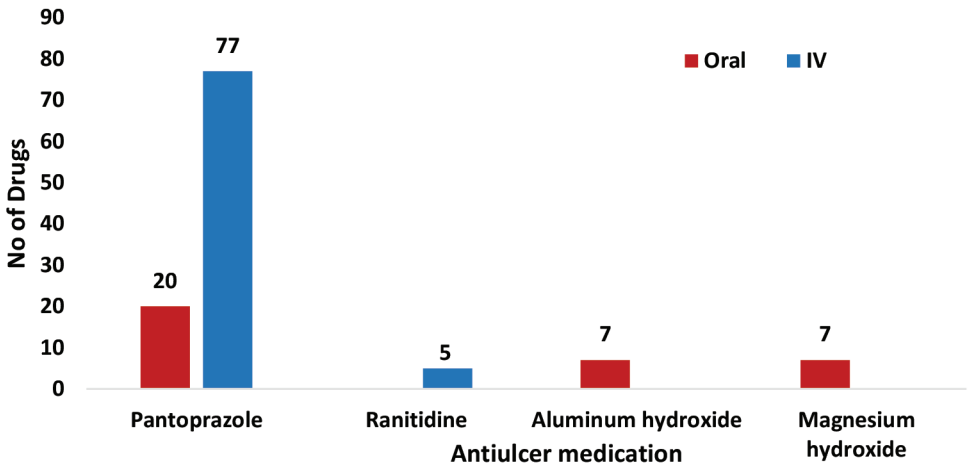
Appendix Figure 9 Monotherapy vs combination therapy

Comparison of antiulcer drug prescribing by generic vs brand name: Most of the antibiotics were prescribed by brand names (100) (100%) compared to generic names (0) (0%) (Appendix Figure 10).



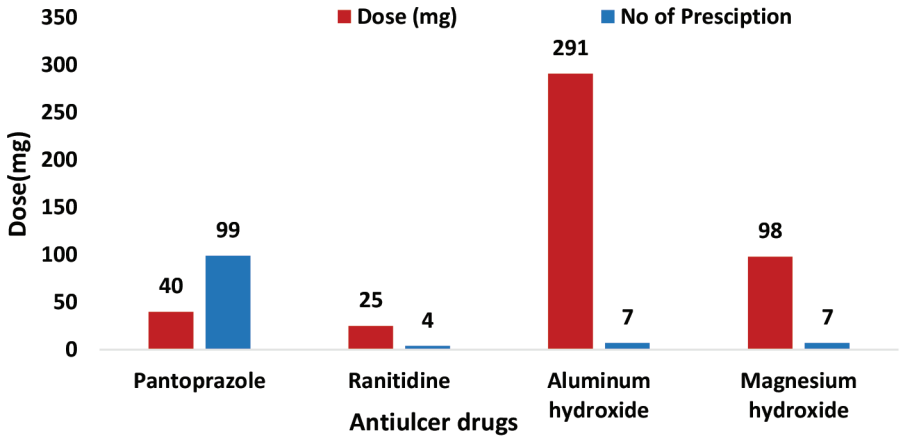
Appendix Figure 10 Generic vs brand name

Mode of administration of drugs: Most of the antibiotics were prescribed by IV route 82 (67.77%) [pantoprazole 77 (93.90%) and Ranitidine 5 (6.10%)] and Oral route 39 (31.40%) [pantoprazole 20 (52.63%), aluminium hydroxide 7 (18.42%) and magnesium hydroxide 7 (18.42%)] (Appendix Figure 11).



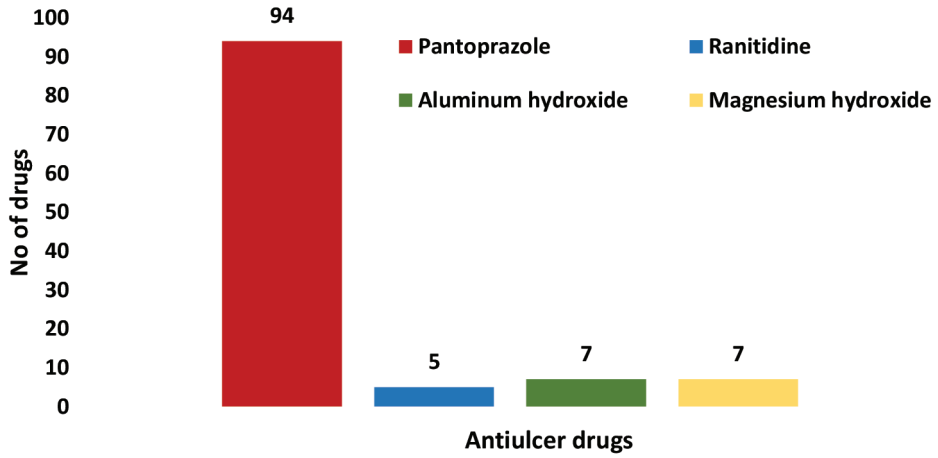
Appendix Figure 11 Mode of administration

Different doses of antiulcer drugs prescribed in prescriptions: The most commonly prescribed dosage of antiulcer drugs was pantoprazole 99 (80.49%), aluminium hydroxide 7 (5.49%), magnesium hydroxide 7 (5.49%), and ranitidine 4 (3.25%) (Appendix Figure 12).



Appendix Figure 12 Different doses of antiulcer drugs

Most commonly used agents of a particular class: Pantoprazole 94 (87.04%), aluminium hydroxide 7 (6.48%), magnesium hydroxide 7 (6.48%), and ranitidine 5 (4.63%) were the most commonly prescribed agents of particular classes in 100 patients (Appendix Figure 13).



Appendix Figure 13 Most commonly used antiulcer agents