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Original Research Article

Prescription Analysis and Improvement of Prescription Practices in a Tertiary Care Hospital: A Study on Core Prescribing Indicators

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Abstract

Introduction: This study aimed to analyze prescriptions and generate information on core prescribing indicators proposed by the World Health Organization (WHO). The objectives were to identify frequently prescribed drugs, understand the morbidity pattern, and propose measures to improve prescription practices. The study was conducted in a tertiary care hospital attached to a teaching hospital.

Materials and Methods: Prescriptions were collected from the outpatient department (OPD) by photographing them at the dispensing window of the hospital pharmacy. A Case Record Form was used to collect relevant information, including OPD number, department, age, diagnosis, system involved, drugs, dosage, frequency, duration of treatment, and route of administration. The collected data were assessed using WHO core prescribing indicators.

Results: The average number of drugs per prescription was found to be 3.54. Approximately 72.95% of the prescribed drugs were prescribed using generic names, indicating a favorable practice. About 3.01% of the prescribed drugs were in combination form, suggesting the use of fixed dose combinations. Around 6.69% of the prescriptions contained at least one injection, and 25.80% of the prescriptions included at least one antibiotic. Notably, in 50.01% of the prescriptions, a vitamin or tonic was prescribed. Additionally, approximately 97.76% of the prescribed drugs were in accordance with the Central Medical Stores Organization Gujarat State Essential Drug List for the year 2021-22.

Conclusions: The findings of this study emphasize the importance of prescription audit and continuous evaluation of prescribing practices in order to enhance the quality of care provided by hospitals. The analysis of prescription patterns and adherence to core prescribing indicators provides valuable insights into prescription practices and treatment preferences. The study underscores the need for rational prescribing, including the use of generic names, minimizing polypharmacy, and ensuring appropriate use of antibiotics. These measures can optimize patient outcomes, reduce healthcare costs, and improve patient safety. Efforts to improve prescription practices should be an integral part of healthcare systems to provide high-quality and cost-effective care.

Keywords: Prescription Practices, WHO, Healthcare Outcomes.

Introduction

"Prescription auditing is a crucial tool in evaluating and improving the quality of healthcare services provided by hospitals. Inappropriate prescribing practices can have significant implications for patient outcomes, antimicrobial resistance, and healthcare costs. [1] The World Health Organization (WHO) has proposed core prescribing indicators as a means to assess prescribing patterns and promote rational drug use. [2] The generation of information on frequently prescribed drugs and the development of an essential medicine list (EML) tailored to the hospital's needs are essential steps towards optimizing prescribing practices. Additionally, understanding the morbidity pattern and identifying areas for improvement in prescription practices are vital for enhancing patient care in tertiary care hospitals attached to medical colleges.

Irrational prescribing practices are a pervasive global issue with significant implications for patient safety, disease exacerbation, adverse health outcomes, economic burdens on patients, and resource wastage. The rationality of prescribing patterns is of utmost importance in ensuring safe and effective treatment. Examples of irrational medicine use encompass a range of detrimental practices, such as poly-pharmacy (the concurrent use of multiple medications), inadequate dosages that compromise therapeutic efficacy, inappropriate utilization of antimicrobials for non-bacterial infections, excessive reliance on injections when oral alternatives are available and more suitable, self-medication without proper guidance, and non-compliance with prescribed dosing regimens. These patterns of irrational medicine use not only pose risks to individual patients but also contribute to the growing challenges of antimicrobial resistance, healthcare costs, and suboptimal health outcomes at a global scale. [3]

Medication errors, unfortunately, are common occurrences due to the fallibility of human practitioners. However, there are several strategies to mitigate these errors and enhance medication safety. These include the establishment of committees to coordinate drug usage policies, the effective implementation and enforcement of clinical guidelines, the development and utilization of national essential medicines lists, public education campaigns on appropriate medicine use, and the avoidance of financial incentives from pharmaceutical companies.[4] Furthermore, comprehensive medical education in clinical pharmacology should incorporate the principles of rational pharmacotherapeutics through problem-based learning and interactive sessions. Another crucial approach to promote rational prescribing among physicians is prescription auditing, which provides accurate feedback on their prescribing patterns. This auditing process can be conducted either prospectively or retrospectively. The implementation of these strategies should be prioritized across all hospitals in India to ensure rational prescribing practices. [5]

The objective of this study is to conduct a comprehensive analysis of outpatient prescriptions in a tertiary care hospital attached to a medical college. The study aims to assess the prescribing patterns and identify potential areas for improvement in prescription practices. Additionally, the study seeks to generate information on frequently prescribed drugs and evaluate their adherence to the World Health Organization's core prescribing indicators. The findings of this study will contribute to enhancing the quality of care provided by the hospital and support the development of an essential medicine list tailored to the hospital's needs.

Material and Methods

This study employed a prescription audit methodology conducted at a tertiary care hospital affiliated with the government medical college in the State over a period of 1 year. The audit focused on evaluating prescription completeness, legibility, and adherence to the World Health Organization (WHO) recommended core prescribing indicators. A representative sample comprising 10% of the average monthly prescriptions for the respective hospital was collected for evaluation.

To collect the data, prescriptions from the outpatient department (OPD) were captured through photography at the dispensing window of the hospital's pharmacy. This process was conducted over a period of 15 days or until the desired sample size was attained, whichever occurred later for every month of the year.

The collected prescriptions underwent a thorough evaluation based on several criteria. The completeness of the prescription format was assessed, including patient identification details (such as name, age, sex, weight, and address), prescriber identification (including name, department, hospital, and physician initials), details of the prescribed medication (start date, strength/dose, and product formulation), dosing accuracy (identifying under-dosing and overdosing), treatment duration, directions for administration, follow-up advice, history of allergy, and diagnosis.

Furthermore, the legibility of the prescriptions was categorized into three grades: Grade 1 (legible with ease), Grade 2 (legible with difficulty), and Grade 3 (illegible). The evaluation also encompassed the assessment of WHO prescribing indicators, including the average number of drugs per prescription (where fixed-dose combinations were counted as one drug), the percentage of drugs prescribed by generic name, the percentage of antibiotics prescribed per prescription (based on the WHO model list for antibiotic classification), the percentage of injections prescribed per prescription (excluding vaccinations), and the percentage of drugs prescribed from the Essential Drugs List or hospital formulary.

Results

In our prescription audit study, we analyzed a total of 2,689 patient's prescriptions across different age groups. The patient distribution among the age groups is as follows: 379 patients (14.09%) were less than 20 years old, 946 patients (35.18%) were between 20 and 40 years old, 893 patients (33.24%) were between 41 and 60 years old, and 471 patients (17.53%) were above 60 years old. These findings provide an overview of the patient demographics in the study and help understand the representation of different age groups within the analyzed population.

Table 1:

Age Distribution	**Number of Patients (n=2689)**	**Percentage**
Less than 20	379	14.09%
20-40	946	35.18%
41-60	893	33.24%
More than 60	471	17.53%
Sex Distribution		
Male	1113	41.34%
Female	1576	58.66%

All prescriptions in this study were found to be legible with a grade 1 readability score. Legible prescriptions are crucial for clear understanding and accurate interpretation

of medications, reducing the risk of errors and enhancing patient safety. The high legibility grade observed reflects the commitment to clear prescription writing practices, emphasizing effective communication in healthcare.

In the present study, various prescription indicators were evaluated to assess the medication prescribing patterns and adherence to specific guidelines. The average number of drugs per prescription was found to be 3.54, indicating that patients received multiple medications on average. A small proportion of patients, approximately 4.42%, received monotherapy, while the majority received polytherapy.

The study also examined the percentage of prescriptions that consisted of drugs exclusively from the hospital formulary and the Essential Drug List. It was found that a significant portion of prescriptions, 92.93% and 93.04% respectively, adhered to these formularies. Furthermore, a high percentage of the prescribed drugs, 97.48% and 97.76% respectively, were from the hospital formulary and the Essential Drug List. These findings suggest that the healthcare facility has effective formulary management practices in place. The analysis also focused on the prescribing patterns related to generic names and brand names. Approximately 37.94% of prescriptions comprised drugs prescribed exclusively by generic names, while 26.94% of drugs were prescribed using brand names instead. This indicates a moderate adherence to generic prescribing practices, with room for improvement.

Additionally, the study examined the utilization of fixed drug combinations (FDC) in prescriptions. Results showed that 9.44% of prescriptions included FDC, with 3.01% of the prescribed drugs being in the form of FDC. This highlights the prescribing preferences for specific drug combinations and suggests the need for further evaluation of their efficacy and safety.

The study also assessed the usage of antibiotics and injectables in prescriptions. Antibiotics were found to be prescribed in 25.80% of the prescriptions, with 9.68% of the prescribed drugs being antibiotics. Regarding injectables, they were included in 6.69% of the prescriptions, accounting for 2.33% of the prescribed drugs. These findings raise awareness about the appropriate use of antibiotics and injectables, emphasizing the importance of antimicrobial stewardship and the consideration of alternative routes of administration. Lastly, the study explored the prescription rates of vitamins and iron preparations. Approximately 50.01% of the prescriptions included these supplements, constituting 24.09% of the prescribed drugs. This suggests a significant usage of vitamins and iron preparations in the studied population, highlighting their importance in clinical practice.

Table 2:

Prescription indicator	Value
1. Average no. of drug per prescription	3.54
2. Percentage of patients receiving monotherapy of polytherapy	4.42%
3.(a) Percentage prescriptions with all drug from the hospital formulary (b) % of drugs prescribed from formulary	92.93% 97.48%
4.(a) Percentage prescriptions with all drug from the Essential Drug List (b) % of drugs prescribed from the Essential Drug List	93.04% 97.76%
5.(a) Percentage prescriptions with all drugs prescribed by generic name (b) % of drugs not prescribed with generic names (brand names)	37.94% 26.94%

6.(a) Percentage of prescriptions with fixed drug combinations (FDC) (b) % of drugs prescribed as FDC.	9.44% 3.01%
7.(a) Percentage prescription with antibiotics (b) % of antibiotics prescribed.	25.80% 9.68%
8.(a) Percentage of prescriptions with injectables. (b) % of injectables prescribed	6.69% 2.33%
9.(a) % prescriptions with vitamins/iron preparations (b) % of vitamins/iron preparations prescribed.	50.01% 24.09%

The study analyzed the prescription patterns across various medical specialties, providing insights into the distribution of prescriptions among different healthcare disciplines. General Medicine had the highest number of prescriptions, accounting for 35.25% of the total. Orthopedics followed closely behind with 21.23% of the prescriptions, while Dermatology accounted for 12.45%. Other specialties such as Surgery, Obstetrics & Gynecology, Pediatrics, ENT, and Psychiatry constituted smaller proportions ranging from 7.73% to 1.48%. The remaining specialties, including Ophthalmology, Pulmonary Medicine, Radiotherapy, and Anesthesia, had minimal prescription representation. In total, the study analyzed 2689 prescriptions across these specialties, providing a comprehensive overview of prescription patterns in the healthcare facility.

Table 3:

S. No.	Specialty	Number of Prescriptions (%)
1.	General Medicine	948 (35.25%)
2.	Surgery	208 (7.73%)
3.	Obstetrics & Gynecology	157 (5.83%)
4.	Orthopedics	571 (21.23%)
5.	Pediatrics	133 (4.94%)
6.	Dermatology	335 (12.45%)
7.	ENT	260 (9.66%)
8.	Other Departments	80 (2.97%)
	Total	2689 (100%)

Discussion

Prescription audit plays a crucial role in ensuring the quality, safety, and rational use of medications in healthcare settings. In the Indian healthcare landscape, where the burden of disease is high and access to healthcare services is variable, the need for effective prescription auditing practices becomes paramount. The appropriate and rational use of medications is essential to optimize patient outcomes, minimize medication errors, reduce healthcare costs, and combat the emergence of antimicrobial resistance. [6] Through the systematic evaluation of prescribing patterns and adherence to evidence-based guidelines, prescription audit serves as a valuable tool for identifying areas of improvement and implementing targeted interventions to enhance the quality of healthcare services.

In our study, it was observed that 14.09% of the patients were less than 20 years old, while in the previous study conducted by Abidi et al. [7], frequent prescriptions were from the age group of children (≤14 years). This suggests a potential variation in the age distribution of patients between the two studies. Furthermore, in our study, the largest patient group was between 20 and 40 years old, accounting for 35.18% of the

total prescriptions. In contrast, Sunny et al. [8] found that the majority of prescriptions were from the age group of 41-60 years. These differences in patient age distribution between studies may be influenced by various factors, including the specific population or healthcare setting under investigation, sample size, geographical location, and study design.

In our study, percentage of patients receiving monotherapy of polytherapy was 4.42%. The presence of polypharmacy can pose risks to patient safety. With an increased number of medications being taken simultaneously, there is a higher potential for adverse drug reactions, where one drug may interact negatively with another or cause unintended side effects.

In our study, the average number of drugs per prescription was 3.54. This is slightly higher compared to the average of 3.4 reported in the study by Smitha Rai et al. [9]. Our findings align with the observation that a significant portion of prescriptions in both studies likely include multiple medications. However, our study reflects a lower average number of drugs per prescription compared to the study by Afroz et al. [7], where the mean number of drugs per prescription was 4.22. These variations in the average number of drugs per prescription across studies could be influenced by factors such as healthcare practices, prescribing guidelines, and patient populations.

Based on our study, where 92.93% of prescriptions consisted of drugs from the hospital formulary and 97.48% of drugs prescribed were from the formulary, it indicates a high level of adherence to the hospital's approved list of medications. In our study, the percentage of prescriptions with all drugs from the Essential Drug List was 93.04%, indicating a high level of adherence to the list. Furthermore, the percentage of drugs prescribed from the Essential Drug List was 97.76%, suggesting that a significant majority of prescribed medications were selected from the Essential Drug List. In the study by Abidi et al. [7], it was found that only 53.25% of drugs prescribed were on the Essential Drug List (EDL). Our percentage suggests a higher adherence to the EDL compared to other Indian studies. [10–12] The study highlighted the absence of a specific EDL that physicians could refer to for prescribing medications.

We emphasized the importance of having a local hospital formulary, which would assist physicians in prescribing medications for outpatient care while adhering to clinical protocols. A hospital formulary provides a curated list of approved medications that align with evidence-based guidelines and local healthcare needs. By having a formulary in place, physicians can make informed decisions about drug selection, promoting rational prescribing practices and standardization of care.

In our study, the percentage of prescriptions with all drugs prescribed by generic names was 37.94%, while the percentage of drugs not prescribed with generic names (brand names) was 26.94%. Comparing this to the Rai et al. [9] study, they reported a very minimal practice of prescribing drugs by generic names, which accounted for only 11.3% of prescriptions. This is in contrast to the Anteneh et al. and Ola et al. studies [13,14], which reported much higher percentages of generic name drug prescribing, ranging from 95.4% to 98.7%. The Sudarshan et al. [15] study also revealed a percentage of 69.26% for generic name drug prescribing. The disparities in the rates of generic drug prescribing across these studies may reflect the influence of pharmaceutical company representatives seeking undue favors. However, it is important to note that generic prescribing offers several advantages, including reducing the chances of dispensing errors due to misinterpretation of sound-alike trade names of drugs and decreasing the economic burden on patients.

In our study, the percentage of prescriptions with fixed drug combinations (FDC) was 9.44%, and the percentage of drugs prescribed as FDC was 3.01%. Comparing this to the Abidi et al. study, they found that fixed dose combinations were used in 40.92% of prescriptions. Although this figure is relatively higher than in our study, it is lower than what were reported in the Kaur et al. [12] and Chakrabarti et al. [16] study, which reported FDC usage rates of 75% and 35.87% respectively. The higher usage of FDCs may indicate inappropriate use of unnecessary drugs, which can lead to adverse effects and drug interactions. It is important to discourage the use of fixed dose combinations unless strictly necessary to avoid potential risks.

In our study, the percentage of prescriptions with antibiotics was 25.80%, and the percentage of antibiotics prescribed was 9.68%. Comparing this to the Rai et al. [9] study, they found that 55.4% of the prescriptions included antimicrobials. In the Anteneh et al. [14] and Ola et al. [13] study, the percentages of prescriptions containing antibiotics were reported as 58.1% and 39.2 ± 8.8%, respectively. It is important to emphasize the need for rational use of antimicrobials as irrational use can lead to the emergence of antimicrobial drug resistance, increased adverse reactions, and unnecessary hospital admissions. Overprescribing of antimicrobials can also contribute to the risk of superinfection. Among the various drug categories prescribed in our study, antimicrobials were the most frequently prescribed category, accounting for 25% of prescriptions. In the Ndungu et al. [17] study, the prevalence of anti-infective drug prescribing was reported as 28.6%. The Shiv et al. [18] study and Anteneh study [14] showed prescribing prevalences for antibiotics of 37% and 58%, respectively. These comparisons highlight the importance of appropriate and judicious use of antibiotics to combat antimicrobial resistance and minimize potential harm to patients.

In our study, the percentage of prescriptions with injectables was 6.69%, and the percentage of injectables prescribed was 2.33%. Comparing this to the Abidi et al. [7] study, they found that injectables accounted for only 6.19% of the prescriptions. Additionally, topical forms were the least prescribed at 0.299%. This suggests that injectables were relatively less commonly prescribed in both studies. In the Sharma et al. [19] study, the percentage of injections per prescription was found to be 3.2%. This indicates a slightly higher usage of injectables compared to our study and the Abidi et al. study. These findings suggest variations in the prescribing patterns and preferences regarding injectable medications across different studies. It highlights the importance of carefully evaluating the necessity and appropriateness of prescribing injectables, considering factors such as patient needs, safety, and cost-effectiveness.

In terms of the prevalence of vitamins/iron preparations, our study had a higher percentage compared to the Abidi et al. [7] study. Our study reported a 50.01% prevalence of prescriptions with vitamins/iron preparations, while the Abidi et al. [7] study mentioned the prevalence of vitamins/iron preparations of 10.5% in prescriptions. It is important to consider that variations in the study populations, healthcare settings, and prescribing practices can influence the differences observed. The higher prevalence of vitamins/iron preparations in our study may reflect the specific patient population or prescribing practices in our study setting.

Furthermore, our study highlights the importance of promoting the use of generic names in prescription writing, as it can help reduce dispensing errors, lower costs for patients, and facilitate better communication among healthcare

providers. However, there is room for improvement in this regard, as the percentage of prescriptions with generic names remains relatively low. Another notable finding is the relatively high utilization of antibiotics and injectable medications, which emphasizes the need for rational and judicious use of these therapeutic agents. The overuse or inappropriate use of antibiotics can contribute to antimicrobial resistance and other adverse consequences.

Conclusion

In conclusion, our study on prescription patterns and drug utilization in our setting has provided valuable insights and highlights several important findings. Polypharmacy was prevalent, indicating the need for caution regarding adverse drug reactions, interactions, and financial burden. Adherence to evidence-based guidelines and the use of generic names in prescriptions should be encouraged. Rational use of antibiotics and injectables is crucial to combat antimicrobial resistance. The significant prevalence of vitamins/iron preparations calls for appropriate prescribing practices. Optimizing prescription practices, adhering to formularies, and continuous monitoring are vital for enhancing patient safety and healthcare outcomes. Further research and interventions are necessary to improve healthcare delivery.

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