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Original Research Article

Assessment of prescription patterns in a tertiary care teaching hospital of Eastern Uttar Pradesh: a retrospective observational study

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ABSTRACT

Background: Inappropriate drug use is a pressing global health concern, particularly in developing countries like India. Poor prescribing practices can contribute to medication misuse, reduced patient adherence, and an increased risk of adverse drug events. This study aims to evaluate prescription trends in a tertiary care teaching hospital in Eastern Uttar Pradesh, focusing on identifying prevalent errors and assessing compliance with WHO prescribing indicators.

Methods: This retrospective observational study was conducted from May to October 2023, reviewing 400 randomly selected outpatient prescriptions from the hospital's medical records. The prescriptions were examined for completeness in terms of patient and prescriber details, medication specifics, and adherence to WHO core prescribing standards. Statistical analysis was carried out using Microsoft Excel.

Results: The study found 100% completion rates in documenting patient and prescriber identifiers and medication details. However, 9.25% of prescriptions omitted the duration of treatment, 19% lacked follow-up instructions, and none included allergy status. The average number of medications per prescription was 6.28. Antibiotics were prescribed in 90.38% of cases, injections in 82%, and 84.75% of drugs were prescribed by their generic names. Furthermore, 82.75% of prescriptions followed the Essential Medicines List.

Conclusions: While the study revealed strong adherence to basic prescription documentation, there were significant gaps, such as the omission of allergy status and treatment duration. These findings highlight the need for enhanced prescriber education, particularly around the rational use of antibiotics and injections, along with improved adherence to WHO guidelines.

Keywords: Prescription analysis, Prescription pattern, Tertiary care

INTRODUCTION

The misuse of medications is a serious global health problem, especially in developing countries like India, where healthcare systems are often under pressure. Inadequate prescribing practices not only threaten patient safety but also contribute to rising healthcare costs.[1,2] Errors in prescription writing may result in medication

misuse, poor patient compliance, and a higher likelihood of adverse drug reactions. In 2006, the World Health Organization (WHO) reported that almost half of all prescriptions around the world were either wrongly given or sold, highlighting the urgent need for improved prescribing practices and stronger regulation.[3]

In recent years, efforts to improve prescription practices have gained momentum due to the recognition that irrational drug use contributes to the growing burden of chronic diseases and antimicrobial resistance (AMR).[4,5] Prescription audits, as discussed by Panayappan et al. and Solanki & Shah, have become essential for monitoring healthcare quality.[6,7] These audits systematically review medical practices to ensure that the standard of care aligns with established benchmarks, such as WHO's core prescribing indicators.[7] Studies have shown that regular audits can significantly reduce prescription errors and promote adherence to best practices. For example, Gupta et al demonstrated that implementing regular prescription audits in Indian hospitals improved prescription quality and reduced the overuse of antibiotics.[8]

The integration of technology in prescription audits has gained popularity, especially for detecting fraudulent prescriptions, which cause substantial financial losses in healthcare systems. Innovative methods, such as data mining algorithms, have proven effective in identifying prescription fraud, highlighting the need for robust audit processes.[9] While audit and feedback mechanisms are increasingly embraced by healthcare professionals, their success depends on clear objectives and a comprehensive understanding of the healthcare landscape[10] Zhang et al. noted that successful implementation of these tools in Chinese hospitals required significant investments in training and infrastructure, along with leadership support.[11]

In tertiary care settings, particularly teaching hospitals, following WHO guidelines for prescribing is vital for patient safety and efficient resource use. However, despite this, deviations such as the excessive use of antibiotics and injections persist, suggesting a need for stricter oversight. Even in well-resourced tertiary hospitals, inappropriate antibiotic prescribing remains prevalent, pointing to the need for continuous education and stricter guideline enforcement.[5] Errors in prescription details, including missing patient information or allergy status, are also common. Singh et al. found that about 30% of prescriptions in a large teaching hospital in India were missing key patient information, which could lead to harmful drug reactions.[12]

Aim

This study aims to look at the prescribing patterns in a teaching hospital in Uttar Pradesh, finding common mistakes and comparing them to WHO standards.[3]

METHODS

A retrospective observational study was carried out at a tertiary care facility in Eastern Uttar Pradesh between May 2023 and October 2023. Prior to initiating the study, ethical approval was obtained from the institutional ethics review board (BMR/189/2023) to ensure compliance with ethical guidelines. Confidentiality of patient data was strictly maintained throughout the research. The primary data source consisted of prescription records in hard copy form, housed in the Medical Record Department (MRD) for inpatient departments. Access to these records was granted following approval from the Medical Superintendent. Given the assumption of an unknown population size, the sample size was calculated to estimate proportions with 95% confidence (Z=1.96). The expected proportion was set at 50% (P=0.5), with a margin of error of ±5% (e=0.05). Based on this, the minimum required sample size was 385, but a total of 400 prescriptions were included in the study. These 400 prescriptions were randomly selected using a random number generator, and the relevant data were gathered for analysis.

Table 1: WHO core prescribing indicators.[3]

Indicator	Formula
The average number of drugs prescribed	Total no. of medicines prescribed/ Total no. of prescriptions audited
Percentage of drugs prescribed by generic name	No. of prescription with medicines in Generic names/ No. of prescription audited X 100
Percentage of encounters with an antibiotic-prescribed	No. of prescription with antibiotics/ No. of prescription audited X 100
Percentage of encounters with an injection prescribed	No. of prescription with injections/No. of prescription audited X 100
Percentage of drugs prescribed from essential medical list or formulary	No. of prescription with medicines prescribed from EML/ No. of prescription audited X 100

Prescription format and its completeness with regards to:

Patient identifications (name, age, sex, weight, address),

Prescriber identification (name, department, hospital, registration number, physician initials),

Medication details (start date, strength/dose/product formulation),

Dosing details

Directions for administration, Duration of treatment, Follow up advice, Allergy status, and Diagnosis

WHO core prescribing indicators

These prescriptions were evaluated based on specific parameters and WHO core prescription indicators (Table 1).

Statistical analysis

The collected data were analyzed using Microsoft Excel. Descriptive statistics, such as means and percentages, were calculated to summarize demographic information, identify pharmacological interactions, and assess instances of treatment duplication. The results were then presented in tables and figures created using Microsoft Word and Excel.

RESULTS

A total of 400 inpatient prescriptions were randomly selected from the medical records for analysis. All prescriptions included the necessary patient information, such as name, age, gender, and address, ensuring 100% compliance in documenting these details. Additionally, prescriber details, including the prescriber's name, department, hospital name, registration number, and other relevant information, were present in all prescriptions. Furthermore, every prescription included details of the medications, such as dosage, strength, formulation, and instructions for use. However, some prescriptions lacked critical elements, including provisional diagnosis, duration of treatment, and follow-up instructions for patients, as shown in Figure 1.

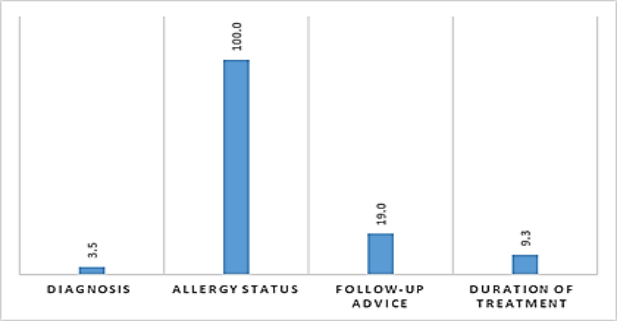

Figure 1: Missing parameters as percentage of total audited prescriptions (n=400).

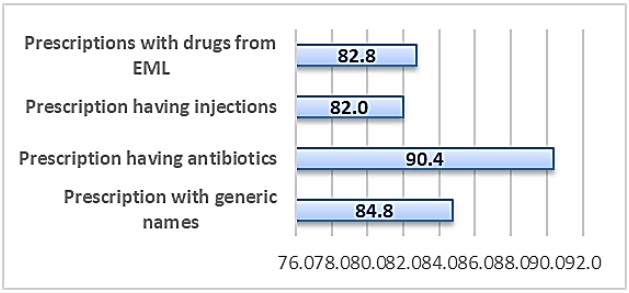

Figure 2: Results (as percentage of total) from audited prescriptions as per WHO core prescribing indicators.

With reference to the WHO core prescribing indicators (Table 1), we observed that a total of 2,515 medications were prescribed in the reviewed prescriptions, with an average of 6.3 drugs per prescription. The detailed analysis report as per the WHO prescribing indicator is mentioned in Figure 2.

DISCUSSION

This was a hospital based cross-sectional study of prescriptions, showing complete adherence (100%) to patient and prescriber identifiers, including name, age, gender, address, prescriber's name, specialty, and registration details. Additionally, all prescriptions included essential medication details such as strength, dosage, formulation, and administration directions. However, certain gaps were identified, with 9.3% of prescriptions missing the treatment duration, 19.0% lacking follow-up instructions, and none including allergy information. In terms of the WHO core prescribing indicators, the average number of drugs per prescription was 6.3, with 90.4% containing antibiotics, 82.0% including injections, and 84.8% of the medications being prescribed by their generic names.

We found strong adherence to basic prescription documentation standards, as all prescriptions (100%) included essential patient and prescriber details. These findings align with similar studies conducted in other parts of India, which also reported high compliance with basic documentation requirements.[6,7] This can likely be attributed to the widespread use of computer-based patient registration systems in most tertiary healthcare institutions across India. However, the complete absence of documented allergy status in all prescriptions is concerning. This omission poses a significant risk for adverse drug reactions, which could be life-threatening, especially in settings with inconsistent patient follow-up. Recent studies have highlighted the critical importance of recording allergy status for prescription safety. For instance, Gupta et al found that the lack of allergy documentation was a major factor contributing to adverse drug events in Indian hospitals.[8] Raising awareness among prescribers about the importance of documenting allergy status could help reduce this prescription error observed in our study.

Furthermore, the study identified that 9.3% of the prescriptions lacked a specified duration of treatment, and 19% did not include follow-up advice. These indicate need for further training and sensitization of prescribers towards completeness of prescription. These gaps in prescription information can lead to incomplete treatment regimens and poor patient adherence, ultimately affecting patient outcomes. This is consistent with findings from a study conducted in a similar tertiary care setting, where incomplete prescriptions were found to contribute to higher rates of treatment failure and patient dissatisfaction.[1] In contrast, studies from more developed healthcare systems report much lower incidences of such

omissions, highlighting the need for improved training and awareness among prescribers in resource-limited settings.[2] A study by Zhang et al. in China demonstrated that enhanced training and electronic prescription systems significantly reduced the incidence of incomplete prescriptions.[11] Current medical education curriculum guidelines in India also put emphasis on training on this aspects important competency to be learned during under graduation.

Table 2: Comparative analysis of prescription audit results in current study versus similar and dissimilar studies.

Results from current study	Studies with similar findings	Studies with dissimilar findings	Justification for dissimilarity based on current study
High compliance with patient and prescriber identifiers	Studies like Panayappan et al. and Solanki & Shah have reported similar high compliance (~98%) with the documentation of essential prescription elements.[6-7] These studies show that tertiary care hospitals, especially those with computerized systems, are more likely to document critical identifiers in prescriptions consistently.	Parihar et al. reported that prescriptions in rural India have much lower compliance. In their findings, critical details like the prescriber's name were missing in over 18% of prescriptions, and patient details like age were often omitted.[20]	The disparity is largely due to the lack of technological tools (like computer-based patient registration systems) and standardized record-keeping (due to inadequate training of healthcare workers in prescription documentation) in rural and resource-limited areas.
Lack of allergy documentation (100%)	Gupta et al. showed that lack of allergy documentation was a frequent contributor to adverse drug events in Indian tertiary care hospitals.[8] This aligns with global concerns about the role of allergy documentation in preventing drug reactions.	Joshi et al. reported better compliance (~40%) in urban settings, where computerized prescription systems and stricter oversight were in place.[21]	Urban centers with better healthcare infrastructure often have more robust audit systems and technology-driven reminders for clinicians to fill out allergy information.
Gaps in treatment duration (9.25%) and follow-up advice (19%)	In India, Panayappan et al. reported comparable gaps in rural prescriptions, with over 15% missing follow-up advice.[6] Fijn et al. noted similar issues in Dutch hospitals, where missing information such as treatment duration led to incomplete therapies and higher patient dissatisfaction rates.[1]	Sarkar et al found that in the UK, almost all prescriptions included clear treatment instructions and follow-up advice, aided by electronic health systems.[2]	The disparity can be attributed to the presence of electronic health records (EHRs) in developed countries, which automatically prompt clinicians to include essential details such as treatment duration and follow-up advice.
Polypharmacy concerns (6.28 drugs per prescription)	Studies like Solanki & Shah and Kumar et al. raised similar concerns about polypharmacy (average of over five drugs per prescription) especially in India, where over-prescribing is prevalent in tertiary care hospitals. [7,22]	Developed healthcare systems report lower rates of polypharmacy. For instance, studies from European countries show that prescriptions rarely exceed three drugs per patient. [23]	Polypharmacy in developing countries often arises from the absence of standardized treatment protocols, leading doctors to prescribe multiple medications to address a variety of symptoms that may increase the risk of adverse drug interactions.
Overprescription of antibiotics (90.38%) and injections (82%)	WHO and a recent study by Patel et al. highlighted the global issue of antibiotic overuse, particularly in developing countries like India which are driven by outdated clinical practices and patient expectations. [3,5]	Studies from Patel et al in the developed countries reported that antibiotic prescriptions rarely exceed 50% in outpatient settings, due to stricter guidelines to prevent antimicrobial resistance.[24]	Developed countries have implemented strict antimicrobial stewardship programs and clinical decision-support systems that prevent unnecessary antibiotic and injection use.

Continued.

Results from current study	Studies with similar findings	Studies with dissimilar findings	Justification for dissimilarity based on current study
Use of generic names (84.75%)	Sarkar et al found that efforts to promote generic drug use in India have been largely successful.[2] Similar to our study, Singh et al. reported over 80% compliance with generic prescribing in Indian hospitals. [12]	Western countries report near-complete compliance with generic prescribing. Field et al. noted that generic drugs were prescribed in 95% of cases in the US. [25]	Developed healthcare systems have well-enforced policies to promote generic drugs, and prescriber education ensures adherence to these policies.
Adherence to EML (82.75%)	Flottorp et al. and Ahmed et al. reported similar adherence (~80%) to the Essential Medicines List (EML) in low- and middle-income countries (LMICs). [10,16]	In developed countries, Rao et al. observed that adherence to EML or equivalent formularies is higher, nearing 100% which is possibly attributed to the integration of decision-support tools in EHRs.[17]	Adherence to EML in developing countries like India is improving, but it is hindered by a lack of awareness and the absence of decision-support systems that guide prescribers.

The study revealed that the average number of drugs per prescription was 6.3, raising concerns about polypharmacy. Polypharmacy, particularly in older adults and patients with multiple health conditions, is linked to an increased risk of adverse drug reactions, drug interactions, and elevated healthcare costs.[6] These results align with other research in Indian hospitals, where similar concerns about polypharmacy have been noted.[7] Additionally, the high percentage of prescriptions containing antibiotics (90.4%) and injections (82%) points to a trend of overprescribing these treatments. Overuse of antibiotics is a significant contributor to antimicrobial resistance, a global health threat recognized by the WHO.[3] The frequent use of injections is also troubling, as injections are more invasive, more expensive, and carry additional risks, such as infections due to non-sterile techniques.[9] Recent studies emphasize the need for stronger antimicrobial stewardship programs; for instance, Patel et al. showed that implementing these programs in Indian hospitals significantly reduced unnecessary antibiotic use.[5]

The study found that 84.8% of the drugs were prescribed by their generic names, indicating a positive move towards cost-effective prescribing. This practice aligns with WHO recommendations and mirrors similar findings from other Indian studies, where the use of generic names has been promoted to improve the affordability and accessibility of essential medicines.[2] However, there is still room for improvement to reach 100% compliance, which would further standardize prescription practices and reduce healthcare costs.[14] A study by Singh et al. demonstrated that initiatives like prescriber education and policy enforcement significantly increased the use of generic drugs in Indian healthcare settings.[12]

The high adherence to the Essential Medicines List (EML), observed in 82.75% of prescriptions, is another encouraging finding, suggesting that most prescribed medications are evidence-based and consistent with national and international guidelines.[6] However, the study underscores the need for continuous monitoring and education to further improve prescribing practices. Similar research in other low- and middle-income countries has highlighted the importance of following the EML to ensure the rational use of medicines.[11] A recent study by Ahmed et al in Bangladesh showed that EML adherence not only improved patient outcomes but also significantly reduced healthcare costs.[15] Additionally, Rao et al. suggested that integrating electronic health records with decision-support systems could enhance compliance with the EML and reduce instances of guideline deviations in Indian hospitals.[16]

When comparing the findings of this study with those from previous research, it becomes evident that targeted interventions are necessary to address the gaps in prescription practices. For instance, while the adherence to prescribing generic medications is commendable, the overprescription of antibiotics and injections highlights a need for stricter regulatory oversight and more robust antimicrobial stewardship programs (World Health Organization, 2006).[3] The study's findings are consistent with other research conducted in similar settings, which also identified a need for improved training and awareness among healthcare providers to ensure adherence to best practices and WHO guidelines.[9] A study by Sharma et al. in Nepal found that continuous medical education (CME) programs significantly improved prescribers' adherence to WHO prescribing guidelines, particularly in rural healthcare settings.[17]

Furthermore, the importance of integrating technology into healthcare systems to enhance prescription accuracy and adherence to guidelines has been highlighted in several recent studies. For instance, Jain et al. demonstrated that the implementation of electronic prescribing systems in Indian hospitals reduced

medication errors and improved adherence to best practices.[18] Similarly, a study by Verma et al. highlighted the importance of Computerized Physician Order Entry (CPOE) systems in minimizing prescription errors and enhancing the overall quality of patient care.[19]

Limitations of the study

The results of this study are based on data from a single tertiary care teaching hospital in Eastern Uttar Pradesh, which may restrict the broader applicability of the findings to other healthcare settings. Additionally, the relatively small sample size may limit the detection of significant trends or differences, suggesting that future research should involve larger sample sizes to increase statistical reliability. Potential biases in data recording, as well as the effect of confounding variables that were not controlled for, could have influenced the outcomes. Moreover, the study did not account for seasonal or temporal variations in prescribing patterns, which may have also impacted the results.

CONCLUSION

While the study revealed strong adherence to basic prescription documentation, there were significant gaps, such as the omission of allergy status and treatment duration. These findings highlight the need for enhanced prescriber education, particularly around the rational use of antibiotics and injections, along with improved adherence to WHO guidelines.

Recommendations

To address the issues identified, it is recommended that ongoing education and training programs for healthcare professionals be implemented, with an emphasis on adhering to best practice guidelines. The use of Clinical Decision Support Systems (CDSS) integrated into the hospital's Electronic Health Records (EHR) could further improve the accuracy of prescriptions. Implementing feedback mechanisms following prescription audits could assist healthcare providers in identifying and correcting their prescribing habits. Additionally, interdisciplinary collaboration, regular updates to the drug formulary, increased involvement of pharmacists, and enhanced patient education should be prioritized to improve prescription practices and medication management. Monitoring polypharmacy, performing medication reconciliation, and initiating quality improvement initiatives are crucial steps toward minimizing medication errors and promoting patient safety. Establishing a continuous prescription audit system within the hospital could significantly help maintain and improve the quality of care provided.

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