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Assessment of Rational Prescribing Practices, ADA Guideline Adherence, and Medication Safety in Diabetes Management

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Abstract: ***Background*:** Rational prescribing and adherence to evidence-based clinical guidelines are fundamental to optimizing therapeutic outcomes and ensuring medication safety in patients with diabetes mellitus. Given the increasing complexity of antidiabetic pharmacotherapy and the growing prevalence of polypharmacy, periodic evaluation of prescribing practices remains essential for identifying deviations from recommended standards and minimizing medication-related risks. ***Objective*:** To assess rational prescribing practices, evaluate adherence to American Diabetes Association (ADA) treatment guidelines, and determine the prevalence of medication safety concerns among patients receiving antidiabetic therapy in a tertiary care hospital. ***Methods*:** A prospective observational prescription audit was conducted involving 400 antidiabetic prescriptions. Prescriptions were evaluated using World Health Organization (WHO) core prescribing indicators, ADA guideline recommendations, and established medication safety assessment criteria. Prescribing rationality was assessed based on drug selection, dosage regimen, frequency, route of administration, and conformity with standard treatment guidelines. Drug–drug interactions, prescribing errors, and dose modification patterns were systematically analysed. ***Results*:** A total of 892 medications were prescribed, with an average of 2.23 drugs per prescription. Generic prescribing constituted 38.5% of medications, while 82.3% were prescribed from the Essential Medicines List. Injectable medications and antibiotics were identified in 15.25% and 6.0% of prescriptions, respectively. ADA guideline adherence was observed in 80.5% of prescriptions. Overall, 84.0% of prescriptions were categorized as rational, whereas 16.0% demonstrated prescribing inadequacies. Drug–drug interaction assessment revealed no clinically significant interactions in 57.0% of prescriptions; however, minor, moderate, and major interactions were identified in 24.0%, 14.5%, and 4.5% of cases, respectively. Prescribing error analysis showed that 82.5% of prescriptions were free from errors, while omission of dosage information represented the most frequent deficiency (6.0%). Dose adjustment evaluation indicated that 61.0% of prescriptions required no modification, whereas dose escalation and dose reduction were observed in 25.5% and 13.5% of cases, respectively. ***Conclusion*:** The study demonstrates substantial adherence to ADA recommendations and a high prevalence of rational prescribing practices in diabetes management. Nevertheless, the occurrence of prescribing errors, clinically relevant drug interactions, and suboptimal generic prescribing underscores the need for continuous prescription auditing, guideline-directed pharmacotherapy, and enhanced clinical pharmacy interventions to further improve medication safety and therapeutic quality.

Keywords: Diabetes Mellitus, Rational Prescribing, ADA Guideline Adherence, Drug Utilization Evaluation, Medication Safety, Prescription Audit, Drug–Drug Interactions, Clinical Pharmacy.

Research Paper

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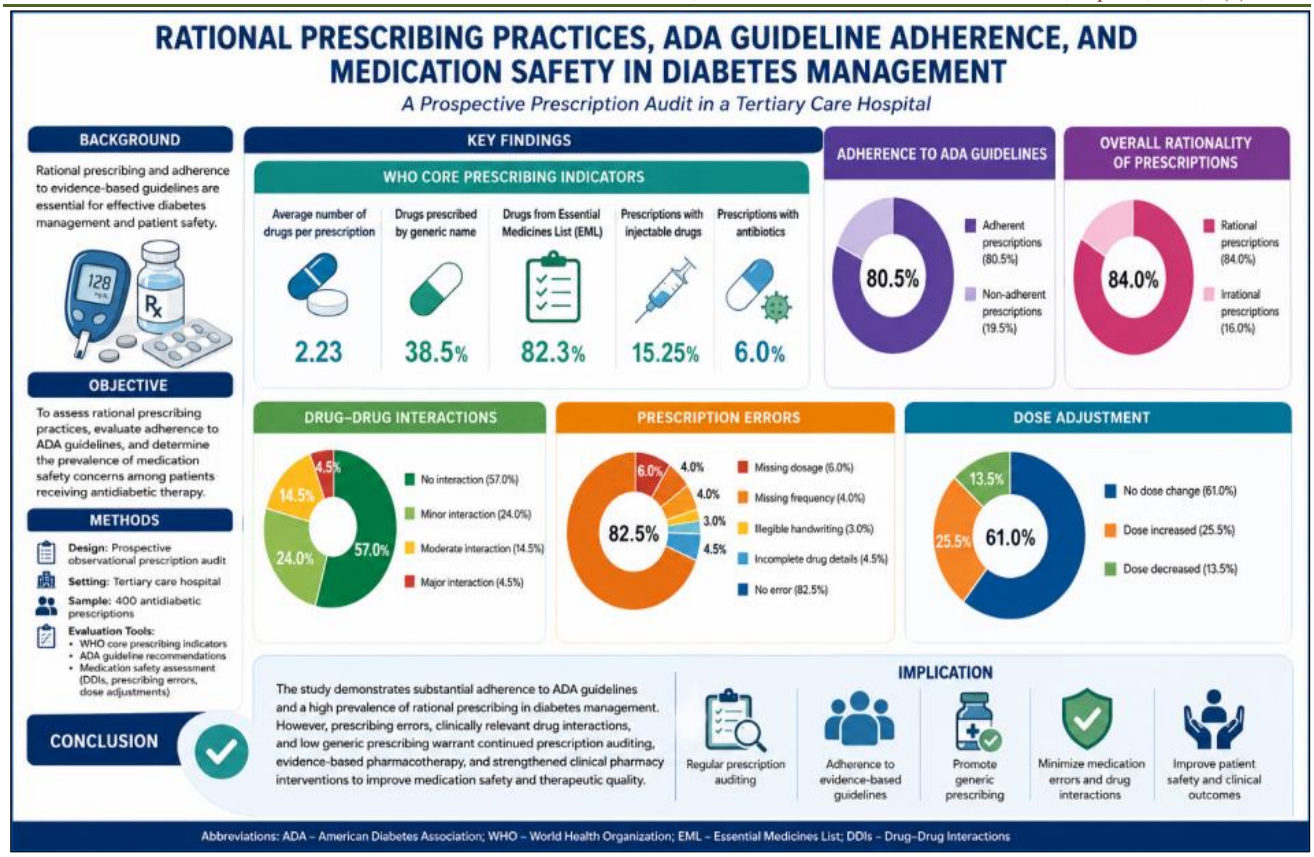

Graphical Abstract

INTRODUCTION

Diabetes mellitus (DM) is a complex, chronic, and progressive metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or a combination of both mechanisms. The disease has emerged as one of the most significant non-communicable health challenges worldwide, imposing a substantial burden on healthcare systems through increased morbidity, premature mortality, diminished quality of life, and escalating healthcare expenditures. According to recent epidemiological estimates, more than 537 million adults are currently living with diabetes globally, and this number is projected to exceed 780 million by 2045 if effective preventive and therapeutic strategies are not implemented [1].

The management of diabetes extends beyond glycaemic control and encompasses the prevention of microvascular and macrovascular complications, reduction of cardiovascular risk, optimization of metabolic parameters, and enhancement of overall patient outcomes [2]. Contemporary pharmacotherapy has evolved considerably over the past decade with the introduction of novel therapeutic classes including sodium-glucose cotransporter-2 (SGLT-2) inhibitors, glucagon-like peptide-1 receptor agonists (GLP-1 RAs), and dual incretin-based therapies. These advances have transformed treatment paradigms by providing additional cardiovascular and renal protective benefits beyond glucose lowering [3].

Rational prescribing, as defined by the World Health Organization, requires that patients receive medications appropriate to their clinical needs, in doses tailored to individual requirements, for an adequate duration, and at the lowest possible cost to both patients and society [4]. In diabetes management, rational prescribing assumes particular importance because treatment frequently involves long-term pharmacotherapy, multiple comorbidities, polypharmacy, and continuous dose adjustments based on disease progression and therapeutic response. Irrational prescribing practices may contribute to therapeutic failure, adverse drug reactions, medication errors, unnecessary healthcare expenditures, and poor patient adherence [5].

Prescription pattern monitoring and drug utilization evaluation constitute indispensable components of healthcare quality assessment and pharmacovigilance programmes. These methodologies facilitate the identification of inappropriate prescribing trends, excessive medication use, deviations from evidence-based guidelines, potential drug–drug interactions, and medication-related safety concerns. Furthermore, prescription audits provide valuable

insights into the effectiveness of existing prescribing practices and help formulate targeted interventions for improving patient care [6].

The American Diabetes Association (ADA) annually publishes comprehensive evidence-based Standards of Care that serve as internationally recognized recommendations for the diagnosis, pharmacological management, and monitoring of diabetes mellitus [7]. Adherence to ADA guidelines has been associated with improved glycaemic outcomes, reduction in diabetes-related complications, enhanced cardiovascular protection, and better overall healthcare quality. Nevertheless, studies conducted across various healthcare settings have reported variable levels of compliance with guideline-directed therapy, highlighting persistent gaps between evidence and clinical practice [8].

Medication safety remains a critical concern in diabetic populations due to the high prevalence of polypharmacy, advanced age, multiple comorbid conditions, and frequent utilization of concomitant medications. Potential drug–drug interactions, prescribing errors, inappropriate dose selection, incomplete prescription information, and inadequate monitoring may significantly compromise treatment effectiveness and increase the risk of adverse clinical outcomes [9]. Therefore, continuous evaluation of medication safety parameters is essential for ensuring optimal therapeutic benefit while minimizing preventable harm.

The World Health Organization prescribing indicators provide a standardized framework for assessing the quality of prescribing practices and have been extensively utilized in drug utilization research worldwide [10]. Parameters such as average number of drugs per prescription, generic prescribing frequency, utilization of essential medicines, injectable drug use, and antibiotic prescribing patterns offer objective measures of prescribing quality and rationality. Integration of these indicators with guideline adherence assessment and medication safety evaluation provides a comprehensive understanding of prescribing behaviour in routine clinical practice.

Given the growing prevalence of diabetes mellitus and the increasing complexity of antidiabetic pharmacotherapy, periodic evaluation of prescribing practices is essential to ensure evidence-based, safe, and cost-effective patient care. Therefore, the present study was undertaken to assess rational prescribing practices using WHO core prescribing indicators, evaluate adherence to current ADA treatment guidelines, and identify medication safety concerns including drug–drug interactions, prescribing errors, and dose modification patterns among patients receiving antidiabetic therapy in a tertiary care hospital setting.

MATERIALS AND METHODS

Study Design and Setting

A prospective, observational, prescription-based drug utilization study was conducted to assess rational prescribing practices, adherence to American Diabetes Association (ADA) guidelines, and medication safety among patients receiving antidiabetic therapy. The study was carried out in the Department of General Medicine of a tertiary care teaching hospital over a period of six months.

Study Population

The study included adult patients diagnosed with diabetes mellitus who received at least one antidiabetic medication during the study period. A total of 400 prescriptions were consecutively collected and evaluated. Both inpatient and outpatient prescriptions meeting the eligibility criteria were included in the analysis.

Inclusion Criteria

- Patients aged 18 years and above diagnosed with Type 1 or Type 2 diabetes mellitus.
- Prescriptions containing one or more antidiabetic medications.
- Complete and legible prescriptions available for review.
- Patients willing to provide informed consent, where applicable.

Exclusion Criteria

- Prescriptions with insufficient clinical information for evaluation.
- Duplicate prescriptions from the same patient during the study period.
- Gestational diabetes and other secondary forms of diabetes.
- Patients receiving investigational or experimental therapies.

Data Collection

Data were collected using a structured and pre validated data collection form. Information extracted from prescriptions included patient demographics, diagnosis, antidiabetic medications prescribed, dosage regimen, route of administration, frequency of administration, duration of therapy, concomitant medications, and relevant clinical parameters. All prescriptions were reviewed prospectively by trained clinical pharmacy researchers.

Assessment of Rational Prescribing

Rational prescribing practices were evaluated using World Health Organization (WHO) Core Prescribing Indicators, including:

- Average number of drugs per prescription.
- Percentage of drugs prescribed by generic name.
- Percentage of drugs prescribed from the Essential Medicines List (EML).
- Percentage of prescriptions containing injectable medications.
- Percentage of prescriptions containing antibiotics.

Prescriptions were categorized as rational or irrational based on appropriateness of drug selection, dose, frequency, route of administration, and conformity with established therapeutic guidelines.

Assessment of ADA Guideline Adherence

Each prescription was evaluated against the most recent American Diabetes Association (ADA) Standards of Medical Care in Diabetes. Adherence was determined by assessing the appropriateness of antidiabetic therapy selection, treatment intensification strategies, use of cardiovascular and renal protective agents where indicated, and overall conformity with evidence-based recommendations. Prescriptions were classified as either adherent or non-adherent.

Medication Safety Evaluation

Medication safety assessment included identification of:

- Potential drug–drug interactions.
- Prescribing errors.
- Dose modification requirements.

Drug–drug interactions were categorized as minor, moderate, or major according to standard drug interaction databases. Prescribing errors included missing dosage information, omission of administration frequency, incomplete drug details, and illegible handwriting. Dose modifications were categorized as dose increase, dose decrease, or no dose adjustment.

Sample Size

A total sample size of 400 prescriptions was included in the study, providing an adequate representation of prescribing practices and enabling reliable evaluation of prescribing indicators, guideline adherence, and medication safety outcomes.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 32.0. Descriptive statistics were used to summarize study findings. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. Results were tabulated and graphically represented wherever appropriate.

RESULTS

This table summarizes the World Health Organization (WHO) core prescribing indicators used to evaluate rational prescribing practices among the study participants. The findings indicate predominance of multidrug therapy, with a higher proportion of drugs prescribed by brand names compared to generic names.

Table 1: WHO Core Prescribing Indicators for Antidiabetic Prescriptions (n = 400)

Prescribing Indicator	Frequency/Value	Percentage (%)
Total number of drugs prescribed	892	—
Average number of drugs per prescription	2.23	—
Drugs prescribed by generic name	343	38.5
Drugs prescribed from Essential Medicines List (EML)	734	82.3
Prescriptions containing injectable drugs	61	15.25
Prescriptions containing antibiotics	24	6

This table evaluates the adherence of prescribed antidiabetic regimens to current American Diabetes Association (ADA) treatment guidelines among the study participants. Most prescriptions were found to be compliant with ADA guideline recommendations, while a smaller proportion showed non-adherence.

Table 2: Adherence of Prescriptions to ADA Guidelines (n = 400)

Guideline Adherence Status	Frequency (n)	Percentage (%)
Adherent prescriptions	322	80.5
Non-adherent prescriptions	78	19.5

This table summarizes the overall rationality of antidiabetic prescriptions based on dosage appropriateness, frequency of administration, route of administration, and conformity with standard treatment guidelines. Most prescriptions were categorized as rational according to prescribing assessment criteria.

Table 3: Overall Rationality Assessment of Prescriptions (n = 400)

Prescription Rationality	Frequency (n)	Percentage (%)
Rational prescriptions	336	84
Irrational prescriptions	64	16

This table summarizes the burden of potential drug–drug interactions identified in the reviewed prescriptions among the study participants. Most prescriptions did not contain clinically significant interactions, while moderate and major interactions were observed in a smaller proportion of cases.

Table 4: Frequency of Drug–Drug Interactions Identified (n = 400)

Interaction Status	Frequency (n)	Percentage (%)
No interaction	228	57
Minor interaction	96	24
Moderate interaction	58	14.5
Major interaction	18	4.5

This table presents the common prescribing errors identified during the review of antidiabetic prescriptions among the study participants. Most prescriptions were free from prescribing errors, while missing dosage information was the most frequently observed error.

Table 5: Prescription Errors Identified During Review (n = 400)

Error Type	Frequency (n)	Percentage (%)
Missing dosage	24	6
Missing frequency	16	4
Illegible handwriting	12	3
Incomplete drug details	18	4.5
No error	330	82.5

This table presents the frequency of dose modifications made during the review of antidiabetic therapy among the study participants. Most prescriptions did not require dose adjustment, whereas dose escalation was observed more frequently than dose reduction.

Table 6: Frequency of Dose Adjustments in Antidiabetic Prescriptions (n = 400)

Dose Adjustment Status	Frequency (n)	Percentage (%)
No dose change	244	61
Dose increased	102	25.5
Dose decreased	54	13.5

DISCUSSION

The present study comprehensively evaluated rational prescribing practices, adherence to American Diabetes Association (ADA) guidelines, and medication safety parameters among patients receiving antidiabetic therapy in a tertiary care healthcare setting. The findings demonstrate an encouraging level of rational prescribing, substantial compliance with evidence-based therapeutic recommendations, and an overall satisfactory medication safety profile. Nevertheless, several areas requiring optimization were identified, particularly regarding generic prescribing, prescription completeness, and the occurrence of clinically relevant drug–drug interactions.

The average number of drugs prescribed per prescription in the present study was 2.23, indicating a relatively controlled prescribing pattern and a lower propensity toward excessive polypharmacy. Although diabetes management often necessitates multidrug therapy due to the coexistence of hypertension, dyslipidaemia, cardiovascular disease, and other comorbidities, irrational polypharmacy remains a significant concern because it increases treatment complexity and the risk of adverse drug reactions. A similar average number of medications per prescription was reported by Bhosale *et al*., who observed 2.41 drugs per prescription among diabetic patients attending a tertiary care hospital, suggesting comparable prescribing trends across similar healthcare settings [11]. Likewise, Chawla *et al*., reported an average of 2.6 medications per prescription, emphasizing the increasing reliance on combination therapy in diabetes management [12].

Generic prescribing remains an important indicator of rational drug use because it enhances medication affordability, accessibility, and healthcare sustainability. In the present study, only 38.5% of medications were prescribed by generic name. Although

this finding is higher than that reported in certain developing healthcare systems, it remains substantially lower than the ideal WHO recommendation of 100% generic prescribing. Similar observations were reported by Das *et al*., who documented generic prescribing rates ranging between 32% and 45% in antidiabetic prescriptions [13]. The persistence of brand-name prescribing may reflect physician preference, pharmaceutical marketing influences, perceived differences in quality, and institutional prescribing practices. Increasing generic prescribing could significantly reduce treatment costs and improve medication adherence among patients with chronic diseases.

The proportion of medications prescribed from the Essential Medicines List (EML) was 82.3%, reflecting a commendable degree of conformity with national and international recommendations. Essential medicines are selected based on efficacy, safety, cost-effectiveness, and public health relevance. Comparable findings were reported by Nandimath *et al*., who observed EML utilization rates exceeding 80% among patients receiving chronic disease pharmacotherapy [14]. High EML utilization is generally considered indicative of rational and evidence-based prescribing behaviour.

Assessment of ADA guideline adherence demonstrated that 80.5% of prescriptions complied with contemporary evidence-based recommendations. This finding reflects a substantial level of implementation of guideline-directed therapy in routine clinical practice. Similar adherence rates have been reported in previous investigations evaluating diabetes care quality. Ali *et al*., demonstrated that adherence to standardized diabetes management recommendations significantly improves glycaemic control and reduces diabetes-related complications [15]. Likewise, Grant *et al*., reported that healthcare institutions incorporating structured guideline-based treatment protocols achieve superior clinical outcomes compared with non-standardized approaches [16]. Despite the encouraging adherence observed in the present study, nearly one-fifth of prescriptions remained non-compliant, highlighting the need for continued educational initiatives and regular prescription audits.

Evaluation of prescription rationality revealed that 84.0% of prescriptions fulfilled predefined rationality criteria, whereas 16.0% demonstrated varying degrees of irrational prescribing. These findings are consistent with previous drug utilization studies indicating that most antidiabetic prescriptions conform to accepted therapeutic standards. Shankar *et al*., reported rational prescribing rates ranging from 78% to 86% in tertiary care institutions, closely paralleling the observations of the current investigation [17]. The relatively high proportion of rational prescriptions may be attributed to increased awareness of evidence-based medicine, improved physician training, and wider availability of clinical practice guidelines.

Medication safety assessment identified potential drug–drug interactions in 43.0% of prescriptions, including moderate interactions in 14.5% and major interactions in 4.5% of cases. Although the majority of interactions were not clinically significant, these findings underscore the challenges associated with managing patients requiring multiple medications. Similar interaction frequencies have been reported by Patel *et al*., who observed clinically relevant drug interactions in approximately 40% of diabetic prescriptions [18]. Polypharmacy, advanced age, and multiple comorbidities are recognized contributors to increased interaction risk. Clinical pharmacist-led medication review programmes have been shown to significantly reduce preventable drug-related problems and improve patient safety outcomes [19].

Prescription error analysis revealed that 82.5% of prescriptions were free from identifiable errors. Among the detected deficiencies, omission of dosage information represented the most common error, followed by incomplete drug details and missing administration frequency. These findings are consistent with previous reports indicating that prescribing omissions constitute a major category of medication errors in ambulatory and hospital-based practice. Dean *et al*., reported that incomplete prescription documentation remains a frequent cause of medication-related incidents and may contribute to therapeutic failure or adverse events [20]. Regular prescription review, computerized physician order entry systems, and pharmacist participation in multidisciplinary healthcare teams have been shown to reduce such errors significantly.

The present study further demonstrated that 61.0% of patients required no dose modification, whereas dose escalation and dose reduction were observed in 25.5% and 13.5% of prescriptions, respectively. These findings reflect the dynamic nature of diabetes management, where therapeutic regimens frequently require adjustment based on glycaemic response, disease progression, renal function, and treatment tolerability. Similar trends were documented by Khunti *et al*., who highlighted the importance of timely treatment intensification and individualized dose optimization in achieving long-term glycaemic targets [21]. Appropriate dose modification is considered a cornerstone of personalized diabetes care and contributes substantially to improved therapeutic outcomes.

Collectively, the findings of the present study indicate that prescribing practices within the evaluated healthcare setting largely conform to accepted standards of rational pharmacotherapy and ADA

recommendations. However, opportunities remain for further improvement, particularly through enhanced generic prescribing, strengthened medication safety surveillance, routine prescription auditing, and greater integration of clinical pharmacy services. Such interventions may further optimize therapeutic effectiveness, improve patient safety, reduce healthcare costs, and promote evidence-based diabetes management.

In conclusion, the study demonstrates a high prevalence of rational prescribing and substantial adherence to ADA guidelines among patients receiving antidiabetic therapy. Nevertheless, the occurrence of prescribing errors, clinically relevant drug interactions, and suboptimal generic prescribing practices highlights the need for ongoing quality improvement initiatives. Continuous professional education, implementation of standardized prescribing protocols, and active involvement of clinical pharmacists may further enhance the quality, safety, and effectiveness of diabetes pharmacotherapy.

CONCLUSION

The present study provides a comprehensive evaluation of rational prescribing practices, adherence to American Diabetes Association (ADA) treatment guidelines, and medication safety among patients receiving antidiabetic therapy in a tertiary care healthcare setting. The findings demonstrated a high prevalence of rational prescribing, with the majority of prescriptions conforming to established therapeutic standards and evidence-based recommendations. Adherence to ADA guidelines was observed in a substantial proportion of prescriptions, reflecting an encouraging level of implementation of contemporary diabetes management strategies in routine clinical practice.

Evaluation of WHO core prescribing indicators revealed satisfactory utilization of essential medicines and a relatively controlled degree of polypharmacy. However, the comparatively low rate of generic prescribing indicates a potential area for improvement in promoting cost-effective pharmacotherapy. Medication safety assessment identified clinically relevant drug–drug interactions and prescribing deficiencies in a minority of prescriptions, highlighting the continued need for vigilant medication review and prescription monitoring. Furthermore, the requirement for dose modifications in a considerable proportion of patients underscores the importance of individualized therapeutic management and continuous clinical assessment.

Overall, the study findings suggest that diabetes management within the evaluated healthcare setting largely aligns with principles of rational drug use and guideline-directed care. Nevertheless, ongoing efforts are required to enhance generic prescribing practices, minimize medication-related errors, optimize drug safety, and improve adherence to evidence-based treatment recommendations. Regular prescription audits, integration of clinical pharmacy services, implementation of antimicrobial and medication stewardship programmes, and continuous professional education of healthcare providers may further strengthen the quality, safety, and effectiveness of diabetes pharmacotherapy. Such interventions have the potential to improve clinical outcomes, reduce healthcare costs, and promote sustainable patient-centred diabetes care.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee prior to commencement. All patient information was maintained with strict confidentiality, and data were analysed anonymously in accordance with the ethical principles outlined in the Declaration of Helsinki.

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Conflict of Interest: The authors declare that there are no conflicts of interest regarding the publication of this study.

Informed Consent: Written informed consent was obtained from all participants before inclusion in the study wherever applicable.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Limitations of the Study

The study was conducted in a single tertiary care healthcare institution, which may limit the generalizability of the findings to other healthcare settings. The relatively short study duration and prescription-based assessment may not fully capture long-term prescribing trends, clinical outcomes, medication adherence patterns, or disease progression. Future multicentre studies involving larger populations and longer follow-up periods are warranted to provide broader insights into rational prescribing practices and diabetes management.

REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas. 11th ed. Brussels: International Diabetes Federation; 2024.
2. American Diabetes Association Professional Practice Committee. Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(Suppl 1):S1-S350.
3. Davies MJ, Aroda VR, Collins BS, et al. Management of hyperglycaemia in type 2 diabetes. Diabetologia. 2023;66(9):1527-1550.
4. World Health Organization. The Rational Use of Drugs: Report of the Conference of Experts. Geneva: WHO; 1985.
5. Ofori-Asenso R, Agyeman AA. Irrational use of medicines. Int J Risk Saf Med. 2016;28(2):93-103.
6. Wettermark B, Elseviers M, Almarsdottir AB, et al. Introduction to drug utilization research. Drug Utilization Research. 2016:1-12.
7. American Diabetes Association Professional Practice Committee. Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(Suppl 1):S1-S350.
8. Ali MK, Bullard KM, Saaddine JB, et al. Achievement of goals in U.S. diabetes care. N Engl J Med. 2013;368(17):1613-1624.
9. Gandhi TK, Weingart SN, Borus J, et al. Adverse drug events in ambulatory care. N Engl J Med. 2003;348(16):1556-1564.
10. World Health Organization. How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators. Geneva: WHO; 1993.
11. Bhosale RR, Suthar SD, Banavalikar JN, et al. Drug utilization study in patients with diabetes mellitus at a tertiary care hospital. Int J Basic Clin Pharmacol. 2018;7(4):704-709.
12. Chawla S, Kaur S, Bharti A, et al. Prescription pattern and drug utilization study in patients with type 2 diabetes mellitus. Int J Res Med Sci. 2019;7(8):3021-3027.
13. Das P, Debnath S, Ghosh A, et al. Evaluation of prescribing patterns and rational drug use in diabetes mellitus patients. J Clin Diagn Res. 2018;12(7):FC01-FC05.
14. Nandimath VA, Aithal S, Kulkarni V, et al. Assessment of essential medicine prescribing practices in chronic disease management. Natl J Physiol Pharm Pharmacol. 2019;9(5):421-426.
15. Ali MK, Bullard KM, Gregg EW, et al. Achievement of goals in U.S. diabetes care, 1999–2010. N Engl J Med. 2013;368(17):1613-1624.
16. Grant RW, Cagliero E, Dubey AK, et al. Clinical inertia in the management of type 2 diabetes metabolic risk factors. Diabet Med. 2004;21(2):150-155.
17. Shankar PR, Upadhyay DK, Subish P, et al. Drug utilization patterns among diabetic patients in tertiary care settings. Pharm Pract. 2007;5(3):123-128.
18. Patel PS, Rana DA, Suthar JV, et al. A study of potential drug–drug interactions in prescriptions of diabetic patients. Perspect Clin Res. 2014;5(2):79-83.
19. Chisholm-Burns MA, Kim Lee J, Spivey CA, et al. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. Med Care. 2010;48(10):923-933.
20. Dean B, Schachter M, Vincent C, et al. Causes of prescribing errors in hospital inpatients. Drug Saf. 2002;25(11):819-836.
21. Khunti K, Gomes MB, Pocock S, et al. Therapeutic inertia in the treatment of hyperglycaemia in patients with type 2 diabetes. Diabetes Obes Metab. 2018;20(2):427-437.