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Original Research Article

A study of prescribing pattern in type-1 and type-2 diabetes in a tertiary care centre

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder with rising global prevalence, necessitating evidence-based prescribing to prevent complications. Understanding prescribing patterns provides insights into guideline adherence, drug utilization, and rational therapy. This study aimed to evaluate and compare prescribing patterns among Type-1 and Type-2 diabetes patients in a tertiary care hospital, assess rationality of prescriptions, and analyze combination therapies.
Methods: A prospective, observational study was conducted over 18 months (March, 2024 to August, 2025) in a tertiary care hospital. Prescriptions from 506 patients (T1DM = 49, T2DM = 457) were collected and analyzed. Data included demographics, drug class, dose, frequency, regimen, combination therapy medications. Descriptive statistics were used for analysis.
Results: Insulin therapy was prescribed universally in T1DM, predominantly basal-bolus regimens. In T2DM, metformin was the most frequently prescribed (72.92%), followed by sulfonylureas, SGLT2 inhibitors, and DPP-4 inhibitors. Dual and triple combination therapies were common. The use of generic drugs prefers more over the brands. Polypharmacy was seen in 32.30% of the study population.
Conclusions: Prescribing patterns largely adhered to evidence-based guidelines. Rational use of combination therapies and newer antidiabetic agents was observed. Reinforcing guideline-based prescribing can improve patient outcomes.

Keywords: Diabetes mellitus, Insulin therapy, Oral antidiabetic drugs, Prescribing patterns, Type-1 diabetes, Type-2 diabetes

INTRODUCTION

The World Health Organization describes rational drug use as a process in which patients receive medications that are suitable for their clinical condition, administered in appropriate doses tailored to individual requirements, for an adequate duration, and at the lowest possible cost to both the patient and the community.[1] In practice, however, irrational prescribing remains common and may include overprescription or under-prescription of medicines, unnecessary polypharmacy, deviation from established treatment guidelines, use of non-essential medications, and preference for branded products instead of cost-effective generics.[2] These patterns contribute to increased healthcare expenditure and suboptimal therapeutic outcomes.[3]

Drug utilization research plays a critical role in promoting evidence-based prescribing practices. Such studies help identify trends in medication use, assess adherence to clinical guidelines, and detect inappropriate prescribing behaviours. By doing so, they contribute to minimizing ineffective therapy, reducing adverse drug reactions, and lowering the financial burden on patients.[4]

Diabetes mellitus (DM) is a long-standing metabolic disorder characterized by sustained elevation of blood glucose levels due to impaired insulin secretion, decreased insulin sensitivity, or a combination of both mechanisms. The global burden of diabetes has risen dramatically over recent decades.[5] According to international epidemiological estimates, hundreds of millions of individuals worldwide are currently living with the disease, and projections indicate a substantial increase in prevalence in the coming decades. The rise is particularly pronounced in low- and middle-income countries, with India representing one of the most affected populations globally.[6]

Type 1 diabetes mellitus (T1DM) primarily results from autoimmune-mediated destruction of pancreatic β-cells, leading to absolute insulin deficiency and the lifelong need for exogenous insulin therapy.[7] In contrast, Type 2 diabetes mellitus (T2DM), which accounts for the majority of cases, develops from a combination of insulin resistance and progressive β-cell dysfunction. Management of T2DM often requires multifaceted pharmacological strategies, including oral antidiabetic agents, injectable therapies, or combination regimens.[8]

Appropriate prescribing in diabetes management is essential for achieving optimal glycemic control, preventing both microvascular and macrovascular complications, and enhancing overall quality of life. Evaluating patterns of antidiabetic drug use provides valuable insight into the extent of guideline adherence, prevalence of polypharmacy, and potential areas for therapeutic optimization.[9] Previous investigations have demonstrated regional variations in prescribing practices, emphasizing the importance of context-specific assessments, particularly in tertiary care institutions.[10]

The present study aimed to comprehensively evaluate prescribing patterns among patients with T1DM and T2DM in a tertiary care hospital. The analysis focuses on the utilization of monotherapy, combination therapy, and various insulin regimens in order to assess rational prescribing practices.

METHODS

This study was designed as a prospective, observational investigation conducted at the department of pharmacology, in collaboration with the department of medicine, government medical college, Chhatrapati Sambhajinagar. The objective was to analyse the prescription patterns of antidiabetic medications in patients who have either T1DM or T2DM, focusing on individuals aged between 40 to 60 years older who are receiving treatment for these conditions.

The study specifically targeted patients who were aged between 40-60 years older, had received a diagnosis of at least 5 years of T1DM or T2DM. Patients who either did not meet the inclusion criteria or opted to withdraw from the study were excluded from the analysis.

Before initiating the study, ethical approval was obtained from the institutional ethics committee, and a no objection certificate (NOC) was secured from the head of the medicine department to ensure that all necessary permissions were granted. The investigator thoroughly explained the objectives and procedures of the study to the HOD, ensuring full understanding and support for the project.

The study enrolled all patients attending or admitted to the medicine department of government medical college, Chhatrapati Sambhajinagar, from March 2024 to August 2025. To meet statistical rigor, the study followed the world health organization (WHO) guidelines for drug use surveys, which recommend a minimum of 300 patient encounters for a comprehensive prescription audit. A total of 506 prescriptions were reviewed during the study.

Prescription data was collected for each patient, with a particular focus on patients receiving insulin/antidiabetic medications. The collected data included details such as the class of insulin/antidiabetic drugs, dosage, and the treatment regimen. Patients who not willing to gave informed consent or who chose to withdraw were excluded from further analysis. All patient-related information was recorded in a case record form (CRF), ensuring confidentiality and that only anonymized data would be used in subsequent analysis and reporting.

The source documents for this study included CRFs from outpatient, records from the health management information system (HMIS), and relevant documents from the medical records section of the medicine department. These documents were reviewed thoroughly to extract relevant data in line with the study objectives.

Data collected from the patients were analysed using Microsoft excel. The data were expressed as mean standard deviation for continuous variables and as percentages for categorical variables.

RESULTS

The table 1 shows the gender distribution of 506 participants. Females constituted a higher proportion of the study population 279 (55.14%) compared to males 227 (44.86%).

Table 1: Details of gender distribution of patients.

Gender distribution	Number of patients	Percentage (%)
Male	227	44.86
Female	279	55.14
Total	506	100

The age-wise gender distribution of the patients shows that the majority of patients were in the 56-60 years age group (27.07%) of which 73 (53.28%) were females and 64 (46.72%) were males. The second-largest group was in the 51-55 years range, accounting for 26.08% out of which 67 (50.75%) were females and 65 (49.25%) were males. The detailed age-wise distribution is shown in Figure 2.

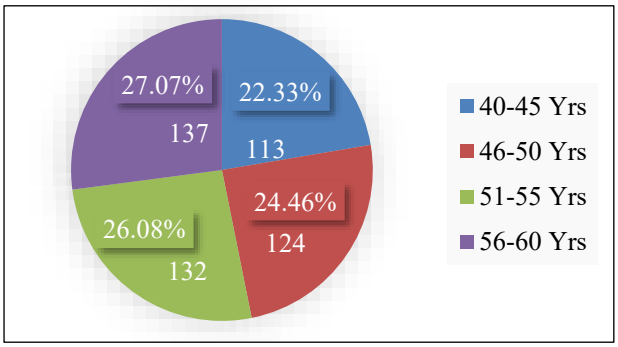

Figure 1: Age-wise gender distribution.

The table 2 shows the prescribing pattern of antidiabetic drugs in 960 prescriptions. Metformin (72.92%) was the most commonly prescribed drug, followed by glimepiride (44.08%) and crystalline insulin (25.88%). Dapagliflozin (21.54%) was moderately used, while gliclazide and vildagliptin were prescribed less frequently 9.28% and 5.73% respectively. Long-acting insulins were used in a small proportion of patients. Overall, oral antidiabetic drugs were prescribed more commonly than insulin.

Table 2: Details of drugs prescribed.

Name of drug	No. of prescriptions	Percentage (%)
Tab. Metformin	369	72.92
Tab. Glimepiride	223	44.08
Inj. Crystalline Insulin	131	25.88
Tab. Dapagliflozin	109	21.54
Tab.Gliclazide	47	9.28
Tab. Vildagliptin	29	5.73
Inj. Glargine	24	4.74
Inj. Degludec	8	1.58
Total	960	

Table 3: Drugs prescribed by generic and brand names.

Types of prescription	Percentage (%)
Generic name	83.33
Brand name	16.67

The table 3 shows the type of prescriptions used in the study. Most drugs were prescribed by their generic names (83.33%), while brand-name prescriptions accounted for 16.67%, indicating a preference for generic prescribing, which supports cost-effective and rational use of medicines.

The table 4 shows the distribution of antidiabetic drugs by class. Biguanides, mainly metformin, were the most commonly prescribed (64.60%). Sulfonylureas, including glimepiride and gliclazide, were also frequently used (38.95%). SGLT-2 inhibitors, represented by dapagliflozin, accounted for 33.40% of prescriptions. Insulin preparations were used in 23.10% of cases. DPP-4 inhibitors, such as vildagliptin, were prescribed least frequently (5.75%).

Table 4: Most prescribed class of drugs.

Drug class	Drug name	Percentage
Biguanides	Tab. Metformin 500/1000 mg	72.92
Sulfonylurea	Tab. Glimepiride 0.5/1/2 mg	44.08
	Tab. Gliclazide	9.28
SGLT-2 inhibitor	Tab. Dapagliflozin 10 mg	33.40
Insulin	Inj. Crystalline Insulin	23.10
	Inj. Insulin Glargine	4.74
	Inj. Degludec	1.58
DPP-4 inhibitor	Tab. Vildagliptin 50 mg	5.75

Among the study population, 184 patients (40.52%) were treated with monotherapy for diabetes. Metformin, a biguanide, was the most commonly prescribed single drug (16.20%), followed by the sulfonylurea glimepiride (10.28%). Newer agents such as the SGLT-2 inhibitor dapagliflozin were used in 5.74% of patients, while gliclazide was prescribed in 4.54%. Regular (crystalline) insulin was used as monotherapy in 3.75% of patients, mainly those with type 1 diabetes mellitus (Table 5).

Table 5: Monotherapy class of drugs.

Monotherapy	No. of patients	Percentage
Biguanides Tab. Metformin	82	16.20
Sulfonylurea Tab. Glimepiride	52	10.28
SGLT-2 Inhibitor Tab. Dapagliflozin	29	5.74
Sulfonylurea Tab. Gliclazide	23	4.54
Regular Insulin Inj. Crystalline Insulin	19 (T1DM)	3.75
Total	184	40.52

The table 6 shows the two-drug therapy pattern used in diabetic patients. A total of 234 patients (46.26%) were treated with combination therapy. The most commonly prescribed class of combination was biguinides (metformin 500mg) with sulfonylurea (glimepiride 1mg/

2mg) 16.60%, indicating preference for combining an insulin sensitizer with an insulin secretagogue. This was followed by biguinides (metformin 500 mg) with SGLT-2 inhibitors (dapagliflozin 1mg) 9.28%, reflecting the use of newer agents for better glycaemic control. Other frequently used combinations included metformin with insulin (5.92%), metformin with vildagliptin (5.74%), and gliclazide with dapagliflozin (4.74%). In Type 1 diabetes mellitus (T1DM) patients, combinations of short-acting insulin with long-acting insulin analogues (glargine or degludec) were prescribed to achieve basal-bolus insulin control. Overall, the data suggest rational use of combination therapy to improve blood glucose control when monotherapy is insufficient.

Table 6: Combination of 2 drugs class for diabetics.

2-Drug therapy	No. of patients	Percentage
Tab. Meformin + Tab. Glimepiride	84	16.60
Tab. Metformin + Tab. Dapaglifozin	47	9.28
Tab. Metformin + Inj. Crystalline Insulin	30	5.92
Tab. Metformin + Tab. Vildagliptin	29	5.74
Tab. Gliclazide + Tab. Dapagliflozin	24	4.74
Inj. Crystalline Insulin + Inj. Glargine	22 (T1DM)	4.34
Inj. C.I. + Inj. Degludec	8 (T1DM)	1.60
Total	234	46.26

Table 7: Combination of 3 drugs class for diabetics.

3-Drug therapy	No. of patients	Percentage
Tab. Metformin + Tab. Glimepiride + Inj. C. I	53	10.48
Tab. Metformin + Tab. Glimepiride + Tab. Dapaglifozin	25	4.94
Total	78	15.42

The table 7 shows the use of three-drug therapy among the study participants. A total of 78 patients (15.42%) received triple-drug therapy. The most common combination was metformin, glimepiride, and crystalline insulin (10.48%), followed by metformin, glimepiride and dapagliflozin (4.94%).

The table 8 shows the use of therapy with more than three drugs. A small proportion of patients (1.98%) received a combination of metformin, glimepiride, dapagliflozin, and crystalline insulin, indicating the use of intensive therapy in selected cases.

Table 8: Combination of more than 3 drug therapy.

More than 3 drug therapy	No. of patients	Percentage
Tab. Metformin + Tab. Glimepiride + Tab. Dapagliflozin + Inj. Crystalline Insulin	10	1.98

The table 9 presents important prescribing and drug-utilization indicators related to antidiabetic therapy in the study.

Table 9: Analysis of prescription patterns according to the WHO drug use indicators.

Parameters	Findings
The average numbers of drugs per prescription	2.15
The percentage of drugs prescribed by generic name	83.33
The average no. of antidiabetic drugs prescribed from the department drug schedule	9/11
The percentage of antidiabetic drugs prescribed from the department drug schedule	81.81
The percentage of antidiabetic drugs dispensed from the department drug schedule	81.81
The percentage utilization of scheduled drugs from the National List of Essential Medicines (NLEM) 2022	72.72
The percentage utilization of scheduled drugs from the WHO essential list 2025	54.04

The average number of drugs per prescription was 2.15, which indicates a relatively low level of polypharmacy, suggesting rational prescribing practices and a reduced risk of drug-drug interactions and adverse effects.

A high 83.33% of drugs were prescribed by their generic names, reflecting good prescribing practices. Generic prescribing promotes cost-effectiveness, improves accessibility, and aligns with national and international recommendations for rational drug use.

On average, 9 out of 11 antidiabetic drugs were prescribed from the department drug schedule, and 81.81% of antidiabetic drugs were prescribed according to this schedule. This demonstrates substantial adherence to institutional treatment guidelines. Similarly, 81.81% of antidiabetic drugs were dispensed from the department drug schedule, indicating good availability and effective implementation of the schedule within the department.

The utilization of drugs listed in the National List of Essential Medicines (NLEM) 2022 was 72.72%, showing a favourable level of compliance with national essential

medicine recommendations, though there remains scope for further improvement.

In contrast, the utilization of drugs from the WHO Essential Medicines List 2025 was 54.04%, which is comparatively lower. This suggests partial alignment with global essential medicine guidelines and highlights the need to strengthen prescribing practices in accordance with international standards. Overall, the findings indicate good generic prescribing, reasonable adherence to departmental and national guidelines, and moderate alignment with WHO essential medicine recommendations, with opportunities to further improve rational drug use and standardization of therapy.

DISCUSSION

Among the 506 diabetic patients, 49 had T1DM and the remaining were diagnosed with T2DM and admitted to the Medicine Ward. A higher proportion of females (55.14%) was observed compared to males 227 (44.86%). The study showed that the percentages of patients on antidiabetic monotherapy and combination therapy were 36.40% and 63.60%, respectively, showing similarity with the study of Sharma et al.[11] Of the 506 patients on antidiabetic therapy, 233 (46.05%) and 88 (17.40%) were on two-drug and three-drug combinations, respectively, showing similarity with the study of Gafar et al.[12]

Overall, metformin was the most frequently prescribed antidiabetic agent (71.50%), showing similar findings to the study by Okoro et al.[13] The metformin + glimepiride combination was the most commonly prescribed regimen, consistent with findings reported by Tanwar et al.[14]

This is in line with current clinical guidelines, which recommend biguanides and sulfonylureas as preferred treatments for patients with type 2 diabetes. Similar findings were observed in studies by Okoro et al and Tanwar et al, where biguanides and sulfonylureas were most commonly prescribed.[13,14]

The study showed that monotherapy was prescribed to 40.52% of patients, with metformin 500 mg being the most common monotherapy (16.20%), which aligns with the findings of Jimoh et al.[12] This was followed by glimepiride 1 mg or 2 mg, the most frequently prescribed sulfonylurea monotherapy (10.28%). These findings are similar to those of Sharma et al, where metformin was used in 24.60% of biguanide monotherapies.[11] In the present study, SGLT-2 inhibitors (dapagliflozin 10 mg) accounted for 5.74% of monotherapy prescriptions. The least commonly prescribed agents were gliclazide (4.54%) and crystalline insulin (3.75%).

A significant observation from the study was the frequent use of combination therapy, with 46.26% of patients being prescribed two-drug combinations. This aligns with the results reported by Tanwar et al and Jimoh et al, where two-drug combinations were commonly prescribed.[12,14]

The most frequent two-drug combination was biguanides plus sulfonylureas, prescribed to 16.20% of patients, particularly the combination of metformin and glimepiride. This is consistent with the findings of Tiwari et al and Rekha et al.[15,16]

The study found that 15.42% of patients were prescribed three-drug regimens, with the most common combination being biguanides plus sulfonylureas plus regular insulin (53 patients, 67.94%). In the present study, the combination of biguanides, sulfonylureas, and an SGLT-2 inhibitor was prescribed to 25 patients (32.05%). The use of four-drug combinations was relatively rare (1.98%) but not unexpected in patients with uncontrolled diabetes or additional comorbid conditions. This group predominantly received the combination of biguanides, sulfonylureas, SGLT-2 inhibitors, and regular insulin. These findings emphasize the complex nature of managing elderly diabetic patients and highlight the need for individualized treatment strategies. Comparable results were observed in the study by Sharma et al.[17]

A high proportion of generic drug prescriptions (83.33%) was observed, consistent with national and global efforts to promote generic prescribing to reduce healthcare costs while ensuring effective treatment. Similar findings were seen in the study by Sharma et al.[17] However, other studies, such as those by Tanwar et al and Rekha et al, reported lower rates of generic prescribing.[14,16] The remaining 16.67% of prescriptions were for brand-name drugs, which may reflect preferences for specific formulations or patient-related considerations such as tolerability.

The WHO-DUS prescribing indicators revealed positive results. The average number of drugs per encounter was 2.15, similar to patterns seen in studies by Sharma et al and Upadhyay et al, where comparable averages were reported.[17,18] Furthermore, the high percentage of drugs prescribed from the Essential Drug List (72.72% for India, 2023; 54.04% for WHO, 2025) reflects adherence to recommended guidelines, ensuring that prescribed drugs are both clinically effective and cost-effective. Similar findings were observed in the study by Bhavika et al.[19] Polypharmacy was observed in 32.30% of the study population. The low percentage of encounters with injections (5.82%) further underscores the preference for oral medications in this patient population.

This study has several limitations. As a single-centre study, its findings may have limited generalizability. The relatively small sample size may reduce statistical power and representativeness. The study focuses on prescribing patterns without assessing clinical outcomes such as glycaemic control, complications, or adherence, and lacks longitudinal follow-up. Incomplete evaluation of comorbidities and reliance on medical records may introduce bias. Additionally, the study does not assess prescribing appropriateness according to standard guidelines or consider pharmacoeconomic aspects such as cost-effectiveness and affordability.

CONCLUSION

This study highlights the prevalence of combinations of insulin and antidiabetic agents in the treatment of Type-1 & Type- 2 diabetics with Biguanides and Sulfonylurea being the most commonly prescribed drug classes. The use of generic drugs and adherence to EDLs (NLEM 2022 and WHO 2023) demonstrate a rational and cost-effective approach to managing Diabetes in this vulnerable population. The use of generic drugs prefers more over the brands. The combination of antidiabetic drugs prescribed at our tertiary care hospital was found rational. Further research is warranted to evaluate the long-term outcomes and adherence patterns in this cohort.

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