



Research Article

An Observational Study to Analyse the Prevalence and Patterns of Drug Utilization Among Diabetes Mellitus Patients Attending the Diabetic Clinic Opd at A Tertiary Care Centre in Bikaner, (Rajasthan)

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Abstract: **Introduction:** Diabetes Mellitus (DM) is a complex, chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. **Aim:** To analyze the prescribing patterns and drug utilization trends among diabetes mellitus patients attending the Diabetic Clinic OPD at a tertiary care center using WHO core prescribing indicators. **Methodology:** The present study was a hospital-based cross-sectional observational study conducted in the Department of Pharmacology in association with the Diabetic Clinic Outpatient Department (OPD) at S. P. Medical College and P.B.M. Associated Group of Hospitals, Bikaner, Rajasthan. **Result:** The study showed that type 2 diabetes mellitus was the predominant form of diabetes, with metformin and glimepiride being the most commonly prescribed drugs, while triple-drug therapy and polypharmacy were frequently observed. Prescribing practices demonstrated high adherence to generic and NLEM drug use, with limited but increasing use of newer agents such as SGLT2 inhibitors. **Conclusion:** The prescribing pattern largely followed current standard treatment guidelines, emphasizing rational use of antidiabetic medications and extensive generic prescribing. Regular prescription audits and greater use of evidence-based newer therapies can further optimize diabetes management and improve patient outcomes.

Keywords: Type 2 Diabetes Mellitus, Drug Utilization Pattern, Rational Prescribing

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INTRODUCTION

Diabetes Mellitus (DM) is a complex, chronic metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or both [1]. It is recognized as one of the leading global health concerns of the 21st century due to its rapidly rising prevalence and associated complications. The International Diabetes Federation (IDF) reports that approximately 537 million adults worldwide were living with diabetes in 2021, a number projected to increase to 643 million by 2030 [2]. The burden of diabetes is not limited to developed countries but is increasingly affecting low- and middle-income nations, imposing significant economic and social costs. According to the World Health Organization (WHO), diabetes is a chronic metabolic condition marked by elevated blood glucose levels, which can cause severe harm to the heart, blood vessels, eyes, kidneys, and nerves over time. The most prevalent type is type 2 diabetes mellitus (T2DM), mainly affecting adults.³ This condition arises when the body becomes insulin-resistant or fails to produce sufficient insulin. Effective management of diabetes aims to achieve optimal glycaemic control to prevent or delay the onset of complications. This involves a combination of lifestyle modifications, pharmacotherapy, and regular monitoring. Pharmacological treatment includes various classes of anti-diabetic drugs such as metformin, sulfonylureas, thiazolidinedione's, DPP-4 inhibitors, SGLT2 inhibitors, insulin, and others. The selection of medication regimens depends on factors like age, disease duration, comorbidities [4], risk of hypoglycaemia, and patient preferences. The primary regulation of glucose is managed by two hormones, insulin and glucagon, which are secreted by the pancreas. In diabetes mellitus, this regulation is disrupted. A WHO report from October 2018 indicated that 72.9 million people (8.8%) in India had diabetes in 2017, and this figure rose to 77 million by 2019, according to the International Diabetes Federation. This study aimed to evaluate the prevalence and patterns of drug utilization in diabetes mellitus patients [5], ensuring rational prescribing and adherence to guidelines. It helped identify

gaps, optimize therapy, and improve patient outcomes by analyzing prescribing trends, polypharmacy risks, and the impact of comorbidities in a tertiary care setting. The need for this study arises from the growing burden of diabetes mellitus (DM) worldwide, including in India, where the prevalence of DM is escalating rapidly. Effective management of diabetes heavily depends on appropriate drug utilization [6], adherences to treatment protocols, and understanding prescribing patterns. Moreover, such an analysis can provide valuable insights into prescribing behaviors, patient compliance, and the impact of socioeconomic factors on medication use. This knowledge is essential for healthcare providers to optimize treatment strategies, improve patient outcomes, and minimize medication- related complications [7]. Additionally, the findings can reform policy-making, promote rational drug use, and enhance the quality of diabetic care in the region.

Aim

To analyze the prescribing patterns and drug utilization trends among diabetes mellitus patients attending the Diabetic Clinic OPD at a tertiary care centre using WHO core prescribing indicators.

MATERIALS AND METHODS

The present study was a hospital-based cross-sectional observational study conducted in the Department of Pharmacology in association with the Diabetic Clinic Outpatient Department (OPD) at S. P. Medical College and P.B.M. Associated Group of Hospitals, Bikaner, Rajasthan. The study was carried out over a period of one year, from March 2025 to February 2026, after obtaining approval from the Institutional Ethics Committee. The study population comprised all eligible patients attending the Diabetic Clinic OPD during the study period who fulfilled the inclusion criteria. A simple random sampling technique was employed for the selection of study participants. Prescriptions of diabetic patients aged 18 years or above, irrespective of gender, were included in the study. Patients with associated co-morbidities such as hypertension, ischemic heart disease, congestive heart failure, chronic kidney disease, and peripheral neuropathy were also included. Written or verbal informed consent was obtained from all participants before their inclusion in the study. Patients younger than 18 years of age, those with gestational diabetes, prescriptions lacking a provisional diagnosis, and patients who were unwilling to participate or did not provide consent were excluded from the study.

RESULTS

The majority of cases are concentrated in the 36–55 years’ age group that is 257 (42.83%) cases and among the 56–75 years’ age group are 248 (41.33%) cases. While the 18–35 years’ age group makes up 46 (7.66%) cases. The >75 years’ group comprises 49 (8.16%) of the total cases. Overall, most cases are observed among middle-aged and older adults, with a smaller proportion occurring in young adults Table 1.

Table 1: Age wise Distribution

Age Group	Number of cases	Percentage
18–35	46	7.66%
36–55	257	42.83%
56–75	248	41.33%
>75	49	8.16%
Total	600	100.00%

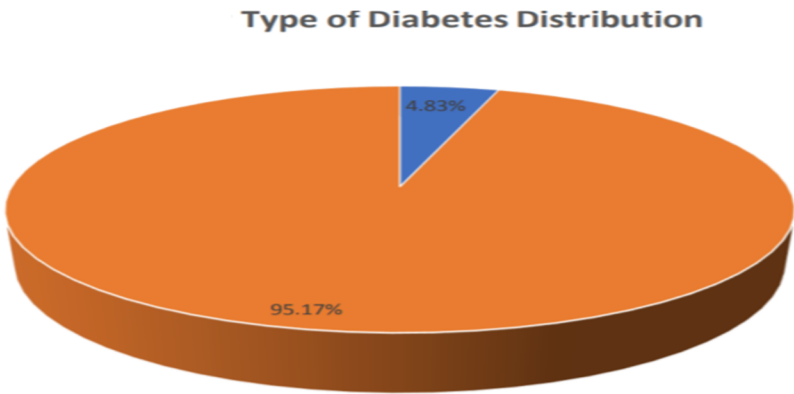


Figure 1: Type of Diabetes and Comorbidities among Study Population

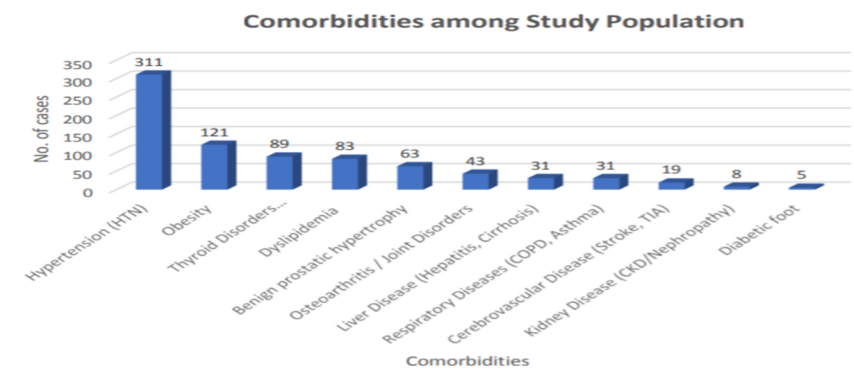


Figure 2: Type of Diabetes and Comorbidities among Study Population

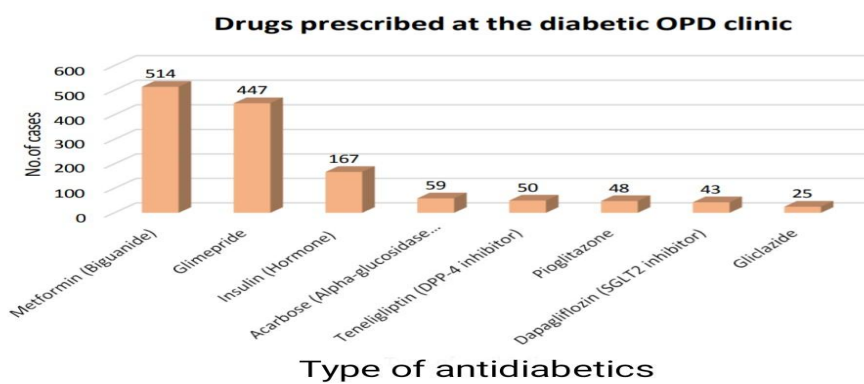


Figure 3: Drugs Prescribed at the Diabetic OPD Clinic

Table 2: NLEM and Non NLEM 2022 Drugs Usage

	Drug Name	No. of occasions	Percentage
NLEM Drugs	Metformin (Biguanide)	514	85.67%
	Glimepiride	447	74.50%
	Insulin	167	27.83%
	Teneligliptin (DPP-4 inhibitor)	50	8.33%
Non NLEM Drugs	Acarbose (Alpha Glucosidase Inhibitors)	59	9.83%
	Pioglitazone	48	8.00%
	Dapagliflozin (SGLT2 Inhibitor)	43	7.17%
	Gliclazide	25	4.17%

Figure 1 showed the distribution of diabetes types among a total of 600 cases, indicating that the vast majority are type 2 diabetes mellitus (T2DM) with 571 cases, accounting for 95.17%. Only 29 cases (4.83%) are of type 1 diabetes mellitus (T1DM). And figure 2 represented that Hypertension was the most prevalent comorbidity, affecting 311 patients (51.83%), followed by obesity in 121 patients (20.17%) and thyroid disorders in 89 patients (14.83%). Dyslipidemia was present in 83 patients (13.83%) and benign prostatic hypertrophy in 63 patients (10.5%). Osteoarthritis/joint disorders were reported in 43 patients (7.17%). Liver disease and respiratory diseases such as COPD and asthma were each noted in 31 patients (5.17%). Cerebrovascular disease including stroke, TIA and Parkinsonism was documented in 19 patients (3.17%). Renal diseases including CKD and nephropathy were observed in 8 patients (1.33%), while diabetic foot was seen in only 5 patients (0.83%).

Figure 3 depicts the prescribing frequency of various antidiabetic agents in the diabetic OPD among 600 prescriptions. Metformin was the most commonly prescribed drug, used in 514 prescriptions (85.67%), followed by glimepiride in 447 prescriptions (74.5%). Insulin was prescribed in 167 cases (27.83%).

Among other oral agents, acarbose was used in 59 prescriptions (9.83%), teneligliptin in 50 prescriptions (8.33%), pioglitazone in 48 prescriptions (8.0%), and dapagliflozin in 43 prescriptions (7.17%). Gliclazide was the least prescribed sulfonylurea, accounting for 25 prescriptions (4.17%). The data reflects predominant use of biguanides and sulfonylureas, consistent with first-line therapy recommendations,

Table 3: Concomitant use of Insulin & Oral Antidiabetic Agents

Drug usage	No. of patients	Percentage
Oral Antidiabetic Agents + Insulin	108	18%
Insulin alone	59	9.83%
Total Insulin used	167	27.83%

Table 4: Utilisation Pattern of Antidiabetic Drug Combinations

Parameter	No. of Patients	Percentage
Monotherapy	68	11.33%
Dual therapy	243	40.5%
Triple therapy	276	46%
Quadruple therapy (Four)	9	1.5%
Quintuple therapy (Five)	4	0.67%

Table 5: Assessment of Polypharmacy & Concomitant Drug Use among Diabetic Patients

No. of drugs prescribed	No. of Patients	Percentage
(Antidiabetic drugs +/- concomitant drugs)		
1 drug	26	4.33%
2 drugs	72	12%
3 drugs	203	33.83%
4 drugs	271	45.17%
≥5 drugs	28	4.67%

Table 6: WHO Core Prescribing Indicators in Diabetic OPD

WHO Prescribing Indicator	Observed Value	WHO Optimal Value	Remarks
Average no. of drugs per encounter	(2003/600) = 3.34	1.6 - 1.8	Higher than optimal, expected in diabetic patients with comorbidities
Percentage of drugs prescribed by generic name	99%	100%	Near-optimal adherence
Percentage of encounters with an antibiotic prescribed	9.5%	<10%	As per the WHO guidelines
Percentage of encounters with an Injection prescribed	27.83%	<20%	Higher than optimal, reflects the Insulin prescribed in the diabetic OPD
Percentage of drugs prescribed from NLEM 2022 out of the total Antidiabetic Agents prescribed	(1178/1353) x 100 i.e. 87.06%	100%	Below optimal, based on the availability, cost and indications of usage

along with substantial insulin use and increasing adoption of newer drug classes like DPP-4 inhibitors and SGLT2 inhibitors.

Table 2 shows that among the 600 antidiabetic drug prescriptions, Metformin 514 (85.67%) and Glimepiride 447 (74.50%) were the most frequently prescribed NLEM 2022 drugs, followed by Insulin 167 (27.83%), Teneligliptin 50 (8.33%).

Table 3 presented Acarbose, an alpha-glucosidase inhibitor, as the most frequently prescribed non-NLEM drug, used on 59 occasions (9.83%). Pioglitazone was the second most common, prescribed on 48 occasions (8.00%), followed by Dapagliflozin, an SGLT2 inhibitor, on 43 occasions (7.17%). Gliclazide had the lowest usage among these four drugs, with 25 prescriptions (4.17%). Of the total study population, 167 patients (27.83%) were prescribed insulin in some form. Among these, 108 patients (18%) received a combination of oral antidiabetic agents with insulin, while 59 patients (9.83%) were on insulin therapy alone.

Triple therapy was the most common regimen, prescribed to 276 patients (46.0%), closely followed by dual therapy in 243 patients (40.5%). Monotherapy was used in 68 patients (11.33%). Higher-order combinations were less frequent, with quadruple therapy prescribed to 9 patients (1.5%) and quintuple therapy to only 4 patients (0.67%) Table 4.

Above table shows that 4 drugs observed in 271 patients (45.17%), followed by 3 drugs in 203 patients (33.83%). Two-drug regimens were noted in 72 patients (12%), while polypharmacy 5 or more drugs were prescribed to 28 patients (4.67%). Only 26 patients (4.33%) received monotherapy with a single drug. The data shows 83.67% of patients receiving 3 or more drugs. This reflects the multimorbidity burden in diabetic patients and the need for multiple agents to manage diabetes and associated conditions such as hypertension and dyslipidemia Table 5.

The average number of drugs per encounter was 3.34, which is higher than the WHO optimal range of 1.6 - 1.8. This elevation is expected given the prevalence of comorbidities in diabetic patients. Prescribing by generic name was 99%, showing near-optimal adherence to WHO standards of 100%. Antibiotic use was documented in 9.5% of encounters,

which falls within the WHO recommended limit of <10%. Injection use was observed in 27.83% of encounters, exceeding the WHO optimal value of <20%, reflecting the frequent need for insulin in diabetic care Table 6.

DISCUSSION

In our study, Table 1 demonstrates maximum diabetic patients were in 36–55 years 42.83% and 56–75 years 41.33% age groups, indicating middle- aged and elderly predominance. This aligns with Das *et al.* [8] who reported highest prevalence in 51-60 years 29.3%.

In our study T2DM constituted 95.17% and T1DM only 4.83% in our study. This is consistent with WHO and IDF reports stating T2DM accounts for 90-95% of all diabetes globally. Pawar *et al.* [9] documented 97.1% T2DM in Western Maharashtra.

In the present study, hypertension 51.83% and obesity 20.17% were most common comorbidities, followed by thyroid disorders 14.83%. Our HTN prevalence is lower than Karthikeyan *et al.* [10] who reported 59.3% HTN, but similar to Venkateshwarlu *et al.* [11] 24.5%.

In the present study Metformin 85.67% and glimepiride 74.50% were most prescribed NLEM drugs, reflecting first-line status per ADA and ICMR guidelines. This matches Satpathy *et al.* [12] metformin 78.2%, glimepiride 62.1%. Among non-NLEM drugs, acarbose 9.83% was highest, similar to Brahmabhatt *et al.* [13] 11.2%. SGLT2i dapagliflozin use 7.17% is increasing compared to older studies like Abidi *et al.* [14] <2%, aligning with recent guidelines promoting cardio-renal benefits. Pioglitazone 8.0% usage is lower than Chaudhary *et al.* [15] 14.6%, likely due to safety concerns.

In our study, among 600 non-NLEM 2022 antidiabetic prescriptions, acarbose was the most utilized at 9.83% of occasions, followed by pioglitazone at 8.00%, dapagliflozin at 7.17%, and gliclazide at 4.17%. The relatively low usage of these agents reflects their non-essential status and higher cost. Pioglitazone use at 8.00% likely due to concerns of the adverse effect profile. Dapagliflozin at 7.17% indicating limited uptake despite CV/renal benefits, possibly due to cost and UTI risk. Acarbose usage at 9.83%, as it remains preferred for post-prandial hyperglycemia in carbohydrate-rich Indian diets despite GI side effects. Gliclazide at 4.17%, suggesting a prescriber shift toward glimepiride among sulfonylureas for its once-daily dosing.

In our study, insulin was prescribed in 27.83% patients, with 18% on OAD + insulin and 9.83% on insulin alone. Among all the patients who were receiving insulin, Glargine 49.1% was most common, followed by premix 30.53%, aligning with modern basal-bolus trends noted by Pandya *et al.* [16] NPH use was 0% in our study vs 29.94% in some earlier Indian studies, reflecting updated prescribing.

In our study Triple drug therapy with Antidiabetic agents- 46.0% and Dual therapy 40.5% dominated, with monotherapy only 11.33%. This exceeds Joshi *et al.* [17] multicentric study showing 28.3% triple therapy, indicating aggressive management in our OPD. Therapy with multiple antidiabetic agents like four or five drugs was limited in our study population with Quadruple therapy in only 1.5% and Quintuple therapy in only 0.67% cases.

In our study, polypharmacy was common with 4 drugs being the most frequent regimen at 45.17%, followed by 3 drugs at 33.83%, 2 drugs at 12.00%, ≥5 drugs at 4.67%, and monotherapy at only 4.33%. Indicating high prescribing burden due to antidiabetic combinations and concomitant medications for comorbidities. Our 4-drug regimen rate of 45.17% is higher than Joshi *et al.*¹⁷ who reported 32.6% reflecting variation in comorbidity profiles and prescriber preference.

In the present study Table 6 depicts average drugs per encounter 3.34 exceeding WHO optimal 1.6-1.8 but is justified in diabetes with comorbidities, similar to Joshi *et al.* [17] 2.6. Generic prescribing 99% was superior to How to Investigate Drug Use Indian average 60-70% and matched Kavitha *et al.* [18] 98.7%.

CONCLUSION

The present study demonstrates that T2DM is the predominant form of diabetes in the OPD setting, affecting mainly middle-aged and elderly males. Hypertension and obesity were the most common comorbidities. Prescribing trends strongly aligned with the standard ICMR guidelines, with metformin and glimepiride being the most utilized NLEM drugs, and insulin glargine being preferred among insulins. Dual or triple drug therapy with Antidiabetic agents was the norm, reflecting intensive management strategies. Polypharmacy was not very common with an average of 3.34 drugs per prescription, largely due to antidiabetic combinations and concomitant medications for comorbidities. Generic prescribing was nearly universal at 99% and adherence to the NLEM 2022 list was high at 87.06%, indicating rational and cost-effective drug use. Antibiotic use was limited, suggesting judicious prescribing practices for acute conditions. Injection use for slightly higher than the WHO guidelines reflecting Insulin prescription in the diabetic OPD. Overall, the prescription pattern reflects

evidence-based, guideline-directed management of diabetes with emphasis on combination therapy and patient compliance.

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