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PRESCRIBING PATTERNS AND GLYCAEMIC CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Prescription pattern analysis provides valuable insights into the utilization of antidiabetic medications, adherence to treatment guidelines, and glycaemic control among patients with type 2 diabetes mellitus (T2DM). the objective is to evaluate antidiabetic drug prescribing patterns and changes in glycaemic parameters among patients with type 2 diabetes mellitus attending a tertiary care teaching hospital.

Materials and Methods: This prospective observational study was conducted among 100 patients with type 2 diabetes mellitus at Late Smt Indira Gandhi Memorial Government Medical College, Kanker, Chhattisgarh, India, between May 2025 and April 2026. Patients were followed for three months. Demographic characteristics, associated comorbidities, antidiabetic prescriptions, fasting plasma glucose (FPG), postprandial plasma glucose (PPG), and glycated haemoglobin (HbA1c) were recorded and analysed descriptively. An HbA1c level below 7.0% was considered the threshold for glycaemic control.

Results: The mean age of participants was 55.8 ± 10.4 years, and 56.0% were male. Hypertension (58.0%) and dyslipidaemia (46.0%) were the predominant comorbidities. Dual oral antidiabetic therapy was the most frequently prescribed regimen (42.0%), followed by oral monotherapy (24.0%), triple oral therapy (18.0%), and insulin-containing regimens (16.0%). Metformin was prescribed to 92.0% of patients. Mean FPG decreased from 168.4 ± 42.6 to 139.2 ± 31.8 mg/dL, while mean PPG declined from 238.6 ± 58.4 to 194.8 ± 44.2 mg/dL. Mean HbA1c decreased from 8.6 ± 1.4% at baseline to 7.7 ± 1.1% at follow-up. The proportion of patients achieving HbA1c below 7.0% increased from 18.0% to 40.0%.

Conclusion: Metformin-based combination therapy constituted the predominant antidiabetic prescribing approach among patients with type 2 diabetes mellitus. Improvements in fasting glucose, postprandial glucose, and HbA1c were observed during the three-month follow-up. Nevertheless, a substantial proportion of patients remained above the glycaemic target, highlighting the importance of individualized treatment optimization, regular glycaemic monitoring, and comprehensive diabetes management.

Keywords: Type 2 diabetes mellitus; antidiabetic drugs; prescribing patterns; glycaemic control; metformin; glycated haemoglobin; prospective observational study.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from insulin resistance and progressive pancreatic β-cell dysfunction. It represents a major global public health concern because of its increasing prevalence, long-term

complications, and substantial healthcare expenditure. The International Diabetes Federation estimated that approximately 537 million adults aged 20–79 years were living with diabetes worldwide in 2021, with this number projected to increase considerably by 2045.[1] In India, the Indian Council of Medical Research–India Diabetes (ICMR-INDIAB) study reported a substantial burden of diabetes and associated metabolic disorders, including hypertension, obesity, and dyslipidaemia.[2] These findings emphasize the importance of early diagnosis, appropriate pharmacological treatment, and sustained glycaemic monitoring to minimize diabetes-related morbidity and mortality.

Effective glycaemic management is essential for preventing microvascular complications, including diabetic retinopathy, nephropathy, and neuropathy, while reducing the long-term risk of cardiovascular complications. The United Kingdom Prospective Diabetes Study demonstrated that intensive glycaemic control significantly reduced microvascular complications, while metformin-based treatment provided additional clinical benefits among overweight patients with newly diagnosed T2DM.[3,4] However, achieving optimal glycaemic control remains challenging because of progressive disease severity, associated comorbidities, medication-related adverse effects, treatment costs, and variable therapeutic adherence. Consequently, individualized treatment strategies are necessary to achieve glycaemic targets while minimizing hypoglycaemia and unnecessary medication burden.

The pharmacological management of T2DM has evolved considerably with the availability of multiple classes of antidiabetic medications. Commonly prescribed agents include biguanides, sulfonylureas, dipeptidyl peptidase-4 inhibitors, sodium–glucose cotransporter-2 inhibitors, glucagon-like peptide-1 receptor agonists, and insulin preparations. Metformin continues to occupy an important position in diabetes management because of its glucose-lowering efficacy, established safety profile, affordability, and extensive clinical experience. Contemporary American Diabetes Association guidelines and ADA/EASD consensus recommendations emphasize patient-centred therapeutic selection based on glycaemic status, cardiovascular risk, kidney function, body weight, affordability, and individual treatment preferences.[5,6] Combination therapy is frequently required when monotherapy fails to achieve individualized glycaemic targets, particularly among patients with longstanding diabetes.

Regular assessment of fasting plasma glucose, postprandial plasma glucose, and glycated haemoglobin (HbA1c) is fundamental to evaluating treatment response. An HbA1c level below 7.0% is generally recommended for many nonpregnant adults, although individualized targets are necessary in selected clinical circumstances.[7] Despite the availability of effective antidiabetic medications, inadequate glycaemic control remains common in routine clinical practice. Therapeutic inertia, delayed treatment intensification, inconsistent adherence, and limited access to newer medications contribute to persistent hyperglycaemia. Khunti et al. documented considerable delays in treatment intensification among patients with uncontrolled diabetes.[8] Similarly, the Indian DiabCare study highlighted important deficiencies in glycaemic control, indicating the need for systematic evaluation of prescribing practices and treatment outcomes.[9]

Prescription pattern studies provide valuable information regarding medication utilization, therapeutic combinations, prevailing prescribing preferences, and opportunities for improving rational drug use. Prospective observational assessments additionally allow the documentation of changes in glycaemic parameters during routine clinical follow-up. Such evaluations are particularly relevant in government tertiary care hospitals, where clinical decisions must accommodate differences in disease severity, comorbidities, medication availability, and affordability. Therefore, the present study was undertaken at Late Smt Indira Gandhi Memorial Government Medical College, Kanker, Chhattisgarh, India, to evaluate antidiabetic drug prescribing patterns among 100 patients with T2DM, assess their demographic and clinical characteristics, and determine changes in fasting plasma glucose, postprandial plasma glucose, and HbA1c levels over a three-month follow-up period.

MATERIALS AND METHODS

Study Design and Setting: This hospital-based prospective observational study was conducted at Late Smt Indira Gandhi Memorial Government Medical College, Kanker, Chhattisgarh, India, between May 2025 and April 2026. The study was designed to evaluate antidiabetic drug prescribing patterns and changes in glycaemic parameters among patients diagnosed with type 2 diabetes mellitus (T2DM). Participants were assessed at baseline and followed for three months under routine clinical care. The study involved observation of prescribing practices without investigator-directed modification of treatment. Reporting was organized in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[10]

Study Population and Eligibility Criteria: The study included 100 adult patients with an established diagnosis of T2DM who were receiving antidiabetic pharmacotherapy at the study institution. Patients were evaluated according to the eligibility criteria specified in the study protocol. The exclusion criteria were including pregnancy, diabetes, and medical conditions affecting HbA1c interpretation. Eligible participants were assessed for demographic characteristics, clinical history, associated comorbidities, ongoing medications, and glycaemic parameters.

Sampling Method and Sample Size: A total of 100 patients were included in the study. Participants were recruited through [insert actual sampling method] from [insert outpatient department, inpatient department, or other clinical recruitment setting]. The sample size was [insert whether determined through a prior sample-size calculation or based on the number of eligible patients enrolled during the study period]. Each participant was assigned a study identification number to facilitate documentation and linkage of baseline and follow-up assessments. The numbers of patients screened, excluded, enrolled, and completing follow-up should be reported according to the original recruitment records.

Clinical Assessment and Prescription Pattern Evaluation: Demographic and clinical information was collected using [insert actual data collection instrument]. Recorded variables included age, sex, duration of diabetes, body mass index, hypertension, dyslipidaemia, and documented diabetic peripheral neuropathy. Antidiabetic prescriptions were reviewed to identify the medications prescribed, number of antidiabetic agents, therapeutic combinations, and use of insulin.

Treatment regimens were categorized as oral monotherapy, dual oral therapy, triple oral therapy, insulin combined with oral antidiabetic medications, and insulin monotherapy. Prescriptions were also evaluated according to drug classes, including biguanides, sulfonylureas, dipeptidyl peptidase-4 inhibitors, sodium–glucose cotransporter-2 inhibitors, and other prescribed antidiabetic agents. Each participant was counted once within each applicable drug class. Treatment regimen categories were mutually exclusive, whereas individual drug-class exposure and associated comorbidities were permitted to overlap.

Assessment of Glycaemic Parameters: Glycaemic control was assessed using fasting plasma glucose (FPG), postprandial plasma glucose (PPG), and glycated haemoglobin (HbA1c) measurements recorded at baseline and at the three-month follow-up. Laboratory investigations were performed using [insert laboratory methods, analyser details, and HbA1c assay standardization information]. Fasting duration, timing of postprandial blood collection, and laboratory quality-control procedures followed [insert actual institutional protocol].

An HbA1c level below 7.0% was used as a descriptive threshold for glycaemic control, consistent with commonly applied recommendations for many nonpregnant adults with T2DM [7]. Individualized glycaemic targets were considered clinically distinct from this analytical threshold. Changes in glycaemic measurements between baseline and follow-up were evaluated to describe glycaemic status during routine treatment.

Study Outcome Measures: The primary outcome was the distribution of antidiabetic prescribing patterns, including monotherapy, combination therapy, and insulin-containing regimens. Secondary outcomes included changes in mean FPG, PPG, and HbA1c between baseline and three months, together with the proportion of patients having HbA1c below 7.0% at each assessment. The distribution of associated comorbidities and clinical characteristics was also evaluated.

Statistical Analysis: Data were summarized using descriptive statistical methods. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means and standard deviations. Antidiabetic prescribing frequencies were calculated using the relevant patient denominators. Baseline and follow-up glycaemic measurements were compared descriptively, and absolute changes in mean values were calculated by subtracting baseline measurements from follow-up measurements. The proportions of participants with HbA1c below 7.0% were reported at both assessments. No inferential statistical tests were performed. Consequently, statistical significance and causal associations between prescribing patterns and glycaemic outcomes were not established.

RESULTS

Demographic and clinical characteristics: The mean age was 55.8 ± 10.4 years, and 56 patients (56.0%) were male. The largest age category was 51–60 years, comprising 36 patients (36.0%). Mean diabetes duration was 7.2 ± 4.8 years, with 42 patients (42.0%) reporting a duration of 5–10 years. Hypertension was documented in 58.0% and dyslipidaemia in 46.0%. Baseline characteristics are presented in [Table 1].

Table 1: Demographic and clinical characteristics of the study population (N = 100)

Characteristic	Number (%) or mean ± SD
Age, years	55.8 ± 10.4
Age group, years	
30–40	10 (10.0)
41–50	24 (24.0)
51–60	36 (36.0)
>60	30 (30.0)
Sex	
Male	56 (56.0)
Female	44 (44.0)
Duration of diabetes, years	7.2 ± 4.8
Duration category	
<5 years	34 (34.0)
5–10 years	42 (42.0)

>10 years	24 (24.0)
Body mass index, kg/m²	27.1 ± 3.9
Hypertension	58 (58.0)
Dyslipidaemia	46 (46.0)
Documented diabetic peripheral neuropathy	18 (18.0)

Note: Comorbidities were not mutually exclusive. SD: standard deviation.

Antidiabetic prescribing patterns: Oral antidiabetic agents alone were prescribed to 84 patients (84.0%); 16 (16.0%) received insulin-containing regimens. Dual oral therapy was most frequent (42.0%), followed by monotherapy (24.0%) and triple oral therapy (18.0%). Ten patients received insulin with oral treatment, while six received insulin alone [Table 2].

Table 2: Antidiabetic treatment patterns at enrolment (N = 100)

Treatment pattern	Number (%)
Oral monotherapy	24 (24.0)
Dual oral therapy	42 (42.0)
Triple oral therapy	18 (18.0)
Insulin with oral antidiabetic therapy	10 (10.0)
Insulin alone	6 (6.0)
Total	100 (100.0)

Note: Treatment categories were mutually exclusive.

Metformin was prescribed to 92 patients (92.0%), sulfonylureas to 42 (42.0%), DPP-4 inhibitors to 24 (24.0%), and SGLT2 inhibitors to 14 (14.0%). Metformin with a sulfonylurea was the most common individual regimen (24.0%). Metformin monotherapy accounted for 22.0%, while the two triple oral combinations together accounted for 18.0% [Table 3].

Table 3: Antidiabetic regimens at enrolment (N = 100)

Regimen	Number (%)
Metformin alone	22 (22.0)
DPP-4 inhibitor alone	2 (2.0)
Metformin + sulfonylurea	24 (24.0)
Metformin + DPP-4 inhibitor	12 (12.0)
Metformin + SGLT2 inhibitor	6 (6.0)
Metformin + sulfonylurea + DPP-4 inhibitor	10 (10.0)
Metformin + sulfonylurea + SGLT2 inhibitor	8 (8.0)
Insulin + metformin	10 (10.0)
Insulin alone	6 (6.0)
Total	100 (100.0)

Note: Regimens were mutually exclusive. DPP-4: dipeptidyl peptidase-4; SGLT2: sodium–glucose cotransporter-2. Drug-class percentages overlap because combinations contain multiple classes.

Glycaemic parameters during follow-up: Mean fasting plasma glucose decreased from 168.4 ± 42.6 mg/dL to 139.2 ± 31.8 mg/dL, corresponding to a mean change of −29.2 mg/dL. Mean postprandial plasma glucose declined from 238.6 ± 58.4 mg/dL to 194.8 ± 44.2 mg/dL. Mean HbA1c decreased from 8.6 ± 1.4% to 7.7 ± 1.1%, an absolute reduction of 0.9 percentage points [Table 4].

Table 4: Glycaemic parameters at baseline and three months (N = 100)

Parameter	Baseline Mean ± SD	Three months Mean ± SD	Mean change
Fasting plasma glucose, mg/dL	168.4 ± 42.6	139.2 ± 31.8	−29.2
Postprandial plasma glucose, mg/dL	238.6 ± 58.4	194.8 ± 44.2	−43.8
HbA1c, %	8.6 ± 1.4	7.7 ± 1.1	−0.9 percentage points

Note: Mean change = follow-up minus baseline. HbA1c: glycated haemoglobin. No paired statistical significance or confidence intervals were calculated.

Distribution of glycaemic control: The proportion with HbA1c <7.0% increased from 18.0% at baseline to 40.0% at three months, a net increase of 22 percentage points. The proportion with HbA1c ≥9.0% decreased from 22.0% to 10.0%. At follow-up, 60 patients (60.0%) remained at or above the descriptive 7.0% threshold (Table 5). These marginal distributions do not identify which individuals changed categories.

Table 5: HbA1c categories at baseline and three months (N = 100)

HbA1c category	Baseline, n (%)	Three months, n (%)
<7.0%	18 (18.0)	40 (40.0)
7.0–7.9%	32 (32.0)	32 (32.0)
8.0–8.9%	28 (28.0)	18 (18.0)

≥9.0%	22 (22.0)	10 (10.0)
Total	100 (100.0)	100 (100.0)

Note: HbA1c categories were mutually exclusive. The <7.0% threshold was used descriptively

DISCUSSION

The present prospective observational study evaluated antidiabetic prescribing patterns and glycaemic parameters among 100 patients with type 2 diabetes mellitus attending a tertiary care teaching hospital in Chhattisgarh, India. Metformin-based treatment constituted the predominant prescribing approach, with dual oral therapy accounting for 42.0% of prescriptions, followed by oral monotherapy (24.0%), triple oral therapy (18.0%), and insulin-containing regimens (16.0%). Improvements in mean fasting plasma glucose, postprandial plasma glucose, and glycated haemoglobin (HbA1c) were observed during the three-month follow-up. However, 60.0% of patients continued to have HbA1c levels of 7.0% or higher, indicating that achieving optimal glycaemic control remained challenging despite ongoing pharmacotherapy.

Metformin was prescribed to 92.0% of participants, reflecting its prominent position in the pharmacological management of type 2 diabetes mellitus. The United Kingdom Prospective Diabetes Study demonstrated the clinical benefits of metformin in overweight patients with newly diagnosed diabetes.[4] Similarly, contemporary ADA guidelines and ADA/EASD consensus recommendations recognize metformin as an important glucose-lowering medication while emphasizing individualized therapeutic selection according to cardiovascular risk, renal function, comorbidities, and patient preferences.[5,6] The frequent use of combination therapy in the present study reflects the complexity of managing glycaemic control in routine clinical practice. Nevertheless, treatment selection must also consider medication tolerability, hypoglycaemia risk, affordability, and patient-specific clinical requirements.

The use of sodium–glucose cotransporter-2 (SGLT2) inhibitors in 14.0% of patients demonstrates the incorporation of newer antidiabetic medications into clinical practice. Evidence from the EMPA-REG OUTCOME trial established cardiovascular benefits associated with empagliflozin in patients with type 2 diabetes and established cardiovascular disease.[11] Similarly, the LEADER trial demonstrated cardiovascular benefits with liraglutide among patients at high cardiovascular risk.[12] The DECLARE–TIMI 58 trial further demonstrated that dapagliflozin reduced the composite outcome of cardiovascular death or hospitalization for heart failure.[13] These findings emphasize the importance of selecting antidiabetic medications according to cardiovascular and renal indications in addition to glucose-lowering efficacy. However, the appropriateness of individual prescriptions cannot be determined solely from drug utilization frequencies.

Glycaemic parameters demonstrated favourable changes during follow-up. Mean fasting plasma glucose decreased from 168.4 ± 42.6 to 139.2 ± 31.8 mg/dL, while postprandial plasma glucose declined from 238.6 ± 58.4 to 194.8 ± 44.2 mg/dL. Mean HbA1c decreased from 8.6 ± 1.4% to 7.7 ± 1.1%, representing an absolute reduction of 0.9 percentage points. These findings are clinically relevant because sustained hyperglycaemia contributes to diabetes-related complications. The baseline HbA1c was comparable to the inadequate glycaemic control reported in the Indian DiabCare study, which documented a mean HbA1c of approximately 8.9%.[9] Nevertheless, differences in population characteristics and study methodology should be considered when interpreting comparisons.

The proportion of patients with HbA1c below 7.0% increased from 18.0% at baseline to 40.0% after three months. Despite this improvement in the cohort-level distribution, a substantial proportion remained above the commonly recommended glycaemic threshold. The GRADE trial demonstrated differences in the durability of glycaemic control among medications added to metformin.[14] Additionally, Khunti et al. identified therapeutic inertia as an important challenge in routine diabetes management.[8] The findings of the present study therefore reinforce the importance of regular glycaemic monitoring, individualized treatment reassessment, adherence evaluation, and timely therapeutic optimization. Because the study was observational and did not establish a causal relationship between individual prescriptions and glycaemic changes, the observed improvements should be interpreted within the broader context of routine diabetes care.

Generalizability: The findings provide institution-specific information regarding antidiabetic prescribing patterns and short-term glycaemic outcomes among patients receiving care at a government tertiary care teaching hospital in Chhattisgarh. Similar healthcare settings with comparable patient characteristics, medication availability, and clinical practices could find these observations relevant for prescribing audits. However, the single-centre design, sample size of 100 patients, and limited follow-up restrict extrapolation to wider populations. Multicentre investigations with larger samples and longer observation periods are necessary to establish broader applicability.

Limitations: The study was conducted at a single tertiary care institution with a relatively small sample of 100 patients, restricting generalizability. The three-month follow-up limited assessment of sustained glycaemic control and long-term complications. Medication adherence, treatment modifications, renal function, adverse drug reactions, and individualized glycaemic targets were not

evaluated. The observational design and absence of adjusted analyses prevented causal interpretation of treatment-related changes.

CONCLUSION

The present prospective observational study demonstrated that metformin-based regimens constituted the predominant antidiabetic prescribing approach among patients with type 2 diabetes mellitus. Dual oral therapy was the most frequently prescribed treatment regimen, followed by monotherapy, triple oral therapy, and insulin-containing combinations. Improvements in fasting plasma glucose, postprandial plasma glucose, and HbA1c were observed during the three-month follow-up. The proportion of patients achieving HbA1c below 7.0% increased from 18.0% to 40.0%. Nevertheless, a substantial proportion remained above the recommended glycaemic threshold. These findings emphasize the importance of individualized pharmacotherapy, regular glycaemic assessment, medication adherence, and periodic treatment optimization to strengthen diabetes management in routine clinical practice.

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