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Original Article

# Prescription Pattern Analysis of Antidiabetic Drugs in Patients with Diabetes Mellitus: A Retrospective Observational Study

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## ABSTRACT

Diabetes Mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia, associated with significant morbidity and mortality if inadequately managed. Prescription pattern analysis serves as a vital pharmacoepidemiological tool for evaluating real-world drug utilization, rationality of prescribing, and adherence to standard treatment guidelines. To analyse the prescription pattern of antidiabetic drugs, evaluate prescribing trends, classify drug classes, compare monotherapy with combination therapy, and assess the influence of comorbid conditions on drug selection among diabetic patients in Hyderabad, Telangana. A retrospective observational study was conducted using 25 prescriptions collected from KIMS Hospital, Srinagesh Diabetes and Endocrine Clinic, Caspian Diagnostic Centre, and private clinics in Hyderabad. Demographic and therapeutic data were recorded and analysed using descriptive statistics. The study included 13 males (52%) and 12 females (48%), with age ranging from 39 to 79 years. Combination therapy was prescribed in 60% of cases. The most frequent regimen was sulfonylurea plus metformin (20%), followed by dipeptidyl peptidase-4 inhibitor plus metformin (16%) and insulin monotherapy (16%). Metformin was involved in 72% of prescriptions. Comorbid hypertension was present in 36% of patients. Prescribing patterns largely adhered to evidence-based guidelines, with metformin as the cornerstone and progressive adoption of newer drug classes. Regular prescription audits are recommended to promote rational drug use and optimize glycemic outcomes.

**Keywords:** Antidiabetic Drugs, Combination Therapy, Diabetes Mellitus, Drug Utilization, Metformin.

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## INTRODUCTION

Diabetes Mellitus is one of the most prevalent metabolic disorders worldwide and represents a Major public health challenge owing to its increasing incidence and long-term treatment requirements. The International Diabetes Federation estimated that India harbours over 101 million people with diabetes as of 2023, making it the country with the second-highest diabetic population globally (International Diabetes Federation [IDF], 2023). Rapid urbanization, sedentary lifestyles, dietary changes, and population aging have contributed substantially to this rising burden, particularly in states such as Telangana.

Effective management primarily relies on long-term pharmacological therapy alongside lifestyle modification. A wide range of antidiabetic drugs are currently available, including conventional agents such as metformin, sulfonylureas, and insulin, as well as newer therapeutic classes including Dipeptidyl Peptidase-4 (DPP-4) inhibitors and Sodium-Glucose co-Transporter 2 (SGLT-2) inhibitors. The choice of therapy is influenced by patient demographics, disease duration, associated comorbidities, affordability, and prescriber preference, resulting in significant variation across healthcare settings (Brunton *et al*., 2018; Tripathi, 2018).

Prescription pattern analysis plays a vital role in understanding actual drug utilization in clinical practice. It helps evaluate whether prescribing is rational, evidence-based, and aligned with standard treatment guidelines, while providing insight into trends in monotherapy versus combination therapy, adoption of newer drug classes, and extent of polypharmacy (American Diabetes Association [ADA], 2023). For pharmacy professionals, understanding prescribing patterns is essential for promoting

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rational drug use, identifying potential drug-related problems, and improving patient outcomes.

Despite the considerable burden of diabetes in Telangana, published data on real-world prescribing patterns from outpatient and specialty diabetic care settings in Hyderabad remain limited. The present study was therefore conducted to analyse the prescription pattern of antidiabetic drugs among diabetic patients attending healthcare facilities in Hyderabad, to assess the prevalence of monotherapy versus combination therapy, and to examine the influence of comorbid conditions on prescribing behaviour.

## MATERIALS AND METHODS

### Study design and setting

A retrospective observational study was conducted by collecting prescriptions from patients diagnosed with Diabetes Mellitus at various healthcare facilities in Hyderabad, Telangana, including KIMS Hospital, Srinagesh Diabetes, Thyroid and Endocrine Clinic, Caspian Diagnostic Centre, and other private clinics, during the academic year 2025-26.

### Sample size

A total of 25 prescriptions of patients diagnosed primarily with Type 2 Diabetes Mellitus were analysed during the study period.

### Data collection

Relevant demographic details (age, gender, weight, blood pressure) and therapeutic information (drug name, dosage form, drug class, dose, and timing of administration) were collected and systematically tabulated using a pre-designed structured data-collection form. Prescriptions issued by registered medical practitioners over the defined study period were included.

### Inclusion criteria

Patients of either gender diagnosed with Diabetes Mellitus (Type 1, Type 2, or with comorbidities) and prescribed at least one antidiabetic medication were included in the study.

### Exclusion criteria

Prescriptions that were incomplete or illegible were excluded from the study.

### Drug classification

Antidiabetic drugs were classified by pharmacological class into biguanides (metformin), sulfonylureas (glimepiride), DPP-4 inhibitors (vildagliptin, sitagliptin), SGLT-2 inhibitors (empagliflozin, dapagliflozin), and insulin preparations (rapid-acting, premixed, and basal). Prescriptions involving two or more distinct antidiabetic agents were classified as combination therapy.

### Statistical analysis

Prescribing trends were evaluated with respect to drug class, frequency of monotherapy versus combination therapy, dose patterns, use of insulin preparations, and influence of comorbid conditions on prescribing decisions. Data were tabulated and analysed using descriptive statistics expressed as frequencies and percentages.

### Ethical statement

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (revised 2013). As this study involved only retrospective review of existing prescriptions with no direct patient intervention, individual informed consent was not mandatorily required. Institutional permission was obtained from each participating facility prior to data collection, and all patient data were anonymized before analysis.

## RESULTS

### Demographic profile

The study included 25 patients with age ranging from 39 to 79 years (mean age 58.6 years). Gender distribution showed 13 males (52%) and 12 females (48%), indicating near-equal distribution across genders. The majority of patients were in the middle-aged to elderly age group, consistent with epidemiological data on Type 2 Diabetes Mellitus. Complete demographic and prescription details are presented in Table 1.

### Type of diabetes and comorbid conditions

All 25 patients carried a diagnosis of Diabetes Mellitus, with 23 patients (92%) diagnosed with Type 2 DM. Comorbid hypertension was the most frequently encountered associated condition, present in 9 patients (36%). Other comorbidities included dyslipidaemia (8%), Vitamin D deficiency (4%), adenomyosis (4%), and multiple myeloma undergoing chemotherapy (4%). The presence of comorbid conditions influenced the selection of antidiabetic agents and the addition of adjunct therapies.

### Prescribing trends of antidiabetic medications

Combination therapy was more commonly prescribed than monotherapy. The most frequently used regimen was sulfonylurea plus metformin ($n$=5; 20%), followed by DPP-4 inhibitor plus metformin ($n$=4; 16%), and insulin monotherapy ($n$=4; 16%). Metformin alone was prescribed to 3 patients (12%). SGLT-2 inhibitor-based combinations and multi-drug oral regimens were each prescribed to 2 patients (8%). The distribution of antidiabetic drug classes is summarized in Table 2. Metformin was the most frequently involved drug overall, present in 18 of 25 prescriptions (72%). Newer agents including DPP-4 inhibitors and SGLT-2 inhibitors collectively accounted for 32% of drug use (Figure 1).

### Dose pattern

Table 3 summarizes the commonly prescribed doses and dosing frequencies of oral antidiabetic drugs. Metformin was most frequently administered at 500-1000 mg once or twice daily, typically before meals to enhance tolerability. Glimepiride was prescribed at low doses (1-2 mg once daily) before food to minimize hypoglycaemia risk. DPP-4 inhibitors (vildagliptin and sitagliptin) were prescribed at standard recommended doses, while empagliflozin was prescribed once daily at 25 mg.

### Insulin preparations

Insulin therapy was prescribed in a limited subset of patients, either as monotherapy or combined with oral antidiabetic agents, primarily in cases of uncontrolled blood glucose levels or long disease duration. Human Mixtard (premixed intermediate-acting insulin) was prescribed at 15-20 units before breakfast and dinner. Rapid-acting insulin (Humalog) was prescribed at 5-12 units before meals, and basal insulin was initiated at 10 units once daily.

## DISCUSSION

The present study evaluated prescribing patterns of antidiabetic drugs among patients attending various healthcare facilities in Hyderabad. The demographic analysis confirmed that the majority of patients belonged to the middle-aged to elderly age group, consistent with previously reported epidemiological data indicating that prevalence of Type 2 Diabetes Mellitus increases with advancing age owing to progressive insulin resistance and reduced physical activity (Brunton *et al.*, 2018; Shobhana *et al.*, 2011).

The near-equal gender distribution (52% male, 48% female) reflects the changing epidemiological pattern of diabetes in urban areas such as Hyderabad, where lifestyle-related risk factors are increasingly prevalent across genders. The marginally higher prevalence among males may relate to occupational

**Table 1: Demographic and Prescription Details of Diabetic Patients.**

| Sl. No. | Patient Name | Age | Sex | Diagnosis | BP (mmHg) | Drug Prescribed | Dosage Form | Dose | Timing |
|---|---|---|---|---|---|---|---|---|---|
| 1. | P1 | 61 | M | Type 2 DM | 120/60 | Glycomet MV SR | Oral | 500 mg | Before breakfast |
| 2. | P2 | 60 | F | Type 2 DM + Vit D Deficiency + Hyperlipidemia | 140/60 | Jardiance (Empagliflozin) | Tablet | 25 mg | After food |
| 3. | P3 | 60 | M | DM + Multiple Myeloma + HTN | 120/80 | Human Mixtard | Injection | 20 U (AM); 15 U (PM) | Before breakfast; before dinner |
| 4. | P4 | 66 | F | Type 2 DM | 130/70 | Metformin | Oral | 1000 mg BD | Before dinner |
| 5. | P5 | 67 | M | Type 2 DM | 110/70 | Glyconet GP2; Protonet AM | Oral | As prescribed | After dinner |
| 6. | P6 | 46 | M | Type 2 DM | 140/90 | Glimepiride + Metformin | Oral | 2 mg + 500 mg | Before dinner |
| 7. | P7 | 47 | M | Type 2 DM + HTN | 114/74 | Gliminyl M1 Forte | Oral | 1-0-1 | Before food, daily |
| 8. | P8 | 75 | F | Type 2 DM | - | Jalra (Vildagliptin) | Oral | 50 mg | Before breakfast |
| 9. | P9 | 39 | F | Type 2 DM + Adenomyosis | 100/70 | Happyglip M 50/500 | Oral | 1-0-1 | After food, daily |
| 10. | P10 | 50 | F | Type 2 DM | 120/70 | Lupisit + DM 10/500 mg | Oral | 1-0-0 | After breakfast |
| 11. | P11 | 74 | F | Type 2 DM | 110/74 | Lupisit+DM 10/500 mg; Reclimet | Oral | 0-1-0; 1-0-0 | After lunch; before breakfast |
| 12. | P12 | 54 | M | Type 2 DM | 110/70 | R-Met-G2; VD-Met 500 | Oral | 1-0-1 | As prescribed |

| Sl. No. | Patient Name | Age | Sex | Diagnosis | BP (mmHg) | Drug Prescribed | Dosage Form | Dose | Timing |
|---|---|---|---|---|---|---|---|---|---|
| 13. | P13 | 79 | F | Diabetes | 140/90 | Glimepiride | Oral | 1 mg OD | Before meals |
| 14. | P14 | 70 | M | DM + HTN | 110/70 | Amaryl M | Oral | 1 tablet | Before breakfast |
| 15. | P15 | 75 | M | Diabetes | 130/80 | Teniva M 20/500 | Oral | 1 tablet | After dinner |
| 16. | P16 | 49 | F | DM | 120/80 | Insulin (Humalog) | Injection | 5/5/5 units | 30 min before meals |
| 17. | P17 | 52 | F | Type 2 DM | - | Insulin (Sebulpa) | Injection | - | Before meals |
| 18. | P18 | 56 | M | Type 2 DM | - | Metformin | Oral | 500 mg | Before meals |
| 19. | P19 | 50 | F | DM + HTN | 150/90 | Insulin | Injection | 12 units | Before meals |
| 20. | P20 | 69 | M | DM | - | Metformin + Insulin | Oral + Injection | - | Before meals |
| 21. | P21 | 56 | M | Type 2 DM | 130/70 | Metformin | Oral | 500 mg | As prescribed |
| 22. | P22 | 55 | F | Type 2 DM + HTN | 150/80 | Sensityn (Vildagliptin + Metformin) | Oral | 50/850 mg | After breakfast |
| 23. | P23 | 59 | M | Type 2 DM + HTN | 190/110 | Sensityn (Vildagliptin + Metformin) | Oral | 50/850 mg | As prescribed |
| 24. | P24 | 65 | M | Type 2 DM + HTN | 140/70 | Gemer Sita-1; Basalog One 3 ml Pen | Oral + Injection | 1-0-1; 10 units OD | Before meals daily |
| 25. | P25 | 45 | F | Type 2 DM | 130/80 | Glynamic MVI; Glimsay-MI | Oral | 0-0-1 | After dinner |

BP = Blood Pressure; DM = Diabetes Mellitus; HTN = Hypertension; FDC = Fixed-Dose Combination; BD = Twice Daily; OD = Once Daily; U = Units; - = Not Recorded; P=Patient.

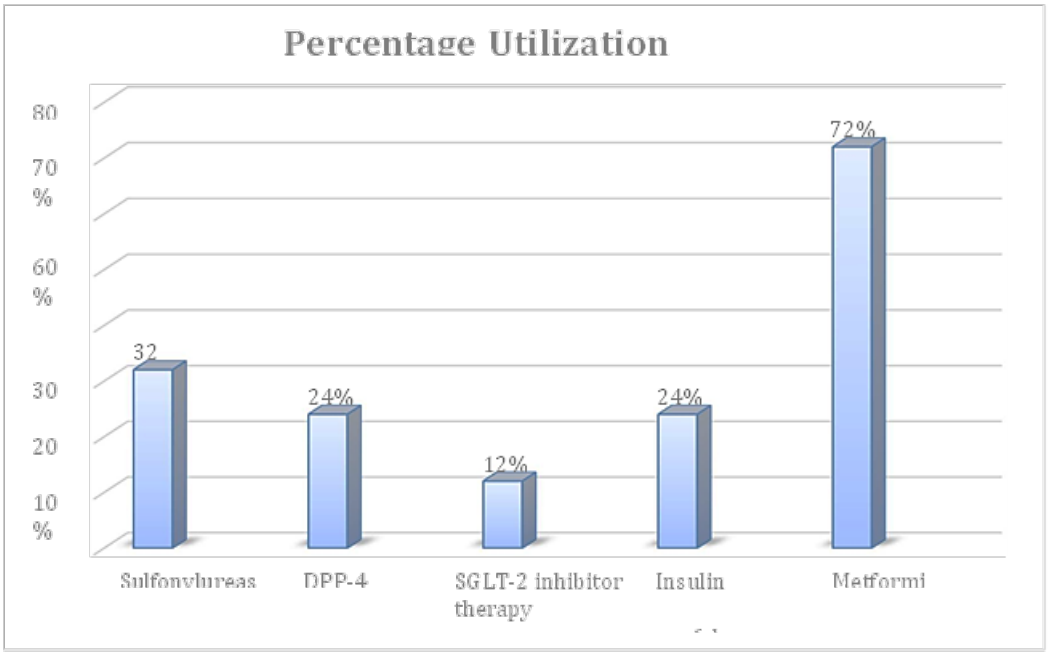


**Figure 1:** Percentage utilization pattern of antidiabetic drug classes.

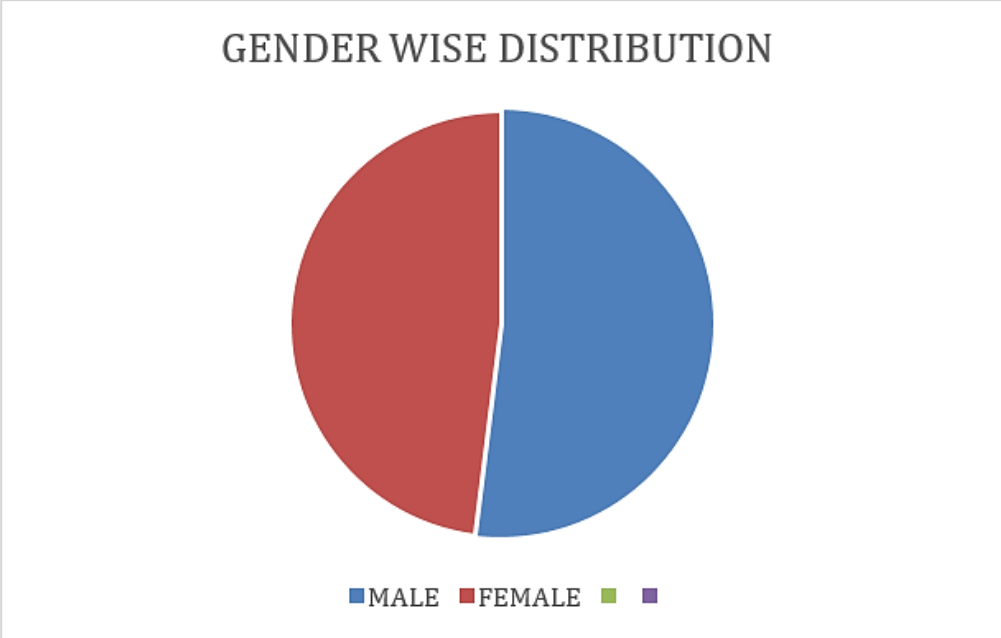


**Figure 2:** Gender distribution of diabetic patients (*n*=25).

**Table 2: Distribution of Antidiabetic Drug Classes Prescribed (*n*=25).**

| Drug Class / Therapy Type | Number of Patients | Percentage (%) |
|---|---|---|
| Metformin alone | 3 | 12.0 |
| Sulfonylurea alone | 1 | 4.0 |
| DPP-4 inhibitor alone | 1 | 4.0 |
| SGLT-2 inhibitor alone | 1 | 4.0 |
| Insulin alone | 4 | 16.0 |
| Sulfonylurea + Metformin (FDC) | 5 | 20.0 |
| DPP-4 inhibitor + Metformin (FDC) | 4 | 16.0 |
| SGLT-2 inhibitor + Metformin (FDC) | 2 | 8.0 |
| Multi-drug oral combinations | 2 | 8.0 |
| Oral + Insulin combination | 2 | 8.0 |
| Total | 25 | 100.0 |

FDC = Fixed-Dose Combination; DPP-4 = Dipeptidyl Peptidase-4 Inhibitor; SGLT-2 = Sodium-Glucose co-Transporter 2 Inhibitor.

stress, irregular dietary habits, and delayed healthcare-seeking behaviour, while the substantial representation of females highlights the role of hormonal changes and post-menopausal metabolic alterations in disease susceptibility (Figure 2).

Combination therapy was more commonly prescribed than monotherapy, with sulfonylurea plus metformin representing the most frequently used regimen (20%). This prevalence of combination therapy suggests that most patients required multi-targeted pharmacological intervention due to advanced disease stage, suboptimal glycemic control, or the presence of insulin resistance. Both the American Diabetes Association Standards of Care and the RSSDI-ESI Clinical Practice Recommendations support early combination therapy in patients with $HbA_{1C}$ significantly above target (ADA, 2023; RSSDI and ESI, 2020).

Metformin featured prominently in 72% of all regimens, either alone or as part of fixed-dose or free-dose combinations. This aligns with its status as the first-line agent in Type 2 Diabetes Mellitus due to its efficacy, safety, affordability, and favourable metabolic profile. Its mechanism-primarily suppression of hepatic gluconeogenesis and enhancement of peripheral insulin sensitivity-makes it suitable as a background therapy for combination regimens (Tripathi, 2018).

The incorporation of DPP-4 inhibitors (vildagliptin, sitagliptin) and SGLT-2 inhibitors (empagliflozin, dapagliflozin) indicates increasing awareness among prescribers of agents with lower hypoglycaemia risk and added cardiovascular or renal protective benefits. DPP-4 inhibitors were weight-neutral with a favourable safety profile, while SGLT-2 inhibitors, by promoting urinary glucose excretion independently of insulin, additionally provided mild diuretic and weight-reducing effects advantageous in patients with comorbid cardiovascular conditions (Zinman *et al.*, 2015).

Insulin therapy was reserved for patients with uncontrolled blood glucose levels, longer disease duration, or inadequate response to oral therapy, reflecting cautious and individualized clinical decision-making. The selection of premixed insulin (Human Mixtard) provided both basal and prandial glycemic control, while rapid-acting insulin (Humalog) effectively managed post-prandial hyperglycaemia. The dosing patterns observed

**Table 3: Dose Pattern of Commonly Prescribed Oral Antidiabetic Drugs.**

| Drug | Common Dose Observed | Frequency |
|---|---|---|
| Metformin | 500-1000 mg | Once or twice daily |
| Glimepiride | 1-2 mg | Once daily |
| Vildagliptin | 50 mg | Once or twice daily |
| Sitagliptin | 100 mg | Once daily |
| Empagliflozin | 25 mg | Once daily |
| FDCs (Metformin + others) | 500/50 mg, 500/10 mg | Once or twice daily |

FDC = Fixed-Dose Combination; DPP-4 = Dipeptidyl Peptidase-4 Inhibitor; SGLT-2 = Sodium-Glucose Co-Transporter 2 Inhibitor. Frequency denotes standard outpatient prescribing frequency observed in the study.

were consistent with standard treatment guidelines (Powers *et al.*, 2022).

Certain limitations of this study merit acknowledgment. The sample size ($n$=25) is small, which limits generalizability to broader populations. The retrospective design precluded collection of $HbA_{1C}$ values, diabetes duration, and patient adherence data. Additionally, prescriptions were collected from heterogeneous settings, so patterns may reflect site-specific practices. Future studies with larger sample sizes and prospective designs incorporating HbA1c-correlated analyses would provide more robust insights.

## RESEARCH GAPS

The current study's sample size ($n$=25) is small, which limits generalizability to broader populations, and its retrospective design precluded the collection of $HbA_{1C}$ values, diabetes duration, and patient adherence data. Furthermore, as prescriptions were collected from heterogeneous settings, the patterns may reflect site-specific practices. Future studies with larger sample sizes and prospective designs incorporating $HbA_{1C}$-correlated analyses are necessary to provide more robust insights into prescribing patterns and glycemic outcomes.

## CONCLUSION

The prescribing pattern observed in this study reflects a rational and guideline-oriented approach to the management of Diabetes Mellitus in real-world clinical practice. The predominant use of combination therapy indicates a practical shift toward early multi-targeted regimens for achieving optimal glycemic outcomes. The continued preference for metformin confirms its central role due to its efficacy, safety, and affordability. The incorporation of DPP-4 inhibitors and SGLT-2 inhibitors demonstrates increasing clinician awareness of agents with favourable safety profiles and additional cardio-renal benefits. Insulin therapy was appropriately restricted to patients with advanced or poorly controlled disease. Regular prescription pattern analysis serves as an effective tool to monitor rational drug use, guide therapeutic optimization, and support quality improvement in diabetes management.

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## ABBREVIATIONS

**BD:** Twice daily; BP: Blood pressure; **DM:** Diabetes Mellitus; **DPP-4:** Dipeptidyl peptidase-4; **FDC:** Fixed-dose combination; **HTN:** Hypertension; **OD:** Once daily; **SGLT-2:** Sodium-glucose co-transporter 2; **U:** Units; **$HbA_{1C}$:** Glycated Hemoglobin; **RSSDI:** Research Society for the Study of Diabetes in India; **ESI:** Endocrine Society of India; **Vit D:** Vitamin D; **AM:** Ante Meridiem; **PM:** Post Meridiem.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## FUNDING

No funding was received for the conduct of this research.

## AUTHOR CONTRIBUTIONS

Zaina Naqi and Syeda Sameera Anjum conceptualized the study, collected and analysed the data, and drafted the manuscript. Damineni Saritha supervised the study design and critically reviewed the manuscript for intellectual content. Anupama Koneru provided institutional support and final approval of the manuscript. All authors read and approved the final version of the manuscript.

## SUMMARY

This retrospective observational study of 25 diabetic patients in Hyderabad revealed a guideline-oriented prescribing pattern, with a strong preference for multi-targeted combination therapies (60%) over monotherapy. Metformin remains the cornerstone of treatment, appearing in 72% of prescriptions, while the integration of newer drug classes like DPP-4 and SGLT-2 inhibitors reflects growing clinical awareness of their safety and cardio-renal benefits.

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