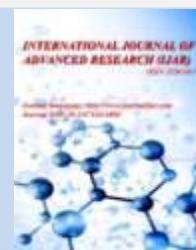




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RESEARCH ARTICLE

PRESCRIPTION PATTERN OF GLUCOSE-LOWERING AGENTS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS AND DYSLIPIDAEMIA: A CROSS- SECTIONAL STUDY

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Abstract

Background:- Type 2 diabetes mellitus (T2DM) frequently coexists with dyslipidaemia and significantly increases the risk of cardiovascular disease. Rational prescribing of glucose-lowering and lipid-lowering medications is essential to achieve optimal metabolic control and reduce long-term complications. Evaluating prescribing trends using World Health Organization (WHO) prescribing indicators provides insight into the rationality of pharmacotherapy in clinical practice.

Methods:- A cross-sectional observational study was conducted in the General Medicine outpatient department of MGM Hospital, Chhatrapati Sambhaji Nagar, India, between January and June 2025. Six hundred consecutive prescriptions of patients diagnosed with T2DM and dyslipidaemia were analysed. Data regarding demographic characteristics, and WHO core prescribing indicators were collected. Descriptive statistics were used to summarize prescribing patterns.

Results:- Among the 600 prescriptions analysed, 49.67% were males and 50.33% females. The average number of drugs per prescription was four. Injections were prescribed in 23.2% of encounters and antibiotics in 6%. Drugs prescribed by generic name accounted for 96.8%, while 92.8% belonged to the National Essential Medicines List. Among antidiabetic agents, dipeptidyl peptidase-4 (DPP-4) inhibitors were most frequently prescribed (60.9%), followed by sulfonylureas (57.8%) and biguanides (56.4%). Statins constituted the majority of lipid-lowering therapy (78%), followed by fenofibrates (12%) and ezetimibe (8%).

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Conclusion:-The prescribing pattern demonstrates predominant use of DPP-4 inhibitors and statins in patients with T2DM and dyslipidaemia, with high adherence to generic and essential medicine prescribing. However, the observed level of polypharmacy highlights the need for continuous prescription audits and guideline-based prescribing to optimize cost-effective therapy.

Introduction: -

Type 2 diabetes mellitus (T2DM) is one of the most prevalent chronic metabolic disorders worldwide and is characterized by insulin resistance and progressive β -cell dysfunction leading to persistent hyperglycaemia [1]. The global prevalence of diabetes has risen dramatically over the past decades, with developing countries contributing significantly to the increasing disease burden [2]. India is currently among the countries with the largest number of individuals affected by diabetes due to rapid urbanization, sedentary lifestyles, and genetic susceptibility [3,4].

Dyslipidaemia commonly accompanies T2DM and is characterized by elevated triglycerides, reduced high-density lipoprotein cholesterol (HDL-C), and increased levels of small dense low-density lipoprotein cholesterol (LDL-C) [5]. This lipid profile contributes to accelerated atherosclerosis and substantially increases the risk of cardiovascular disease, which remains the leading cause of morbidity and mortality among diabetic patients [6,7].

Management of T2DM with dyslipidaemia typically requires long-term pharmacotherapy involving multiple drug classes such as oral antidiabetic agents, insulin, statins, and other lipid-lowering drugs [8]. While combination therapy is often necessary for adequate metabolic control, excessive polypharmacy may increase the risk of adverse drug reactions, drug interactions, higher treatment costs, and poor medication adherence [9]. Evaluation of prescription patterns using WHO core prescribing indicators is an established method for assessing rational drug use in healthcare settings [10]. Such studies help identify trends in drug utilization, assess adherence to treatment guidelines, and detect potential areas of irrational prescribing. Despite the availability of evidence-based guidelines such as the American Diabetes Association (ADA) Standards of Care and international cardiovascular risk management recommendations, prescribing practices vary across healthcare settings [8,11]. Data on real-world prescribing patterns in tertiary care hospitals in India remain limited [12]. Therefore, the present study aimed to evaluate the prescribing pattern of glucose-lowering and lipid-lowering agents in patients with T2DM and dyslipidaemia using WHO prescribing indicators in a tertiary care hospital.

Materials and Methods:-

Study Design:-

A hospital-based cross-sectional observational study was conducted to evaluate prescribing patterns of antidiabetic and lipid-lowering drugs.

Study Setting:-

The study was carried out in the General Medicine outpatient department of MGM Hospital, Chhatrapati Sambhaji Nagar (Aurangabad), Maharashtra, India.

Study Duration:-

Data collection was performed over a six-month period from January 2025 to June 2025.

Study Population:-

Patients attending the outpatient department with a diagnosis of Type 2 diabetes mellitus and dyslipidaemia were included.

Sampling Method:-

A consecutive sampling method was used in which all eligible prescriptions meeting the study criteria during the study period were included until the required sample size was achieved.

Sample Size Justification:-

As per WHO recommendations and International Network for Rational Use of Drugs (INRUD) guidelines, a minimum of 600 prescriptions is generally required to evaluate core prescribing indicators.

Inclusion Criteria:-

- Patients diagnosed with Type 2 diabetes mellitus
- Patients with documented dyslipidaemia
- Prescriptions issued from the outpatient department
- Patients aged ≥ 18 years

Exclusion Criteria:-

- Patients with Type 1 diabetes mellitus
- Pregnant women with gestational diabetes
- Incomplete or illegible prescriptions
- Inpatient prescriptions
- Duplicate prescriptions from the same patient during the study period

Data Collection: -

Data were extracted from prescriptions and recorded using a structured data collection form including: Patient demographic details, Number of drugs prescribed per encounter, Use of injections, Use of antibiotics, Generic vs brand prescribing, Essential medicines list inclusion, Classes of glucose-lowering agents and Classes of lipid-lowering drugs

WHO Prescribing Indicators:-

The following WHO core prescribing indicators were assessed:

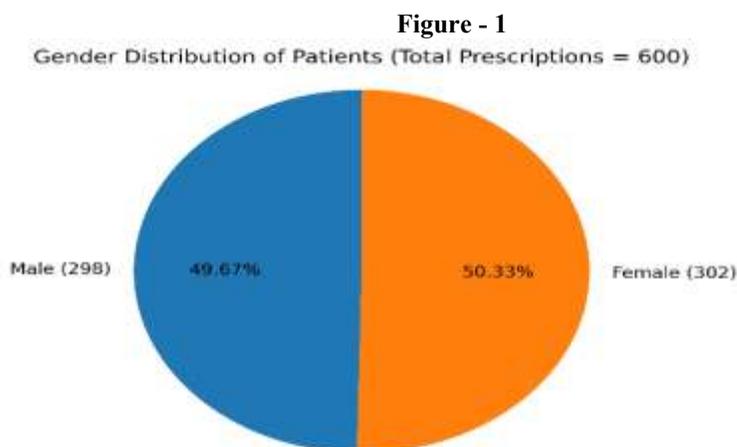
1. Average number of drugs per encounter
2. Percentage of drugs prescribed by generic name
3. Percentage of encounters with injections
4. Percentage of encounters with antibiotics
5. Percentage of drugs prescribed from the essential medicines list

Statistical Analysis:-

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Results were expressed as frequencies, percentages, and averages.

Ethical Approval:-

Ethical approval was obtained from the Institutional Ethics Committee (Approval No: MGM-ECRHS/2025/191). Patient confidentiality was maintained throughout the study.

Results:-

A total of 600 prescriptions were analyzed in the present study to evaluate the prescribing pattern of glucose-lowering and lipid-lowering drugs. Among the study population, 298 (49.67%) were male patients and 302 (50.33%) were female patients, indicating a nearly equal gender distribution with a male-to-female ratio of 0.98 which is depicted in **Figure - 1**.

WHO Prescribing Indicator	Value
Average number of drugs per prescription	4
Prescriptions containing injections	23.2%
Prescriptions containing antibiotics	6%
Drugs prescribed by generic name	96.8%
Drugs from Essential Medicines List (EML)	92.8%

Table -1 shows WHO prescribing indicators. The average number of drugs per prescription was 4, reflecting moderate polypharmacy. Injections were prescribed in 23.2% of prescriptions, whereas antibiotics were prescribed in 6% of prescriptions. A high proportion of drugs were prescribed by generic name (96.8%), and 92.8% of the prescribed drugs were from the Essential Medicines List (EML) suggesting good adherence to rational prescribing practices.

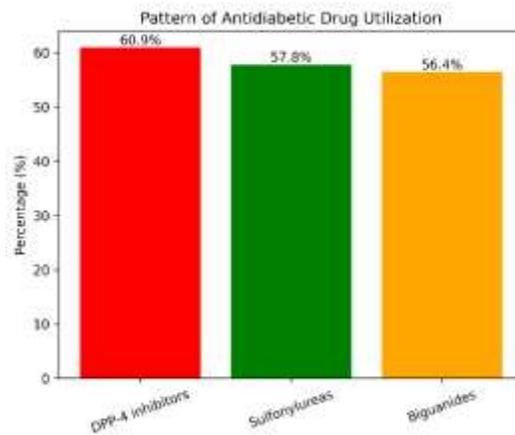


Figure -2 shows the pattern of antidiabetic drug utilization, DPP-4 inhibitors were the most frequently prescribed class (60.9%), followed by sulfonylureas (57.8%) and biguanides (56.4%).

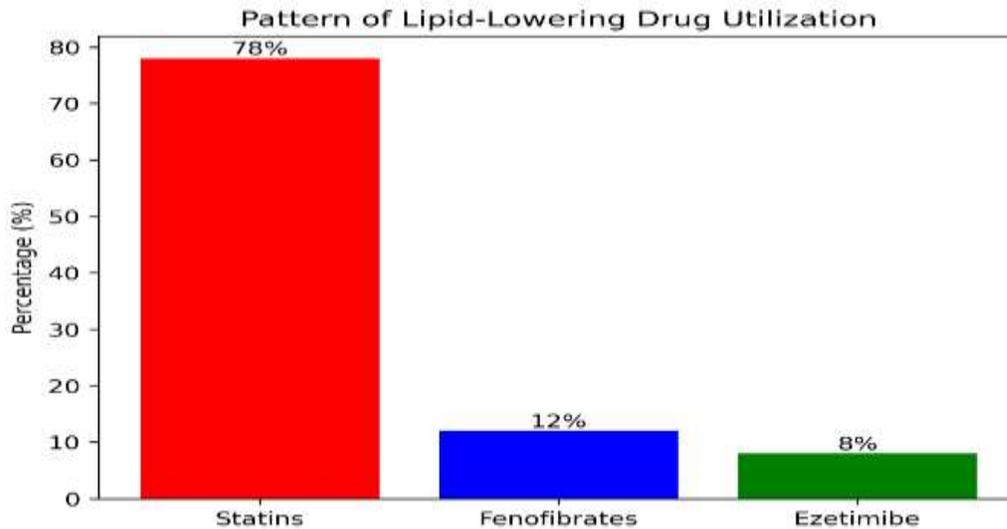


Figure-3 demonstrating the lipid-lowering therapy, statins were the most commonly prescribed agents (78%), followed by fenofibrates (12%) and ezetimibe (8%). These findings indicate a predominance of DPP-4 inhibitors in antidiabetic therapy and statins in the management of dyslipidaemia among patients with type 2 diabetes mellitus in the study setting.

Discussion:-

Our study evaluated the prescribing patterns of glucose-lowering and lipid-lowering drugs in patients with type 2 diabetes mellitus (T2DM) with dyslipidaemia in a tertiary care hospital using WHO prescribing indicators. The nearly equal gender distribution observed in our study suggests that the burden of diabetes is increasing among both males and females. Similar gender distribution has been reported in studies by Dr. Naseem Begum et al. and others, indicating that diabetes is no longer predominantly a male-dominant disease. For instance, a drug utilization study conducted in a tertiary care hospital reported a comparable proportion of male and female diabetic patients, highlighting the widespread prevalence of the disease across genders in India.¹³

The average number of drugs per prescription in the present study was four, reflecting moderate polypharmacy. This finding is higher than that reported in some earlier studies. For example, Venkateshwarlu et al. reported an average of 2.4 drugs per prescription among diabetic patients in a tertiary care hospital.¹⁴

The higher drug count observed in the present study can be explained by the coexistence of multiple comorbidities such as hypertension, dyslipidaemia, and cardiovascular disease in patients with T2DM, which necessitates multidrug therapy. Although polypharmacy is common in diabetes management, it requires careful monitoring to minimize adverse drug reactions, drug interactions, and poor medication adherence.¹⁵

In the present study, DPP-4 inhibitors were the most frequently prescribed oral antidiabetic agents, which differs from several earlier studies where metformin (biguanides) was reported as the most commonly prescribed drug. Prescription pattern analyses conducted in India have reported that metformin accounted for more than 70–90% of antidiabetic prescriptions.¹⁶

The greater use of DPP-4 inhibitors in the present study may reflect evolving treatment trends favoring drugs with improved safety profiles. DPP-4 inhibitors are associated with a low risk of hypoglycaemia, weight neutrality, and better tolerability, which may explain their increasing preference as add-on therapy in patients with inadequate glycaemic control.¹⁷ In addition to glucose lowering, emerging evidence suggests that DPP-4 inhibitors may exert pleiotropic effects including anti-inflammatory actions, endothelial protection, and potential cardiovascular benefits.¹⁸

Sulfonylureas and biguanides were also commonly prescribed in the present study, consistent with findings from other developing countries where cost-effective medications remain widely used due to affordability and accessibility. Previous utilization studies have similarly reported sulfonylureas and metformin as commonly prescribed agents due to their long-established efficacy and low cost.¹⁹

Statins were the most frequently prescribed lipid-lowering drugs in this study. This finding is consistent with multiple previous studies that have reported statins as the primary pharmacological therapy for dyslipidaemia in diabetic patients. For instance, pharmacoepidemiologic studies have reported that statins account for a majority of lipid-lowering drug prescriptions among diabetic patients.²⁰

However, earlier studies in India have shown that statin therapy is often underutilized, with fewer than 60% of patients with T2DM receiving statins despite guideline recommendations.²¹ The high proportion of statin use in the present study therefore suggests improved adherence to current treatment guidelines.

Beyond lipid lowering, statins are also known to exert several pleiotropic effects including anti-inflammatory, antioxidant, and endothelial protective actions. These effects contribute to stabilization of atherosclerotic plaques, improvement of endothelial function, and reduction of cardiovascular events, which are particularly beneficial in patients with diabetes who are at high cardiovascular risk.²²

The present study also demonstrated a high proportion of drugs prescribed by generic name (96.8%) and inclusion of drugs from the essential medicines list (92.8%), indicating good adherence to rational prescribing principles and

national drug policy guidelines. This proportion is considerably higher than that reported in some earlier studies where generic prescribing rates were around 55%.²³ Higher generic prescribing rates improve the affordability of medications and enhance patient access to essential therapies, particularly in resource-limited healthcare settings.

Injectable drugs were prescribed in 23.2% of prescriptions, which may largely reflect insulin therapy in patients with uncontrolled diabetes or advanced disease. Earlier studies have also reported significant use of insulin therapy in patients with poor glycaemic control or long-standing diabetes.²⁴ Although injectable therapy is often necessary in such patients, its use should be guided by evidence-based clinical indications and patient-specific factors.

Overall, the findings of this study highlight evolving prescribing trends in diabetes management, particularly the increasing use of newer antidiabetic agents such as DPP-4 inhibitors along with continued reliance on statins for dyslipidaemia management. Continuous prescription audits and pharmacovigilance programs are essential to ensure rational drug use, optimize therapeutic outcomes, and improve adherence to evidence-based clinical guidelines.²⁵

Limitations:-

The study was conducted at a single tertiary care centre which may limit generalizability, The cross-sectional design does not allow assessment of treatment outcomes, Clinical parameters such as HbA1c levels and lipid profiles were not analysed, Information on duration of diabetes and comorbidities was not fully evaluated, Cost-effectiveness of prescribed therapies was not assessed. And Future studies incorporating clinical outcomes and guideline adherence would provide more comprehensive insights into rational prescribing practices.

Conclusion:-

The present study demonstrates predominant use of DPP-4 inhibitors and statins in patients with T2DM and dyslipidaemia in a tertiary care setting. Prescribing practices showed high adherence to generic prescribing and essential medicine utilization, reflecting rational pharmacotherapy.

However, the observed degree of polypharmacy highlights the need for continuous prescription monitoring and adherence to guideline-based treatment strategies to ensure safe, effective, and cost-efficient therapy.

Recommendations:-

- Regular prescription audits to improve rational drug use
- Increased emphasis on guideline-based prescribing
- Enhanced patient counseling to improve adherence
- Future research linking prescribing patterns with clinical outcomes

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