

AN ANALYSIS OF THE DRUG UTILIZATION PATTERNS OBSERVED IN PATIENTS WITH HYPERLIPIDEMIA

Vidhun M.*¹, Dr. R. Dinesh Kumar*², Dr. M. Alagarraja*³, Dr. D. Christopher Vimalson*⁴,
Ashitha K. S.*⁵

¹Hospital Pharmacist – Visva Medical Centre & Hospital, Coimbatore, Tamilnadu, India.

²Associate Professor, Department of Pharmacy Practice, United College of Pharmacy, Coimbatore, Tamilnadu, India.

³Principal and Professor, United College of Pharmacy, Coimbatore, Tamilnadu, India.

⁴Professor and Head, Department of Pharmaceutics, United College of Pharmacy, Coimbatore, Tamilnadu, India.

⁵UG Scholar, PharmD, Department of Pharmacy Practice, United College of Pharmacy, Coimbatore, Tamilnadu, India.

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*Corresponding Author: Vidhun M.

Hospital Pharmacist – Visva Medical Centre & Hospital, Coimbatore, Tamilnadu, India.

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ABSTRACT

Background: Hyperlipidemia is a major risk factor for atherosclerosis and cardiovascular diseases. Evaluating drug utilization patterns provides critical insights into clinical practice and rational medicine use. **Aim:** To analyze the drug utilization patterns, clinical characteristics, and treatment outcomes among patients with hyperlipidemia in a hospital setting. **Methodology:** A retrospective observational study was conducted involving 150 hyperlipidemic patients receiving lipid-lowering pharmacotherapy at Visva Medical Centre and Hospital. Demographic data, prescribed treatment regimens, baseline, and post-treatment lipid profiles (Total Cholesterol, LDL, HDL, and Triglycerides) were collected and analyzed. Statistical significance was assessed using p-values. **Results:** Among the 150 participants, males constituted 53.33% (n=80) and females 46.67% (n=70). The majority of patients belonged to the 41–50 age group (n=42) and were classified as overweight based on BMI (n=65). Statin monotherapy was the predominant treatment choice. Atorvastatin was the most frequently prescribed agent (38.00%, n=57), followed by Rosuvastatin (26.67%, n=40), and Fenofibrate (20.00%, n=30). Combination therapy was prescribed in 15.34% (n=23) of patients. Post-treatment evaluation demonstrated statistically significant improvements across all lipid parameters ($p < 0.001$). Rosuvastatin monotherapy achieved the lowest current mean LDL level (114.35 mg/dL), Atorvastatin showed the highest mean HDL level (50.70 mg/dL), and Fenofibrate + Atorvastatin combination achieved the lowest triglyceride levels (161.60 mg/dL). **Conclusion:** Atorvastatin was the most commonly utilized lipid-lowering drug. All prescribed monotherapies and combination regimens resulted in statistically significant improvements in lipid profiles, demonstrating effective therapeutic outcomes in routine clinical practice.

KEYWORDS: Hyperlipidemia, Drug utilization pattern, Atorvastatin, Rosuvastatin, Fenofibrate, Statins, Combination therapy.

INTRODUCTION

Hyperlipidemia is a metabolic disorder characterized by abnormal elevation of circulating lipids and lipoproteins, particularly total cholesterol, triglycerides and low-density lipoprotein cholesterol (LDL-C), with or without a reduction in high-density lipoprotein cholesterol (HDL-C). Alterations in lipid metabolism may occur due to genetic factors, lifestyle-related factors or secondary

conditions and may contribute to the development of vascular complications.^[1] Hyperlipidemia is recognized as an important risk factor for atherosclerosis and cardiovascular disease. Increased concentrations of circulating atherogenic lipoproteins can promote lipid deposition and progression of atherosclerotic changes in blood vessels. The condition may occur as pure hypercholesterolemia, hypertriglyceridemia or mixed

forms involving abnormalities of both cholesterol and triglycerides.^[2]

The development of hyperlipidemia is influenced by several factors. Genetic abnormalities can result in overproduction or defective clearance of cholesterol, triglycerides and LDL, whereas acquired factors include unhealthy dietary habits, physical inactivity, obesity and associated metabolic disorders. Age and other patient-related factors may also influence lipid abnormalities and the subsequent cardiovascular risk.^[3]

Management of hyperlipidemia involves both non-pharmacological and pharmacological approaches. Lifestyle modification, including dietary control, physical activity and weight management, forms an important component of treatment. When pharmacological therapy is required, lipid-lowering agents are selected according to the lipid abnormality, associated risk factors and therapeutic requirements of the patient.^[4] Among the available pharmacological agents, statins are widely used because of their lipid-lowering effects and their role in reducing cardiovascular risk. Commonly used statins include atorvastatin, rosuvastatin, simvastatin, pravastatin and fluvastatin. The intensity of statin therapy can vary according to the drug and dose prescribed, and the choice of treatment may depend on the patient's clinical characteristics and required degree of lipid reduction.^[5]

Other pharmacological options are also available for the management of lipid abnormalities. Fibrates such as fenofibrate are particularly associated with the management of elevated triglyceride levels, while other lipid-lowering agents act through different mechanisms involved in cholesterol absorption or metabolism. Ezetimibe, bile-acid sequestrants and other agents may therefore be used according to the therapeutic requirement of individual patients.^[6] Recent developments in the pharmacological management of hyperlipidemia have expanded the available treatment options beyond conventional statin therapy. Established therapies such as statins, fibrates and ezetimibe continue to be used, while newer approaches include PCSK9 inhibitors, inclisiran, bempedoic acid and other emerging therapies. These developments provide additional options when conventional treatment does not achieve the required lipid control.^[7]

The effectiveness of lipid-lowering therapy also depends on appropriate utilization and continued use of prescribed medicines. Drug utilization patterns may include the type of lipid-lowering agent selected, prescribed dose, treatment intensity, duration of therapy, switching between agents and the use of combination therapy. Evaluation of these patterns can provide useful information regarding the manner in which lipid-lowering medicines are being used in routine clinical

practice.^[8] Drug utilization studies are therefore important for evaluating prescribing practices and identifying commonly used medications and treatment combinations. Previous studies have demonstrated that statins constitute a major proportion of prescribed hypolipidemic drugs. In a tertiary-care study from Southern India, atorvastatin was the most commonly prescribed hypolipidaemic drug as monotherapy, while combinations involving atorvastatin and other medicines were also observed.^[9]

Studies evaluating drug utilization have also reported differences in the selection of individual statins and combination regimens. In patients with dyslipidemia and type 2 diabetes mellitus, statins represented the predominant group of hypolipidemic medicines, with rosuvastatin and atorvastatin being frequently utilized. Combination therapy involving rosuvastatin and fenofibrate was also reported, demonstrating that treatment patterns may vary according to the patient's lipid abnormalities and clinical characteristics.^[4] In addition to the choice of drug, the prescribed dose and treatment intensity are important aspects of pharmacotherapy. Evaluation of prescribing patterns can identify whether commonly used agents are being prescribed at appropriate intensities and can help describe changes in therapy during follow-up. Such information is relevant when assessing the utilization of lipid-lowering medicines in real-world clinical practice.^[5] Long-term use of lipid-lowering therapy also makes adherence an important component of drug utilization. Patients may discontinue, switch or modify treatment because of treatment complexity, adverse effects, cost, comorbidities or inadequate response to therapy. Therefore, assessment of adherence together with drug utilization provides a broader understanding of the actual therapeutic pattern among patients receiving lipid-lowering medicines.^[8]

Real-world pharmaco-utilization studies provide information regarding the characteristics of treated patients, their lipid profiles, therapeutic pathways and patterns of medicine use. A retrospective Italian study of hypercholesterolemic patients treated with statins evaluated treatment patterns and adherence using real-world healthcare data. The study included patients with different cardiovascular risk categories and assessed the use of individual statins, combinations with ezetimibe and adherence to therapy. In that study, atorvastatin represented the most frequently used statin among non-familial hypercholesterolemic patients, followed by simvastatin and rosuvastatin, while ezetimibe was used either alone or in combination with statins. The study also assessed adherence based on the proportion of days covered and demonstrated that adherence was an important component of pharmaco-utilization assessment.^[10]

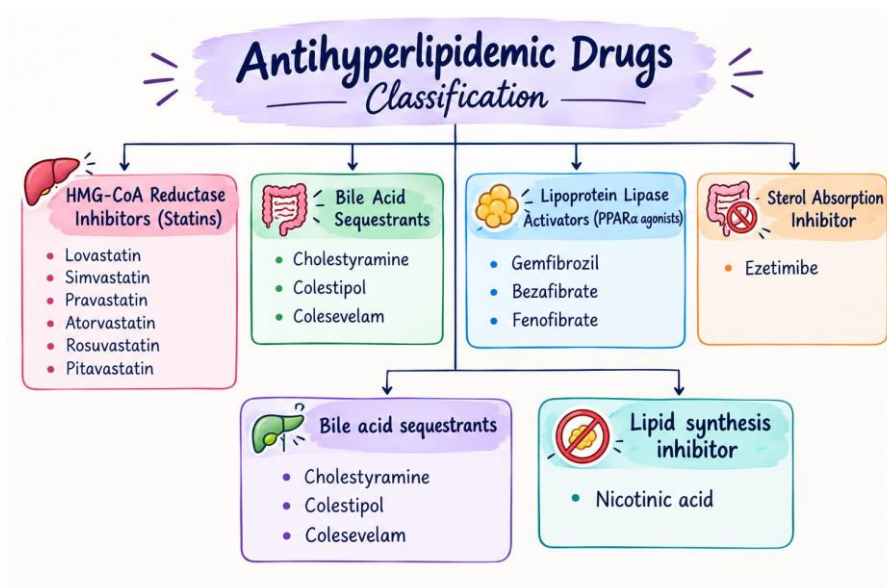


Fig. 01: Antihyperlipidemic Drugs Classification.

AIM

To analyze the drug utilization patterns among patients with hyperlipidemia by evaluating the commonly prescribed lipid-lowering medications, their utilization patterns, treatment combinations, and to understand the overall pattern in routine clinical practice.

OBJECTIVES

1. To identify the demographic and clinical characteristics of patients with hyperlipidemia receiving pharmacological treatment.
2. To evaluate the pattern and frequency of utilization of different lipid-lowering drugs prescribed for the management of hyperlipidemia.
3. To assess the use of individual lipid-lowering agents and their combinations containing regimens.
4. To determine the overall drug utilization pattern in relation to lipid control and appropriate therapeutic management of hyperlipidemia.

METHODOLOGY

Study Design: The present study will be a retrospective observational study conducted to evaluate the drug utilization patterns among patients with hyperlipidemia.

Study Site: The present study will be conducted at [VISVA MEDICAL CENTRE AND HOSPITAL], [Kannarpalayam road, karamadai CBE – 641104] The hospital will serve as the study site for identifying eligible patients diagnosed with hyperlipidemia and receiving lipid-lowering therapy. The study will be carried out using the available medical records and

prescription information of patients attending the hospital during the predefined study period. The selected study site provides a suitable setting for evaluating real-world drug utilization patterns among patients with hyperlipidemia

Study Plan: Eligible patient records will be identified from the hospital during the predefined study period. Patients diagnosed with hyperlipidemia and receiving lipid-lowering therapy will be screened according to the predefined inclusion and exclusion criteria. Relevant information including demographic characteristics, BMI, prescribed lipid-lowering drugs, dosage, treatment regimen, and available initial and current lipid profile parameters will be collected from the medical records. The collected data will be systematically recorded and analyzed to evaluate the utilization patterns of individual lipid-lowering drugs and combination regimens, along with changes in lipid profile parameters following treatment.

Sample Size: The sample will include patients from different age groups and genders who are diagnosed with hyperlipidemia and are receiving lipid-lowering pharmacotherapy. The study will focus on patients for whom information regarding the prescribed lipid-lowering medications is available. The final number of patients included in the study will be based on the availability of eligible patient records during the specified study period.

Total sample size: [150]

RESULTS

Table 01: Demographic and Clinical Charecteristics of Study Population (N = 150).

CHARACTERISTICS	CATEGORY	FENO	ATORVA	ROSUVA	FENO + ATORVA	FENO + ROSUVA
GENDER	MALE	21	28	16	8	7
	FEMALE	9	29	25	4	3

AGE (YEARS)	31 - 40	5	16	3	1	0
	41 - 50	10	12	6	2	2
	51 - 60	7	8	8	4	3
	61 - 70	4	15	14	0	2
	71 - 80	6	9	8	2	3
BMI	UNDER WEIGHT (<18.5)	-	-	-	-	-
	NORMAL (18.5 – 24.9)	8	24	18	2	1
	OVER WEIGHT (25.0 – 29.9)	19	16	15	6	9
	OBESITY CLASS I (30.0 – 34.9)	3	17	7	2	3
	SEVERE OBESITY CLASS II (35.0 – 39.9)	-	-	-	-	-
	EXTREME OBESITY (>40)	-	-	-	-	-

Among the 150 study participants, males (n=80) were slightly more predominant than females (n=70). The majority of patients belonged to the 41–50 years age group (n=42), followed by 51–60 years (n=30).

Regarding BMI, most patients were categorized as overweight (n=65), followed by normal weight (n=53) and obesity class I (n=32).

Table 02: Overall Drug Utilization (n = 150).

LIPID – LOWERING MEDICATION	NO OF PATIENTS (n)	PERCENTAGE %
FENOFIBRATE	30	20.00
ATORVASTATIN	57	38.00
ROSUVASTATIN	40	26.67
FENOFIBRATE + ATORVASTATIN	10	6.67
FENOFIBRATE + ROSUVASTATIN	13	8.67
TOTAL	150	100

Among the 150 patients, atorvastatin was the most commonly prescribed lipid-lowering drug (n=57, 38.00%), followed by rosuvastatin (n=40, 26.67%) and

fenofibrate (n=30, 20.00%). Combination therapy was prescribed in 23 patients (15.34%), comprising fenofibrate + atorvastatin and fenofibrate + rosuvastatin.

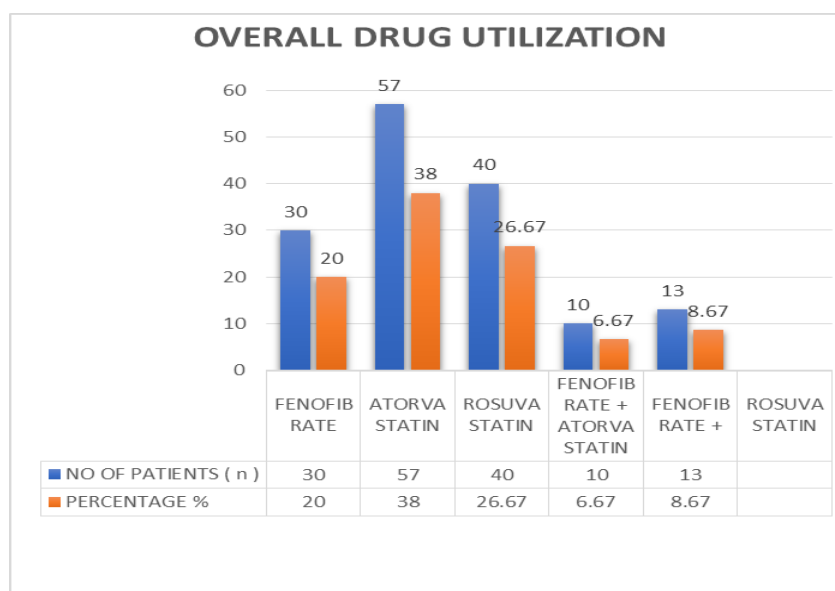


Fig. 02: Overall Drug Utilization.

The overall drug utilization pattern showed that atorvastatin was the most frequently used drug (38.00%), followed by rosuvastatin (26.67%) and fenofibrate

(20.00%). Combination therapy accounted for 15.34% of prescriptions.

Table 03: Comparison of Lipid Profile Parameters Before And After Prescription.

DRUG REGIMEN	TOTAL CHOLESTEROL				LDL				HDL				TG			
	I.P	M	C.P	M	I.P	M	C.P	Mean	I.P	M	C.P	M	I.P	M	C.P	M
FENO	193-285	243	147-262	209	115-205	157	92-164	123	32-65	46	34-71	49	120-276	205	105-233	170
ATORVA	185-290	238	158-256	202	91-197	152	73-171	119	32-62	48	36-67	51	129-282	200	103-261	175
ROSUVA	198-293	243	150-269	203	97-193	148	77-155	114	30-59	47	32.65	49	101-291	190	87-259	162
FENO + ATORVA	195-279	246	161-247	200	125-205	167	101-167	128	32-54	44	36-58	48	120-276	192	101-250	161.60
FENO + ROSUVA	192-262	225	150-225	186	118-196	164	89-152	124	33-59	43	37-62	47	131-296	225	107-252	180

ABBREVIATIONS

- 1) I.P - INITIAL PRESCRIPTION RANGES
- 2) C.P - CURRENT PRESCRIPTION RANGES
- 3) M – MEAN VALUE

reduction in total cholesterol, LDL and triglyceride levels across all drug regimens. HDL levels showed an improvement after prescription. Overall, the findings indicate a favourable change in lipid profile following treatment.

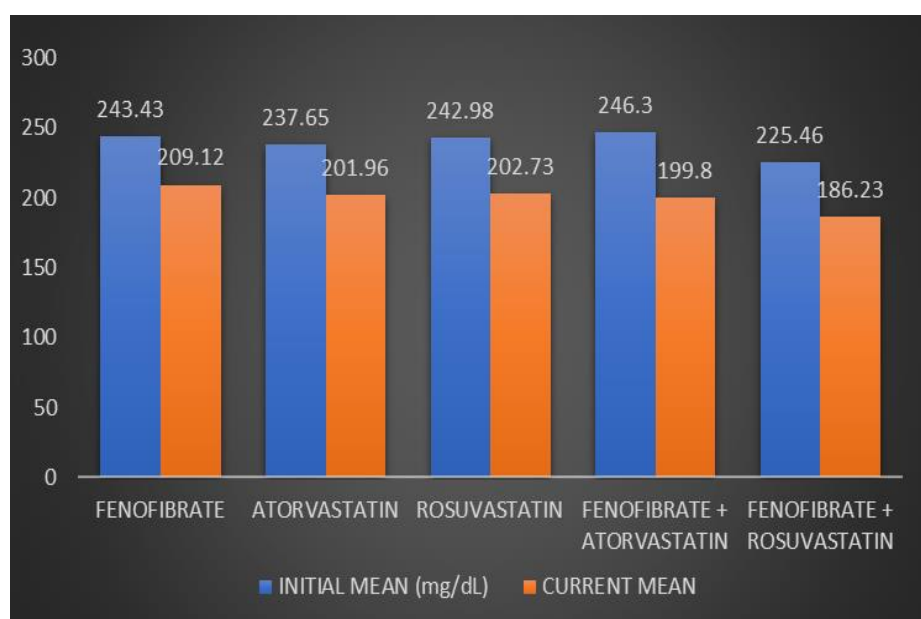
The above table shows that Comparison of lipid profile parameters before and after prescription showed a

Table 04: Comparison of Initial And Current Total Cholesterol Levels Among Different Drug Regimens.

DRUG REGIMEN	INITIAL MEAN (mg/dL)	CURRENT MEAN (mg/dL)	P - VALUE
FENOFIBRATE	243.43	209.12	<0.001
ATORVASTATIN	237.65	201.96	<0.001
ROSUVASTATIN	242.98	202.73	<0.001
FENOFIBRATE + ATORVASTATIN	246.30	199.80	<0.001
FENOFIBRATE + ROSUVASTATIN	225.46	186.23	<0.001

It demonstrates a significant reduction in total cholesterol levels across all drug regimens. Fenofibrate showed a reduction from 243.43 to 209.12 mg/dL. Atorvastatin and

rosuvastatin also showed notable reductions in cholesterol levels. Combination regimens showed significant reductions, with all groups having $p < 0.001$

**Fig. 03: Total Cholesterol Levels Initial Vs Current.**

The graph shows a clear reduction in total cholesterol levels from initial to current values across all drug regimens. The combination therapies showed greater

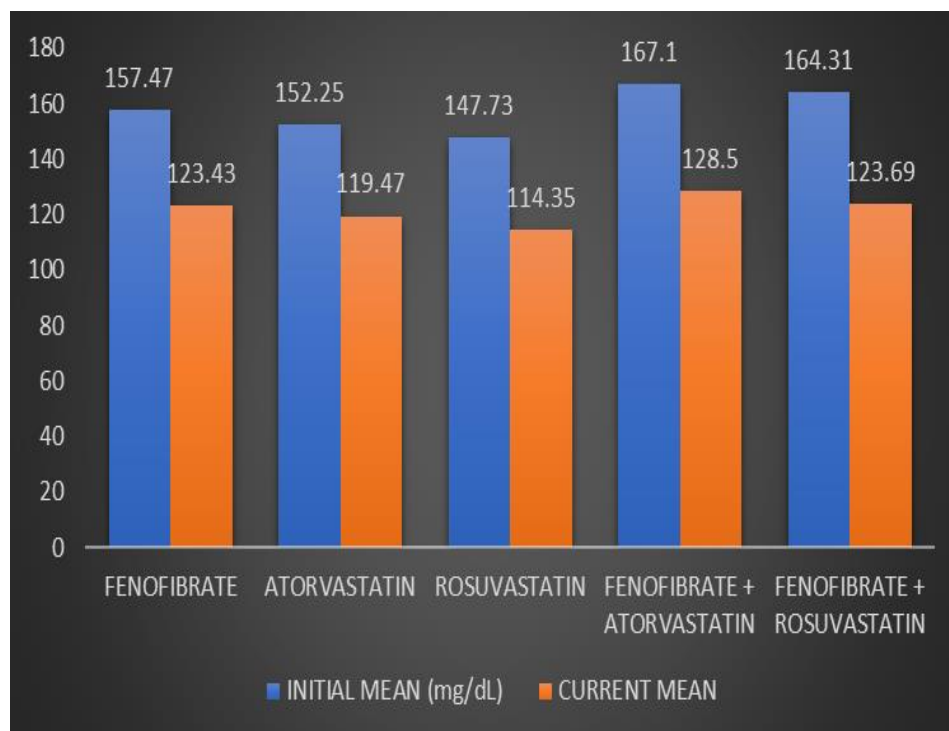
reductions compared with individual drug regimens. Overall, all treatment groups demonstrated improved total cholesterol levels.

Table 05: Comparison of Initial and Current Low Density Lipoproteins Among Different Drug Regimens.

DRUG REGIMEN	INITIAL MEAN (mg/dL)	CURRENT MEAN (mg/dL)	P – VALUE
FENOFIBRATE	157.47	123.43	<0.001
ATORVASTATIN	152.25	119.47	<0.001
ROSUVASTATIN	147.73	114.35	<0.001
FENOFIBRATE + ATORVASTATIN	167.10	128.50	<0.001
FENOFIBRATE + ROSUVASTATIN	164.31	123.69	<0.001

It compares the initial and current mean Low-Density Lipoprotein (LDL) levels across five drug regimens. All regimens demonstrated a statistically significant

reduction in LDL levels ($p < 0.001$). Among them, Rosuvastatin monotherapy achieved the lowest current mean LDL level at 114.35 mg/dL.

**Fig. 04: Ldl - Initial Vs Current.**

It illustrates the reduction in mean LDL levels across all five drug regimens, comparing initial values (blue bars) to current values (orange bars). Every treatment group showed a clear decrease in LDL levels, with

Rosuvastatin showing the lowest final mean level at 114.35 mg/dL. Overall, the chart visually highlights the efficacy of each treatment in lowering LDL levels from baseline.

Table 06: Comparison of Initial and High Density Lipoproteins Among Different Drug Regimens.

DRUG REGIMEN	INITIAL MEAN (mg/dL)	CURRENT MEAN (mg/dL)	P – VALUE
FENOFIBRATE	45.83	48.87	<0.001
ATORVASTATIN	47.67	50.70	<0.001
ROSUVASTATIN	46.65	49.33	<0.001
FENOFIBRATE + ATORVASTATIN	44.30	48.00	<0.001
FENOFIBRATE + ROSUVASTATIN	43.38	47.23	<0.001

It compares the initial and current mean High-Density Lipoprotein (HDL) levels across five drug regimens. All treatment groups showed a statistically significant increase in HDL ("goodcholesterol") levels from

baseline to current values ($p < 0.001$). Among the regimens, Atorvastatin achieved the highest current mean HDL level at 50.70 mg/dL, followed closely by Rosuvastatin at 49.33 mg/dL.

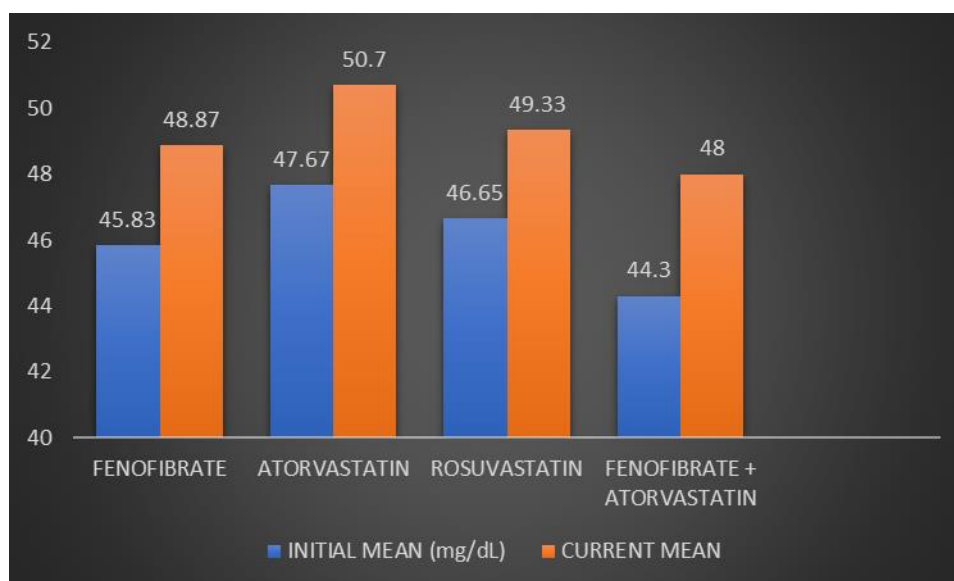


Fig. 05: - Hdl: Initial Vs Current.

It shows the increase in mean High-Density Lipoprotein (HDL) levels across treatment groups, comparing initial baseline values (blue bars) to current values (orange bars). Every drug regimen resulted in an improvement in

HDL levels, with Atorvastatin reaching the highest current mean at 50.70 mg/dL. Overall, the chart demonstrates the clear effectiveness of all regimens in elevating HDL ("good cholesterol") levels

Table 07: comparison of initial and current triglyceride levels.

DRUG REGIMEN	INITIAL MEAN (mg/dL)	CURRENT MEAN (mg/dL)	P – VALUE
FENOFIBRATE	204.77	169.73	<0.001
ATORVASTATIN	200.47	175.14	<0.001
ROSUVASTATIN	190.45	161.95	<0.001
FENOFIBRATE + ATORVASTATIN	192.00	161.60	<0.001
FENOFIBRATE + ROSUVASTATIN	225.15	180.31	<0.001

It compares the initial and current mean levels across five different drug regimens. All treatment groups showed a statistically significant reduction in mean

levels from baseline ($p < 0.001$). Among them, the combination of Fenofibrate + Atorvastatin achieved the lowest current mean level at 161.60 mg/dL.

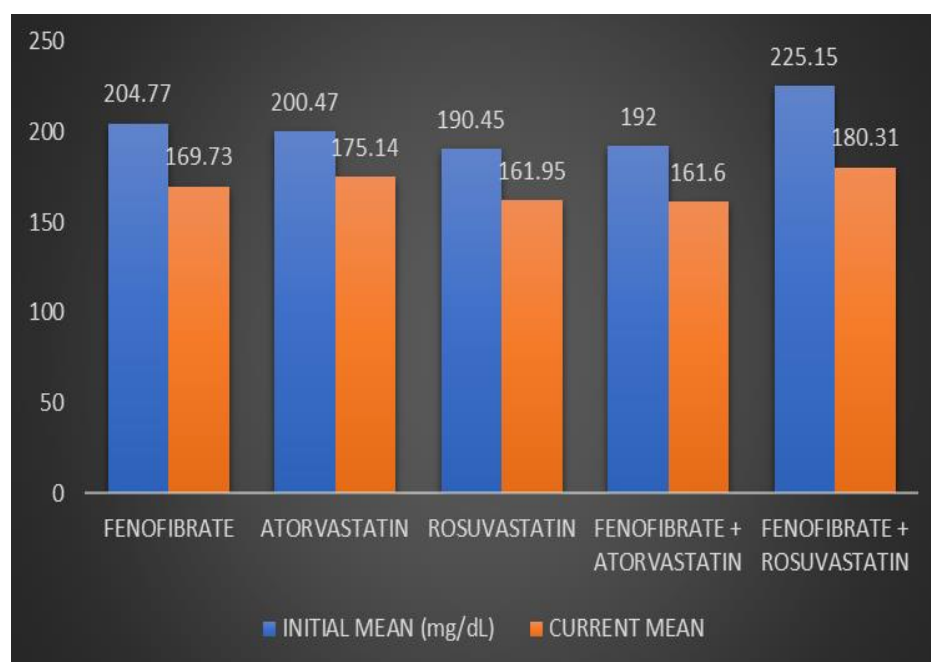


Fig. 06: Triglycerides: Initial Vs Current.

It illustrates the reduction in mean Triglycerides levels across all five drug regimens, comparing initial baseline values (blue bars) to current values (orange bars). Every treatment group showed a clear decrease in Triglycerides levels, with the combination of Fenofibrate + Atorvastatin achieving the lowest current mean level at 161.60 mg/dL. Overall, the chart highlights the effectiveness of all regimens in lowering Triglycerides levels from baseline.

DISCUSSION

The present study evaluated the drug utilization patterns and changes in lipid profile parameters among 150 patients diagnosed with hyperlipidemia receiving various lipid-lowering regimens. Demographics analysis revealed a slight male predominance (53.33%, n=80) compared to females (46.67%, n=70). The majority of patients belonged to the 41–50 years age group, followed by the 51–60 years group, indicating that hyperlipidemia requiring pharmacological intervention is most prevalent among middle-aged and older adults. Regarding Body Mass Index (BMI), overweight individuals constituted the largest patient group, followed by normal weight and class I obesity, with no patients recorded in the underweight or severe/extreme obesity categories.

In terms of drug utilization, statin monotherapy was the predominant treatment choice in routine clinical practice. Atorvastatin was the most frequently prescribed drug (38.00%, n=57), followed by rosuvastatin (26.67%, n=40) and fenofibrate (20.00%, n=30). Combination therapies accounted for 15.34% of total prescriptions, comprising fenofibrate with rosuvastatin (8.67%, n=13) and fenofibrate with atorvastatin (6.67%, n=10). The high prescription frequency of atorvastatin aligns with existing literature on standard hypolipidemic treatment options.

Following treatment intervention, all five drug regimens produced statistically significant improvements across all measured lipid parameters (p<0.001):

1. Total Cholesterol: All regimens achieved notable reductions, with initial baseline mean values ranging from 225.46 to 246.30 mg/dL decreasing to current mean values of 186.23 to 209.12 mg/dL. Fenofibrate + rosuvastatin reduced total cholesterol from 225.46 mg/dL to 186.23 mg/dL, while fenofibrate + atorvastatin reduced it from 246.30 mg/dL to 199.80 mg/dL.
2. Low-Density Lipoprotein (LDL): Initial mean LDL values ranged from 147.73 to 167.10 mg/dL and dropped significantly to 114.35–128.50 mg/dL post-treatment. Rosuvastatin monotherapy achieved the lowest current mean LDL level at 114.35 mg/dL (from 147.73 mg/dL), followed closely by atorvastatin monotherapy at 119.47 mg/dL (from 152.25 mg/dL).
3. High-Density Lipoprotein (HDL): Unlike atherogenic lipids, HDL levels exhibited a favorable

increase across all treatment groups. Baseline mean values ranged between 43.38 and 47.67 mg/dL, increasing to current means of 47.23 to 50.70 mg/dL. Atorvastatin monotherapy achieved the highest current mean HDL level at 50.70 mg/dL (from 47.67 mg/dL), followed by rosuvastatin at 49.33 mg/dL (from 46.65 mg/dL).

4. Triglycerides: Baseline triglyceride levels ranged from 190.45 to 225.15 mg/dL and showed marked reductions down to 161.60–180.31 mg/dL. The combination therapy of fenofibrate + atorvastatin demonstrated the most pronounced effect, lowering mean triglycerides from 192.00 mg/dL to 161.60 mg/dL, followed by rosuvastatin monotherapy (190.45 to 161.95 mg/dL).

Overall, these findings confirm that both statin/fibrate monotherapies and combination regimens lead to statistically significant and clinically beneficial improvements in lipid profiles in real-world clinical practice

CONCLUSION

The present study provides an overview of drug utilization patterns among patients with hyperlipidemia and demonstrates that atorvastatin was the most commonly prescribed lipid-lowering agent, followed by rosuvastatin and fenofibrate, while combination therapy was used in a smaller proportion of patients. The study population was predominantly middle-aged, with overweight patients forming the largest BMI category. Following pharmacological treatment, all evaluated regimens showed reductions in total cholesterol, LDL and triglyceride levels, along with an increase in HDL levels, and these changes were statistically significant. Overall, the findings indicate that the lipid-lowering regimens utilized in routine clinical practice were associated with favourable changes in the measured lipid parameters. The study therefore highlights the importance of evaluating drug utilization patterns together with changes in lipid profiles to understand the practical use of lipid-lowering therapy and support appropriate pharmacological management of patients with hyperlipidemia.

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