



ORIGINAL ARTICLE

Cost Variation Analysis of Hypolipidemic Drugs Currently Available in Indian Pharmaceutical Market

Prajnyan Prasad Kalita^{1,*}, Hiteswar Saikia², Meghali Chaliha³

¹Post Graduate Trainee, Department of Pharmacology, Assam Medical College and Hospital, Dibrugarh, Assam, India

²Assistant Professor, Department of Pharmacology, Assam Medical College and Hospital, Dibrugarh, Assam, India

³Professor and Head of the Department, Department of Pharmacology, Assam Medical College and Hospital, Dibrugarh, Assam, India

ARTICLE INFO

Article history:

Received 30-04-2024

Accepted 18-06-2024

Published 06.08.2024

* Corresponding author.

Prajnyan Prasad Kalita

pragyankalita92@gmail.com

[https://doi.org/](https://doi.org/10.18579/jopcr/v23.2.39)

10.18579/jopcr/v23.2.39

ABSTRACT

42% of all fatalities worldwide resulting from non-communicable diseases (NCD) are attributable to cardiovascular illnesses. The availability of several brands and generic medications causes a wide range in the pricing at which they are sold. This study was conducted to raise awareness among health care workers and patients about the cost difference between different brands of the same hypolipidemic drug, so that, if possible, a cheaper effective brand can be prescribed to ensure better patient adherence. Maximum retail price (MRP) of various hypolipidemic drugs of same strength and dosage forms manufactured by different pharmaceutical companies were obtained from various online and offline sources. The maximum and minimum cost of 10 tablets/capsules were noted. The cost ratio and percentage cost variation were calculated for single drug and fixed dose combinations. The ceiling price (as per DPCO) of hypolipidemics (as per national list of essential medicines) was compared with their maximum cost. Maximum cost variation observed in case of single drug was Atorvastatin 10mg (3043.9393%), and in case of FDC was seen in Rosuvastatin 10mg + Aspirin 75mg (561.341%). This study led us to the conclusion that the majority of hypolipidemic medications should be governed by DPCO in order to lessen the economic load of healthcare services on the Indian population.

Keywords: Pharmacoeconomic; Cost variation; Hypolipidemic; Statins

INTRODUCTION

Two-fifths (42%) of all fatalities worldwide resulting from non-communicable diseases (NCD) are attributable to cardiovascular illnesses (CVD).¹ CVDs are the cause of over half (52%) of all premature deaths globally. Globally, CVDs account for over 17.5 million deaths annually.² South Asian nations saw the largest rise in CVD-associated mortality (97.3%) between 1990 and 2013.³ About one in four fatalities in India are attributable to CVDs, mostly stroke and ischemic heart disease.⁴ According to the Global Burden of Disease report, India has an age-standardized CVD mortality rate of 272 per 100,000 people, which is much higher than the 235 global averages.⁵ Compared to 15.2% and 6.9%, respectively, in 1990, chronic diseases (CVDs) accounted for 28.1% of all deaths and 14.1% of all disability-adjusted life years (DALYs) in India in 2016.⁶ Dyslipidemia is one of the major risk factors of cardiovascular diseases. Hypercholesterolemia is

the most common form of dyslipidemia. The primary feature of dyslipidemia is elevated low-density lipoprotein (LDL) cholesterol, which is linked to a higher risk of cardiovascular disease, especially in those with atherosclerotic cardiovascular disease (ASCVD).⁷ As a result, one of the most widely used methods for treating and preventing ASCVD in clinical practice is reducing LDL cholesterol levels.⁸ For decreasing LDL cholesterol, statins are currently the first line of treatment in the majority of clinical situations.⁹

The availability of several brands and generic medications causes a wide range in the pricing at which they are sold. Rosuvastatin (Tablet, 10 mg), a cholesterol-lowering agent, is marketed through 127 brands by 105 companies. Three brands of the same formulation of rosuvastatin are marketed by four companies. Price comparisons between branded generics in the private retail market and pure/unbranded generics in the public procurement market for Atorvastatin (10 mg tablet) found that atorvastatin (10mg) is procured

by the procurement agency at Rs. 0.21 (21 paise) while the same is sold at Rs. 5.1 in the private retail segment, resulting in a 184% price difference. The highest-priced brand of atorvastatin (10 mg) is sold at Rs. 7.4 per tablet whereas the same is also sold at Rs. 2 per tablet.¹⁰ This leaves consumers, healthcare professionals, and prescribers perplexed about what constitutes a reasonable and appropriate product. Drug prices that vary significantly and are routinely used by a big portion of the population will have significant economic effects. Patients whose treatments account for the majority of their income are likewise impacted in terms of compliance.¹¹

To regulate the cost of medications, the Indian government enacted the Drug Price Control Order (DPCO). Once a medication is covered by DPCO, its price cannot be raised above what the government specifies. The number of medicines covered by DPCO has declined over the past many years, which has increased the cost of medications and placed a financial strain on the population of low-income people.¹²

The purpose of our study was to determine the variation in the cost of oral hypolipidemic drugs such as statins, sterol inhibitors, lipoprotein and triglyceride inhibitors, and peroxisomal proliferator-activating receptor agonists (fibrates) that are available in India, either alone or in combination with other hypolipidemic drugs. We also aimed to assess the differences in cost between different brands of the same oral hypolipidemic drug by computing the percentage variation in cost in Indian rupees (INR).

Aims & Objectives

The aim of the study is to analyze cost variations of different brands of hypolipidemic drugs marketed in India.

METHODS

This study was conducted in the Department of Pharmacology at Assam Medical College and Hospital over a period of 3 months. "Current Index of Medical Specialities (CIMS)" April-July 2023 and "Indian Drug Review (IDR) 2023" drug manuals was used to analyze the prices of hypolipidemic drugs. The NPPA website was used to gather information about the generic drug pricing set by the NPPA (National Pharmaceutical Pricing Authority) under the DPCO (Drug price control order).

The cost was cross-checked at pharmacy shops (retail drug stores). The fixed dose combinations (FDC) of hypolipidemic drugs were analyzed for the cost differences. The FDC is the formulation including two or more active pharmaceutical ingredients combined in a single dosage form. FDCs included in the study were formulations containing two or three active ingredients combined in single dosage form.

The cost of a particular drug (single drug or drug combinations) in the same strength and number of brands

being manufactured by different companies were compared in Indian rupees per 10 tablets/capsules. The drugs manufactured by only one company or by different companies, however, in different strengths were excluded. Parenteral formulations were also excluded. The following formulas were used to calculate the Cost ratio and Cost variance.¹³

$$\text{Cost Ratio} = \frac{\text{Maximum Cost}}{\text{Minimum Cost}}$$

$$\% \text{ Cost Variation} = \frac{\text{Maximum Cost} - \text{Minimum Cost}}{\text{Minimum Cost}} \times 100$$

The maximum cost of hypolipidemic drugs (as per NLEM) were compared with their ceiling price (as per DPCO). Ceiling prices of 10 tablets/capsules were calculated. The cost difference between maximum cost and ceiling price will be analyzed.

To compare the prices of brand drug with generic drug, <http://janaushadhi.gov.in/ProductList.aspx> were used as source for generic drug price.¹⁴

Statistical Analysis

The data was compiled in the form tables and results were expressed in numbers and percentages after entering the data into MS Excel Worksheet.

RESULTS

The prices of a total of 14 drugs (3 single and 11 combination preparation), available in 22 different formulations were analyzed. All formulation were manufactured by different pharmaceutical companies.

The results were formulated using Tables 1, 2, 3 and 4.

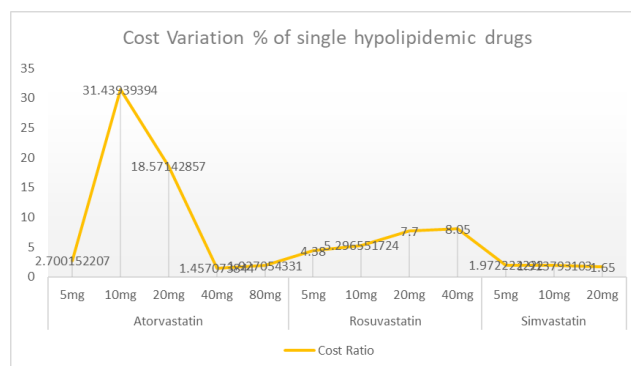


Fig. 1: Cost Variation percentage of single hypolipidemic drugs

Among the single drug formulations in our study, the cost variation observed in the present study was as high as 3043.9393% in case of Atorvastatin 10mg, Atorvastatin 20mg (1757.1428%) Rosuvastatin 40mg (705%). (Figure 2)

Among the fixed drug combinations, the maximum cost variations were seen in case of Rosuvastatin 10mg +

Table 1: Cost variation percentage of monotherapy hypolipidemic drugs

Sl. No	Drug	Dosage and formulation (quantity-10) (mg/Tablet)	Minimum cost	Maximum cost	Cost Difference	Cost Ratio	Cost Variation %
1	Atorvastatin	5mg	26.28	70.96	44.68	2.7	170.01
		10mg	2.64	83	80.36	31.4	3043.93
		20mg	28	520	492	18.5	1757.14
		40mg	144.9	211.13	66.23	1.45	45.707
		80mg	251.42	484.5	233.08	1.92	92.705
2	Rosuvastatin	5mg	20	87.60	67.6	4.38	338
		10mg	29	153.6	124.6	5.29	429.655
		20mg	40	308	268	7.7	670
		40mg	60	483	423	8.05	705
3	Simvastatin	5mg	36	71	35	1.97	97.22
		10mg	58	111	53	1.91	91.379

Table 2: Cost variation percentage of combination of hypolipidemic drugs

Sl. No	Drug Dosage and formulation (quantity-10) (mg/Tablet or Capsule)	Minimum cost	Maximum cost	Cost Difference	Cost Ratio	Cost Variation %
1	Atorvastatin 10mg + Ezetimibe 10mg	39	228	189	5.84	484.615
2	Atorvastatin 10mg + Clopidogrel 75mg	64.1	231	166.9	3.60	260.374
3	Atorvastatin 10mg + Aspirin 75mg (Capsule)	26.62	65	38.38	2.44	144.177
4	Atorvastatin 20mg + Aspirin 75mg (Capsule)	33.9	120	86.1	3.53	253.982
5	Atorvastatin 10mg + Aspirin 150mg (Capsule)	18.66	70	51.34	3.75	275.133
6	Atorvastatin 20mg + Clopidogrel 75mg + Aspirin 75mg (Capsule)	71.41	118.75	47.34	1.66	66.293
7	Atorvastatin 10mg + Clopidogrel 75mg + Aspirin 75mg (Capsule)	38.7	183	144.3	4.72	372.868
8	Rosuvastatin 10mg + Aspirin 75mg (Capsules)	31.3	207	175.7	6.61	561.341
9	Rosuvastatin 10mg + Clopidogrel 75mg (Capsules)	57.2	242	184.8	4.23	323.076
10	Rosuvastatin 10mg + Aspirin 75mg + Clopidogrel 75mg (Capsules)	44	135	91	3.06	206.818
11	Rosuvastatin 20mg + Aspirin 75mg + Clopidogrel 75mg (Capsules)	130	221	91	1.7	70

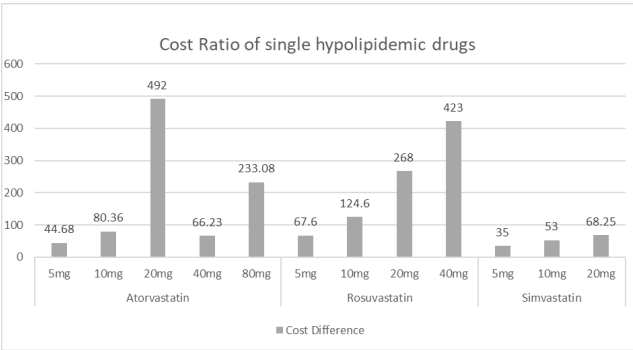


Fig. 2: Cost Ratio of single hypolipidemic drugs

Aspirin75mg (561.341%), Atorvastatin 10mg + Ezetimibe 10mg (484.615%), Atorvastatin 10mg +Clopidogrel 75mg + Aspirin 75mg (372.868%), Rosuvastatin 10mg + Clopidogrel 75mg (323.076%). (Figure 3)

The cost ratio was seen to be highest for Atorvastatin 10mg (31.439) followed by Rosuvastatin 40mg (8.05), Simvastatin 5mg (1.972) and the combination of Rosuvastatin 10mg + Aspirin 75mg (6.613). (Figure 4)

Maximum cost difference between maximum price of branded formulations & generic Medicines (Jan Aushadhi) was found in case of Atorvastatin 20mg (507.9 rupees), Atorvastatin 80mg (449.5 rupees), Rosuvastatin 40mg (439 rupees). (Figure 5)

Table 3: Comparison between generic price, minimum & maximum price

Sl. No	Dosage and formulation (quantity-10) (mg/Tablet or Capsule)	Generic Price (A)	Minimum price	Maximum price (B)	Cost difference (B-A)
1	Atorvastatin 5mg	10	26.28	70.96	60.96
2	Atorvastatin 10mg	8.8	2.64	83	74.2
3	Atorvastatin 20mg	12.1	28	520	507.9
4	Atorvastatin 80mg	35	251.42	484.5	449.5
5	Rosuvastatin 5mg	13.2	20	87.60	74.4
6	Rosuvastatin 10mg	12.46	29	153.6	141.14
7	Rosuvastatin 20mg	28.6	40	308	279.4
8	Rosuvastatin 40mg	44	60	483	439
9	Simvastatin 10mg	11	58	111	100
10	Simvastatin 20mg	16	105	173.25	157.25
11	Atorvastatin 10mg + Ezetimibe 10mg	25	39	228	203
12	Atorvastatin 10mg + Clopidogrel 75mg	38.5	64.1	231	192.5
13	Atorvastatin 10mg + Aspirin 75mg (Capsule)	16	26.62	65	49
14	Atorvastatin 20mg + Aspirin 75mg (Capsule)	18.2	33.9	120	101.8
16	Atorvastatin 10mg + Aspirin 150mg (Capsule)	17.33	18.66	70	52.67
18	Atorvastatin 20mg + Clopidogrel 75mg + Aspirin 75mg (Capsule)	44	71.41	118.75	74.75
19	Atorvastatin 10mg + Clopidogrel 75mg + Aspirin 75mg	38	38.7	183	145
20	Rosuvastatin 10mg + Aspirin 75mg (Capsules)	37	31.3	207	170
22	Rosuvastatin 10mg + Clopidogrel 75mg (Capsules)	42	57.2	242	200
23	Rosuvastatin 10mg + Aspirin 75mg + Clopidogrel 75mg (Capsules)	49.5	44	135	85.5
24	Rosuvastatin 20mg + Aspirin 75mg + Clopidogrel 75mg (Capsules)	55	130	221	166

Table 4: Ceiling prices of hypolipidemic drugs as per NPPA in the year 2023

Sl. No	Drug name & Formulation	Ceiling price (INR)	Maximum price (INR)	Cost Difference
1	Atorvastatin 10mg	49.4	83	33.6
2	Atorvastatin 20mg	125.5	520	394.5
3	Atorvastatin 40mg	192.9	211.13	18.23
4	Atorvastatin 80mg	405.7	484.5	78.8

DISCUSSION

In our study findings showed a very high fluctuation in the minimum and maximum price of hypolipidemic drugs. The cost ratio was also observed to be high. The percentage variation in the cost was above 100% with most of the commonly used hypolipidemic drugs and also with combination form of hypolipidemic drugs. Similar results were found as per study done by Ujjawal Rawat et.al (2023) where atorvastatin 10mg (3668.50%) had the highest cost variation percentage of single hypolipidemic drugs followed by atorvastatin 20mg (3293.90%)¹⁵. The study done by Shinde and Khushwah (2021) found Atorvastatin 80mg

to have the highest cost variation percentage (3284%). Minimum cost variation percentage of single hypolipidemic drugs is Atorvastatin 40mg (45.707%) in our study. Among 11 FDCs studied, cost variation was highest for Rosuvastatin 10mg + Aspirin 75mg (561.341%) and minimum was seen in Atorvastatin 20mg + Clopidogrel 75mg + Aspirin 75 mg (66.293%). Maximum cost variation of FDCs in studies done by Sondarva DB et al. (2020) was atorvastatin 10 mg + fenofibrate 160 mg (500.32%)¹³ and Shinde et al. (2021)¹⁶ was atorvastatin 10mg + ezetimibe 10 mg (484%). In our study we found that minimum price of branded formulation of Atorvastatin 10 mg (2.64 INR) is less than the generic price (8.8 INR). When we compared the generic prices of

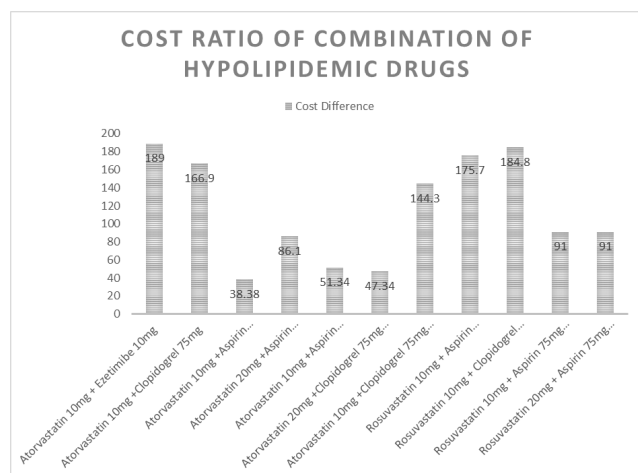


Fig. 3: Cost Ratio of combination of hypolipidemic drugs

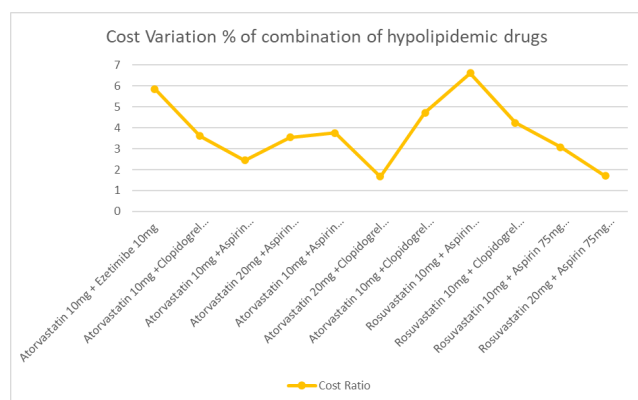


Fig. 4: Cost variation percentage of combination of hypolipidemic drugs

various hypolipidemics with their maximum branded price, it was found that the maximum cost difference was seen in Atorvastatin 20 mg (394.5%).

Two essential components that allow expensive medications to sustain even in the presence of lower priced alternatives particularly generic medicines that lack functional differentiation are:

- Brand differentiation supported by assertive marketing despite no significant difference existing between the quality of the branded and generic medication.
- Financial incentives to chemists by different pharmaceutical companies that impact the retail sale of drugs in the form of higher trade margins. Patients take the prescriptions as prescribed by doctors and dispensed by pharmacists, because they are unaware of the therapeutic qualities and alternatives to their required medicines and lack the independence and expertise required to decide for themselves and thus influencing market dynamics in their advantage.

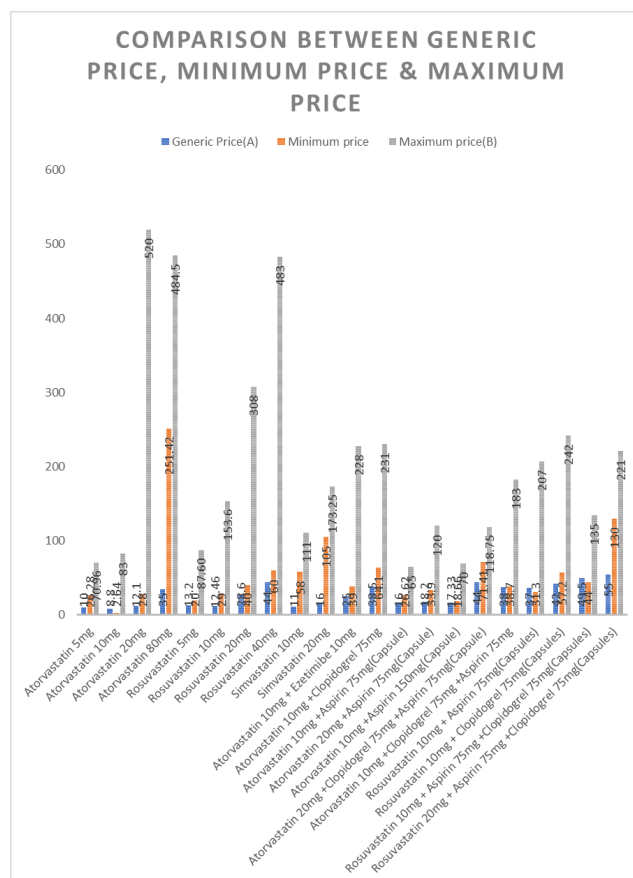


Fig. 5: Comparison between generic price, minimum price and maximum price

CONCLUSION

Our analysis revealed significant price variations for hypolipidemic medications on the Indian market. This study led us to the conclusion that the majority of hypolipidemic medications should be governed by DPCO in order to lessen the economic load of healthcare services on the Indian population and to enhance community health through treatment adherence. Physicians should prescribe more generic medications and take the patient's financial situation into account before writing a prescription for any medication. Therefore, doctors may provide their patients better healthcare services at a price that they can afford if they have easy access to information about prescription pricing. Research by Frazier et al. has demonstrated that providing doctors with a handbook of comparable drug prices together with prescribing guidance lowers their patients' drug costs.¹⁷

Limitations of the study

First, we have considered only the drug brands listed in CIMS and Drug Today India, despite the fact that there are many more on the market, but their prices are not

widely accessible. Second, generic drug prices were obtained from the official website of the Pharmaceuticals and Medical Devices Bureau of India (PMBI). However, other branded generics are available on the market, but their pricing have not been addressed in this article. There has been a relatively small number of studies on this topic, resulting in a lack of evidence-based data and direct comparisons. To alleviate these limits and provide a more realistic picture of cost, larger-scale trials should be done using the same therapeutic class of drugs.

Acknowledgement

We would like to thank Dr Monalisha Das for helping with the cost evaluation of the hypolipidemic drugs currently in use and thus helping with the results and discussion of this research.

Source of Funding

None.

Conflict of Interest

None.

REFERENCES

1. Noncommunicable diseases. 2023. Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>.
2. Roth GA, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the Global Burden of Disease Study. *The Lancet*. 2018;392(10159):1736–1788. Available from: [https://doi.org/10.1016/S0140-6736\(18\)32203-7](https://doi.org/10.1016/S0140-6736(18)32203-7).
3. Roth GA, Forouzanfar MH, Moran AE, Barber R, Nguyen G, Feigin VL, et al. Demographic and Epidemiologic Drivers of Global Cardiovascular Mortality. *New England Journal of Medicine*. 2015;372(14):1333–1341. Available from: <https://www.nejm.org/doi/10.1056/NEJMoa1406656>.
4. The India State-Level Disease Burden Initiative. 2017. Available from: <https://phfi.org/the-work/research/the-india-state-level-disease-burden-initiative/>.
5. Prabhakaran D, Jeemon P, Roy A. Cardiovascular Diseases in India: Current Epidemiology and Future Directions. *Circulation*. 2016;133(16):1605–1620. Available from: <https://doi.org/10.1161/circulationaha.114.008729>.
6. Ruhil R. India has reached on the descending limb of tobacco epidemic. *Indian Journal of Community Medicine*. 2018;43(3):153–156. Available from: https://journals.lww.com/ijcm/fulltext/2018/43030/india_has_reached_on_the_descending_limb_of.4.aspx.
7. Du Z, Qin Y. Dyslipidemia and Cardiovascular Disease: Current Knowledge, Existing Challenges, and New Opportunities for Management Strategies. *Journal of Clinical Medicine*. 2023;12(1):1–4. Available from: <https://doi.org/10.3390/jcm12010363>.
8. Boren J, Chapman MJ, Krauss RM, Packard CJ, Bentzon JF, Binder CJ, et al. Low-density lipoproteins cause atherosclerotic cardiovascular disease: Pathophysiological, genetic, and therapeutic insights: A consensus statement from the European Atherosclerosis Society Consensus Panel. *European Heart Journal*. 2020;41(24):2313–2330. Available from: <https://doi.org/10.1093/eurheartj/ehz962>.
9. Pearson GJ, Thanassoulis G, Anderson TJ, Barry AR, Couture P, Dayan N, et al. 2021 Canadian Cardiovascular Society Guidelines for the Management of Dyslipidemia for the Prevention of Cardiovascular Disease in Adults. *Canadian Journal of Cardiology*. 2021;37(8):1129–1150. Available from: <https://doi.org/10.1016/j.cjca.2021.03.016>.
10. Market Study on the Pharmaceutical Sector in India: Key Findings and Observations. New Delhi, India. Competition Commission of India. 2021. Available from: <https://www.cci.gov.in/images/marketstudie/en/market-study-on-the-pharmaceutical-sector-in-india1652267460.pdf>.
11. Shankar PR, Subish P, Mishra P, Lalit M. Ambiguous pricing of Nepalese medicines. *Journal of Institute of Medicine Nepal*. 2006;28(3):35–38. Available from: <https://www.nepjol.info/index.php/JIOM/article/view/627>.
12. P. Compendium of Ceiling Prices of Scheduled drugs. 2022. Available from: <https://www.nppaindia.nic.in/uploads/pdf/Compendium-Prices-2022pdf-464b22085495ff4e3f8700c0e00cf45d.pdf>.
13. Sondarva DB, Hirpara HN. Cost variation analysis of hypolipidemic drugs currently available in Indian pharmaceutical market. *International Journal of Basic & Clinical Pharmacology*. 2020;9(1):69–76. Available from: <https://doi.org/10.18203/2319-2003.ijbcp20195585>.
14. Product Portfolio: Product and MRP List. Available from: <http://janaushadhi.gov.in/SortingView.aspx>.
15. Rawat AU, Kumar P, Qasim M, Chauhan R, Mohsin M. A Cost Variation Analysis of Hypolipidemic Drugs Available in the Indian Market. *International Journal of Research and Review*. 2023;10(4):2454–2237. Available from: https://www.ijrrjournal.com/IJRR_Vol.10_Issue.4_April2023/IJRR60.pdf.
16. Shinde M, Kushwah A. A Pharmacoeconomic Comparison of Cost Variation among Hypolipidemic Drugs Available in Indian Market. *Pharmacology and Clinical Pharmacy Research*. 2021;6(3):112–121. Available from: <https://jurnal.unpad.ac.id/pcpr/article/view/32488/pdf>.
17. Frazier LM, Brown JT, Divine GW, Fleming GR, Philips NM, Siegal WC, et al. Can Physician education lower the price of prescription drugs? A prospective control trial. *Annals of Internal Medicine*. 1991;115(2):116–121. Available from: <https://doi.org/10.7326/0003-4819-115-2-116>.