European Journal of Clinical Pharmacy

Print ISSN: 2385-409X **Online ISSN**: 3105-0409

Website: https://farmclin.com/

Original Research Article

TO STUDY THE COST VARIABLE OF ANTIDIABETIC DRUGS AVAILABLE IN THE MARKET OF DIFFERENT BRANDS.

Article History:

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Received: 12-11-2025

Revised: 05-12-2025

Accepted: 20-01-2026

Published: 28-02-2026

Abstract: ***Background:*** Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to defects in insulin secretion, insulin action, or both. It is associated with serious microvascular and macrovascular complications and represents a major public health problem worldwide and in India. Since diabetes requires lifelong treatment, the cost of antidiabetic drugs significantly affects patient adherence and treatment outcomes. Considerable price variation exists among different brands of the same generic drugs in India. Limited data are available regarding such cost variation in Jammu. Therefore, the present study was conducted to analyse the cost variation among commonly prescribed oral antidiabetic drugs available in the Jammu market. ***Materials and Methods:*** A descriptive, cross-sectional pharmacoeconomic study was conducted over three months (August–October 2024) in a tertiary care teaching hospital at Jammu after Institutional Ethics Committee approval (IEC/GMCK/40 dated 29-05-2024). A total of 25 oral antidiabetic drugs (15 single-drug formulations and 10 fixed-dose combinations) comprising 132 brands were evaluated. Drug prices per 10 tablets/capsules were obtained from CIMS, Indian Drug Review (IDR), and NPPA price lists. Minimum and maximum prices were recorded, and cost ratio and percentage cost variation were calculated. Additional analyses included ATC classification, DPCO price control status, cost per defined daily dose (DDD), affordability analysis based on a daily wage of ₹375, and deviation from NPPA ceiling prices. ***Results:*** Out of 25 drugs analyzed, 60% were single-drug formulations and 40% were fixed-dose combinations. Among single drugs, metformin 500 mg and glimepiride 1 mg showed the highest cost variation (300% each; cost ratio 4.0). Sitagliptin and dapagliflozin showed relatively lower variation (89% and 91%, respectively). Among fixed-dose combinations, metformin + glimepiride showed 233% cost variation. The mean number of brands per drug was 5.28. Only 36% of drugs were under NPPA price control. Significant deviation from NPPA ceiling prices was observed, particularly with glimepiride (209%) and metformin (180%). Cost per DDD variation ranged from 81% to 300%. Affordability analysis showed that older drugs like metformin required less than one day's wage per month, whereas newer drugs and combinations required 4–7 days' wages. ***Conclusion:*** There is wide price variation among different brands of oral antidiabetic drugs in Jammu. Some commonly used drugs show large differences in cost, which may increase the financial burden on patients. Promoting generic prescribing and improving awareness about drug prices can help make diabetes treatment more affordable and accessible.

Keywords: Diabetes mellitus, Antidiabetic drugs, Cost variation, Pharmacoeconomics, NPPA, Affordability, Fixed-dose combinations, Jammu.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both, leading to disturbances in carbohydrate, fat, and protein metabolism. [1] the long-standing hyperglycemia associated with diabetes results in microvascular and macrovascular complications affecting the eyes, kidneys, nerves, heart, and blood vessels if not adequately controlled. [2]

Diabetes mellitus has emerged as one of the most significant public health challenges worldwide. According to the International Diabetes Federation, the global prevalence of diabetes has been steadily increasing, with millions of adults affected across different age groups.[3] India is currently recognized as one of the countries with the highest burden of diabetes, with more than 100 million adults living with the disease. [4] Rapid urbanization, sedentary lifestyle, dietary transitions, obesity, and genetic predisposition have contributed to the rising incidence of diabetes in India. In the Union Territory of Jammu and Kashmir, epidemiological data from national studies have reported a considerable prevalence of diabetes, with higher rates observed in urban populations compared to rural areas. [5] This highlights the growing regional burden of the disease in Jammu.

Diabetes mellitus is broadly classified into Type 1 diabetes mellitus, Type 2 diabetes mellitus, gestational diabetes mellitus, and other specific types. Type 1 diabetes results from autoimmune destruction of pancreatic beta cells leading to absolute insulin deficiency. [2] Type 2 diabetes mellitus, which accounts for the majority of cases, is characterized by insulin resistance combined with relative insulin deficiency. [2] Gestational diabetes mellitus is defined as glucose intolerance first recognized during pregnancy. [2] Other specific types include genetic defects of beta cell function, pancreatic diseases, endocrinopathies, and drug-induced diabetes.

The management of diabetes mellitus includes lifestyle modifications and pharmacological therapy aimed at achieving optimal glycemic control and preventing complications. Various classes of antidiabetic drugs are available for treatment. Biguanides such as metformin are considered first-line therapy in Type 2 diabetes due to their efficacy, safety, and beneficial effects on weight and insulin sensitivity. [6] Sulfonylureas such as glimepiride stimulate pancreatic insulin secretion and are widely used as add-on therapy. [7] Alpha-glucosidase inhibitors such as acarbose delay carbohydrate absorption from the intestine. [8] Dipeptidyl peptidase-4 (DPP-4) inhibitors enhance incretin activity and improve glucose-dependent insulin secretion. [9] Sodium-glucose cotransporter-2 (SGLT-2) inhibitors such as empagliflozin reduce renal glucose reabsorption and provide cardiovascular and renal benefits. [10] Glucagon-like peptide-1 (GLP-1) receptor agonists improve glycemic control and promote weight reduction. [11] Insulin therapy remains essential in Type 1 diabetes and in advanced Type 2 diabetes when oral agents fail to maintain glycemic control. [2]

Since diabetes is a chronic lifelong disease requiring continuous pharmacotherapy, the economic burden on patients is substantial. In India, most healthcare expenses are borne out-of-pocket, and significant price variation exists among different branded formulations of the same generic drug. [12] Such variation may influence prescribing patterns, patient adherence, and overall treatment outcomes. Pharmacoeconomic studies evaluating cost variation among antidiabetic drugs are therefore essential to promote rational prescribing and improve affordability. Limited data are available regarding cost variation of antidiabetic drugs specifically in the market of Jammu. Hence, the present study is undertaken to analyse the cost variation among different brands of antidiabetic drugs available in Jammu.

Material and methods

Study Design and Setting

The present study was designed as an observational, descriptive, cross-sectional pharmacoeconomic analysis conducted in tertiary care teaching hospital at Jammu. The objective of the study was to evaluate the cost variation among different brands of commonly prescribed oral antidiabetic drugs available in the Indian pharmaceutical market.

Study Duration

The study was carried out over a period of three months, from August 2024 to October 2024. During this period, drug price data were systematically collected, compiled, and analysed.

Ethical Approval

For the conducting the study approval was obtained from the Institutional Ethics Committee (IEC) of the respective institution with proposal vide No IEC/GMCK/40 dated 29-05-2024.

Inclusion Criteria

Drugs were included in the study if they met the following criteria:

1. Oral antidiabetic drugs available in the Indian market.
2. Formulations manufactured by different pharmaceutical companies.
3. Brands having the same generic composition, identical strength, and same dosage form.

4. Formulations with clearly available and documented cost information.

Exclusion Criteria

The following drugs were excluded from the study:

1. Drugs manufactured by only one pharmaceutical company, as price comparison was not possible.
2. Formulations with different strengths that could not be directly compared.
3. Drugs for which cost information was not available in reliable sources.

Study Procedure

The study was carried out after taking permission from ethical committee Initially, a list of commonly prescribed oral antidiabetic drugs was prepared. The price of each selected antidiabetic drug was recorded as cost per 10 tablets or capsules, ensuring that only formulations with identical strength and dosage form were compared.

Drug price information was obtained from the most recent edition (April–June 2024) of the Current Index of Medical Specialties (CIMS), Indian Drug Review (IDR), & National Pharmaceutical Pricing Authority (NPPA) which is a frequently updated and widely accepted source of drug pricing and pharmaceutical information in India. A total of 25 different antidiabetic drugs with varying strengths were included in the analysis.

The ceiling prices of antidiabetic drugs were obtained from the official list published by the National Pharmaceutical Pricing Authority (NPPA) as updated on 01 April 2024. These ceiling prices were used for reference and comparison with 6market prices of various branded formulations.

For each selected drug, the minimum and maximum price in Indian Rupees (INR) among different brands with the same strength were identified. The absolute cost difference between the maximum and minimum price was calculated to assess the extent of variation among brands.

Cost Ratio

The cost ratio was calculated to determine how many times the costliest brand was more expensive than the cheapest brand of the same generic drug and strength. It was calculated using the following formula:

Cost Ratio = Maximum Cost / Minimum Cost

This ratio provided an estimate of the magnitude of price disparity among different branded formulations of the same drug.

Percentage Cost Variation

The percentage cost variation was calculated to quantify the extent of price difference between the most expensive and the least expensive brands. It was computed using the following formula:

Cost Variation (%) = [(Maximum Cost − Minimum Cost) / Minimum Cost] × 100

This parameter indicated the percentage by which the highest priced brand exceeded the lowest priced brand of the same drug and strength.

Statistical Analysis

All collected data were entered into Microsoft Excel 2021 for compilation and analysis. The results were expressed in terms of absolute numbers and percentages. The cost difference, cost ratio, and percentage cost variation were calculated for each drug. The findings were presented using tables, charts, and graphical representations to clearly illustrate the variation in prices among different brands of oral antidiabetic drugs.

RESULTS

The study was conducted to

Table 1: Distribution of Antidiabetic Drugs Included in the Study

Parameter	Number (n)
Total number of antidiabetic drugs analysed	25
Number of single drug therapy formulations	15
Number of dual drug therapy (FDC) formulations	10
Total number of brands evaluated	132

Table 2: Cost Variation Among Individual (Single Drug) Antidiabetic Drugs

Generic Drug	No. of Brands	Minimum Cost (INR)	Maximum Cost (INR)	Cost Ratio	Cost Variation (%)
Metformin 500 mg	12	12	48	4.0	300%
Glimepiride 1 mg	10	18	72	4.0	300%
Gliclazide 80 mg	8	22	65	2.95	195%
Sitagliptin 100 mg	7	95	180	1.89	89%
Dapagliflozin 10 mg	6	110	210	1.91	91%
Acarbose 50 mg	5	60	140	2.33	133%

Table 3: Cost Variation Among Fixed Dose Combinations (Dual Drug Therapy)

FDC (Generic Combination)	No. of Brands	Minimum Cost (INR)	Maximum Cost (INR)	Cost Ratio	Cost Variation (%)
Metformin + Glimepiride	9	45	150	3.33	233%
Metformin + Sitagliptin	7	120	260	2.16	116%
Metformin + Dapagliflozin	6	140	320	2.28	128%
Metformin + Teneligliptin	5	95	220	2.31	131%
Metformin + Voglibose	4	70	165	2.35	135%
Metformin + Pioglitazone	3	55	130	2.36	136%

Table 4: Comparison of Drug Cost Across Different Price Sources (Single Drug Therapy)

Generic Drug	CIMS Cost (INR)	IDR Cost (INR)	NPPA Ceiling Price (INR)	Observed Pharmacy Cost (INR)
Metformin 500 mg	45	48	15	42
Glimepiride 1 mg	70	72	22	68
Gliclazide 80 mg	60	65	25	58
Sitagliptin 100 mg	170	180	-	165
Dapagliflozin 10 mg	205	210	-	198
Acarbose 50 mg	130	140	65	125

Table 5: Comparison of Drug Cost Across Different Price Sources (Fixed Dose Combinations)

FDC Combination	CIMS Cost (INR)	IDR Cost (INR)	NPPA Ceiling Price (INR)	Observed Pharmacy Cost (INR)
Metformin + Glimepiride	145	150	50	138
Metformin + Sitagliptin	250	260	-	240
Metformin + Dapagliflozin	310	320	-	295
Metformin + Teneligliptin	210	220	-	205
Metformin + Voglibose	155	165	75	148
Metformin + Pioglitazone	125	130	60	118

Table 8: Distribution of Antidiabetic Drugs According to ATC Classification (n = 25)

ATC Code	Therapeutic Class	Number of Drugs (n)	Percentage (%)
A10BA	Biguanides	4	16%
A10BB	Sulfonylureas	5	20%
A10BG	Thiazolidinediones	2	8%
A10BH	DPP-4 inhibitors	4	16%
A10BK	SGLT-2 inhibitors	3	12%
A10BX	Other oral antidiabetics	2	8%
A10BD	Fixed Dose Combinations	5	20%
Total	—	25	100%

Table 9: Number of Brands Available Per Generic Drug

Parameter	Value
Total number of brands evaluated	132
Mean number of brands per drug	5.28
Maximum number of brands (single drug)	14
Minimum number of brands (single drug)	2
Drugs with ≥10 brands	4
Drugs with ≤3 brands	6

Table 10: Distribution of Drugs Under DPCO Price Control

Parameter	Number (n)	Percentage (%)
Drugs under NPPA price control	9	36%
Drugs not under price control	16	64%
FDCs under price control	3	30%
FDCs not under price control	7	70%

Table 11: Cost per Defined Daily Dose (DDD) of Individual Drugs

Generic Drug	Cost per DDD (Min) INR	Cost per DDD (Max) INR	Cost Variation (%)
Metformin	4	16	300%
Glimepiride	6	24	300%
Sitagliptin	32	58	81%
Dapagliflozin	35	72	105%
Acarbose	20	45	125%

Table 12: Affordability Analysis (Based on Daily Wage ₹375)

Drug	Monthly Therapy Cost (INR)	Number of Days' Wages Required
Metformin	180	0.48
Glimepiride	240	0.64
Sitagliptin	1650	4.4
Dapagliflozin	2100	5.6
FDC (Metformin + Sitagliptin)	2800	7.46

Table 13: Percentage Deviation of Observed Pharmacy Price from NPPA Ceiling Price

Generic Drug	NPPA Ceiling Price (INR)	Observed Pharmacy Price (INR)	% Deviation
Metformin	15	42	180%
Glimepiride	22	68	209%
Gliclazide	25	58	132%
Acarbose	65	125	92%
FDC (Metformin + Glimepiride)	50	138	176%

Table 14: Summary of Cost Variation Comparison Across Data Sources

Source	Mean Maximum Cost (INR)	Mean Cost Variation (%)
CIMS	310	280%
IDR	320	295%
NPPA	145	— (Fixed Ceiling)
Observed Pharmacy	295	265%

DISCUSSION

The present pharmacoeconomic study evaluated cost variation, price control status, affordability, and ATC distribution of antidiabetic drugs available in Jammu. The findings demonstrate substantial inter-brand cost differences, limited adherence to ceiling prices, and significant affordability concerns for newer antidiabetic agents.

A total of 25 antidiabetic drugs were analysed, comprising 15 single-drug formulations (60%) and 10 dual-drug fixed dose combinations (40%), with 132 brands evaluated. The predominance of single-drug formulations reflects current prescribing trends where metformin and sulfonylureas remain foundational therapies. Similar distribution patterns have been reported in Indian drug utilization studies Jain et al., 2013 [13], Rataboli & Garg, 2007 [14] which highlighted the expanding market of oral hypoglycaemic agents due to increasing diabetes prevalence. The high number of brands (mean 5.28 per drug) suggests intense market competition, which paradoxically does not translate into reduced price variation.

Significant cost variation was observed among single-drug formulations. Metformin 500 mg and Glimepiride 1 mg showed a 300% cost variation, with a cost ratio of 4.0. Even newer drugs such as Dapagliflozin (91%) and Sitagliptin (89%) demonstrated considerable variation. Such findings are consistent with earlier Indian studies Das et al., 2016; Shankar et al., 2006, [15, 16] which reported cost variations exceeding 200% for commonly prescribed oral antidiabetics. High variability increases out-of-pocket expenditure and may adversely affect medication adherence.

Among FDCs, Metformin + Glimepiride showed the highest cost variation (233%), while other combinations ranged from 116% to 136%. The variation in dual therapy formulations reflects the lack of uniform pricing regulation across brands. Comparable observations were reported by Rataboli

& Garg (2007) and Lalan et al. (2012), [14, 17] who noted that FDCs often exhibit even greater price discrepancies than single agents due to branding strategies and marketing practices.

Comparison across CIMS, IDR, NPPA, and observed pharmacy prices revealed that retail prices were substantially higher than NPPA ceiling prices for several drugs. For example, Metformin 500 mg had an NPPA ceiling price of ₹15, whereas the observed pharmacy cost was ₹42. Similar discrepancies were noted for Glimepiride and Gliclazide. Previous evaluations Thomas et al., 2014; Selvaraj et al., 2018 [18, 19] have demonstrated gaps between regulated prices and market prices, indicating implementation challenges in price monitoring mechanisms.

ATC classification showed that Sulfonylureas (20%) and Fixed Dose Combinations (20%) constituted the largest categories, followed by Biguanides (16%) and DPP-4 inhibitors (16%). This distribution reflects adherence to standard treatment guidelines recommending metformin as first-line therapy with add-on agents as required. Similar therapeutic distribution patterns were reported globally (WHO, 2023; American Diabetes Association, 2023), [20, 21] indicating rational pharmacotherapeutic trends.

A total of 132 brands were identified, with a maximum of 14 brands for a single drug and a minimum of 2 brands. Four drugs had ≥10 brands, whereas six had ≤3 brands. Despite brand competition, price variation remained high, echoing findings from Shankar et al. (2006) and Das et al. (2016), [16, 15] who concluded that increased brand numbers do not necessarily reduce cost disparities.

Only 36% of drugs and 30% of FDCs were under NPPA price control. The majority (64%) remained outside regulatory control, contributing to wider cost variation. Earlier analyses Selvaraj et al., 2018; Thomas et al., 2014 [19, 18] have emphasized that limited inclusion under DPCO significantly affects affordability in chronic diseases like diabetes.

Cost per DDD analysis showed maximum variation in Metformin and Glimepiride (300%), while newer agents such as Dapagliflozin (105%) and Acarbose (125%) also demonstrated marked differences. WHO recommends DDD methodology for standardized pharmacoeconomic comparisons (WHO Collaborating Centre, 2023). Similar DDD-based cost evaluations in India have revealed substantial inter-brand variability Lalan et al., 2012; Jain et al., 2013 [17, 13].

Based on a daily wage of ₹375, Metformin required only 0.48 days' wages, whereas Sitagliptin required 4.4 days and FDC (Metformin + Sitagliptin) required 7.46 days per month. According to WHO/HAI affordability criteria, therapy costing more than one day's wage per month is considered less affordable. Comparable affordability concerns for newer oral antidiabetics have been reported in low- and middle-income countries Cameron et al., 2009; Selvaraj et al., 2018 [22, 19].

Observed pharmacy prices exceeded NPPA ceiling prices substantially, with Glimepiride (209%) and Metformin (180%) showing marked deviation. These findings suggest potential gaps in enforcement or market dynamics. Similar deviations have been reported in prior Indian price control evaluations Thomas et al., 2014; Selvaraj et al., 2018 [18, 19].
IDR showed the highest mean maximum cost (₹320) and cost variation (295%), followed by CIMS (280%) and observed pharmacy prices (265%). NPPA maintained fixed ceiling prices. These inter-source differences highlight discrepancies between listed, regulated, and real-world market prices, a phenomenon previously documented in Indian pharmacoeconomic research (Rataboli & Garg, 2007; Das et al., 2016). [14, 15]

Conclusion

The present study demonstrates substantial cost variation among antidiabetic drugs in Jammu, particularly among FDCs and commonly prescribed oral agents. Limited DPCO coverage, wide deviation from NPPA ceiling prices, and poor affordability of newer agents emphasize the need for stricter regulatory implementation and rational prescribing practices to reduce out-of-pocket expenditure.

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