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Cost Variation Analysis of Oral Anti-Diabetic Drugs Available in the Indian Market: A Prospective Observational Study

Dr Krishnakanth K[1], Dr Sivarama Krishna[2], Dr Supriya Sanke[1], Dr TV Naresh[1], Dr K Chandrakala[3]

[1]Assistant Professor, Department of Pharmacology, Government Medical College, Ongole
[2]Post Graduate Final Year Student, Department of Pharmacology, Government Medical College, Ongole
[3]Professor and HOD, Department of Pharmacology, Government Medical College, Ongole

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Corresponding Author:

Dr Supriya Sanke
Assistant Professor, Department of Pharmacology, Government Medical College, Ongole, Andhra Pradesh;
Email:
sankesupriya45@gmail.com

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ABSTRACT

Background: Diabetes Mellitus (DM) is a chronic metabolic disorder that requires lifelong pharmacotherapy. India is projected to have approximately 101 million individuals with diabetes by 2025. Patients spend nearly 20% of their annual income on diabetes care, and wide inter-brand price variations of oral anti-diabetic drugs substantially influence treatment adherence and overall healthcare expenditure.
Methods: This prospective observational study was conducted from May to July 2025. Price data for 25 oral anti-diabetic drug formulations (13 single-drug preparations and 12 fixed-dose combinations) were obtained from the Current Index of Medical Specialties (CIMS) and Monthly Index of Medical Specialities (MIMS). For identical strengths and dosage forms, cost ratio (maximum price/minimum price) and percentage price variation [(Max − Min)/Min × 100] were calculated.
Results: Among monotherapies, the highest price variation was observed with glibenclamide 2.5 mg (619.5%) within the sulfonylurea group, whereas glipizide 5 mg demonstrated the lowest variation (154.3%). Among non-sulfonylureas, metformin 500 mg showed a price variation of 601.36%, while sitagliptin 50 mg had the least variation (37.4%). In fixed-dose combinations, glimepiride + metformin (1 mg + 1000 mg) exhibited an exceptionally high variation of 1425%.
Conclusion: Marked price variations exist among oral anti-diabetic drug brands in the Indian market. Improving physician awareness of these variations is essential for cost-effective prescribing, which may enhance patient compliance and long-term glycemic control.

Keywords: *Oral anti-diabetic drugs, cost variation, cost ratio, adherence, compliance.*

INTRODUCTION

Diabetes Mellitus is a chronic metabolic disorder of multifactorial etiology, characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The disease burden is particularly pronounced in India, where approximately 89.8 million adults were living with diabetes in 2024, with projections estimating an increase to 101 million by 2025. [1-3] The lifelong nature of diabetes and its associated microvascular and macrovascular complications make it a costly condition for both individuals and healthcare systems.[4,5] On average, Indian patients spend nearly 20% of their annual income on diabetes management. The Indian pharmaceutical market provides a wide range of oral antidiabetic drugs, including sulfonylureas, biguanides, dipeptidyl peptidase-4 (DPP-4) inhibitors, sodium-glucose co-transporter-2 (SGLT-2) inhibitors, thiazolidinediones, and α-glucosidase inhibitors, available in multiple brands, strengths, and formulations. [6-8]

Despite therapeutic equivalence, substantial price differences exist between brands of the same generic drug. In the absence of easily accessible comparative cost information, prescribers may inadvertently select higher-priced brands, thereby increasing treatment costs and contributing to poor medication adherence. Pharmacoeconomic evaluation plays a

critical role in optimizing healthcare resources by identifying cost-effective therapeutic options. The objective of this study was to evaluate the extent of inter-brand cost variation among commonly prescribed oral anti-diabetic drugs available in the Indian pharmaceutical market.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Pharmacology at Government Medical College and Hospital, Ongole, Andhra Pradesh, over a period of three months from May 2025 to July 2025. The objective of the study was to assess inter-brand cost variation among commonly prescribed oral anti-diabetic drugs available in the Indian market. Prior to initiation, ethical approval was obtained from the Institutional Ethics Committee of Government Medical College, Ongole (Approval No. IEC/GMC-OGL/231/2024).

Commonly prescribed oral anti-diabetic drugs were identified through review of prescriptions collected from both government and private healthcare facilities in Ongole. The selection included single-drug formulations as well as fixed-dose combinations commonly used in routine clinical practice. The study size was determined based on the number of commonly prescribed oral anti-diabetic formulations available from multiple manufacturers during the study period in Ongole.

Price data were collected for a uniform pack size of 10 tablets for each formulation, ensuring identical strength and dosage form to allow valid comparison. Drug cost data were sourced from the April–July 2025 editions of Current Index of Medical Specialties (CIMS) and the 2025 edition of Monthly Index of Medical Specialities (MIMS), with comparisons restricted to formulations of identical strength and dosage form to minimize bias.

Oral anti-diabetic drugs manufactured by more than one pharmaceutical company and available in the same strength and dosage form were included in the study. Drugs marketed by only a single manufacturer, formulations with non-comparable strengths or dosage forms, and drugs with incomplete or unavailable price information were excluded from the analysis.

Pharmacoeconomic evaluation was performed to determine inter-brand price variation using two standard indicators. The cost ratio was calculated as the ratio of the maximum price to the minimum price of the same drug formulation. Percentage price variation was calculated using the formula: [9]

[Percentage Price Variation = (Maximum Price − Minimum Price) x 100 / Minimum Price]

All collected data were entered into Microsoft Excel and checked for accuracy. Descriptive statistical analysis was carried out to calculate minimum and maximum prices, cost ratios, and percentage price variations for each formulation. Drugs were grouped according to pharmacological class, and results were summarized in tabular form to facilitate comparison across different categories. Inferential statistical tests were not applied, as the study was descriptive in nature and focused on cost comparison.

RESULTS

A total of 25 oral anti-diabetic drug formulations were evaluated, including 13 single-drug formulations and 12 fixed-dose combinations, covering six major pharmacological classes. Inter-brand price variation was evident across all categories analyzed.

Price variation among oral anti-diabetic monotherapies: Price variation among sulfonylurea monotherapy formulations is depicted in Figure 1. Sulfonylureas demonstrated the highest inter-brand price variation among the evaluated monotherapy classes. As presented in Table 1 and illustrated in Figure 1, glibenclamide 2.5 mg exhibited the greatest percentage price variation (619.5%) with a cost ratio of 7.19. In contrast, glipizide 5 mg showed the lowest variation within this group (154.3%). Other sulfonylureas also displayed considerable variability, including gliclazide 80 mg (490%) and glimepiride 1 mg (288.6%). Among non-sulfonylurea monotherapy agents, biguanides exhibited marked inter-brand variability. Metformin 500 mg demonstrated a percentage price variation of 601.36% with a cost ratio of 7.01, as detailed in Table 1 and illustrated in Figure 3.

Figure 1: Price variation of sulfonylurea monotherapy formulations

Table 1: Inter-brand cost variation of single-drug oral anti-diabetic agents

Group	Drug	Dose (mg)	Cost Ratio
Sulfonylureas	Glibenclamide	2.5	7.19
Biguanides	Metformin	500	7.01
α glucosidase inhibitors	Voglibose	0.3	6.71
Thiazolidinediones	Pioglitazone	15	4.8
SGLT-2 inhibitors	Dapagliflozin	10	2.87
DPP-4 inhibitors	Sitagliptin	50	1.37

α-glucosidase inhibitors also showed considerable variation, with voglibose 0.3 mg exhibiting a price variation of 571.1% and a cost ratio of 6.71. Thiazolidinediones such as pioglitazone 15 mg showed a price variation of 388% with a cost ratio of 4.8. In comparison, newer classes of oral anti-diabetic drugs demonstrated relatively lower variability; dapagliflozin 10 mg (SGLT-2 inhibitor) showed a cost ratio of 2.87, while sitagliptin 50 mg (DPP-4 inhibitor) exhibited the lowest price variation among all monotherapies at 37.4%, with a cost ratio of 1.37 (Table 1, Figure 3).

A focused evaluation of the DPP-4 inhibitor subgroup, as presented in Table 1 and illustrated in Figure 3, demonstrated marked inter-molecular price variation. Teneligliptin showed the highest percentage price variation (465.7%), followed by linagliptin (312%) and vildagliptin (240.6%). Sitagliptin exhibited the lowest variation at 37.4%, with a cost ratio of 1.37. These findings highlight substantial inter-brand price dispersion within the same pharmacological class.

Price variation among fixed-dose combination formulations: Inter-brand price variation among fixed-dose combination formulations is illustrated in Figure 4. The combination of glimepiride and metformin (1 mg + 1000 mg) exhibited the highest percentage price variation observed in the study at 1425%, with a corresponding cost ratio of 15.25, as shown in Table 2. Other fixed-dose combinations also demonstrated substantial variability, including pioglitazone + metformin (15 mg + 500 mg) with a price variation of 497.7% and a cost ratio of 5.97, and vildagliptin + metformin (50 mg + 500 mg) with a variation of 357.8% and a cost ratio of 4.57 (Table 2, Figure 4). In contrast, the triple-drug combination of glimepiride + metformin + voglibose (1 mg + 500 mg + 0.3 mg) demonstrated the lowest inter-brand price variation among fixed-dose combinations at 54.7%, with a cost ratio of 1.54, as detailed in Table 2 and Figure 4.

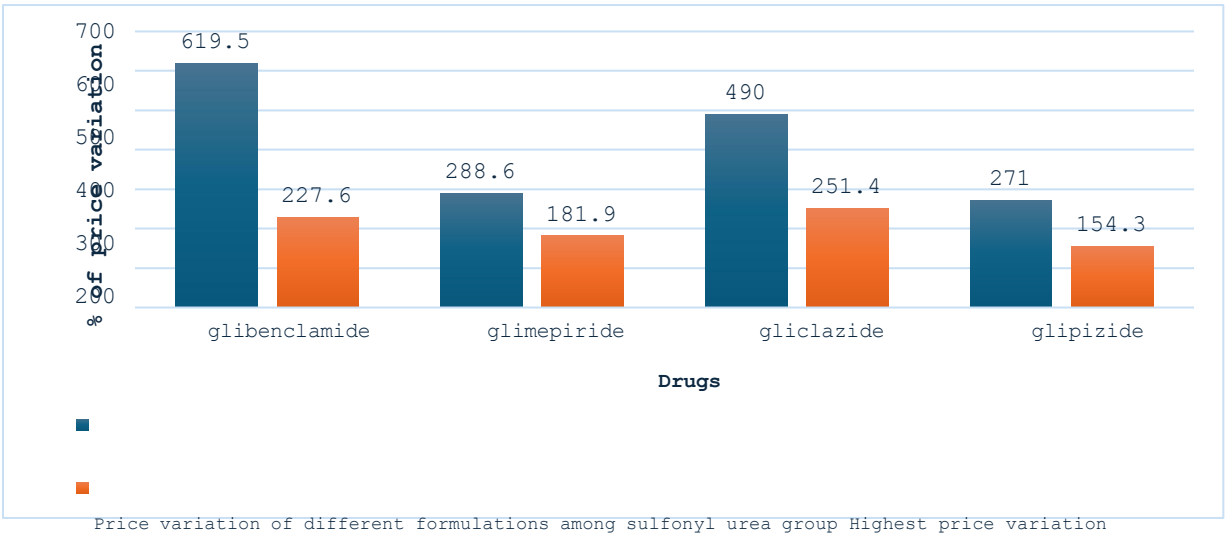

Figure 2: Inter-class comparison of maximum percentage price variation among monotherapy groups

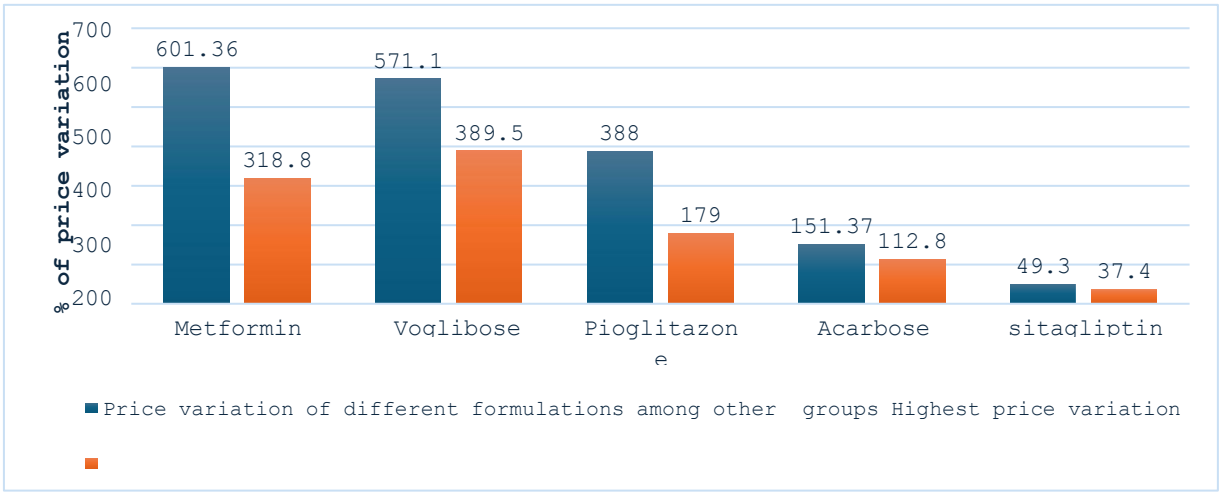

Figure 3: Price variation among non-sulfonylurea monotherapy formulations

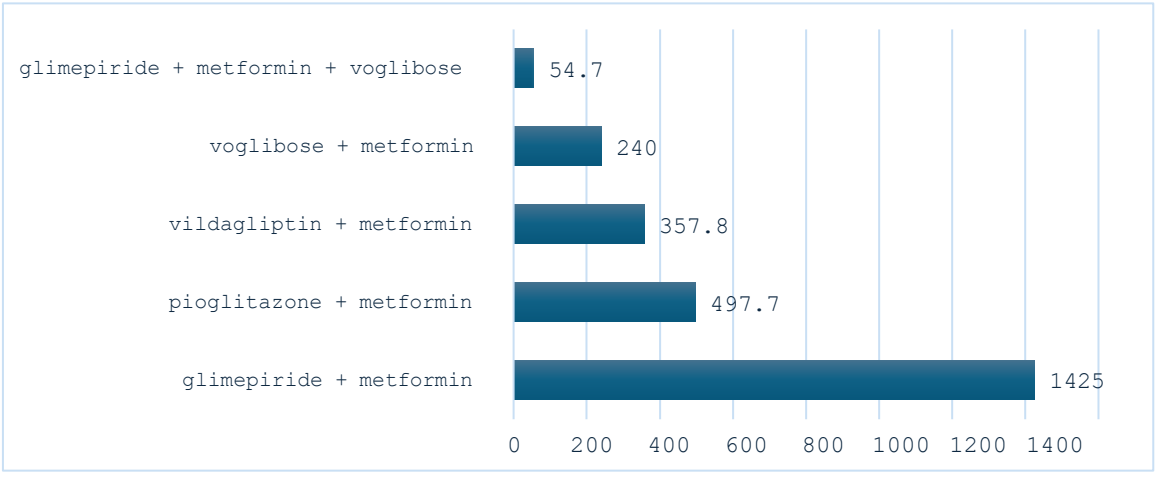

Figure 4: Price variation among fixed-dose combination formulations

DISCUSSION

The present study demonstrates substantial inter-brand price variation among oral anti-diabetic drugs marketed in India, reinforcing concerns regarding affordability and rational prescribing. Among sulfonylureas, glibenclamide 2.5 mg showed a price variation of 619.5% with a cost ratio of 7.19. This finding is comparable with Nallani et al. [10], who reported very high variations for glibenclamide formulations, including 1980% for glibenclamide 2 mg, and Singh et al. [11], who

documented up to 900% variation for glibenclamide 5 mg. However, the magnitude observed in the present study is lower than the extreme variations reported by Advani et al. [12], indicating partial stabilization over time but persistent inconsistency across brands. Glipizide 5 mg demonstrated the lowest variation within sulfonylureas (154.3%), aligning with Chincholkar et al. [13], who also reported relatively lower variation (38.88%) for higher-dose glipizide, suggesting better price uniformity for this molecule.

Among biguanides, metformin 500 mg exhibited a price variation of 601.36%, consistent with Veena et al. [14] and Shyam et al. [15], who reported variations of 809% for the same strength. Although the present value is lower, it remains clinically significant given metformin's role as first-line therapy. Gupta et al. [16] and Nallani et al. [10] reported even higher variations for sustained-release and higher-dose formulations, indicating that formulation type further amplifies cost disparity. For α-glucosidase inhibitors, voglibose 0.3 mg showed a variation of 571.1%, closely mirroring Veena et al. [14] (571%) and Singh et al. [11] (157% for lower strengths), confirming that voglibose remains one of the most price-variable agents across studies. Pioglitazone 15 mg demonstrated a variation of 388%, which is lower than values reported by Nallani et al. [10] (>3000%) and Singh et al. [11] (185.7%), reflecting temporal and market-driven fluctuations.

Newer drug classes showed comparatively lower variability. Sitagliptin 50 mg had the least variation (37.4%, cost ratio 1.37), which contrasts sharply with older studies such as Nallani et al.[10] reporting 902.3% for sitagliptin 100 mg. This suggests improved price regulation and evolving market dynamics for DPP-4 inhibitors in recent years. However, the relatively narrow variation observed for sitagliptin in the present study may also be attributed to comparatively fewer available brands during the study period, resulting in reduced dispersion between minimum and maximum prices. Although the absolute acquisition cost of sitagliptin remains higher than several older oral anti-diabetic agents such as metformin and sulfonylureas, the inter-brand cost difference within sitagliptin itself was comparatively smaller than that observed with teneligliptin and linagliptin.

Thus, lower percentage variation in this context reflects limited price spread rather than superior affordability when compared with other drug classes. Within the same class, teneligliptin and linagliptin still showed moderate-to-high variability, consistent with Sathiyanathan et al. (2025)[17], who reported 586.67% variation for linagliptin.

Fixed-dose combinations exhibited even greater disparities. The glimepiride + metformin (1 mg + 1000 mg) combination showed an exceptionally high variation of 1425% with a cost ratio of 15.25, comparable to Gupta et al. (2703%) and Sathiyanathan et al. (1246.47% for SR formulations). [16,17] Although lower than the extreme values reported by Ramasamy et al. [18] for triple-drug combinations (>200,000%), the present finding highlights that commonly prescribed dual combinations remain economically inconsistent. In contrast, the triple combination of glimepiride + metformin + voglibose showed minimal variation (54.7%), similar to Sathiyanathan et al. [17], indicating selective price stability in certain complex formulations.

Overall, the study confirms persistent and clinically relevant cost variation across oral anti-diabetic drugs, particularly older agents and widely used fixed-dose combinations. Despite some reduction in variability for newer molecules, the magnitude of differences observed can directly influence prescribing behavior, patient adherence, and long-term glycemic outcomes. These findings are consistent with previous Indian studies and underscore the need for strengthened price regulation, routine pharmacoeconomic awareness among prescribers, and preference for cost-effective brands to minimize the financial burden on patients.

CONCLUSION

This study demonstrates substantial inter-brand price variation among commonly prescribed oral antidiabetic drugs in the Indian market. Older agents such as sulfonylureas, biguanides, and α- lucosidase inhibitors showed particularly wide cost disparities, while newer drug classes exhibited relatively lower but still relevant variation. Fixed-dose combinations, especially glimepiride with metformin, showed the highest inconsistency in pricing, posing a significant economic burden on patients requiring long-term therapy. Such variations can adversely affect treatment adherence and glycemic control. Enhancing prescriber awareness, encouraging cost-effective brand selection, and strengthening drug price regulation are essential to improve affordability and optimize diabetes management outcomes.

Limitations: The study relied on published drug compendia, which may not reflect real-time retail pricing or regional discounts. It assessed cost variation alone without evaluating availability, prescription patterns, or clinical outcomes. The short study duration may not capture temporal fluctuations in pharmaceutical pricing.

Generalizability: The study findings are generalizable across India as the price data were derived from nationally recognized compendia (CIMS and MIMS) that reflects standardized brand pricing across the country. Analysis of identical strengths and uniform pack sizes from manufacturers operating nationwide ensures representation of the broader Indian pharmaceutical market. However, minor regional retail variations may influence actual patient expenditure.

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