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Original Research Article

Cost variation analysis of commonly used oral antidiabetic drugs available in the Indian pharmaceutical market: a cross-sectional study

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ABSTRACT

Background: Type 2 diabetes mellitus (DM) is a chronic, progressive metabolic disease that can lead to both microvascular and macrovascular problems. OHAs, or oral hypoglycemic agents, are crucial for controlling elevated blood glucose levels and treatment adherence. The cost of medications affects both patient adherence and sensible prescribing. In India, the same antidiabetic drugs are sold under several different brands at wildly disparate costs. Financial burden may result from prescribing pricey brands, particularly for long-term illnesses like diabetes mellitus. Aim was to enumerate the price of commonly used oral antidiabetic drugs in India and study the cost variation of oral antidiabetic drugs.
Methods: Data from CIMS April-June 2024 on 17 antidiabetic drugs (various strengths) were analysed. Maximum and minimum prices (per 10 tablets) were recorded. Cost differences, cost ratios, and cost variation percentages were calculated using MS Excel 2021, with data represented in tables and charts.
Results: Overall, the maximum and minimum cost variation among individual drugs were linagliptin 5 mg (586.67%) and glibenclamide 5 mg (39.80%) respectively. Among FDC's the minimum cost variation was glibenclamide + metformin (5+500 mg SR tablet; 4.77%) and maximum cost variation was of glimepiride + metformin (1+500 mg SR tablet; 1246.47%).
Conclusions: The prices of the numerous brands of oral anti-diabetics that are sold in the Indian market vary greatly. Physicians need to be aware of these differences and prescribe medications appropriately, taking the patient's financial situation into account and also to encourage treatment compliance.

Keywords: Drug costs, Government regulation, Hypoglycaemic agents pharmacoeconomics

INTRODUCTION

Diabetes mellitus is a chronic metabolic disease that requires lifelong management.[1] People with type 2 diabetes are at higher risk of cardiovascular diseases, including a 72% higher risk of heart attack, a 52% higher risk of stroke, an 84% higher risk of heart failure and a 56% higher risk of dementia.[2] The incidence of diabetes is rising as a result of urbanization, an ageing population, decreased levels of physical exercise, and rising overweight and obesity rates.[3] The latest International Diabetes Federation (IDF) Diabetes Atlas (2025) reports that an estimated 589 million adults aged 20-79 years which represents 11.1% of the world's population in this age group are living with diabetes. By 2050, IDF projections show that 1 in 8 adults, approximately 853 million, will be living with diabetes, an increase of 46%. India accounts for 1 in 7 of all adults living with diabetes worldwide. Over 90% of people with diabetes have type 2 diabetes, which is driven by socio-economic, demographic, environmental, and genetic factors.[3]

In case of absence of appropriate treatment, it can lead to microvascular and macrovascular complications. These can affect the longevity as well as the quality of life.[4] In addition to changing their lifestyle, the majority of type 2 diabetics need oral antidiabetic medications to attain glycaemic control.[5] Patient compliance is crucial for the successful treatment of chronic conditions like diabetes mellitus. Despite the fact that there are numerous brands of oral antidiabetic medications, glycaemic control is not attained. Noncompliance may result in unfulfilled treatment expectations and a worsening of the illness. The cost of medications has a significant impact on treatment compliance, especially for chronic illnesses.[6] In developing countries like India, where the majority of the population falls into the lower socioeconomic class, this is especially crucial.[5]

More emphasis needs to be placed on educating doctors about the cost of medications so that they can choose the least expensive one when there are no significant differences in safety and efficacy between the least and most expensive.[7] The Indian market is primarily a branded generic market, meaning that multiple companies sell a given drug under different brand names. This has resulted in a high number of pharmaceutical products available in the market, ranging from 60,000 to 70,000.This situation has led to greater price variation among drugs marketed.[8] To reduce this burden whenever any pharmaceutical company launches a new drug, whether branded or generic it should be below or equal to the ceiling price fixed for that specific formulation by Drug Price Control Order (DPCO) legislation, which has been effective since 1979 when the price of the majority of the drugs was brought under the control of DPCO.[9] This fixed price of drugs will lead to better treatment outcomes in patients.

In India despite the price control order has set by the government many pharmaceutical companies are still selling branded drugs above the recommended price and violating the price limit set by DPCO. Hence this study was aimed to analyse cost variation of commonly prescribed oral anti-diabetic drugs which were available in the Indian market under various brand names. In addition, we have also compared their cost-ratio and percentage cost variation along with their maximum and minimum price.

METHODS

The current observational, cross-sectional study was conducted in department of pharmacology at a tertiary care teaching hospital of south India. The study duration was 3 months from August 2024 to October 2024. The study got approval from the institutional ethics committee (IEC).

Inclusion criteria

Drugs with same strength but manufactures by different companies and with same strength and quantity were included.

Exclusion criteria

Drugs manufactured by only one company with different strengths were excluded. Drugs without available cost information were excluded from the study.

Study procedure

A list of commonly used oral antidiabetics was made and the price of a particular antidiabetic drug (cost per 10 tablets or capsules) in the same strength and dosage forms brought manufactured by different companies was obtained using the most recent "current index of medical specialties" April-June 2024, which is a frequently updated and easily accessible source of research. A total of 17 drugs with different strengths were considered. The ceiling prices of antidiabetic drugs were taken from the National Pharmaceutical Pricing Authority (NPPA) list as on 01.04.2024.

The minimum and the maximum cost in INR of a particular drug manufactured by various pharmaceutical companies in the same strength were noted. The difference between the maximum cost and minimum cost were calculated.

Cost ratio[10]

It is the ratio of the cost of the costliest to the cheapest branded formulation of a particular drug which gives an idea of how much is the expensive brand costlier than the cheapest brand of the same drug.

Cost ratio = Maximum cost/ Minimum cost

Cost variation percent[11]

Percentage cost variation was calculated as per the following formula,

$$\text{Cost variation (\%)} = \frac{(\text{Maximum Cost} - \text{Minimum Cost}) \text{x } 100}{\text{Minimum Cost}}$$

Statistical analysis

The obtained data was entered into MS excel 2021 and expressed as absolute numbers and percentages. The cost difference, cost ratio, Cost variation percentage were calculated using the findings. Tables, figures, charts were used to represent the data.

RESULTS

A total of 17 drugs (11 individual and 06 combination preparation), available in in 41 different formulations were enlisted and their latest costs were analysed. Among individual drugs, linagliptin 5 mg showed a maximum price variation of 586.67% and glibenclamide 5 mg showed a minimum price variation of 39.80% (Figures 1 and 2).

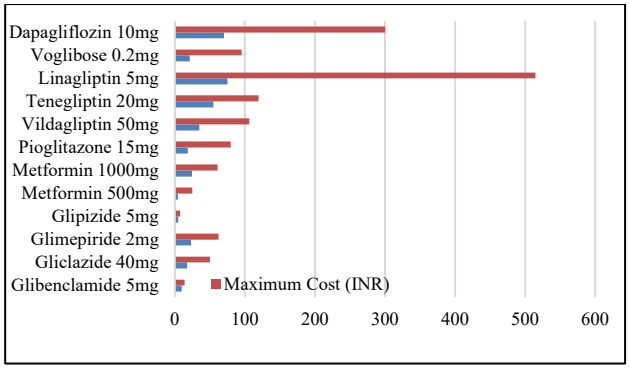

Figure 1: Maximum and minimum cost among individual andtidiabetic drugs.

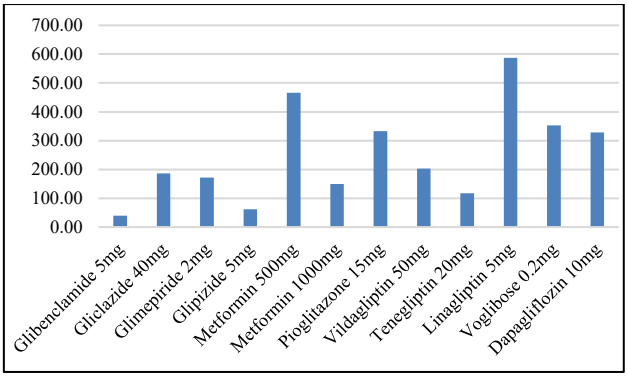

Figure 2: Cost variation (%) among individual antidiabetic drugs.

Table 1: Cost variation among sulfonylureas.

Drug	Formulations	Strength (mg)	Minimum cost (INR)	Maximum cost (INR)	Ceiling price (INR)/tablet	Cost difference	Cost ratio	% Cost variation
Glibenclamide	Tablet	5 mg	9.85	13.77	1.03	3.92	1.40	39.80
Gliclazide	Tablet	40 mg	17.5	50	3.26	32.5	2.86	185.71
	Tablet	80 mg	30	80	5	50	2.67	166.67
	SR Tab	30 mg	18.22	81.4	5.77	63.18	4.47	346.76
	Tablet	60 mg	39	123	9.9	84	3.15	215.38
Glimepiride	Tablet	1 mg	15	40.1	3.7	25.1	2.67	167.33
	Tablet	2 mg	23	62.5	5.8	39.5	2.72	171.74
	Tablet	3 mg	48.6	141	-	92.4	2.90	190.12
	Tablet	4 mg	44	145.2	-	101.2	3.30	230.00
Glipizide	Tablet	5 mg	4.55	7.38	-	2.83	1.62	62.20

Table 2: Cost variation among biguanides, thiazolidinediones, DPP4 inhibitors.

Drug	Formulations	Strength (mg)	Minimum cost (INR)	Maximum cost (INR)	Ceiling price (INR)/tablet	Cost difference	Cost ratio	% Cost variation
Metformin	Tablet	250 mg	7.7	14.29	-	6.59	1.86	85.58
	Tablet	500 mg	4.4	24.93	2.02	20.53	5.67	466.59
	Tablet	850 mg	10.91	39	-	28.09	3.57	257.47
	Tablet	1000 mg	24.5	61.15	3.49	36.65	2.50	149.59
	SR Tablet	500 mg	12.82	27.05	-	14.23	2.11	111.00
	Tablet	1000mg	24.5	46.07	4.05	21.57	1.88	88.04
Pioglitazone	Tablet	7.5mg	44	66.5	5.31	22.5	1.51	51.14
	Tablet	15 mg	18.46	79.9	4.11	61.44	4.33	332.83
	Tablet	30 mg	29	91.9	6.88	62.9	3.17	216.90
Vildagliptin	Tablet	50 mg	35	106	-	71	3.03	202.86
Tenegliptin	Tablet	20 mg	55	119.67	11.09	64.67	2.18	117.58
Linagliptin	Tablet	5 mg	75	515	-	440	6.87	586.67

Table 3: Cost variation among alpha glucosidase inhibitors and SGLT-2 inhibitors.

Drug	Formulations	Strength (mg)	Minimum cost (INR)	Maximum cost (INR)	Ceiling price (INR)/tablet	Cost difference	Cost ratio	% Cost variation
Voglibose	Tablet	0.2 mg	21	95	6.68	74	4.52	352.38
	Tablet	0.3 mg	29.5	135	8.98	105.5	4.58	357.63
Dapagliflozin	Tablet	5 mg	50	285	-	235	5.70	470.00
	Tablet	10 mg	70	300	-	230	4.29	328.57

Table 1-3 shows the cost variation of commonly used antidiabetic drugs used as monotherapy.

Sulfonylureas

Among sulfonylureas, the cheapest drug is glipizide (5 mg tablet; INR 04.55/10 tablets) and the costliest drug was glimepiride (4 mg tablet; INR 145.20/10 tablets). The cost ratio of gliclazide (30 mg SR tablet; 4.47) was the highest, while that of glibenclamide (5 mg tablet; 1.40) was the lowest. The cost variation of gliclazide (30 mg SR tablet; 346.76%) was the highest and that of glibenclamide (5 mg tablet; 39.80%) was the lowest (Table 1, Figure 1).

Biguanides, thiazolidinediones, DPP4 inhibitors

Among biguanides, the most commonly used drug is metformin which was considered in this study. The costliest formulation was metformin 1000 mg (tablet; INR 61.15/10 tablets) and the cheapest formulation was metformin 500 mg (tablet; INR 4.40/ 10 tablets) The cost ratio and cost variation of metformin 500 mg was the highest (5.67; 466.59%) and the lowest cost ratio and cost variation was metformin 250 mg (1.86; 85.58%) (Table 2).

Among thiazolidinediones, pioglitazone was considered in this study. The costliest formulation was pioglitazone 30 mg (tablet; INR 91.90/10 tablets) and the cheapest formulation was pioglitazone 15 mg (tablet; INR 18.46/10 tablets). The cost ratio and cost variation of pioglitazone 15 mg was the highest (4.33; 332.83%) and the lowest cost ratio and cost variation was pioglitazone 7.5 mg (1.51; 51.14%) (Table 2).

Among DPP4 inhibitors, the cheapest drug was vildagliptin (50 mg tablet; INR 35/10 tablets) and the costliest drug was linagliptin (5 mg tablet; INR 515/10 tablets). The cost ratio of linagliptin (50 mg tablet; 6.87) was the highest, while that of teneligliptin (20 mg tablet; 2.18) was the lowest. The cost variation of linagliptin (50 mg tablet; 586.67%) was the highest and that of teneligliptin (20 mg tablet; 117.58%) was the lowest (Table 2, Figure 2).

Alpha glucosidase inhibitors and SGLT-2 inhibitors

Among alpha glucosidase inhibitors, the most commonly used drug is voglibose which was considered in this study. The costliest formulation was voglibose 0.3 mg (tablet; INR 135/10 tablets) and the cheapest formulation is voglibose 0.3 mg (tablet; INR 21/10 tablets). The cost ratio and cost variation of voglibose 0.3 mg was the highest (4.58; 357.63%) and the lowest cost ratio and cost variation was voglibose 0.2 mg (4.52; 352.38%) (Table 3).

Among SGLT-2 inhibitors, the most commonly used drug is dapagliflozin which was considered in this study. The costliest formulation was dapagliflozin 10 mg (tablet; INR 300/10 tablets) and the cheapest formulation was dapagliflozin 5 mg (tablet; INR 50/10 tablets). The cost ratio and cost variation of dapagliflozin 5 mg was the highest (5.70; 470%) and the lowest cost ratio and cost variation was dapagliflozin 10 mg (4.29; 328.57%) (Table 3).

Fixed dose combination drugs

Among fixed dose combination drugs, the cheapest drug is glibenclamide + metformin (1.25+250 mg tablet; INR 12.50/10 tablets) and the costliest drug is glimepiride + metformin (2+500 mg tablet; INR 470/10 tablets). The cost ratio of glimepiride + metformin (1+500 mg SR tablet; 13.46) was the highest, while that of glibenclamide + metformin (5+500 mg SR tablet; 1.05) was the lowest. The minimum cost variation was glibenclamide + metformin (5+500 mg SR tablet; 4.77%) and maximum cost variation was of glimepiride + metformin (1+500 mg SR tablet; 1246.47%) (Table 4, Figures 3 and 4).

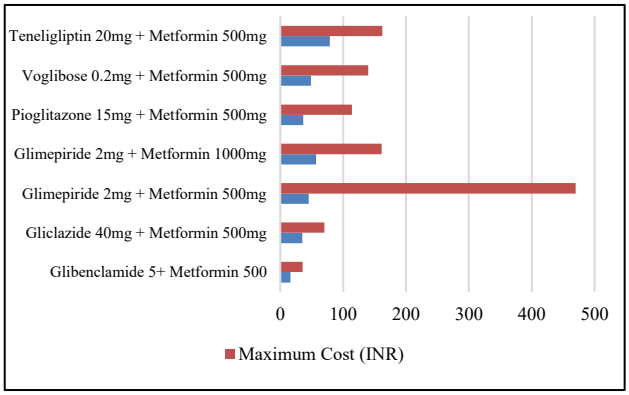

Figure 3: Maximum and minimum cost among FDC of antidiabetic drugs.

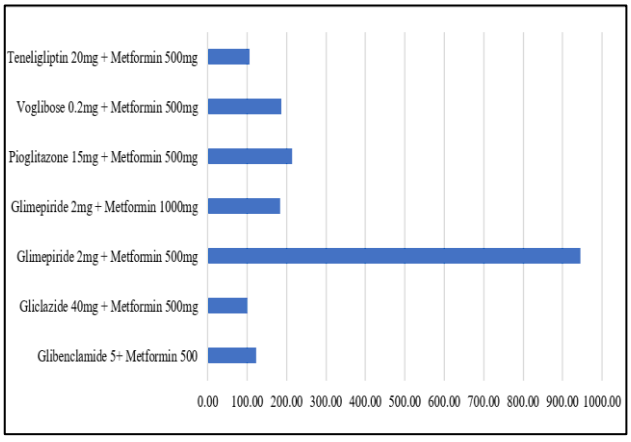

Figure 4: Cost variation (%) among FDC of antidiabetic drugs.

Table 4: Cost variation among fixed dose combinations.

Drug	Formulations	Strength (mg)	Minimum cost (INR)	Maximum cost (INR)	Cost difference	Cost ratio	% Cost variation
Glibenclamide + metformin	Tablet	1.25+250	12.5	29	16.5	2.32	132.00
	Tablet	2.5+400	22.37	42.9	20.53	1.92	91.77
	Tablet	5+500	16	35.6	19.6	2.23	122.50
	SR Tablet	5+500	48.68	51	2.32	1.05	4.77
Gliclazide + metformin	Tablet	40+500	35	70	35	2.00	100.00
	Tablet	80+500	45	130	85	2.89	188.89
Glimepiride + metformin	SR Tablet	1+500	30.45	410	379.55	13.46	1246.47
	Tablet	2+500	45	470	425	10.44	944.44
	Tablet	3+500	70	125.5	55.5	1.79	79.29
	Tablet	1+1000	46	144.5	98.5	3.14	214.13
	Tablet	2+1000	57	161.5	104.5	2.83	183.33
Pioglitazone + metformin	Tablet	15+500	36.4	114	77.6	3.13	213.19
Voglibose + metformin	Tablet	0.2+500	49	140	91	2.86	185.71
	Tablet	0.3+500	58.5	170	111.5	2.91	190.60
Teneligliptin + metformin	Tablet	20+500	79	162.5	83.5	2.06	105.70

DISCUSSION

The Government of India's NPPA regulates drug prices on the Indian market. It establishes a drug's maximum price depending on its necessity. This avoids pharmaceutical firms from charging more than the set price for medications on the Drug Prices Control Order (DPCO) list.[12]

Consistent with previous research, we found that our data show notable differences in price amongst antidiabetic medications available in the Indian market.[13-18] The general pattern of significant pricing disparities remains, even though the particular medications and percentages may differ between our research and those in previous publications (Table 5). This emphasizes how crucial it is to take cost into account when writing prescriptions. Additionally, we saw that, unlike the minimum cost, the NPPA ceiling pricing do not cover the maximum cost.

We observed that linagliptin 5 mg tablet showed a maximum cost variation which was in contrast with studies done by Singh et al in which Glibenclamide 5 mg showed maximum cost variation (900%), Solanki et al in which glimepiride 2 mg showed maximum cost variation (677%), Aran et al in which pioglitazone 15 mg showed maximum price variation (185.17%), Chincholkar et al in which glimepiride 1 mg showed maximum price variation (655.38%) and Gupta et al in which metformin 500 mg SR tablet showed maximum price variation (3668%).[5,13,15-17] We observed that glibenclamide 5 mg tablet showed minimum price variation (39.80%) which was in contrast in studies done by Singh et al (glimepiride 0.5 mg, 27%), Aran et al (acarbose 25 mg, 117.18%), Chincholkar et al (glipizide 10 mg, 38.88%), and Gupta et al (glipizide 2.5 mg, 64.68%).

In FDC's, we observed that glimepiride 1 mg + metformin 500 mg SR tablet showed a maximum cost variation of 1246.47% which was in contrast with studies done by Gupta et al (glimepiride 2 mg + metformin 1000 mg, 2703%) and Chincholkar et al (voglibose 0.3 mg + metformin 500 mg, 2809%)

Though all the results were in contrast with previous studies, wide variation of price was common in all these studies which corroborate with our study. Basic price differences between marketed formulations may be caused by lax government pricing and regulatory policies, the parent company's financial objectives, the target return on investment, the overall cost of production, distribution, and drug promotion, the makeup of the pharmaceutical industry as it stands today, and prescribers' understanding of medicine prices. Due to the fact that several companies in India sell the same medication under various brand names, there is a significant price difference between the various branded medications.

Since diabetes mellitus is a chronic condition, continuous medical attention is necessary for its management. The cost of the medications may not always be known by the prescribing physicians. Additionally, some doctors are enticed by the numerous incentives offered by pharmaceutical corporations, which leads them to prescribe more costly medications when there is a less expensive option. Patients who receive prescriptions that are appropriate for their clinical needs, in doses that satisfy their own unique needs, for a sufficient amount of time, and at the lowest feasible cost are said to be engaging in rational drug usage.[18] Having multiple brands of a given medication available for a given indication complicates and reduces the rationality of the selection. To guarantee their sensible usage, the doctor's p-drug list should only include carefully chosen, safe, and reasonably priced medications.

Table 5: Findings of various studies and the present study.

Authors and year of study	Findings
Chincholkar et al[13]	As per results there exists a huge price variation around 100% among oral antidiabetic drugs which is not acceptable situation for patients
Gedam et al[14]	The study highlights that there is wide price variation of different brands of the same generic anti-diabetic drug in Indian market
Solanki et al[5]	Our study findings showed a wide range of the minimum and maximum price of anti-diabetic drugs manufactured under different brand names
Gupta et al[15]	The present study shows that there is a wide variation in the cost of different brands of the same oral anti-diabetic drug currently available in Indian market. Pharmacoeconomics should be given greater emphasis during medical training
Aran et al[16]	The current research found that the pricing of various brands of the identical anti-diabetic medications presently accessible in the Indian market varies significantly
Sinha et al[17]	In spite of strict regulations, our study revealed a wide range large cost variation among most commonly prescribed oral anti-diabetic drugs
Present study 2024	Consistent with previous research, we found that our data show notable differences in price amongst antidiabetic medications available in the Indian market. The general pattern of significant pricing disparities remains, even though the particular medications and percentages may differ between our research and those in previous publications

A limitation of this study is that only limited number of references used. Only data from CIMS and NPPA list were utilised and further studies are needed involving other pricing indexes to gain a better understanding of cost variation analysis

CONCLUSION

The present study shows that there is a wide variation in the cost of different brands of the same oral anti-diabetic drug currently available in Indian market. Rational prescription may be aided by lower treatment costs, modifications to laws and regulations, and a better awareness among treating physicians of the advantages of moving to more affordable therapy. More emphasis should be placed on drug prescriptions by practitioners. It's also critical to raise awareness that less costly medications are just as good as their more costly, branded counterparts. Physicians need to consider how much their patients will spend on medications. Patients are negatively impacted by rising medicine costs. Cost-effective prescriptions are becoming more and more popular due to the escalating cost of healthcare.

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