

## Study of cost variation analysis for oral anti-diabetic drugs dispensed in pharmacy

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### Abstract

The management of diabetes mellitus requires long-term pharmacological interventions, making the cost of anti-diabetic drugs a critical factor influencing treatment adherence and patient outcomes. In India, particularly in regions like Trichy, Tamil Nadu, significant cost variations in oral anti-diabetic drugs are observed across brands and formulations. In this study aims to analyze the price disparities and their potential implications on healthcare affordability and accessibility. In addition, we evaluate the cost variation among commonly prescribed oral anti-diabetic drugs, including Metformin, Glimepiride, Vegliote, Vildagliptin, and Gliclazide, dispensed in pharmacies in Trichy, Tamil Nadu. A cross-sectional observational study was conducted by collecting retail prices of different brands of oral anti-diabetic drugs from pharmacies in Trichy. The percentage cost variation was calculated to determine the extent of price differences among brands of the same generic formulation. The analysis revealed significant cost variations, with Glimepiride (1 mg) showing the highest disparity (1366%), followed by Metformin (500 mg) at 809% and Vegliote (0.3 mg) at 571%. Vildagliptin (50 mg) and Gliclazide (80 mg) exhibited cost variations of 264.6% and 334.78%, respectively. These discrepancies highlight the coexistence of highly affordable generics alongside premium-priced branded alternatives. The findings emphasize the critical role of policymakers, prescribers, and pharmacists in ensuring equitable access to essential medications for diabetes management in resource-limited settings.

**Keywords:** Brands; Cost variation; Cost ratio; Oral anti-diabetic drugs; Diabetes mellitus

### 1. Introduction

Diabetes mellitus (DM) is a chronic condition that affects millions of people throughout the globe. According to the most recent epidemiological research, 12.8 % of Chinese adults have diabetes; however, this figure does not reflect the prevalence since many people are in the pre-DM stage or have not been identified [1]. According to the Global Burden of 2015, the prevalence of diabetes has grown from 333 million to 435 million people in ten years [2], with 642 million people will be affected by 2040 [3]. Type 1 Diabetes (T1D) is a potentially life-threatening multifactorial autoimmune illness marked by T-cell-mediated alteration pancreatic cells, resulting in deficiencies of insulin production and secretion [4]. T1D has been on the rise globally since the 1950s, with a yearly increase of 3–4% on average over the last three decades. Childhood T1D is on the rise, with rates rising fastest in historically low-risk areas and differing by ethnicity and race [5]. T2DM is one of the most prevalent metabolic illnesses globally, and it is caused by a combination of two basic factors: inadequate insulin production by pancreatic  $\beta$ -cells and the failure of insulin-sensitive tissues to react to insulin [6]. Insulin release and action must be precisely timed to satisfy metabolic demand; as a result, the molecular processes involved in insulin production and release and insulin response in tissues must be properly controlled. As a result, flaws in any of the processes involved might cause a metabolic imbalance, leading to T2DM pathogenesis.

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Diabetes mellitus is on alarming rise in India. Diabetes Mellitus is one of the most common endocrine disorders affecting 6% of the world's population. According to report of the International Diabetes Federation in 2001, the number of diabetic patients will reach 300 million in 2025. Indian market has over 100,000 formulations and there is no system of registration of medicines [7]. The drugs are mainly sold under brand names [8]. Current trend in epidemiology of diabetes is very disturbing and may make India, A Diabetic Capital of the World by year 2025 [9]. Government of India is likely to consider issuing compulsory licenses for some patented diabetes management drugs sold in the country to make them affordable. The Indian pharmaceutical industry has become a cornucopia of medicines with wide variation in prices for the same molecule marketed under different brand names. This creates lot of problems for physician in deciding the drug of choice for individual patient [10].

In this present research, we have analyzed and to determine the cost analysis for Anti-diabetic drugs among pharmacist in community pharmacy. The main objectives are: To study the cost analysis for Anti-diabetic drugs disposed in pharmacy and the primary objective of cost analysis is to provide organizations with a comprehensive understanding of their costs and cost drivers and to give suggestions for improving usage of medicines. While the analysis offers valuable insights, it has certain limitations. The study was restricted to pharmacies in Trichy, which may not fully represent broader pricing trends across Tamil Nadu or India. The data primarily focuses on retail prices, excluding the impact of insurance coverage or government-subsidized schemes. This study will assist pharmacists in understanding the differences and prescribing the appropriate medication while taking the patient's financial situation into account and supporting adherence to treatment.

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## 2. Methods and materials

### 2.1. Study Design

We have selected location from Trichy, Tamilnadan, India. This research employed a case study design to analyze the cost variations of anti-diabetic drugs in community pharmacies. The study aimed to investigate pricing trends and the sales patterns of brand-name and generic drugs.

### 2.2. Study Population

The study was conducted among 50 community pharmacies in Trichy, Tamil Nadu. A total of 50 pharmacists, each representing one pharmacy, participated in the study. The selection of pharmacies was based on convenience sampling to ensure representation from different areas within the city.

### 2.3. Data Collection

Data were collected using a structured questionnaire distributed to the pharmacists. The questionnaire consisted of six questions designed to capture the following key information.

- The range of anti-diabetic drugs available in the pharmacy.
- The pricing of brand-name drugs compared to generic equivalents.
- The sales rates of brand-name and generic anti-diabetic drugs.
- Factors influencing customers' preferences for brand-name or generic drugs.
- Pharmacists' perceptions of pricing disparities and their impact on patients.
- Strategies employed by the pharmacy to promote affordable medication options.

### 2.4. Procedure

The questionnaires were distributed and completed on-site at each pharmacy. Pharmacists were given sufficient time to provide accurate responses based on their professional experience and pharmacy records. To ensure consistency, a brief orientation on how to complete the questionnaire was provided before distribution.

### 2.5. Data Analysis

The collected data were compiled and analyzed to calculate the percentage of cost variation between brand-name and generic drugs. Additionally, sales trends were examined to identify the preferences of customers and the extent of generic drug usage in the study population. Descriptive statistics were used to summarize the findings, while qualitative data from open-ended questions were thematically analyzed.

## 2.6. Ethical Considerations

Participation in the study was voluntary, and informed consent was obtained from all pharmacists. Confidentiality of responses and anonymity of participants were maintained throughout the study.

## 3. Result and discussion

In our analysis of single drugs was found with high price variability for Anti-diabetic drug. The drugs such Metformin (250 mg, 500 mg), Glimepiride (1 mg, 2 mg), Glipalamide (5 mg) Gliclazide (40 mg, 80 mg), Repaglinide (1 mg, 2 mg), Vegliote (0.2 mg,0.3 mg), Sitagliptin (50 mg, 10 mg), Vildagliptin (50 mg), Pioglitazone (7.5 mg, 15 mg), Dapagliflozin (5 mg, 10 mg).

The price variation percentage of Metformin (250 mg, 500 mg) with it Brand and Generic varies with 26%, Glimepiride (1 mg, 2 mg) with it Brand and Generic varies with (1.2%,11%), Glipalamide (5 mg) with it Brand and Generic varies with 70%, Gliclazide (40 mg, 80 mg) With it Brand and Generic varies with (58.2%,76%),Repaglinide (1 mg, 2 mg) with it Brand and Generic varies with 84.2%, Vegliote (0.2 mg, 0.3 mg) with it Brand and Generic varies with 2.4%, Sitagliptin (50 mg, 100 mg) with it Brand and Generic varies with (52%,65%) , Vildagliptin (50 mg) with it Brand and Generic varies with 71%, Pioglitazone (7.5 mg, 15 mg) with it Brand and Generic varies with (87%, 80.1%), Dapagliflozin (5 mg, 10 mg) with it Brand and Generic varies with (41%,40%). Generic drug for Metformin 250 mg, Repaglinide 2 mg, and Vegliote 0.2 mg is not available based on the analysis in various pharmacies we analyzed.

**Table 1** Marketing Profile for Single Drug Therapy

S. No	Drug	Highest Selling	Dose	Cost Variation	Variation Percentage
1	Metformin	Glycomet	250 mg	-	-
			500 mg	7.2	26%
2	Glimepride	Glypride	1 mg	0.5	1.20%
			2 mg	7.06	11%
3	Glibemclamide	Daonil	5 mg	37.52	70%
4	Gliclazide	Glizid	40 mg	20.9	58.20%
			80 mg	62.5	76%
5	Rapaglinide	Eurepa	1 mg	160.5	84.20%
6	Voglibose	Vogs	0.2 mg	-	-
7	Sitagliptin	Istavet	50 mg	48	52%
			100 mg	92	65%
8	Vildagliptin	Vidagard	50 mg	85	71%
9	Pioglitazone	Pioglit	7.5 mg	67	87%
			15 mg	60.5	80.10%
10	Dapagliflozin	Udapa	5 mg	51.5	41%
			10 mg	56	40%

In our analysis of fixed drugs was found with high price variability for Anti-diabetic drug. The drugs such as Metformin+Glimepiride (1/500 mg), Metformin+Glibenclamide (5/500 mg), Metformin Gliclazide (80/500 mg), Metformin Sitagliptin (50/500 mg, 50/1000 mg) Metformin+Vildagliptin (50/500 mg, 50/1000 mg), Metformin+Saxagliptin (5/500 mg), Metformin+ Repaglinide (1/500 mg, 2/500 mg), Metformin Pioglitazone (15/500 mg).

The price variation percentage of Metformin+Glimepride (1/500 mg) with it Brand and Generic varies with (79%, 85%), Metformin +Glibenclamide (5/500 mg) with it Brand and Generic varies with 48%. Metformin Gliclazide (80/500 mg) with it Brand and Generic varies with 29.1%, Metformin Sitagliptin (50/500 mg, 50/1000 mg) with it Brand and Generic varies with (55.1% ,48%), Metformin +Vildagliptin (50/500 mg, 50/1000 mg) with it Brand and Generic varies with (60% , 59%). Generic drug for Metformin+Saxagliptin (5/500 mg), Metformin+Rapaglinide (1/500 mg, 2/500 mg), Metformin Pioglitazone (15/500 mg) is not available based on the analysis in various pharmacies we analyzed.

**Table 2** Marketing Profile for Fixed Drug Therapy

S. No	Drug	Highest Selling	Dose	Cost Variation	Percentage Variation
1	Metformin+Glimepride	Glicomet	1/500 mg	96	79%
			2/500 mg	152	85%
2	Metformin+Glibenclamide	Glucored forte	5/500 mg	32	48%
3	Metformin+Gliclazide	Glizid M	80/500 mg	58	29.10%
4	Metformin+Sitagliptin	Istamet	50/500 mg	86	55.10%
			50/1000 mg	83	48%
5	Metformin+Vildagliptin	Jalra M	50/500 mg	75	60%
			50/1000 mg	129	59%

In our analysis of multiple drugs was found with high price variability for Anti-diabetic drug. The drugs such as Metformin +Glimepiride +Pioglitazone (500/1/15 mg), Metformin +Glimepiride +Vegliote (500/2/0.2 mg), Dapagliflozin+Sitagliptin+Metformin (5/50/1000 mg). The price variation percentage of Metformin+Glimepride+Pioglitazone (500/1/15 mg) with it Brand and Generic varies with 68%, Metformin+Glimepride+Voglibose (500/2/0.2 mg) with it Brand and Generic varies with 38.3%.

**Table 3** Marketing Profile for Multiple Drug Therapy

S. No	Drug	Highest Selling	Dose	Cost Variation	Percentage Variation
1.	Metformin+ Glimepride+ Pioglitazone	Triptide	500/1/15 mg	125.4	68%
2.	Metformin+ Glimepride+ Voglibose	Glycomet trio 2	500/2/0.2 mg	87	38.3%

#### 4. Conclusion

In this study, we investigated the pricing differences between branded drugs and generic drugs. The sale of branded pharmaceuticals is higher than that of generic drugs, although the cost of the drug is lower in generic drugs, despite the fact that people are less aware of generic drugs. To ensure that diverse individuals are aware of the pricing variation between branded and generic pharmaceuticals, we completed this project on the subject. In the Indian market, prices for different brands of the same generic anti-diabetic medicine vary greatly. The cost of a drug is significant in the treatment of diabetes since it has a long course and adherence to the therapy is linked to drug cost. To reduce the vast cost difference among different brands of anti-diabetic medications, it is possible to interact with physicians about the influence of cost effectiveness of treatment regimens and to have drug pricing regulated by the relevant bodies. The report emphasizes the critical need for efforts to close the prescription pricing gap and ensure equitable access to key anti-diabetic drugs in Trichy. A collaborative effort combining legislators, healthcare professionals, and pharmaceutical corporations can help patients save money while also improving diabetes care quality.

## Compliance with ethical standards

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### *Disclosure of conflict of interest*

Authors have declared no conflict of interests.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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