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Original Research Article

A cost variation analysis of various brands of oral anti-diabetic drugs currently available in Indian pharmaceutical market

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ABSTRACT

Background: Diabetes mellitus is a metabolic disorder requiring lifelong treatment. There are a large number of anti-diabetic drugs available in the Indian market. The cost of drugs plays an important role in patient's care, warranting the need for all physicians to keep themselves updated with the latest prices and price variation of various brands of anti-diabetic drugs. The objective of this study is to evaluate the cost of oral anti-diabetic drugs of different brands currently available in the Indian market.

Methods: Cost of oral anti-diabetic drugs manufactured by different pharmaceutical companies in the same strength and dosage forms was obtained. The percentage price variation and cost ratio for each formulation was calculated.

Results: In sulfonylurea group of drugs, maximum price variation was seen in glimepiride 1mg 1366% and minimum was seen in glipizide 2.5 mg 17%. In non-sulfonylurea group of drugs, a maximum variation was seen in metformin 500 mg 809% and a minimum variation was seen in acarbose 100 mg 10%. Among the fixed dose combination therapy, glimepiride 2 mg and metformin 500 mg showed the highest price variation 555% and pioglitazone 7.5 mg and metformin 500 mg showed the least price variation 8%.

Conclusions: Our study showed that there is a very high price variation for oral anti-diabetic drugs by different brands. Since diabetes mellitus is a chronic illness, cost of the drug plays an important role in compliance to the treatment regimen. It is necessary to bring awareness regarding this wide variation in prices, such that the drug costs can be reduced and made more affordable to the common man.

Keywords: Anti-diabetic drugs, Brands, Cost analysis, Cost variation, Price variation

INTRODUCTION

Type 2 diabetes mellitus is seen as a heterogenous group of diseases, characterized by a state of chronic hyperglycaemia, resulting from a diversity of environmental and genetic aetiologies, acting jointly.¹ Diabetes mellitus is a major public health problem that is becoming an epidemic globally.²

With the rise in prevalence and high costs of management of type 2 diabetes mellitus, it is necessary to work towards prevention of the disease. Intervention prior to the onset of the diabetes is probably the only way of preventing the complications. Diabetes is an expensive disease, not only for the affected individuals but also for the healthcare systems due to its chronic nature, severity of its complications and the medications required to control them.²

WHO revised its estimates of the persons with diabetes in India in 2000 to 31.7 million; this number is likely to increase to 79.4 million in 2030.³

The longer duration of disease, non-adherence to self-care management behaviours, obesity, need for combination therapy and lack of family support has resulted in poor control of diabetes.⁴ Along with this, a major challenge in the effective treatment of diabetes and compliance towards the treatment regimen is the cost of drug therapy. With diabetes emerging rapidly as a public health challenge, it is imperative to analyse the cost variations to make the treatment more affordable. In India, 20,000 firms are licensed to produce drugs with over 100,000 formulations and there is no system of registration of these formulations.⁵

This creates a dilemma among the physicians to decide the drug of choice for individual patients. Regarding anti-diabetic drugs, with the best of our knowledge hardly any studies are available which compares the cost of different brands available in Indian market. The current study projects a representative view of the existing situation of the cost variation among the various oral anti-diabetic drugs available in Indian market.

Aim of the study is to evaluate the cost of oral anti-diabetic drugs of different brands currently available in the Indian market.

METHODS

In this study, the management of type 2 diabetes mellitus was understood by studying the Indian Council of Medical Research (ICMR) guidelines for the same. Current Index of Medical Specialities (CIMS) April to July 2019 edition and Indian Drug Review (IDR) issue no. 3 vol. XXV were used to analyse the price of oral hypoglycaemic agents across the different brands available in the Indian pharmaceutical market.

Cost of drugs in Indian Rupee (INR) for 10 tablets was calculated. The drugs were divided as single and combination therapy and single therapy drugs were further divided as sulfonylurea and non-sulfonylurea. Costs of individual drugs that were manufactured by all the companies in the same strength and dosage form were obtained and compared. The variations between the maximum and minimum price of individual drugs by various companies was calculated. The formula used to calculate variations in price was:

$$\frac{(\text{Cost of brand with highest price} - \text{Cost of brand with lowest price})}{\text{Cost of brand with lowest price}} \times 100$$

The cost ratio (ratio of the brand with maximum price to the brand with minimum price) of drugs of the same strength and dosage was calculated.

Spearman correlation analysis was done to observe the correlation between number of manufacturing companies and their percentage price variation with the help of IBM statistical package for social sciences (SPSS v 20, SPSS Inc.).

Exclusion criteria

The drugs being manufactured by only one company and those manufactured by different companies but, in different strengths were excluded.

RESULTS

In this study, percentage price variation of 12 drugs in single therapy and 10 in combination therapy were analysed. A total of 68 different formulations manufactured by various companies was available for single and combination therapy.

Single drug therapy

The price variation in single drug therapy among sulfonylurea group of drugs is shown in Table 1. In this category, glimepiride 1mg shows maximum price variation of 1366% followed by glimepiride 3 mg at 998% and glipizide 5 mg at 780%. On the other hand, glipizide 2.5 mg shows minimum price variation of 17%. The cost ratio ranged from 1.17 for glipizide 2.5 mg to 14.66 for glimepiride 1 mg.

The price variation in single drug therapy among non-sulfonylurea group of drugs is shown in Table 2. It comprises of eight drugs, out of which metformin 500 mg shows a maximum variation of 809%, followed by voglibose 0.3 mg 793%. Acarbose 100 mg shows a minimum variation of 10%. The cost ratio of metformin 500 mg was 9.09, voglibose 0.3 mg was 8.93 and acarbose 100 mg was 1.10.

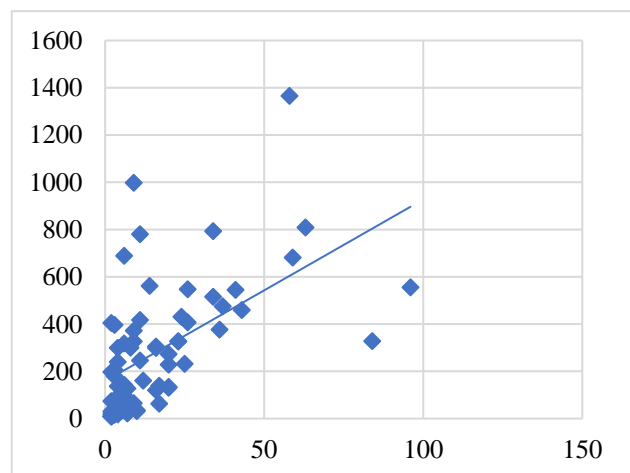


Figure 1: Correlation between no. of manufacturing companies and percentage price variation.

Combination therapy

The price variation of fixed dose combination (FDC) drugs is shown in Table 3. A total of 10 oral hypoglycaemic fixed dose combinations were analysed. Among these, glimepiride 2 mg and metformin 500 mg show the highest price variation of 555%, followed by pioglitazone 15 mg and metformin 500 mg and glimepiride 2 mg 475%. On the contrary, pioglitazone 7.5

mg and metformin 500 mg formulation shows least price variation of 8%. Glimepiride 2 mg and metformin 500 mg had maximum cost variation of 6.55 and pioglitazone 7.5 mg and metformin 500 mg had minimum cost variation of 1.08.

Spearman rank correlation (Figure 1) shows that there is a positive correlation between the number of manufacturing companies and percentage price variation.

Table 1: Price variation in single drug therapy among sulfonylurea group of drugs.

Drug	No. of formulations	Dose (mg)	No. of manufacturing companies	Min. price (INR)	Max. price (INR)	% price variation	Cost ratio
Glibenclamide	2	2.5	6	2.66	6.11	130	2.30
		5	6	5.11	40.31	689	7.89
Gliclazide	4	30	9	18.22	77.7	326	4.26
		40	14	15.12	100	561	6.61
		60	9	39	184	372	4.72
		80	25	30	99.5	232	3.32
Glimepiride	4	1	58	14.5	212.5	1366	14.66
		2	59	23	179.76	682	7.82
		3	9	30	329.42	998	10.98
		4	16	40	162	305	4.05
Glipizide	3	2.5	4	2.75	3.23	17	1.17
		5	11	1.48	13.03	780	8.80
		10	5	19	25	32	1.32

Table 2: Price variation in single drug therapy among non-sulfonylurea group of drugs.

Drug	No. of formulations	Dose (mg)	No. of manufacturing companies	Min. price (INR)	Max. price (INR)	% price variation	Cost ratio
Acarbose	3	25	7	47.25	80.5	70	1.70
		50	9	85	140.5	65	1.65
		100	2	91.27	100.2	10	1.10
Metformin	4	250	7	7.7	17.5	127	2.27
		500	63	4.4	40	809	9.09
		850	16	10.91	43.5	299	3.99
		1000	41	10	64.5	545	6.45
Miglitol	2	25	4	50.3	201	300	4.00
		50	4	90	306	240	3.40
Nateglinide	2	60	3	30.76	86	180	2.80
		120	3	51.27	157	206	3.06
Pioglitazone	2	15	26	17.27	87.65	408	5.08
		30	26	20.51	132.81	548	6.48
Repaglinide	3	0.5	6	19.9	48.4	143	2.43
		1	6	39.9	78.9	98	1.98
		2	5	75	124.8	66	1.66
Voglibose	2	0.2	34	19.5	120	515	6.15
		0.3	34	29.5	263.5	793	8.93
Teneligptin	1	20	20	55	127	131	2.31

Table 3: Price variation in FDC category of drugs.

Drug	No. of formulations	Dose (mg)	No. of manufacturing companies	Min. price (INR)	Max. price (INR)	% price variation	Cost ratio
Glibenclamide and metformin	3	1.25+250	3	12.5	22	76	1.76
		2.5+400	6	7.3	30.5	318	4.18
		5+500	24	13	69	431	5.31
Gliclazide and metformin	4	30+500	2	26.9	80	197	2.97
		40+500	3	60	70	17	1.17
		60+500	3	40.9	203	396	4.96
		80+500	43	28.6	160	459	5.59
Glimepiride and metformin	8	1+500	84	34	145.5	328	4.28
		2+500	96	36	235.94	555	6.55
		1+1000	23	46	196.5	327	4.27
		2+1000	23	57	243	326	4.26
		3+1000	5	65	161.5	148	2.48
		4+1000	4	69	163.5	137	2.37
		1+850	2	62.5	69	10	1.10
Glipizide and metformin	2	2.5+400	2	5.2	26.25	405	5.05
		5+500	11	6.72	34.75	417	5.17
Tenagliptin and metformin	2	20+500	17	79	129	63	1.63
		20+1000	7	114.75	140	22	1.22
Pioglitazone and glimepiride	3	15+1	8	19.25	77	300	4.00
		15+2	11	30.9	107	246	3.46
		30+2	2	69	120	74	1.74
Pioglitazone and metformin	3	7.5+500	2	50	54	8	1.08
		15+500	20	22.5	84	273	3.73
		30+500	12	31.9	83.19	161	2.61
Voglibose and metformin	2	0.2+500	20	46.5	109	134	2.34
		0.3+500	16	57	125.5	120	2.20
Pioglitazone, metformin and glimepiride	5	15+500+1	36	32	152.5	377	4.77
		15+500+2	37	44	253	475	5.75
		15+500+3	2	123.95	161.7	30	1.30
		7.5+500+1	5	32	66	106	2.06
		7.5+500+2	5	44	77	75	1.75
Voglibose, metformin and glimepiride	4	0.2+500+1	17	89	212.5	139	2.39
		0.2+500+2	20	85	279	228	3.28
		0.3+500+1	10	88.5	120	36	1.36
		0.3+500+2	10	110	145.5	32	1.32

DISCUSSION

Diabetes is a chronic illness that requires life-long treatment and compliance of the patient. The objective of this study was to assess the costs and percentage price variation among the various brands of oral anti-diabetic drugs available in the Indian market. Drug prices were obtained from the latest available CIMS and IDR. Prescribing a cost-effective drug will reduce the economic burden on the patient and the healthcare system as well.

The results of the study showed that there is a very high variation in the least and highest price of oral anti-diabetic drugs being manufactured by several companies

across the different brands. In our study, glimepiride 1 mg shows maximum price variation of 1366%, followed by glimepiride 3 mg 998% and metformin 500 mg 809% among all oral anti-diabetic drugs.

However, Hussain et al reported that glipizide 5 mg showed the highest price variation 780% followed by glimepiride 2 mg 682%.⁶ Jadhav et al reported that glimepiride 1 mg showed the highest price variation of about 650%.⁷ Mehani et al reported that glimepiride 2 mg 562% showed the maximum price variation followed by metformin 500 mg 492%.⁸ In our study, glimepiride 2 mg and metformin 500 mg combination show maximum price variation of 555%. However, Hussain et al reported that glimepiride 1 mg and metformin 500 mg

combination showed the highest price variation of 533% among all fixed dose combinations.⁶ Jadhav et al reported that combination of glipizide 2.5 mg and metformin 400 mg showed the highest price variation of about 400%.⁷ There is a difference in the results of cost analysis among the various studies due to newer brands entering the market often with different formulations. Spearman rank correlation revealed that there is a significant positive correlation existing between the percentage price variation and the number of manufacturing companies (Figure 1). This observation reinforced the fact that as the number of manufacturing company's increases the percentage price variation also increases.⁶ Despite an implementation of price control, price variations among the brands still exist.⁹

Pharmaceutical companies are promoting their brands to the physicians with profitable offers.¹⁰ In India, most physicians use brand names while prescribing drugs and are unaware of other brands and the wide variation in prices that exists.¹¹ There is an urgent need for the government to regulate the prices of these commonly used drugs.¹²⁻¹⁴ Also, providing a drug manual to the physicians with information on the various available brands and their prices would be helpful too. Most patients are non-compliant and stop taking their drugs as it becomes expensive for them. This largely impacts the health of the patient, eventually the morbidity and mortality. Hence, adherence to treatment regimen can be increased by prescribing cost-effective drugs.¹⁵

The strength of this study is that the sources of information were obtained from both CIMS and IDR and included single as well as combination therapies. The limitation is that some miscellaneous oral anti-diabetic drugs and Insulin are not included in this study.

CONCLUSION

Our study showed that there is very high price variation for oral anti-diabetic drugs by different brands available in the Indian market. Since diabetes mellitus is a chronic illness, cost of the drug plays an important role in compliance to the treatment regimen. It is necessary to bring awareness among the physicians, pharmaceutical companies and the regulatory bodies regarding this wide variation in prices, such that the drug costs can be reduced and made more affordable to the common man.

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