Original Research Article

Cost variation analysis of commonly prescribed anti-diabetic drugs available in Indian market: a pharmaco-economic study

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ABSTRACT

Background: Diabetes mellitus (DM) is a chronic metabolic disorder requiring lifelong treatment. Due to rapid expansion of urbanization, unhealthy diet habits and sedentary lifestyle, the incidence of DM is increasing. The chronic nature of DM causes significant personal suffering and economic difficulty to families. The was aimed at investigating the cost difference in various brands of the same oral anti-diabetic drug.
Methods: The minimum and the maximum cost in rupees (INR) of a particular anti-diabetic drug manufactured by various pharmaceutical companies were obtained from current index of medical specialties (CIMS) website, Indian drug review (IDR) 2021 issue and National pharmaceutical pricing authority-pharma sahi daam. The cost ratio and percentage cost variation were noted for each brand.
Results: Amongst single drug therapy, metformin 500 mg sustained release showed highest price variation (3668%). Minimum cost variation was found with glipizide 2.5 mg (65%). Amongst the fixed dose combinations, highest cost variation was seen with glimepiride 2 mg+metformin 1000 mg (2703%) while minimum cost variation was found with repaglinide 1 mg+voglibose 0.3 mg (29%).
Conclusions: A noticeable cost variation was found in different brands of the same anti-diabetic drug. Prescribing a more expensive brand when a cheaper one is available can burden the patient financially and thus reduce patient compliance. In addition, the Government should also include more anti-diabetic drugs under the price control policy to ensure that affordable and efficacious medicines are available to all.

Keywords: Anti-diabetic agents, Cost variation, Pharmaco-economics, Adherence, Brands

INTRODUCTION

DM is a chronic metabolic disorder requiring lifelong treatment.[1] Due to rapid urbanization, unhealthy diet habits and a sedentary lifestyle, the incidence of DM is increasing.[2] The global DM prevalence in 2019 was estimated to be 9.3% (463 million people) and is expected to rise to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045.[3] In India too, DM is fast gaining the status of a potential epidemic with nearly 65 million diabetic individuals currently diagnosed with the disease.[4]

The chronic nature of DM causes significant personal suffering and economic difficulties to families.[5] Since patients with chronic illnesses often take multiple medications, they are particularly susceptible to medication cost pressures. Patients who are concerned about out-of-pocket medication costs often restrict their use of prescription drugs.[6]

Indian market is predominantly a branded generic market, more than one company sells a particular drug under different brand names apart from the innovator company. Hence, the number of pharmaceutical products available in

the market is very high in the range of 60,000-70,000 products. This situation has led to greater price variation among drugs marketed.[7] Studies suggested that the prescribing doctors have a poor knowledge of cost of drugs. Much more focus is required in the education of physicians about costs and the access to cost information so that they can choose the least costly medication when there are no substantial differences in safety and efficacy between the least and most expensive.[8]

Increasing pharmaceutical costs negatively impacts patients in two ways. First, high direct expenses for those of limited resources may mean a choice between medicines and necessities such as food or clothing. Alternatively, patients who do not take their medicine as directed or go without the potentially beneficial therapies suffer negative health consequences.[9,10] Patients may also sometimes be too embarrassed to tell their physicians when they cannot afford their medicines.[6]

The aim of our study was 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 alongwith their maximum and minimum price.

METHODS

A cross-sectional, observational study was carried out at a tertiary hospital in Western India over 2 months from 1 May 2021 to 31 June 2021 after approval from the institutional ethics committee. The study adhered to the tenets of Declaration of Helsinki. Price in INR of commonly used oral anti-diabetic drugs of same preparation and same strength manufactured by different pharmaceutical companies was obtained from CIMS website, IDR 2021 issue and National pharmaceutical pricing authority-pharma sahi daam . The cost of 10 tablets (pack size) was calculated. The minimum and the maximum cost in INR of a particular anti-diabetic drug manufactured by various pharmaceutical companies of the same strength was noted. The cost ratio defined as the ratio of the costliest brand to that of the cheapest brand of the same drug was calculated as follows,[11]

$$\text{Cost ratio} = \frac{price\ of\ the\ costliest\ brand}{price\ of\ the\ least\ costly\ brand}.$$

Percentage cost variation was calculated as follows,[12]

$$\text{Percentage cost variation} = \frac{maximum\ cost - minimum\ cost}{minimum\ cost} \times 100.$$

From the above two ratios, we assessed how many times more does the costliest brand cost, compared to the cheapest brand. All detailed data was entered in MS excel and values expressed in counts, percentages and ratios.

RESULTS

The cost of 23 commonly used oral anti-diabetic drugs (15 single and 8 combination preparations) manufactured by different pharmaceutical companies were analysed.

Table 1: Cost variation of different brands of oral anti-diabetic agents.

S. No.	Drugs	Strength (mg)	Dosage form (10 tabs)	Number of brands	Lowest cost (INR)	Highest cost (INR)	Cost ratio	Cost variation (%)
1.	Glimepiride	1	Tab	108	5.9	212.59	36.032	3503.22
		2	Tab	108	4.5	117.90	26.20	2520
		3	Tab	27	31.25	150.64	4.82	382.05
		4	Tab	39	38.10	178.4	4.68	368.24
2.	Gliclazide	30	Tab	8	48.9	90	1.84	84.05
		40	Tab	20	15	51.5	3.43	243.33
		60	Tab	10	73.9	126.35	1.70	70.97
		80	Tab	31	25.33	82	3.23	223.73
3.	Glipizide	2.5	Tab	4	2.52	4.15	1.64	64.68
		5	Tab	11	1.43	29.47	20.60	1960.84
		10	Tab	7	7.2	25	3.47	247.22
4.	Glibenclamide	2.5	Tab	5	4.35	12.22	2.80	180.92
		5	Tab	14	2.66	50	18.79	1779.69
5.	Metformin	500	Tab	64	4.4	80	18.18	1718.18
		500	SR	73	7.43	280	37.68	3668.51
		850	Tab	14	7.18	38	5.29	429.25
		850	SR	8	20	43.8	2.19	119
		1000	Tab	27	14.6	48	3.28	228.77

Continued.

S. No.	Drugs	Strength (mg)	Dosage form (10 tabs)	Number of brands	Lowest cost (INR)	Highest cost (INR)	Cost ratio	Cost variation (%)
		1000	SR	59	10	61.15	6.11	511.50
6.	Nateglinide	60	Tab	3	30.76	94	3.05	205.59
7.	Repaglinide	0.5	Tab	7	19.90	88.7	4.45	345.73
		1	Tab	6	39.90	175.1	4.38	338.85
		2	Tab	8	75	231.65	3.08	208.87
8.	Acarbose	25	Tab	7	47.25	88	1.86	86.24
		50	Tab	9	31.85	154	4.835165	383.52
9.	Voglibose	0.2	Tab	101	15.62	251.11	16.07	1507.62
		0.3	Tab	101	18.21	143	7.85	685.28
10.	Miglitol	25	Tab	4	48	146.67	3.05	205.56
		50	Tab	4	102.87	244.67	2.37	137.84
11.	Teneligliptin	20	Tab	118	32.9	210	6.38	538.30
12.	Linagliptin	5	Tab	2	247.5	515	2.08	108.08
13.	Vildagliptin	50	Tab	79	29	284	9.79	879.31
14.	Sitagliptin	50	Tab	3	140	414.28	2.95	195.91
		100	Tab	4	254.28	450	1.76	76.97
15.	Pioglitazone	7.5	Tab	10	29.7	77.31	2.60	160.30
		15	Tab	45	12.5	135	10.80	980
		30	Tab	29	20	185	9.25	825

Table 2: Cost variation of fixed drug combinations of oral anti-diabetic agents.

S. No.	Fixed drug combination	Strength (mg)	Dosage form (10 tabs)	Number of brands	Lowest price (INR)	Highest price (INR)	Cost ratio	Cost variation (%)
1.	Glimepiride+ metformin	1+500	Tab	168	9	111.65	12.40	1140.55
		1+500	SR	32	11.2	98.4	8.78	778.57
		1+1000	Tab	82	32.8	131.8	4.01	301.82
		1+1000	SR	14	31.9	143.33	4.49	349.31
		2+500	Tab	166	10.77	175.2	16.26	1526.74
		2+500	SR	29	18.68	235.94	12.63	1163.06
		2+1000	Tab	97	15.3	429	28.03	2703.92
		2+1000	SR	16	33.90	159.50	4.70	370.50
2.	Glimepiride+ metformin+ pioglitazone	1+500+7.5	Tab	20	25	96.25	3.85	285
		1+500+15	Tab	96	20	167	8.35	735
		2+500+7.5	Tab	26	27.3	122.7	4.49	349.45
		2+500+15	Tab	101	20	202	10.10	910
		2+500+30	Tab	3	89	121.25	1.36	36.23
3.	Voglibose+ metformin+ glimepiride	0.2+500+1	Tab	100	20	202.5	10.12	912.50
		0.2+500+2	Tab	101	20	224.66	11.23	1023.30
		0.3+500+1	Tab	38	88.50	210	2.37	137.28
		0.3+500+2	Tab	44	80	260	3.25	225
4.	Gliclazide+ metformin	60+500	Tab	19	43	145	3.37	237.20
		80+500	Tab	86	26.9	500	18.58	1758.73
5.	Glipizide+ metformin	5+500	Tab	17	6.72	140.52	20.91	1991.07
6.	Teneligliptin+ metformin	20+500	Tab	115	47.17	163.33	3.46	246.25
		2+1000	Tab	80	50.62	170	3.35	235.83
7.	Voglibose+ metformin	0.2+500	Tab	85	30.90	283.87	9.18	818.67
		0.3+500	Tab	59	34	318	9.35	835.29
8.	Repaglinide+ voglibose	1+ 0.2	Tab	4	128	165	1.28	28.90
		1+0.3	Tab	5	131	165	1.25	25.95

Table 3: Ceiling price of oral anti-diabetic drugs under price control by NPPA, GOI.

S. No.	Drugs	Strength (mg)	Dosage form	Number of tablets	Ceiling price (INR/unit)
1.	Glimepiride	1	Tab	1	3.60
		2	Tab	1	5.72
2.	Metformin	500	Tab	1	1.51
		500	SR	1	1.92
		750	Tab	1	3.05
		750	SR	1	2.40
		1000	Tab	1	3.61
		1000	SR	1	3.66

Single drug preparations

Among single drug preparations, a total 15 commonly used preparations were analysed (Table 1). The highest percentage cost variation was found for metformin 500 mg sustained release (3668%). Other significance high cost variations were glimepiride 1 mg (3503%), gimipiride 2 mg (2520%), glipizide 5 mg (1960%), glibenclamide 5 mg (1779%) and metformin 500 mg (1718%). The minimum cost variation was found with glipizide 2.5 mg (65%) followed by gliclazide 60 mg (71%), sitagliptin 100 mg (77%), gliclazide 30 mg (84%) and acarbose 25 mg (86%).

Maximum number of brands is available for glimepiride 1 mg and 2 mg (108 brands each) followed by teneligliptin 20 mg (118 brands), voglibose 0.2 mg and 0.3 mg (101 brands). Minimum number of brands were available for linagliptin 5 mg (2 brands) followed by sitagliptin 50 mg and nateglinide 60 mg (3 brands each). The most expensive was sitagliptin 100 mg (₹ 450) followed by sitagliptin 50 mg (₹ 414) and metformin 500 mg SR (₹ 280). Minimum cost was of glipizide 5 mg (₹ 1.43) followed by glipizide 2.5 mg (₹ 2.52) and gliclazide 5 mg (₹ 2.66).

Fixed dose combinations

Amongst fixed dose combinations, a total of 8 commonly used combination preparations were analyzed (Table 2). The maximum cost variation was found for glimepiride 2 mg+metformin 1000 mg (2703%). Other significant high cost variations were glipizide 5 mg+metformin 500 mg (1991%), gliclazide 80 mg+metformin 500 mg (1758%), glimepiride 2 mg+metformin 500 mg (1527%) and glimepiride 2 mg+metformin 500 mg SR (1163%). While minimum cost variation was found in repaglinide 1 mg+voglibose 0.3 mg (26%) followed by repaglinide 1 mg+voglibose 0.2 mg (29%), glimepiride 2 mg+metformin 500 mg+pioglitazone 30 mg (36%), voglibose 0.3 mg+metformin 500 mg+glimepiride 1 mg (137%) and voglibose 0.3 mg+metformin 500 mg+glimepiride 2 mg (225%).

Maximum number of brands were available for glimepiride 1 mg+metformin 500 mg (168 brands) followed by

glimepiride 2 mg+metformin 500 mg+pioglitazone 15 mg and voglibose 0.2 mg+metformin 500 mg+glimepiride 2 mg (101 brands each). Minimum number of brands were available for glimepiride 2 mg+metformin 500 mg+pioglitazone 30 mg (3 brands) followed by repaglinide 1 mg+voglibose 0.2 mg (4 brands). Maximum price was of gliclazide 80 mg+metformin 500 mg (₹ 500) followed by voglibose 0.3 mg+metformin 500 mg (₹ 318) and voglibose 0.3 mg+metformin 500 mg+glimepiride 2 mg (₹ 260). Minimum cost was of glipizide 5 mg+metformin 500 mg (₹ 6.72) followed by glimepiride 1 mg+metformin 500 mg (₹ 9) and glimepiride 2 mg+metformin 500 mg (₹ 10.77).

DISCUSSION

In the present study, a noticeable cost variation was found in different brands of the same oral antidiabetic drug. The most commonly prescribed single drug therapy was metformin 500 mg SR.[13] It showed the maximum price variation of 3668%. This was unlike the study by Dharani et al and Mehani et al wherein the maximum cost variation was seen with glimepiride 2 mg and 1 mg respectively.[14,15] The highest cost variation among multiple drug therapy was seen with the combination glimepiride 2 mg+metformin 1000 mg (2703%) unlike the study by Dharani et al and Mehani et al in which maximum cost variation was seen with glimepiride 1 mg+metformin 500 mg.[14,15]

Drug prices in the Indian market are controlled by the NPPA of the Government of India. It fixes the ceiling price of a particular drug based on its essentiality. This prevents pharmaceutical companies from selling medicines from the drugs prices control order (DPCO) list at a price which is higher than the fixed price.[16] Amongst various oral anti-diabetic drugs, only two drugs namely glimepiride and metformin are under DPCO price control (Table 3). Other newer agents frequently prescribed by the treating physician, either alone or in combination, are not under price control. Wealth is not distributed equally. So, the gap between the rich and poor continues to widen in India.[17] The poor and middle classes cannot afford high quality health care like the wealthy.[18] Hence, prescribing doctors should strongly consider drug prices especially in a

developing country like India, where a majority patients are paying out of their pockets for their medical expenses and are not covered by insurance schemes.[8] In India, more than 80% health financing is borne by patients. If an expensive brand is prescribed, patients have to unnecessarily pay more for the same medicine which in turn increases the economic burden on them.[8] This can be prevented by educating the masses about various health insurance facilities available, so that good quality and affordable healthcare can be given to them.

Being a chronic disease, the management of DM requires continuous medical care. Prescribing doctors may not necessarily know the cost of the drugs. Some clinicians also get lured by various incentives provided by the pharmaceutical companies and thus prescribe more expensive drugs when a cheaper alternative is available. Rational use of drugs is defined as patients receiving medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest possible cost.[17] Many brands of a particular drug available for an indication makes the decision complex and less rational. Thus the physician's P drug list should consist of selected safe, efficacious and cost-effective drugs to ensure their rational use.

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. Pharmaco-economics should be given greater emphasis during medical training. Physicians should switch to cost effective therapy and prescribe rationally. Education about health insurance facility should be given to all people. More oral anti-diabetic drugs should be covered under DPCO so that all patients irrespective of their financial condition will be able to afford these medicines. In case of non-compliance to DPCO by pharmaceutical companies, more stringent actions should be ensured.

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