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Pharmacoeconomic evaluation of oral hypoglycemic drugs available in Indian market

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Abstract

Introduction: Diabetes mellitus is chronic metabolic disorder requiring lifelong treatment. Various drugs are available in market with different brand names and with wide variations in the prices. This study is done to find out the percentage variation of cost among different brands of oral hypoglycemic drugs available in Indian market.

Methods: The cost of a particular oral hypoglycemic drug being manufactured by different companies, in the same strength and dosage forms, was referred from "Indian Drug Today (January - March 2017)". The difference between the maximum and minimum prices of same drug was analyzed and percentage variation in the prices and cost ratio were calculated.

Results: In Single drug therapy, among sulfonylurea group of drugs, Glimperide (1 mg) shows maximum price variation of 892%. The price variation of Metformin (500 mg), Pioglitazone (15 mg) and Vildagliptin were 492%, 486.1% & 1.91% respectively. In α -glucosidase inhibitors Voglibose showed maximum price variation of 151.4 %. Among meglitinides, Regaglinide (0.5mg) showed maximum price variation of 93.1%. In combination therapies, Glimperide + Metformin (1 mg + 500 mg) combination showed the maximum variation of 346 %

Conclusion: This study shows a wide variation in the prices of most of the oral hypoglycemic drugs available in India. Physicians have to select cost effective drug reducing the economic burden on population.

Keywords: pharmacoeconomics, oral hypoglycemic drugs, price variation, cost ratio

1. Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia due to defects in insulin secretion, insulin action or both. It was first reported in Egyptian manuscript about 3000 years ago [1]. India had 69.2 million people living with diabetes (8.7%) as per the 2015 data [2] and it is predicted that by 2030, up to 79.4 million individuals may be affected. As diabetes is a chronic disorder, lifelong treatment is required, thus cost associated with this is very large. On an average a person spends 20% of his or her income for the treatment of diabetes per year [3]. The management of type 1 diabetes mellitus depends mainly on insulin, whereas the oral hypoglycemic drugs are the first line treatment for type 2 diabetes mellitus. Selection of oral hypoglycemic drugs as first-line drug or combined therapy should be based on both the pharmacological properties of the compounds like efficacy, safety profile and also on the clinical characteristics of the patient like stage of disease, body weight, BMI [4].

Pharmaceutical market in India has over 20,000 medicine formulations and majority of them are sold under brand names [5]. Due to lack of information on comparative drug prices and quality it becomes difficult for physicians to prescribe most economical treatment [6]. Percentage cost variation is an effective tool to find out the difference between the various brands prescribed by prescriber in the same setting [7]. Information generated from cost analysis studies will be helpful for both the doctors in choosing the correct medicine for their patients and for policy makers in successfully utilizing the available resources [8]. So the present study was done to analyze the variation of cost among different brands of oral hypoglycemic drugs available in the Indian market.

2. Methods

The study was done in the department of pharmacology of a teaching hospital in south India. Indian Drug Today (January - March 2017) was used to analyze the prices of oral hypoglycemic drugs. The cost of a particular oral hypoglycemic drug in the same dose and

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dosage forms being manufactured by different companies was compared. The cost of drugs in Indian rupee (INR) for 10 tablets was calculated for each brand. The difference between the maximum and minimum costs of the same drug manufactured by different pharmaceutical companies was

$$\text{Percentage cost variation} = \frac{\text{Price of most expensive brand} - \text{Price of least expensive brand}}{\text{Price of least expensive brand}} \times 100$$

Cost ratio is calculated by the ratio of most expensive brand to least expensive brand of the same drug^[9]. It helps to know how many times the most expensive formulation is costlier than the least expensive formulation of the same drug.

Exclusion criteria: The drugs manufactured by only one company; drugs with no cost information were excluded. Fixed dose combinations of more than two hypoglycemic agents were also excluded.

Statistical analysis

The data collected was entered in Microsoft Excel 2007. Cost ratio and percentage cost variation were calculated. The data is represented in the form of tables and charts.

3. Results

The prices of total of 19 drugs (11 single and 8 combination preparations) belonging to six different categories were analyzed. Percentage cost variation increases with increase in the no. of manufacturing companies.

Monotherapy

Overall, among the six categories of oral hypoglycemic drugs available in the Indian market, the maximum price variability was seen highest with sulfonylureas (glimepride - 892%) followed by Metformin (492%) which was followed by Pioglitazone (486.1%), α -glucosidase inhibitors (Voglibose 151.4%), meglitinides (Repaglinide 93.1%) and lowest was seen with Vildagliptin (1.91 %) (Figure 1).

The price variation between sulfonylureas was shown in Table 1, Figure 2. In this group, Glimepride (2 mg) showed maximum price variation of 892%, while Glipizide (2.5mg) showed minimum price variation of 8.75%. The cost ratio ranged from 1.1 for Glipizide 2.5mg to 9.92 for Glimepride 2mg. The cost ratio for the most expensive Glimepride and least expensive Glibenclamide was 62.8.

Table 2 shows price variation in Biguanides (Metformin), Thiazolidinediones (Pioglitazone) and Dipeptidyl peptidase – 4 inhibitors (Vildagliptin) groups of drugs. Among these, Metformin (500 mg) & Pioglitazone (15 mg) showed maximum price variation of 492% & 486.1% respectively. Vildagliptin has only one formulation with price variation of 1.91%. The cost ratio of Metformin ranged from 2.01 for 1000mg to 5.92 for 500mg. The cost ratio for the most expensive 1000mg and least expensive 500mg tab was 6.3. The cost ratio of Pioglitazone ranged from 4.7 for 15mg to 5.9 for 30mg. Among the α -glucosidase inhibitors Voglibose 0.2mg showed maximum price variation of 151.4% and Acarbose 50 mg showed minimum price variation of 61.1%. (Table 3) The cost ratio ranged from 1.61 for Acarbose 50mg to 2.51 for Voglibose 0.2mg. The cost ratio for the most expensive Acarbose 50mg and least expensive Voglibose 0.2mg was 3.02. Among Meglitinide group, Repaglinide (0.5 mg) showed maximum price variation of 93.1 % where as Repaglinide 2 mg showed minimum price variation of

calculated. The percentage cost variation and cost ratio were then calculated for each drug. The percentage variation in the cost of the drugs was calculated using the following formula^[5]

13.14%. (Table 4). The cost ratio ranged from 1.13 for Repaglinide 2mg to 2.19 for 1mg. The cost ratio for the most expensive Repaglinide 2mg and least expensive Repaglinide 0.5mg was 3.04.

Figure 3 shows price variation among non sulfonylurea group of drugs.

Combination therapy

In Combination therapy, total 8 combination preparations were analyzed. In this, Glimepride + Metformin (1 mg + 500 mg) combination showed the maximum variation of 346 %, while Vildagliptin + Metformin (50 mg + 500 mg) showed minimum variation of 2.33% (Table 5).

4. Discussion

Diabetes is a complex, chronic illness requiring long duration and expensive treatment. This affects not only patients' quality of life but also imposes huge economic burden to both the family and society. It was evident from literature that rise in burden of diabetes can be due to high price variation among different brands of same drug^[5, 10]. The compliance of patient also is significantly dependent on the cost of the prescribed medicines and higher cost means the compliance will be less^[11]. Selection of cost effective brand will improve the compliance and the consequence of the treatment.

There is a high fluctuation in the minimum and maximum price of oral hypoglycemic agents. In our study Glimepride 2mg (892%) showed the highest price variation followed by Metformin 500mg (492%) among all oral hypoglycemic agents.

The National pharmaceutical pricing authority (NPPA), of Government of India controls drug prices in Indian market. It fixes the ceiling price of a drug based on essentiality of a drug and the pharmaceutical companies fix the price for their products equal to or below the ceiling price for that formulation; however, they cannot sell any medicine given in the drugs prices control order (DPCO) list at a cost higher than that fixed under this order^[12]. The DPCO, 2017 list of price-controlled drugs includes only Glimepride and Metformin. The cheapest Glimepride 1mg in India is for INR 8 per 10 tablets and the costliest for INR 75 per 10 tablets. Thus, a patient on the cheapest Glimepride 1mg would be saving INR 67. Among oral hypoglycemic drugs, only 2 drugs out of the total 11 drugs i.e. Gliclazide (30/60/80 mg) and Metformin 500mg were included in the WHO model list of essential Medicines^[13] while other newer and more effective drugs were not included in the list. There is a huge price variation of 492% with Metformin 500mg even though it is mentioned in WHO model list and DPCO.

Glimepride (1mg) and Metformin (500mg) is the most commonly used fixed dose combination. This also showed high price variation 346% and high cost ratio of 4.46. This is unlike the findings of Jadhav *et al*^[5] who reported glipizide 2.5 mg + metformin 400 mg to have maximum price variation

of 400%

Physicians should thus prescribe the low cost drugs and should not be influenced by pharmaceutical industries. Even though Medical Council of India have insisted on prescribing generic drugs as far as possible, doctors are not writing prescriptions containing only generic or unbranded chemical name of drugs. Often, the physicians and the patients prefer

the expensive brand name drugs because they believe that the generic equivalent is inferior. The costly brand of same generic drug is scientifically proved to be in no way superior to its economically cheaper counterpart [14]. It is necessary that the government has to take some action to regulate the prices which can be affordable by a common man.

Table 1: Price variation among Sulfonylureas

Drug	Dosage form	Dose (mg)	Least expensive price	Most expensive price	Cost ratio	Cost variation (%)
Glibenclamide	Tab	2.5	2.82	6	2.13	113
		5	3.73	10.08	2.7	170.2
Gliclazide	Tab	40	16	37	2.31	131.25
		80	19.5	88.25	4.52	353
Glipizide	Tab	2.5	2.97	3.23	1.1	8.75
		5	4.36	12.8	2.93	194
		10	10.35	22.76	2.2	120
Glimepride	Tab	1	8	75	9.4	838
		2	14	139	9.92	892
		4	36.57	177	4.84	384

Table 2: Price variation among Biguanides, Thiazolidinediones and DPP-4 inhibitors

Drug	Dosage form	Dose (mg)	Least expensive price	Most expensive price	Cost ratio	Cost variation (%)
Metformin	Tab	500	6	35.5	5.92	492
		500	9.9	22.15	2.23	124
		1000	18.9	38	2.01	101
Pioglitazone	Tab	15	11.9	69.75	5.9	486.1
		30	21.9	101.95	4.7	365.5
Vildagliptin	Tab	50	209	213	1.02	1.91

Table 3: Price variation among α -glucosidase inhibitors

Drug	Dosage form	Dose (mg)	Least expensive price	Most expensive price	Cost ratio	Cost variation (%)
Voglibose	Tab	0.2	35	88	2.51	151.4
		0.3	53	102	1.92	92.5
Acarbose	Tab	25	38	61.99	1.63	63.1
		50	65.63	105.71	1.61	61.1

Table 4: Price variation among Meglitinides

Drug	Dosage form	Dose (mg)	Least expensive price	Most expensive price	Cost ratio	Cost variation (%)
Repaglinide	Tab	0.5	29	56	1.93	93.1
		1	48	92	2.19	91.66
		2	78	88.25	1.13	13.14
Nateglinide	Tab	60	30	36.8	1.22	22.6
		120	50	60.6	1.21	21.2

Table 5: Price variation among combination therapy.

Drug	Dosage form	Dose (mg)	Least expensive price	Most expensive price	Cost ratio	Cost variation (%)
Glibenclamide+Metformin	Tab	5 + 500	12	35	2.91	192
Gliclazide +Metformin	Tab	30 + 500	26.9	80	2.97	197.3
		60 + 500	44.1	129	2.92	192.5
Glipizide + Metformin	Tab	80+ 500	35	89	2.54	154.2
		2.5 + 400	5.35	8.9	1.66	66.35
		5 + 500	6.72	12.7	1.89	88.9
Glimepride + Metformin	Tab	1 + 500	18	80.3	4.46	346
		2 + 500	30	108.1	3.6	260
		2 + 1000	45	83	1.84	84.4
		SR	1 + 500	18	48	2.66
Pioglitazone + Metformin	Tab	2 + 500	30	70	2.33	133
		15 + 500	27.3	81.75	2.99	199.5
		30 + 500	48.5	69.55	1.43	43.4
Pioglitazone +Glimepride	Tab	15 + 500	20.9	45.95	2.2	120
		30 + 500	31.9	68.94	2.2	116.1
Pioglitazone +Glimepride	Tab	1 + 15	20.9	50	2.39	139.2

		2 + 15	30.9	53.6	1.73	73.46
Voglibose + Metformin	Tab	0.2 + 500	35.5	63	1.77	77.5
		0.3 + 500	53.5	66	1.23	23.4
Vildagliptin + Metformin	Tab	50 + 500	215	220	1.02	2.33

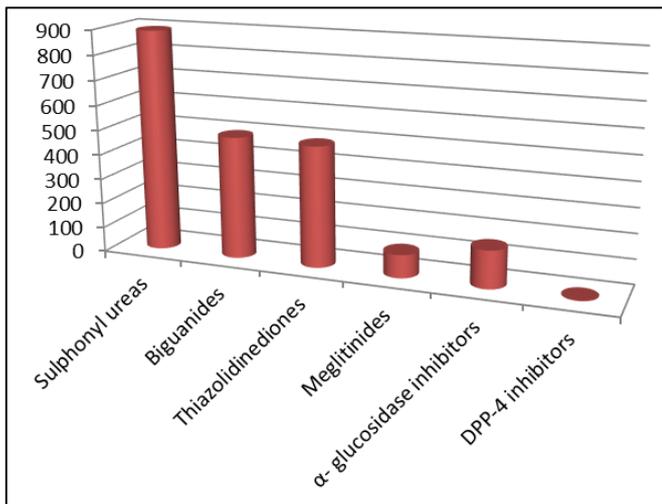


Fig 1: Maximum price variation among different oral hypoglycemic drugs

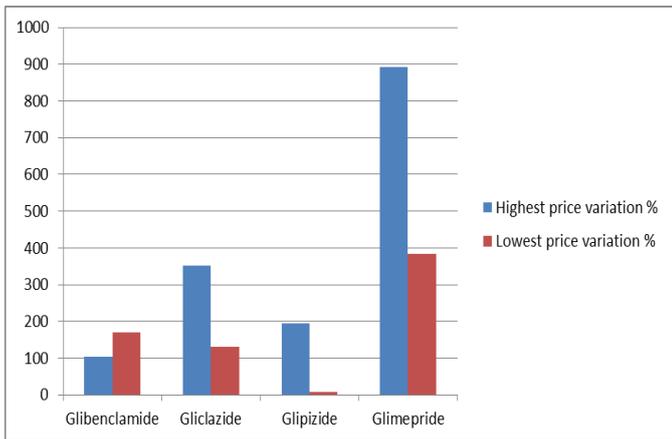


Fig 2: Price variation of different formulations in sulfonylurea drugs

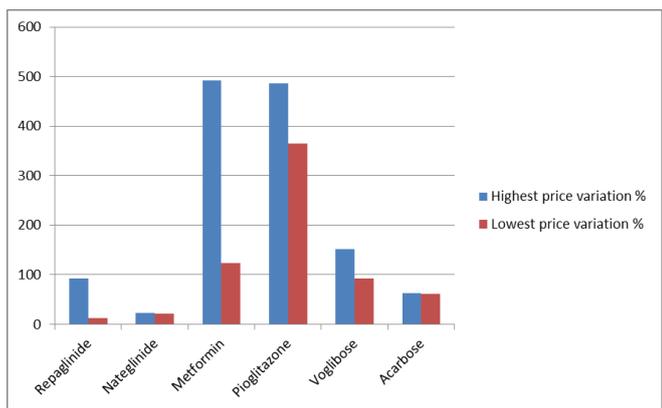


Fig 3: Price variation among non sulfonylurea drugs

5. Conclusion

This study shows a wide variation in the prices of most of the oral hypoglycemic drugs available in India. The health care providers must be aware of the availability of low cost drugs and can select the cost effective oral hypoglycemic drugs based on the economic status of the patient. This reduces the economic burden on the patient and health care system.

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