

A PHARMACOECONOMIC EVALUATION OF COST VARIATION AMONG VARIOUS BRANDS OF ANTI-DIABETIC DRUGS CURRENTLY AVAILABLE IN INDIA

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ABSTRACT

Objective: Diabetes mellitus is a multisystem disorder affecting almost all the organs of the human body. There are a large number of anti-diabetic drugs available in the Indian market. The cost of the drugs plays an important role in patient's care, warranting the essential for all physicians to keep themselves updated with the modern prices and price variation of various brands of anti-diabetic drugs.

Methods: Cost of a exact drug (cost per 10 tablets) in the same strength and amount forms being manufactured by different companies was got from the latest editions of "Current Index of Medical Specialties" and "Indian Drug Review". The percentage price difference and cost ratio for each formulation were intended.

Results: Among non-sulfonylureas, the highest cost variation was found in the drug metformin available in the form of tablet of 500 mg in the Indian pharmaceutical market, a cost ratio of 9.09 was calculated which was highest in the non-sulfonylurea drugs. In sulfonylureas, the highest cost variation was found in the drug glibenclamide having cost ratio of 7.89 in the form of tablet of 5 mg. In combination therapy, the highest percentage cost variation of 432 was found in the fixed-dose combination of glibenclamide+metformin having cost ratio of 5.2.

Conclusion: Our study depicted that there is very high price variation in some of the brands oral anti-diabetic drugs. India being a developing country cannot bear such huge treatment cost of such common lifestyle diseases like diabetes mellitus Type 2. Therefore, a general awareness and proper measures should be taken by controlling authorities, pharmaceutical companies, and treating physicians. Generic prescribing should be promoted in whole country by creating awareness and imposing proper regulatory guidelines.

Keywords: Anti-diabetic drugs, Cost variation, Pharmacoeconomics, Cost ratio.

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INTRODUCTION

In our country, diabetes is a disease of utmost concern as it affects people of all strata in the society. It affects poor and rich people irrespective of their economic status and runs in families. Furthermore, lifestyle of persons also makes them susceptible to DM Type 2 like sedentary lifestyle and poor eating habits like eating more junk and fast foods and not doing proper physical activity as required in their daily routine. Thus, antidiabetic drugs become very important for our country and their price and availability should always be regulated by the concerned regulatory agencies.

This is a disease having increased blood sugar heights (fasting plasma glucose 126 mg/dL and/or 200 mg/dL 2 h after 75 g oral glucose), glycosuria, increase lipid levels, negative nitrogenbalance, and seldom increased ketone bodies in blood [1].

The physiological changes mainly seen in diabetes mellitus are either reduced insulin production from beta cells or increased insulin resistance seen in various tissues. These pathophysiologic changes in multiple organ systems cause immense effect on the normal health of the patient [2].

About 80% of the patients suffering after diabetes are obese and have poor food habits [3]. The management of Type 1 disease depends mainly on insulin, whereas the oral hypoglycemic drugs are the main line treatment for Type 2 diabetes mellitus.

Oral antidiabetic drugs should be selected for the patients on the basis of their efficacy, adverse effects, and cost of therapy as the treatment of

diabetes is prolong and affects the normal life of the patient. Choice of oral hypoglycemic agents also depends on the type of patient, that is, his age and weight [4].

There are more than 20,000 formulations available of different pharmaceutical companies under various brand names and also different varying cost [5]. As the prescribing doctor is not aware of the comparative prices of different brands of the same antidiabetic drug, these types of studies are very important for rational prescribing [6]. If we calculate percentage of cost variation, it is an effective measure to find out the difference among the various brands prescribed by prescriber in the same setting [7]. Information generated from cost analysis lessons will be helpful for both the doctors in selecting the precise medicine for their patients and for policymakers in successfully utilizing the available resources [8]. Hence, the present study was done to analyze the variation of cost among different brands of oral hypoglycemic drugs available in India.

People suffering from Type 2 DM are usually more prone to develop macrovascular complications like cardiovascular diseases as well as microvascular changes in retina diagnosed as diabetic retinopathy and also affecting kidney as diabetic nephropathy [9-11]. Due to these problems developed in people, their lifestyle is greatly affected in the form of their work life suffered and also their routine life getting disturbed [12,13].

Impact of diabetes to the society is so much in the form of investigations, treatment, travel expenses, and other lifestyle changes [14].

Table 1: Non-sulfonylurea drugs

Drug	No. of formulations	SR/DSR/DIS/ODT/TAB	Dose (mg)	No. of manufacturing companies	Min. Price (INR)	Max. Price (INR)	%Price variation	Cost ratio		
Metformin	3	ER	500	5	19	22.3	17.3	1.17		
			850	3	37	39	5.4	1.05		
			1000	4	35	44	25.7	1.25		
	SR	500	11	12.83	21	63.6	1.63			
		850	2	33.7	38.7	14.83	1.14			
		1000	11	25.5	40	56.8	1.56			
		250	5	7.7	14.29	85.5	1.85			
		500	19	4.4	40.00	809.09	9.09			
		850	5	11.12	36.29	226.3	3.26			
		1000	6	29.5	38	28.8	1.28			
Voglibose	3	DIS	0.2	2	36.30	64.5	77.6	1.77		
			0.2	2	52.3	95	81.6	1.81		
			0.3	2	66.3	135	103.6	2.03		
			0.2	21	21	85	304.7	4.04		
Vildagliptin	1	TAB	0.3	21	29.5	116	293.2	3.93		
		TAB	50	10	49.9	82	64.3	1.64		
		TAB	0.5	4	22	68	209.09	3.09		
		TAB	1	4	44	95	115.9	2.15		
		TAB	2	3	78	124	58.9	1.58		
		TAB	25	4	50.3	200	297.6	3.97		
		TAB	50	4	90	306	240	3.4		
		TAB	25	3	54.5	83.5	53.2	1.53		
		TAB	50	4	94.5	146	54.49	1.54		
		TAB	100	2	91.27	100.2	9.67	1.09		
		Pioglitazone	1	TAB	7.5	4	44	70.6	60.4	1.604
				TAB	15	14	18.4	79.9	334	4.34
				TAB	30	13	29	91.9	216.8	3.16
Nateglinide	1	TAB	60	3	30.76	86	179.5	2.80		
		TAB	120	3	51.2	157	206.6	3.06		
Miglitol	1	TAB	25	4	50.3	201	299.6	4		
		TAB	50	4	90	306	240	3.40		
Repaglinide	1	TAB	0.5	4	22	68	209	3.09		
		TAB	1	4	44	95	115.9	2.15		
		TAB	2	3	78	124	58	1.58		

Table 2: Sulfonylurea drugs

Drug	No. of formulations	SR/DSR/DIS/ODT/TAB	Dose (mg)	No. of manufacturing companies	Min. Price (INR)	Max. Price (INR)	%Price variation	Cost ratio		
Metformin	3	ER	500	5	19	22.3	17.3	1.17		
			850	3	37	39	5.4	1.05		
			1000	4	35	44	25.7	1.25		
	SR	500	11	12.83	21	63.6	1.63			
		850	2	33.7	38.7	14.83	1.14			
		1000	11	25.5	40	56.8	1.56			
		250	5	7.7	14.29	85.5	1.85			
		500	19	4.4	40.00	809.09	9.09			
		850	5	11.12	36.29	226.3	3.26			
		1000	6	29.5	38	28.8	1.28			
Voglibose	3	DIS	0.2	2	36.30	64.5	77.6	1.77		
			0.2	2	52.3	95	81.6	1.81		
			0.3	2	66.3	135	103.6	2.03		
			0.2	21	21	85	304.7	4.04		
Vildagliptin	1	TAB	0.3	21	29.5	116	293.2	3.93		
		TAB	50	10	49.9	82	64.3	1.64		
		TAB	0.5	4	22	68	209.09	3.09		
		TAB	1	4	44	95	115.9	2.15		
		TAB	2	3	78	124	58.9	1.58		
		TAB	25	4	50.3	200	297.6	3.97		
		TAB	50	4	90	306	240	3.4		
		TAB	25	3	54.5	83.5	53.2	1.53		
		TAB	50	4	94.5	146	54.49	1.54		
		TAB	100	2	91.27	100.2	9.67	1.09		
		Pioglitazone	1	TAB	7.5	4	44	70.6	60.4	1.604
				TAB	15	14	18.4	79.9	334	4.34
				TAB	30	13	29	91.9	216.8	3.16
Nateglinide	1	TAB	60	3	30.76	86	179.5	2.80		
		TAB	120	3	51.2	157	206.6	3.06		
Miglitol	1	TAB	25	4	50.3	201	299.6	4		
		TAB	50	4	90	306	240	3.40		
Repaglinide	1	TAB	0.5	4	22	68	209	3.09		
		TAB	1	4	44	95	115.9	2.15		
		TAB	2	3	78	124	58	1.58		

METHODS

The study was done in the department of pharmacology of a teaching hospital in central India. Cost per 10 tablets of a drug, in the same strength and dosage forms, was got from latest editions of "Current Index of Medical Specialties" and "Indian Drug Review". The price difference was analyzed and from the data obtained, the percentage cost variation and cost ratio for each drug were then calculated. The percentage difference in the cost of the drugs was calculated by the following formula [5].

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 luxurious brand to least expensive brand of the same drug [15]. It helps to know how numerous times the record expensive formulation is costlier than the least expensive one of the same drug. Fixed dose combinations of more than two hypoglycemic agents were also included in the study. The drugs manufactured by only one company and drugs with no cost information were excluded from this study.

Statistical analysis

The data collected were arrived in Microsoft Excel 2013. Cost ratio and percentage cost variation [16] were calculated. The data are represented in the form of tables.

RESULTS

Total 17 drugs were analyzed out of which 12 were single and five were in the form of fixed-dose combinations.

Monotherapy

Single drugs were broadly classified in two groups, that is, sulfonylureas and non-sulfonylureas (Tables 1 and 2). Among non-sulfonylureas, the highest price variation was found in the drug metformin available in the form of tablet (500 mg), a cost ratio of 9.09 was calculated which was again significant. After metformin, the next drug was pioglitazone in the form of tablet (15 mg) followed by drug voglibose in the form of tablet of 0.2 mg having cost ratio of 4.04. Drug miglitol was also found to have percentage cost variation of 299.6 in the form of tablet of 25 mg. Vildagliptin was found to have cost ratio of 3.97 in the form of tablet of 25 mg, which also shows significant cost variation.

In sulfonylureas, the drug glibenclamide was having cost ratio of 7.89 in the form of tablet (5 mg), followed by drug gliclazide having cost ratio of 4.45 in the form of tablet (30 mg.)

Combination therapy

A total of 5 drug combinations were analyzed and the highest % cost variation of 432 was found in tablet of glibenclamide+metformin having cost ratio of 5.2. (Table 3) followed by glimipiride+metformin.

DISCUSSION

Indian population contributes greatly in the sales of drugs for the above-mentioned disease. Furthermore, we are having large number of patients suffering from diabetes; these patients come from all the economic backgrounds. It is a complex, chronic illness requiring prolonged and expensive treatment. This affects not only patients' quality of life but also levies huge economic burden to both the family and society [5,17].

In our study, we found that the highest variation was found in the drug metformin available in the form of tablet of 500 mg which

Table 3: Fixed dose combinations

Drug	No. of formulations	SR/DSR/DIS/ODT/TAB	Dose (mg)	No. of manufacturing companies	Min. Price (INR)	Max. Price (INR)	%Price variation	Cost ratio
Metformin	3	ER	500	5	19	22.3	17.3	1.17
			850	3	37	39	5.4	1.05
			1000	4	35	44	25.7	1.25
	SR		500	11	12.83	21	63.6	1.63
			850	2	33.7	38.7	14.83	1.14
			1000	11	25.5	40	56.8	1.56
			250	5	7.7	14.29	85.5	1.85
			500	19	4.4	40.00	809.09	9.09
			850	5	11.12	36.29	226.3	3.26
	TAB		500	6	29.5	38	28.8	1.28
			1000	6	29.5	38	28.8	1.28
			250	5	7.7	14.29	85.5	1.85
500			19	4.4	40.00	809.09	9.09	
850			5	11.12	36.29	226.3	3.26	
1000			6	29.5	38	28.8	1.28	
Voglibose	3	DIS	0.2	2	36.30	64.5	77.6	1.77
			0.2	2	52.3	95	81.6	1.81
			0.3	2	66.3	135	103.6	2.03
			0.2	21	21	85	304.7	4.04
Vildagliptin	1	TAB	0.3	21	29.5	116	293.2	3.93
			50	10	49.9	82	64.3	1.64
			0.5	4	22	68	209.09	3.09
			1	4	44	95	115.9	2.15
			2	3	78	124	58.9	1.58
			25	4	50.3	200	297.6	3.97
			50	4	90	306	240	3.4
			25	3	54.5	83.5	53.2	1.53
			50	4	94.5	146	54.49	1.54
			100	2	91.27	100.2	9.67	1.09
			Pioglitazone	1	TAB	7.5	4	44
15	14	18.4				79.9	334	4.34
30	13	29				91.9	216.8	3.16
Nateglinide	1	TAB	60	3	30.76	86	179.5	2.80
			120	3	51.2	157	206.6	3.06
Miglitol	1	TAB	25	4	50.3	201	299.6	4
			50	4	90	306	240	3.40
Repaglinide	1	TAB	0.5	4	22	68	209	3.09
			1	4	44	95	115.9	2.15
			2	3	78	124	58	1.58

is similar to the finding of the study done by Dupaguntla and Gujjarlamudi [16].

After metformin, the next drug was pioglitazone in the form of tablet of 15 mg which was also the finding of study done by Dupaguntla and Gujjarlamudi [16].

Industries responsible for the manufacturing of these drugs are promoting their brands with profitable offers [18].

In India, mostly brand names are used and physicians are unaware of other brands and the wide variation in prices that exists [19].

There is an urgent essential for the government to control the prices of these commonly used drugs [17,20,21].

The limitation of the study is that certain miscellaneous oral anti-diabetic medications and insulin are not included in this study.

If the cost of drugs is very high, it becomes difficult for the patients to continue their treatment for longer time. This largely impacts the fitness of the patient, eventually the morbidity and mortality. Hence, adherence to treatment regimen can be enlarged by prescribing cost-effective drugs [22,23].

CONCLUSION

Our study depicted that there is very high price variation in some of the brands. India being a developing country cannot bear such huge treatment cost of such common lifestyle diseases like diabetes mellitus Type 2. Therefore, a general awareness and proper measures should be taken by controlling authorities, pharmaceutical companies, and treating physicians. Generic prescribing should be promoted in whole country by creating awareness and imposing proper regulatory guidelines.

CONTRIBUTION

None declared.

CONFLICTS OF INTEREST

None declared.

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