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COMPARISON OF COST EFFECTIVENESS OF MEDICAMENT IN ANTI-DIABETIC PATIENT

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ABSTRACT
Diabetes is fast gaining the status of a potential epidemic in India, with >62 million individuals currently diagnosed with the disease. India currently faces an uncertain future in relation to the potential burden that diabetes may impose on the country. The diabetes mellitus type- II (T2DM) in India, many interventions can reduce the burden of this disease. A prospective cross-sectional study was performed to assess the cost-effectiveness of antidiabetic drugs in patients with T2DM. Face-to-face interviews were conducted by using a validated questionnaire in a total of 45(29 males, 16 females) patients with T2DM from GMC Hospital Gondia, RH Tirora, RH Goregaon. Cost-effectiveness was determined on the basis of cost of antidiabetic drug/s, efficacy, adverse drug reactions, safety of administration, frequency of administration, and bioavailability. The treatment of T2DM in participants, Glibenclamide And Metformin HCl costed least (Rs.3.3) per unit of effectiveness followed by Glimepiride (Rs.11.2), Gliclazide (Rs.10.8), Metformin(Rs.11.9), and Glipizide (Rs.5.7).

KEYWORDS: Antidiabetic, Cost-effectiveness, Diabetes mellitus.

INTRODUCTION
Diabetes mellitus has been recognized as the greatest challenge for all health care systems. Care of diabetes presents a high burden for individuals and society.[1,2] People with diabetes are at increased risk of macrovascular and microvascular complications and are more likely than people without diabetes to have other cardiovascular problems. "Pharmaco-economic analysis compares two or more medication options or strategies in terms of their cost and outcome or benefit".[3] Drug utilization research is collection of descriptive and analytical methods for the quantification, understanding and evaluation of the processes of prescribing, dispensing, and consumption of medicines, the testing of interventions to enhance the quality of this process, drug utilization controlling cost is the basic issue, national budget, which is crucial in developing countries resources are limited. Prescribing pattern helps in evaluating local consumption resistance pattern for optimized therapeutic effect of medications.[4] As per the author knowledge very few studies available that compared the cost of drug across the different brands. Present study aimed to compute the costs and percentage price variation of oral hypoglycaemic agents across the different brands available in the Indian market. India currently faces an uncertain future in relation to the potential burden that diabetes may impose on the country. It is important to conduct studies focusing on economic evaluations to make evidence based health decisions and, consequently, to offer the best risk and cost-effective treatment choices along with better quality of life for patients with diabetes.[5] Present study was designed to assess the cost-effectiveness of antidiabetic drugs in patients.

MATERIALS AND METHODS
A study was conducted at hospital in Government Medical College, Gondia district, Rural Hospital, Tirora and Rural Hospital, Goregaon for a period of 2 months. 45 patients who satisfy the inclusion criteria were recruited during the study period. Information related to cost of each parameter were collected from the in-patient pharmacy as well as financial department. All of the earlier mentioned data were assembled in a specific pre-design collection form. The assembled data was introduced to cost effectiveness analysis to arrive at the cost of different treatments options.[6]

1. The retail cost of a particular drug being manufactured by different companies, in the same strength, number and dosage form was compared.
2. The difference in the maximum and minimum price of the same drug manufactured by different pharmaceutical companies was calculated.
3. The percentage variation in price was calculated.
4. The drugs being manufactured by only one company or being manufactured by different companies however, in different strengths were excluded.

The percentage variation in price was calculated using the following formula[2]

Price of most expensive brand − Price of least expensive brand × 100

Price of least expensive brand

Cost- effectiveness calculations[2]

1) Cost effectiveness calculations were done by following method.

- Bioavailability: It was identified from the standard pharmacology textbook.
- Tolerability: Percentage adverse drug reactions (ADR) were determined by following formula=

(Number of adverse drug reactions/Number of patients on thetreatment)×100

- Tolerability was calculated as=100-%ADR

2) Efficacy: Efficacy calculations were done by following formulas.

- Fasting blood glucose (FBG) efficacy. (Participants'FBG–130)/1.3
- Post pran dialglucose (PPG) efficacy. (Participants' PPG–180)/1.8
- Drug efficacy for single patient = (FBG efficacy+ PPG efficacy)/2
- Average efficacy for a treatment = total efficacy for treatment/number of patients on that treatment.

3) Effectiveness of a treatment option = Sum of all criterionrating,

- Where (Criterion Rating=Criterion value×Assigned weight).
- Assigned weights were based on the earlier study done byAbdulganiyu.[11]

4) Cost effectiveness Analysis (CEA) was done by following method:

- Anti-diabetic therapy is a lifelong management but follow up visit to physician is every 2-3 months. So for all treatments, the duration of therapy was considered as 2 months for calculations of cost effectiveness.
- CEA= (Total cost for a treatment option for 2 months/ Effectiveness of the treatment option).

This was done and compared for each ant diabetic treatment option presently prescribed for the respondents in this study.

Sensitivity analysis was performed to test whether the decisions change when specific variable (e.g. cost, effectiveness) were altered within reasonable range (10-25%) in favor of less cost-effective option in the management of type 2diabetes

RESULTS AND DISCUSSION

The demographic parameters of participants from Gondia district shown in Table no. 1. Total 45 patients were included in study of Gondia Medical College, Gondia, RH Goregaon and RH Tirora. The age of patients was in between 46-64 years. Effective criteria rating for was higher than Glimepiride (95.6), Gliclazide (88.4), Glibenclamide + Metformin (90.8), Metformin (80.9), Glipizide (73.2) shown in Table No.-2. Treatment of T2DM Glibenclamide and Metformin HCl costed least (Rs.3.3) per unit of effectiveness followed by Glipizide (Rs. 5.7), Gliclazide (Rs. 10.8), Glimepiride (Rs.11.2) and Metformin (Rs.11.9) were shown in Table-2 and 3. Sensitivity analysis by assuming 25% increase and 25% decrease cost, indicated that the decision remains valid. In participants effectiveness for Glibenclamide and Metformin HCl costed least (95.6%) per unit of effectiveness followed by Glipizide (90.8%), Gliclazide (88.4%), Glimepiride (95.6%), Metformin (80.9%) shown in Table-4. This is in agreement with UKPDS report which established that, although relatively effective in the short term, oral agent monotherapy with sulfonylureas or metformin is insufficient to maintain glycemic control against the relentless background of progressive beta cell failure. The addition of metformin to a sulfonylurea generally provides only temporary respite and many patients require further additional therapies.[6,7]

Cost effectiveness analysis results were line with the effectiveness of treatments used in the present study Glibenclamide and Metformin HCl costed least (Rs.3.30) per unit of effectiveness followed by Glipizide (Rs. 5.70), Gliclazide (Rs. 10.80), Glimepiride (Rs.11.20), Metformin (Rs.11.90). The cost effectiveness analysis could help to make decisions about whether new drugs should be included in a drug formulary list where decisions are made. These decisions are made based on the principle that if a drug is not better than a comparable product, it should not cost more, if it is superior to existing therapies but more expensive and funds are available, any extra expenditure should represent "value for money". The present finding is significant because it has given a guide to institutional treatment and formulary system development for anti-diabetic therapy based on cost effectiveness. This Pharmaco- economic approach is presently lacking in Indian public and private Hospitals.

Table 1: Demographic profile of anti-diabetic patient.

CHARACTERISTICS	VALUE
MALE	26(57.77%)
FEMALE	19(42.22%)
AGE	46-64 YEARS
INCOME	
<12000	24(Rular area)
>12000	19(Urban Area)

Table 2: Variation in cost of single drug therapy.

Drug	Brand Formulation	Dose (mg)	Manufacturing Companies	Minimum cost (INR)	Maximum cost (INR)	% variation in cost
Acarbose	2	25	8	30.01	44	46.18
		50	7	75	120	71.43
Glibenclamide	2	2.5	5	2.66	3.53	32.71
		5	4	3.73	4.44	19.03
Gliclazide	4	30	11	23.70	70	195.36
		40	7	9.13	25	173.82
		60	10	35	96.80	176.57
		80	34	25	94.94	279.76
Glimperide	4	1	43	8.90	67	652.80
		2	40	15	89.50	496.67
		3	8	40	131	227.50
		4		29.90	139.50	366.56
Glipizide	3	2.5	6	2.94	9.35	219.11
		5	14	4.74	13.03	174.89
		10	5	18	25	38.88
Metformin	4	250	7	7.40	9	21.62
		500	48	6.45	48	644.18
		850	18	10.85	36.50	236.40
		1000	34	17.50	59.17	238.11
Miglitol	2	25	8	50	78.70	57.40
		50	14	90	147.50	63.30
Pioglitazone	3	7.5	35	39.45	50.40	27.75
		15	40	12	70	483.30
		30	40	20.50	112	446.34
Repaglimide	3	0.5	6	22	48.40	120
		1	4	44	78.90	79.30
		2	4	78	124.80	60
Voglibose	2	0.2	12	19.50	80	310.25
		0.3	9	29.50	110	272.88

Table 3: Effectiveness of a treatment options used in the study.

Criteria	Assigned value	Glimepiride N=33		Metformin N=38		Glipizide N=20		Gliclazide N=7		Glibenclamide and metformin HCl N=12	
		value	Criteria rating	value	Criteria rating	value	Criteria rating	value	Criteria rating	value	Criteria rating
Efficacy	0.4	94	37.6	94	37.6	68	27.2	85	34	93	37.2
Tolerability	0.2	90	18	86.6	17.3	100	20	100	20	90	18.6
Safety	0.1	100	10	100	10	100	10	100	10	100	10
Frequency	0.1	100	10	50	5	50	5	50	5	100	10
Bioavailability	0.2	100	20	55	11	56	11.2	97	19.4	75	15
Sum	1		95.6		80.9		73.2		88.4		90.8

Table 4: Cost effectiveness analysis of treatment option used in the study.

Treatment Option	Frequency per day	Cost for one tablet	Daily cost	Cost for 2 months	Criteria value	Cea	Increase 25% cost	Decrease 25% cost	Cea with 25% more	Cea with 25% more
Glimepiride	1	7	18	1080	95.6	11.2	1350	810	14	8.4
Metformin	2	4	16	960	80.9	11.9	1200	720	14.8	8.9
Glipizide	1	2	7	420	73.2	5.7	525	315	7.1	4.2
Gliclazide	2	8	16	960	88.4	10.8	1200	720	13.5	8.1
GlibenclamideAnd Metformin HCl	1	5	5	300	90.8	3.3	375	225	4.1	2.4

Table 5: Variation In Cost of Combination Therapy.

Drug combination	Formulation (n)	Dose (mg)	Manufacturing companies	Minimum cost(INR)	Maximum cost(INR)	Percentage in cost (%)
Glibenclamide+ metformin	3	2.5+400	8	8.15	19	133.33
		2.5+500	2	16	26	62.50
		5+500	12	12	29.9	149.16
Gliclazide+ metformin	4	40+500	3	35	60	71.43
		30+500	3	32	59	84.37
		60+500	5	39.25	68.50	74.52
		80+500	43	18.10	78.25	332.32
Glimepride+ metformin	4	1+500	50	18	69	283.33
		2+500	53	26	120.4	362.07
		1+1000	2	38	41.75	9.86
		2+1000	4	51.8	60	15.83
Glipizide+ Metformin	1	5+500	11	6.72	14	108.33
Pioglitazone+ Glimiperide	2	15+1	12	17.1	59.3	246.78
		15+2	15	41.9	70	67.06
Pioglitazone+ Metformin	2	15+500	34	19	70.6	271.57
		30+500	21	32.40	86	165.43
Voglibose+ Metformin	2	0.2+500	8	20	85	325
		0.3+500	12	39.60	99	150

CONCLUSION

The work provides evidence based information that could be used to change prescription practice- irrational prescription of less cost-effective anti- diabetics over more cost-effective ones, by using the information for Educational intervention at prescribers' and managerial levels. The resultant effect will be cost savings in drug therapy. The use of valid economic evaluation methods to measure the value and impact of new services can increase acceptance of such programs by the medical profession, third party payers and consumers.

REFERENCES

1. Anjali D Deshpande, Epidemiology of Diabetes and Diabetes-Related Complications Phys Ther., Nov, 2008; 88(11): 1254–1264.
2. About Diabetes. Available at: http://www.who.int/ diabetes/publications/diabetes_booklet/en/ Accessed on 19 September 2016.
3. AdanelaMusaraj et,al., Pharmaco-economics analysis, as a strategy on facilitating choices between health and non-health programs in the establishment of the national health care system, Alexandria Journal of Medicine, March 2014; 50(1): 1-6.
4. Sharonjeet Kaur, Prescribing Pattern & Cost-Identification Analysis of Antimicrobial Use in Respiratory Tract Infections JKSCIENCE, January-March 2013; 15(1). www.jkscience.
5. Aikaterini Trikkalinou et, al., Type 2 diabetes and quality of life, World J Diabetes, Apr 15, 2017; 8(4): 120–129.
6. Ashley N. Newton, A Comprehensive Cost-Effectiveness Analysis of Treatments for Multiple Sclerosis, *Int J MS Care*. Fall, 2011; 13(3): 128–135.
7. Turner RC, Cull CA, Frighi V, Holman RR. Glycemic control with diet, sulfonylurea, metformin, or insulin in patients with type 2 diabetes mellitus: progressive requirement for multiple therapies (UKPDS).
8. UK Prospective Diabetes Study (UKPDS) Group. JAMA, 1999; 28: 2005–12. Prospective Diabetes Study Group. Diabetes Care. 1998; 21: 87–92.