

COST – EFFECTIVENESS ANALYSIS OF ANTIHYPERTENSIVE DRUGS AVAILABLE IN INDIAN MARKET

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ABSTRACT

Objective: Rising cost of medical therapy is a major concern for patients, and there is high variability in the prices of numerous branded medicines available in India especially in life style diseases like hypertension. Thus, a cost analysis study was carried out to assess the brand price variations in the oral antihypertensive drugs available either singly or in combination and number of manufacturing companies for each, also to evaluate the difference in cost of different brands of same active drug by calculating percentage variation of cost.

Materials and Methods: The cost of different brands of commonly used antihypertensive drugs was sorted out by referring latest “Current

Index of Medical Specialties” October – December 2016, “Indian Drug Review” (IDR) 2016, Monthly Index of Medical Specialties December 2016. The cost of 10 dosage forms (Tablets / capsules) in INR of each brand, Cost Ratio and Percentage Cost Variation were calculated.

Results: The percentage variation in the cost was above 100% with most of the commonly used antihypertensive drugs like Amlodipine (5 mg): 864.70%, Atenolol (25mg): 412.33%, Telmisartan (40 mg) 277.38% and Enalapril (10 mg) 520.08%. Among the combination therapy, Amlodipine + Atenolol (5 + 50 mg): 490.37%, Amlodipine + Losartan (5 + 50 mg): 440%, Atenolol + Hydrochlorothiazide (50 + 12.5 mg) 504.82% Telmisartan + Hydrochlorothiazide (80 + 12.5 mg): 401.67%, Losartan + Hydrochlorothiazide (50 + 12.5 mg): 200.16% variation. **Conclusion:** Despite the implementation of price control, brand price variations still exist widely for commonly used drugs. Re-assessment of pricing policy and implementation of quality norms is needed.

KEYWORDS: Pharmacoeconomics, Price control, Brands, Price variation.

INTRODUCTION

Hypertension is a public health problem and in the year 2000 hypertension was estimated to affect almost one billion patients worldwide and the prevalence is predicted to increase by approximately 60% by 2025 representing an increase from 26.4% in 2000 to 29.2% in 2025 worldwide.^[1] Several factors like socioeconomic status, social habits, sedentary life style, food and poor self-health maintenance can lead to the development of hypertension.^[2] Uncontrolled hypertension leads to severe long-term consequences such as stroke, heart failure, coronary heart disease and end-stage kidney disease. It is commonly associated with diabetes mellitus. Hypertension related deaths constitute one third of global mortality cases and there is scientific evidence to suggest that such adverse outcomes can be prevented by lowering blood pressure effectively.^[3]

In addition to the large health burden, there is also an enormous financial burden associated with the disease.^[4] Hypertension has been estimated to cost about 4.5% of the global disease burden.^[1] Prices of prescription can affect users, suppliers and most importantly payers in health care system.^[5] In fact, several studies have indicated that therapeutic compliance is influenced by drug prices.^[6] Thus; the cost of therapy may be a barrier in controlling high blood pressure and should be an important consideration in selecting antihypertensive medication.

Pharmaco-economics plays an important role in practice of medicine in developing countries. Cost of drugs is an important factor influencing compliance with treatment of disease and also constitutes an essential part of rational drug prescription. Pharmaceutical Industry has many branded formulation of the same drug with large difference in selling price. In India, most of the drugs are available in brands and these are also prescribed by clinician mostly in brand name. This may affect the patient's finance adversely if costly brand is prescribed specially in diseases like hypertension which need treatment for longer duration.^[7] The out of pocket expenditure in India is highest on antihypertensive drugs i.e., 64%.^[8]

Very few studies are available in Indian scenario, which compare the cost of drugs of different brands. Therefore, we decided to carry out the study which compares the cost of different brands of drugs used for the treatment of one of the most common disorder, hypertension. The study here focuses on cost effectiveness analysis on different available brands of antihypertensive drugs in India.

METHODS

Cost of a particular antihypertensive drug (Cost per 10 tablets/ capsules) in the same strength and dosage forms being manufactured by different companies was obtained from latest “Current Index of Medical Specialties” October – December 2016, “Indian Drug Review” (IDR) 2016, Monthly Index of Medical Specialties December 2016. As they are readily available source of drug information and are updated regularly.

A number of brands available for a drug formulation. Difference between the maximum and minimum cost of the same drug manufactured by different pharmaceutical companies was calculated. The drug formulation being manufactured by only one company was excluded.

Cost ratio between the maximum and minimum cost of the same drug manufactured by different pharmaceutical companies was calculated as follows.

Cost ratio = Maximum cost / Minimum cost

Percentage cost variation^[6] was calculated as follows.

$$\% \text{ cost variation} = \frac{\text{Max cost} - \text{Min cost} \times 100}{\text{Min cost}}$$

RESULTS

The prices of a total of 31 drugs (18 single and 13 combination preparations), available in 69 different formulations were analyzed. These 69 formulations are manufactured by different pharmaceutical companies.

Table 1: shows the price variation of a few commonly used antihypertensives used as a single drug therapy. Overall Amlodipine (5 mg) shows maximum price variation of 864.70%, while olesmesartan (40 mg) shows minimum variation of 28.57%. The maximum and minimum percentage price variation respectively for CCBs: Amlodipine (5 mg) 864.70% and nifedipine (20 mg) 180%, ACE inhibitors: Enalapril (10 mg) 520% and lisinopril (10 mg) 96.36%, ARBs: Telmisartan (40 mg) 277.38% and olmesartan (40 mg) 28.57%, beta blockers: Atenolol (25 mg) 412.33% and nebivolol (2.5 mg) 59.02%.

Table 2 : shows price variation in combination of drugs were out of 13 combination therapies commonly used drugs like Amlodipine + Atenolol (5 + 50 mg) combination shows maximum variation up to 490.37%, Telmisartan + Hydrochlorothiazide (40 + 12.5 mg) and (80 + 12.5 mg) 327.58% and 401.67%, respectively, Losartan + Hydrochlorothiazide (50 + 12.5 mg)

200.16%, Atenolol + Hydrochlorothiazide (50 + 12.5mg) 504.82%, Losartan + Hydrochlorothiazide (25 + 12.5mg) 31.92% and Amlodipine + Losartan (5 + 50 mg) shows variation of 440%. Overall Atenolol + Hydrochlorothiazide (50 + 12.5mg) shows maximum price variation of 504.82%, while Losartan + +Hydrochlorothiazide (25 + 12.5mg) shows minimum variation of 31.92%.

Table 1: Percentage Cost Variation Of Commonly Used Antihypertensive Drugs As A Single Drug Therapy.

Drug	Formulations	Doses (mg)	Manufacturing companies	Minimum cost (Rs)	Maximum cost(Rs)	Cost ratio	% cost variation
Calcium channel blockers							
Amlodipine	3	2.5	38	4.50	42	9.4	833.33
		5	59	8.5	82	9.7	864.70
		10	32	13.8	122.50	8.87	787.68
Nifedipine	4	5	7	6.51	62.6	9.61	861.59
		10	16	3.72	16.28	4.37	337.63
		20	11	7.50	21	2.8	180
		30	2	32.50	260	8	700
Diltiazem	5	30	19	10.02	32	3.20	219.36
		60	19	30.6	70.9	2.32	131.69
		90	18	29.19	122	4.18	317.95
		120	12	56	131.50	2.34	134.82
		180	07	36.13	148	4.09	309.63
		240	02	90.6	148.7	1.64	63.35
Beta blockers :							
Atenolol	4	12.5	3	3.50	16.50	4.71	371.42
		25	29	4.46	22.85	5.12	412.33
		50	38	7.9	34.28	4.33	333.92
		100	19	21.4	50	2.33	133.64
Metoprolol	3	25	20	13.02	58	4.45	345.46
		50	22	18	89	4.94	394.44
		100	14	25	129	5.16	416
Carvedilol	4	3.125	15	5.74	29.25	5.09	409.58
		6.25	14	9.84	48	4.87	387.70
		12.5	18	18.04	62	3.43	243.68
		25	10	34.45	101	2.93	193.17
Nebivolol	2	2.5	8	32.07	51	1.59	59.02
		5	11	49	83.20	1.69	69.79
Labetalol	1	100	03	107	300	2.80	180.37
ACE inhibitors							
Ramipril	4	1.25	18	12.5	44.30	3.54	254.4
		2.5	27	25	79.80	3.19	219.2
		5	28	43	128.80	2.99	199.53
		10	10	63.50	179.30	2.82	182.36

Catopril	1	25	2	9.07	37.50	4.13	313.45
Lisinopril	3	2.5	18	13.50	50	3.70	270.37
		5	25	25	100	4	300
		10	18	55	108	1.96	96.36
Enalapril	3	2.5	25	6	18.40	3.06	206.66
		5	27	9	36.84	4.09	309.33
		10	18	12	74.41	6.20	520.08
ARB s							
Losartan	2	25	30	10	36.65	3.66	266.5
		50	34	20	69.30	3.46	246.5
Telmisartan	3	20	39	12.50	42	3.36	236
		40	43	19.90	89	4.47	277.38
		80	15	39	131.33	3.36	236.74
Candesartan	2	4	3	26	34	1.30	30.76
		8	3	45.50	61.80	1.35	35.82
Olemesartan medoxomil	3	10	7	36.90	49	1.32	32.79
		20	17	58	112	1.93	93.10
		40	18	105	135	1.28	28.57
Miscellaneous							
Methyldopa	1	250	4	15.29	30.48	1.99	99.34
Hydrochlor thiazide	2	12.5	4	6.75	11.75	1.74	74.07
		25	5	12.00	18.60	1.55	55

Table 2: Percentage Cost Variation in Combination of Antihypertensive Drug.

Drug	Formulations	Doses	Manufacturing companies	Min Cost (Rs)	Max cost (Rs)	Cost ratio	% cost variation
Amlodipine+Atenolol	2	5+50	65	13.50	79.90	5.90	490.37
		5+25	10	11	43.50	3.95	295.45
Amlodipine + Metoprolol	2	5+25	4	51.5	303	5.92	488.34
		5+50	4	29.7	92	3.09	209.24
Amlodipine+Lisinopril	2	5+5	20	35	105	3	200
		2.5+2.5	02	26.1	48	1.83	83.55
Amlodipine+Losartan	2	5+50	21	12.5	67.50	5.4	440
		5+25	03	32	39.20	1.22	22.5
Amlodipine+Telmisartan	2	5+40	12	29.9	119	3.97	297.99
		5+80	4	80	45	1.81	81.25
Telmisartan+Hydrochlorthiazide	2	40+12.5	38	29	124	4.27	327.58
		80+12.5	8	29.9	150	5.01	401.67
Losartan+Hydrochlorthiazide	2	50+12.5	48	29.9	89.90	3	200.16
		25+12.5	03	37.90	50	1.31	31.92
Enalapril+Hydrochlorthiazide	2	10+12.5	6	27.75	125	4.50	350.45
		5+12.5	2	25	31.4	1.25	25.6
Ramipril+Hydrochlorthiazide	2	5+12.5	9	43	108	2.51	151.16
		2.5+12.5	14	34	135	3.97	297.05
Metoprolol+Hydrochlorthiazide	2	100+12.5	2	27.15	37	1.36	36.27
		50+12.5	2	25.97	67	2.57	157.98
Atenolol + Nifedipine	1	50+25	9	18.25	67	3.6	267.12
Nebivolol + Hydrochlorthiazide	1	5+12.5	3	57	108	1.89	89.47
Atenolol + Hydrochlorthiazide	1	50+ 12.5	3	8.3	50.2	6.05	504.82

DISCUSSION

Indian market is predominantly a branded generic market i.e. 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 also is very high in the range of 60,000-70,000 products. This situation has led to greater price variation among drugs marketed.^[9]

The drug prices available in CIIMS and IDR were compared as they are readily available source of drug information and are updated regularly. Drugs used in the management of hypertension were selected as it is one of the major causes of morbidity and mortality, and the treatment requires continuous prescription drug use.

Our study findings showed a very high fluctuation in the minimum and maximum price of antihypertensive agents which is being manufactured by several companies across the different brands. The cost ratio was also observed to be very high. The prices of most of the antihypertensive brands have percentage price variation above 100%, which is not acceptable situation for patients. Of 31 drugs studied, most of which are commonly prescribed, percentage price variation is very wide leading to unfair burden on the consumer.

Similar studies done by Karve AV *et al*^[10] and Kamath and Satish^[11] showed a similar significantly high price variations in different brands of the same antihypertensive drug.

The Indian market has over 100,000 formulations and there is no system of registration of medicines. Patients are paying out of their pockets for their medical bills and are not covered by insurance schemes unlike developed countries.^[12] It is felt that physicians could provide better services and reduce costs of drugs if the information about drug prices was readily available. Studies have shown that providing a manual of comparative drug prices annotated with prescribing advice to physicians reduced their patients' drug expense.^[13]

Drug price control order (DPCO) is an order issued by the government to fix prices of drug. Once medicine is brought under DPCO, it cannot be sold at a price higher than that fixed by the government. In India, in 1979, 80-85% of the drugs in the market were under price control. The number has slowly decreased and by 2002 only 15-20% drugs were under price control.^[14] We found in our study, price variation with antihypertensive drugs is very high even though the ceiling price quoted by DPCO is low. Many hypertensive patients need

combination drug therapy during the course of the disease. Hence, it is desired that the Government should bring all lifesaving drugs and combinations under price control.

CONCLUSION

The average percentage price variation of different brands of the same oral antihypertensive drug manufactured in India is very wide. The appraisal and management of marketing drugs should be directed toward maximizing the benefits of therapy and minimizing negative personal and economic consequences.

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REFERENCES

1. Kearny, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K. and He, J. Global Burden of Hypertension: Analysis of Worldwide Data. *Lancet*, 2005; 365: 217-223. [http://dx.doi.org/10.1016/S0140-6736\(05\)17741-1](http://dx.doi.org/10.1016/S0140-6736(05)17741-1)
2. Etuk E, Isezuo SA, Chika A, Akuche J, Ali M. Prescription pattern of antihypertensive drugs in a tertiary health institution in Nigeria. *Annals of African Medicine*, 2008; 7(3): 128-32.
3. World Health Organization. A Global Brief on Hypertension; Silent Killer, Global Public Health Crisis. World Health Organization, Geneva, 2013.
4. Amira, C.O. and Okubadejo, N.U. Antihypertensive Pharmacotherapy in a Developing Economy: Pattern, Acquisition Costs and Conformity to International Guidelines in a Tertiary-Care Setting. *Journal of Human Hypertension*, 2006; 20: 894-897. <http://dx.doi.org/10.1038/sj.jhh.1002080>
5. Patel D, Thiyagu R, Surulivelrajan M, Patel H, Pandey S. Price variability among the oral antibiotics available in a South Indian Tertiary Care Hospital. *J ClinDiagn Res*, 2009; 3(6): 1871-5.
6. Shankar PR, Subish P, Mishra P, Lalit M. Ambiguous pricing of Nepalese medicines. *J Inst Med*, 2006; 28(3): 35-8.
7. Das SC, Mandal M, Mandal SC. A critical study on availability and price variation between different brands: Impact on access to medicines. *Indian J Pharm Sci*, 2007; 69(1): 160-3.

8. Mahal A, Karan A, Engelgau M. The Economic Implications of Noncommunicable Disease for India. Washington, DC: World Bank, 2010.
9. Thomas M. Rational drug use and essential drug concept. In: Parthasarathi G, Nyfort-Hasen K, editors. A Textbook of Clinical Pharmacy Practice. 1st Edition. Himayatnagar, Hyderabad: Orient Longman, 2004; 72-3.
10. Karve A V, Chattar KB. IJBCP International Journal of Basic & Clinical Pharmacology Cost analysis study of oral antihypertensive agents available in Indian market, 2014; 3(3): 479–83.
11. Laxminarayana Kamath and Satish. IJPSR International Journal of Pharmaceutical Sciences and Research Cost variation analysis of antihypertensive drugs available in Indian market: An Economic Perspective, 2016; 7(5): 2050-2056.
12. World Health Organization. Essential drugs and medicines: Drug finance. Available from: http://www.whoindia.org/EN/Section2/Section/Section160_959.htm. [Last accessed on 2013 Dec 2].
13. Frazier LM, Brown JT, Divine GW, Fleming GR, Philips NM, Siegal WC, *et al.* Can physician education lower the cost of prescription drugs? A prospective, controlled trial. *Ann Intern Med*, 1991; 115(2): 116-21.
14. Jana S, Mondal P. Pharmacoeconomics: The need to sensitize undergraduate medical students. *Indian Pharmacol*, 2005; 37(5): 277-8.