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Research Article

The extent of price variation amongst branded antihypertensive drugs and its association with number of pharmaceutical companies

Rahul Kumar, Chandrama Manu, Dheeraj Kumar Singh, Preet Lakhani, Sachin Tutu, Rakesh Kumar Dixit*

Department of Pharmacology, King George's Medical University, Lucknow, Uttar Pradesh, India

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***Correspondence:**
Dr. Rakesh Kumar Dixit,
E-mail: dixitkumarrakesh@gmail.com

ABSTRACT

Background: The study was performed to analyze the extent of price variation amongst branded antihypertensive drugs in India and the relation of this price variation to number of pharmaceutical companies manufacturing/marketing these drugs.
Methods: Price of different brands of antihypertensive drugs was collected from authentic sources. The data were segregated and the percentage price variation was calculated applying suitable statistical tools.
Results: A total of 116 formulations from different companies representing 38 antihypertensive drugs were analyzed. Maximum price variation (3233.33%) was seen with 10 mg dose of propranolol. In general the price variations are proportionally correlated to the number of pharmaceutical companies.
Conclusions: Price variation of great extent was found among many formulations. Physicians should be aware of these variations for choosing the appropriate brand for rational therapeutics. This will reduce the burden on patients and family.

Keywords: Antihypertensive drugs, Price variation, Pharmaceuticals, Branded

INTRODUCTION

In the world, the estimated total number of people with hypertension was 972 million in 2000. It was predicted that in 2025 the number of adults with hypertension will reach to a total of 1.56 billion.[1] A great portion of this increased population of hypertension will be contributed by developing countries like India. In developed countries, prevalence of hypertension is stable or decreased. [2] As per the WHO 2008 estimates, the prevalence of hypertension in Indians was 32.5% (33.2% in men and 31.7% in women).[3] After being diagnosed, most of the hypertensive persons have to take antihypertensive drugs for life long. The cost of antihypertensive drugs can be reduced by selecting economical options for the benefit of common people without compromising the quality of treatment.[4] The same medicine may differ in terms of price depending on brand, place and type of clinic/hospital. A study showed that the cost of antihypertensive drugs was about five to six times higher in the private hospitals/stores than at the government owned medical stores.[5] Rational therapeutics is the amalgamation of right decisions. This includes choosing right drug, dosage form, and dose at the right cost. In the developing countries including India the main hindrance in proper treatment is the financial aspects of therapy. Many advisory committees have been formed regarding the recommendations of using generic drugs in place of branded to reduce the cost. Sometimes it becomes mandatory to prescribe drug by trade name due

to bioequivalence factors involvement. The diseases where a narrow range of therapeutic outcomes are to be achieved the clinicians don't take chance to prescribe a drug formulation which may have alerted bioequivalence. To minimize the inter drug formulation variations the clinicians rely on the branded drug for the treatment of diseases like hypertension, diabetes, epilepsy, stroke, cancer, etc. Physicians often ignore the price variations among the branded drugs of same compound of same strength. This ignorance is one of the causes for irrational therapeutics. To make the prescription rational the physicians should be aware of prize variations among the prescribed drugs. Whenever one writes a prescription he/she has to take 360^0 consideration including the overall cost of the drug. Several studies have been done to compare the price variation among the generic versus branded medicine of same compound, however no scientific study has been done to compare the branded drugs regarding their price variation. Selection of P drug by clinicians is influenced by multiple factors including the personal experience, the advertisement policy of the drug company and other hidden unexplained favours or conflict of interest of physicians.[6] Every time the selection of P dug may not be appropriate due to lack of knowledge of price of the to be selected drug and cost-effectiveness analysis of drugs is seldom available.[7] A large price gap usually exists between branded and generic drugs and even the branded drugs may have remarkable variations in prices. So the selection should be based on basis of all pharmacological and economical factors. A lot has been discussed about generic versus branded drugs. Generic drugs usually cost a fraction of branded but sometimes physicians are suspicious about their quality. Cost of the treatment can also be down regulated by choosing branded drugs that are on the lower spectrum of price. The average monthly cost of antihypertensive drugs ranges between US $0.8 and US $6.6.[8] The present article is about the cost effectiveness of choosing a drug depending on its position over the price spectrum.

METHODS

The present study was of descriptive type. Required information was obtained from the authentic sources including Drug today, CIMS (current index of medical specialities) and refRx. According to price, several brands of a particular drug used in management of hypertension are arranged on a spectrum and various parameters were observed.

1). Difference in maximum and minimum price for the same drug in same strength and dosage among various brands (absolute number as well as percentage). and 2). Difference in treatment cost between two ends of spectrum.

This study is not to promote or highlight any particular brand or company so brand/company names are not mentioned in the study.

Statistical analysis was done with the help of word excel. The formula for percentage variation in price was adopted from previous studies.[9] The formula is as follows.

The percentage variation in price =
Price of most expensive brand - Price of least expensive brand / Price of least expensive brand x 100

The drugs were classified into nine categories depending on the percentage (%) range of price variation, which were as follows:[10]

1) 0-50%
2) 51-100%
3) 101-150%
4) 151-200%
5) 201-250%
6) 251-300%
7) 301-350%
8) 351-400%
9) >400%

RESULTS

A total of 116 formulations from different companies represented 38 antihypertensive drugs. All these were evaluated on price spectrum. The formulations whose price was not mentioned in books were excluded from the study.

The drugs manufactured/marketed by large number of companies are found to have high % price variation (Figure 1). Amlodipine formulations dominate amongst calcium channel blockers (Table 1). Four formulations of amlodipine are manufactured by more than fifty pharmaceutical companies. Some of the pharmaceuticals manufacture only single strength of amlodipine while many are manufacturing more than one strength. Percentage price variation ranges from 500% to 962.5%. Maximum variation is shown by 10 mg tablets on the other hand 7.5 mg preparation of amlodipine.

Among ACE inhibitors, ramipril is most commonly manufactured and is available in 4 formulations by 89 companies. Maximum price variation is seen with 5 mg dose of enalapril (Table 2).

Among ARBs, losartan is most commonly manufactured i.e., by 62 (25 mg by 28 companies and 50 mg by 34 companies) Maximum price variation (494.2%) is seen with 80 mg dose of valsartan (Table 3).

Among diuretics, torsemide is most commonly manufactured and is available in 6 formulations. Maximum price variation (210.71%) is seen with 2.5 mg dose of indapamide (Table 4).

Among β-blockers, atenolol is most commonly manufactured i.e., by 64 (50 mg by 28 companies, 25 mg

by 19 companies and 100mg by 17 companies). Maximum price variation (3233.33%) is seen with 10 mg dose of propranolol (Table 5). Among alpha blockers, highest price variation (131.66%) is seen with 1 mg dose of terazocin. Phenoxybenzamine and phentolamine are not shown in drug today though these are preferred drugs for hypertensive crisis in pheochromocytoma (Table 6). Central sympatholytics drugs were manufactured by very few companies (Table 7).

Table 1: Price variation in calcium channel blocker group of antihypertensive drugs.

Drugs	Doses (mg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price variation
Nifedipine	5	5	0.31	0.9	0.698	190.32
	10	9	0.51	1.57	1.086	207.84
	10 retard	5	0.75	1.62	1.13	116
	20	2	1.08	2	1.54	85.19
	20 retard	7	0.85	2.1	1.508	147.06
Felodipine	2.5	2	3.15	3.67	3.41	16.51
	5	2	6.2	6.5	6.35	4.83
	10	2	8	11.6	9.8	45
Amlodipine	2.5	23	0.45	2.7	1.39	500
	5	54	0.68	6.66	2.32	879
	7.5	1	3.33	3.33	3.33	NA
	10	27	1.2	12.75	4.74	962.5
Benidipine	4	1	5.55	5.55	5.55	NA
	8	1	9.57	9.57	9.57	NA
Nitrendipine	10	1	2.85	2.85	2.85	NA
	20	1	4.97	4.97	4.97	NA
Lacidipine	2	1	3.92	3.92	3.92	NA
	4	1	7.32	7.32	7.32	NA
Lercanidipine	10	2	3.96	4.4	4.18	11.11
	20	1	6.76	6.76	6.76	NA

Table 2: Price variation in ACE inhibitors group of antihypertensive drugs.

Drugs	Doses (mg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price Variation
Enalapril	2.5	20	0.51	2	1.177	292.16
	5	21	0.67	3.2	1.815	377.61
	10	12	3	4.8	3.28	60
	Inj 1.25	1	163.55	163.55	163.55	NA
Lisinopril	2.5	18	1.35	5	2.39	270.37
	5	20	2.5	10	4.25	300
	10	14	3.9	11.4	6.81	192.31
	20	1	9.64	9.64	9.64	NA
Perindopril	2	2	5.625	9.4	7.51	67.11
	4	2	8.525	12.3	10.41	44.28
Fosinopril	10	1	6.85	6.85	6.85	NA
	20	1	12.57	12.57	12.57	NA
Ramipril	1.25	12	1.25	4.43	2.49	254.4
	2.5	35	2.5	8	4.24	220
	5	32	4	12.8	7.03	220
	10	10	6.35	17.93	10.68	182.36
Captopril	12.5	1	2.45	2.45	2.45	NA
	25	2	0.907	3.5	2.2	285.89
Benazepril	5	1	4.42	4.42	4.42	NA
	10	1	7.76	7.76	7.76	NA

DISCUSSION

We are living in an era of drug explosion. It is to be expected that more than lacs of medicinal formulations comprising of thousands of active ingredients are being marketed. Drug regulating authorities have emphasized a lot on quality and safety. Developing countries including India require medications at affordable prices for the benefit of masses. Most of the pharmaceuticals try to compensate the investments within a very short period without considering the financial status of the patients' population.

Table 3: Price variation in ARBs group of antihypertensive drugs.

Drugs	Doses (mg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price Variation
Losartan	25	28	1	3.8	2.29	280
	50	34	1.9	6.77	4.15	256.32
Candesartan	4	2	2.7	2.78	2.74	2.96
	8	2	4.5	4.8	4.65	6.67
	16	1	8	8	8	NA
Irbesartan	150	3	7.86	24	13.98	205.34
	300	2	16.8	20	18.4	19.05
Valsartan	40	1	24	24	24	NA
	80	3	6.9	41	18.83	494.20
	160	3	13	50	26.43	284.61
Olmesartan	10	1	4.5	4.5	4.5	NA
	20	7	6.5	9	7.74	38.46
	40	6	8.33	16.1	12.07	93.28
Telmisartan	20	12	2.33	5	3.465	114.59
	40	28	1.8	8.53	5.91	373.88
	80	7	2.55	13.13	9.09	414.90

Table 4: Price variation in diuretics group of antihypertensive drugs.

Drugs	Doses (mg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price Variation
Hydrochlorothiazide	12.5	3	0.6	1.06	0.78	76.67
	25	4	1.1	1.78	1.37	61.81
Chlorthalidone	12.5	1	1.25	1.25	1.25	NA
	100	1	2.38	2.38	2.38	NA
Indapamide	1.5	7	3.75	10.65	6.07	184
	2.5	3	2.8	8.7	4.83	210.71
Furosemide	40	2	0.48	1.36	0.92	183.33
	Inj 10mg/2ml	1	3.28	3.28	3.28	NA
Spironolactone	25	1	1.73	1.73	1.73	NA
	100	1	6.75	6.75	6.75	NA
Torsemide	5	3	1.3	2.05	1.65	57.69
	10	8	2.1	4.9	2.9	133.33
	20	6	4	5.8	4.99	45
	40	2	9.2	11.2	10.2	21.74
	100	2	19.65	19.9	19.77	1.27
	Inj 100mg/ml	1	12	12	12	NA

In India NPPA (National Pharmaceuticals Pricing Authority) under the control of ministry of Chemicals and Fertilizers, was set up in 1997 to control drug pricing. The main aim of this authority is to restrict/control the price of new as well as old medicines and to discourage the pharmaceuticals for taking undue profits. Indirectly this authority is playing a very important role in rational

therapeutics. As per DPCO (Drugs Prices Control Order), a ceiling price is fixed for each scheduled formulation and the medicine cannot be sold at an MRP exceeding the ceiling price plus applicable local taxes.

Table 5: Price variation in β-blockers group of antihypertensive drugs.

Drugs	Doses (mg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price Variation
Propranolol	10	9	0.3	10	2.02	3233.33
	20	6	1	2.5	1.79	150
	40	10	0.94	4.1	2.37	336.17
	60	3	2.8	4.27	3.76	52.5
	80	3	3.4	5.9	4.93	73.53
Metoprolol	12.5	1	2.4	2.4	2.4	NA
	12.5 ER	1	2.5	2.5	2.5	NA
	25	5	1.4	3.08	2.28	120
	25 ER	7	3.5	5.8	4.19	65.71
	50	7	0.83	4.9	2.94	490.36
	50 ER	8	5.26	9.21	6.62	75.09
	100	4	2.5	6	4.34	140
	100 ER	2	7.5	12.9	10.2	72
Atenolol	25	19	0.54	2.4	1.29	344.44
	50	28	0.57	2.36	1.68	314.04
	100	17	1.4	4.07	3.02	190.71
Labetalol	50	1	1.53	1.53	1.53	NA
	100	3	2.96	11	8.12	271.62
	200	1	5.42	5.42	5.42	NA
	Inj 20 mg/4ml	2	230	281	255.5	22.17
	Inj 100 mg/20ml	1	1250	1250	1250	NA
Carvedilol	3.125	13	0.7	3.45	1.61	392.86
	6.25	12	1.2	4.8	2.44	300
	12.5	13	2.2	6.2	3.83	181.81
	25	7	4.2	10.1	6.03	140.48
Bisoprolol	2.5	2	1.65	7.3	4.48	342.42
	5	3	1.95	9	5.78	361.54
	10	2	3.5	13.5	8.5	285.71
Nebivolol	2.5	8	3.2	5.1	4.215	59.38
	5	10	4.9	8.32	6.281	69.79

In present study the price variation among β blockers was appreciably high (>3000%, lowest price was Rs. 0.3/tablet and highest price was Rs. 10/tablet). Second highest price variation (of 962%) is seen with amlodipine 10mg tablet and third highest price variation (of 879%) is also seen with amlodipine (5 mg tablet).

Some of the formulations were manufactured by only single company. The reason for this may be less requirement of a particular drug or particular formulation/strength. Surprisingly we found that labetalol 200mg formulation which is manufactured by single company is costing less as compared to 100mg strength. We couldn't hypothesize the cause for this price discrepancy. Logically it is expected that the company which formulates single preparation without competitors keep the price slightly high showing its monopoly. But the case of labetalol is just the opposite.

On the other hand captopril 12.5 mg was costing more (manufactured by single pharmaceutical company) than its counterpart strength 25 mg (manufactured by multiple pharmaceutical companies). Similar price discrepancy is seen in case of valsartan 40mg as compared to valsartan 80mg. this discrepancy is one of the most important point which we want to highlight. The price regulation authorities should take these types of price variation into consideration and ask the explanations from pharmaceuticals companies.

CONCLUSION

Indian pharmaceutical companies are well known in the world for providing drugs at very low cost. At the same time there is huge price variation among some formulations and by considering this fact, cost of treatment can be further reduced. By creating awareness

among doctors and pharmacists about various methods of drug cost reduction, monetary burden of diseases (especially chronic) can be reduced in other parts of the world also.

Table 6: Price variation in α-blockers group of antihypertensive drugs.

Drugs	Doses (mg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price Variation
Prazosin	1	1	2.28	2.28	2.28	NA
	2	1	4.25	4.25	4.25	NA
	2.5	2	7.14	9.45	8.29	32.35
	5	3	9.42	12.53	10.96	33.01
Terazosin	1	6	3.98	9.22	7.25	131.66
	2	6	7	14.75	10.91	110.71
	5	2	20.3	26.25	23.28	29.31
Doxazosin	1	2	2.41	2.85	2.63	18.26
	2	2	4.35	5.15	4.75	18.39
	4	2	8.7	9.05	8.87	4.02
Phentolamine	1ml Inj. 10mg/ml	1	495	495	495	NA
Phenoxybenzamine	10	1	35	35	35	NA
	1 ml Inj. 50mg/ml	1	1650	1650	1650	NA

Table 7: Price variation in central sympatholytics group of antihypertensive drugs.

Drugs	Doses (µg)	No. of companies	Min. price (Rs)	Max. price (Rs)	Average price	% price Variation
Clonidine	100	3	0.629	1.15	0.83	82.54
Methyldopa	250	2	2.18	2.41	2.29	10.55

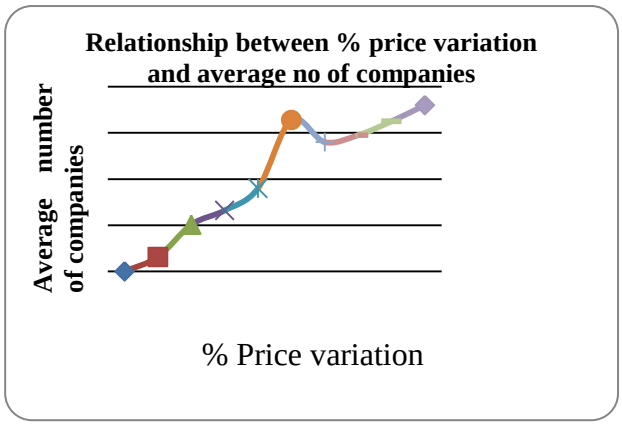

Figure 1: The relation of Price variation with number of pharmaceuticals companies.

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