

DOI: <https://dx.doi.org/10.18203/2319-2003.ijbcp20212927>

Original Research Article

## A pharmacoeconomic study of different brands of commonly prescribed antihypertensive drugs

Pooja C. Upasani, Rohidas M. Barve\*, Rajesh S. Hiray

Department of Pharmacology, Byramjee Jeejeebhoy Government Medical College and Sassoon General Hospitals, Pune, Maharashtra, India

**Received:** 30 May 2021

**Accepted:** 24 June 2021

**\*Correspondence:**

Dr. Rohidas M. Barve,

Email: [rohidas.barve@yahoo.com](mailto:rohidas.barve@yahoo.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** The hypertension is the most common chronic disease, therefore treatment should be affordable. The antihypertensive drugs of same strength are available in market at different costs. This study was undertaken to create awareness among health care workers and patients, about cost difference among different brands of same antihypertensive drug. So that whenever possible, a cheaper effective brand can be prescribed to ensure better patient adherence.

**Methods:** Maximum retail price (MRP) of various antihypertensive drugs of same strength, manufactured by different pharmaceutical companies was obtained from various offline and online sources. The minimum and maximum cost of 10 tablets/capsules noted. The cost ratio and percentage cost variation was calculated for single drug and fixed dose combinations. The ceiling price (as per DPCO) of essential antihypertensives (as per national list of essential medicines) was compared with their maximum cost.

**Results:** The formulations of single antihypertensive drugs (41) and fixed dose combinations of two drugs (19) and three drugs (9) were included in the study. Among the single antihypertensives analyzed the highest cost difference was of eplerenone (50 mg) and high cost ratio and cost variation percentage was of amlodipine (5 mg). Among fixed dose combination of two drugs analyzed highest cost difference was found that of hydrochlorothiazide (12.5 mg)+olmesartan (40 mg) combination and highest cost ratio and percentage cost variation was of amlodipine (5 mg)+telmisartan (40 mg).

**Conclusions:** There was a huge price variation among the antihypertensive drugs manufactured by various companies. Some measures must be taken by the government to bring the uniformity in the price that will help to reduce the economic burden on the patients.

**Keywords:** Antihypertensive, Pharmacoeconomic, Cost variation, Upasani

### INTRODUCTION

The burden of hypertension is progressively on a rise worldwide, with India contributing to a major part of this burden. The global burden of disease study stated that increase in systolic blood pressure is associated with the major burden among all risk factors, accounting for 10.2 million deaths and 208 million disability adjusted life years (DALYs).<sup>1</sup>

World health report 2002 identified hypertension as a 3rd ranked factor for DALYs.<sup>2</sup> Hypertension is an important risk factor for chronic disease burden in India and a preventable contributor to mortality and morbidity and requires lifelong treatment.<sup>3,4</sup> Nearly 10.8% of all deaths in India are attributed to hypertension.<sup>5</sup> Several studies have indicated the decrease in the patient compliance is influence by drug prices.<sup>6</sup> Thus, the therapeutic cost should be appropriate, affordable to each and every individual.

In India most of the drugs are available by manufacturing brands and these are prescribed by clinicians mostly in brand names. This may affect the patients financial condition adversely if costly brand is prescribed especially in chronic diseases.<sup>7</sup> Many chronically ill patients frequently cut back on medications owing to cost. Out-of-pocket costs and inadequate prescription coverage may lead to adherence problems for many important medication. There is wide cost variation among different brands of the same antihypertensive drug. Clinician's awareness of cost of therapeutics is poor. The costly brand of same generic drug is proved to be in no way superior to its economically cheaper counterpart.<sup>8</sup>

The national pharmaceutical pricing authority (NPPA) was established on 29 August 1997 to regulate the prices of pharmaceutical drugs in India. The implementation of the NPPA, 2012 and the drugs prices control order (DPCO), 2013 was brought about by NPPA. It safeguards the interest of both the manufacturer and the consumers by ensuring the availability of essential medicines at affordable prices. It fixed the ceiling prices of 856 formulations of medicines mentioned in the NLEM, 2015. Once medicine is brought under DPCO, it cannot be sold at a price higher than that fixed by the government. Also none of the combinations of antihypertensive drugs are included in DPCO list 2018. 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.<sup>9,10</sup> The common man therefore has to shell out more money with medicine prices spinning out of his reach.

During last few decades, the demand for healthcare has increased rapidly resulting in high expenditure. To spend financial resources as efficiently as possible, cost containment has assumed significant importance.<sup>11</sup> Limited studies are available in Indian scenario, which compare the cost of drugs of different brands. Hence, this study was carried out to compare the cost of different brands of drugs used for treatment. The present study was aimed at investigating the cost differences in various brands of same antihypertensive drug, so that whenever possible, a cheaper effective brand could be prescribed.

## METHODS

MRP of a particular antihypertensive drug (cost per 10 tablets/capsules) with the same strength and dosage forms manufactured by different pharmaceuticals was obtained. The data was retrieved from online sources including: Pharma Sahi Dam of NPPA of government of India, (NPPA) and CIMS (current index of medical specialties). The cost was cross-checked at pharmacy shops (retail drug stores).

The fixed dose combinations (FDC) of antihypertensive drugs were also analyzed for the cost differences. The FDC is the formulation including two or more active

pharmaceutical ingredients combined in a single dosage form. FDCs included in the study were formulations containing two or three active ingredients combined in single dosage form.

The parameters included in this study were: (1) the minimum and maximum cost: the minimum and the maximum cost in rupees (₹) of a particular antihypertensive drug manufactured by various pharmaceutical companies in the same strength were noted; (2) the cost ratio: it is the ratio of the cost of the costliest to cheapest brand of a drug which tells, how many times costliest brand costs more than the cheapest one; (3) percentage cost variation: it was calculated as follows,<sup>12</sup>

$$\% \text{ cost variation} = \frac{\text{maximum cost} - \text{minimum cost}}{\text{minimum cost}} \times 100.$$

The maximum cost of essential antihypertensives (as per NLEM) was compared with their ceiling price (as per DPCO).<sup>10,13</sup>

Ceiling prices of 10 tablets/capsules were calculated. The cost difference between maximum cost and ceiling price was analyzed.

## RESULTS

All the commonly prescribed groups of antihypertensive drugs were included in the present study. Wide cost variation was found in most of the antihypertensive drugs studied. We have studied 41 individual antihypertensive drugs. FDCs analyzed included two drug combination and three drug combination. Number of two drug fixed dose combinations studied were 19 and those of three drug combinations were 9. The cost difference, cost ratio and percentage cost variation of all antihypertensive drugs were calculated.

### *Diuretics*

Highest cost difference was seen with eplerenone (50 mg) which was 311 and cost ratio and percentage cost variation were found to be highest with furosemide (40 mg) (Table 1).

### *Angiotensin converting enzyme inhibitors (ACEI)*

The highest cost difference was observed in case of lisinopril (10 mg) about 180, while highest cost ratio (9.32) and highest percentage cost variation (832.58) was with enalapril (10 mg) (Table 1).

### *Angiotensin receptor blockers*

Among ARB's wide cost difference was found in case of valsartan (160 mg) (Table 1). Very high cost ratio (8.69) and percentage cost variation (769.64) were observed with losartan.

**Sympathetic inhibitors**

Total 10 sympathetic inhibitors were analyzed in this study. Among them highest cost difference was observed with propranolol (10 mg) and cost ratio and percentage cost variation were greater in case of metoprolol (80 mg) as shown in Table 1.

**Calcium channel blockers**

Total 9 antihypertensive drugs from calcium channel blockers were analyzed. Maximum cost difference (120) was observed with benidipine (8 mg). Cost ratio and percentage cost variation were higher in case of amlodipine (5 mg) brands (Table 1).

**Fixed dose combination (FDC)**

We compared 19 two drug FDCs and 9 three drug FDCs (Table 2 and 3).

Among two drug FDCs highest cost difference was found in case of different brands of hydrochlorothiazide (12.5 mg)+olmesartan (40 mg) combination. Cost ratio and percentage cost variation were higher in case of amlodipine (5 mg)+telmisartan (40 mg) FDC brands (Table 2).

Three drugs combination of telmisartan (40 mg), amlodipine (5 mg) and hydrochlorothiazide (12.5 mg) had highest cost difference and combination of olmesartan (20 mg), amlodipine (5 mg) and hydrochlorothiazide (12.5 mg) has shown maximum cost ratio and percentage cost variation (Table 3).

The cost difference between maximum cost and the ceiling price of essential antihypertensive drugs was analyzed. The wide cost difference was found with amlodipine (5 mg) means the maximum cost was far higher than the ceiling price. Most of the essential antihypertensives analyzed were having greater maximum cost as compared to the ceiling price. Only one essential antihypertensive drug (telmisartan) had maximum cost within the limit of the ceiling price (Table 4).

**Table 1: Cost variation analysis of single drug formulations of antihypertensive drugs.**

Sr. No.	Drugs	Formulation	Strength formulation (in mg)	Number of brands	Number of tablets/capsules	Min cost	Max cost	Cost difference	Cost ratio	% cost variation
Diuretics										
1.	Hydrochlorothiazide	3	12.5	7	10	8.12	10.97	2.85	1.350	35.098
			25	7	10	8.12	10.97	2.85	1.350	35.098
			50	7	10	8.12	10.97	2.85	1.350	35.098
2.	Chlorthalidone	1	12.5	25	10	20	71	51	3.55	255
3.	Indapamide	2	1.5	2	10	69.5	100.6	31.1	1.447	44.748
			2.5	4	10	44	107.1	63.1	2.4340	143.409
4.	Furosemide	1	40	16	10	3.3	36	32.7	10.909	990.909
5.	Spironolactone	3	25	5	10	19.35	31.8	12.45	1.643	64.341
			50	4	10	25	50	25	2	100
			100	3	10	42	191.9	149.9	4.569	356.904
6.	Eplerenone	2	25	13	10	140.3	354	213.7	2.523	152.316
			50	9	10	287	598	311	2.083	108.362
ACE inhibitors										
7.	Captopril	1	25	3	10	25.98	41	15.02	1.578	57.813
8.	Enalapril	3	2.5	12	10	9.3	21.54	12.24	2.316	131.612
			5	12	10	10	32.31	22.31	3.231	223.1
			10	9	10	10.68	99.6	88.92	9.325	832.584
9.	Lisinopril	3	2.5	6	10	24.83	54	29.17	2.174	117.478
			5	6	10	53.41	100	46.59	1.872	87.230
			10	4	10	118	184	66	1.559	55.932
10.	Perindopril	2	4	3	10	88.75	135	46.25	1.521	52.112
			8	2	10	119.75	170	50.25	1.419	41.962
11.	Ramipril	1	2.5	14	10	25.23	52.86	27.63	2.095	109.512
12.	Fosinopril	1	10	2	10	60.95	68.53	7.58	1.124	12.436
13.	Quinapril	1	10	5	10	66.3	152.37	86.07	2.298	129.819
			ARB							

Continued.

Sr. No.	Drugs	Formulation	Strength formulation (in mg)	Number of brands	Number of tablets/capsules	Min cost	Max cost	Cost difference	Cost ratio	% cost variation
14.	Losartan	3	25	54	10	4.81	41.83	37.02	8.696	769.646
			50	66	10	11.98	99	87.02	8.263	726.377
15.	Candesartan	1	16	7	10	61.65	120	58.35	1.946	94.647
16.	Valsartan	3	40	3	10	47.52	94.65	47.13	1.991	99.179
			80mg	5	10	86.3	165.35	79.05	1.915	91.599
17.	Telmisartan	3	160	3	10	129.2	345	215.8	2.670	167.027
			20	113	10	15.92	61.5	45.58	3.863	286.306
			40	113	10	13.75	59.6	45.85	4.334	333.454
18.	Irbesartan	2	80	113	10	15.92	61.5	45.58	3.863	286.306
			150	2	10	155.5	213.5	58	1.372	37.299
19.	Olmesartan	3	300	2	10	243	286.8	43.8	1.180	18.024
			10	10	10	55	102.8	47.8	1.869	86.909
19.	Olmesartan	3	20	69	10	29	128.3	99.3	4.424	342.413
			40	61	10	49	226.5	177.5	4.622	362.244
Direct renin inhibitors										
20.	Aliskiren	2	150	2	10	342.75	489.64	146.89	1.428	42.856
Beta-adrenergic blockers										
21.	Propranolol	4	10	29	10	18.48	108.9	90.42	5.892	489.285
			20	27	10	16.45	72.6	56.15	4.413	341.337
			40	5	10	31	49	18	1.580	58.064
			80	2	10	55	58.33	3.33	1.06	6.054
22.	Metoprolol	1	25	48	10	15	116	101	7.733	673.333
23.	Atenolol	1	50	35	10	5.12	25.97	20.85	5.072	407.226
Alpha+beta adrenergic blockers										
24.	Labetalol	2	50	4	10	50	134	84	2.68	168
			100	17	10	110	177.9	67.9	1.617	61.727
25.	Carvedilol	1	6.25	50	10	12	76.85	64.85	6.404	540.416
Alpha-blockers										
26.	Prazosin	2	2.5	3	10	57.5	96	38.5	1.669	66.956
			5	4	10	85	129	44	1.517	51.764
27.	Terazosin	3	1	2	10	100	182.18	82.18	1.821	82.18
			2	2	10	180	269.95	89.95	1.499	49.972
28.	Doxazosin	3	5	2	10	170	540	370	3.176	217.647
			1	3	10	20	40	20	2	100
			2	3	10	33	73.83	40.83	2.237	123.727
28.	Doxazosin	3	4	2	10	87	99.5	12.5	1.143	14.367
			Central sympatholytics							
29.	Clonidine	1	100	2	10	13.75	20.03	6.28	1.456	45.672
30.	Methyldopa	2	250	6	10	24.15	71.4	47.25	2.956	195.652
			500	2	10	46.8	99	52.2	2.115	111.538
Calcium channel blockers										
31.	Verapamil	3	40	6	10	5	8.86	3.86	1.772	77.2
			120	2	10	38.5	42.34	3.84	1.099	9.974
			240	2	10	75.8	83.38	7.58	1.1	10
32.	Diltiazem	3	30	11	10	19.47	26.7	7.23	1.371	37.134
			60	9	10	38.38	54.54	16.16	1.421	42.105
			90	5	10	66.57	104.16	37.59	1.564	56.466
33.	Nifedipine	1	5	3	10	12.88	14.55	1.67	1.129	12.965

Continued.

Sr. No.	Drugs	Formulation	Strength formulation (in mg)	Number of brands	Number of tablets/capsules	Min cost	Max cost	Cost difference	Cost ratio	% cost variation
34.	Felodipine	1	5	2	10	62	115.56	53.56	1.863	86.387
35.	Amlodipine	1	5	93	10	0.025	97.1	97.075	3884	388300
36.	Cilnidipine	2	10	64	10	25	125.1	100.1	5.004	400.4
			20	42	10	39.3	157.7	118.4	4.012	301.272
37.	Lacidipine	1	4	2	10	68.5	75.1	6.6	1.096	9.63
38.	Lercanidipine	1	10	5	10	25.65	93	67.35	3.625	262.573
39.	Benidipine	2	4	24	10	34.65	106	71.35	3.059	205.916
			8	23	10	59	179	120	3.033	203.389
Vasodilators										
40.	Hydralazine	1	25	3	10	62.5	95.23	32.73	1.523	52.368
41.	Minoxidil	1	5	5	10	150	366	216	2.44	144

Table 2: Cost variation analysis of two drug FDCs of antihypertensive drugs.

Sr. No.	Drugs	Formulation	Strength formulation (in mg)	Number of brands	Number of tablets/capsules	Min cost	Max cost	Cost difference	Cost ratio	% cost variation
1.	Amlodipine+atenolol	2	5+25	10	10	25.58	55	29.42	2.150	115.011
			5+50	98	10	6.25	175.2	168.95	28.032	2703.2
2.	Amlodipine+losartan	2	2.5+25	2	10	59.35	92.5	33.15	1.558	55.855
			5+50	33	10	15	155.7	140.7	10.38	938
3.	Amlodipine+metoprolol	2	2.5+25	15	10	59	135.2	76.2	2.291	129.152
			5+25	37	10	21	149.2	128.2	7.104	610.476
4.	Amlodipine+olmesartan	2	5+20	52	10	45	176	131	3.911	291.111
			5+40	26	10	70	239.8	169.8	3.425	242.571
5.	Amlodipine+hydrochlorothiazide	2	2.5+12.5	7	10	51	76.5	25.5	1.5	50
			5+12.5	14	10	16.5	101.75	85.25	6.166	516.666
6.	Amlodipine+telmisartan	5	5+40	142	10	14.87	169.4	154.53	11.39	1039.206
			5+80	36	10	82.5	267.5	185	3.242	224.242
			80+5	2	10	111	130	19	1.171	17.117
			2.5+40	9	10	78.5	109.3	30.8	1.392	39.235
7.	Amlodipine+enalapril	1	5+5	4	10	33.71	94.66	60.95	2.808	180.806
			2.5+ 2.5	2	10	45.5	85.15	39.65	1.871	87.142
8.	Amlodipine+lisinopril	2	5+5	16	10	49.81	130	80.19	2.609	160.991
			5+1.5	2	10	113.9	122	8.1	1.071	7.111
9.	Amlodipine+indapamide	1	5+1.5	2	10	113.9	122	8.1	1.071	7.111
10.	Amlodipine+perindopril	1	5+4	2	10	157	170	13	1.082	8.280
11.	Hydrochlorothiazide+bisoprolol	3	6.25+ 2.5	5	10	42.53	80.66	38.13	1.896	89.654
			12.5+5	4	10	46.25	135.09	88.84	2.920	192.086
			6.25+5	4	10	75	117.81	42.81	1.570	57.08
12.	Hydrochlorothiazide+olmesartan	2	12.5+20	56	10	45	174.19	129.19	3.870	287.0888
			12.5+40	46	10	75	323.7	248.7	4.316	331.6
13.	Hydrochlorothiazide+losartan	2	12.5+25	2	10	47.3	88	40.7	1.860	86.046
			12.5+50	69	10	30	165.6	135.6	5.52	452

Continued.

Sr. No.	Drugs	Formulati	Strength formulati on (in mg)	Number of brands	Number of tablets/capsules	Min cost	Max cost	Cost difference	Cost ratio	% cost variation
14.	Ramipril+losartan	1	5+50	3	10	80.76	152.25	71.49	1.885	88.521
15.	Hydrochlorothiazide+enalapril	1	25+10	7	10	32	90.48	58.48	2.827	182.75
16.	Hydrochlorothiazide+irbesartan	1	12.5+150	2	10	157	225.2	68.2	1.434	43.439
17.	Spironolactone+furosemide		50+20	6	10	27	67.15	40.15	2.487	148.703
18.	Spironolactone+torseamide	4	25+10	4	10	24	34.35	10.35	1.431	43.125
			50+10	11	10	40	103.8	63.8	2.595	159.5
			50+20	6	10	45	134	89	2.977	197.777
			50+5	4	10	35	43.6	8.6	1.245	24.571
19	Atenolol+indapamide	1	50+2.5	3	10	52.8	89.8	37	1.700	70.075

Table 3: Cost variation analysis of three drug FDCs of antihypertensive drugs.

Sr. No.	Drugs	Formulati	Strength formulati on (in mg)	Number of brands	Number of tablets/capsules	Min cost	Max cost	Cost difference	Cost ratio	% cost variation
1.	Amlodipine+losartan+hydrochlorothiazide	1	5+50+12.5	6	10	87.35	142.5	55.15	1.631	63.136
2.	Olmesartan+amlodipine+chlorthalidone	2	20+5+12.5	5	10	104.15	143.55	39.4	1.378	37.830
			40+5+12.5	4	10	181.3	214.5	33.2	1.183	18.312
3.	Olmesartan+amlodipine+hydrochlorothiazide	2	20+5+12.5	22	10	69.3	192.32	123.02	2.775	177.518
			40+5+12.5	16	10	121	266.7	145.7	2.204	120.413
4.	Telmisartan+benidipine+chlorthalidone	1	40+4+12.5	3	10	139	179	40	1.287	28.776
5.	Telmisartan+cilnidipine+metoprolol	2	40+10+25	4	10	99	150	51	1.515	51.515
			40+10+50	3	10	110	178.5	68.5	1.622	62.272
6.	Telmisartan+amlodipine+chlorthalidone	4	40+5+12.5	10	10	100	150	50	1.5	50
			40+5+6.25	4	10	90	114	24	1.266	26.666
			80+5+12.5	7	10	160	197.63	37.63	1.235	23.518
			80+5+6.5	3	10	164.95	178	13.05	1.079	7.911
7.	Telmisartan+amlodipine+hydrochlorothiazide	2	40+5+12.5	52	10	20	181.5	161.5	9.075	807.5
			80+5+12.5	9	10	151	188	37	1.245	24.503
8.	Telmisartan+cilnidipine+chlorthalidone	3	40+10+12.5	22	10	100	189	89	1.89	89
			40+10+6.25	20	10	82.5	176	93.5	2.133	113.333
			40+20+12.5	2	10	140	156.32	16.32	1.116	11.657
9.	Telmisartan+chlorthalidone+metoprolol	1	40+6.25+50	2	10	120	141	21	1.175	17.5

Table 4: Comparison of maximum cost of essential antihypertensives (as per NLEM) with their ceiling price (as per DPCO).

Sr. No.	Medicine	Dosage (in mg)	No. of tablet	Ceiling price per tablet/capsule	Ceiling price per 10 tablets/capsules	Maximum cost	Cost difference
1.	Amlodipine	5	1	2.60	26	97.1	71.1
2.	Atenolol	50	1	1.78	17.8	25.97	8.17
3.	Enalapril	2.5	1	1.93	19.3	21.54	2.24
		5		3.2	32	32.31	0.31
4.		12.5	1	0.98	9.8	10.97	1.17

Continued.

Sr. No.	Medicine	Dosage (in mg)	No. of tablet	Ceiling price per tablet/capsule	Ceiling price per 10 tablets/capsules	Maximum cost	Cost difference
	Hydrochlorot hiazide	25	1	1.68	16.8	10.97	5.63
		50	1	0.08	0.8	10.97	10.17
5.	Methyldopa	250	1	2.44	24.4	71.4	47
		500	1	4.67	46.7	99	52.3
6.	Ramipril	2.5	1	4.72	47.2	52.86	5.66
7.	Telmisartan	20	1	3.64	36.4	61.5	25.1
		40	1	6.57	65.7	59.6	-6.1
		80	1	10.02	100.2	61.5	-38.7

## DISCUSSION

In this study, noticeable cost variation was found in different brands of same antihypertensive drugs. The cost variation observed in the present study was as high as 388300% of amlodipine, 2703% (amlodipine+atenolol), 990.90% (furosemide), 769.64% (losartan). Other significantly high cost variations found in the present study were 1039.20% (amlodipine+telmisartan), 938% (amlodipine+losartan), 807.5% (telmisartan +amlodipine+hydrochlorthiazide) (Table 2 and 3).

Similar results were found in other studies. The study done by Ahmed et al stated high as 2337.50% for hydralazine. 1315.25% (telmisartan+hydrochlorthiazide), 870.58% (amlodipine), 558.34% (amlodipine+atenolol), 537.68% (valsartan), 394.44% (metoprolol), 344.44% (enalapril), 316.22% (propranolol), 300% (lisinopril).<sup>14</sup>

The other study done by Karve et al reveal that the prices of most of the antihypertensive brands have percentage price variation above 100%.<sup>15</sup>

The reasons for this price variation could be as follows: the existing market structure of the pharmaceutical industry, asymmetry of information or imperfect information, government regulations and pricing policies, costs of raw supplies, distribution and promotion and economic goals of the parent company, target return on investment.<sup>15</sup>

At present, there are very few medicines under drug prices control order. Hence, it is necessary that the government of India should bring all lifesaving and essential medicines under price control. FDCs of antihypertensive drugs are not included in NLEM which should be taken into consideration while revising the list. Due consideration must be placed on the pricing of drugs in the NLEM to increase their accessibility to common people. DPCO appears to be an effective tool to keep in rein the drug prices which should be implemented for all drugs included in NLEM.

Despite increased awareness, poor adherence to treatments for chronic diseases remains a global problem. Adherence issues are common in patients taking antihypertensive drug therapy and are associated with increased risks of coronary and cerebrovascular events. To gain the maximal benefits

of their antihypertensive therapy, it is important for the clinicians to support adherence to prescribed drugs. Because hypertension is so common and its treatment often requires the use of more than one medication, antihypertensive drug therapy is a common target of cost-cutting efforts.

While patients may assume that their doctors know the cost of the drugs they are prescribing, that's often not the case. Doctors in clinics seeing patients don't necessarily know how much the drugs cost. Doctors must prescribe rationally. Rational prescribing implies using the right drug for the right patient at the right time in the right dose and manner of administration, at affordable cost and with right information. They need to be educated about the cost variation in different brands of same drug.

## CONCLUSION

This study highlights that there is a huge price variation among the antihypertensive drugs manufactured by different companies. Some measures must be taken by the government to bring about the uniformity in the price. It will help to reduce the economic burden on the patients to some extent. There is a strong need to create awareness about this huge price variation among the general public, health care providers, healthcare payers, government agencies, policy makers, pharmacists for appropriate intervention to reduce economic burden on patients as well as on the healthcare system.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. GBD 2016 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 84 behavioral, environmental and occupational, and metabolic risks or clusters of risks, 1990-2016: a systematic analysis for the global burden of disease study 2016. *Lancet*. 2017;390(10100):1345-422.
2. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension:

- Analysis of worldwide data. *Lancet.* 2005;365(9455):217-23.
3. Gupta R, Xavier D. Hypertension: the most important non communicable disease risk factor in India. *Indian Heart J.* 2018;70(4):565-72.
  4. Zhou D, Bo X, Zhao M, Wang L, Veeranki S. Uncontrolled hypertension increases risk of all-cause and cardiovascular disease mortality in US adults: the NHANES III linked mortality study. *Sci Reps.* 2018;8:9418.
  5. Gupta R, Yusuf S. Towards better hypertension management in India. *Indian J Med Res.* 2014;139(5):657-60.
  6. Kardas P, Bishai WR. Compliance in infective medicine. *Adv Stud Med.* 2006;6(7C):652-8.
  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. Piette JD, Heisler M, Wagner TH. Cost-related medication underuse among chronically ill adults: The treatments people forgo, how often, and who is at risk. *Am J Public Health.* 2004;94:1782-7.
  9. Kumar V, Gupta NV, Kumar KA. A comparison between old and latest systems in DPCO. *Int J Pharmaceut Sci.* 2014;6(2):19-20.
  10. Government of India Ministry of Chemicals and Fertilizers Department of Pharmaceuticals National Pharmaceutical Pricing Authority. Available at: <https://www.nppaindia.nic.in/wp-content/uploads/2020/03/1-1.pdf>.
  11. Rivers PA, Glover SH. Health care competition, strategic mission, and patient satisfaction: research model and propositions. *J Health Organ Manag.* 2008;22(6):627-641.
  12. Mir SA. A calm look at the cost of various brands of antiasthmatic drugs available in India. *Int J Basic Clin Pharmacol.* 2016;5:142-5.
  13. Central Drugs Standard Control Organization. Fact sheet: National List of Essential Medicines, 2015. Available at: <https://cdsco.gov.in/opencms/opencms/en/consumer/Essential-Medicines/>. Accessed on 15 May 2021.
  14. Mir SA. Cost variation analysis of different brands of commonly prescribed antihypertensive drugs, available in Indian market: a pharmacoeconomic study. *Int J Basic Clin Pharmacol.* 2018;7(3):556-60.
  15. Karve AV, Chattar KB. Cost analysis study of oral antihypertensive agents available in Indian market. *Int J Basic Clin Pharmacol.* 2014;3(3):479-83.

**Cite this article as:** Upasani PC, Barve RM, Hiray RS. A pharmacoeconomic study of different brands of commonly prescribed antihypertensive drugs. *Int J Basic Clin Pharmacol* 2021;10:976-83.