



Original Research Article

Cost analysis study of antihypertensive agents available in India

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ABSTRACT

Aim: Hypertension is a global public health problem. To decrease its morbidity and mortality it needs lifelong treatment. There is a wide range of variation in the prices of antihypertensive drugs marketed in India. Thus, a study was planned 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 CIMS, MIMS and Drug Today. 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 single drug therapy for hypertension and is 42 out of 69. It's found maximum in Atenolol (12.5mg) 880%, Amlodipine (5mg) 460%, Nifedipine (30mg) 456.29% and Diltiazem (90mg) 407.02%. Among the combination therapy percentage variation in the cost was above 100% in 16 out of 26. It's found maximum in Lisinopril+Hydrochlorothiazide (5mg+12.5mg) 926%, Telmisartan+Hydrochlorothiazide (40mg+12.5mg) 254.75%, Amlodipine+Losartan (5mg+50mg) 246.96% and Amlodipine+Enalapril (5mg+5mg) 217.20%.

Conclusion: The average percentage price variation of the same molecules of antihypertensive drugs manufactured by different pharmaceuticals company in India is very wide. So, government, pharmaceutical company, marketing manager and prescribing doctors should think about variation of cost and do needful for providing maximum benefits to the patients receiving antihypertensive drugs.

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1. Introduction

Hypertension is one of the major chronic diseases resulting into high mortality and morbidity. Cost of drug is one of the factors of Poor control of HTN in our Country and it can lead to development of Ischemic heart disease, stroke and chronic renal failure. Worldwide nearly 1 billion adults (more than a quarter of world's population) had hypertension in 2010 and this is predicted to increase 1.56 billion by 2025. Prevalence of hypertension in India is reported to vary from 17-21%.¹⁻³ Reviews of Epidemiological studies suggest that the prevalence of hypertension in the last six decades has increased from 2% to 25% among urban residents and from 2% to

15% among the rural residents in India.⁴ Hypertension is ranked as the third most important risk factor for attributable burden of disease in South Asia (2010).⁵ Hypertension is directly responsible for 57% of all stroke death and 24% of all coronary heart disease (CHD) in India.⁶ Hypertension as one of the most important cause of premature death worldwide.⁷ Hypertension accounts for 10% of worldwide healthcare expenditure underlining the considerable economic implications to resource constrained health systems.⁸

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Table 1: Percentage cost variation of commonly used antihypertensive drugs as a single drug therapy

Drug	Doses	Minimum cost (INR)	Maximum cost (INR)	Cost Ratio	% Cost variation
Calcium channel Blockers					
Amlodipine	2.5mg	6.50	27.60	4.24	324.61
	5mg	12.50	70	5.6	460
	10mg	16	75.60	4.72	372.5
Nifedipine	5mg	3.18	12.03	3.78	278.30
	10mg	5.12	19.39	3.78	278.71
	20mg	7.50	29.10	3.88	288
Clinidipine	30mg	18.42	102.47	5.56	456.29
	5mg	41.50	64.50	1.55	55.42
	10mg	55	94.20	1.71	71.27
Diltiazem	30mg	10.02	29.27	2.92	192.11
	60mg	20.03	50.40	2.51	151.62
	90mg	29.19	148	5.07	407.02
	120mg	36.13	173.05	4.78	378.96
Beta blockers					
Atenolol	2.5mg	2	19.60	9.8	880
	25mg	6.30	24.10	3.82	282.53
	50mg	6.77	23	3.39	239.73
	100mg	25.70	36.60	1.42	42.41
Metoprolol	12.5mg	33.30	54	1.62	62.16
	25mg	18.01	46.60	2.58	158.74
	50mg	32.80	70.50	2.14	114.93
Nebivolol	100mg	67	152.90	2.28	128.20
	2.5mg	32	77.20	2.41	141.25
	5mg	50	109	2.18	118
Alpha blocker					
Prazosin	2.5mg	94.60	125.80	1.32	32.98
	2.5mg	109.35	156.80	1.43	43.39
	1mg	39.80	150.63	3.78	278.46
Terazosin	2mg	69.50	223.20	3.21	221.15
	5mg	201.50	406	2.01	101.48
Alpha+Beta blockers					
Labetalol	100mg	100	137	1.37	37
	3.125mg	9	32	3.55	255.55
Carvedilol	6.25mg	17.93	52	2.90	190.01
	12.5mg	30	87	2.9	190
	25mg	52	145	2.78	178.84
Central Sympatholytic					
Methyldopa	250mg	24.14	24.15	1.00	0.04
ACE inhibitors					
Enalapril	2.5mg	10.40	20.30	1.95	95.19
	5mg	17.95	33.71	1.87	87.79
	10mg	27.75	66.40	2.39	139.27
Ramipril	1.25mg	25.87	69.75	2.69	169.61
	2.5mg	26.75	66.73	2.49	149.45
	5mg	48.25	82.43	1.70	70.83
	10mg	166	255.60	1.53	53.97
	2.5mg	20.10	36.50	1.81	81.59
Lisinopril	5mg	36.93	76.80	2.07	107.96
	10mg	66.50	108.50	1.63	63.15

Continued on next page

Table 1 continued

ARB s					
Losartan	25mg	16.50	38.35	2.32	132.42
	50mg	29.50	85.80	2.90	190.84
Telmisartan	20mg	15	42	2.8	180
	40mg	27	80	2.96	196.29
	80mg	65.43	114	1.74	74.23
Olmesartan	10mg	65.20	85	1.30	30.36
	20mg	34	116.70	3.43	234.23
Candesartan	40mg	54	206.30	3.82	282.03
	4mg	27.81	34.95	1.25	25.67
Irbesartan	8mg	45.25	61.80	1.36	36.57
	150mg	78.56	240	3.05	205.49
Valsartan	300mg	199.65	202	1.01	1.17
	40mg	24.70	45	1.82	82.18
Azilsartan	80mg	41	86	2.09	109.75
	40mg	70	152.50	2.17	117.85
	80mg	130	199	1.53	53.07
Diuretics					
Hydrochlorothiazide	12.5mg	7.6	10.30	1.35	35.52
	25mg	17.60	21.81	1.23	23.92
Torasemide	5mg	15.95	29.70	1.86	86.20
	10mg	23.52	48.20	2.04	104.93
	20mg	44.28	83.90	1.89	89.47
	40mg	154.20	163.35	1.05	5.93
	100mg	148.50	315.70	2.12	112.59
Indapamide	1.5mg	37.50	137.70	3.67	267.20
	2.5mg	88.50	97.50	1.10	10.16

Antihypertensive drug treatment often has elevated cost,⁹ a limitation that has not always been taken into account in clinical practice.¹⁰ High cost of medicines has economic implications for the patients. Prices of prescription can affect users, suppliers and most importantly payers in health care system.¹¹ Several studies have indicated that therapeutic compliance is influenced by drug prices.¹² In developing country like India cost of drugs play an important role in compliance of treatment of any chronic disease. Pharmaceutical industry has many branded formulation of the same drug with large difference in selling price. This may affect the patient's finance adversely if costly brand is prescribed specially in disease like hypertension which needs treatment for longer duration.¹³ The purpose of present study was to assess the cost-effectiveness of antihypertensive drugs in hypertensive patients.

2. Materials and 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" July-October 2019, Drug Today, July-October 2019 and "Indian Drug Review" April 2019.

The cost of drugs was also crosschecked at pharmacy or retail drug store.

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 was calculated as follows:

$$\% \text{ cost variation} = \frac{\text{Maximum cost} - \text{Minimum cost} \times 100}{\text{Minimum cost}}$$

The drug formulation being manufactured by only one company was excluded.

3. Results

The prices of a total of 41 drugs (25 single and 16 combination preparation), available in 95 different formulations were analyzed. All formulation is manufactured by different pharmaceutical companies.

Table 1 shows the price variation of commonly used antihypertensive drugs used as a single drug therapy. Overall Atenolol (12.5mg) shows maximum price variation of 880%, while Methyldopa (250mg) shows minimum variation 0.04%. The maximum and minimum percentage price variation respectively for CCB_s: Amlodipine (5mg) 460% and Clindipine (5mg) 55.42%; Beta blockers: Atenolol (12.5%) 880% and Atenolol (100mg) 42.41%; Alpha and Beta blockers: Terazosin (1mg) 278.46% and Prazosin (2.5mg) 32.98%; ACE inhibitors: Ramipril (1.25mg) 169.61% and Ramipril (10mg) 53.97%; ARB_s: Olmesartan (40mg) 282.03% and Irbesartan (300mg);

Diuretics: Indapamide (1.5mg) 267.20% and Torasemide (40mg) 1.05%.

Table 2 Shows price variation in some combination form of antihypertensive drugs out of 16 commonly used drugs maximum variation found in Lisinopril+Hydrochlorothiazide (5mg+12.5mg) 926%, Telmisartan+Hydrochlorothiazide (40mg+12.5mg) 254.75%, Amlodipine+Losartan (5mg+50mg) 246.96% and Amlodipine+Enalapril (5mg+5mg) 217.20%.

4. Discussion

Pharmaceuticals Company in Indian market commonly sells a particular drug under different brand names apart from the innovator company. Hence, the number of products available in the market is very high in the range of 60,000-70,000. This situation has led to greater price variation among drugs marketed.¹⁴

In our study findings showed a very high fluctuation in the minimum and maximum price of antihypertensive drugs (Figures 1 and 4) The cost ratio was also observed to be very high (Figures 2 and 5). The percentage variation in the cost was above 100% with most of the commonly used antihypertensive drugs (Figure 3) and also with combination form of antihypertensive drugs (Figure 6). Similar study done by Kamath. L. et al. in 2015; Karve AV et al. in 2014 and Limaye. D. et al. in 2017 also showed significant higher price variations in different brands of the same antihypertensive drug.¹⁵⁻¹⁷

In such situation Patients have to pay more price if costly brands are prescribed. Whereas the costly brand of same generic drug is scientifically proved to be in no way superior to its economically cheaper counterpart.¹³ In India patients have to pay from their pockets due to very less use of mediclaim policies in comparison to developed countries.¹⁸

The reason behind this price variation could be as follows.^{13,19-24}

1. Government regulation and pricing policies.
2. The existing market structure of pharmaceutical industry.
3. Cost of raw supplies, distribution and promotion.
4. Asymmetry of information or imperfect information.
5. Economic goals of the parent company, target return on investment.

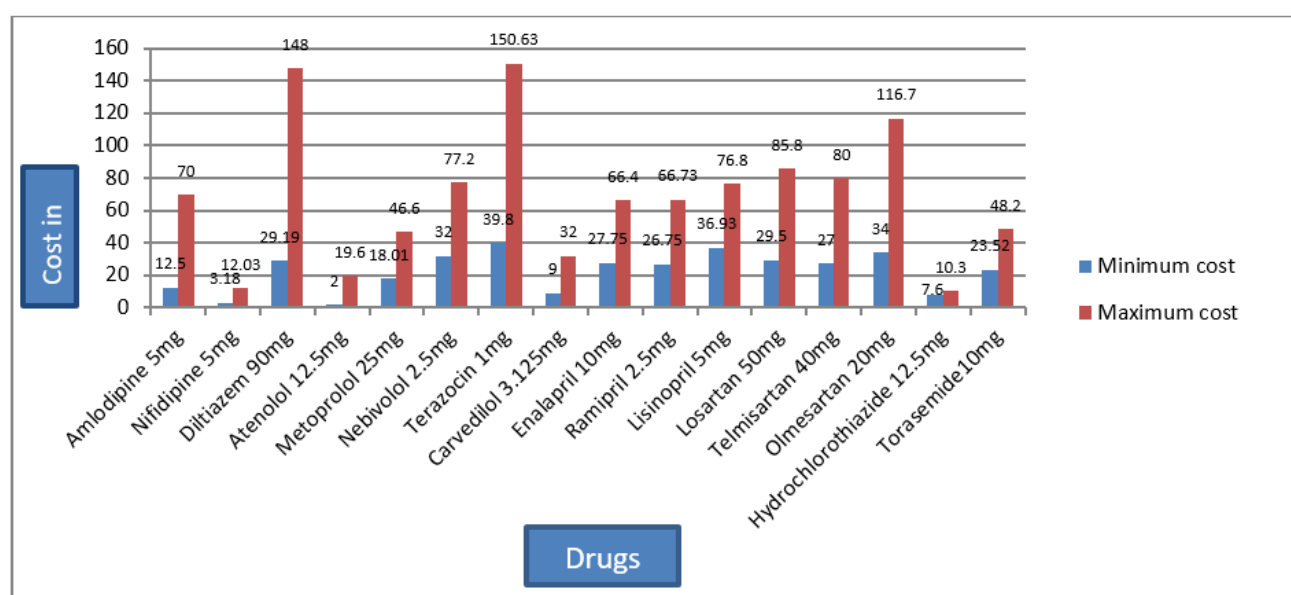
Under NMLM 2015 the prices of a total 376 drugs and 857 formulations are under price control. IN the DPCO list 2015 only few antihypertensive drugs (Amlodipine, Atenolol, Enalapril, Losartan, Methyldopa, Nifedipine and Hydrochlorothiazide) were included.^{25,26}

5. Conclusion

According to result of our studies and previous various studies over cost analysis; there is a strong need to

Table 2: Percentage cost variation of commonly used antihypertensive drugs in combination form

Drug	Doses	Minimum cost (INR)	Maximum cost (INR)	Cost Ratio	% Cost variation
Amlodipine +Atenolol	5mg+25mg	44	55.36	1.25	25.81
	5mg +50mg	16.80	96.60	5.75	475
Amlodipine+Metoprolol	5mg+25mg	60	79.20	1.32	32
	5mg+50mg	46	111	2.41	141.30
Amlodipine+Enalapril	5mg+5mg	25	79.30	3.17	217.20
Amlodipine + Lisinopril	5mg + 5mg	76	101.50	1.33	33.55
Amlodipine + Losartan	5mg + 25mg	39	68	1.74	74.35
	5mg +50mg	33	114.50	3.46	246.96
Amlodipine+Telmisartan	5mg +40mg	47.43	112.51	2.37	137.21
	5mg +80mg	89.20	208.45	2.33	133.68
Clinidipine + Telmisartan	10mg+40mg	87.80	210	2.39	139.86
	12.5mg+40mg	37.50	126	3.36	236
Chlorthalidone + Telmisartan	12.5mg+80mg	92	195	2.11	111.95
	25mg+40mg	114	142.95	1.25	25.39
Metoprolol + Telmisartan	50mg+40mg	136.90	182.52	1.33	33.32
Losartan+	25mg_12.5mg	28.50	50	1.75	75.43
Hydrochlorothiazide	50mg+12.5mg	36	105.70	2.93	193.61
Telmisartan+	40mg+12.5mg	40	141.90	3.54	254.75
Hydrochlorothiazide	80mg+12.5mg	69.50	202.45	2.91	191.29
Olmesartan+	20mg+12.5mg	69	143.55	2.08	108.04
Hydrochlorothiazide	40mg+12.5mg	120	200.75	1.67	67.29
Enalapril +	10mg+25mg	32	34.50	1.07	7.81
Hydrochlorothiazide					
Ramipril+	2.5mg+12.5mg	45	111.30	2.47	147.33
Hydrochlorothiazide	5mg+12.5mg	100	181.24	1.81	81.24
Lisinopril +	5mg+12.5mg	10	102.60	10.26	926
Hydrochlorothiazide					
Telmisartan+Amlodipine+	40mg+5mg+12.5mg	73.20	152.90	2.08	108.87
Hydrochlorothiazide					

**Fig. 1:** Cost difference (Minimum and Maximum) commonly used antihypertensive drugs used as a single drug therapy

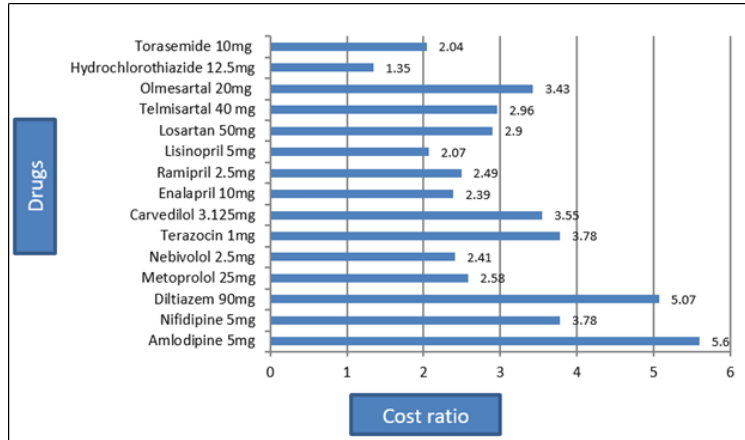


Fig. 2: Cost ratio of commonly used antihypertensive drugs used as a single drug therapy

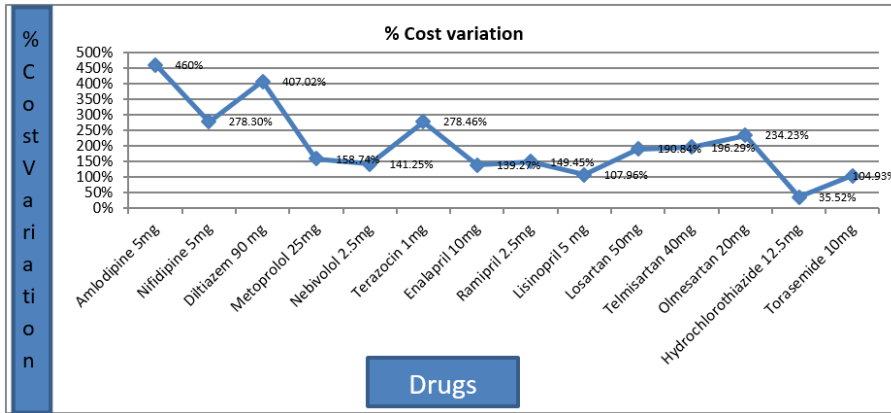


Fig. 3: Cost ratio of commonly used antihypertensive drugs used as a single drug therapy

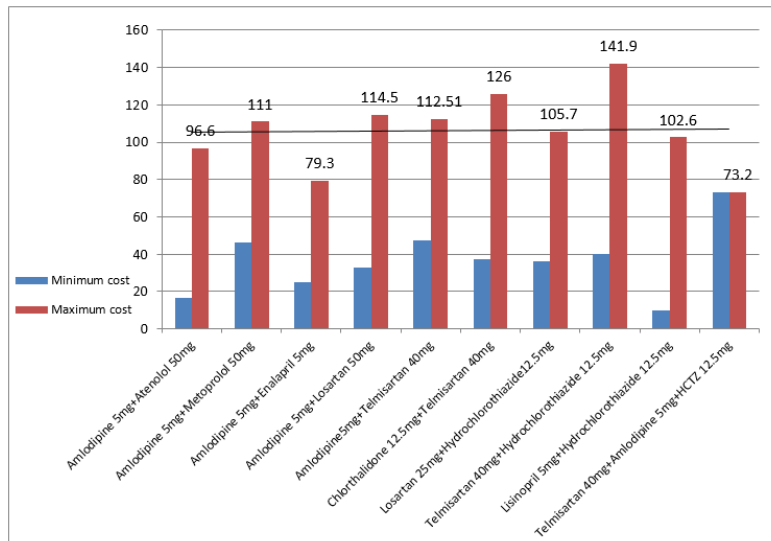


Fig. 4: Percentage cost variation of commonly used antihypertensive drugs used as a single drug therapy

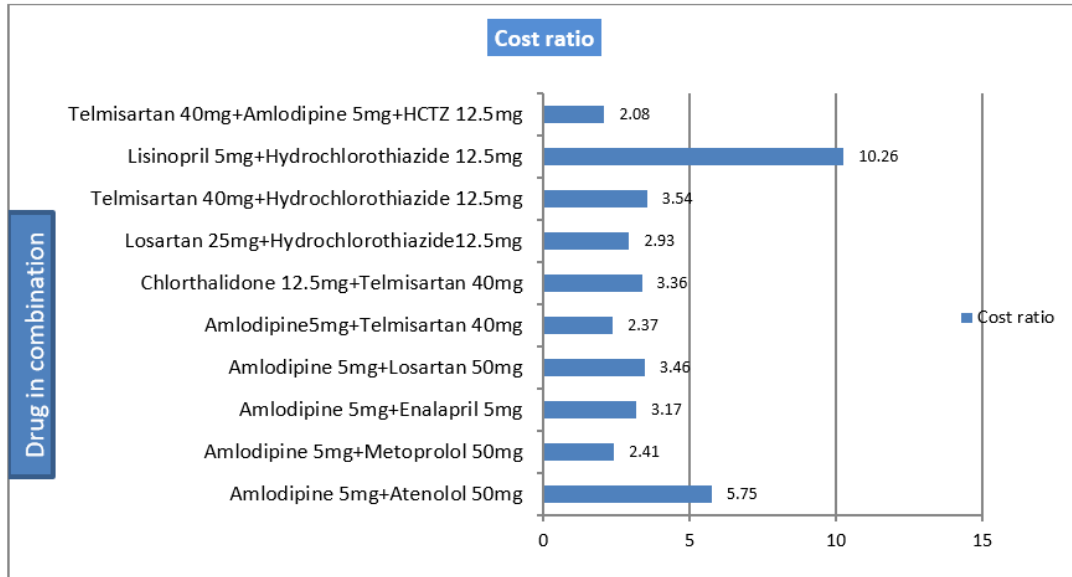


Fig. 5: Cost ratio of antihypertensive drugs in combination form

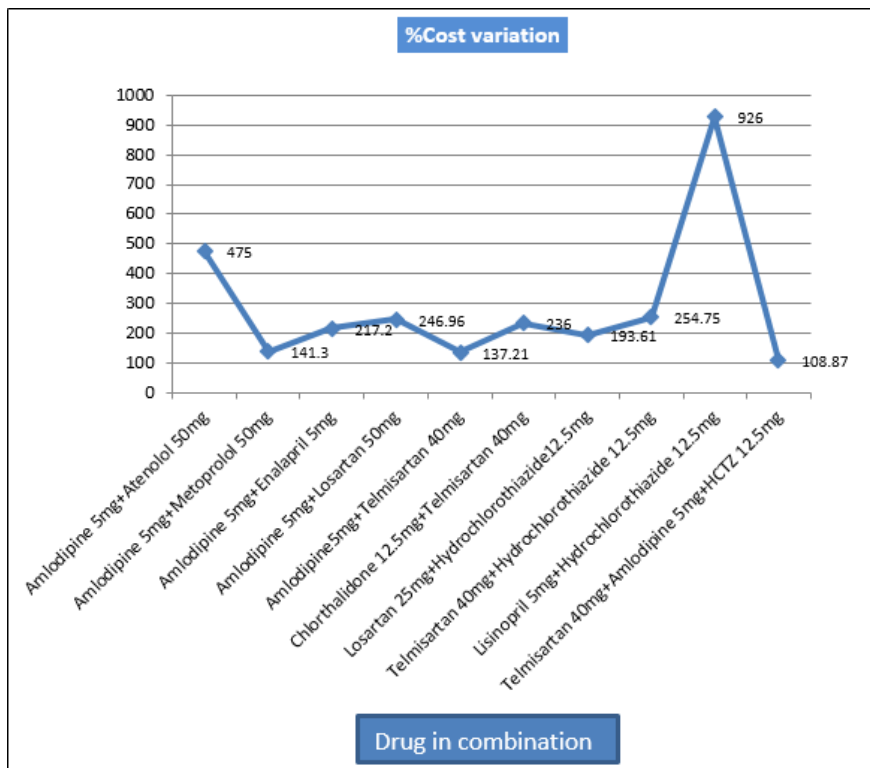


Fig. 6: Percentage cost variation of antihypertensive drugs in combination form

create awareness in public, healthcare providers and even in prescriber regarding huge cost variation of same molecules of different brands. It should also highlighted among concerned government agencies, policy makers, pharmaceuticals company for taking appropriate consideration and action to reduce the huge cost variation of antihypertensive drugs.

6. Source of Funding

None.

7. Conflict of Interest

None.

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