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COST VARIATION ANALYSIS OF ANTIHYPERTENSIVE DRUGS AVAILABLE IN INDIAN MARKET: AN ECONOMIC PERSPECTIVE

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ABSTRACT: Aim: To analyze the percentage cost variations among different brands of the commonly prescribed anti-hypertensive drugs. **Materials and Methods:** The cost of different brands of commonly used antihypertensive drugs was sorted out by referring latest CIMS, MIMS, Drugs Monitor and IDR. 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 (2.5 mg) 1040.58%, Atenolol (50 mg) 564.10%, Telmisartan (40 mg) 542.22% and Ramipril (10 mg) 478.39%. Among the combination therapy Atenolol + Hydrochlorothiazide (50 + 12.5 mg) 504.82%, Amlodipine + Atenolol (5 + 50 mg) 437.86% and Lisinopril + Hydrochlorothiazide (5 + 12.5 mg) 403.33% variation. **Conclusion:** Hypertension is the most common cardiovascular disease and drugs are to be prescribed for prolonged period. If a costly brand is prescribed, the patients have to pay more money unnecessarily for their treatment. The costly brand of same generic drug is proved to be in no way superior to its economically cheaper counterpart. Ideally, therefore, the drugs should be prescribed in generic to save the patient's money and to enhance the compliance.

INTRODUCTION: Hypertension is one of the major causes of morbidity, mortality and needs lifelong treatment. It is a major risk factor for cardiovascular disease. 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. Hypertension is fast gaining the status of a potential epidemic in India. Prevalence of hypertension in India is reported to vary from 17 – 21%. The situation is more alarming as hypertension attributes for nearly 10% of all deaths.¹⁻³

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.⁴

Very few studies are available in Indian scenario, which compare the cost of drugs of different brands. Therefore, we decided to carry out the

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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.

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" October - December 2015,⁵ "Indian Drug Review" (IDR) 2015,⁶ Monthly Index of Medical Specialties November 2015,⁷ Drugs monitor 2015.⁸ as they are readily available source of drug information and are updated regularly. The cost was also crosschecked at pharmacy (retail drug store).

Cost ratio between the maximum and minimum cost of the same drug manufactured by different

pharmaceutical companies was calculated as follows:

$$\text{Cost ratio} = \frac{\text{Maximum cost}}{\text{Minimum cost}}$$

Percentage cost variation was calculated as follows:

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

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

RESULTS:

The prices of commonly used antihypertensive drugs (23 single + 15 combination preparations) manufactured by different pharmaceutical companies were analyzed. **Table 1** shows percentage cost variation of 23 commonly used antihypertensive drugs used as a single drug therapy.

TABLE 1: PERCENTAGE COST VARIATION OF COMMONLY USED ANTIHYPERTENSIVE DRUGS AS A SINGLE DRUG THERAPY

Drug	Dosage form	Minimum cost(INR)	Max cost(INR)	cost ratio	% Cost variation
Calcium Channel Blockers					
Amlodipine 2.5mg	Tablet	7.54	86	11.41	1040.58
Amlodipine 5mg	Tablet	5.71	44	7.71	670.58
Clinidipine 5mg	Tablet	25	42	1.68	68.00
Nifedipine 10mg	SR-Tablet	11.33	14.2	1.25	25.33
Beta Blockers					
Atenolol 50mg	Tablet	5.71	37.92	6.64	564.10
Atenolol 25mg	Tablet	4.14	27.07	6.54	553.86
Labetalol 100mg	Tablet	29.57	110	3.72	272.00
Metoprolol 25mg	Tablet	12	37	3.08	208.33
Metoprolol 50mg	Tablet	18.5	55.97	3.03	202.54
Carvedilol 12.5mg	Tablet	30	66	2.20	120.00
Metoprolol25mg	ER-Tablet	21	45.35	2.16	115.95
Metoprolol25mg	ER-Tablet	31.5	62.95	2.00	99.84
Carvedilol 25mg	Tablet	52	100	1.92	92.31
Nebivolol 5mg	Tablet	52	81.5	1.57	56.73
ACE inhibitors					
Ramipril 10mg	Tablet	31	179.3	5.78	478.39
Ramipril 5mg	Tablet	45	123.9	2.75	175.33
Enalapril 2.5mg	Tablet	8.8	22.6	2.57	156.82
Enalapril 5mg	Tablet	15	36.84	2.46	145.60
Lisinopril 5mg	Tablet	25.1	53.24	2.12	112.11
Drug	Dosage form	Minimum cost(INR)	Max cost(INR)	cost ratio	% Cost variation
Lisinopril 10mg	Tablet	43.45	73.7	1.70	69.62
ARB'S					
Telmisartan 40mg	Tablet	18	115.6	6.42	542.22
Telmisartan 80mg	Tablet	25.5	160	6.27	527.45
Losartan 25mg	Tablet	12	45.1	3.76	275.83
Losartan 50mg	Tablet	24.5	68.5	2.80	179.59
Olmesartan 20mg	Tablet	49	135	2.76	175.51
Olmesartan 40mg	Tablet	79	144.6	1.83	83.04
Valsartan 80mg	Capsule	69	85.79	1.24	24.33
Candesartan 4mg	Tablet	28.48	34.95	1.23	22.72
Miscellaneous					
Chlorthalidone 12.5mg	Tablet	13.25	49	3.70	269.81
Torsemide 10mg	Tablet	19.5	55	2.82	182.05
Metolazone 5mg	Tablet	90.5	187.9	2.08	107.62
Hydrochlorothiazide 12.5mg	Tablet	6	9.53	1.59	58.83
Hydrochlorothiazide 25mg	Tablet	11	16.51	1.50	50.09
Prazosin 2.5mg	Tablet	72	99	1.38	37.50
Prazosin 5mg	Tablet	130	163.5	1.26	25.77
Methyldopa 250mg	Tablet	21.77	24.14	1.11	10.89

Overall Amlodipine (2.5 mg) shows maximum price variation of 1040.58 %, while methyldopa (250 mg) shows minimum variation of 10.89 %. The maximum and minimum percentage price variation respectively for CCBs: Amlodipine (2.5 mg) 1040.58% and nifedipine (10 mg) 25.33%, ACE inhibitors: Ramipril (10 mg) 478.39% and lisinopril (10 mg) 69.62%, ARBs: Telmisartan (40 mg) 542.22% and candesartan (4 mg) 22.72%, beta blockers: Atenolol (50 mg) 564.10% and nebivolol (5 mg) 56.73% etc.

Table 2 shows percentage cost variation of 15 commonly used antihypertensive drug combination. Overall Atenolol + Hydrochlorothiazide (50 + 12.5 mg) combination shows maximum variation of 504.82%, Amlodipine + Atenolol (5 + 50 mg) 437.86%, Lisinopril + Hydrochlorothiazide (5 + 12.5 mg) 403.33%, Ramipril + Amlodipine (2.5 + 5 mg) 328.57% and Amlodipine + Losartan (5 + 50 mg) shows variation of 265.38% etc.

TABLE 2: PERCENTAGE COST VARIATION IN COMBINATION OF ANTIHYPERTENSIVE DRUGS

Drug	Dosage form	Min cost(INR)	Max cost(INR)	Cost ratio	% Cost variation
Atenolol 50mg + Hydrochlorothiazide 12.5mg	Tablet	8.3	50.2	6.05	504.82
Amlodipine 5mg + Atenolol 50mg	Tablet	10.3	55.4	5.38	437.86
Lisinopril 5mg + Hydrochlorothiazide 12.5mg	Tablet	15	75.5	5.03	403.33
Ramipril 2.5mg + Amlodipine 5mg	Capsule	28	120	4.29	328.57
Amlodipine 5mg + Losartan 50mg	Tablet	20.8	76	3.65	265.38
Amlodipine 5mg + Lisinopril 5mg	Tablet	32	110.4	3.45	245.00
Telmisartan 40mg + Hydrochlorothiazide 12.5mg	Tablet	32	98.5	3.08	207.81
Amlodipine 5mg + Telmisartan 40mg	Tablet	38.25	90	2.35	135.29
Telmisartan 40mg + Amlodipine 5mg	Tablet	39.2	91	2.32	132.14
Ramipril 2.5mg + Hydrochlorothiazide 2.5mg	Tablet	43.86	92	2.10	109.76
Nebivolol 5mg + Hydrochlorothiazide 12.5mg	Tablet	57	108	1.89	89.47
Temisartan 40mg + Amlodipine 5mg + Hydrochlorothiazide 12.5mg	Tablet	55	104	1.89	89.09
Amlodipine 2.5mg + Metoprolol 25mg	ER-Tablet	41	67	1.63	63.41
Telmisartan 40mg + Ramipril 2.5mg	Tablet	69.95	111.5	1.59	59.40
Atenolol 50mg + Nifedepine 20mg	Capsule	23	35	1.52	52.17

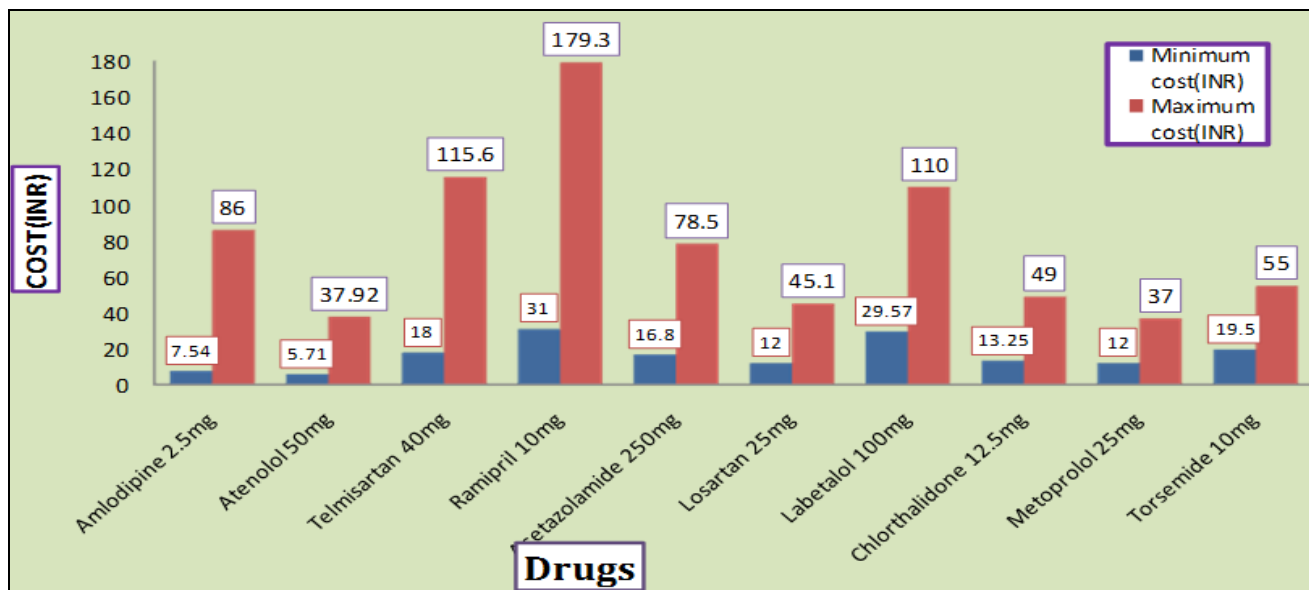


FIG. 1: COST DIFFERENCE [MIN AND MAX] COMMONLY USED ANTIHYPERTENSIVE DRUGS USED AS A SINGLE DRUG THERAPY

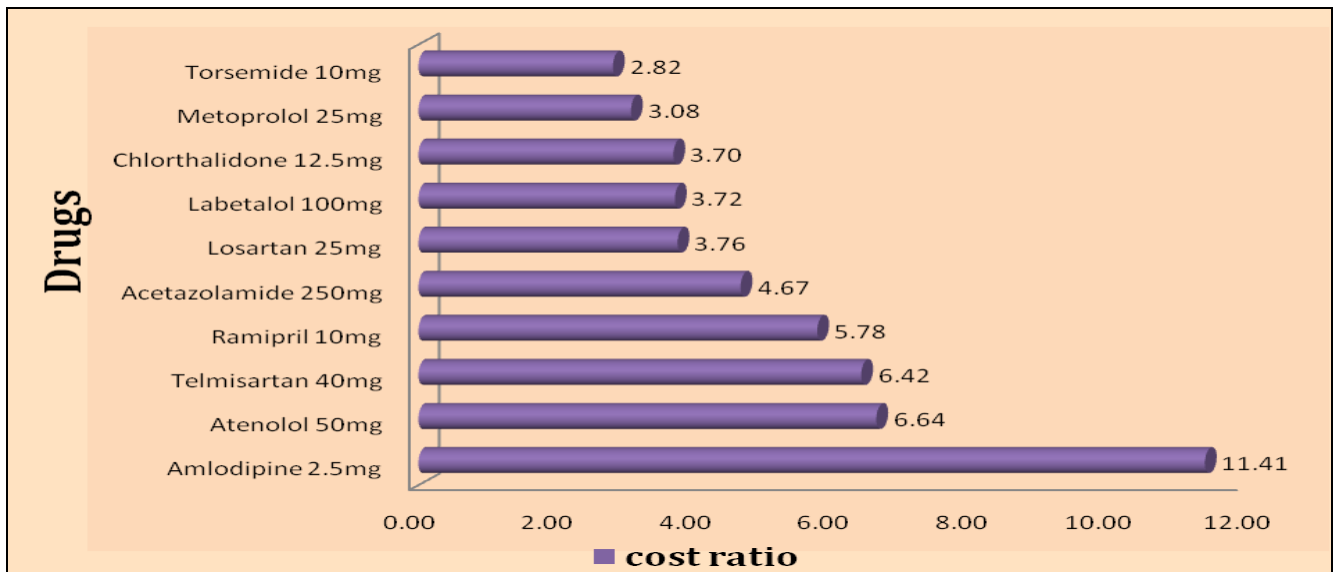


FIG.2: COST RATIO OF COMMONLY USED ANTIHYPERTENSIVE DRUGS USED AS A SINGLE DRUG THERAPY

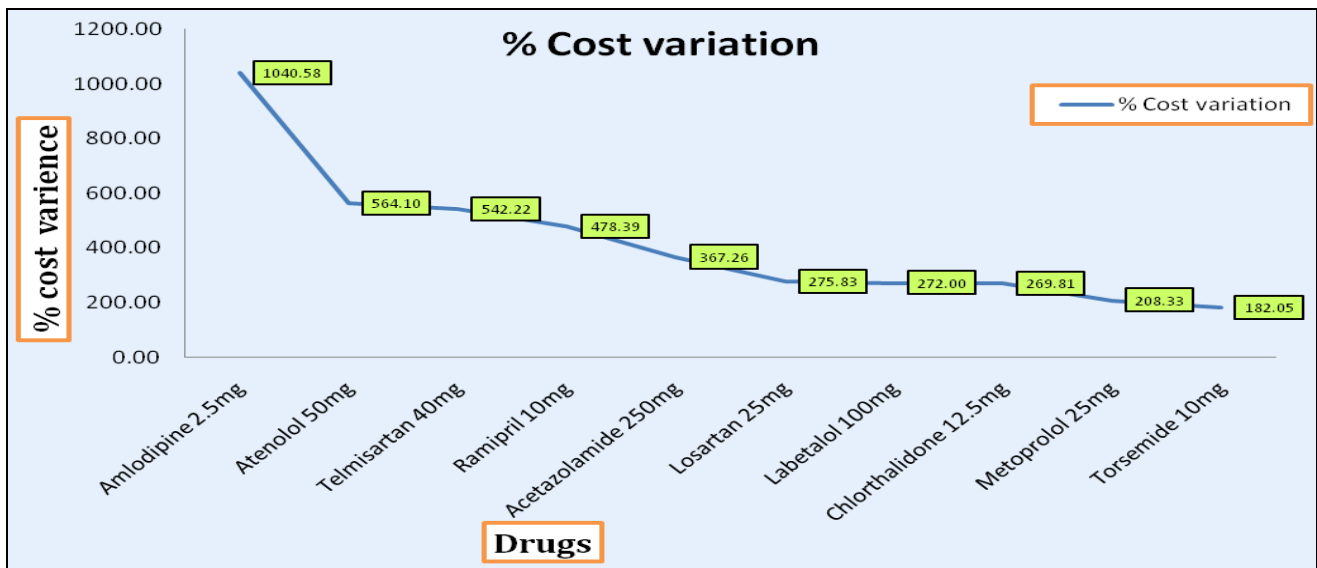


FIG. 3: PERCENTAGE COST VARIATION OF COMMONLY USED ANTIHYPERTENSIVE DRUGS USED AS A SINGLE DRUG THERAPY

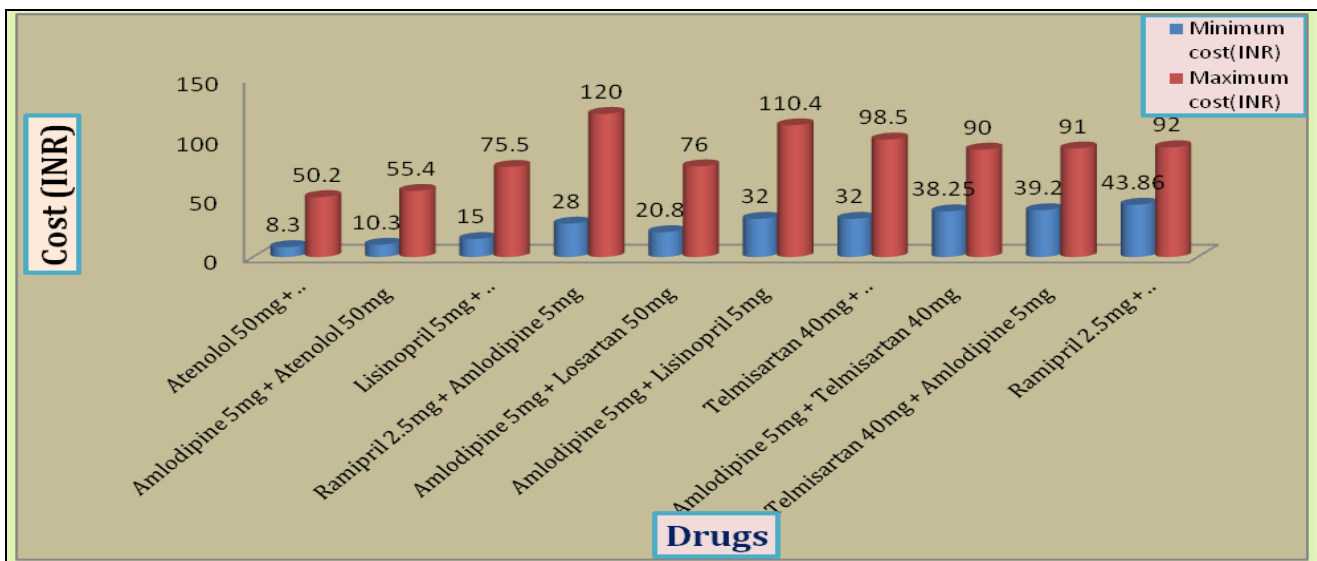


FIG. 4: COST DIFFERENCE [MINIMUM AND MAXIMUM] IN COMBINATION OF ANTIHYPERTENSIVE DRUGS

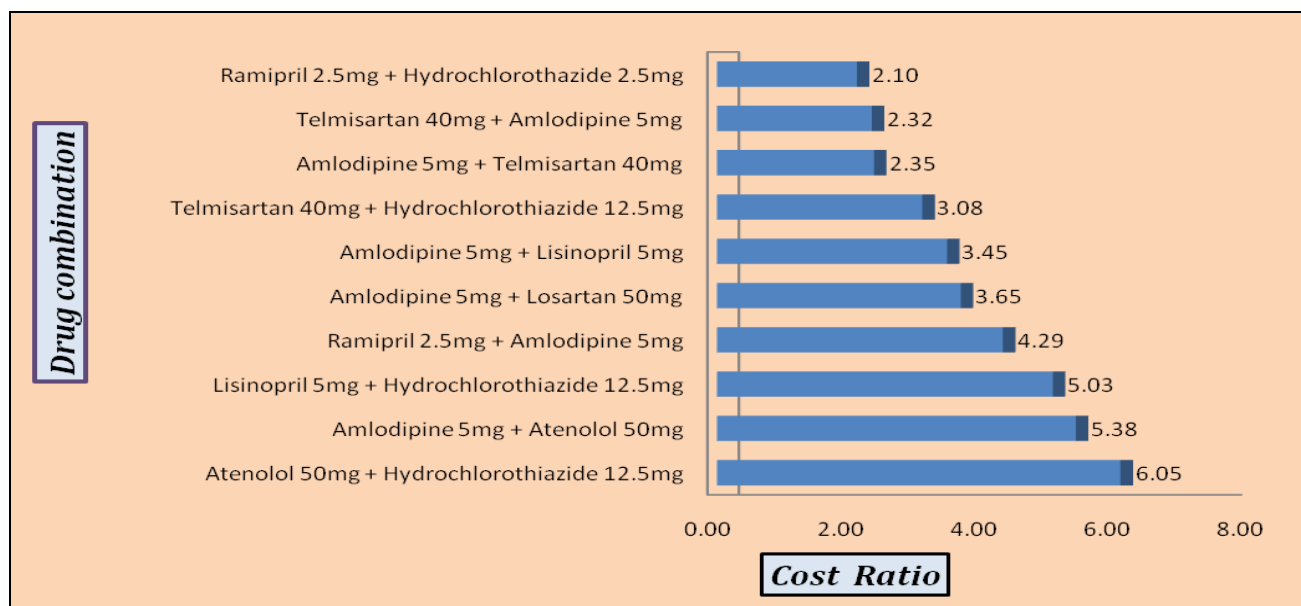


FIG.5: COST RATIO IN COMBINATION OF ANTIHYPERTENSIVE DRUGS

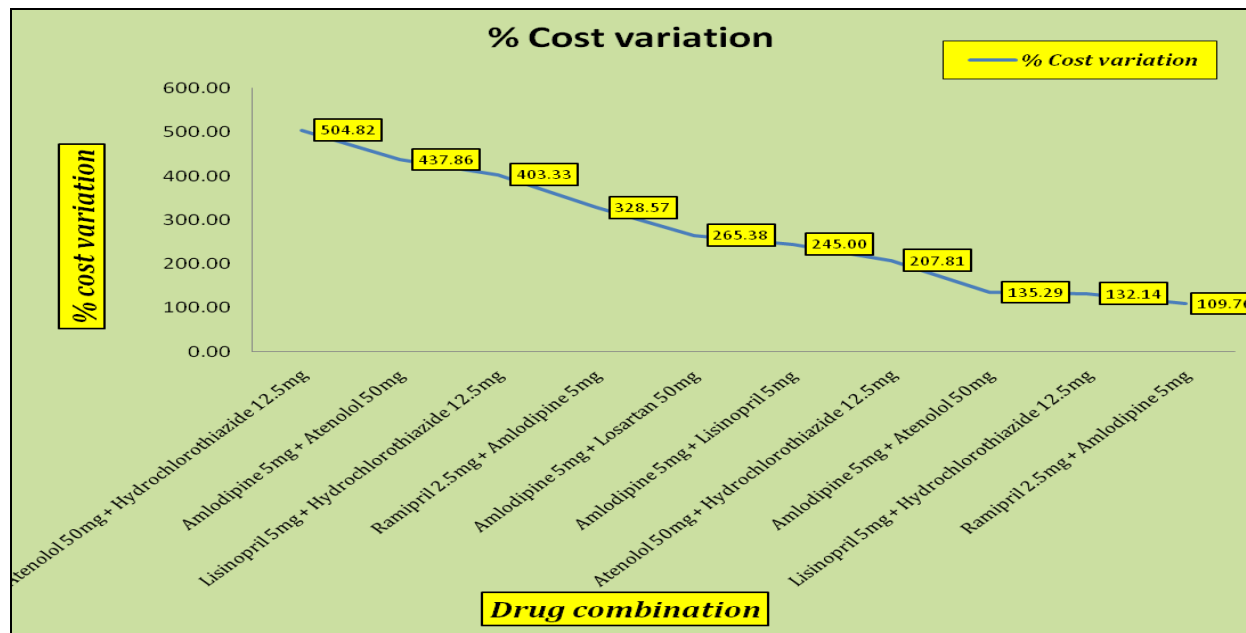


FIG. 6: PERCENTAGE COST VARIATION IN COMBINATION OF ANTIHYPERTENSIVE DRUGS

DISCUSSION: Our study findings showed a very high fluctuation in the minimum and maximum price of antihypertensive agents (Fig. 1&4) which is being manufactured by several companies across the different brands. The cost ratio was also observed to be very high (Fig. 2&5). The percentage variation in the cost was above 100% with most of the commonly used antihypertensive drugs (Fig. 3) and also with combination of antihypertensive drugs (Fig. 6). A Similar study done by Karve AV et al at Mumbai also showed significant higher price variations in different brands of the same antihypertensive drug.⁹ Other

similar studies on oral anti-diabetic drugs, antidepressants, antibiotics, anti-epileptics also found similar results.¹⁰⁻¹³

India is known to export medicines to various countries at low cost, but faces the challenge of access to affordable and quality medicines for its own population. The Indian market has over 100,000 formulations and there is no system of registration of Medicines. More than one company sells a particular drug under different brand names apart from the innovator company. This situation has led to greater price variation among drugs

marketed. These wide variations in the prices of different formulations of the same drug have severe economic implications in India. Unlike developed countries, people in developing countries pay the cost of medicines out-of-pocket. In India, more than 80% health financing is borne by patients.¹⁴⁻¹⁶ Patients have to pay more unnecessarily if costly brands are prescribed. The costly brand of same generic drug is scientifically proved to be in no way superior to its economically cheaper counterpart.⁴

Many poor people frequently face a choice between buying medicines or buying food or other necessities due to limited resources and high pricing of drug. So medicine prices do matter. Ideally the drugs of cheaper brands should be prescribed to save the patient's money and to enhance the compliance. In India, doctors have less awareness in the cost difference of different brands of the same drug. It is felt that physicians could provide better services and reduce costs of drugs if 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 especially in a diseases like hypertension which needs long term treatment.¹⁷ Rational prescribing involves selecting the cost effective treatment.

There is a need for concerted action from regulatory authorities, doctors, pharmacists and general public at large to address this issue of antihypertensive drugs price variation. The excess profit margins presently being shared by pharmaceutical traders must be passed on to consumers which is a feasible and economically viable.

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 (DPCO). Out of 509 drugs under price control, we found that only eight antihypertensive drugs amlodipine, atenolol, enalapril, losartan, methyl dopa, nifedipine, hydrochlorothiazide were included in the DPCO list 2015.^{18, 19} We found in our study, price variation with above drugs even

though the price is less than the ceiling price quoted by DPCO. Also none of the combinations of antihypertensive drugs are included in DPCO list 2015. 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.

Government of India has opened few generic drug stores in some states that sell generic medicines manufactured by public sector companies.²⁰ The quality of generic medicines available on these stores at cheaper rates should be tested and compared with popular branded drugs and results should be widely published. Studies involving comparative evaluation on quality of branded and their generic counterpart may be made mandatory for the generic manufacturer and their reports should be made public to promote generic use and prescription.

CONCLUSION: Our study findings show a wide variation in the prices of different brands of same antihypertensive drugs in India (**Table 1** and **2**). There is a strong need to create awareness about this huge price variation among the general public, health care providers, health care payers, government agencies, policy makers, pharmacists for appropriate intervention to reduce economic burden on patients as well as the healthcare system. Results of our study make the prescriber informed about various brands and their price variations. So the prescriber can chose the cost effective antihypertensive agents for a patient to achieve rational prescribing.

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Ethical committee approval: Not Required.

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