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COST VARIATION ANALYSIS OF VARIOUS ANGIOTENSIN RECEPTOR BLOCKERS AVAILABLE IN THE INDIAN MARKET

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ABSTRACT: Background: Analysis of price inconsistencies among various brands guides prescribing physicians. A cost-effective prescribing pattern safeguards good patient compliance and better treatment outcomes. **Aims and Objectives:** The study aimed to analyze the cost variation of different angiotensin receptor blockers available in the Indian market. **Materials and Methods:** The prices of angiotensin receptor blockers, produced by different pharmaceutical companies in India, with the same strength and dosage form were obtained from the Current Index of Medical Specialties, manual 2024-2025. The cost of generics was obtained from the janaushadhi.gov.in website. The maximum and minimum prices of brand drugs manufactured by different companies, cost differences of brand versus generic drugs, cost ratio, and the percentage cost variation, were calculated. **Results:** Candesartan had the highest cost variation. The difference between the minimum price of brand drugs and the cost of generic drugs was highest with telmisartan 80 mg at 41.23%. The cost variation among the combinations was maximum with telmisartan 80 mg + hydrochlorothiazide 12.5 mg at 559 %. Olmesartan 40 mg + chlorthalidone 12.5 mg showed a large difference when we compared the cost of brand versus generic combinations (108.65%). **Conclusion:** The prices of different brands of ARBs vary widely. Physicians must be aware of the availability of cost-effective drugs, which helps them prescribe the most suitable drug according to the patient's economic status. This reduces the economic burden on both patients and the healthcare system.

INTRODUCTION: According to WHO, hypertension is the major non-communicable disease responsible for premature death worldwide [1]. The National Family Health Survey (NFHS-5) states that the prevalence of hypertension in India is 22.6% in men and 21.2% in women [2]. Complications of untreated hypertension include left ventricular hypertrophy, heart failure, atherosclerosis, cerebrovascular disease, stroke, renal failure, and retinopathy [3].

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Management of hypertension includes most common antihypertensives like diuretics, Angiotensin Converting Enzyme (ACE) inhibitors, Angiotensin receptor blockers (ARBs), beta-blockers, Calcium channel blockers, and other vasodilators along with lifestyle modifications. Among these drugs, ACE inhibitors and ARBs are mainly used in patients with heart failure, post-myocardial infarction, diabetes, and chronic kidney disease [4].

Being one of the most commonly prescribed antihypertensive drugs, ARBs are manufactured by many pharmaceuticals under different brands. Despite the comprehensive data available on antihypertensive drugs, inadequate research has been done in the pharmacoeconomics section.

In a developing country like India, drug prices play an important role, along with the efficacy and safety of drugs, while forming the National List of Essential Medicines (NLEM) [5]. National Pharmaceutical Pricing Policy 2012 and Drug Prices Control Order 2013 ensure the availability of essential medicines at affordable prices in India [6]. The Government of India launched the Jan Aushadhi Scheme in 2008 to make generic drugs available at affordable prices [7].

Information gathered from this study will be beneficial for physicians, patients, and policymakers. Physicians can compare the various drug prices available in the market and prescribe cost-effective drugs accordingly. This will improve the patient's adherence to treatment. It is also vital in evidence-based policymaking. Due to the limited studies done in India on the cost variation analysis of ARBs, the current study was undertaken to compare the price differences among various ARBs accessible in the Indian market.

MATERIALS AND METHODS: The prices of ARBs manufactured by different pharmaceutical companies in India with the same strength and dosage form were obtained from the Current Index of Medical Specialties (CIMS) manual, 2024-2025 edition. The cost of generics was obtained from the official website janaushadhi.gov.in.

The following calculations were analyzed:

1. Difference between the maximum and minimum price of the same formulation manufactured by various companies
2. Difference between the maximum and minimum price of brands versus generics of the same formulation
3. Cost ratio
4. Percentage cost variation.

Oral ARBs that are available as individual preparations and fixed drug combinations and those manufactured by two or more pharmaceutical companies were included in the study.

Cost Ratio: Calculated by dividing the maximum cost by the minimum cost of the different brands of the same drug.

Percentage Cost Variation:

Percentage cost variation = maximum cost – minimum cost/ minimum cost × 100

Statistical Analysis: The data was collected and entered in to a Microsoft Excel sheet. Analysis was carried out with simple descriptive statistics like percentages and proportions.

RESULTS: In our study, telmisartan had the highest number of brands, 57, followed by losartan 31, olmesartan 20, and candesartan the least 2.

Among the combinations of antihypertensives, telmisartan had the highest number of brands, 60, followed by olmesartan 42, losartan 38, and valsartan the least 6.

We calculated the minimum price, maximum price, cost ratio, and cost variation % for different ARBs. The cost of ten tablets of each brand was taken into consideration for comparison.

The doses of losartan considered in our study were 25 mg, 50 mg, and 100 mg. Cost variation was seen from 28.8% - 300 % across the different brands and doses. Telmisartan had dose range from 20 mg, 40 mg to 80 mg. And the cost variation among the different doses was 158.6% - 366.7%. Olmesartan consisted of 3 doses: 10 mg, 20 mg, and 40 mg. Cost variation ranged from 43.4% - 304.5%. Candesartan was studied for 4 mg and 8 mg doses. The cost variation was 25.67% - 582.6%. **Table 1** shows the large cost variation across the different brands of each ARB. Maximum cost variation was observed with candesartan.

Table 2 summarises the comparison of brand versus generic costs of different ARBs. The difference between the minimum price of brand drugs and the cost of generic drugs was studied. It was least with telmisartan 20 mg 4% and highest with telmisartan 80 mg 41.23%.

The least expensive generic drug was losartan 25 mg with 7.7 Rs, and its counterpart brand drug had a minimum price of 16.5 Rs. The highest price among all the generic drugs was for olmesartan 40 mg at 36.3 Rs and its counterpart brand drug cost 63.8 to 245 Rs.

TABLE 1: PRICE VARIATION AMONG DIFFERENT BRANDS OF ARBs

Drugs	Dose (mg)	Min. Price (INR)	Max. Price (INR)	Cost ratio	Cost variation %
Losartan	25	16.5	66	4	300
	50	29.5	80.4	2.7	172.5
	100	53.98	69.52	1.3	28.8
Telmisartan	20	15	70	4.6	366.7
	40	28.68	207	7.2	621.8
	80	65.43	169.18	2.6	158.6
Olmesartan	10	65.2	93.5	1.4	43.4
	20	44.5	180	4	304.5
	40	63.8	245	3.8	284
Candesartan	4	27.81	34.95	1.3	25.67
	8	45.27	309	6.8	582.6

TABLE 2: COMPARISON OF BRAND VS GENERIC COST OF ARBs

Drugs	Dose (mg)	Min. Price (INR)	Price of generic formulations (INR)	Difference between Min. Price and Janaushadhi (INR)
Losartan	25	16.5	7.7	8.8
	50	29.5	12.1	17.4
Telmisartan	20	15	11	4
	40	26.68	12	11.68
	80	65.43	24.2	41.23
Olmesartan	40	63.8	36.3	27.5

Table 3 depicts the price variation of the combinations of ARBs among the different brands. It was maximum with telmisartan 80 mg + hydrochlorothiazide 12.5 mg 559% and minimum with olmesartan 40 mg + chlorthalidone 6.25 mg 10%. **Table 4** discusses the comparison of brand versus generic costs of combinations. A large difference was seen with olmesartan 40 mg + chlorthalidone 12.5 mg 108.65% and a small difference with losartan 50 mg + amlodipine 5 mg 11%. Therefore, generic drugs are economical when compared with the least expensive brands.

TABLE 3: PRICE VARIATION AMONG THE COMBINATIONS OF ARBs

Drugs	Dose (mg)	Min. Price (INR)	Max. Price (INR)	Cost ratio	Cost variation %
Losartan + Hydrochlorothiazide	25 + 12.5	28.5	50	1.8	75.4
	50 + 12.5	36	144	4	300
Losartan + Chlorthalidone	25 + 12.5	75	115.1	1.5	53.5
	50 + 12.5	87.75	142.9	1.6	62.8
	50 + 6.25	91.11	142.9	1.6	56.8
Losartan + Atenolol + Hydrochlorothiazide	50 + 50 + 12.5	120	188.45	1.6	57
Losartan + Amlodipine	50 + 5	33	188	5.7	469.7
Telmisartan + Amlodipine	40 + 5	40	239	6	497.5
	80 + 5	90.75	252.21	2.8	177.9
Telmisartan + Hydrochlorothiazide	40 + 12.5	40	211.1	5.3	427.6
	80 + 12.5	69	454.7	6.6	559
Telmisartan + Chlorthalidone	40 + 6.25	56	229.85	4.1	310.4
	40 + 12.5	59	131	2.2	122
	80 + 12.5	145	195.1	1.3	34.6
Telmisartan + Ramipril	40 + 2.5	69.65	86.9	1.2	24.8
	40 + 5	98.52	106.3	1.1	7.9
Telmisartan + Cilnidipine	40 + 10	102	148	1.4	45.1
Telmisartan + Amlodipine + Hydrochlorothiazide	40 + 5 + 12.5	80	218	2.7	172.5
Telmisartan + Amlodipine + Chlorthalidone	40 + 5 + 12.5	93.5	152.95	1.6	63.6
Telmisartan + Cilnidipine + Chlorthalidone	40 + 10 + 12.5	119	313	2.6	163
Olmesartan + Amlodipine	20 + 5	75	159.72	2.1	113

	40 + 5	109	221	2	102.8
Olmesartan +	20 + 12.5	69	201	2.9	191.3
Hydrochlorothiazide	40 + 12.5	109	323.7	3	197
Olmesartan + Chlorthalidone	20 + 6.25	140	170	1.2	21.4
	40 + 6.25	263.1	289.45	1.1	10
Olmesartan + Metoprolol	20 + 25	131.45	204	1.6	55.2
	20 + 50	153	228	1.5	68.6
Olmesartan + Amlodipine +	20 + 5 + 12.5	106.33	148.5	1.4	39.7
Hydrochlorothiazide	40 + 5 + 12.5	145	174	1.2	20
Valsartan + Hydrochlorothiazide	80 + 12.5	104	744	7.2	615.4
Azilsartan + Chlorthalidone	40 + 12.5	109	184.85	1.7	69.6

TABLE 4: COMPARISON OF BRAND VS GENERIC COST OF COMBINATIONS

Drugs	Dose (mg)	Min. Price (INR)	Price of generic formulations (INR)	Difference between Min. Price and Janaushadhi (INR)
Losartan + Hydrochlorothiazide	50 + 12.5	36	13.2	22.8
Losartan + Amlodipine	50 + 5	33	22	11
Telmisartan + Amlodipine	80 + 5	90.75	30	60.75
Telmisartan +	40 + 12.5	40	17	23
Hydrochlorothiazide	80 + 12.5	69	23	46
Telmisartan + Chlorthalidone	40 + 6.25	56	20	36
	40 + 12.5	59	22	37
	80 + 12.5	145	30	115
Telmisartan + Amlodipine + Hydrochlorothiazide	40 + 5 + 12.5	80	20.9	59.1
Olmesartan + Amlodipine	20 + 5	75	25	50
	40 + 5	109	35	74
Olmesartan +	20 + 12.5	69	27	42
Hydrochlorothiazide	40 + 12.5	109	30	79
Olmesartan + Chlorthalidone	20 + 12.5	96.45	30	66.45
	40 + 12.5	153.65	45	108.65
Olmesartan + Amlodipine +	20 + 5 + 12.5	106.33	41.8	64.53
Hydrochlorothiazide	40 + 5 + 12.5	145	45	100
Olmesartan + Cilnidipine +	20 + 10 + 12.5	138.69	35	103.69
Chlorthalidone	40 + 10 + 12.5	205.2	40	165.2

DISCUSSION: We analyzed the cost of 4 ARBs available in 111 various brands under 11 different doses. Similarly, for the cost comparison of combinations, a total of 146 brands were studied. A large cost variation was seen among the different brands manufactured by diverse pharmaceuticals.

A study by Gujjarlamudi *et al.* showed a wide percentage cost variation among different brands of ARBs containing the same strength. The percentage price variation was highest with Valsartan 80 mg at 494.2%, followed by Telmisartan 40 mg at 372.22%, then Losartan 25 mg at 280% [8].

Physicians must not be influenced by medical representatives or pharmaceutical companies while prescribing the brand drugs. Although NMC guidelines urge physicians to prescribe generic drugs, many doctors are hesitant because of doubtful effectiveness and quality of generic medications [9]. When there is enough evidence to support the effectiveness of the generic drugs physicians will be able to convince the patients of the use of generic drugs [10]. The ultimate goal is to increase the rational prescription of drugs, including the right drug, right patient, right dose, and right cost. This increases patient compliance, reduces financial loss, and improves health standards.

There are limited studies with comparative drug prices on ARBs. Thus, our findings will be useful for physicians when prescribing ARBs.

Limitations of this Study: because the prices of drugs were compared from the CIMS book, other prices of drugs available from pharmacies or online apps with discount prices were not included.

CONCLUSION: There is a huge cost variation across the different brands of ARBs available in the

market. ARBs are now first-line drugs in the management of hypertension and diabetic nephropathy. By creating awareness among doctors about the availability of various cost-effective drugs, the monetary burden on patients can be reduced. By choosing a cost-effective drug doctors can improve the patient's adherence to treatment of hypertension and thus reduce morbidity and mortality.

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