A Study of Cost Comparison in Anti-Hypertensive Drugs between Jan Aushadhi's Generic Drugs and Branded Drugs

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ABSTRACT

Background: Considering the long-term nature of hypertension and its continuous treatment requirements, the high cost of branded antihypertensive drugs poses a significant challenge for low-and middle-income patients. Generic medications, known for their comparable effectiveness to branded counterparts at a more affordable price point, can significantly reduce the financial burden on patients. The aim of this study was to analyze the cost variation between Jan Aushadhi's generic drugs and branded medications for antihypertensive therapy. **Materials and Methods:** Cost minimization analysis study was conducted over a three-month period, from August 2023 to October 2023. We include Anti-hypertensive drugs listed in the Jan Aushadhi drug list. **Results:** Our findings show that Jan Aushadhi's generic drugs were less costly than average branded drug cost. Ramipril 5 mg shows maximum price variation of 696%, while Bisoprolol 5 mg shows minimum variation of 40.91%. **Conclusion:** Our study concluded that cost disparity between Jan Aushadhi generic drugs and branded drugs commonly used for hypertension treatment in India.

Keywords: Hypertension, Anti-hypertensive drugs, Generic drugs, Branded drugs, Jan Aushadhi's generic drugs.

INTRODUCTION

The prevalence of non-communicable diseases had been on the rise, posing a significant threat in both developed and developing countries. These conditions, including cardiovascular diseases are responsible for a shocking 40 million deaths every year, constituting 70% of total global mortality.[1] Significantly, elevated Blood Pressure (BP), a primary factor increasing the risk of cardiovascular ailments, is linked to 7.5 million fatalities annually. Characterized by a BP reading is 140/90 mmHg or higher, high blood pressure (Hypertension), if left untreated, can lead to severe health complications including coronary heart disease, stroke, renal impairment, and visual impairment.[2-4]

Generic medications, known for their comparable effectiveness to branded counterparts at a more affordable price point, can significantly reduce the financial burden on patients.[5] In the domain of health economics, pharmacoeconomic plays a crucial role, focusing on the assessment of costs and consequences associated with pharmaceutical products and services.[6] An in-depth cost analysis, particularly for chronic conditions like hypertension, holds immense importance in promoting medication adherence and managing healthcare expenses effectively.[7]

The "Jan Aushadhi Scheme," initiated by the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India, aimed to provide quality generic medications at a reasonable price through dedicated outlets and then it was renamed as "Pradhan Mantri Bhartiya Janaushadhi Pariyojana" (PMBJP) in November 2016.[8]

Considering the long-term nature of hypertension and its continuous treatment requirements, the high cost of branded antihypertensive drugs poses a significant challenge for low-and middle-income patients. Hence, conducting a comprehensive cost comparison between Jan Aushadhi's generic and branded formulations in antihypertensive medicine can offer valuable insights into the potential benefits of affordable generic medications for hypertension management.

So far, there have been no comprehensive studies comparing the cost difference between the Jan Aushadhi Store pricing and the branded drug price of antihypertensive medications.

Aim

To analyze the cost variation between Jan Aushadhi's generic drugs and branded medications for antihypertensive therapy.

Objectives

To compare the quantity of antihypertensive drugs within each category based on the drug list provided by Jan Aushadhi.

Conducting a comprehensive analysis of the price gap between Jan Aushadhi's generic drugs and branded medications across various categories, including angiotensin receptor blockers, diuretics, beta-blockers, selective alpha-2 receptor agonists, ACE inhibitors, sympathetic inhibitors, and calcium channel blockers

MATERIALS AND METHODS

Study Design: Cost minimization analysis.

Study Duration: Study was conducted over a three-month period, from August 2023 to October 2023.

Inclusion criteria: Anti-hypertensive drugs listed in the Jan Aushadhi drug list

Exclusion criteria: Anti-hypertensive drugs not listed in the Jan Aushadhi drug list

Statistical analysis: Mean, median, mode and Percentage

Study procedure

We collect generic drug cost from Jan Aushadhi drug list and branded drug cost from drug today, 1mg.com and CIMS. Then, we compare the cost difference generic and branded drug.

$$\text{Percentage cost difference between Average cost branded drug and generic drug cost} = \frac{\text{Average Branded drug cost} - \text{Jan Aushadhi's generic drug cost}}{\text{Jan Aushadhi's generic drug cost}} \times 100$$

$$\text{Cost ratio} = \text{Average Branded drug cost} / \text{Jan Aushadhi's generic drug cost}$$

RESULTS

In our study, we conducted a cost analysis of antihypertensive medication. Our study exclusively focused on the inclusion of monotherapy drugs within the antihypertensive category.

Table 1 illustrates that there were 29 drugs accessible within the antihypertensive drug category on Jan Aushadhi's drug list. The diuretics class comprises the largest quantity of drugs, whereas the class of selective alpha 2 adrenergic agonists contain the fewest drugs.

Table 2 shows that cost difference between Jan Aushadhi's generic drug and the average branded drug within the category of angiotensin receptor blockers. It demonstrates that Telmisartan 40 mg exhibits the most significant cost disparity (500%) between Jan Aushadhi's generic drug and the average branded drug. In contrast, Azilsartan medoxomil 40 mg reveals the least difference in cost (75%) between Jan Aushadhi's generic drug and the average branded drug.

Table 3 demonstrates the cost variation between Jan Aushadhi's generic drugs and the average branded drugs within the category of calcium channel blockers. Amlodipine 5 mg, in particular, exhibits the most significant cost difference (398%) between Jan Aushadhi's generic drug and the average branded drug. Conversely, Nifedipine 10 mg displays the smallest difference in cost (60%) between Jan Aushadhi's generic drug and the average branded drug. Notably, Benidipine 4 mg exhibits a higher generic drug cost compared to the average branded drug cost.

Table 4 demonstrates the cost variation between Jan Aushadhi's generic drugs and the average branded drugs within the category of beta blockers. Metoprolol 50 mg demonstrates the most considerable difference in cost (495%) between Jan Aushadhi's generic drug and the average branded drug. In contrast, Bisoprolol 5 mg shows the least variance in cost (40%) between Jan Aushadhi's generic drug and the average branded drug.

Table 5 demonstrates the cost variation between Jan Aushadhi's generic drugs and the average branded drugs within the category of diuretics. Torsemide 10 mg demonstrates the most considerable difference in cost (400%) between Jan Aushadhi's generic drug and the average branded drug. In contrast, Spironolactone 25 mg shows the least variance in cost (44%) between Jan Aushadhi's generic drug and the average branded.

Table 6 demonstrates the cost variation between Jan Aushadhi's generic drugs and the average branded drugs within the category of ACE inhibitor. Ramipril 5 mg demonstrates the most considerable difference in cost (696%) between Jan Aushadhi's generic drug and the average branded drug. In contrast, Enalapril maleate 2.5 mg shows the least variance in cost (114%) between Jan Aushadhi's generic drug and the average branded drug.

Table 1: List of number of antihypertensive drugs in each category as per Jan Aushadhi's drug list.

Sl. No.	Category of antihypertensive drugs	Number of drugs
1	Angiotensin receptor blocker	5
2	Calcium channel receptor blocker	5
3	Beta blocker	5
4	Diuretics	
	Potassium sparing diuretics	2
	Thiazide diuretics	2
	High ceiling diuretics	2
	Adjunctive diuretics	1
5	Angiotensin converting enzyme inhibitor	3
6	Sympathetic inhibitors	
	Alpha + Beta blocker	2
	Central sympatholytic	1
7	α-2 receptor agonist	1
Total		29

Table 2: Cost comparison of angiotensin receptor blockers category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Azilsartan medoxomil tablet	40 mg	Angiotensin receptor blocker	6.4	6.5	11.2	18.9	75	1.75
2	Losartan tablet	25 mg		0.77	0.86	2.35	5.6	205.19	3.05
		50 mg		1.21	1.2	4.8	9.9	296.69	3.97
3	Olmesartan medoxomil tablet	20 mg		1.7	2.5	6.95	18.5	308.82	4.09
		40 mg		3.63	4.5	8.2	26.8	125.90	2.26
4	Telmisartan tablet	20 mg		1.1	0.8	3.5	9.9	218.18	3.18
		40 mg		1.2	2.3	7.2	36.7	500.00	6.00
		80 mg		2.42	1	9.8	16.5	304.96	4.05
5	Valsartan tablet	40 mg		2	1.8	7.5	12.52	275.00	3.75
		80 mg		3.63	2.8	13.63	22.92	275.48	3.75

Table 3: Cost comparison of Calcium channel receptor blocker category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Amlodipine tablet	10 mg	Calcium channel blockers	1	0.7	3.8	11.67	280	3.8
		5 mg		0.55	0.45	2.74	14	398.18	4.98
2	Benidipine tablet	4 mg		1.5	1	1.2	12	-20.00	0.80
3	Cilnidipine tablets	10 mg		1.65	1.5	6.55	16.02	296.97	3.97
		20 mg		1.98	1.9	9.5	19.07	379.80	4.80
		5 mg		1.1	0.5	4.29	9.44	290.00	3.90
4	Diltiazem tablet	90 mg		3.63	3	9.13	20.9	151.52	2.52
		30 mg		1.21	1	2.12	5.4	75.21	1.75
		60 mg		1.7	2.1	4	11	135.29	2.35
5	Nifedipine tablet	20 mg		0.9	1.2	2.5	4.27	177.78	2.78
		10 mg		0.8	0.88	1.28	1.6	60.00	1.60

Table 4: Cost comparison of beta blocker category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Atenolol tablet	25 mg	Beta blockers	0.43	0.24	1.99	7.07	362.79	4.63
		50 mg		0.47	0.35	2	8.07	325.53	4.26
2	Bisoprolol tablet	2.5 mg		2.2	0.6	4.2	7.4	90.91	1.91
		5 mg		3.3	1.25	4.65	17.8	40.91	1.41
3	Metoprolol tablet	50 mg		0.99	1.8	5.9	12	495.96	5.96
		12.5 mg		1	3.24	3.55	5.36	255.00	3.55
		25 mg		1.1	3.03	4.6	14.06	318.18	4.18
4	Nebivolol tablet	2.5 mg		2.86	1.9	5.35	10.6	87.06	1.87
		5 mg		4.4	3	8.65	17.2	96.59	1.97
5	Propanolol tablet	10 mg		0.55	0.3	1.4	10	154.55	2.55
		40 mg		0.66	0.6	3.2	7.8	384.85	4.85

Table 5: Cost comparison of diuretics category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Eplerenone tablet	25 mg	Potassium sparing diuretics	13	14.9	24	36.6	84.62	1.85
2	Spironolactone tablet	25 mg		1.47	1.6	2.13	2.35	44.90	1.45
3	Hydrochlorothiazide tablet	12.5 mg	Thiazide diuretics	0.6	0.8	1.23	6	105.00	2.05
4	Indapamide tablet	1.5 mg		2.6	1.6	4.96	7.5	90.77	1.91
5	Furosemide tablet	40 mg	High ceiling diuretics	0.5	0.3	0.93	4.5	86.00	1.86
6	Torsemide tablet	10 mg		1.13	1.5	5.65	42	400.00	5.00
		20 mg		1.98	2.4	6.9	14.4	248.48	3.48
		40 mg		3.33	2.8	11.98	22.5	259.76	3.60
		5 mg		0.67	1	2.7	4.95	302.99	4.03
7	Acetazolamide tablet	250 mg	Adjunctive diuretics-Carbonic anhydrase inhibitor	1.8	0.72	3.7	8	105.56	2.06

Table 6: Cost comparison of ACE inhibitors category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Lisinopril tablet	10 mg	Angiotensin converting enzyme inhibitors	1.53	1.6	10	43.33	553.59	6.54
2	Ramipril tablet	10 mg		2	2.5	12.45	27.19	522.50	6.23
		2.5 mg		0.77	0.968	4.87	8	532.47	6.32
		5 mg		1	0.81	7.96	32.45	696.00	7.96
3	Enalapril maleate tablet	2.5 mg		0.7	0.67	1.5	2.5	114.29	2.14
		5 mg		0.55	0.7	2.23	3.99	305.45	4.05

Table 7: Cost comparison of sympathetic inhibitors category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Carvedilol phosphate tablet	10 mg	Alpha + Beta adrenergic blocker	1.7	7	7	11.6	311.76	4.12
		20 mg		2.5	12	15.29	17.6	511.60	6.12
		12.5 mg		1.5	1.45	5.95	12.6	296.67	3.97
		3.125 mg		0.77	0.7	2.88	8.8	274.03	3.74
		6.25 mg		0.77	0.95	4.19	8.7	444.16	5.44
2	Labetalol tablet	100 mg		4.5	4.5	14.36	31.73	219.11	3.19
3	Clonidine tablet	100 mcg	Central sympatholytic	1.1	0.9	2	3.3	81.82	1.82

Table 7 demonstrates the cost variation between Jan Aushadhi's generic drugs and the average branded drugs within the category of sympathetic inhibitors. It includes Alpha + Beta adrenergic blocker drugs and Central sympatholytic drugs.

Table 8 demonstrates the cost variation between Jan Aushadhi's generic drugs and the average branded drugs within the category of selective alpha-2-receptor agonist.

DISCUSSION

High blood pressure, or hypertension, stands as the foremost preventable factor for a range of health issues including cardiovascular diseases like heart conditions and strokes, chronic kidney problems, and cognitive decline. It's the primary cause of global mortality and disability.[9,10] Global rise in cardiovascular disease has led to increased morbidity and mortality worldwide.

Table 8: Cost comparison of α-2 receptor agonist category of drugs.

Sl. No.	Generic drug name	Dose	Category of drugs	Jan Aushadhi's generic drug cost	Low branded drug cost	Average branded drug cost	High branded drug cost	Percentage cost difference between Average cost branded drug and generic drug cost	Cost ratio between Average cost branded drug and generic drug cost
1	Moxonidine tablet	0.3 mg	α-2 receptor agonist	4.7	8.8	10.9	13.89	131.91	2.32

Individuals managing these chronic conditions face increasing out-of-pocket expenses. Despite the acknowledgment of the necessity for universal healthcare, achieving equitable access in developing nations like India is hindered by insufficient public health spending and negligible health insurance coverage. This amplifies out-of-pocket spending, making healthcare inaccessible for many impoverished individuals.[6] Generic medications were at least similar, and in some cases superior, to their effect of branded drugs.[11] Generic drugs lowered the region's drug bill by 61% in most countries. Even in poorer nations, moving private sector purchases from branded to generic pharmaceuticals could result in cost savings. The Jan Aushadhi medical store's lower pricing and better quality are the main reasons people choose to buy generic medications from them.[8]

Our findings show that Jan Aushadhi's generic drugs were less costly than average branded drug cost.

In our study, we conduct percentage cost difference of 29 antihypertensive drugs listed in Jan Aushadhi's drug price list. Kamath L et al., 2015 concluded that percentage cost variation of 23 commonly used antihypertensive drugs used as a single drug therapy.[12]

Overall, in our study, Ramipril 5 mg shows maximum price variation of 696%, while Bisoprolol 5 mg shows minimum variation of 40.91%. Avanthi et.al conducted a cost analysis study in antihypertensive agents in branded drugs concluded that amlodipine 5 mg has highest cost variation of 625%, Nifedipine 5 mg has lowest cost variation of 3.6%.[13] Smitha V.K et al. conducted a pharmacoeconomic study concluded that Prazosin 25 mg was found to have maximum price variation of 7.76 and the least variation (0.05) was observed with telmisartan 80 mg.[14] Kamath L et al., 2015 concluded that Amlodipine 2.5 mg shows maximum price variation of 1040.58%, while methyldopa 250 mg shows minimum variation of 10.89%.[12]

Arya N et al. 2019 concluded that amlodipine 5 mg shows maximum price variation of 1128.57%, while Olmesartan 10 mg shows minimum variation of 25.64%.[15]

In our study, Percentage price variation between average branded cost drug and generic drug respectively for CCBs: Amlodipine 5 mg-398.18% and Benidipine 4 mg-(-20%), ACE inhibitors: Ramipril 5 mg-696% and Enalapril maleate 2.5 mg-114.29%, ARBs: Telmisartan 40 mg-500% and Azilsartan 40 mg-75%, beta blockers: Metoprolol 50 mg-495.96% and Bisoprolol-40.91% and diuretics: Torsemide 10 mg-400% and Spironolactone 25 mg-44.9%. Kamath L et al., 2015 concluded that 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%.[12] Arya N et al. 2019 concluded that maximum and minimum percentage price variation respectively for CCBs: Amlodipine 5 mg-1128.57% and nifedipine 5 mg-36.36%, ACE inhibitors: Enalapril 10 mg-394.67% and Ramipril 10 mg-92.21%, ARBs: Telmisartan 20 mg-288.33% and Olmesartan 10 mg-25.64%, beta blockers: Atenolol 12.5 mg-683.53% and nebivolol 5 mg-63.76%.[15]

Beck RK et al. concluded that Atenolol 12.5 mg shows maximum price variation of 880%, while Methyldopa 250 mg shows minimum variation 0.04%. The maximum and minimum percentage price variation respectively for CCBS: Amlodipine 5 mg-460% and Cilnidipine 5 mg-55.42%; Beta blockers: Atenolol 12.5%-880% and Atenolol 100 mg-42.41%; Alpha and Beta blockers: Terazosin 1mg-278.46% and Prazosin 2.5 mg-32.98%; ACE inhibitors: Ramipril 1.25 mg-169.61% and Ramipril 10 mg-53.97%; ARBs: Olmesartan 40 mg-282.03% and Irbesartan 300 mg-1.01%; Diuretics: Indapamide 1.5 mg-267.20% and Torsemide 40 mg-1.05%.[16]

Yuvanesh et al. conducted a study in cost comparison between branded medicines and Jan Aushadhi's medicines concluded that JAS price of antihypertensive agents was less compared to branded drugs.[17]

CONCLUSION

Our research highlights the cost disparity between Jan Aushadhi generic drugs and branded drugs commonly used for hypertension treatment in India. Lowering drug costs stands to enhance affordability, boost medication adherence, and alleviate financial strain on patients from a societal standpoint. Consequently, it's crucial to raise awareness among physicians about the cost variance among these drugs, their potential financial advantages for marginalized patients, and to promote the prescription of Jan Aushadhi medications. The findings from this cost analysis will benefit healthcare professionals, patients, policymakers, and society overall.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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