

## PHARMACOECONOMIC STUDY OF VARIOUS BRANDS OF ANTI-EPILEPTIC DRUGS AVAILABLE CURRENTLY IN INDIA

MEHUL AGRAWAL<sup>1</sup>, TARUN KUMAR<sup>1</sup>, SWAPNIL MUJUMDAR<sup>1</sup>, SAMAN AATIF SAULAT\*<sup>1</sup>

Department of Pharmacology, Gandhi Medical College, Bhopal, Madhya Pradesh, India.

\*Corresponding author: Saman Aatif Saulat; Email: drsamanaatif@gmail.com

Received: 18 November 2023, Revised and Accepted: 20 January 2024

### ABSTRACT

**Objectives:** (a) Compiling a comprehensive list of the available dosage forms and strengths of various antiepileptic drugs marketed in India. (b) Calculating the percentage cost variation of individual drug formulations produced by different pharmaceutical companies. (c) Evaluating the percentage cost variation of these drugs.

**Methods:** The cost of an exact drug (cost per 10 tablets) in the same strength and amount of forms being manufactured by different companies were got from the latest editions of "Current Index of Medical Specialties" and "Indian Drug Review." The percentage price difference and cost ratio for each formulation were intended.

**Result:** Among single drugs, the highest price variation was found in the drug pregabalin available in the form of capsules (75 mg and 150 mg), and a cost ratio of 6.64 and 5.87 was calculated which was significant. Among combination drugs, tablet Na valproate+valproic acid with the cost ratio of 1.91 was found to be the highest.

**Conclusion:** Our study shows that there is very high price variation in some of the brands of anti-epileptic drugs. Generic prescribing should be promoted in the whole country by creating awareness and implementing proper regulatory guidelines.

**Keywords:** Anti-epileptic drugs, Cost variation, Pharmacoeconomics, Cost ratio.

© 2024 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2024v17i2.50310>. Journal homepage: <https://innovareacademics.in/journals/index.php/ajpcr>

### INTRODUCTION

In the expansive landscape of the Indian pharmaceutical market, there exists an extensive array of over 20,000 medicine formulations. Epilepsy stands as the most prevalent neurological condition globally, affecting individuals of all age groups, with an Indian prevalence rate of 572.8 cases per 100,000 population per year. Alarmingly, about 90% of individuals with epilepsy in developing countries including India do not have access to the appropriate treatments, and this is often directed to their financial capabilities and the availability of medications [1]. These pharmaceutical products are predominantly marketed under various brand names and generic branded names [2,3]. Management of epilepsy is itself a Herculean task in our country [4]. Factors such as age, sex, psychomotor development, or seizure type do not usually influence the adherence of patients to medication [5]. Medication adherence which influences health outcomes is mainly affected by the cost of the medicines [6]. Higher medication costs have been found to be the reason for poor adherence of treatment which leads to adverse health outcomes [7]. This situation underscores the pressing need for a thorough cost analysis of the available drug formulations within the realm of medical practice. Such an analysis serves the critical purpose of identifying avenues for cost reduction and facilitating the judicious selection of more economical alternatives when prescribing medications.

The management of epilepsy involves the use of various anti-epileptic drugs, each offered under different brands and formulations, resulting in substantial cost variation in the Indian market. The cost variation profiles of these drugs shed light on the unnecessary financial burdens faced by the patients. Reducing these costs is imperative. Our study is headed with the following objectives: (a) Compiling a comprehensive list of the available dosage forms and strengths of various anti-epileptic drugs marketed in India. (b) Calculating the percentage cost variation

of individual drug formulations produced by different pharmaceutical companies. (c) Evaluating the percentage cost variation of these drugs due to the diversity in dosage forms and formulations of the same drug, by employing the defined daily dose methodology [8,9]. This approach aims to find more economical anti-epileptic drug options for the patients.

In essence, our study seeks to provide valuable insights into the cost dynamics of anti-epileptic drugs, ultimately contributing to the identification of cost-effective treatment alternatives for individuals living with epilepsy, and thereby contributing to the overarching goal of improving the quality and efficiency of health-care delivery in the field of epilepsy management.

### METHODS

The study was done in the Department of Pharmacology of a teaching hospital in central India. The cost per 10 tablets of a drug, in the same strength and dosage forms, was got from the latest editions of "Current Index of Medical Specialties" and "Indian Drug Review." The price difference was analyzed and from the data obtained, the percentage cost variation and cost ratio for each drug were then calculated. The percentage difference in the cost of the drugs was calculated by the following formula [1].

$$\text{Percentage cost variation} = \frac{\text{Price of most expensive brand} - \text{Price of least expensive brand}}{\text{Price of least expensive brand}}$$

The cost ratio is calculated by the ratio of the most expensive brand to the least expensive brand of the same drug. It helps to know how numerous times the record expensive formulation is costlier than the least expensive one of the same drugs. Fixed dose combinations of

more than two anti-epileptic agents were also included in the study. The drugs manufactured by only one company and drugs with no cost information were excluded from this study. The data collected were arrived in Microsoft Excel 2013. Cost ratio and percentage cost variation were calculated.

## RESULTS

A total of 15 drugs were analyzed out of which 12 were single and three were in the form of fixed-dose combinations.

### Monotherapy (Table 1)

Among single drugs, the highest price variation was found in the drug pregabalin available in the form of capsules (75 mg and 150 mg), and a cost ratio of 6.64 and 5.87 was calculated which was significant. After pregabalin, the next drug was levetiracetam in the form of a tablet (750 mg) having a cost ratio of 4.7 followed by the drug lorazepam in the form of a tablet of 1 mg having a cost ratio of 3.47. A tablet of clobazam in the dose of 20 mg was also found to have a cost ratio of 2.8. Clonazepam was found to have a cost ratio of 2.28 in the form of a tablet of 0.5 mg, which also shows significant cost variation.

### Combination therapy (Table 2)

A total of three drug combinations were analyzed and the highest percentage cost variation of 91.6 was found in the tablet of Na valproate+valproic acid having a cost ratio of 1.91 followed by the combination of gabapentin and nortriptyline.

## DISCUSSION

Indian population contributes greatly to the sales of drugs for the above-mentioned disease. Furthermore, we have a large number of patients suffering from epilepsy; these patients come from all economic backgrounds. This affects not only patient's quality of life but also leaves a huge economic burden on both the family and society. Epilepsy is the most common neurological disorder and epileptic drugs have to be prescribed for a long period of time [10]. There is a large difference in the cost of different brands of anti-epileptic drugs available in India. The clinicians prescribing these drugs must be aware of these variations in the cost to not only reduce the cost of drug therapy but also improve the quality, efficiency of health-care delivery and compliance in the field of epilepsy management [11].

Table 1: Monotherapy

Drug	No. of formulation	SR/DSR/DIS/ODT/TAB	Dose (mg)	No. of manufacturing companies	Min. price (INR)	Max. price (INR)	%price variation	Cost ratio
Valproic acid	3	TAB	250	2	51.6	54	46.5	0.95
			500	2	82	104	26.8	1.26
		EC-TAB	200	3	25.09	34.58	37.8	1.37
			500	2	75.87	77.45	2.08	1.02
		FC-TAB	200	2	49.9	53	6.2	1.06
			300	2	56.78	57.61	0.7	1.01
Carbamazepine	2	TAB	500	2	88.72	96.88	9.1	1.09
			200	4	15.2	16.32	7.3	1.07
		ER-TAB	200	2	14	17	21.4	1.21
			400	2	31.02	33.42	7.7	1.07
		clobazam	1	TAB	5	8	35	57.36
10	9				65	105	61.5	1.61
20	2				135	378.74	180	2.8
Clonazepam	1	TAB	0.25	10	12	24	100	2
			0.5	17	16.78	38.32	128	2.28
			1	10	32	60	87.5	1.8
			2	10	54	108	100	2
			100	2	57	66.66	16.9	1.1
Gabapentine	2	TAB	300	2	145	152	4.8	1.04
			300	2	119.5	130	8.7	1.08
			300	2	119.5	130	8.7	1.08
Lamotrigine	1	TAB	25	5	40	64	60	1.6
			50	6	75	149.95	99	1.9
			100	6	125	280	124	2.2
			200	2	349.87	523.35	49.5	1.49
Lorazepam	2	TAB	1	8	7.68	26.7	247	3.47
			2	9	15.17	29.36	93.5	1.93
			2	2	16.35	20	22	1.22
Levetiracetam	3	TAB	250	7	57	67	17.5	1.17
			500	11	118	132	11.8	1.11
			1000	3	245	279.5	14	1.14
			750	7	159	748	370	4.7
			100	4	15	17	13.3	1.13
Phenytoin	1	TAB	100	4	15	17	13.3	1.13
			100	4	15	17	13.3	1.13
Oxcarbazapine	2	TAB	150	7	48.19	74	53.5	1.53
			300	8	76.67	138	79.9	1.79
			450	5	115	188	63.4	1.63
			600	5	115	224.5	95.2	1.95
		FC-TAB	150	2	62.5	62.92	0.6	1.006
			300	2	99	123.11	24.3	1.24
			600	2	168	242.45	44.3	1.44
			600	2	168	242.45	44.3	1.44
Pregabalin	2	CAP	75	5	95	631.5	564.7	6.64
			150	4	140	823.08	487.9	5.87
			75	2	104	168.95	62.4	1.62
Topiramate	1	TAB	25	5	38.3	75	95.8	1.95
			50	5	81.96	149	81.7	1.81
			100	5	107.87	180	66.8	1.66

Table 2: Combination therapy

S.No	Drug	No. of formulation	SR/DSR/DIS/ODT/TAB	Dose (mg)	No. of manufacturing companies	Min. price (INR)	Max. price (INR)	%Price variation	Cost ratio
1	Na valproate+ Valproic acid	1	TAB	134+58	2	43	45	4.6	1.04
					3	36	69	91.6	1.91
					3	60	105	75	1.75
2	Gabapentine+ Methylcobalamin	1	TAB	100+500 mcg	2	105	132	25.7	1.25
					4	142	210	47.8	1.47
3	Gabapentine+ Nortryptiline	1	TAB	400+10	4	142	210	47.8	1.47

According to a study conducted by Sai and Vedavathi, the highest cost ratio and percentage price variation were shown by carbamazepine 200 mg and the lowest ratio by oxcarbazepine 450 mg [2]. According to Shukla and Mehani, the highest cost ratio and percentage price variation were shown by divalproex 500 mg [3]. In a study conducted by Kandra and Rajesh among well-established oral anti-epileptic drugs, divalproex sodium 250 mg had the highest cost ratio and percentage price variation whereas the least was by diazepam 2 mg. However, among the newer oral anti-epileptic drugs, levetiracetam 500 mg had the highest cost ratio and percentage price variation whereas the least was oxcarbazepine 450 mg. There are huge price variations among anti-epileptic drugs similar to earlier mentioned studies [4].

In our study, we found that the tablet pregabalin (capsules 75 mg and 150 mg) had having highest cost variation. This drug is a commonly prescribed drug in patients of epilepsy and other neurological pains. This drug is used for long-term management therapy so it should be affordable to the patient.

Gupta and Reddy also observed more than 100% variation in the cost of selected anti-epileptics. A lot of variations in different brands of the same strength of the newer anti-epileptic drugs such as gabapentin, clobazam, and levetiracetam in comparison to older first-line anti-epileptic drugs such as phenytoin, phenobarbitone, carbamazepine, and valproic acid [12].

Treatment with generic anti-epileptic drugs has been associated with increased adherence and decreased adverse clinical outcomes compared to treatment with branded anti-epileptics [13]. Sincere effort should be made by the concerned authorities to bring more number of anti-epileptic drugs under price control since only a few medicines are under drug price control order currently. Some of the effective tools for regulating drug prices are drug price control orders and national pharmaceutical pricing [14].

Studies have shown that providing a manual of comparative drug prices with explanatory prescribing advice to physicians helped in reducing the patient's expenditure, especially those who need long-term treatment [15].

## CONCLUSION

Our study shows that there is very high price variation in some of the brands of anti-epileptic drugs. India being a developing country cannot bear such huge treatment costs of such common lifestyle diseases such as epilepsy. Therefore, general awareness and proper measures taken by controlling authorities, pharmaceutical companies, and treating physicians are the need of the hour. Generic prescribing should be promoted in the whole country by creating awareness and implementing proper regulatory guidelines. The wide variation in prices of different brands of the same drug has severe economic implications in India. Hence, there is a need to draw attention to reduce the cost of therapy.

## ACKNOWLEDGMENT

The authors are thankful to the various scientific journals for the literature resource.

## CONFLICTS OF INTEREST

None declared.

## FUNDING

No funding sources.

## REFERENCES

- Wagle L, Swammy KM, Kempegowda MB. Cost variation study of antiepileptic drugs available in India. *Asian J Pharm Clin Res* 2016;9:64-8.
- Sai NP, Vedavathi H. Cost analysis study of price variation among the various brands of antiepileptics available in India. *Int J Basic Clin Pharmacol* 2017;6:422-6. doi: 10.18203/2319-2003.ijbcp20170342
- Shukla AK, Mehani R. Cost analysis of antiepileptic drugs available in India. *Int J Basic Clin Pharmacol* 2017;5:1636-40. doi: 10.18203/2319-2003.ijbcp20162485
- Kandra N, Rajesh B. Cost variation analysis of different brands of oral anti-epileptic drugs available in India. *Int J Basic Clin Pharmacol* 2021;10:948-53. doi: 10.18203/2319-2003.ijbcp20212923
- Ho PM, Bryson CL, Rumsfeld JS. Medication adherence: Its importance in cardiovascular outcomes. *Circulation* 2009;119:3028-35. doi: 10.1161/CIRCULATIONAHA.108.768986, PMID 19528344
- Akila L, Rani RJ. Cost analysis of different brands of antianginal drugs available in India. *Int J Basic Clin Pharmacol* 2016;4:860-3. doi: 10.18203/2319-2003.ijbcp20150856
- Mojtabai R, Olfson M. Medication costs, adherence, and health outcomes among medicare beneficiaries. *Health Aff (Millwood)* 2003;22:220-9. doi: 10.1377/hlthaff.22.4.220, PMID 12889771
- Wertheimer AI. The defined daily dose system (DDD) for drug utilization review. *Hosp Pharm* 1986;21:233-4, 239-41, 258. PMID 10317694
- Kopciuch D, Fliciński J, Steinborn B, Winczewska-Wiktor A, Paczkowska A, Zaprutko T, et al. Pharmacoeconomics aspects of antiepileptic drugs in pediatric patients with epilepsy. *Int J Environ Res Public Health* 2022;19:7517. doi: 10.3390/ijerph19127517, PMID 35742766
- Lallan HN, Borde MK, Ray IM, Deshmukh YA. Cost variation study of antidiabetics: Indian scenario. *Indian J Appl Res* 2014;4:420-1.
- World Health Organization. Defined Daily dose Approach to Economic Evaluation of Drug Therapy. Geneva: WHO Health Economics and Health Sector Reform Document WHO/HE/HSR; 2007. p. 1-176.
- Gupta RK, Reddy PS. A calm look on cost analysis of different brands of anti-epileptic drugs. *J MGIMS* 2011;16:64-6.
- Eaddy MT, Cook CL, O'Day K, Burch SP, Cantrell CR. How patient cost-sharing trends affect adherence and outcomes: A literature review. *P T* 2012;37:45-55. PMID 22346336
- Allisabanavar SA, Reddy NS. Cost variation analysis of various brands of anti-epileptic drugs currently available in Indian pharmaceutical market. *Int J Basic Clin Pharmacol* 2017;6:1666. doi: 10.18203/2319-2003.ijbcp20172727
- Rataboli PV, Garg A. Confusing brand names: Nightmare of medical profession. *J Postgrad Med* 2005;51:13-6. PMID 15793332