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Original Research Article

Cost variation analysis of different brands of oral anti-epileptic drugs available in India

Nagavishnu Kandra, Rajesh B.*

Department of Pharmacology, Santhiram Medical College and General Hospital, Nandyal, Kurnool, Andhra Pradesh, India

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***Correspondence:**
Dr. Rajesh B.,
Email: drrajeshb83@gmail.com

ABSTRACT

Background: Epilepsy is a group of neurological disorders, characterized by seizures, loss of consciousness, muscular contraction. Prevalence of epilepsy in India is about 1%. High medical care cost should be cause of concern for policy makers and service providers. Hence, a study was planned to analyse cost ratio and percentage cost variations of oral antiepileptic drugs available in India.
Methods: An analytical study with maximum and minimum price of 10 tablets/capsules and syrup of one bottle of available strength of each drug was noted in Indian Rupee, using "Current Index of Medical Specialties" July to October 2020; "Drug Today" July To October 2020 volume-1 and "Indian Drug Review" 2020 volume-26 issue 6. Percentage cost variation and cost ratio for individual drugs was compared.
Results: Significant cost variations were found in different brands of same drug. Among established oral antiepileptic drugs, Divalproex sodium 250 mg has highest cost ratio 16.071 and 1507.14% price variation and Clonazepam 0.25 mg with cost ratio 16.005 and 1500.55% price variation. Diazepam 2 mg has lowest cost ratio 1.024 and 2.43% price variation. Among newer oral antiepileptic drugs, Levetiracetam 500 mg has highest cost ratio 66.389 and 6538.93% price variation; least is Oxcarbazepine 450 mg with cost ratio 1.317 and 31.75% price variation.
Conclusions: Epilepsy has long course of treatment. Increased adherence to treatment is achieved by switching to cost-effective therapy and by making Pharmacoeconomics an integral part of Undergraduate and Postgraduate Curriculum.

Keywords: Anti-epileptic drugs, Cost ratio, Percentage cost variation

INTRODUCTION

Epilepsy is a group of neurological disorders characterized by seizures, loss of consciousness, muscular contraction.[1] The etiology in most cases is not known. Some of the causes may bestroke, brain tumors, injury andinfections of the brain, and birth defects through a process known as epileptogenesis.[2] About 50 million people worldwide suffer from epilepsy.[3] There are about 10 million people with epilepsy in India with a prevalence of 1%.[4]

The treatment of epilepsy is a challenging task while selecting an appropriate drug or a combination of drugs that controls seizures most effectively at an acceptable level of adverse effects, taking into account the cost of the drug.

Poverty and Poor health infrastructure are reasons for large treatment gap in epilepsy.[5] Usually, the difference between expensive and inexpensive drugs is not properly appreciated by clinicians. This could be due their ignorance about drug cost. Overestimating the price of

inexpensive drugs or underestimating the price of expensive drugs can result in overall increase in expenditures of patients for a drug.[6] Hence a study was conducted to analyze and compare the cost of various brands and strengths of oral antiepileptic drugs available in India.

METHODS

In this analytical study the maximum and minimum price in INR (per 10 tablets/capsules and syrup of one bottle) of all available strengths and dosage form of antiepileptics, manufactured by different companies were noted using Current Index of medical specialties (CIMS), July to October 2020; Drug Today, July To October 2020 volume-1 and Indian Drug Review (IDR) 2020 volume 26 issue 6.([7,8] Antiepileptic drugs in combinations with other classes of drugs were not included in the study.

Percentage cost variation is calculated as Cost variation (%) = [(Maximum cost-minimum cost) / Minimum cost] x 100.[9,10]

Cost ratio is calculated as Cost ratio = Price of the costliest brand/Price of the least costly brand.[11]

Statistical analysis

The collected data was noted in MS excel and same was used to generate cone diagrams which involves comparing % price variation and cost ratio of antiepileptics.

RESULTS

Significant cost variations were found in different brands of same drug. Among well-established oral antiepileptic drugs, Divalproex sodium 250 mg has highest cost ratio 16.071 and 1507.14%price variation, followed by Clonazepam 0.25 mg with cost ratio 16.005 and 1500.55% price variation. Diazepam 2 mg has lowest cost ratio 1.024 and 2.43% price variation.

Table 1: The different available strengths, maximum and minimum prices of each available strength, % price variations and cost ratios for well-established oral antiepileptic drugs.

Drug	Dose (mg)	No. of brands	Max Price (INR)	Min Price (INR)	Cost Ratio	% Price variation
Carbamazepine	100	16	70	6.19	11.308	1030.85
	200	31	120	10	12	1100
	300	4	38.42	19.04	1.995	101.78
	400	14	37.13	24.77	1.498	49.89
Phenytoin	50	6	15.85	6.49	2.442	144.22
	100	14	170	13.34	12.743	1174.36
	300	4	67.20	51.93	1.294	29.40
Clobazam	5	20	78.30	5.5	14.236	1323.63
	10	20	137.70	41	3.348	235.85
	20	7	313.03	81	3.864	286.45
Divalproex sodium	125	5	80	19.37	4.13	313.01
	250	28	90	5.6	16.071	1507.14
	500	34	141.08	32	4.408	340.87
	750	9	182	12.2	14.918	1391.08
Valproic acid	200	32	119	21	5.666	466.66
	300	16	68.96	34	2.028	102.82
	500	24	111	58.30	1.903	90.39
Clonazepam	0.25	32	28.81	1.8	16.005	1500.55
	0.5	57	48.92	3.2	15.287	1428.75
	1	28	47.16	4.1	11.502	1050.24
	2	29	99	7.2	13.75	1275
Diazepam	2	4	16.39	16	1.024	2.43
	5	6	15.83	8.9	1.778	77.86
	10	4	77.98	12.30	6.339	533.98
Lorazepam	1	14	27	7.68	3.515	251.56
	2	14	35	15.17	2.307	130.71

Table 2: The different available strengths, maximum and minimum prices of each available strength, % price variations and cost ratios for newer oral antiepileptic drugs.

Drug	Dose (mg)	No. of brands	Max price (INR)	Min price (INR)	Cost ratio	% Price variation
Lamotrigine	25	10	324.80	21	15.466	1446.66
	50	13	131	39	3.358	235.89
	100	13	349.87	69	5.07	407.05
	200	3	394.50	215.13	1.833	83.37
Gabapentin	100	6	100	42	2.380	138.09
	300	15	312.87	99	3.160	216.03
	400	6	412.41	125	3.299	229.92
Pregabalin	50	3	101.11	59	1.713	71.37
	75	29	631.50	40	15.787	1478.75
	150	17	823.08	70	11.758	1075.82
Topiramate	25	8	72	30	2.4	140
	50	7	115	58	1.982	98.27
	100	3	158	108	1.462	46.29
Levetiracetam	250	14	81	5.8	13.965	1296.55
	500	30	399	6.01	66.389	6538.93
	750	11	748	164.88	4.536	353.66
	1000	9	325	185.50	1.752	75.20
Lacosamide	50	4	63.70	45	1.415	41.55
	100	5	110	80	1.375	37.5
Zonisamide	25	2	43	32.30	1.335	33.54
	50	4	85	55.98	1.518	51.84
	100	5	208	92.68	2.244	124.43
Oxcarbazepine	150	11	61	41.96	1.453	45.37
	300	13	117.23	71	1.651	65.11
	450	2	151.52	115	1.317	31.75
	600	9	204	106.46	1.916	91.62

Table 3: The different available strengths, maximum and minimum prices of each available strength, % price variations and cost ratios for FDC of well-established oral antiepileptic drugs.

Drug	Dose (mg)	No. of brands	Max price (INR)	Min price (INR)	Cost ratio	% Price variation
Valproic acid + Sodium valproate	58+135	10	65.94	14.75	4.470	347.05
	87+200	12	70.33	24.50	2.870	187.06
	145+333	13	190	60	3.166	216.66
Phenobarbitone + Phenytoin	30+100	6	20	2.462	8.123	712.34
	50+100	4	41.19	11.30	3.645	264.51

Among newer oral antiepileptic drugs, Levetiracetam 500 mg has highest cost ratio 66.389 and 6538.93% price variation while Oxcarbazepine 450 mg has least cost ratio 1.317 and 31.75% price variation.

The different available strengths, maximum and minimum prices of each available strength, % price variations and cost ratios for well-established oral antiepileptic drugs are given in Table 1.

Highest percentage price variation among available strengths for well-established oral antiepileptic drugs are given in Figure 1.

Lowest percentage price variation among available strengths for well-established oral antiepileptic drugs are given in Figure 2.

Highest cost ratio among available strengths for well-established oral antiepileptic drugs are given in Figure 3.

Lowest cost ratio among available strengths for well-established oral antiepileptic drugs are given in Figure 4.

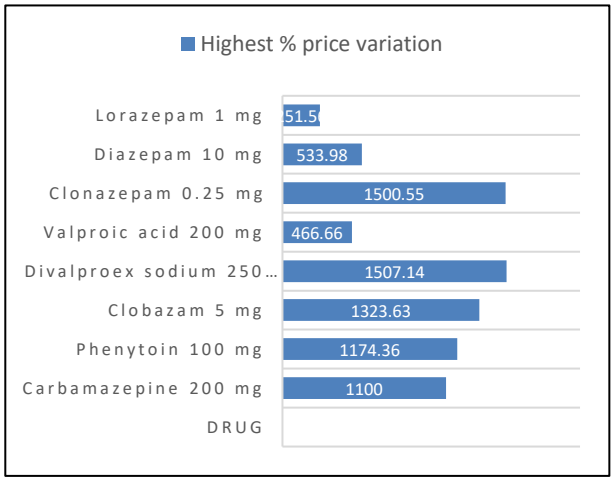

Figure 1: Highest % price variation among available strengths for well-established oral antiepileptic drugs.

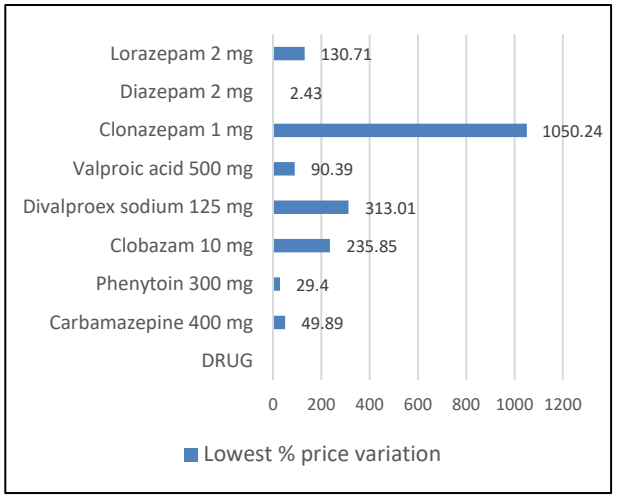

Figure 2: Lowest % price variation among available strengths for well-established oral antiepileptic drugs.

The different available strengths, maximum and minimum prices of each available strength, percentage price variations and cost ratios for newer oral antiepileptic drugs are given in Table 2.

Highest percentage price variation among available strengths for newer oral antiepileptic drugs are given in Figure 5.

Lowest percentage price variation among available strengths for newer oral antiepileptic drugs are given in Figure 6.

Highest cost ratio among available strengths for newer oral antiepileptic drugs are given in Figure 7.

Lowest cost ratio among available strengths for newer oral antiepileptic drugs are given in Figure 8.

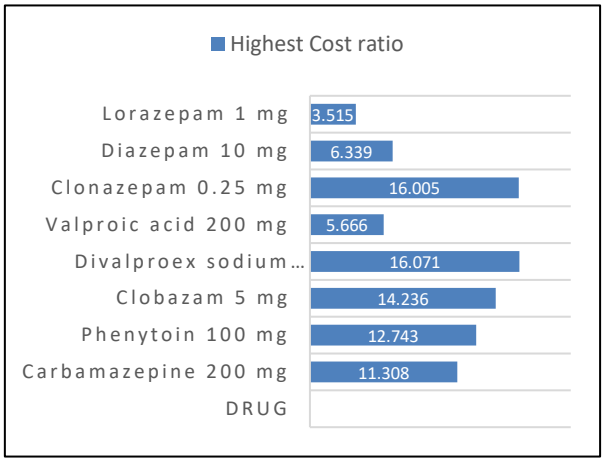

Figure 3: Highest cost ratio among available strengths for well-established oral antiepileptic drugs.

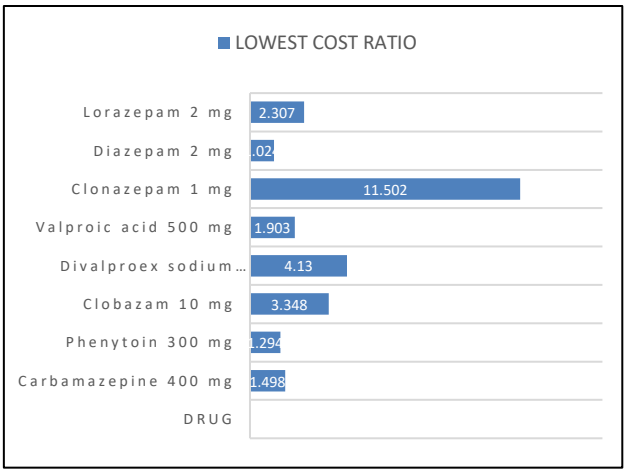

Figure 4: Lowest cost ratio among available strengths for well-established oral antiepileptic drugs.

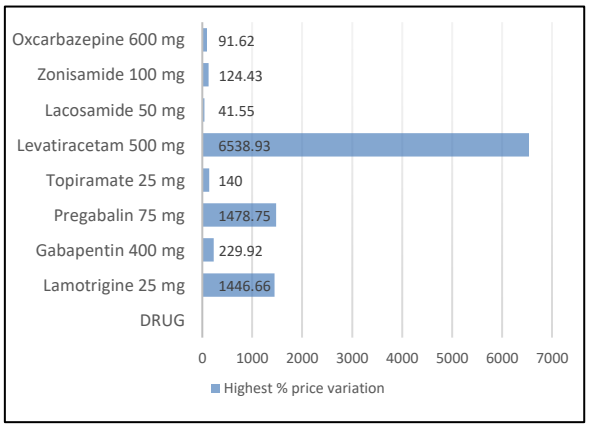

Figure 5: Highest % price variation among available strengths for newer oral antiepileptic drugs.

The different available strengths, maximum and minimum prices of each available strength, percentage price variations and cost ratios for fixed dose combination (FDC) of well-established oral antiepileptic drugs are given in Table 3.

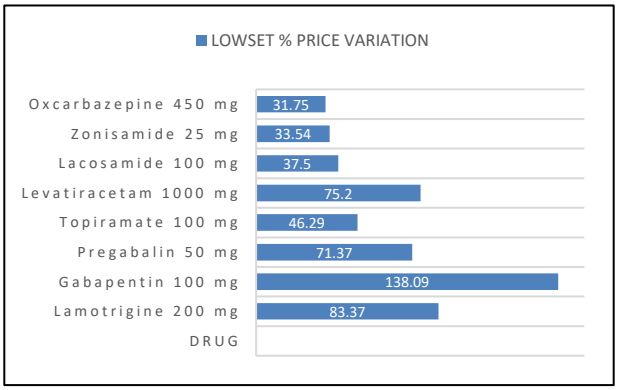

Figure 6: Lowest % price variation among available strengths for newer oral antiepileptic drugs.

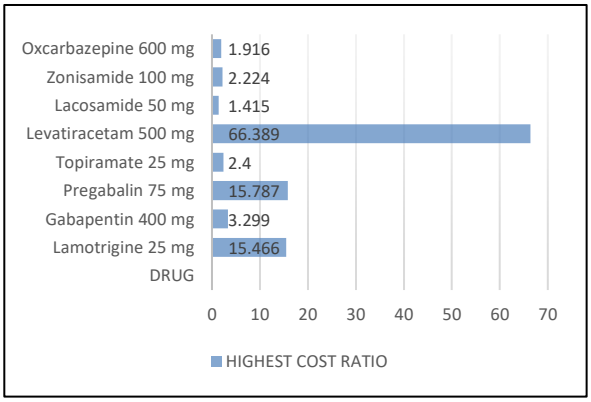

Figure 7: Highest cost ratio among available strengths for newer oral antiepileptic drugs.

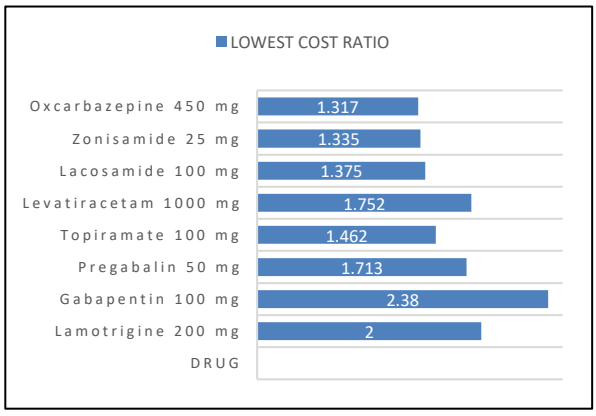

Figure 8: Lowest cost ratio among available strengths for newer oral antiepileptic drugs.

Highest percentage price variation and cost ratio among available strengths for fixed dose combinations of antiepileptic drugs are given in Figure 9.

Lowest percentage price variation and cost ratio among available strengths for fixed dose combinations of antiepileptic drugs are given in Figure 10.

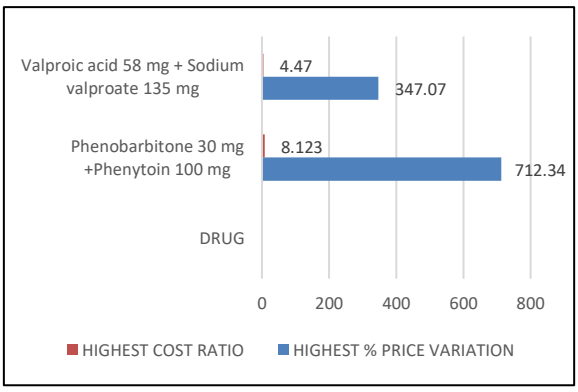

Figure 9: Highest % price variation and cost ratio among available strengths for fixed dose combinations of antiepileptic drugs.

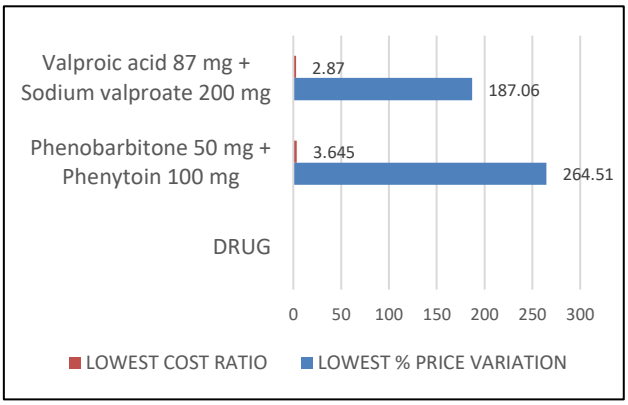

Figure 10: Lowest % price variation and cost ratio among available strengths for fixed dose combinations of antiepileptic drugs.

DISCUSSION

According to a study conducted by Sai NP et al., highest cost ratio and percentage price variation is shown by Carbamazepine 200 mg and lowest by Oxcarbazepine 450 mg.[12] According to Shukla et al highest cost ratio and percentage price variation is shown by Divalproex 500 mg.[11] In our study, among well-established oral antiepileptic drugs, Divalproex sodium 250 mg has highest cost ratio and percentage price variation while least is by diazepam 2 mg. And among the newer oral antiepileptic drugs, Levetiracetam 500 mg has highest cost ratio and percentage price variation while least is Oxcarbazepine 450 mg. There is huge price variation among antiepileptic drugs similar to earlier mentioned studies.

Factors like age, sex, psychomotor development or seizure type do not influence adherence of patient to medication.[13] Medication adherence which influences health outcome is mainly affected by cost.[14] Higher medication cost has been

found to be reason for poor adherence of treatment which leads to adverse health outcomes.[15]

Gupta et al had also observed more than 100% variation in the cost of selected anti-epileptics. A lot of variations in different brands of same strength of the newer anti-epileptic drugs like gabapentin, clobazam, levetiracetam in comparison to older first line antiepileptic drugs like phenytoin, phenobarbitone, carbamazepine and valproic acid.[16]

Treatment with generic antiepileptic drugs have been associated with increased adherence and decreased adverse clinical outcomes compared to treatment with branded antiepileptics.[17] Prescribing doctors should give importance to drug prices in country like India where majority of medical bill is paid by patient. 80% of health financing is borne by patients in India.[18] Sincere effort should be made by the concerned authorities to bring more number of antiepileptic drugs under price control since only a few medicines are under drug prices control order currently. Some of the effective tools for regulating drug prices are Drug price control order (DPCO) and National Pharmaceutical pricing (NPPA).[10]

The wide variation in prices of different brands of same drug have severe economic implications in India.[2] Hence there is need to draw attention to reduce cost of therapy. 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.[19]

CONCLUSION

Epilepsy has a long course of treatment. The percentage price variation of different brands of same antiepileptic drug is very wide. In developing countries like India where patient bears majority of medical bill, prices are of utmost importance. There is urgent need to reduce unnecessary cost variation by changing drug pricing policy from government authorities so that the drugs are affordable to common man. Increased adherence to treatment can be ensured by switching to cost effective therapy by physicians and making Pharmacoeconomics an integral part of undergraduate and postgraduate curriculum.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Chang BS, Lowenstein DH. Epilepsy. N Engl J Med. 2003;349(13):1257-66.
2. Arya P, Kumar R, Chandra A, Mohan L. Study of price variations of anti-epileptic drugs available in different brands in Indian pharmaceutical market. Int J Res Med Sci. 2018;6:4102-5.
3. WHO. Neurological disorders: Public health challenges. Geneva: World Health Organization. 2006. https://www.who.int/mental_health/neurology/neurological_disorders_report_web.pdf. Accessed on 03 May, 2021.
4. Sridharan R, Murthy BN. Prevalence and pattern of epilepsy in India. Epilepsia. 1999;40:631-6.
5. Santhosh NS, Sinha S, Satishchandra P. Epilepsy: Indian perspective. Annals of Indian Academy of Neurology. 2014;17(1):S3-11.
6. Allan GM, Lexchin J, Wiebe N. Physician awareness of drug cost: A systematic review. PLoS Med. 2007;4(9):e283.
7. Phatak MA, Hotwani HJ, Deshmukh RK, Panchal SS, Naik SM.Cost analysis of long established and newer oral antiepileptic drugs available in the Indian market. Int J Med Res Health Sci. 2015;4(4):744-48.
8. Wagle L, Swammy MK, Kempegowda MB. Cost variation Study of antiepileptic drugs available in India. Asian J Pharm Clin Res. 2016;9(2):64-8.
9. Jana S, Mondal P. Pharmacoeconomics: The need to sensitize undergraduate medical students. Indian J Pharmacol. 2005;37(5):277-8.
10. 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;6:1666-9.
11. Shukla AK, Mehani R. Cost analysis of antiepileptic drugs available in India. Int J Basic Clin Pharmacol. 2016;5:1636-40.
12. 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.
13. Ho PM, Bryson CL, Rumsfeld JS. Medication adherence: Its importance in cardiovascular outcomes. Circulation. 2009;119:3028-35.
14. Akila L, Rani RJ. Cost analysis of different brands of antianginal drugs available in India. Int J Basic Clin Pharmacol. 2015;4:860-3.
15. Mojtabai R, Olfson M. Medication costs, adherence, and health outcomes among medicare beneficiaries. Health Affairs. 2003;22(4):220-9.
16. Gupta RK, Reddy PS. A calm look on cost analysis of different brands of anti-epileptic drugs. JMGIMS. 2011;169(1):64-6.
17. Eaddy MT, Cook CL, O'Day K, Burch SP, Cantrell CR. How patient cost-sharing trends affect adherence and outcomes: A literature review. Pharmacy and Therapeutics. 2012;37(1):45-55.
18. World Health Organisation. Essential drugs and medicines: Drug finance. Available at: http://www.whoindia.org/EN/Section2/Section/Section160_959.html. Accessed on 20th April, 2021.
19. Rataboli PV, Garg A. Confusing brand names: nightmare of medical profession. J Postgrad Med. 2005;51:13-6.

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