



An evaluation of price variation amongst different brands of antimicrobials and impact of this variation on fixation of ceiling price in India

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Background: Cost of drugs is an important factor influencing patient compliance in India. Different brands of the same medication are available leading to considerable price variation. Significant price variation may have socio-economic implications at the level of patient, prescribing dilemma for physician and drug policy related impact in market based calculation of ceiling price. The present study was undertaken to evaluate the price variation among the commonly prescribed antibiotics and the related issues.

Methods: Fifty leading general physicians were asked to enlist the most commonly used antibiotics for the commonly prevalent infections in the area. Price of different brands of these antibiotics was obtained from Drug today and Jan Aushadi list. The difference in the maximum and minimum price of the same drug manufactured by different pharmaceutical companies and percentage variation in price was calculated. The averages, percentage cost ratios and percentage variation in cost were calculated.

Results: The highest cost ratio and percentage price variation was found with Ofloxacin (1:21 and 1994.6%) followed by Azithromycin (1:9 and 800%). More than 100% variation was also seen with Cefixime(1:6.2 and 520.8%), Ceftriaxone(1:4.4 and 342.3%), Amoxicillin+Clavulnicacid(1:4.4 and 336.4%) and Amikacin(1:2.9 and 185.7%).

Conclusion: A great, sometimes grossly absurd variation, in the prices of various popular brands of antimicrobials was observed. Such a variation has a definite impact on the prescriber's decision, patient compliance and calculation of the ceiling price by regulatory authorities, thus damaging the health care objectives.

I. INTRODUCTION

Pharmaco-economics has evolved as an integral part of rational prescribing. Drug cost is an important factor contributing to the patient compliance and in determining the prescribing

practices of the physicians. There is availability of a large number of branded generics with price variations. The Drug Price Control Order (DPCO) 2013 uses market-based mechanisms to set price ceiling. The ceiling price is decided by taking the simple average of prices of brands with more than 1% market share(1).

India, with a high incidence of infectious diseases bears a huge financial burden for infectious disease management. Antibiotics are among the most frequently prescribed group of drugs as indicated by the drug utilization studies. According to WHO, 15-25% of the prescriptions in developing countries with high prevalence of infections contain antibiotics(2),(3). However, in various studies from India, the percentage encounters with antibiotics were higher. A study by Bachewar et al, in Maharashtra, India showed antibiotic usage as high as 78.25% while other studies by Meena et al and Pathak et al India, showed antibiotic usage of 59.1% and 24.27% respectively(4, 5, 6). Due to high frequency of prescribing antibiotics, their cost becomes an important issue of interest for the patient, clinician and the public health authorities.

A single drug is manufactured by various pharmaceutical companies with different brand names and variable prices. Cost of treatment is a crucial factor determining the patient compliance and plays an integral role in rational drug use. Most of the developed countries have well established health insurance systems, where the insurance companies bear the treatment expenses. But in developing countries like India, where the health Insurance sector is still in infancy, the patients have to bear the treatment costs. The inter-brand variation of drug prices becomes a crucial issue in India as the Drug Price Control Order 2013 uses the average of the prices of brands with more than 1% share to fix a ceiling price(1).

There are a very few studies comparing the variability among antibiotic prices in India. This study compares the Maximum Retail Price of



different brands of the most commonly prescribed antibiotics.

II. MATERIALS AND METHODS

Fifty leading practitioners were asked to enlist the ten commonly used antibiotics for the commonly prevalent diseases in their practice with a ranking 1 to 10 based on prescription frequency. The data was analysed and seven antibiotics with highest ranking were chosen as study drugs.

A leading quarterly drug index “Drug today 2017” and Jan Aushadi price list (7) were studied to obtain the MRP of different brands of each these antibiotics. The maximum and minimum price of the antibiotic manufactured by different pharmaceutical companies was obtained.

Cost ratio was calculated as :

$$\frac{\text{Maximum cost/}}{\text{Minimum Cost}}$$

The percentage cost variation among different brands of same antibiotic was calculated as:

$$\frac{[(\text{Maximum price} - \text{Minimum Price})/\text{Minimum price}] * 100}{}$$

The averages, percentage cost ratios and percentage variation in cost were calculated and compared.

III. RESULTS

The seven most commonly prescribed antibiotics enlisted by the fifty practitioners as per preferential ranking were Cefixime, Amoxicillin+Clavulanic acid, Ofloxacin, Azithromycin, Ceftriaxone, Amikacin and Metronidazole.

The Defined Daily Dose of the seven most commonly used antibiotics was obtained from the WHO collaborating centre for Drug Statistics Methodology ATC/DDD Index (8).

S. No.	Drug	ATC Code	DDD (Mg)
1.	Amikacin	J01CR02	1000
2.	Amoxicillin+Clavulanic Acid	J01CR02	1000
3.	Azithromycin	J01FA10	500
4.	Cefixime	J01DD04	400
5.	Ceftriaxone	J01DD04	2000
6.	Metronidazole		1500
7.	Ofloxacin	J01MA01	400

The maximum and the minimum MRP amongst the different brands of each of these antibiotics was as per the Table 1

Table 1

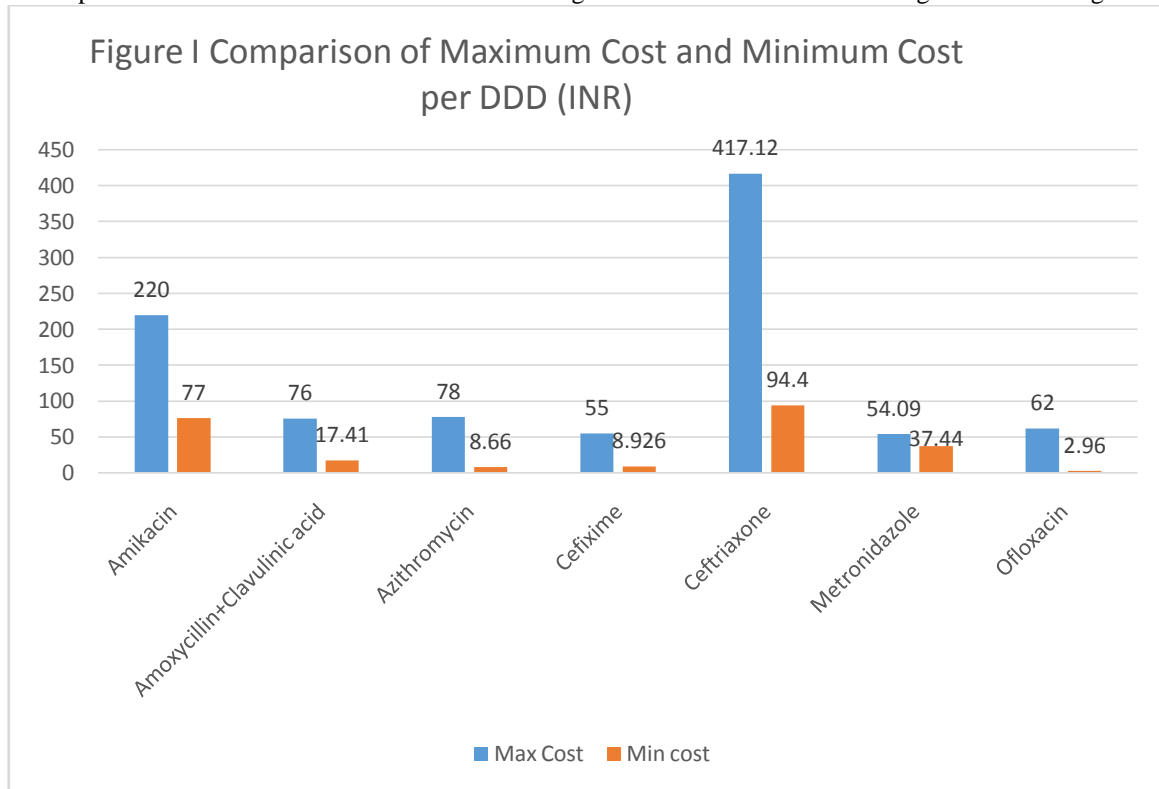
Drug	Dosage form	Strength	Maximum Price(INR)	Minimum Price (INR)
Amikacin	1 Vial	500mg	110	38.5
Amoxicillin+ Clavulanic acid	6 Tablets	500mg+125mg	228	52.24
Azithromycin	10 Tablets	500 mg	780	86.6
Cefixime	10 Tablets	200 mg	275	44.63
Ceftriaxone	1 Ampoule	250 mg	52.14	11.8
Metronidazole	Infusion 100ml	500 mg	18.03	12.48
Ofloxacin	10 Tablets	200 mg	310	14.8



The maximum and minimum cost of defined daily dose of each drug is as shown in Table 3

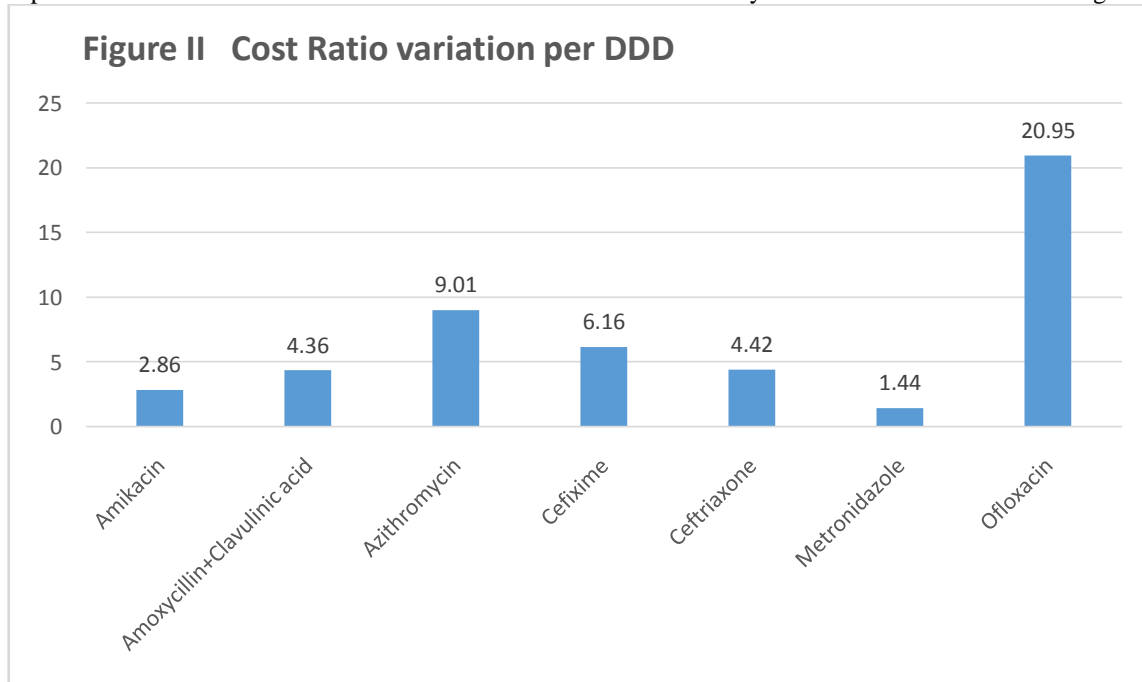
Drug	Maximum Price DDD (INR)	Minimum Price DDD (INR)
Amikacin	220	77
Amoxicillin+Clavulinic Acid	76	17.41
Azithromycin	78	8.66
Cefixime	55	8.93
Ceftriaxone	417.12	94.4
Metronidazole	54.09	37.44
Ofloxacin	62	2.96

The comparison of maximum and minimum cost among different brands of various drugs is shown in Figure I.

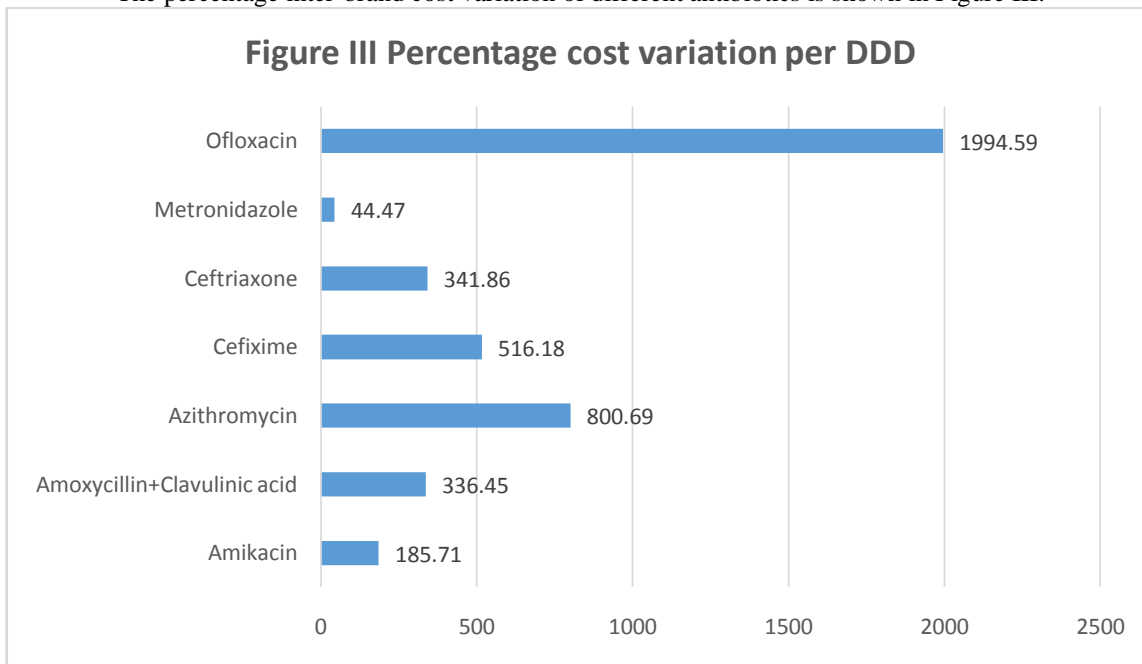




Comparative inter-brand cost ratio variation of the seven most commonly used antibiotics is shown in Figure II.



The percentage inter-brand cost variation of different antibiotics is shown in Figure III.



IV. DISCUSSION

The study findings reveal that there is a huge price variation among different brands of antibiotics. The inter-brand percentage variation among the different antibiotics in our study ranges from 1994.59% to 44.47%. Similar high variations have been observed in other studies as well.

Rataboli P.V et al used a database for drug prices and compared the price variation of commonly used antibiotics (9). They concluded that the variation in medicine prices was 95% to 350% of the average price. But, the difference from our study was that the prices were compared with the average price whereas in our study, we compared the



highest price with the lowest price. In various other studies, researchers found the percentage price variation of anti-hypertensive drugs in the range of 1040.58% to 403.33% (10) and that of anti-anxiety drugs to be in the range of 371.42% to 150% (11).

The reasons for variations among the drug prices could be the variable cost of raw materials, drug promotions, advertisements, government drug regulations and pricing policies (12, 13, 14). The price variation among the drugs leads to prescribing dilemma among the clinicians and economic implications for the patients. There is a general notion among public and clinicians that a low priced drug may not be as efficacious as an expensive drug. But, the high price does not guarantee high quality either. The available brands have to fulfil bioavailability standards set by regulatory authorities. The issue of quality and therapeutic equivalence of the costly and the low priced counterparts needs to be explored.

In our study, the maximum price variation was shown by Ofloxacin followed by Azithromycin, Cefixime, Ceftriaxone, Amoxycylav, Amikacin and Metronidazole. Among these seven drugs, only Ofloxacin is not a part of National List of Essential Medicines, 2015. The drugs under NLEM, 2015 come under the drug price control order (DPCO). Thus, all our study drugs are under DPCO 2013 except Ofloxacin, which shows maximum cost fluctuation (15, 16). The costlier drugs Ofloxacin and Azithromycin show higher cost variation as compared to low priced drugs Amoxycylav and Metronidazole.

The patients in the developed countries do not have to bear the medical expenses directly due to well established health insurance system. But, in developing countries like India, the patient pays for the cost of treatment from his pocket. Thus, price variation has a huge financial and psychological impact on the patients. It also affects the compliance where higher prices are involved, especially amongst the lower socio-economic strata of the population (17, 18, 19).

The inter-brand price variations play a crucial role in drug pricing in India. The ceiling price of the drugs under DPCO are fixed by Market Based Pricing as against the Cost Based Pricing. Under the provisions of DPCO-2013, ceiling prices are fixed based on the average retail price of the drug, produced by all those companies which have a market share of $\geq 1\%$ of the total market turnover. The huge price variations among different brands would thus have an impact on the fixation of ceiling price, resulting in higher fixation rates.

Thus, there is a need to rationalise the drug pricing. The factors contributing to the high

price variations of drugs should be explored and rectified as much as possible. The DPCO formula for Ceiling Price calculation may also be altered taking into account the affordability, quality and essentiality of the drug concerned.

V. CONCLUSIONS

In developing countries like India, with poor medical insurance coverage, the issue of drug pricing and affordability is of utmost importance. Our study finds a huge variation of inter-brand prices of a chosen set of medications sold in India. The factors contributing to large price variation among the different brands of the same drug passing the criteria of bioequivalence need further research. Rationalisation of drug prices without compromising quality, availability and innovative potential of pharmaceutical sector is the need of hour. The drug price control policies should be reviewed time to time in the light of new pharmaco-economic research, striking a balance between affordability, quality and availability.

REFERENCES

- [1]. S, Narula E. Current Drug Pricing Status in India. *Pharmacoeconomics Open Access*. 2015 Sep 17;1(1):1–1.
- [2]. Summoro TS, Gidebo KD, Kanche ZZ, Woticha EW. Evaluation of trends of drug-prescribing patterns based on WHO prescribing indicators at outpatient departments of four hospitals in southern Ethiopia. *Drug Des Devel Ther*. 2015;9:4551–7.
- [3]. Atif M, Azeem M, Sarwar MR, Shahid S, Javaid S, Ikram H, et al. WHO/INRUD prescribing indicators and prescribing trends of antibiotics in the Accident and Emergency Department of Bahawal Victoria Hospital, Pakistan. *SpringerPlus* [Internet]. 2016 Nov 8;5(1). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5099312/>
- [4]. Bachewar NP, Choudhari SR, Dudhgaonkar S. Assessment of prescription pattern using WHO drug prescribing indicators in medicine wards of a tertiary care teaching hospital: a retrospective observational study. *Int J Basic Clin Pharmacol* 2017;6:2070-7
- [5]. Meena N, Rita S, Sania MKH, Gunaseelan V, Thangkhiew B. drug prescription pattern in a tertiary health centre in Imphal: a cross sectional study. *Int J Pharm B Sci*. 2013;4(4):838-42.
- [6]. Pathak A, Gupta VK, Maurya A, Kumar A, Singh A. Assessment of drug prescribing



- pattern using WHO indicators in hospitalized patients at a tertiary care teaching hospital in rural area of India. *Int J Basic Clin Pharmacol.* 2016 Dec 30;5(3):651-5.
- [7]. <http://janaushadhi.gov.in/>
- [8]. https://www.whocc.no/atc_ddd_index/
- [9]. Rataboli PV, Dang A. Antimicrobial price variation: Conundrum of medical profession. *J Postgrad Med.* 2007;53:72-74.
- [10]. Kamath L and Satish GR: Cost Variation Analysis of Antihypertensive Drugs Available in Indian Market: An Economic Perspective. *Int J Pharm Sci Res* 2016; 7(5): 2050-56.doi: 10.13040/IJPSR.0975-8232.7(5).2050-56.
- [11]. Chawan VS, Badwane SV, Gawand KV, Chhaya MU. Analysis of price variation amongst different formulations of anxiolytic drugs available in Indian market. *Int J Res Med Sci* 2016;4:2398-401.
- [12]. Berki SE, Richards JW, Weeks HA. The mysteries of prescription pricing in retail pharmacies. *Med Care.* 1977;15:241-50.
- [13]. Roy V, Rewari S. Ambiguous drug pricing: a physician's dilemma. *Indian J Pharmacol.* 1998;30:404-
- [14]. Wertheimer AI, Grumer SK. Overview of international pharmacy pricing. *Pharmacoeconomics.* 1992;2:449-55
- [15]. National List of Essential Medicines 2015. Available at <http://www.cdsc.nic.in/NLEM2015/recommendations.pdf>.
- [16]. The Drugs (Prices Control) Order (DPCO), 2013. Available at <http://www.nppaindia.nic.in/DPCO2013.pdf>.
- [17]. Cox ER, Jernigan C, Coons SJ, Draugalis JL. Medicare beneficiaries' management of capped prescription benefits. *Med Care.* 2001;39:296-301.
- [18]. Spence MM, Hui R, Chan J. Cost reduction strategies used by elderly patients with chronic obstructive pulmonary disease to cope with a generic-only pharmacy benefit. *J Manag Care Pharm.* 2006;12:377-382.
- [19]. Piette JD, Heisler M, Wagner TH. Cost-related medication underuse: Do patients with chronic illnesses tell their doctors? *Arch Intern Med.* 2004;164:1749-1755.