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## ORIGINAL ARTICLE

# Price Variability Among The Oral Antibiotics Available In A South Indian Tertiary Care Hospital

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### ABSTRACT

**Background:** There exist a wide range of variation in the prices of drugs marketed in India and other countries of world. Very few studies have been conducted to reveal such price variations in the open market.

**Objective:** This Pharmacoeconomic study is designed to obtain the picture of price variability among the different oral antibiotic drugs available in the hospital pharmacy and their economic impact on patients.

**Methods:** Prices and the units of oral antibiotics sold included in the study were obtained from computer data base of hospital pharmacy department. The percentage price variation was calculated for all the brands of drugs. Brands were classified into costliest, cheapest and mid range based on the cost in comparison with all available brands for a drug. Impact of number of brands on percentage price variation was calculated. The cost incurred by the patient if costliest and the cheapest brands were prescribed for managing clinical condition was calculated.

**Results:** Percentage price variability of 30 brands was 0 - 25% and for 24 brands it was 25.1 - 50%. For 15 brands percentage price variability was more than 100%. It has been observed that costliest brands were preferentially prescribed over the cheaper alternatives. As the number of brands increased for any drug the percentage price variation (range) also increased.

**Conclusion:** It was observed that percentage price variation was higher among some drugs and this percentage price variation might result in bigger difference in cost of management of infections, if costlier brands were prescribed. Costlier brands were preferred more and there is a need to formulate policy at the Hospital level to address these issues.

**Key Words:** Antibiotics, Price variation, Hospital pharmacy, Pharmacoeconomics

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### Introduction

Rational use of medicines requires that patients receive medications appropriate to their clinical needs in doses that meet their requirements for an adequate period of time and at the lowest cost to them and their community [1]. The irrational use leads to ineffective and unsafe drug treatment, worsening or prolonging of illness, and adverse drug reactions [2]. Healthy competition in trade always provides a better option to the consumer but these does not hold right for the medicines as person who buys the

medicines has very little choice in selection of the drugs [3]. As per Central Drugs Standard Control Organization (CDSCO) of India, bioequivalence of a drug product is achieved if the rate and extent of absorption are not statistically different from those of reference product at certain significant levels when administered in the same molar dose. Many generic drugs are approved to be marketed based on the bio equivalence data. Generic drugs are widely believed to be bio-equivalent and provide same therapeutic effects as the innovator products [4]. High cost of medicines has economic implications for the patients and also the patient compliance significantly depends on the cost of the medicines prescribed. In fact, several studies have indicated that therapeutic compliance is influenced by drug prices [3]. Prices of prescription can affect users, suppliers and most importantly payers in health care systems. Price discrimination occurs in the pharmaceutical industry both in India and as well as in other countries.

According to industry, drug prices in India are the cheapest in the world yet the access to these medicines is increasingly getting restricted to those who can afford it. There exists a wide variation in the prices of drugs manufactured by different companies. In India very few patients are covered by health insurance and hence patients have to pay from their pocket [5]. Jennifer et al. reported that there is potential savings from substituting generic drugs for brand-name drugs [6]. But in many countries, there is a considerable variation in the price of generics also. Antibiotics are one of the commonly prescribed medicines in almost all the departments of any hospital. In the absence of comparative information on antibiotic prices it is difficult for physicians to prescribe the most economical treatment regimen. The current study was designed to assess the price variability pattern among the oral antibiotics and study their usage in relation to their cost.

## Method

Prices of oral antibiotics included in the study were obtained from computer data base of hospital pharmacy department of the study site which is a tertiary care hospital. The selling cost

of a particular drug manufactured by different companies in same strength available in hospital pharmacy department was compared. If only one brand was available for a drug without any competitor's brand that particular drug was excluded. Parental antibiotics were not included in this study. The percentage variation in price was calculated using the following formula [3]

Percentage variation =

$$\frac{\text{Price of most expensive brand} - \text{price of least expensive brand}}{\text{Price of least expensive brand}} \times 100$$

The difference between the prices of same drug of same strength e.g. amoxicillin 500 mg manufactured by the different Pharmaceutical companies available in hospital pharmacy was compared. The drugs were classified into five categories depending on the percentage (%) range of price variation. Five categories were as follows: 0-25%, 25.1-50%, 50.1-75%, 75.1-100% and more than 100% price variation.

Analysis of number of prescriptions of oral antibiotics filled in the pharmacy with their cost was studied to find out most prescribed brands. These brands were further classified into the costliest, the cheapest and the mid range comparing with the price of all the brands of that particular drug.

Drugs were classified into three different groups based on number of available brands viz., Group I with less than 3 brands and Group II with 3-5 brands and Group III with more than 5 brands and the correlation between the number of brands of a particular drug and percentage price variability was calculated.

Hypothetical clinical situation of infections, where in antibiotic therapies to be used were considered and the cost to a patient was calculated. Five drugs viz., cefuroxime axetil, levofloxacin, cefdinir, ofloxacin and cefpodoxime were selected since they had more than 100% price variation. The cost to be incurred by a patient was calculated for costliest and cheapest brand.

## Results

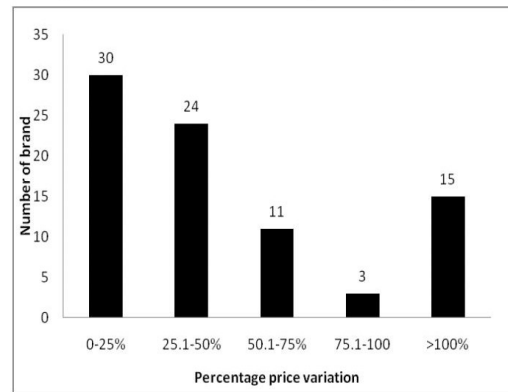
The prices of 34 oral antibiotic drugs available in the hospital pharmacy of a tertiary care hospital were compared and analyzed for the variation. A total of 117 brands of these 34 drugs were available and prescribed by clinicians. The number of brands available in various categories based on the percentage price variation is presented in [Table/Fig 1]. Thirty brands were available in the category of 0-25% price variation which was the largest group compared to other categories of price variation. Extreme percentage price variation between brands of same drugs was found in case of levofloxacin 500mg (1837.77%) and cefixime 200 mg (0.67%).

Drugs were categorized as three groups viz., 1) Costliest brands were preferred. 2) Cheapest brands were preferred and 3) Mid range priced brands were preferred [Table/Fig 2]. Out of total drugs studied, it was found that costliest brands were preferably prescribed over cheaper brands (44.12%).

When the number of brands available for drugs were studied it was found that as the number of brands increases the range of prices also increases but the mean price variation remained same [Table/Fig 3].

When the cost of managing illness with certain antibiotic regimen was studied for their common indication, a big difference was found when costlier and cheaper brands were used. In case of levofloxacin which is used for managing complicated urinary tract infection in a one week regimen the cost of therapy was \$ 0.648 with cheaper brand whereas it will cost \$ 13.27 if the costliest brand was prescribed. This shows more than 20 fold difference in the cost of therapy [Table/Fig 4].

(Table/Fig 1) Number of brands with percentage price variation.



(Table/Fig 2) Most prescribed costliest, cheapest and mid-range brands.

Costliest brand preferred	Cheapest brand preferred	Mid range brand preferred
Amoxicillin 250 Mg	Ampicillin 500 mg	Amoxicillin 500 mg
Amoxicillin 125 Mg	Cefdinir 300 mg	Amoxicillin + clavulanate potassium 626 mg
Amoxicillin + Clavulanate Potassium 1000 Mg	Cefixime 200 mg	Cefuroxime 500 mg
Amoxicillin + Clavulanate Potassium 375 Mg	Cefpodoxime 200 mg	Ciprofloxacin 250 mg
Azithromycin 250 Mg	Cefpodoxime 100 mg	Ciprofloxacin 500 mg
Azithromycin 500 Mg	Chloramphenicol 500 mg	Feropenam 150 mg
Cefuroxime 250 Mg	Ciprofloxacin 750 mg	Levofloxacin 500 mg
Ciprofloxacin + Tinidazole (500/600mg)	Clarithromycin 500 mg	Levofloxacin 750 mg
Clarithromycin 250 Mg	Linezolid 600 mg	
Erythromycin 500 mg	Ofloxacin 200 mg	
Feropenem 200 mg	Ofloxacin 400 mg	
Gatifloxacin 400 Mg		
Levofloxacin 250 mg		
Moxifloxacin 400 mg		
Erythromycin 250 Mg		

(Table/Fig 3) Percentage price variation with number of brands available for drug

Number of brands available for a drug	Percentage price variability (%)		
	Mean	Standard deviation	Range
<3	100.71	28.53	34.93-165.07
3-5	103.63	23.9	36.69-177.94
>5	99.49	82.93	23.35-530.17

(Table/Fig 4) Cost difference in managing a clinical condition with different brands of a same drug

Drug	Strength (mg)	Condition	Dosing and Duration	Total cost of costliest brand (US \$)	Total cost of cheapest brand (US \$)	Difference (US \$)
Cefuroxime Axetil	500	Bronchitis	Twice daily for 7 days	21.05	5.93	15.12
Levofloxacin	500	Complicated urinary tract infection	Once daily for 7 days	13.26	0.65	12.61
Cefdinir	300	Bronchitis	Twice daily for 5 days	12.65	4.25	8.40
Ofloxacin	200	Typhoid fever	Twice daily for 7 days	8.79	1.86	6.93
cefpodoxime	200	Community acquired pneumonia	Twice daily for 14 days	18.71	11.24	7.47

## Discussion

Indian market is predominantly a branded generic market i.e. more than one company

selling a particular drug under different brand names apart from the innovator company. So, the number of pharmaceutical products available in the market also is very high in the range of 60,000-70,000 products [2]. This situation has led to greater price variation among drugs marketed. Antibiotics class of drugs is very commonly prescribed for prophylaxis and also for the treatment of infectious disease. The prices of the oral antibiotics prescribed and available in hospital pharmacy were compared. More than 50% price variation was noted in 35% of the brands. Only 30 brands were in the group of 0-25% price variation. Remaining 53 brands had price variation above 25% and in some cases more than 100% price variation which is not an acceptable situation to patients. The average price variation for this study was 93%. In a study conducted by P.R.Shankar *et al.* in Nepal, they found out that mean percentage price variation for antibiotics was around 38.1% [3]. Our study showed more price variation than that study. The reason for such high price variation might be that India is altogether a different country in terms of its size, strong manufacturing industry and the sheer number of players. Even though large number of pharmaceutical companies help in bringing down the cost of medicines due to competition, there is a tendency among pharmaceutical companies to promote the idea that the brands priced higher are better than their cheaper counterparts which is not true. In this market situation patient might be prescribed with costly brands adding to his/her burden which could be avoided if there is strong mechanism to control price variation among brands.

In a study conducted by Rataboli P.V *et al* where a database of drugs marketed in India was used to find the percentage price variation from average of marketed antibiotics, 3 drugs fell in 0 - 25% and 25.1 - 50% variation group, 5 drugs fell each in 50.1 - 75% and 75.1 - 100% while 11 drugs were having more than 100% price variability [7]. In comparison with the open market situation reported by that study, this study reported a much less price variation pattern. This might be attributed to the systems of Pharmacy and Therapeutic committee which has some control over selection of drugs.

Pharmacy and Therapeutic committee in this hospital performs cost comparison of brands before adding it into the hospital formulary and this helps to control price variation to an extent. Thorough cost evaluation by the Pharmacy and Therapeutic committee before including in the hospital formulary will be an ideal situation and this might help patients especially from poor economic background [8].

It was noted that mean percentage price variation did not change much as the number of brands increased per drug. But the range and standard deviation clearly appeared to increase as the number of brands per formulation increased. In this situation it is not prudent to use just mean percentage price variation as it may make the interpretation difficult. These findings calls for restriction of number of brands in hospital and inclusion of fewer brands in the hospital formulary and physicians should also restrict themselves by prescribing limited (2-3) brands per drug. Active involvement of Pharmacy and Therapeutic committee and hospital administrators will help in controlling the number of brands in the hospital formulary consequently reducing the percentage variation of price in management of diseases.

In this study it has been noted that costliest brands of drugs were mostly prescribed than their cheaper counterparts even though there is no evidence that costly brands are better in terms of bioavailability or efficacy. This tendency of prescribing costliest brand particularly in antibiotic class which are already expensive may contribute to poor compliance which in turn might result in increased drug resistance. Employing the use of cheaper options in disease management makes the treatment to be more affordable and successful. In a study reported by Das.S.C *et al* out of 7 drugs studied costliest brands were sold more than cheapest brands in case of 5 drugs and this shows the tendency to prescribe costliest brands among the prescribers [9]. There is clearly a need to inform clinicians on the cheaper choices to bring some change in prescribing practice. Promotional strategies of pharmaceutical companies have to be studied further to understand this issue.

When the cost of management of clinical conditions with antibiotics was studied it was noted that there was a minimum of two fold to twenty fold difference in cost of therapy between costliest and cheapest brands. In case of Cefuroxime one week course for bronchitis cost \$ 5.93 with the cheapest brand whereas the same therapy will cost \$ 21.05 if the costliest brand is used. India being a developing country with a Per capita income of \$770.69 [10] such high cost for one week of therapy might put patients at financial trouble. In India mostly patients are paying out of their pockets for their medical bills and are not covered by insurance schemes unlike developed countries. In this situation it is prudent to revisit the costing mechanisms and the huge difference between pricing of brands have to be regulated by concerned agencies. Further studies exploring the reasons for such a price variation and ways to counter this trend will go long way in rationalizing the cost of managing infections with antibiotics.

### Conclusion

The average percentage price variation of different brands of the same drug manufactured in India and available in hospital is very wide. As the number of brands for a drug increases percentage price variation also shows concurrent increase. Costliest brands were preferred over cheaper brands and this shows the need for educating physician and further study of this issue. At the hospital level authorities and concerned committees have to frame policies on these aspects. There is a need for concerted action from regulatory authorities, doctors, pharmacists and general public at large to address this issue of antibiotic price variation.

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