Research Article

Fluoroquinolones in India—Are we prescribing it right: A cost variation study

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Abstract

Background: Quinolones are the fastest growing antibacterial agents worldwide as they are being used in both the hospitals and community practices to treat infections. Ciprofloxacin and levofloxacin dominate the market mostly, which together charge 65% ($3.3 billion) of global sales. Quinolones such as ciprofloxacin, levofloxacin, and moxifloxacin have been found to possess enormous market capacity and sales volume. Fluoroquinolones in India comprise 30% share of Global Pharmaceuticals Market counterparts. **Aims and Objective:** To find out the cost of various oral fluoroquinolones available in India either as a single drug or in combination and to evaluate the difference in cost of various brands of same fluoroquinolone by calculating percentage variation in cost in Indian rupees. **Material and Methods:** Cost of oral fluoroquinolones manufactured by different companies, in the same strength and dosage forms, was obtained from *Current Index of Medical Specialties*, July–October 2014, and *Indian Drug Review*, Vol. XXI, Issue No. 4, 2014. The difference in the maximum and minimum price of the same drug manufactured by different pharmaceutical companies and percentage variation in price was calculated. **Result:** Percentage price variation for various fluoroquinolones was as follows: ofloxacin (200 mg) 869%; sparfloxacin (200 mg) 648%; gemifloxacin (320 mg) 477%; norfloxacin (400 mg) 291%; ciprofloxacin (500 mg) 290%; levofloxacin (250 mg) 264%; lomefloxacin (400 mg) 104%; and moxifloxacin (400 mg) 60%. Among the combination therapy, price variation was norfloxacin + tinidazole (400 + 600 mg) 983%; ofloxacin + cefixime (200 + 200 mg) 232%; levofloxacin + ornidazole (250 + 500 mg) 211%; ofloxacin + ornidazole (200 + 500 mg) 156.60%; and ciprofloxacin + tinidazole (500 + 600 mg) 150%. **Conclusion:** The average percentage price variation of different brands of same oral fluoroquinolones manufactured in India is very wide. As India is a developing country, clinicians must prescribe fluoroquinolones keeping in mind the cost of therapy.

KEY WORDS: Fluoroquinolones; Cost Analysis; Price; Cost Variation

Introduction

The treatment of infectious diseases still remains an important and challenging problem because of a combination of factors including development of resistance to current antibacterial therapy.[1–4] The science of administering chemical agents to combat infectious diseases is known as anti-infective chemotherapy, which is the one of the most triumphant of all pharmaceutical therapies. The past 25 years has seen introduction of antimicrobial agents at a rate higher than our ability to incorporate them into clinical practice. Since their introduction, fluoroquinolones are considered to be a basis in the combating of bacterial infections.[5–10]

Oral fluoroquinolones vary in the spectrum of antimicrobial activity. Fluoroquinolones are synthetic, broad-spectrum antibacterial agents. The fluorine molecule provides increased potency against Gram-negative organisms and broadens the spectrum to include Gram-positive organisms; the piperazine moiety confers antipseudomonal activity. These agents are bactericidal. Fluoroquinolones promote cleavage of bacterial DNA in the DNA–enzyme complexes of DNA gyrase (associated

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Table 1: Variation in cost of single drug therapy

Drug	Formulations (*n*)	Dose (mg)	Minimum cost (INR)	Maximum cost (INR)	% Variation in cost
Ofloxacin		200	32	310	869
Sparfloxacin		200	46	150	648
Ciprofloxacin	5	100	12	23	92
		250	21	62	195
		500	40	156	290
		750	55	130	136
		1000	76	188	147
Gemifloxacin	1	320	130	750	477
Levofloxacin	3	250	28	102	264
		500	40	120	200
		750	38	120	239
Norfloxacin	2	200	20	36	80
		400	11	43	291
Lomefloxacin	1	400	90	184	104
Moxifloxacin	1	400	500	800	60

Table 2: Variation in cost of combination therapy

Drug combination	Formulations (*n*)	Dose (mg)	Minimum cost (INR)	Maximum cost (INR)	% Variation in cost
Norfloxacin + tinidazole	1	400 + 600	6	65	983
Cefixime + ofloxacin	1	200 + 200	60	199	232
Ofloxacin + ornidazole	1	200 + 500	53	136	156
Levofloxacin + ornidazole	1	250 + 500	45	140	211
Ciprofloxacin + tinidazole	2	250 + 300	28	70	150
		500 + 600	43	107	148

with Gram-negative activity) and type IV topoisomerase (associated with Gram-positive activity), resulting in rapid bacterial death.[11]

Quinolones are the fastest growing antibacterial agents worldwide as they are being used in both the hospitals and community practices to treat infections. Pharmaceutical marketing is an indirect approach, and the prescribers play a vital role for both pharmaceutical companies and patients, as every patient is dependent on the type of drug prescribed by them and the turnover of any company also depends on prescribing practices of prescribers. Ciprofloxacin and levofloxacin dominate the market mostly, which together charge 65% ($3.3 billion) of global sales. Quinolones such as ciprofloxacin, levofloxacin, and moxifloxacin have been found to possess enormous market capacity and sales volume. Currently, China, India, Germany, Japan, and United States are the world's production and sales counters globally. Fluoroquinolones in India comprise 30% share of Global Pharmaceuticals Market counterparts.[12]

Materials and Methods

The prices of 13 oral fluoroquinolones (eight single and five combinations) available in 21 different formulations were analyzed.

Price in Indian rupees (INR) of oral fluoroquinolones manufactured by different pharmaceutical companies in India, in the same strength, was obtained from *Current Index of Medical Specialties (CIMS)*, July–October 2014, and *Indian Drug Review (IDR)*, Vol. XXI, Issue No.4, 2014.

1. The drug formulations manufactured by a single company or by different companies, however, in different strengths, were excluded.
2. Because the number of tablets available per strip differed, the cost of the oral fluoroquinolones drugs was estimated for an average of 10 tablets.
3. The difference in the maximum and minimum prices of the same drug formulation manufactured by different pharmaceutical companies and percentage variation in price was calculated.
4. Percentage cost variation was calculated as follows:

$$\%\ \text{Price variation} = \frac{\text{Maximum cost} - \text{Minimum cost}}{\text{Minimum cost}} \times 100.$$

Results

Table 1 shows single drug percentage price variation for various fluoroquinolones, which was as follows: ofloxacin

(200 mg) 869%; sparfloxacin (200 mg) 648%; gemifloxacin (320 mg) 477%; norfloxacin (400 mg) 291%; ciprofloxacin (500 mg) 290%; levofloxacin (250 mg) 264%; lomefloxacin (400 mg) 104%; and moxifloxacin (400 mg) 60%.

Table 2 shows the combination therapy and price variation: norfloxacin + tinidazole (400 + 600 mg) 983%; ofloxacin + cefixime (200 + 200 mg) 232%; levofloxacin + ornidazole (250 + 500 mg) 211%; ofloxacin + ornidazole (200 + 500 mg) 156.60%; and ciprofloxacin + tinidazole (500 + 600 mg) 150%.

Discussion

In India, more than one pharmaceutical company sells a particular drug under different brand names along with the innovator company. Hence, a large number of formulations for the same drug are available at different prices.

Studies are lacking in India comparing the cost of the same drug sold under different brand names by different pharmaceutical companies. Therefore, this study was conducted to compare the cost of different brands of the same oral fluoroquinolones. The drug prices available in CIMS and IDR were compared as they are the major available sources of drug information, which are updated on a regular basis.

The findings in our study show a percentage variation in cost above 100% for the available oral fluoroquinolones in India. These percentage variations in cost cannot be accepted in a developing country such as India. Of the 13 commonly prescribed drugs that were studied, there was a wide percentage variation in cost, leading to an unnecessary economic burden on Indian population.

Various studies have reported that availability of a comparative manual of drug prices will reduce the cost of therapy enormously.[13] Health-care providers are using this information in allocating their limited health-care resources.[14]

Conclusion

Thus, this study highlights that there is a wide variation in cost among the oral fluoroquinolones manufactured by different pharmaceutical companies. The Government of India should initiate effectual measures to bring regularity in the cost incurred by patients.

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