

ASSESSING THE COST OF QUINOLONES PRESENT IN THE INDIAN MARKET

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ABSTRACT

Background: Quinolones antibiotics are effective against gram-positive and gram-negative bacteria and are very widely used to treat many bacterial infections like upper respiratory tract infection, urinary tract infection, eye infection, skin infection, etc. Hence this study was carried out to know the types of quinolones used in the community practices/setups and their price variation. **Method:** The patient's prescribed/prescription containing quinolone drugs in community pharmacies was collected. The price of all generations of quinolones between private pharmacies and Jan-Aushadhi medical stores by visiting the pharmacies. The cost variation and the percentage of the

price variation calculated and an even top brand in the Indian market. **Results:** Among 50 prescriptions observed, only that twenty prescriptions had quinolones considered in our study. Rest did not take due to other antibiotic-containing medicines in our research. There were six males and 14 females who visited community pharmacies diagnosed with different infections. Innovator drugs, which are on the top list, are costly for patients to purchase for their treatment. Quinolones cost of community pharmacies were compare with Jan Aushadhi medical stores. Jan Aushadi quinolones were cheaper than private community pharmacies. **Conclusion:** The study showed that JanAushadi quinolone's cost was cheaper and could treat various infections. Hence physicians can encourage them to put their practice into generic drug usage, which is affordable. The cost of the therapy reduction will also be helpful to improve the Quality of life.

KEYWORDS: CP: Community pharmacy, QOL: Quality of life, CIMS: Current index of medical specialties.

INTRODUCTION

Quinolones are broad-spectrum antibiotics related to bicyclic core structures pertaining to the substances of four quinolones and have expanded spectrum and high efficacy. Because of their high potency, a broad range of activity, favorable bioavailability, convenient formulations, and elevated serum concentrations, as well as a comparatively low incidence of side effects, these are using for more than five decades.

Quinolones are prescribed commonly in several infections like urinary tract infections, bacterial infections, sinus infections, lower respiratory infections, upper respiratory infections, skin infections, typhoid, eye infections, and pneumonia.

Prescriptions are written instructions to the patients who a pharmacist can dispense to dispense a stated quantity of a particular drug in a specified dose. Cost is one of the critical parameters which influence the patient's behavior of consumption generally. This will also affect even the.

Health condition. India is a big private hub for the growth of various companies with different brands.

Jan Aushadhi Scheme (JAS), initiated by the Government of India, is a powerful intervention against the private pharmaceutical industry's unjustifiable pricing to make generic drugs available at affordable prices. So Quinalones are very widely used in treating various infections in the community practice by the physicians. Understanding the cost estimation is very important to promote cost-effective therapy promotion. Hence this study was carried out with the following objectives.

General objective

1. To find out the cost of the various quinolones available in the market.

Specific objective

- 2 Find out the number of brands available and consider the top ten brands of Quinolones.
- 3 To find the minimum cost of the generic Quinolones drugs available in Jan Aushadi stores.
- 4 To find out the cost Variation of the quinolone & percentage of price variation.

METHODOLOGY

The present study was carried out over six months after obtaining the institutional ethical clearance from November 2020 to April 2021. The CIMS /MIMS are used to calculate drugs cost and visits of the community pharmacy and Janoushadhi. The researcher spent one month in the specified permitted periods in the community pharmacy to get the quinolones prescriptions and calculate the cost ratio & percentage of price variation using the maximum brand and minimum brand cost. The cost ratio was calculated by Maximum cost/Minimum brand cost. This formula can calculate the percentage price variation ;(Maximum brand cost - Minimum brand cost/ Minimum brand cost X 100).To find out the Quinolones prescription in community pharmacies.

RESULTS AND DISCUSSION

The different categories of quinalones were categorized based on the generation and the cost ratio and price variations were shown in the given table1;

Table 1: Distribution of Quinolones (tablets) cost range & percentage of Price variations.

Sl no.	Generic name	Brand name	Minimum cost	Brand name	Maximum cost	Cost Range	% of price variation
First generation:							
1.	Nalidixic acid 500 mg	Gramoneg	22.53	Nalid	38.96	16.43	72.92
Second generation							
2.	Norfloxacin 400mg	Norwin	24.00	Norflex	64.52	40.52	168.83
3.	Ofloxacin 200mg	Zowf	54.67	okaflox	56.77	2.10	3.84
4.	Ciprofloxacin 500mg	Baycip	65.41	ciprowin	66.67	1.26	19.26
Third generation							
5.	Levofloxacin 500mg	Quinolev	77.50	levoday	90.00	12.50	16.12
6.	Sparfloxacin 200mg	Bluspar	48.00	novospar	85.02	37.02	77.12
7.	Gatifloxacin 200mg		BANNED	NOT	FOR	SALE	
8.	Moxifloxacin 400 mg	Moxam	101.50	moxicip	266.00	164.50	162.06
Fourth generation							
9.	Trovafloxacin 300mg	Trovan	98.60				

This table showed that Norfloxacin has the highest percentage price variation with INR 168.83, where the lowest is Ofloxacin with 3.84. Moxifloxacin has the highest cost range of 164.50 INR & Ciprofloxacin has the most miniature cost range of 1.26 INR.

There are 16 brands of nalidixic acid, 61 brands of Norfloxacin, 522 brands of Ofloxacin, 163 brands of Ciprofloxacin, 139 brands of Levofloxacin, 369 brands of Sparfloxacin & 64 brands of Moxifloxacin were available in the Indian market.

Table 2: Distribution of Quinolones (Tablet) cost variation available in the Indian Market between Generic (JanAushadi) and Branded.

Sl. No	Drug name	Generic cost	Branded cost	Cost range	%variation price
1	Ofloxacin 200mg	13.00	54.67	41.67	320.53
2	Ciprofloxacin 500mg	18.00	65.41	47.41	263.38
3	Levofloxacin 500mg	30.00	77.50	47.5	158.33
4	Sparfloxacin 200mg	Not available	48.00	-	
5	Moxifloxacin	60.00	101.50	41.5	69.16
6	Gatifloxacin 200mg	NOT	FOR	SALE	
7	Norfloxacin 400mg	19.00	24.00	5	26.31
8	Nalidixic acid 500mg	Not available	22.53	-	

Ofloxacin has the highest percentage variation of INR 320.53, whereas Norfloxacin has the lowest INR 26.31. Levofloxacin has the highest price difference of 47.5 INR, where Norfloxacin has the most negligible price difference of INR 5/.

Among 20 prescriptions collected, Female patients 14 (70 %) were more when compared to males 6(30%) in the prescription. The age category of the medications showed more were at the age of 21-30(25%) followed by 10-20(20%), 41-50(20%), 51-60(20%) & least were at the age of 31-40(15%).

Among different dosage forms of quinolones used tablet form was 70 %, eye drops 20 %, and intravenous formulations 10 %. Among the types of quinolones ofloxacin, levofloxacin was 15%, 10% were Norfloxacin & ciprofloxacin with tinidazole combinations prescriptions, and rest were other quinolones.

The quinolones prescribed were for various purposes like UTI, Acute GE, RTI & eye infections.

Several quinolones are available in the Indian market. From our analysis, many brands of each generation of drugs are available, and trovafloxacin has the least number of a brand that is only one.

There are variations in the cost of various brands of quinolones available in the Indian pharmaceutical industry.

Quinolones are the drugs prescribed commonly for the treatment of various infections. The complete cure of the disease depends on patient compliance. Expensive medicines are often an essential factor for non-adherence, dropout of drugs. Hence physicians must prescribe generic medicines which are available in Jan Aushadi to reduce patient compliance.

Table 3: Distribution of I & II generation Quinolones.

Sl.No	Brand Name	Price	Brand Name	Price/10 Tab	Brand Name	Price	Brand Name	Price
	I generation		II Generation					
	Nalidixic acid		Norfloxacin		Ofloxacin		Ciprofloxacin	
1	Diarlop SUSP	16.16	Uroflorc 400mg	10.09	Zowf 200mg	54.67	Baycip 500mg	65.41
2	DIX 250mg	28.31	Norbid 400mg	10.40	Okaflox 200mg	56.77	Ciprowin 500mg	66.67
3	Gramoneg 500mg	22.53	Norilet400mg	12.40	Ceoflox 200mg	39.00	Cina 500mg	32.00
4	Nadla Acutab	16.5	Zeflorc 400mg	12.40	Emoflox100mg	23.00	Cip tab 500mg	31.89
5	Negadix SUSP	35.69	Normanc 400mg	20.76	Aroflox 200mg	45.00	Cipac 500mg	29.70
6	Nalid 500mg	38.96	Negaflox 400mg	23.60	Axflo 200mg	48.00	Ciflon 500mg	32.50
7	NedaloX 500mg	13.98	Tamflox 400mg	48.49	Atoflox 200mg	46.00	Cifron 500mg	22.19
8	ULIX-P 150mg	17.00	Norflox 400mg	73.00	Anaflox 100mg	42.46	CIF 500mg	30.00`
9	Wintomylon 500mg	22.79	Actflox 400mg	31.00	Cinoflox 200mg	45.05	Cifomed 500mg	12.5
10	Nega Dx 500mg	35.82	Alflox 400mg	12.00	Alox 200mg	55.00	CIP TAB 500mg	31.89

The above table showed the various generations of I and II second generations. Among these, norfloxacin has a maximum price of 73 INR. Among the least cost was 23INR, Ciprofloxacin was 12.5 INR.

Tab 4: Distribution of III generation quinolones.

Sl.No	Brand Name	Price	Brand Name	Price	Brand Name	Price
III Generation						
	Levofloxacin		Sparfloxacin		Moxifloxacin	
1	Fynol 500mg	31.26	Bluspar 200mg	48.00	Moxam400mg	101.50
2	Levoquin 500mg	34.10	Novospa 200mg	85.02	Moxicip 400mg	266.00
3	Lozonol 500	38.00	Spar bact 200mg	37.30	M.cin 400mg	109.52
4	Day 5-500mg	40.00	Sparrx 200mg	75.00	Moxigram 400mg	115.86
5	Quinolev 500mg	77.50	Zospar 200mg	57.00	Moxif400mg	128.73
6	Levoday 500mg	90.00	Sparx 200mg	79.50	Maximac 400mg	190.00
7	Levomac 500mg	42.00	Sparquin 200mg	86.94	Newquin 400mg	347.75
8	Loxa F 500mg	46.20	Spardac DT	57.04	Flox Safe 400mg	269.00
9	Lufi 500mg	46.20	Sparta 200mg	86.60	Hinemox 400mg	298.00
10	Levocide 500mg	55.40	Wyspar 200mg	100.00	Macflox 400mg	240.00

In the survey of 20 prescriptions containing antibiotic quinolone drugs, we have noticed that the number of male patients is less compared to female patients. This study shows that females are more susceptible to infections such as skin and Urinary tract and other local infections than males due to their anatomy & physiology. Hence more females are in a prescription for Quinolones than males.

Quinolones are available in other formulations like eye drops, ear drops, tablets, and Intravenous injections to treat many bacterial infections. In this study, some of these types of formulations were used.

A similar study was conducted on fluoroquinolones in India by Chawan VS et al.^[1,2] The result showed the percentage price variation for various fluoroquinolones are ofloxacin 869%, sparfloxacin 648%, gemifloxacin 477%, norfloxacin 291%, ciprofloxacin 290%, levofloxacin 264%, lomefloxacin 104%, and moxifloxacin 60% of fluoroquinolones manufactured in India is very extensive high and clinicians can consider while prescribed by the physicians, which is similar to this present study.

Another similar study conducted by Almalki ZS et al.^[3], Kotwani^[4] showed that among the antimicrobials like ciprofloxacin, Ofloxacin & Levofloxacin were very widely used in their studies, and quinolones were also presented in their WHO essential list showing that generic

products cost lesser when compare with branded products among the quinolones. Arfat M et al^[5] studies showed that the branded and generic contents did not vary much in the frusemide combination bioequivalence studies. But interestingly, another study conducted by Singal GL et al.^[6] showed there is a slight difference between the branded and generics. But the margin is very high for the retailer with generic when compared with the branded generics. Alefan et al. and other researchers^[7-12] showed that the quinolones price variation was observed even in the Jordan country among the essential drug list. The same types of responses were observed even in our study except for Quantitative studies like bioequivalence studies.

CONCLUSION

This study showed that Prices of the branded drug are becoming a burden for general people who not economically stable. Cost burden to the patients leads to patient noncompliance. The study clearly shows that doctors must consider the patient economic status before prescribing any medicine. The janaushadi Generic drug was cheaper than branded drugs, so quinolones' generic medication must be specified while defining Ciprofloxacin, Norfloxacin, Levofloxacin, and ofloxacin are fast-moving drugs, so they should always be made available in pharmacies.

Limitation

- The study was carried out for duration of 6months.
- Due to the covid-19 pandemic & Lockdown, we reached only 2 to 3 pharmacies and Jan Aushadi stores to collect information and Collect only 20 quinolone drugs in the study period.

Future Directions

- This project can be extended in depth by visiting many other pharmacies and Jan aushadhi stores in different states.
- Combinational drugs can also be collected and calculate price variations.
- Trovafloxacin brands can be searched in-depth, if any.
- Other types of formulations of quinolones like eye drops, lotions, ear drops, etc., can be searched and include in this study.
- More prescriptions can be collected in different hospitals and calculate the statistics.

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