

## Cost Variation Analysis of Antifungal Agents Available In Indian Market

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### Abstract

Drug therapy is fundamental part of healthcare services. Increased cost of treatment is associated with the poor patient compliance and outcome. So, efforts should be made to choose the drug with minimum cost without affecting efficacy of the drugs. In tropical region like India, fungal infections are more common and some of them are life threatening. These superficial fungal infections require long term therapy significantly increasing the cost of therapy, so the treatment of fungal infection can raise economic burden on the patient. Cost in Indian Rupees (INR) of antifungal agents manufactured by different pharmaceutical companies in India was collected from the Current Index of Medical Specialities (CIMS), July – October 2018 issue. Minimum cost, Maximum cost, Cost ratio, Cost variation were calculated. Forty six percentage drugs show cost variation of more than 75%. In oral dosage form, Itraconazole, fluconazole and terbinafine show the maximum cost variation. In topical single drug therapy clotrimazole and miconazole show maximum cost variation. In topical combination therapy, combination of miconazole+ clobetasol+ gentamycin+ Zn sulphate shows maximum cost variation. There is wide cost variation among antifungal agents available in Indian Market. There is need of strict actions for cost policy regulation and sensitization of doctor for selection of appropriate brand drugs.

**Keywords:** Antifungal Agents, Cost Analysis, Cost Variation.

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### INTRODUCTION

Drug therapy is fundamental part of healthcare services [1]. In developing country like India; drug costs form a significant portion of treatment cost, approximately 30 to 40%. It is a concerning signs not only for patients, but also for policy makers and service providers [2]. Increased cost of treatment is associated with the poor patient compliance and outcome. So, efforts should be made to choose the drug with minimum cost without affecting efficacy of the drugs [3].

In tropical region like India, fungal infections are more common and some of them are life threatening. The incidence of these fungal infections is on continuous rise because of decrease in host defences (immunocompromised state, elder population, critically ill, use of immunosuppressive drugs) or exposure to opportunistic fungus. According to site of infections, fungal infections are divided into superficial, subcutaneous and systemic infections [4]. Superficial fungal infections (infections of nails and hair) are not life threatening, but they may affect quality of life. They may be very uncomfortable and may have spread to other individuals or become invasive [5]. These superficial fungal infections require long term therapy

significantly increasing the cost of therapy, so the treatment of fungal infection can raise economic burden on the patient [6].

Indian Pharmaceutical markets are flooded with large number of formulations of antifungal agents and the same formulations are sold under different brands. This creates a lot of confusion for the doctors in deciding the antifungal agent of choice in individual patient. So, this study was designed to evaluate the cost of antifungal agents of different classes and different brand names and to analyze the cost variation among the various antifungal agents available in Indian market.

### MATERIALS AND METHODS

Cost in Indian Rupees (INR) of antifungal agents manufactured by different pharmaceutical companies in India was collected from the Current Index of Medical Specialities (CIMS), July – October 2018 issue. CIMS is considered authentic and trusted source of commercial drug information. Drugs being manufactured by one company or being manufactured by different companies however in different strengths were excluded. Different brands of same antifungal agent being manufactured by one company with same dosage form and same strength were included in

analysis. Antifungal drugs with incomplete or non verifiable information regarding strengths, formulations, brand name or cost were excluded.

Following parameters of antifungal drugs were calculated/obtained:

- Retail cost of antifungal drugs (mono and multidrug regimen) being manufactured by different companies (same strength, number, dosage forms) was obtained. Cost of the antifungal agents was calculated for an average of 10 tablets because the number of tablets available per strip may be varied. Cost of injectable was calculated per unit dosage form. Cost of topical formulation

was calculated for amount with maximum brands usually per 15 gram.

- The difference in Maximum and minimum cost of same antifungal agent manufactured by same or different pharmaceutical company was calculated.
- Cost ratio was calculated as follows:
  1. Cost ratio: maximum cost /minimum cost
  2. It gives an idea about how many time is costlier brand is expensive than cheapest brand of the same drug.
- Percentage cost variation for oral formulations, per unit dosage for injectable, amount with maximum brands(usually per 15 gram) for topical formulations was calculated as follows:

$$\text{Cost variation: } \frac{\text{Maximum cost} - \text{Minimum cost}}{\text{Minimum cost}} * 100 \text{ [7]}$$

### Minimum cost

- Association between number of brands and cost variation was calculated. All antifungal agents were divided into five groups: 1. 0-25% 2. 25-50% 3. 50-75% 4. 75-100% 5. >100%

Data entry was done in Microsoft office excel and analysed by epiinfo software.

## RESULTS

The cost of total 31 drugs (4 drugs for oral route single drug, 1 drug for injectable route single drug, 1 drug for oral route combination therapy, 7 drugs for topical oral route, 18 drugs for topical combination drugs) being manufactured by different pharmaceutical companies were analysed.

As per Table-1, in oral solid dosage form, Itraconazole (100 mg) shows maximum cost variation of 957.36% and Itraconazole (400 mg) shows minimum

cost variation of 5.71%. In solid parental dosage form caspofungin (50 mg and 70 mg) show cost variation of 5.11%. In combination drugs oral route, fluconazole and tinidazole combination shows cost variation of 16.84%.

As per Table-2, clotrimazole (1%) lotion shows maximum cost variation of 277.78 % and amorolfine (5%) lacquer shows minimum cost variation among all topical single dose formulations.

As per Table-3, Cream miconazole+ clobetasol+ gentamycin+ Zn sulphate (2%+ 0.05%+ 0.1%+ 2.5%) shows maximum cost variation of 511.06%. Cream tolnaftate+ iodochlorhydroxyquinoline+ gentamycin+ betamethasone+ chlorocresol (10mg+ 10mg+ 1 mg+ 0.61mg+ 1mg) shows minimum cost variation of 2.05%.

**Table-1: Cost variation of single drugs (oral, injectable) and combination (oral) drugs**

Name of the drug	Dose	Manufacturing Companies	Minimum Cost	Maximum Cost	Cost ratio	%Cost variation
Fluconazole	50 mg	7	34.1	110	3.23	222.58
	150 mg	31	68.5	375	5.48	447.45
	200 mg	8	87	271.5	3.12	212.07
	400 mg	3	137.21	550	4.01	301.17
Itraconazole	100 mg	27	72	761.3	10.57	957.36
	200 mg	25	100	547.5	5.48	447.5
	400 mg	2	350	370	20	5.71
Terbinafine	250 mg	20	76.1	390	5.13	412.48
Ketoconazole	200 mg	3	150	315	2.1	110
Caspofungin	50 mg	4	9990	10500	1.05	5.11
	70 mg	3	9990	10500	1.05	5.11
Fluconazole+Tinidazole	150 mg+ 1000 mg	2	380	444	1.17	16.84

**Table-2: Cost variation of single drugs (topical)**

Name of the drug	Dose	Strength	Manufacturing Companies	Minimum Cost	Maximum Cost	Cost ratio	%Cost variation
clotrimazole	powder	1%	7	9.14	20.3	2.22	122.1
	lotion	1%	2	18	68	3.78	277.78
	cream	1%	6	24.28	57	2.35	134.75
	solution	1%	2	26	51.1	1.97	96.54
Ketoconazole	cream	2%	5	35	96	2.74	174.29
	shampoo	2%	2	32.4	45	1.39	38.89
	soap	2%	2	15	19.2	1.28	28
	ointment	2%	2	65	89	1.37	36.92
Miconazole	cream	2%	2	14.18	45	3.17	217.35
Terbinafine	cream	1%	14	55	107	1.95	94.55
Luliconazole	cream	1%	2	112.5	223	1.98	98.22
Fluconazole	gel	0.50%	2	51.44	65	1.26	26.36
Amorolfine	lacquer	5%	1	2700	3375	1.25	25

**Table-3: Cost variation of combination drugs (topical)**

Name of the drug	Dosage form	Strength	Companies	Minimum cost	Maximum Cost	Cost ratio	Cost variation
Terbinafine+Ofloxacin+Ornidazole+Clobetazol	cream	1%+0.75%+2%+0.05%	6	49	65	1.33	32.65
Terbinafine+Ofloxacin+Ornidazole+Clobetazol+Methylparaben +Propylparaben	cream	1%+ 0.75%+ 2%+ 0.05%+ 0.2%+ 0.02%	4	49	54	1.1	10.2
Terbinafine+Mometasone	cream	1%+0.1%	2	105	200.4	1.91	90.86
Tolnaftate+Iodochlorhydroxy quinoline+Gentamycin+Betamethasone+Chlorocresol	cream	10mg+ 10mg +1 mg + 0.61 mg + 1mg	1	73.5	75	1.02	2.05
Miconazole+Beclomethasone +Neomycin	cream	2%+0.025%+ 0.5%	1	62	105	1.69	69.36
Miconazole+Betamethasone+ Gentamycin	cream	2%+0.05%+0.1%	2	10.28	15	1.46	45.91
Miconazole+Clobetazol+Gentamycin+zn sulphate	cream	2%+0.05%+0.1%+2.5%	1	11.21	68.5	6.11	511.06
Miconazole+Clobetazol	cream	2%+0.05%	3	38.2	57.6	1.51	50.79
Miconazole+Clobetazol+zn sulphate	cream	2%+0.05%+2.5%	1	71	76	1.07	7.04
Miconazole+Clobetazol+Neomycin	cream	2%+0.05%+0.05%	2	38	60	1.58	57.9
Miconazole+Clobetazol+Neomycin	cream	2%+0.05%+0.5%	2	39	52.5	1.35	34.62
Ketoconazole+zinc pyrithone	lotion	2%+1%	4	17.55	29.63	1.69	68.8
Ketoconazole+zinc pyrithone	shampoo	2%+1%	4	26.25	52.5	2	100
Ketoconazole+Glycerine	soap	2%+1%	2	17	18	1.06	5.88
Clotrimazole+Gentamycin+Beclomethasone	ointment	1%+0.1+0.025	1	32	54	1.69	68.75
Clotrimazole+Neomycin+Beclomethasone	cream	1+0.5+0.025	5	46.5	114.45	2.46	146.13
Clotrimazole+Beclomethasone +Neomycin+Chlorocresol	cream	1%+0.028%+ 0.5%+0.1%	1	55	81	1.47	47.27
Clotrimazole+Betamethasone	Cream	1%+0.05%	2	42.32	84	1.99	98.49
Clotrimazole+Gentamycin+Beclomethasone	ointment	1%+0.1+0.025	1	32	54	1.69	68.75
Clotrimazole+Beclomethasone	Cream	1%+0.025	2	44	54.75	1.24	24.43
Clotrimazole+Beclomethasone	Lotion	1%+0.025	2	37.5	45	1.2	20

**Table-4: Percentage cost variation of antifungal agents (oral, injectable, topical formulations)**

Percentage Variation	No of drugs/combinations (%)
0-25	11 (23.91)
25-50	8 (17.40)
50-75	6 (13.04)
75-100	6(13.04)
>100	15(32.61)

## DISCUSSION

The study was conducted to evaluate and compare the cost differences in various brands of antifungal agents available in Indian market.

In India, a large number of drug formulations with same dose and amount are available at different costs. They are manufactured and sold by different pharmaceutical companies under different brand names. It is therefore necessary for doctors to have exact knowledge regarding the cost of different brands and to choose the most cost effective drug for rational therapeutics [8]. There is lack of awareness among doctors about the cost of drugs and ultimately, it may raise overall health expenditure. Highest drug costs are associated with medication non adherence and poor patient outcome. Poor medication adherence is associated with progression of disease which increases overall health expenditure [3].

In our research, forty six percentage drugs show cost variation of more than 75%. In oral dosage form, Itraconazole, fluconazole and terbinafine show the maximum cost variation. In topical single drug therapy clotrimazole and miconazole show maximum cost variation. In topical combination therapy, combination of miconazole+clobetasol+gentamycin+Zn sulphate shows maximum cost variation. Generally, cost variation is associated with more number of manufacturing companies. But in topical combination of miconazole+clobetasol+gentamycin+Zn sulphate, there is only one manufacturing company with two different brands of same product but showing wide variation in the cost. In single topical therapy, terbinafine cream is manufactured by fourteen different pharmaceutical companies, but still has low cost variation as compared to other topical agents like ketoconazole, clotrimazole. Oral fluconazole (400 mg) is manufactured by three different manufacturing companies, but shows wide cost variation.

Patients have cost burden due to prescription of costlier brand drugs. So, costlier brands are marketing strategy of pharmaceutical companies, are not associated with quality of medications [9]. So, pharmacoeconomic study should be included in the undergraduate and postgraduate curriculum. This will enhance the ability of future doctors for rational therapeutics. There is need of awareness among doctors about selection of drugs on the basis of cost without compromising efficacy. Easy availability of drug

manual with comparison of drug cost will be helpful for the awareness among doctors [10]. Sensitization of doctors for prescription of generic drugs must be promoted. It is high time that government should include more number of drugs under drug price control order [11]. Currently, Medical Council of India has published a circular for doctors to prescribe drugs with generic name, legibly and preferably in capital letters [12].

## CONCLUSION

We found that there is wide cost variation among antifungal agents available in Indian Market. Fungal infections require long term therapy in many cases. Patient compliance and cost burden to the patient are important contributing factors for failure of therapy. There is need of strict actions for cost policy regulation and sensitization of doctor for selection of appropriate brand drugs.

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