

Drug utilization pattern evaluation and cost variation analysis of anti-fungal agents in tinea infected patients in dermatology department of a tertiary care teaching hospital

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ABSTRACT

Background: Tinea infections are chronic superficial fungal infections, highly prevalent in tropical countries like India. Therefore, long-term therapy is needed and this can inflict a financial burden on the patients. Aim of the study was to assess drug utilization patterns in patients diagnosed with tinea infection and to evaluate the cost variability of anti-fungal agents.

Methods: A cross-sectional observational study was conducted in patients for 3 months after taking permission from IEC. All adult patients already diagnosed with tinea infection were enrolled. Evaluation of drug utilization pattern was carried out using WHO core drug prescribing indicators and percentage of cost variability was calculated between different brands of anti-fungal agents.

Results: A total of 252 patients were enrolled. Tinea corporis and cruris were the most commonly diagnosed tinea infection. Pruritus was the most common presenting symptom. Past history of similar illness was seen in 74 (29.4%) patients mean of 3.83 ± 0.87 drugs were prescribed per patient. Drugs prescribed from NLEM was only 42.1%. Most commonly prescribed drugs were oral itraconazole and topical miconazole. Percentage of cost variability was seen maximum with capsule itraconazole 200 mg (237.5%) by oral route and luliconazole 30 gm (175.6%) by topical route.

Conclusions: Prescribing practices of drugs can be improved by promoting generic drug and prescribing drugs from NLEM. Wide range of cost variation can lead to high economic burden in tinea infected patients.

Keywords: Cost variability, Drug utilization pattern, Tinea infection

INTRODUCTION

Dermatophytosis (Tinea) infections are superficial fungal infections caused by dermatophytes—a group of fungi that invade and grow in keratinized tissues (skin, hair, and nails). Patients usually develop widespread pruritus, maculopapular rash, pustules, and scaling lesions. The current prevalence of dermatophytosis in India ranges from 6.09% to 61.5%.¹ A significant increase in the incidence of chronic dermatophyte infection of the skin in the last few years has proven challenging to treat. Climate change, ignorance, improper sanitation, poor hygiene, and

overpopulation are some predisposing factors for tinea infections seen mainly in developing countries like India.² Tinea infection may have negative psychological, social, and occupational effects and can affect the quality of life.

Unwanted drug exposure, irrational prescribing, and improper use of drugs can turn the disease into a chronic infection and increases the disease burden on the patients. It is necessary to use topical and systemic antifungal agents appropriately for a complete cure of tinea infection as well as to reduce relapse rate and complications.^{3,4} It is very difficult to improve prescribing practice without knowing

about a pattern of drug use and the sensitivity of drugs in patients, therefore drug utilization study is required. Marketing, distribution, prescription, and drug use in a society with special emphasis on emerging medical, social, and economic outcomes are called drug utilization studies that facilitate the rational use of drugs.⁵

Prescribing drugs with their brand name are very common nowadays in private as well as government hospitals. The majority of tinea infections are chronic and require long-term antifungal therapy and expensive branded drugs increase the economic burden on patients.^{6,7} A cost variability study is required to analyse costs between different prescribed brands of drugs and is useful to estimate cost burden to patients.

Hence this study aimed to evaluate drug utilization pattern, and analyse cost variability between different prescribed brands of antifungal drugs at tertiary care teaching hospital.

METHODS

This cross-sectional observational study was carried out in an outpatient department of dermatology at Sheth L.G. general hospital, Ahmedabad. The study was initiated after obtaining ethical approval from institutional review board. All adult patients of either gender and already diagnosed with tinea infection and on treatment were included in the study. Whereas patients not willing to give written informed consent were excluded. The study was conducted over a period of 3 months from May 2023 to August 2023.

Before enrolling patients, written informed consent was taken in their vernacular languages. Data privacy and confidentiality were assured to the participants. The prescriptions of these patients were reviewed and all the relevant data demographic profile, past history of similar conditions, diagnosis, drugs with their dosing schedule, duration of treatment, and drugs prescribed by their generic or brand name, was collected and entered into pre-designed case record form. Drug utilization pattern evaluation was carried out using WHO core drug prescribing indicators.

We evaluated both the online and offline sources to find out the cost of the prescribed medications. For orally prescribed medications 1 unit was 10 tablets/10 capsules, for topical cream/ointment-15 gm, for topical lotion-15 ml, for topical powder-100 gm, and for shampoo-15 ml to compare cost of prescribed different brands of anti-fungal drugs. Cost of various brands of a particular drug prescribed in the same dose and dosage form was obtained and compared.

The difference in cost between costliest and cheapest brand for each drug was calculated. This cost variability for all the prescribed brands of antifungal drugs was calculated using this formula:

Percentage cost variation =

$$\frac{(\text{Price of costliest brand} - \text{Price of cheapest brand})}{\text{Price of cheapest brand}} \times 100$$

The collected data was entered manually into Microsoft excel 2021 and data analysis was done.

RESULTS

A total of 252 dermatophytosis patients were included in the study. Out of this, 130 (51.6%) were male and 122 (48.4%) were female. The mean age was 40.38±14.6 years. The majority of the patients belonged to the age group of 18 to 37 years (42.9%) (Figure 1).

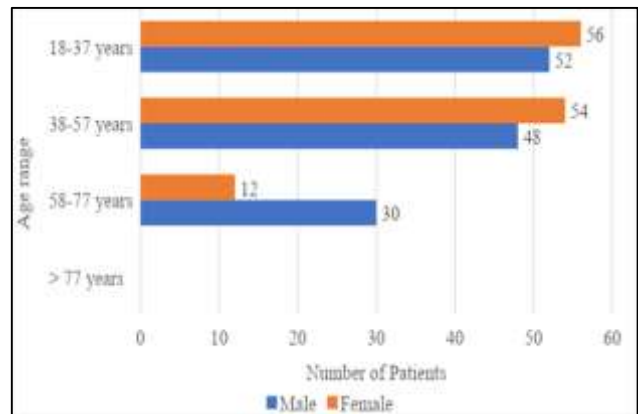


Figure 1: Demographic characteristics of tinea infected patient.

There were 74 (29.4%) patients who had history of similar illness in past and present episode was relapse/ recurrence. Source of infection of 69 (27.4%) patients was contact of tinea affected family members and friends.

In this study, different types of tinea infections (tinea cruris, tinea corporis, tinea faciei, tinea capitis, tinea versicolor, tinea incognito, tinea manuum, tinea pedis) diagnosed in the patients. Tinea corporis and cruris together (52.77%) were the most common tinea infection observed in the patients (Figure 2).

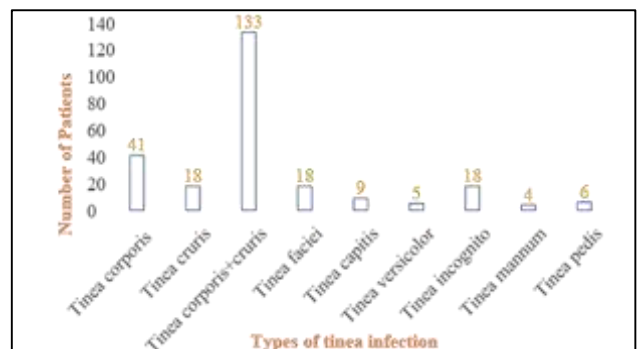


Figure 2: Various types of tinea infections diagnosed in the patients.

In this study, we have found that various anti-fungal drugs belonging to different groups like **imidazole**: ketoconazole, clotrimazole, miconazole, luliconazole, sertaconazole; **triazoles**: fluconazole, itraconazole; **allylamines**: terbinafine; and **others** (Morpholines: amorolfine; oxaboroles: ciclopirox olamine; selenium sulphide) were prescribed to patients. Most commonly prescribed drugs were itraconazole orally and miconazole topically (Figure 3).

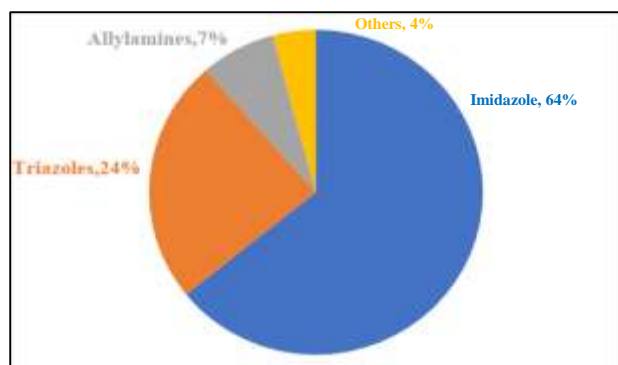


Figure 3: Different groups of anti-fungal drugs prescribed to tinea infected patients.

A total of 11 antifungal drugs in different dosage forms and only one antifungal-steroid topical combination was prescribed to patients. Different types of oral (tablet, capsules) and topical formulations (cream/ointment, lotion, powder, shampoo) were prescribed to the patients. The topical route (60.3%) was most preferred. Among these, creams and ointments were prescribed in maximum (45%) followed by capsules (24.64%) (Table 1).

Table 1: Commonly prescribed drugs to tinea infected patients.

Drugs	Dosage form	Prescription, N (%)
Itraconazole	Capsule	138 (18.4)
Fluconazole	Tablet	42 (5.6)
Terbinafine	Tablet	48 (6.4)
	Cream	6 (0.8)
Luliconazole	Cream	108 (14.4)
	Lotion	18 (2.4)
Miconazole	Cream	228 (30.6)
	Cream	66 (8.8)
Ketoconazole	Powder	42 (5.6)
	Cream	10 (1.3)
Amorolfine	Cream	10 (1.3)
Ciclopirox olamine	Cream	6 (0.8)
Sertaconazole	Cream	6 (0.8)
Clotrimazole + beclomethasone	Cream	7 (0.9)
	Lotion	5 (0.7)
Selenium sulphide	Lotion	6 (0.8)
	Shampoo	9 (1.06)

On average 3.83 ± 0.87 drugs were prescribed per prescription. No injectable medication was prescribed. Only 42.1% drugs were prescribed from national list of essential medicine 2022 (Table 2).

Different anti-fungal drugs were prescribed with number of brands, dose, dosage forms, and their maximum and minimum cost presented and cost variability calculated. Among oral medications, itraconazole showed 237.5% cost variability and in topical medications, luliconazole cream showed 175.6% cost variability (Table 3).

Table 2: Drug utilization pattern in tinea infected patients using WHO core drug prescribing indicators.

WHO core drug prescribing indicators	N	Average drugs per prescription/ percentage of drugs/percentage of encounters	WHO's standard derived (%)
Drugs prescribed	966	3.83	1.6-1.8
Drugs prescribed by generic name	491	50.8	100
Drug encounters with antibiotics	745	77.1	20-26
Drug encounters with injections	0	0	13.4-24.1
Drugs prescribed from NLEM 2022*	407	42.1	100

*NLEM-National List of Essential Medicines.

Table 3: Cost-variation among different drugs prescribed to tinea infected patients.

Drugs	Dose (gm)	Brand prescribed	Units	Maximum price/unit	Minimum price/unit	Cost-variability (%)
Oral medications						
Itraconazole	200	4	10 cap	270	80	237.5
Terbinafine	250	2	10 tab	440	148	197.3
Topical cream						
Luliconazole	30, 60	7	15 gm	175	63.5	175.6
Ketoconazole	30	4	15 gm	91	48.5	87.6
Sertaconazole	15	3	15 gm	260	194	34
Ciclopirox olamine	30	2	15 gm	110.5	93.5	18
Amorolfine	15, 30	4	15 gm	160	110	45.4
Terbinafine	15	1	15 gm	55	-	-

Continued.

Drugs	Dose (gm)	Brand prescribed	Units	Maximum price/unit	Minimum price/unit	Cost-variability (%)
Topical powder						
Ketoconazole	120	2	100 gm	146	119	22.7
Topical lotion						
Luliconazole	30 ml	4	15 ml	174.5	101	72.8
Selenium sulphide	60 ml	2	15 ml	75	39.3	91.1
Topical shampoo						
Selenium sulphide	60 ml, 120 ml	3	15 ml	49.25	35.75	37.8

DISCUSSION

Evaluation of prescribing pattern has an important role in health care system. Prescription is influenced by drug availability and affordability. One of the important factors responsible for patient's compliance is cost of the drug.⁸ Therefore cost analysis of prescription is required. Although tinea infections are not life threatening, due to chronicity of disease these infections are associated with morbidity.

In our study population, it was found that males (51.6%) were more affected than females (48.4%), which was in accordance with another study conducted by Veganda et al.⁹ The highest number of patients affected were in the age group of 18 years to 37 years (42.9%) and most of them were working in agriculture industry, dusty environment and belonged to low socio-economic class and had poor hygiene. Similar findings were reported in a study conducted by Joshi et al in which the majority of the patients belonged to 19 years to 28 years age group (41.6%).¹⁰

Different types of tinea infections were diagnosed in the patients. Amongst these tinea corporis and cruris were responsible for maximum infections (52.7%) whereas tinea faciei, capitis, pedis, versicolor, manuum and incognito were observed comparatively less in our study population and similar results were observed in a study done by Dutta et al.¹¹ Superficial fungal infection can be a chronic condition due to recurrences as was seen in 74 (29.4%) patients who had history of similar infections in past. A study conducted by Sunanda et al also found that 51.6% of patients had recurrence of infection.¹²

Prescription pattern of tinea infected patients was evaluated in the study, and findings revealed that the majority of antifungal drugs were prescribed topically than orally which was similar to study conducted by Bulwi et al.¹³ Maximum number of the drugs were prescribed from imidazole group (64%) followed by triazole group (25%) of anti-fungal drugs, In another study conducted by Yogesh et al imidazole group 78.1% and triazole group 36.8% dominated the prescription.¹⁴ In our study, maximum prescribed oral anti-fungal drug was capsule itraconazole (18.4%) and topical anti-fungal drug was miconazole cream (30.6%) followed by luliconazole cream (14.4%). While in another similar study done by Sudha et al fluconazole was the maximum prescribed oral

anti-fungal drug while terbinafine and clotrimazole were the maximum prescribed topical agents.¹⁵ In our study, triple drug regimen with two anti-fungal and one anti-histaminic was preferred regimen, and most common drugs given per prescription were found as capsule itraconazole, miconazole cream, and cetirizine or levocetirizine tablet.

The average number of drugs prescribed per prescription was 3.83 and 49.2% of drugs were prescribed by their brand names. This was in concordance with the study done by Bansal et al.¹⁶ Moreover a very low number of drugs (42.1%) were prescribed from the NLEM 2022. The majority of tinea infections are chronic and not 100% of drugs are prescribed by generic names, which has a high impact on disease burden and cost burden to patients. Thus, prescribers should consider this issue, and treatment plan need to be updated with the changing pattern of drug sensitivity of dermatophytes as well.¹⁷

In our hospital pharmacy, only miconazole cream and fluconazole tablet were available as free of cost. Thus, cost variation analysis was done for all other prescribed antifungal drugs. In our study among the oral antifungals, capsule itraconazole (237.5%) showed maximum cost variability. This was contradictory to a study conducted by Spoorthy et al where they found that tablet fluconazole showed maximum cost variation.¹⁸ And among the topical anti-fungals, luliconazole cream (175.6%) showed the maximum cost variability in our study, this was also contradictory to the study done by author Naaz et al where ketoconazole cream showed the maximum cost of variation.¹⁹

CONCLUSION

Almost all the patients received both oral and topical formulation of anti-fungal drugs. In our study the most commonly prescribed antifungal drugs were itraconazole capsule and miconazole cream. Wide range of cost variation was seen in prescribed anti-fungal drugs, among them itraconazole showed maximum cost variation. Most superficial fungal infections are chronic and need long course of treatment. Doctors should be encouraged to prescribe more generic formulations to reduce the economic burden on patients. This will empower the mission of providing "health care to all". The limitations of my study were the small sample size and the short duration.

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