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Original Research Article

Prescription pattern of antimicrobial agents prescribed in outpatient department of dermatology in a tertiary care hospital in India

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ABSTRACT

Background: Skin diseases contribute largely to global disease burden. Antimicrobial agents are used for treatment of various skin diseases of microbial aetiology caused by fungi, bacteria, viruses and ectoparasites. The primary objective of this study was to study the prescription pattern of antimicrobial agents in dermatology, to provide insights into the disease patterns, profile of the drugs used and their rationality.

Methods: Cross-sectional observational study was conducted in dermatology outpatient department of T. N. M. C. and B. Y. L. Nair Charitable Hospital, Mumbai for period of 6 months. 372 prescriptions containing an antimicrobial agent (AMA) were analysed. Demographic data, disease pattern, associated comorbidities and prescription details were recorded after taking written informed consent.

Results: Fungal infections were the most common (48%) followed by bacterial infections (31%). The most encountered condition was dermatophytosis. Average number of AMA per prescription was 2.33 ± 0.73 . Percentage of AMA prescribed by generic name was 48%. Percentage of AMA prescribed from National list of essential medicines 2015 (NLEM) was 32.60%. 87.9% of AMA were prescribed as combination therapy and 12.10% were prescribed as monotherapy. The commonest prescribed drugs were antifungals followed by antibiotics. Topical creams were the commonest prescribed dosage form.

Conclusions: The most common class of antimicrobial agents prescribed was antifungal agents. Prescribing combination of oral antimicrobials with topical antimicrobials was found to be high. This study provides a framework for continuous prescription audit of antimicrobials in an outpatient setting and thus can help in rational use of antimicrobials in dermatological prescribing.

Keywords: Drug utilization, Prescription audit, Antimicrobials, NLEM

INTRODUCTION

The skin is a biologically active, multifunctional, and multicompartiment organ and is the largest organ of the human body.^{1,2} It is a part of the integumentary system which consists of the skin, associated glands, hair, and nails. As it forms a protective barrier between the external and the internal environment, it is susceptible to injury by many factors including extrinsic factors such as chemical, environmental, infectious agents as well as intrinsic factors such as genetic, metabolic and immunological. Skin and

subcutaneous diseases were the 18th leading cause of global disease burden and are the fourth leading cause of disability worldwide, affecting nearly one-third of the world's population. Despite their visibility, however, their burden is frequently underestimated.^{3,4}

Various infections and infestations mainly caused by bacteria, viruses, fungi, and parasites may affect the skin and integumentary system. Frequently observed skin infections in India include fungal infections like dermatophytosis and candidiasis, bacterial infections like acne vulgaris, folliculitis, furuncle/carbuncle, leprosy,

impetigo etc as well as viral skin infections including infections by herpes simplex virus, molluscum contagiosum virus, varicella-zoster virus, human papillomavirus, producing a variety of lesions, including warts or blisters.^{2,3,5} Epidermal parasitic skin diseases (EPSD) are parasitic diseases involving the upper layer of skin e.g. scabies and pediculosis.⁶ Sexually transmitted infections like gonorrhoea, chlamydial infection, syphilis, trichomoniasis, chancroid, genital herpes, genital wart etc also fall under the scope of dermatology.⁷ Antimicrobial agents are useful in the treatment of these infections/infestations. They are synthetic as well as naturally obtained drugs that attenuate microorganisms. They include antibacterial, antifungal, antiviral, antiparasitic drugs.⁸

In India, pattern of skin diseases is influenced by the developing economy, literacy, social status, climatic differences, industrialization, rituals, and cultural elements. Skin diseases may have unfavourable effects on the quality of life of the patient as well as increase financial burden as most of them are chronic and may require lifelong treatment.⁹ Appropriate diagnosis by physicians and rational prescribing based on their understanding of both the risks and benefits of drugs thus plays a crucial role in drug therapy.¹⁰

Rational use of medicines is defined as “*Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community*”.¹¹

Irrational and inappropriate use of antimicrobials in healthcare systems is a major concern today, including use of multiple medicines per patient (poly-pharmacy) and inappropriate use of antimicrobials (inadequate dosage, antibiotics for non-bacterial infections; inappropriate self-medication; non-adherence to dosing regimens).⁶ These may contribute to the development of antimicrobial resistance thus raising the cost of health care with longer hospital stays requiring more intensive care.² Periodic evaluation of prescription patterns enables suitable modifications in prescription of drugs to increase the therapeutic benefit and minimize the adverse effects. The study of prescription patterns seeks to monitor and evaluate the prescribing trend of medical practitioners, provide feedback and create awareness about the rational use of medicines.¹²

The primary objective of this study was to study the prescription pattern of antimicrobial agents in dermatology, to provide insights into the disease patterns, profile of the drugs used and their rationality, which may help improve drug therapy for better patient care.

METHODS

This cross-sectional observational study was carried out in the outpatient department (OPD) of dermatology of

Topiwala National Medical College and B. Y. L. Nair Charitable Hospital, a tertiary care teaching hospital in Mumbai city of Maharashtra state of India for duration of six months from June 2021 to December 2021 after taking permission from the Institutional Ethics Committee and the concerned department heads.

Inclusion criteria

All patients visiting OPD of Dermatology who were prescribed an antimicrobial agent and those who had age above 18 years of any gender were included.

Exclusion criteria

Patients who were not willing to give consent were excluded.

Total 372 patients satisfying the inclusion and exclusion criteria were included in the study. Sample size calculated using 95% confidence level and 5% confidence interval (to represent the 6-month patient population of 12000).¹³ Following consultation by the dermatologist, personal interviews were conducted and prescription details were recorded in case record forms after taking written informed consent. The demographic data of the patient, chief complaints and diagnosis were recorded. The drug details included were name, dose, route of administration, and frequency of medication. Details of comorbidities and concomitant medications were also recorded. Data was analysed using descriptive statistics on Microsoft excel 365.

RESULTS

In this study a total of 372 prescriptions containing antimicrobial agents were analysed. The total number of drugs prescribed was 1413. Out of which antimicrobial agents were 868 (61.42%) of total drugs and remaining 545 (38.57%) were considered as concomitant drugs. The average number of AMA per prescription was 2.33 ± 0.73 whereas average number of drugs per prescription was 3.81 ± 1.16 .

Patient demographics

Gender wise distribution of the patients showed, that females accounted for 56.72% of the total study population whereas 43.28% were males. The male to female ratio was 1:1.32. The average age (years) of the study population was 39.075 ± 14.33 (median: 38), with a range of 18-79 years. Maximum patients were in the age group of 18-29 years (30.11%) (Table 1).

Data on disease distribution

With respect to disease distribution among 372 patients, fungal infections were the most common (48%) followed by bacterial infections (31%), parasitic infections and infestations (11%) and viral infections (5%) (Figure 1).

Overall, the most encountered condition was dermatophytosis seen in 33.60% patients, followed by candidiasis (14.52%) and acne vulgaris (14.25%). Sexually transmitted diseases (STDs) (9.95%) included syphilis, gonococcal and non-gonococcal urethritis, herpes simplex genitalis, herpes labialis etc. Epidermal parasitic skin diseases (EPSD) like scabies and pediculosis were seen in 9.68% patients. Other conditions like folliculitis, varicella zoster, leprosy, urticaria, eczema, dermatitis were also observed (Table 2 and Figure 2). 24.19% out of the total 372 patients had associated comorbidities, diabetes mellitus being the most common (Figure 3).

Analysis of the prescription pattern of antimicrobial agents

372 prescriptions were analysed containing total 1413 drugs. Out of which antimicrobial agents were 868 (61.42%) and remaining were considered as concomitant drugs which were 545 (38.57%) of total drugs. The average number of drugs per prescription was 3.81 ± 1.16 . The average number of antimicrobial agents (AMA) per prescription was 2.33 ± 0.73 . Among the 868 antimicrobials prescribed, 54.26% were prescribed topically, 44.59% were prescribed orally and 1.15% were prescribed by injectable route. 52% of the AMA were prescribed by brand name and 48% by generic name. 32.60% of the total AMA were a part of the National List of Essential Medicines (2015) (Table 3). The most frequently prescribed antimicrobial agents were the antifungal agents (60.60%) followed by antibacterial agents (27.19%), antiparasitic agents (9.91%) and antiviral agents (2.30%) (Figure 5). Among the systemically prescribed antimicrobial agents, antifungal agents like itraconazole, fluconazole and antibiotic amoxicillin + clavulanic acid were commonly prescribed (Table 4). Among the topically prescribed antimicrobial agents, antifungal agents like miconazole, amorolfine, luliconazole and antibacterial agents like clindamycin and fusidic acid were commonly prescribed (Table 5).

87.9% of AMA were prescribed as combination therapy and 12.10% were prescribed as monotherapy. 10.4% of

antimicrobial agents were prescribed as part of an FDC, the most common being the beta-lactam antibiotic amoxicillin + clavulanic acid. Antimicrobial agents were prescribed in various dosage forms, topical creams being the most commonly prescribed (35.37%). Among oral AMA, tablets were most frequently prescribed (27.65%) (Table 6). Among a total of 1413 drugs prescribed, 545 (38.57%) constituted concomitant drugs.

Antihistamines were the most frequently prescribed concomitant drug, prescribed to 68.28% of patients (254 out of 372). Other concomitant medications included emollients, corticosteroids, keratolytic agents, retinoids, NSAIDs, sunscreens, antiseptics etc.

Table 1: Patient demographics.

Variables	Characteristics	Frequency	%
Gender	Female	211	56.72
	Male	161	43.28
	Total	372	100.00
Age distribution (years)	18-29	112	30.11
	30-39	94	25.27
	40-49	75	20.16
	50-59	62	16.67
	60-69	16	4.30
	70-79	13	3.49
	Total	372	100

Table 2: Disease distribution.

Diagnosis	N	%
Dermatophytosis	125	33.60
Candidiasis	54	14.52
Acne vulgaris	53	14.25
STDs	37	9.95
EPSD	36	9.68
Folliculitis/furunculosis	36	9.68
Varicella zoster	5	1.34
Leprosy	5	1.34
Others	21	5.65
Total	372	100

Table 3: Prescribing indicators.

Prescribing indicators for AMA	Value
Average no of AMA per prescription	2.33±0.73
Percentage of AMA prescribed by generic name	48%
Percentage of prescriptions with an injection prescribed	2.7%
Percentage of AMA prescribed from National list of essential medicines (2015)	32.60%
Percentage of prescriptions with antibiotics (n=372)	32.25%

Table 4: Systemically prescribed antimicrobial agents.

Route	Type of AMA	Drug	Frequency	Percentage of prescriptions (n=372) (%)
Oral	Antifungal	Itraconazole	106	28.49
		Fluconazole	65	17.47

Continued.

Route	Type of AMA	Drug	Frequency	Percentage of prescriptions (n=372) (%)
	Antibacterial	Terbinafine	14	3.80
		Amoxicillin + clavulanic acid	40	10.75
		Azithromycin	29	7.80
		Doxycycline	26	7.00
		Clofazimine	10	2.69
		Cefixime	8	2.15
		Sulfamethoxazole+trimethoprim	6	1.61
		Cefpodoxime proxetil	5	1.34
		Dapsone	5	1.34
		Rifampicin	5	1.34
	Antiparasitic	Ivermectin	37	4.97
		Metronidazole	7	0.94
		Albendazole	6	0.81
	Antiviral	Acyclovir	15	4.03
Valacyclovir		5	1.34	
Injectable	Antibacterial	Benzathine penicillin G	10	2.69

Table 5: Topically prescribed antimicrobial agents.

Type of AMA	Drug	Frequency	Percentage of prescriptions (n=372)
Anti-fungal agents	Miconazole	109	29.30
	Amorolfine	95	25.54
	Luliconazole	62	16.67
	Clotrimazole	23	6.18
	Terbinafine	8	2.15
	Ciclopirox	19	5.11
	Sertaconazole	17	4.57
	Ketoconazole	6	1.61
	Eberconazole	2	0.54
Anti-bacterial agents	Clindamycin	44	11.83
	Fusidic acid	25	6.72
	Benzoyl peroxide	17	4.57
	Mupirocin	3	0.81
	Gentamicin	3	0.81
Anti-parasitic agents	Permethrin	36	4.84

Table 6: Dosage forms of AMA.

Dosage form	Frequency	Percentage (n=868)
Topical		
Cream	307	35.37
Lotion	77	8.87
Gel	62	7.14
Drops	11	1.27
Solution	9	1.04
Shampoo	5	0.58
Oral		
Tablet	240	27.65
Capsule	147	16.94
Parenteral		
Injection	10	1.15
Total	868	100.00

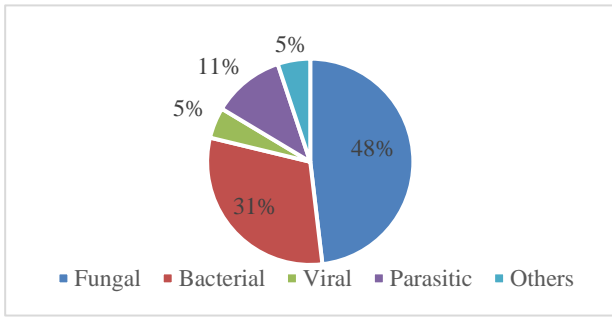


Figure 1: Type of infection/infestation.

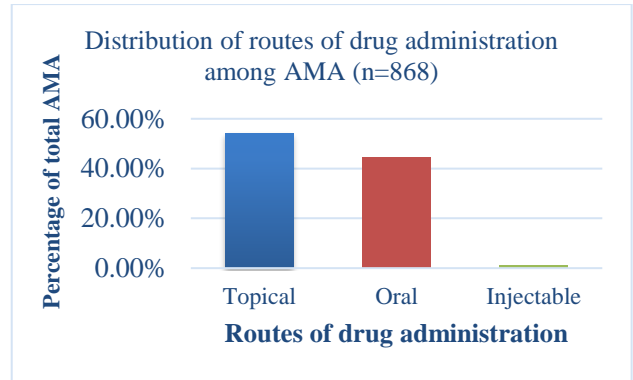


Figure 4: Routes of administration.

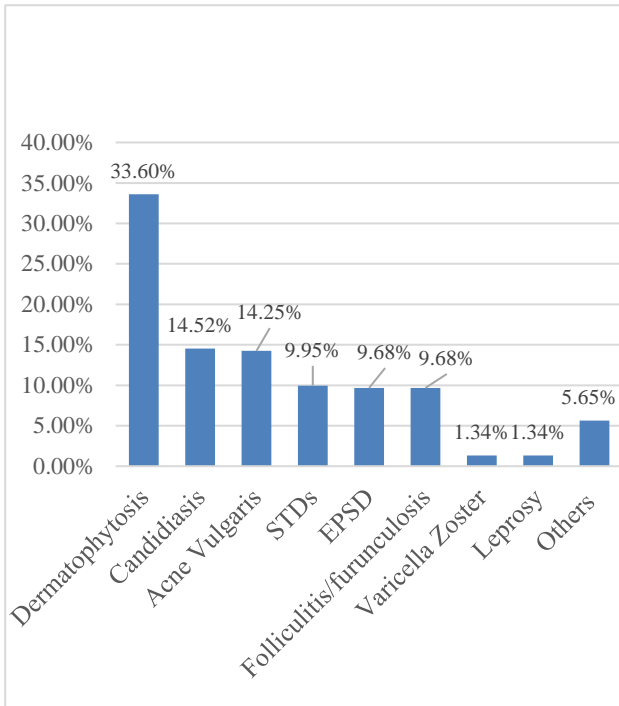


Figure 2: Disease distribution.

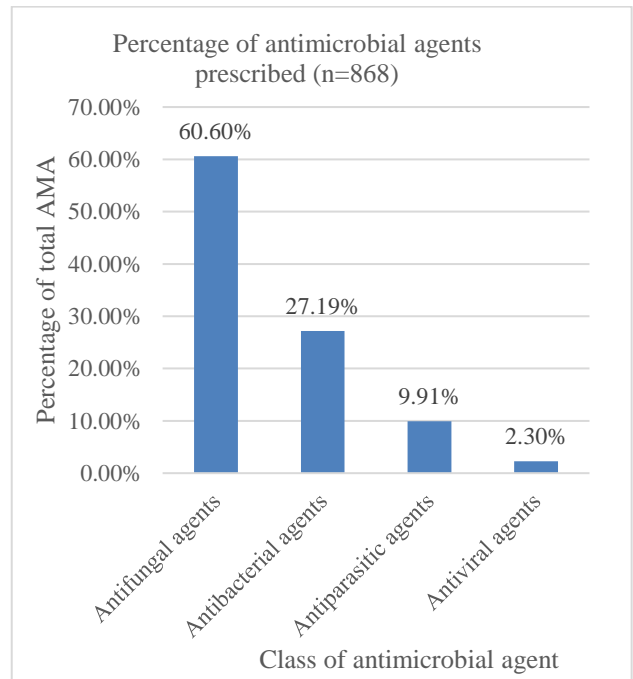


Figure 5: Percentage of antimicrobial agents prescribed.

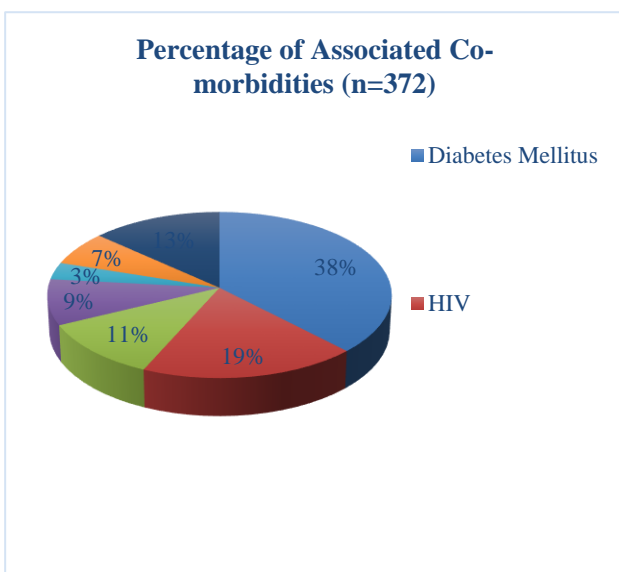


Figure 3: Associated comorbidities.

DISCUSSION

Gender distribution of the patients showed that, among 372 participants, proportion of females (56.72%) was more than males (43.28%) similar to studies done by Suhaina et al and Sumana et al and Pathak et al.^{9,14,15} Maximum number of patients were in the age group of 18-29 which is similar to studies conducted by Lakshmi et al, Chakravarty et al.^{5,12} The average age of the study population was 39.075±14.33 (Median age=38), similar to the study conducted by Nerurkar et al.¹⁶

Fungal infections were the most commonly encountered condition which were seen in 48.12% patients, followed by bacterial infections in 30.65%. This distribution pattern was similar to John et al.¹⁷ The most common fungal infections found in our study were dermatophytosis followed by candidiasis. Similar findings were observed in other studies.¹⁸⁻²⁰ The study was conducted in the monsoon

months in one of the densely populated regions of the city, hence the prevalence of fungal infections seen was high. Sweating, humidity and poor hygiene were the major contributing factors. Among bacterial conditions, acne vulgaris was most common, seen in 14.25% of the study population. Study by Pathak et al also showed acne vulgaris to be the most common bacterial condition.⁹

Out of the total 1413 drugs prescribed, 61.42% were antimicrobial agents (868). The average number of antimicrobial drugs per prescription was 2.33 ± 0.73 which was higher than the study conducted by John et al (1.83).¹⁷ This higher number can be attributed to the fact that dermatological infections often require more than one antimicrobial agent(s) as they are given systemically as well as topically in many conditions. Antifungal agents were the most commonly prescribed. Similar findings were observed in other dermatology prescription audits.^{14,17,19,21} Among all antimicrobial agents, topical miconazole was most frequently prescribed, similar to a study by Narwane et al.²² Among antibiotics, the topical anti-acne agent clindamycin was most frequently prescribed. This finding is similar to studies done by Bijoy et al and Chakrawarty et al.^{5,19} Beta-lactam antibiotics including penicillins and cephalosporins were found to be most commonly used orally, similar to findings by Chakrawarty et al.⁵

Acyclovir and valacyclovir were the antiviral agents used, both prescribed orally. This is similar to findings by Sumana et al and Rathod et al.^{15,23} Permethrin and ivermectin were prescribed for scabies and pediculosis capitis. A study by Pathak et al shows a similar prescribing trend.⁹ 87.9% of AMA were prescribed as combination therapy and 12.10% as monotherapy. Studies by John et al and Khan et al also showed a preponderance of combination therapy over monotherapy.^{17,24}

51.84% of the AMA were prescribed by brand name whereas 48.16% were prescribed by generic name. Brand prescribing was also observed in other studies.^{14,19,20,25,26} Prescribing drugs by generic name eliminates the chance of duplication of drug products, ultimately eliminating the errors of prescription. In order to improve prescribing by generic name, physician education is key. 32.60% of AMA were prescribed from National List of Essential Medicines (2015). The prescribing frequency of our study from an essential drug list/ formulary is higher than the studies done by Vineetha et al and Kumar et al, Maini et al, Krishna et al but lower than the studies by Patil et al and Suhaina et al.^{18,25-28} The primary purpose of NLEM is to promote rational use of medicines considering the three important aspects i.e. cost, safety and efficacy, hence prescribing from an essential drug list is encouraged. Majority of AMA were prescribed by a topical route followed by oral route. Similar findings were seen in other studies.^{9,15,22} Topical route has minimum side effects and is often the more preferred route of administration in dermatology.¹⁵ As pruritus was one of the major complaints associated with majority of skin conditions,

antihistamine prescribing was high.²⁹ Emollients were widely used along with antihistamines to treat pruritus and xerosis. Most of the patients diagnosed with acne vulgaris also received retinoids including tretinoin, isotretinoin and adapalene.

Limitations

It was a cross-sectional quantitative study with limited sample size and short duration, hence seasonal variation could influence the prescribing trend. Dermatological disease patterns are influenced by factors like geographical conditions and the lifestyle of the population. Since our study is a single center study, such variations could not be observed. Future studies with larger sample sizes, longer study duration and multiple centers may be done taking into account the long-term disease variations and population dissimilarities.

CONCLUSION

The analysis of the prescriptions showed that antimicrobial agents were prescribed both topically as well as systemically. The most common class of antimicrobial agents prescribed was antifungal agents. Prescribing combination of oral antimicrobials with topical antimicrobials was found to be high. This study provides a framework for continuous prescription audit of antimicrobials in an outpatient setting and thus can help in rational use of antimicrobials in dermatological prescribing. Considering the findings of this study, the following recommendations can be given to minimize the irrational prescribing and the risks associated with it: formulation of policies related to appropriate use of medicines, creation of a hospital-based drug formulary, continuous supervision, audit and monitoring of prescription and feedback, and continuing medical education of involved physician

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Ethical approval: The study was approved by the Institutional Ethics Committee

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