

Study on drug utilization pattern of antibiotics among dermatology in-patients of a tertiary care teaching hospital, Karaikal, Puducherry**C. M. Divyashanthi^{1*}, A. Nandhini², S. Adithiya Kumar³**

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ABSTRACT

Background: Skin diseases of microbial etiology are caused by bacteria, fungi, viruses and ectoparasites of which bacterial infections are most common than others. Although many bacteria reside on skin, they are unable to establish infection because of the natural defense mechanisms. Most of the bacterial infections are caused by Staphylococcus and Streptococcus. Antibiotic resistance among the micro-organisms is developing due to indiscriminate use of antibiotics and irrational prescription of drugs. Periodic study on drug utilization research and analysis of prescription pattern of antibiotics followed in recent past will guide physicians to prescribe the antibiotics judiciously and with a rational approach.

Methods: A prospective analysis of 291 in-patients admitted in the Department of Dermatology, Karaikal, over a period of 1-year (January 2013-December 2013) was carried out to analyze the usage of antibiotics through various routes to treat infections associated with dermatological disorders.

Results: Among the study population, 60.48% were male and 39.51% were female. We found that out of 29 diseases observed, most common skin disease diagnosed was psoriasis (24.82%), followed by eczema (24.82%). The average number of drugs per prescription was 6.37±2.06. Oral antibiotics were mostly prescribed than parenteral and topical formulations among the study population. Among the oral antibiotics, amoxicillin with clavulanic acid (29.6%) was widely prescribed. In the context of parenteral formulations, cefotaxime (38.92%) was majorly prescribed. Among the topical antibiotics, mupirocin (60.71%) was mostly used.

Conclusion: Our study provided an idea about the prevalence of dermatological disorders in a coastal area of Karaikal, Puducherry, the drug utilization strategy of antibiotics, the rationality behind usage and has given useful suggestions to achieve treatment success through judicious use of antibiotics.

Keywords: Drug utilization research, Bacterial infections, Antibiotics, Dermatology inpatients and prescription analysis

INTRODUCTION

Dermatological disorders vary from genetic, immunological, infectious, inflammatory, and cosmetic disorders to diseases and tumors of the appendages of skin.¹

As skin is the largest and the most exposed organ of human body, it is most vulnerable organ to attack by external biological agents like microorganisms. Skin is a milieu for controlled growth of bacteria i.e., it can support the growth of useful bacteria but also limits the growth of pathogenic bacteria by cutaneous defense mechanism, which include epidermal layer (stratum corneum), its mechanical rigidity,

lipids of stratum corneum, lysozyme, pH of corneum and defensins.² In addition to this, regular shedding of dead keratinocytes physically removes the colonizing bacteria. Factors such as temperature, its acidic nature will further inhibit the growth of microorganisms. Skin associated lymphoid tissue forms the next level of defense mechanism.³ In spite of such good protective mechanisms in skin, microorganisms take congenial circumstances to attack the skin and cause skin diseases.

Skin diseases affect all age groups from neonates to elderly. Bacterial infections of the skin are among the most common reasons for patients to approach doctors for prescription.

Mostly, Gram-positive bacteria reside on skin as commensals and may become pathogenic based on different factors such as virulence, host immunity, etc. and most of them are caused by *Staphylococcus aureus* and *Streptococcus pyogenes*. Gram-negative bacteria are not the natural residents of the skin and few species such as *Pseudomonas aeruginosa*, *Pasteurella multocida*, *Capnocytophaga canimorsus*, *Bartonella sp.*, *Klebsiella rhinoscleromatis*, and *Vibrio vulnificus* may cause cutaneous infection.³

Skin diseases have a serious impact on the quality of life, causes social isolation due to intractable itch and levy economic burden.⁴ Skin diseases in developing countries are prevalent due to ignorance of seriousness of disease,⁵ improper sanitation, low hygiene, and overcrowding, high interpersonal contact.⁶⁻¹¹

Up to 80% of the population contracted with skin problems may not seek medical help.¹² Further the seriousness of the skin diseases will show debilitating effects if not considered in proper attention. This is evident from the high mortality of about 20,000 in sub-Saharan Africa in 2001 due to skin diseases.¹³

Antibiotic resistance has become a major health security challenge of 21st century.¹⁴ Indiscriminate use of antibiotics is one of the major factors of this antibiotic resistance.¹⁵

Dermatologists potentially contribute to the global rise of antibiotic resistance because, they are responsible for nearly 5% of all antibiotic prescriptions¹⁶ and also chronic antibiotic prescriptions tend to be more prevalent in dermatology compared with other specialty areas.¹⁷

Treatment failure in the majority of prescriptions and antibiotic resistance are mainly due to irrational prescription of drugs. Irrational prescription is a regular common occurrence in clinical practice.¹⁸ Drug utilization research, which is a part of pharmacoepidemiology is an effective tool, which can constitute guidelines for improving the utilization pattern of drugs as well as provide economic benefits in the use of drugs by patients.¹⁹ Analysis of data collected in drug utilization research not only improves the standard of treatment but also identify the problems-related to drug use such as adverse drug reactions, poly-pharmacy and drug-drug interactions.²⁰

By taking into consideration the seriousness of prevalence of skin diseases, effects of antibiotic resistance and the importance and need of rational prescription, we made an attempt to analyze the prescription pattern of antibiotics among the in-patients of Dermatology Department in Vinayaka Missions Medical College and Hospital, Karaikal, Puducherry.

Our aim is to generate the base line data and analyze various aspects of prescription pattern of antibiotics in this study. By undertaking this prospective study, we hope to identify

the common skin diseases affecting the population in the coastal area of Karaikal, the use of antimicrobials through all routes to treat the infectious skin disorders and the rationality behind such usage.

METHODS

Prescriptions of 291 in-patients of Dermatology Department, Vinayaka Missions Medical College and Hospital, a tertiary care center in Karaikal, Puducherry were scrutinized. Case sheets were retrieved from medical records during a period of 1-year from January 2013 to December 2013. Demographic profile, pattern of skin diseases reported and trends in antibiotic drugs usage and rationality of prescriptions were analyzed. Emphasis was given to prescription analysis of antibiotics given by three different routes such as oral, parenteral and topical drugs in dermatological disorders. Results were tabulated.

RESULTS

In present study, demographic data (Figure 1) shows that out of 291 in patients 60.58 % were male and 39.51% were found to be female. Age wise distribution of demographic data showed that majority of patients come under age group of 41-50 years, followed by the age group 51-60 years (Figure 2). A total of 29 different dermatological disorders were observed in the patients of current study. Majority of cases reported were psoriasis (24.82%), eczema (12.24%), contact dermatitis (9.52%), bullous disorders (5.78%), whereas least number of patients reported with atopic dermatitis (0.56%) (Table 1).

Based on the route of administration of antibiotics prescribed, majority of cases reported were treated with oral antibiotics (24.44%) when compared to parenteral (11.11%) and topical antibiotics (3.57%). Interestingly, major portion of oral antibiotics were used to treat infections in psoriasis (24.44%), followed by eczema (12.24%). A few

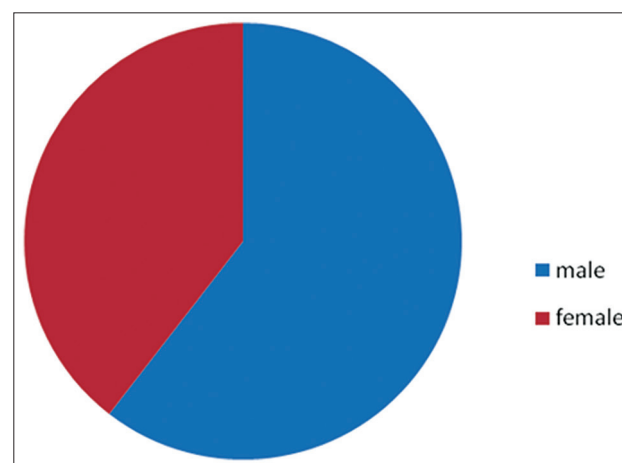


Figure 1: Sex distribution of in-patients in dermatology.

Table 1: Incidence of diseases and the usage of antibiotics.

Diseases	Cases reported (%)	Oral antibiotics n=135 (%)	Parenteral antibiotics n=18 (%)	Topical antibiotics n=28 (%)
Psoriasis	24.82	24.44	11.11	3.57
Eczema	12.24	17.02	5.55	17.85
Allergic contact dermatitis	5.1	8.88	-	-
Airborne contact dermatitis	4.42	-	-	-
Pemphigus and bullous pemphigoid	4.42	6.66	-	10.71
Epidermolysis bullosa aquisita	1.36	2.96	-	-
Urticaria	5.44	1.48	5.55	-
Generalised pruritus	4.76	2.22	-	-
Carbuncle, furuncle	4.76	7.4	49.95	21.42
Vasculitic ulcers	2.38	1.48	11.11	10.71
Vitiligo	2.38	2.96	-	10.71
Lichen planus	2.38	2.22	-	-
Hansens disease (leprosy)	2.04	2.22	-	7.14
Dermatitis herpetiformis	2.04	-	-	-
Mycetoma	2.04	-	16.65	-
Chronic lymphedema	2.04	3.7	-	-
Scabies	2.04	2.22	-	3.57
Herpes	1.7	2.22	-	-
Systemic lupus erythematosus	1.7	1.48	-	-
Seborrhoeic keratoses	1.36	2.96	-	-
Chronic cutaneous lupus	1.36	-	-	-
Cellulitis	1.02	2.22	-	7.14
Polymorphous light eruption	1.02	2.22	-	-
Alopecia areata	1.02	-	-	-
Systemic sclerosis	0.68	-	-	-
Fixed drug eruption	0.68	0.74	-	-
Oral submucous fibrosis	0.68	-	-	-
Extensive tinea cruris/corporis	0.68	0.74	-	-
Discoid lupus erythematosus	0.68	-	-	-
Vulvovaginal candidiasis	0.68	-	-	3.57
Atopic dermatitis	0.56	1.48	-	3.57

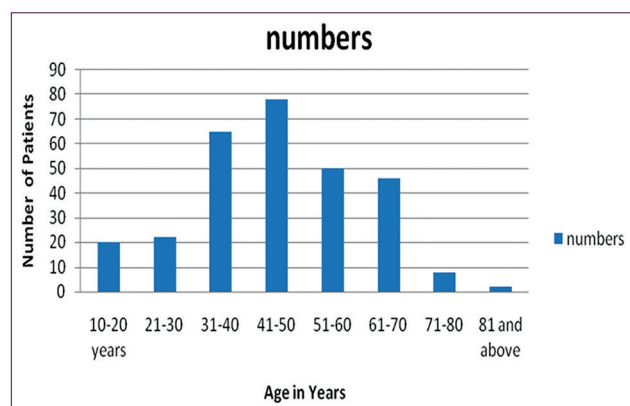


Figure 2: Age wise distribution of study population.

number of infectious diseases were (20.66%) treated with parenteral antibiotics and among those, majority were to treat carbuncle and furuncle (49.95%), followed by mycetoma (16.65%). Study reveals that parenteral antibiotics are best choice for the treatment of carbuncle and furuncle (49.95) followed by topical (21.42%) and oral antibiotics (7.4%). Study also revealed that parenteral antibiotics are less used when compared with oral and topical antibiotics. This shows that parenteral antibiotics remain the least choice for the treatment of bacterial infections associated with dermatological disorders (Table 1). It is also inferred from Table 1 that most of the topical antibiotics were prescribed for carbuncle and furuncle (21.42%) followed by eczema (17.85%).

Analysis of prescription pattern of oral antibiotics revealed that (Figure 3) out of 135 prescriptions involving oral antibiotics 34.78% responded well either to a combination of Amoxicillin with clavulanic acid (29.60%) or amoxicillin (5.18%) alone. This is followed by use of macrolides (29.60%) - erythromycin (18.5%), azithromycin (5.92%), roxithromycin (5.18%). Figure 3 shows that fluoroquinolones (5.92%) and tetracyclines (5.92%) were less used and cotrimoxazole was the least prescribed (2.22%) prescription of other antimicrobial drugs such as antifungal, antileprotic, and antiparasitic drugs were used to treat 5.14% of patients. Of these, mebendazole topped the table with 35.35% (Figure 4).

From Figure 5, it is observed that out of 6.18% of patients responded to parenteral antibiotics, cephalosporins (44.48%) were widely used, cefotaxime constituted (38.92%) and ceftriaxone (5.56%). This is followed by aminoglycosides (38.92%) namely amikacin (22.24%) and gentamicin (16.68%).

Prescription pattern of topical antibacterial drugs used in the study shows that (Figure 6), out of 9.62% prescriptions, mupirocin (60.71%) was prescribed the most followed by fusidic acid (35.71%). The newer drug retapamulin was also prescribed in 3.57% of patients. Considerable number of prescriptions (10.65%) used topical antibacterials in combination with topical corticosteroids (Table 2). Of which, 51.68% of prescriptions included a combination of fusidic acid with mometasone.

DISCUSSION

In the present study, about prescription pattern of antimicrobial drugs among dermatology in-patients of Vinayaka Missions Medical College and Hospital, a tertiary care center in Karaikal, Puducherry, antibiotic prescription pattern was studied based on the type of oral, parenteral and topical administration.

Age-wise distribution of demographic data shows that majority of patients are of age group of 41-50 years, followed by 51-60 years. Proportion of male patients (60.48%) is more when compared with female patients 39.51%. This is similar to studies by Rao et al.,⁸ Narwane et al.²¹ Bijoy et al.²² and Sarkar et al.²³ This is in contrast to the report given by Das et al.,²⁴ where female patients predominate.

Table 2: Topical antibacterial used in combination with topical corticosteroids.

Topical antibacterials	Topical corticosteroid	Numbers prescribed (n=31)	%
Fusidic acid	Mometasone	16	51.68
Fusidic acid	Halobetasol	9	29.07
Fusidic acid	Clobetasol	2	6.46
Gentamicin	Clobetasol	3	9.69
Gentamicin	Betamethasone	1	3.23

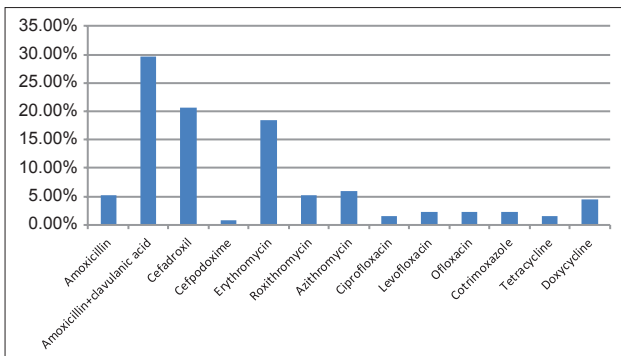


Figure 3: Prescription use of oral antibiotics.

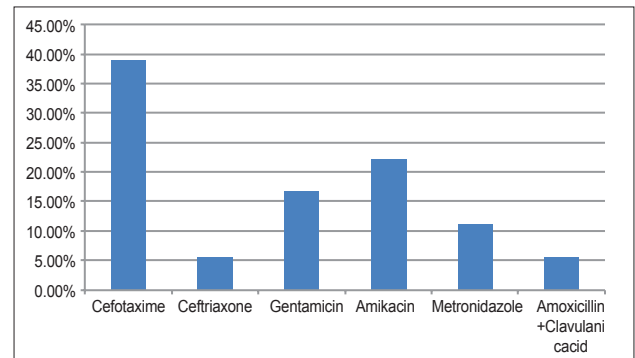


Figure 5: Prescription use of parenteral antibiotics.

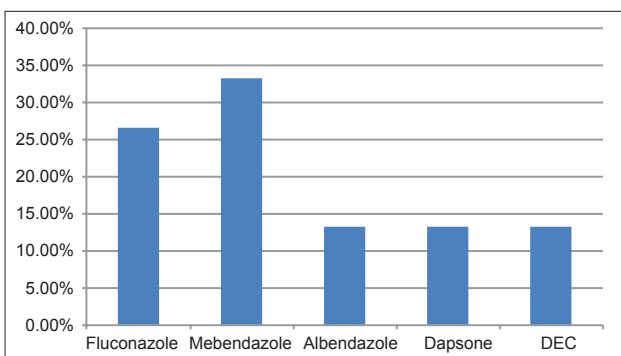


Figure 4: Other oral antimicrobials prescribed.

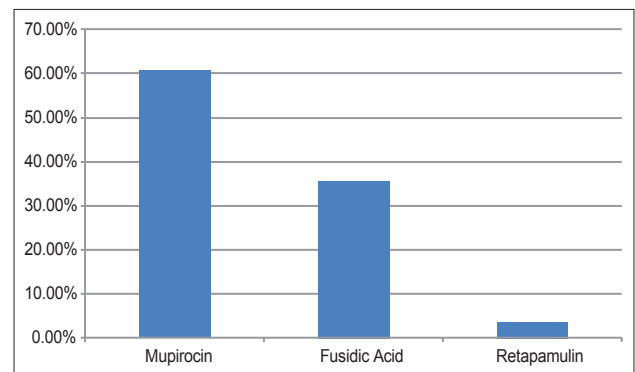


Figure 6: Topical anti-bacterials prescribed.

Disease pattern in the study population showed that majority of cases reported were psoriasis (24.82%), followed by eczema (12.24%). Noninfectious skin diseases are the most common in our study, which is quite similar to studies by Baur et al.⁴ and Rao et al.⁸ but in contrast to studies by Sajith et al.,²⁵ which showed that acne was more common, followed by eczema and psoriasis and study carried out by Symvoulakis et al.,²⁶ found allergic dermatitis and urticaria (35.7%) were the most followed by infectious diseases (26.1%). The study performed by Das et al.,⁶ reported that psoriasis (7.7%) is least in its incidence among major dermatological diseases found in that part of India. Our study revealed that incidence of Hansen's disease is only 2.04%, which is similar with study of Das et al.,⁶ and is less than that of Das et al.,⁶ and Chatterjee²⁷ and is more than the reported percentage in the study observed by Rao et al.⁸ and Devi et al.,¹¹ Asokan et al.²⁷

This variation in disease pattern might be because the pattern of skin diseases are influenced by various factors such as religion, race, occupation, nutritional habits, etc.⁴ and also transmissible skin diseases are observed generally in people living in poor socioeconomic and unhygienic conditions.⁵

It is also observed that primary bacterial infections such as carbuncle and furuncle (4.76%), cellulitis (1.02%) were less compared to secondary bacterial infections in already existing diseases. This is in comparison with the study by Malhotra et al.²⁸ and Khan et al.²⁸ where secondary pyodermas were more common. The low incidence of primary pyodermas might be because majority of them are reported in the outpatient department.²⁸

Majority of dermatological disorders among study population responded well for oral antibiotics (59.44%) followed by topical (12.33%) and then parenteral formulations (7.93%) of antibiotics.

Varsha Kalshetti et al.,²⁹ reports that *S. aureus* is the most common organism usually isolated in pyoderma and further David Feingold³⁰ and Kenneth Tomecki,³¹ states that systemic anti-Staphylococcal antibiotics are usually necessary for furuncles and carbuncles especially when cellulitis or constitutional symptoms are present. Sunderkotter et al.³² also substantiates that the beta lactam antibiotics are the first choice for many skin infections because they are usually effective, have a well-defined profile of adverse events and most are affordable. The above are well-understood from our study where amoxicillin was the major antibiotic prescribed either in single or in combination with clavulanic acid.

Study also revealed that parenteral antibiotics are less used when compared to oral and topical antibiotics. This shows that parenteral antibiotics remain the least choice for the treatment of bacterial infections associated with dermatological disorders. In the context of parenteral antibiotics, cefotaxime (38.92%) was the major antibiotic utilised in the treatment of the study population.

The most frequently prescribed topical antibiotic is mupirocin which is similar to the study by Khan et al.³³ and is in favor of Drucker³⁴ who has mentioned that mupirocin ointment has activity against *S. pyogenes*, both methicillin sensitive *S. aureus* and methicillin resistant *S. aureus* and is bactericidal at concentrations achieved by topical applications.

CONCLUSION

A few of our study findings revealed that main factors responsible for prevalence and incidence of common skin diseases are due to factors such as a low level of hygiene, overcrowding, improper and partial access to water and climatic factors. Among different antibiotics used, majority of in-patients were treated with oral and topical formulations than parenteral formulations.

Prescription pattern of antibiotics in the study proved that physicians followed rationality and contributed their part to curb the spread of antibiotic resistance. During the study period, physicians opted antibiotics such as amoxicillin and cephalosporins more often than macrolides and aminoglycosides. The prescription of topical antibiotics such as mupirocin is also based on the guidelines. This trend of prescribing antibiotics is more rational, increase the therapeutic benefits and have ensured less economic burden in the use of drugs by the patients.

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

REFERENCES

1. Viswanath V, Coondoo A. IADVL's Concise Text Book of Dermatology. 1st Edition. Oxford: Wiley-Black Well Publication; 2012: 2-3.
2. Harder J, Bartels J, Christophers E, Schröder JM. A peptide antibiotic from human skin. *Nature*. 1997;387(6636):861.
3. Chiller K, Selkin BA, Murakawa GJ. Skin microflora and bacterial infections of the skin. *J Invest Dermatol Symp Proc*. 2001;6(3):170-4.
4. Baur B, Sarkar J, Manna N, Bandyopadhyay L. The pattern of dermatological disorders among patients attending the skin OPD of a tertiary care hospital in Kolkata, India. *J Dent Med Sci*. 2013;3(4):04-9.
5. WHO Report on Infectious Diseases. Available at <http://www.who.int/infectious-disease-report/pages>. Accessed 12 Sep 2014.

6. Das KK. Pattern of dermatological diseases in Gauhati Medical College and Hospital Guwahati. *Indian J Dermatol Venereol Leprol.* 2003;69(1):16-8.
7. WHO. Epidemiology and Management of Common Skin Diseases in Children in Developing Countries. [WHO\FCH\CAH\05.12]. Department of Child and Adolescent Health & Development, WHO; 2005:1-62.
8. Rao GS, Kumar SS, Sandhya S. Pattern of skin diseases in an Indian village. *Indian J Med Sci.* 2003;57(3):108-10.
9. Zamania A, Mahjum H. Prevalence of skin diseases in Hamedan, Iran in 2002. *Indian J Dermatol.* 2005;50(4):208-11.
10. Atraide DD, Akpa MR, George IO. The pattern of skin disorders in a Nigerian tertiary hospital. *J Public Health Epidemiol.* 2011;3(4):177-81.
11. Devi TB, Zamzachin G. Pattern of skin diseases in Imphal. *Indian J Dermatol.* 2006;51(2):149-50.
12. Williams HC. Epidemiology of skin diseases. Rook's Textbook of Dermatology. 7th Edition. Oxford: Blackwell Science; 2004: 6.1-6.21.
13. World Health Organization. Global Burden of Disease for the Year 2001 by World Bank Region." Disease Control Priorities Project. 2005. Available at <http://www.fic.nih.gov/dcpp>. Accessed 12 Sep 2014.
14. Group of Eight (2013). G8 science ministers statement. London UK: 12 June, 2013. Available at <https://www.gov.uk/government/publications/g8-science-ministers-statement-london-12-june-2013>. Accessed 12 Sep 2014.
15. World Health Organization. Antimicrobial resistance. Factsheet 194, 2013. Available at <http://www.who.int/mediacentre/factsheets/fs194/en/>. Accessed 12 Sep 2014.
16. Jesitus J. Dermatologists contribute to overuse of antibiotics. *Derm Times*, 01 Oct, 2013. Available at <http://www.dermatologytimes.modernmedicine.com/dermatology-times/news/dermatologists-contribute-overuse-antibiotics>. [Accessed 12 Sep 2014].
17. Antibiotic resistance in dermatology and beyond your role in an emerging global health crisis. Available at <http://www.epresspack.net/galderma-antibiotic-resistance-and-acne>. Accessed 12 Sep 2014.
18. Sweileh WM. Audit of prescribing practices of topical corticosteroids in outpatient dermatology clinics in north Palestine. *Eastern Mediterr Health J.* 2006;12(1/2):161-9.
19. Sjoqvist F, Birkett D. Drug utilization. In: Bramley DW, editor. *Introduction to Drug Utilization Research (WHO Booklet)*. New York: WHO Office of Publication; 2003: 76-84.
20. Michael JC, John T, Catherine H, Julie C, Victoria B, Rachid TA, et al. An audit of adverse drug reactions to aqueous cream in children with atopic eczema. *Pharm J.* 2003;27(1):747-8.
21. Narwane SP, Patel TC, Shetty YC, Chikhalkar SB. Drug utilization and cost analysis for common skin diseases in dermatology OPD of an Indian tertiary care hospital-A prescription survey. *Br J Pharm Res.* 2011;1(1):9-18.
22. Bijoy KP, Vidyadhar RS, Palak P, Chintan SP, Atmaram PP. Drug prescribing and economic analysis for skin diseases in dermatology OPD of an Indian tertiary care teaching hospital: a periodic audit. *Indian J Pharm Pract.* 2012;5(1):28-33.
23. Sarkar C, Das B, Sripathi H. Drug prescribing pattern in dermatology in a teaching hospital in western Nepal. *J Nepal Med Assoc.* 2001;41:241-6.
24. Das S, Chatterjee T. Pattern of skin diseases in a peripheral hospital's skin OPD: a study of 2550 patients. *Indian J Dermatol.* 2007;52(2):93-5.
25. Sajith M, Lokhande KD, Padma S, Pawar AP. Prevalence of various skin disorders and prescribing pattern of antihistamines in tertiary care hospital, Pune. *Int J Pharm Sci Res.* 2014;5(03):73-7.
26. Symvoulakis EK, Krasagakos K, Komninos ID, Kastrinakis I, Lyrionis I, Philalithis A, et al. Primary care and pattern of skin diseases in a Mediterranean island. *BMC Fam Pract.* 2006;7:6.
27. Asokan N, Prathap P, Ajithkumar K, Ambooken B, Binesh VG, George S. Pattern of skin diseases among patients attending a tertiary care teaching hospital in Kerala. *Indian J Dermatol Venereol Leprol.* 2009;75(5):517-8.
28. Malhotra SK, Malhotra S, Dhaliwal GS, Thakur A. Bacteriological study of pyodermas in a tertiary care dermatological center. *Indian J Dermatol.* 2012;57(5):358-61.
29. Kalshetti VT, Bhate VM, Haswani N, Bothikar ST. *Staphylococcus aureus*: a Major causative agent of community-acquired pyoderma. *Int J Curr Microbiol Appl Sci.* 2014;3(9):94-7.
30. Feingold DS. Antibiotic usage in dermatology. *APUA Newsl.* 1999;17(3):1, 4-5.
31. Tomecki KJ. Common Skin Infections. Available at <http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement>. Accessed 12 Sep 2014.
32. Sunderkötter C, Herrmann M, Jappe U. Antimicrobial therapy in dermatology *J Dtsch Dermatol Ges.* 2006;4(1):10-27.
33. Khan NA, Abid M, Maheswari KK, Kaviarasan PK, Mohanta GP. Antibiotic prescribing pattern in department of dermatology of a teaching hospital in Tamil Nadu. *Indian J Pharm Pract.* 2010;3(3):18-21.
34. Drucker CR. Update on topical antibiotics in dermatology. *Dermatol Ther.* 2012;25(1):6-11.

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