

# Current prescribing practices in bacterial skin infections in a tertiary care hospital - A prospective study



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Submission: 09-09-2022

Revision: 26-11-2022

Publication: 01-01-2023

## ABSTRACT

**Background:** Skin diseases of microbial etiology are caused by bacteria, fungi, viruses, and ectoparasites, of which bacterial infections are most common than others. Antibiotic resistance among the micro-organisms is developing due to indiscriminate use of antibiotics and irrational prescription of drugs. **Aims and Objectives:** The aims of this study were to assess various aspects of prescription pattern and rational use of antibiotics for bacterial infections in the department of dermatology. **Materials and Methods:** A prospective analysis of 120 patients attending Dermatology Out Patient Department, at Government Medical College, Srikakulam, for 16 months (June 2017–September 2018) was carried out to analyze the usage of antibiotics through various routes to treat dermatological infections. The number of antibiotics prescribed, their name, class of drug, frequency and route of administration, and duration were recorded and analyzed using descriptive statistics. **Results:** Among the study population, 55.9% were male and 44.1% were female. Acne vulgaris (25%) is the most common condition, for which antibiotics were prescribed followed by impetigo (16.66%). Most commonly prescribed systemic antibiotics were penicillins (51.66%) followed by macrolides (18.33%). Most commonly prescribed topical antibiotic was mupirocin (33.33%) followed by clindamycin (25%). The most preferred route of antibiotic administration was oral route (62.44%). **Conclusion:** Prescription pattern of antibiotics in this study proved that dermatologists followed rationality and contributed their part to curb the spread of antibiotic resistance. Periodic screening of drug prescribing pattern studies should be done to rationalize the prescription, to reduce errors, and to increase therapeutic benefits and cost-effective management.

**Key words:** Drug prescription; Bacterial infections; Antibiotics; Dermatology outpatients and prescription analysis

## INTRODUCTION

Skin is the most exposed organ of human body, thus prone to various kinds of injuries, infections, and infestations. Many systemic diseases also have their dermatological manifestations. Skin is the 18<sup>th</sup> leading cause of health burden worldwide.<sup>1</sup> Dermatological conditions accounts for up to 2% of consultations in general practice worldwide.<sup>2</sup> Infections responsible for skin diseases were mainly caused by bacteria, virus, and fungi. Most of the bacterial infections

are caused by Gram-positive bacteria *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Propionibacterium acnes*. Very few skin infections are caused by Gram-negative bacteria, for example, *Pseudomonas aeruginosa* and *Pasteurella multocida*.<sup>3</sup>

Antibiotics are powerful chemical agents which play an important role in protecting, maintaining, and restoring our health, and these are one of the most commonly prescribed drugs worldwide.<sup>4-6</sup> Since antibiotics form a

### Access this article online

**Website:**

<http://nepjol.info/index.php/AJMS>

**DOI:** 10.3126/ajms.v14i1.48268

**E-ISSN:** 2091-0576

**P-ISSN:** 2467-9100

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very important point of contact between the health-care provider and patients, there have been calls for their rational use. Rational use of antibiotics means that right antibiotics should be prescribed for the right patient in adequate dose for the sufficient duration.<sup>7</sup> Hence, inappropriate or bad prescribing habits represent a potential hazard to patients such as therapeutic failure, toxicities, development of antibiotic resistance, and adverse economic impacts due to the high cost.

Dermatologists potentially contribute to the global rise of antibiotic resistance, as they are responsible for nearly 5% of all antibiotic prescriptions<sup>8</sup> and also chronic antibiotic prescriptions tend to be more prevalent in dermatology compared with other specialty areas.<sup>9</sup>

Prescription pattern monitoring studies plays an important role in constituting guidelines for improving drug utilization patterns and restricting irrational prescribing. Medical treatments at all levels of health-care systems have been improved by drug utilization studies.<sup>10</sup>

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 outpatients, who are attending to Dermatology Out Patient Department.

### Aims and objectives

This study aims to assess the rational use of antibiotics for bacterial infections in the department of dermatology at tertiary care hospital.

## MATERIALS AND METHODS

This was a prospective observational study for 16 months from June 2017 to September 2018, conducted at outpatient department (OPD) of Dermatology at Government Medical College, Srikakulam after approval from Institutional Ethics committee and after obtaining written informed consent from the patients. Sample size estimated to be 73, taking 95% confidence interval, and 5% marginal error.

### Inclusion criteria

The following criteria were included in the study:

1. Patients of all age groups and both sexes attending dermatology OPD
2. Patients having bacterial infections and to whom antibiotics were prescribed.

### Exclusion criteria

Patients with prior history of cardiovascular, renal, and hepatic diseases were excluded from the study for

the convenience of modification of dosages or contra indication.

Once the consultation by the dermatologist was over, details in the prescriptions issued to patients were recorded in predesigned case record forms manually. The data regarding age, gender, diagnosis, total number of prescriptions per encounter, antibiotics information such as drug name, class of drug, dosage data, strength, frequency of administration, route of administration (ROA), duration, quantity to be applied, and whether generic or brand name used were recorded. The recorded data were analyzed using descriptive statistical procedure using windows Microsoft Excel 7.

## RESULTS

There were more male patients (55.83%) compared to female patients (Table 1).

Age-wise distribution of demographic data showed that majority of patients are in 3<sup>rd</sup> decade (32.50%) followed by first decade (18.33%) (Table 2).

Acne vulgaris (25%) is the most common clinical diagnosis made by dermatologists, followed by impetigo (16.66%) and cellulitis (14.16%) (Table 3).

Various antibiotics were prescribed for the different clinical conditions either solely or in combination. Amoxicillin and clavulanic acid (AMC) is the most commonly used antibiotic. AMC is used alone in 17 (14.16%) patients (Table 4), while in combination with other drugs were used in 54 (45%) patients.

**Table 1: Distribution of study sample according to gender**

Gender	Number of patients (n=120)	Percentage of patients
Male	67	55.83
Female	53	44.17
Total	120	100

**Table 2: Distribution of study population according to age**

Age in years	Number of patients (n=120)	Percentage of patients
0–10	22	18.33
11–20	19	15.83
21–30	39	32.50
31–40	19	15.83
41–50	11	9.16
51–60	9	7.50
>60	1	0.83
Total	120	100

**Table 3: Distribution of study population according to clinical diagnosis**

Clinical diagnosis	Antibiotics prescribed	Number of patients	Percentage of patients
Acne vulgaris	Doxycycline azithromycin	30	25.00
Impetigo	Amoxicillin and clavulanic acid	20	16.66
Cellulitis	Amoxicillin and clavulanic acid	17	14.16
Leprosy	Rifampicin, dapsone and clofazamine	14	11.66
Folliculitis	Amoxicillin and clavulanic acid	9	7.50
Syphilis	Benzathine penicillin	8	6.66
Chancroid	Azithromycin	7	5.83
Furunculosis	Amoxicillin and clavulanic acid	6	5.00
Cutaneous TB	Isoniazide, rifampicin, pyrazinamide, ethambutol	4	3.33
Erythrasma	Erythromycin	2	1.66
Carbuncle	Amoxicillin and clavulanic acid	2	1.66
Ecthyma	Erythromycin	1	0.83
Total		120	100

**Table 4: Antibiotics prescribed for patients**

Antibiotics	Number of patients	Percentage of patients
AMC only	17	14.16
CLI+BPO GEL	9	7.50
AZM and CLI+BPO GEL	12	10.00
DOX and CLI+BPO GEL	9	7.50
AMC and OINT MUP	33	27.50
AMC and OINT FUS	4	3.33
AZM and OINT MUP	7	5.83
ERY and OINT FUS	1	0.83
ERYTHROMYCIN	2	1.66
BENZATHINE PENICILLIN	8	6.66
DDS and RIFAMPICIN	9	7.50
DDS, RIFAMPICIN, and CLOFAZIMINE	5	4.16
HRZE and HRE	4	3.33

AMC: Amoxicillin+clavulanic acid, CLI: Clindamycin, BPO: Benzyl peroxide, AZM: Azithromycin, DOX: Doxycycline, OIN: Ointment, MUP: Mupirocin, FUS: Fusidic acid, DDS: Diaminophenyl sulfone, ERY: Erythromycin, H: Isoniazid, R: Rifampicin, Z: Pyrazinamide, E: Ethambutol

The total numbers of drugs prescribed in the 120 prescriptions were 348, out of which 221 drugs were antibiotics. For majority of patients (41.66%), two drugs were prescribed, while a single drug is prescribed in eight patients (6.66%) and none of the patients received more than five drugs (Table 5). Average number of drugs prescribed per encounter was calculated to measure the degree of polypharmacy. In this study, average number of drugs per prescription was 2.9.

Regarding the ROA for antibiotics, oral route (62.44%) is most commonly preferred, followed by topical (33.93%) and parenteral (3.61%) (Table 6).

Most commonly used topical antibiotic was mupirocin (33.33%) followed by clindamycin (25%) (Table 7). While among systemic antibiotics, penicillins (45.00%) followed by macrolides (18.33%) are most used (Table 8).

Majority of the drugs were prescribed by generic names (79%) and antibiotics were prescribed for 5–7 days duration

**Table 5: Distribution of study sample based on total number of drugs per prescription**

Number of drugs per-prescription	Number of patients	Percentage of patients
Single drug	8	6.66
Two drugs	50	41.66
Three drugs	38	31.66
Four drugs	24	20.00
Five drugs	0	0
Total	120	100

**Table 6: Distribution of antibiotics based on their ROA**

Route of administration	Number of antibiotics (n=221)	Percentage of antibiotics
Oral	138	62.44
Topical	75	33.93
Parenteral	8	3.61
Total	221	100

ROA: Route of administration

in most of the patients with exception in some conditions such as cutaneous tuberculosis, leprosy, and acne vulgaris, where prolonged treatment is needed. Furthermore, the dose (95.92%), frequency of administration (97.28%), and duration (96.38%) were written in majority of prescription (Table 9).

## DISCUSSION

Prescription pattern is very important document between the patient and the physician. It is an order for a scientific medication for a person at a particular time.<sup>11</sup> Prescribing drugs is an important skill, and it needs to be assessed continuously. In other words, prescribing drugs reflect the doctor's knowledge, skill, and attitude to treat the patient, with due consideration of the patient condition financially as well as physically.

Irrational use of drugs is now a worldwide problem. Irrational prescription of drugs has a serious impact on

**Table 7: Frequency of utilization of topical antibiotics among study sample**

Drug	Number of patients	Percentage of patients	Condition/disease
Clindamycin+Benzylperoxide gel	30	25.00	Acne vulgaris
2% Mupirocin	40	33.33	Impetigo, Folliculitis, furunculosis, carbuncle, chancroid
2% Fusidic acid	5	4.16	Impetigo, Ecthyma, furunculosis

**Table 8: Frequency of utilization of systemic antibiotics among the study sample**

Route of Administration	Class/ Group	Drug	Number of patients	Percentage of patients	Condition/Disease
Oral	Penicillin	Amoxicillin and clavulanic acid	54	45.00	Cellulitis, impetigo, folliculitis, furunculosis, carbuncle
	Tetracycline	Doxycycline	9	7.50	Acne vulgaris
oral kit	Macrolide	Azithromycin	19	15.83	Acne vulgaris chancroid
		Erythromycin	3	2.50	Erythrasma, ecthyma
		MDT (PB)	Rifampicin9	9	7.50
	MDT (MB)	Dapsone	5	4.16	
		Rifampicin			
	DOTS (CAT-1)	Clofazamine	4	3.33	Cutaneous tuberculosis
		Isoniazide			
Rifampicin					
Injection	Penicillin	Pyrazinamide	8	6.66	Syphilis
		Ethambutol			
		Benzathine penicillin			

**Table 9: Details of drugs prescribed for patients**

Type of Parameter	Number of prescription forms Specified with parameters (n=221)	Percentage of prescription forms Specified with parameters
Dose/Strength	212	95.92
Frequency of administration	215	97.28
Duration of treatment	213	96.38

health, economy, resulting in resources wastage.<sup>12</sup> Thus, prescription pattern of drugs needs to be monitored regularly to increase the therapeutic effects, to reduce undesirable adverse effects, drug interactions, and most importantly to analyze their rationality.

In India, this is the need of the hour to utilize the data produced by various prescription monitoring studies done on every drug and in every state; thus, the main aim of promotion of rational use of drugs will be fulfilled.

In this study, age-wise distribution of demographic data showed that majority of patients were of age group of 21–30 years (39%) followed by 0–10 years (18.33%) which was in contrast with the study conducted by Khan et al.,<sup>13</sup> where majority of patients are of age group of 1–19 years (47%) followed by 20–39 years (40%). There were more male patients (55.9%) compared to female patients (44.1%) which were in accordance with the study conducted by Khan et al.,<sup>13</sup> where percentage of male patients was 58.34% and female was 41.67%.

Majority of cases were Acne 30 (25%) followed by impetigo 20 (16.6%). Acne was more common in males involving mainly face and few cases on chest and back, most of these were mild and non-scarring this might be due to androgen induced over production of sebum, excessive keratin deposition which leads to comedone formation, colonization of follicle by propionibacterium acne. Colonization of propionibacterium acne causes inflammation and release of pro-inflammatory mediators in the skin, where antibiotics were prescribed, that too prolonged period which leads to emergence of resistant microorganisms. This finding was similar to the study conducted by Pathak et al.,<sup>14</sup> Chakrawarty and Jaiswal.<sup>15</sup>

A total of 348 drugs were prescribed in this study. The average number of drugs per prescription was 2.9 which were acceptable compared with the WHO standard (2–3).<sup>16</sup> In this study, the maximum number of drugs prescribed on a single prescription was four and minimum was one. In this study, 8 (6.60%) patients received only a single drug and none of them received more than four drugs. The average number drugs per prescription were calculated to measure the degree of polypharmacy. In this study, it was revealed that there was no polypharmacy. This is an encouraging sign. The low values in this study might mean prescribers have well appropriate training in the therapeutics. The average number of drugs per prescription in the present study was lower than the study conducted by Pathak et al.,<sup>14</sup> Gambre and Gambre,<sup>17</sup> where the values were 5.13 and 3.86, respectively. Polypharmacy promotes unnecessary adverse effects,

undesirable drug interactions, and irrational prescribing of drugs. Unnecessary over prescription of drugs increases economic burden to the patient and decreases patient compliance.<sup>18</sup>

In the present study, out of 348 drugs, 221 (63.50%) antibiotics were prescribed, which was in contrast with the studies conducted by Pathak et al.,<sup>14</sup> Chakrawarty and Jaiswal,<sup>15</sup> and Anand and Thanikaivel,<sup>19</sup> where the percentage of antibiotics were 15.91%, 13.02%, and 3.92% respectively. High percentage of antibiotics prescription was due to the fact that the only prescriptions containing antibiotics were considered in this study.

The ROA of antibiotics is very important. For better prognosis and fast recovery, the antibiotics prescribed need to be administered through proper route. Oral antibiotic therapy was safe, painless, convenient, and economical and associated with lesser complications compared with parenteral antibiotic therapy.

Parenteral antibiotics are prescribed for patients who are systemically ill, have a severe systemic infection, and are unable to tolerate oral drugs or rare known or suspected to have pathogens that are not susceptible to available oral antibiotics.

Topical antibiotics have several advantages over systemic ROA, including reduction of overuse of systemic antibiotics, avoid systemic toxicity, and decrease bacterial resistance. For some bacterial infections such as impetigo, they are preferred to be used as first-line treatment compared to systemic antibiotics.

Based on this study, it was revealed that majority of antibiotics were prescribed by oral route and then followed by topical route. These findings were similar to the studies conducted by Khan et al.,<sup>13</sup> Kayode et al.,<sup>20</sup> Bahelah et al.,<sup>21</sup> and Chakrawarty and Jaiswal.<sup>15</sup> However, in contrast to the study conducted by Pathak et al.,<sup>14</sup> where most preferred route was topical.

In studies conducted by Chakrawarty and Jaiswal<sup>15</sup> and Gambre and Gambre,<sup>17</sup> the most commonly used systemic antibiotic was doxycycline (33.87%), followed by amoxicillin (24.34%) and azithromycin (13.34%). However, in the study conducted by Pathak et al.,<sup>14</sup> the most commonly prescribed systemic antibiotic was azithromycin, In the present study, penicillins (51.6%) were most commonly prescribed systemic antibiotic, followed by macrolides (18.3%) and tetracyclines (7.5%). This finding was similar to the studies conducted by Chakrawarty and Jaiswal<sup>15</sup> Sunderkotter et al.,<sup>22</sup> Stevens et al.,<sup>10</sup> and Moon<sup>23</sup> This may be due to higher safety, efficacy, and well-defined profile of

adverse events and most of them are affordable. Topical antibiotics were prescribed in 75 patients, it was found that most commonly used topical antibiotic was mupirocin (40), and it was similar to the studies conducted by Khan et al.,<sup>13</sup> Divyashanthi et al.,<sup>24</sup> and Chakrawarty and Jaiswal,<sup>15</sup> but it was contrast to the study conducted by Pathak et al.,<sup>14</sup> where clindamycin was most commonly prescribed.

In the present study, majority of the drugs were prescribed by generic names (79%), and this finding was similar to the study conducted by Chkrawarty and Jaiswal,<sup>15</sup> where the generic drugs were prescribed in 81.96%. It is an encouraging sign, as dermatologists do not promote specific branded drugs. Majority of the prescriptions dose/strength (95.92%) of antibiotics were mentioned, frequency of antibiotics administration was mentioned in 97.28%, and duration of antibiotic administration was mentioned in 96.38%. It indicates rational prescribing practices in our study. Antibiotics were prescribed for 5–7 days duration in most of the patients with exception in some conditions such as cutaneous tuberculosis, leprosy, and acne vulgaris, where prolonged treatment is needed. This finding further supports rational prescription. This findings were similar to the study conducted by Chakrawaty and Jaiswal,<sup>15</sup> where many antibiotics were prescribed for duration of 3–7 days and in leprosy, cutaneous tuberculosis, acne vulgaris prolonged that the treatment was given.

Inappropriate prescribing, over use and under use of antibiotics is a worldwide problem which may be responsible for development of antibiotic resistance. The prescription pattern of antibiotics, in this study, proved that dermatologists followed rationality and contributed their part to prevent antibiotic resistance. In this study, it was also found that there was no polypharmacy and majority of drugs were prescribed by generic names. To minimize the irrational prescribing, standard treatment guidelines and hospital based formulary as per local needs should be developed. Physicians and high authorities should take measures to follow WHO prescribing guidelines to promote rational prescription.

Periodic screening of drug utilization studies in clinical departments should be necessary to verify modifications in the prescription of drugs and to establish safety and effectiveness of drugs.

#### Limitations of the study

There were some limitations to our study, as this study was done in tertiary care hospital which was located in urban area, it cannot reflect the health care facilities available to all health-care centers particularly in rural areas. This study was limited by a small sample size; a large sample size should

be necessary for better results and more reliable outcomes to generalize for the entire community.

## CONCLUSION

Acne vulgaris is the most common condition, for which antibiotics were prescribed followed by impetigo and cellulitis. Most frequently prescribed systemic antibiotic were penicillins followed by macrolides. Most commonly prescribed topical antibiotic was mupirocin followed by clindamycin. Most preferred ROA was oral route. It was found that parenteral antibiotics were least preferred in this study. Majority of the drugs were prescribed by generic name. Dose/strength, frequency of administration of antibiotics, and duration of treatment were specified in majority of the prescriptions. It was found that there was no polypharmacy in this study. Good prescribing habit of dermatologists and rational usage of antibiotics in appropriate situation is evident. In our Institute, it is found that dermatologists have appropriately followed rational use of antibiotics for bacterial infections.

## ACKNOWLEDGMENT

1. To the patients involved in the study & Faculty of Dermatology Department for their cooperation
2. Pharmacist M.Venkata Ramana for assisting in collection of patient data.

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<https://doi.org/10.5455/2319-2003.ijbcp20141227>

**Authors Contribution:**

**SD-** Concept and design of the study, prepared first draft of manuscript; **LC-** Interpreted the results; reviewed the literature and manuscript preparation; **SRR-** Concept, coordination, statistical analysis, and interpretation; **RSVR-** preparation of manuscript and revision of the manuscript.

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**Source of Support:** Nil, **Conflict of Interest:** None declared.