

## Bacteriological Profile and Antibiotic Sensitivity Pattern in Cases of Pyoderma

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### Abstract:

**Background:** Pyoderma refers to the purulent skin disease that represents the infection of epidermis, dermis and its appendages. Cutaneous pyogenic infections can be broadly divided into primary and secondary pyodermas. In majority of organisms isolated in primary and secondary pyodermas are either *Staphylococcus aureus* or *Streptococcus pyogenes*. The indiscriminate use of antibiotics has produced changes in the bacterial flora and resulting in emergence of antibiotic resistance. Hence, importance of a study to understand the current aetiological agents and their antibiotic sensitivity patterns cannot be further emphasized.

**Materials and Methods:** An observational non-randomized study was done in 100 clinically diagnosed cases of pyoderma with positive pus culture report & who have not taken any treatment were studied for antibiotic sensitivity testing of the isolated organism.

**Results:** Primary pyoderma cases were 67% and secondary pyoderma cases were 33%. Majority of primary pyoderma cases were found to be that of folliculitis (40%), followed by furuncle (22%), cellulitis (9%), carbuncle (7%), impetigo (6%), acute paronychia (4%), abscess (4%), ecthyma (3%) and periporitis (3%). Secondary pyoderma cases were found to be of Infected eczematoid dermatitis (27%), followed by infected scabies (18%), infected dermatophytosis (18%), intertrigo (15%), miscellaneous secondary pyodermas (15%), infected ulcer (3%), infected wound (3%). Gram positive organisms (91%) outnumbered gram negative organisms on culture. Most common gram positive organism isolated was *Staphylococcus aureus* (71%) which is susceptible to cephalosporins like cefepime, ceftriaxone and cefpodoxime and least susceptibility was seen with ampicillin. Most common gram negative organism isolated was *Escherichia coli* (5%) which showed 100% sensitivity to cefepime and levofloxacin, whereas it was found to be resistant to ampicillin, amoxicillin, amoxicillin + clavulanic acid, cefpodoxime, piperacillin, doxycycline and tetracycline.

**Conclusion:** The study draws our attention to the extent of problem of resistance to commonly used antibiotics. The changing pattern of aetiological organisms and their antibiotic sensitivity pattern needs constant monitoring in future as well.

**Key Word:** Pyoderma; Bacteriological Profile; Antibiotic Sensitivity

Date of Submission: 25-09-2021

Date of Acceptance: 08-10-2021

### I. Introduction

Pyoderma refers to the purulent skin disease that represents the infections of epidermis, dermis and its appendages.<sup>1</sup> Factors that have been implicated in the development of pyodermas include overcrowding, poor hygiene, malnutrition, poverty, illiteracy, lower socio-economic strata residing in congested industrial cities, slums and rural areas.<sup>2</sup> Most of the cutaneous bacterial infections occur in hot and humid climate.<sup>3</sup>

Cutaneous pyogenic infections can be broadly divided into two types which are: - primary pyodermas and secondary pyodermas. Primary pyodermas are the infection of the non-diseased skin and its appendages. They include impetigo, folliculitis, furunculosis, ecthyma, carbuncle, cellulitis, abscess etc. Secondary pyodermas are pyogenic infections originating in the previously diseased skin as a superimposed condition. They include infection of eczemas, infestations, wounds, ulcers etc. In majority of organisms isolated in primary and secondary pyodermas are either *Staphylococcus aureus* or *Streptococcus pyogenes*.<sup>5</sup>

The indiscriminate use of antibiotics has produced changes in the bacterial flora and resulting in emergence of antibiotic resistance. The development of antibiotic resistance poses a significant threat to public health.<sup>8</sup> Hence, importance of a study to understand the current aetiological agents and their antibiotic susceptibility patterns cannot be further emphasized.

## II. Material And Methods

An observational non-randomized study was conducted at a tertiary care hospital, Jaipur, Rajasthan. 100 clinically diagnosed cases of pyodermas with positive pus culture report & who have not taken any treatment were studied.

**Study design:** An observational non-randomized study

**Study location:** The study was done in Department of Dermatology, Venereology & Leprosy of National Institute of Medical Sciences & Research, Jaipur, Rajasthan

**Study Duration:** July 2019 to July 2020.

**Sample size:** 100 patients

### Inclusion Criteria:

1. All clinically diagnosed cases of pyoderma with positive pus culture report, irrespective of age and sex.

### Exclusion Criteria:

1. History of using topical or systemic antibiotic in the past 2 weeks.
2. All clinically diagnosed cases of pyodermas with sterile pus culture reports.
3. Unwilling patients.

### Procedure methodology

Written informed consent was obtained after taking detailed clinical history. Clinical examination was done and appropriate investigation were done; if required. The sample was collected before starting the antibiotic treatment. The sample site was cleaned with sterile normal saline dipped cotton. Material was then collected using a sterile swab. Swab was then put in a sterile test-tube and sent to Microbiology laboratory.

Primary inoculation of the swab was done on Mackonkey Agar Plate, Nutrient Agar Plate and Blood Agar Plate. After inoculation, these samples were incubated aerobically at 37°C for 24 hours. Plates showing no incubation for first 24 hours were further incubated for 24 hours. Various subcultures and standard biochemical testing were done for identifying the organisms. For antibiotic susceptibility testing of the isolated organism, Kirby-Bauer disc diffusion technique on Muller-Hinton agar was used.

## III. Result

Age of the patients in the study is between 6 years to 78 years with mean age being 29 years. Males outnumbered females with male to female ratio being 1.7:1.

Primary pyoderma cases were 67% and secondary pyoderma cases were 33%

Majority of primary pyoderma cases were found to be that of folliculitis (40%), followed by furuncle (22%), cellulitis (9%), carbuncle (7%), impetigo (6%), acute paronychia (4%), abscess (4%), ecthyma (3%) and periporitis (3%).

Majority of secondary pyoderma were found to be of Infected eczematoid dermatitis (27%), followed by infected scabies (18%), infected dermatophytosis (18%), intertrigo (15%), miscellaneous secondary pyoderma (15%), infected ulcer (3%), infected wound (3%).

Most common site involved was lower limbs, followed by upper limbs, trunk, face, head & neck. Least involved site was found to be genital area.

Gram positive organisms (91%) outnumbered gram negative organisms on culture. Most common gram positive organism isolated was Staphylococcus aureus (71%), followed by Coagulase negative staphylococcus (9%),

Streptococcus haemolyticus (7%), Streptococcus non-haemolyticus(3%). Most common gram negative organism isolated was Escherichia coli (5%). [Table no. 1]

**Table no.1: Culture pattern in pyoderma patients**

Culture Pattern	Primary Pyoderma	Secondary Pyoderma	Total
<b>Gram Positive</b>			
Staphylococcus aureus	47	24	71
Coagulase-negative Staphylococcus	6	3	9
Streptococcus haemolyticus	5	2	7
Streptococcus non-haemolyticus	3	1	4
<b>Subtotal</b>	<b>61</b>	<b>30</b>	<b>91</b>
<b>Gram Negative</b>			
Escherichia coli	5	1	5
Pseudomonas	0	1	1

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Enterobacter	1	0	1
Klebsiella	0	1	1
<b>Subtotal</b>	<b>6</b>	<b>3</b>	<b>9</b>
<b>Total</b>	<b>67</b>	<b>33</b>	<b>100</b>

Antibiotic susceptibility testing was done on all isolated organisms. The susceptibility pattern of 5 most common organisms is shown in table no.2.

Staphylococcus aureus was found to be 100% susceptible to cephalosporins like cefepime, ceftriaxone and cefpodoxime and least susceptibility was seen with ampicillin (42.25%).

Coagulase-negative staphylococcus was found to be 100% susceptible to ceftriaxone and tobramycin and was found to be resistant to ampicillin, amoxycillin, chloramphenicol, ofloxacin and levofloxacin.

Escherichia coli showed 100% sensitivity to cefepime and levofloxacin, whereas it was found to be resistant to ampicillin, amoxicillin, amoxicillin + clavulanic acid, cefpodoxime, piperacillin, doxycycline and tetracycline.

**Table no.2: Antibiotic susceptibility pattern (percentage)**

Antibiotics	Organisms				
	S. aureus	CONS	SH	SNH	E.coli
Ampicillin	42.25	0	14.29	0	0
Amoxycillin	39.44	0	14.29	0	0
Amikacin	91.54	55.56	0	50	33.33
Amoxycillin + clavulanic acid	60.56	77.78	28.57	75	0
Azithromycin	61.97	33.33	100	25	83.33
Cefepime	100	77.78	NT	100	100
Cefotaxime	85.91	NT	71.43	75	NT
Ceftriaxone	100	100	85.71	75	16.67
Cefpodoxime	100	22.22	NT	NT	0
Cefoxitin	85.91	22.22	100	100	NT
Co-trimoxazole	69.01	66.67	0	0	66.67
Ciprofloxacin	78.87	66.67	71.43	NT	16.67
Chloramphenicol	66.20	0	57.14	NT	83.33
Doxycycline	87.32	NT	NT	0	0
Gentamicin	71.83	55.56	0	NT	66.67
Ofloxacin	73.23	0	0	50	NT
Piperacillin	69.01	NT	0	NT	0
Linezolid	97.18	88.89	100	NT	NT
Tetracycline	76.05	NT	NT	0	0
Tobramycin	57.74	100	NT	0	NT
Vancomycin	80.28	22.22	71.43	25	NT
Levofloxacin	94.37	0	42.86	75	100

S. aureus = Staphylococcus aureus, CONS = Coagulase-negative Staphylococcus, SH Streptococcus haemolyticus, SNH = Streptococcus non-haemolyticus, E.coli = Escherichia coli, Pseud = Pseudomonas, Entero = Enterobacter, Kleb = Klebsiella

#### IV. Discussion

Pyogenic skin infections comprise of a large number of cases seen in the dermatology out-patient department and general practices. Change in the pattern of causative organisms and indiscriminate use of antibiotics has led to the altered antibiotic sensitivity patterns. Hence, there is always a need to gain more information about aetiology, predisposing factors, modes of transmission and effective methods for prevention and cure of these bacterial skin infections.

Many studies are being conducted to find out the epidemiology, bacteriological aspects, and antibiotic susceptibility patterns of these pyogenic skin infections.<sup>1,2,9,10</sup> The present study was carried out to study the bacteriological pattern and antibiotic sensitivity pattern in 100 consecutive untreated patients of pyogenic skin infections at tertiary care hospital.

In our study, there was a male preponderance with a male: female ratio of 1.7:1. The male preponderance was observed in all age groups. .

In index study, primary pyoderma (67%) cases outnumbered secondary pyoderma cases (33%). This is consistent with many other studies.<sup>2,3,6,11</sup>

Majority of the primary pyoderma cases were found to be that of folliculitis (40%), followed by furuncle (22%), cellulitis (9%), carbuncle (7%), impetigo (6%), acute paronychia (4%), abscess (4%), ecthyma (3%) and perioritis (3%). Several studies reported folliculitis as the commonest primary pyoderma, followed by furuncle and cellulitis, consistent with our study.<sup>5,11,12</sup>

During our study period, 100 samples were sent for culture and sensitivity. Single organism was isolated in all samples. Gram positive organisms (91%) outnumbered gram negative (9%) organisms on culture.

Various studies 2,4,9 concluded that gram positive is the commonest organisms to be isolated from the culture samples of pyogenic skin infections.

In our study, commonest organism isolated was *Staphylococcus aureus* (71%), followed by Coagulase negative staphylococcus (9%), and *Streptococcus haemolyticus* (7%). Our results were consistent with various other studies 2,9,11.

In our study, most common gram negative organism isolated was *Escherichia coli* (5%). Similar to various other studies in the past. 4

In our study, *Staphylococcus aureus* was found to be 100% susceptible to cephalosporins like cefepime, ceftriaxone and cefpodoxime and least susceptibility was seen with ampicillin (42.25%). In the study by Malhotra et al. 13 *Staphylococcus* showed maximum resistance (84.29%) to Ampicillin, which is partly similar to our results.

Among the gram negative organism, *Escherichia coli* showed 100% sensitivity to cefepime and levofloxacin, whereas it was found to be resistant to ampicillin, amoxicillin, amoxicillin + clavulanic acid, cefpodoxime, piperacillin, doxycycline and tetracycline. It was found in some the studies that, for Gram negative bacteria, ampicillin, amoxicillin + clavulanic acid, cephalosporins and to some extent ciprofloxacin are not helpful as empirical drugs.

## V. Conclusion

The study gives some useful insight about the epidemiology, aetiology and changing patterns of antibiotic susceptibility in pyoderma cases. It draws our attention to the extent of problem of resistance to commonly used antibiotics. The changing pattern of aetiological organisms and their antibiotic susceptibility pattern need constant monitoring in future as well. The study may prove to be very useful in choosing optimal and effective antibiotic for treatment of pyodermas.

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Dr. Vishal Patel, et. al. "Bacteriological Profile and Antibiotic Sensitivity Pattern in Cases of Pyoderma." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(10), 2021, pp. 44-47.