

A Hospital-Based Evaluation of the Causative Agents and Their Antibiotic Susceptibility Patterns in Pyodermas

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Abstract

Aim: The aim of the present study was to find out causative organisms and their latest antibiotic susceptibility patterns in pyodermas.

Methods: This hospital based prospective cross-sectional study was conducted in department of Microbiology for a period of 15 months, a total of 8915 cases were examined in the outpatient and inpatient wings of the Dermatology Department and of them 100 cases were diagnosed to have pyoderma, which comprised the study population.

Results: Pyoderma was found all age groups mainly affecting 0-30 yrs age group constituting 55% of cases. There were 54% males as compared to females. There were 66% monomicrobial and 24% were polymicrobial. 60% had primary pyoderma and 40% secondary pyoderma. In the present study, lower limb was affected followed by upper limb, face, trunk and scalp. Majority of the patients had nil risk factors. The predominant isolate obtained was Staphylococcus aureus, followed by Beta hemolytic Streptococci. All the Staphylococcus aureus strains isolated were sensitive to vancomycin and 95% were sensitive to linezolid. Sensitivity to penicillin was 10%, to amikacin it was 74% and to doxycycline it was 82%.

Conclusion: Pyoderma is a major cause of morbidity among patients. In recent times, emerging drug resistant strains are posing difficulties in treating pyoderma. Staphylococcus aureus is most common organism causing pyoderma. Impetigo was found to be the most common type followed by furunculosis, folliculitis & ecthyma.

Keywords: Pyoderma, Antimicrobial resistance, Staphylococcus aureus

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Introduction

Pyoderma presents clinically as any pus-forming infection of the skin accounting for nearly 25% of the patients attending the dermatology outpatient department in India. [1] They can be either primary pyoderma, i.e., de novo or secondary pyoderma as a complication of other underlying systemic disease or due to immunocompromised status or when a lesion is already present and then bacterial infection sets in it. Staphylococcus aureus is considered to be the most common causative organism implicated in its etiology; however, other organisms such as those belonging to Streptococcus or Pseudomonas species have also been incriminated. [2,3] Rarely organisms from Enterobacteriaceae family are also involved which is not confirmed though.

Identification of the causative pathogen by pus culture and sensitivity helps in accurate treatment; but this may not be usually done due to logistic issues. Empirically antibiotics are given without knowing the complete profile of the causative organism. In today's scenario, many cases do not

respond to those antibiotics that were previously known to be very effective in such cases. The indiscriminate use of topical and oral antibiotics has contributed to this current situation. [3] As a result, antibiotic resistance has downplayed the utility of established antibiotics and possesses a serious threat to public health worldwide, for example, methicillin-resistant S. aureus (MRSA).

Factors such as immunosuppression, atopic dermatitis, scabies, pediculosis, pre-existing tissue injury and inflammation predisposes towards pyoderma formation. Pyoderma is classified into primary and secondary infections. Impetigo, folliculitis, furuncle, carbuncle, ecthyma, erythrasma, and sycosis barbae constitutes primary pyoderma and secondary pyodermas constitute tropic ulcer, infected pemphigus, infected contact dermatitis, infected scabies, and various other dermatoses. Baslas et al [4] in 1990 studied 570 cases of pyoderma, in which 58.8% cases were of primary pyoderma, and rest were secondary

pyoderma. Chopra et al [5] in 1994 carried out study in 100 cases found that maximum cases were of impetigo (31%) followed by furunculosis (24%), folliculitis (22%), pyogenic intertrigo (6%), sycosis and carbuncle (6% each), ecthyma (2%) and cellulitis (1%). Majority of cases belonged to age group of 0-10 years. Several other Indian studies classified and demonstrated the presence of primary and secondary pyoderma from different regions. [6,7]

The aim of the present study was to find out causative organisms and their latest antibiotic susceptibility patterns in pyodermas.

Materials and Methods

This hospital based prospective cross-sectional study was conducted department of Microbiology for a period of 15 months in Government Medical College, Bettiah, Bihar, India. Within a period of 15 months, a total of 8915 cases were examined in the outpatient and inpatient wings of the Dermatology Department and of them 100 cases were diagnosed to have pyoderma, which comprised the study population.

Inclusion criteria: Patients belonging to all age groups and either sex with any purulent skin condition presenting to the Dermatology Department (both outpatient and inpatient wings), and giving written informed consent were included in the study. For children less than 18-year-old, parental consent was taken.

Exclusion criteria: Non-infected insect bites and non-inflamed partly healed pyoderma lesions were excluded.

History: History of the patient with regards to mode of onset, history of contact, type, distribution and progression of lesions was taken. Socio-economic status and other relevant history of the patient with respect to associated co-morbidities, details of antibiotic consumption over the last two weeks, occupation, personal habits and hobbies were also recorded. [8] Thorough clinical examination was done to find out the distribution of lesions, the secondary changes, the co-morbidities associated, general health and personal hygiene of the patients.

Specimen collection: A sample of pus was collected on two sterile swabs after cleaning the lesions with normal saline. In case of an intact pustular lesion, it was ruptured with a sterile needle and the material was collected on two sterile swabs. In case of open wounds, the debris was first removed and the lesion was rinsed thoroughly with sterile saline prior to material collection with sterile cotton swab stick. In crusted lesions, the crust was partially lifted and the specimen collected from underneath with a sterile cotton swab stick. Two swab sticks were obtained from the lesion sites. [9]

The sample was transported to the microbiology lab within 30 minutes. Gram stain was done with the first swab. The second swab was inoculated in blood agar and Mac Conkey agar and incubated at 37°C for 24-48 hours. After 24-48 hours, the culture plates were looked for any growth. Pure bacterial growths obtained after incubation were subjected to various biochemical tests (including gram stain, catalase, slide coagulase, tube coagulase, DNase, oxidase, bile esculin, bacitracin test, indole, methyl red, Voges-Proskauer, citrate, urease, triple sugar iron, phenylalanine deaminase and sugar fermentation) as dictated by the presumptive identifications. [10] Any growth that did not correlate with the gram stain findings was not processed further and was reported as probable contamination. Antimicrobial susceptibility testing was carried out by Kirby-Bauer disc diffusion method and interpreted as per Clinical Laboratory Standard Institute (CLSI) guidelines. A cefoxitin disc was used as a surrogate marker for predicting MRSA isolates. An inhibition zone of ≤ 21 mm around a 30 mcg cefoxitin disc was considered as MRSA. [11]

Statistical Analysis

All the data was entered in a Microsoft excel spread sheet and analysed for variables. Descriptive statistics for both clinical and bacteriological characteristics was generated. Statistical comparison of categorical variables was undertaken using Chi-square test and a p-value of <0.05 was considered statistically significant.

Results

Table 1: Demographic details

Age group in years	Number	Percentage
0-15	33	33
16-30	22	22
31-45	17	17
46-60	23	23
61-75	4	4
76-90	1	1
Gender		
Male	54	54
Female	46	46
Type		

Monomicrobial	66	66
Polymicrobial	24	24
Sterile	10	10

Pyoderma was found all age groups mainly affecting 0-30 yrs age group constituting 55% of cases. There were 54% males as compared to females. There were 66% monomicrobial and 24% were polymicrobial.

Table 2: Types of primary pyoderma

Types of primary pyoderma	N =60
Impetigo	40
Folliculitis	8
Furuncle	5
Ecthyma	3
Carbuncle	2
Cellulitis	2
Types of secondary pyoderma	N=40
Contact dermatitis	20
Scabies	10
Skin ulcers	5
Eczema	3
Dermatophytic infection	2

60% had primary pyoderma and 40% secondary pyoderma.

Table 3: Sites affected and risk factors in pyoderma

Site	Number	Percentage
Scalp	5	5
Face	9	9
Trunk	7	7
Upper limb	15	15
Lower limb	64	64
Risk factors		
Atopy	7	7
Diabetes	17	17
Venous insufficiency	6	6
Trauma	3	3
Immunosuppression	5	5
Nil	62	62

In the present study, lower limb was affected followed by upper limb, face, trunk and scalp. Majority of the patients had nil risk factors.

Table 4: Microbiology of pyoderma

Organism	Number	Percentage
Staphylococcus aureus	70	70
Group A Beta haemolytic Streptococci	25	25
Group G Beta haemolytic Streptococci	1	1
Staphylococcus epidermidis	1	1
Staphylococcus hemolyticus	1	1
Citrobacter amalonaticus	1	1
Pseudomonas aeruginosa	1	1
Total	100	100%

The predominant isolate obtained was Staphylococcus aureus, followed by Beta hemolytic Streptococci.

Table 5: Antibiotic sensitivity pattern of Staphylococcus species

Antibiotics	No. of isolates susceptible (%) N=100
Penicillin G	10 (10)
Amikacin	74 (74)
Gentamicin	82 (82)
Erythromycin	48 (48)
Doxycycline	82 (82)
Ciprofloxacin	50 (50)
Clindamycin	65 (65)
Cotrimoxazole	54 (54)
Linezolid	95 (95)
Vancomycin	100 (100)

All the *Staphylococcus aureus* strains isolated were sensitive to vancomycin and 95% were sensitive to linezolid. Sensitivity to penicillin was 10%, to amikacin it was 74% and to doxycycline it was 82%.

Discussion

Pyodermas are one of the most common conditions encountered in dermatological practice. They are purulent skin conditions caused by pyogenic bacteria and constitute a large proportion of skin diseases. [12,13] Infections of the skin and soft tissues with microorganisms that produce an inflammatory response from the infected host are known as pyodermas. [14] The group name for dermatoses which are generally purulent are known as pyodermas. [15] The majority of pyodermas are caused by *Staphylococcus aureus* and *Streptococcus pyogenes*. [16] Other organisms that may cause pyodermas are coagulase negative staphylococci, *Escherichia coli*, *Citrobacter* spp and *Pseudomonas aeruginosa*. [17] When pyodermas involve normal skin, it is known as primary pyoderma and when it involves infection of previously diseased skin it is known as secondary pyoderma. Primary pyoderma involves the conditions of impetigo, furunculosis, carbuncles, sycosis, folliculitis, cellulitis and ecthyma to name a few. Infectious eczematoid dermatitis, infected scabies, infected contact dermatitis, infected herpes zoster are examples of secondary pyoderma. [18] Malnutrition, overcrowding and poor hygiene lead to higher incidence of pyodermas and they are most common during summer and rainy seasons. [19] Clinical conditions causing immune-suppression like malignancy, diabetes, HIV are an additional risk factors which predispose to increased risk of pyoderma. [20]

Pyoderma was found all age groups mainly affecting 0-30 yrs age group constituting 55% of cases which was consistent with the observations of Hulmani M et al., and Ashokan C et al. [21,22] There were 54% males as compared to females. There were 66% monomicrobial and 24% were polymicrobial. 60% had primary pyoderma and 40% secondary pyoderma. In the present study, lower limb was

affected followed by upper limb, face, trunk and scalp. In the present study, lower limb was affected followed by upper limb, face, trunk and scalp. Majority of the patients had nil risk factors which can be compared to a study by Nandihal NW and Ravi GS where 31% of the lesions were on the lower limbs. [23] The predominant isolate obtained was *Staphylococcus aureus*, followed by Beta hemolytic *Streptococci*. This was in accordance with the study by Ashokan C et al., where the incidence of primary pyoderma was 60%. [22]

All the *Staphylococcus aureus* strains isolated were sensitive to vancomycin and 95% were sensitive to linezolid. Sensitivity to penicillin was 10%, to amikacin it was 74% and to doxycycline it was 82%. Studies by Jayaraj YM et al., and Raturaj MK et al., reported the highest antibiotic sensitivity to linezolid (100%), vancomycin (86.32%), amikacin (85.26%), cotrimoxazole (70.53%) and clindamycin (69.47%). [24,25]

Conclusion

Pyoderma is a major cause of morbidity among patients. In recent times, emerging drug resistant strains are posing difficulties in treating pyoderma. *Staphylococcus aureus* is most common organism causing pyoderma. Impetigo was found to be the most common type followed by furunculosis, folliculitis & ecthyma. Emergence of drug resistant strain such as MRSA is an alarming sign for the community, which in turn demands for strict antibiotics policies which can reduce the incidence of drug resistant organisms in this region.

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