



A hospital based prospective evaluation of the causative organisms 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 for a period of 12 months at Department of general Medicine at Mamata Medical College and Hospital. The study was approved by the Institutional Ethics Committee. Within a period of seven months, a total of 1965 cases were examined in the outpatient and inpatient wings of the Dermatology Department and of them 200 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 55% males as compared to females. There were 65% monomicrobial and 25% 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. The predominant isolate obtained was *Staphylococcus aureus*, followed by Beta hemolytic *Streptococci*. All the *Staphylococcus aureus* strains isolated were sensitive to vancomycin and 96% were sensitive to linezolid. Sensitivity to penicillin was 8%, to amikacin it was 75% and to doxycycline it was 84%.

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*

Introduction

Pyodermas are quite common in India and constitute a major portion of the cases in dermatology clinics. Many cases these days do not respond to the antibiotics that were previously very effective in such cases. Perhaps, indiscriminate use of topical and systemic antibiotics has contributed to this situation [1-4]. The emergence of antibiotic resistance has significantly eroded the utility of established antibiotics and poses a serious threat to public health worldwide. In order to successfully treat cases of pyodermas, detailed knowledge is necessary regarding the various causative organisms and their sensitivity patterns.

The most common skin condition seen in dermatological OPDs is Pyoderma. Pyoderma are purulent infections of skin and its appendages mainly caused by pyogenic bacteria such as *staphylococcus aureus*, *streptococcus* species, CoNS, *Enterococcus*, and gram negative bacteria such as *E.coli*, *Klebsiella* and *pseudomonas* [5]. Primary pyoderma is involvement of normal skin and its infection by pyogenic bacteria directly affecting the normal tissue, whereas secondary pyoderma is involvement of skin with a condition predisposing to infection. Primary pyoderma is of various types such as impetigo, carbuncle, furuncle, folliculitis, cellulitis, and other purulent conditions of skin [5, 6]. Malnutrition, poor hygiene, overcrowding, poor socioeconomic status, obesity, immunosuppressive conditions such as diabetes mellitus, malignancies, may increase the risk for pyoderma infection in developing countries [7].

The group name for dermatoses which are generally purulent are known as pyodermas [8]. The majority of pyodermas are caused by *Staphylococcus aureus* and *Streptococcus*

pyogenes [9]. Other organisms that may cause pyodermas are coagulase negative staphylococci, *Escherichia coli*, *Citrobacter* spp and *Pseudomonas aeruginosa* [10]. 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 [11]. Malnutrition, overcrowding and poor hygiene lead to higher incidence of pyodermas and they are most common during summer and rainy seasons [12]. Clinical conditions causing immune-suppression like malignancy, diabetes, HIV are an additional risk factors which predispose to increased risk of pyoderma [13].

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 for a period of 12 months in Department of General Medicine at Mamata Medical College and Hospital. The study was approved by the Institutional Ethics Committee. Within a period of seven months, a total of 1965 cases were examined in the outpatient and inpatient wings of the Dermatology Department and of them 200 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 [14]. 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 [15].

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 [16]. 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 [17].

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	64	32
16-30	46	23
31-45	32	16
46-60	48	24
61-75	8	4
76-90	2	1
Gender		
Male	110	55
Female	90	45
Type		
Monomicrobial	130	65
Polymicrobial	50	25
Sterile	20	10

Pyoderma was found all age groups mainly affecting 0-30 yrs age group constituting 55% of cases. There were 55% males as compared to females. There were 65% monomicrobial and 25% were polymicrobial.

Table 2: Types of primary pyoderma

Types of primary pyoderma	N =120
Impetigo	80
Folliculitis	15
Furuncle	10
Ecthyma	7
Carbuncle	4
Cellulitis	4
Types of secondary pyoderma	N=80
Contact dermatitis	40
Scabies	20
Skin ulcers	10
Eczema	5
Dermatophytic infection	5

60% had primary pyoderma and 40% secondary pyoderma.

Table 3: Sites affected and risk factors in pyoderma

Site	Number	Percentage
Scalp	8	4%
Face	20	10%
Trunk	12	6%
Upper limb	32	16%
Lower limb	128	64%
Risk factors		
Atopy	12	6%
Diabetes	36	18%
Venous insufficiency	10	5%
Trauma	8	4%
Immunosuppression	10	4%
Nil	124	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
<i>Staphylococcus aureus</i>	136	68%
Group A Beta haemolytic <i>Streptococci</i>	54	27%
Group G Beta haemolytic <i>Streptococci</i>	2	1%
<i>Staphylococcus epidermidis</i>	2	1%
<i>Staphylococcus hemolyticus</i>	2	1%
<i>Citrobacter amalonaticus</i>	2	1%
<i>Pseudomonas aeruginosa</i>	2	1%
Total	200	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=200
Penicillin G	16 (8)
Amikacin	150 (75)
Gentamicin	170 (85)
Erythromycin	100 (50)
Doxycycline	162 (84)
Ciprofloxacin	100 (50)
Clindamycin	132 (66)
Cotrimoxazole	110 (55)
Linezolid	192 (96)
Vancomycin	200 (100)

All the *Staphylococcus aureus* strains isolated were sensitive to vancomycin and 96% were sensitive to linezolid. Sensitivity to penicillin was 8%, to amikacin it was 75% and to doxycycline it was 84%.

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 [18, 19]. Infections of the skin and soft tissues with microorganisms that produce an inflammatory response from the infected host are known as pyodermas [20]. The group name for dermatoses which are generally purulent are known as pyodermas [21]. The majority of pyodermas are caused by *Staphylococcus aureus* and *Streptococcus pyogenes* [22]. Other organisms that may cause pyodermas are coagulase negative staphylococci, *Escherichia coli*, *Citrobacter* spp and *Pseudomonas aeruginosa* [23]. 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 [24]. Malnutrition, overcrowding and poor hygiene lead to higher incidence of pyodermas and they are most common during summer and rainy seasons [25]. Clinical conditions causing immune-suppression like malignancy, diabetes, HIV are an additional risk factors which predispose to increased risk of pyoderma [26].

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* [27, 28]. There were 55% males as compared to females. There were 65% monomicrobial and 25% 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 [29]. 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% [28].

All the *Staphylococcus aureus* strains isolated were sensitive to vancomycin and 96% were sensitive to linezolid. Sensitivity to penicillin was 8%, to amikacin it was 75% and to doxycycline it was 84%. 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%) [30, 31].

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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