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Original Article

Clinical and bacteriological study of pyoderma with reference to antibiotic susceptibility profile

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Abstract

Introduction Pyoderma is one of the commonest clinical conditions encountered in a dermatology clinic. Present study was conducted to know the culture and sensitivity pattern to routinely used antibiotics in a dermatology clinic for the effective management of pyoderma.

Aims and Objectives i) To study the frequency of various pyogenic skin infections. ii) To know the bacterial etiology of pyodermas. iii) To determine the antibiotic susceptibility profile of pyogenic isolates.

Materials and Methods Among the patients attending our out-patient-department from Jan-2016 to June-2016, we recorded 100 cases of pyoderma and screened them for antibiotic susceptibility.

Results Out of 100 cases of pyoderma, 80% were primary pyoderma and 20% were secondary pyoderma. 18 were diabetics and 13 had history of recurrent episodes. Maximum cases were of impetigo (30%), followed by furuncle (20%) and folliculitis (12%). Secondary pyoderma constituted ulcers (5%), infected scabies (4%) and infected contact dermatitis (3%). Single organism was isolated from 90% of cases and multiple organisms in 3% cases. No growth was seen in 7% cases. *Staphylococcus aureus* was the most prevalent causative agent observed in 63% of cases, of which coagulase positive were 52% and coagulase negative were 11% followed by *Streptococcus* (15%), *Klebsiella* (7%), *Proteus* (4%) and *E coli* (4%). MRSA was isolated from a single case. *Staph aureus* was found to be highly sensitive to tetracycline in 89% of cases, doxycycline 80.4%, mupirocin 79%, fusidic acid 78.6%, gentamicin 76.9%, clindamycin 70.2% and erythromycin 67.4% while resistant to penicillin in 73.2% of cases, amoxicillin 70.6%, framycetin 68.4% and ciprofloxacin 44%.

Conclusion Knowledge of causative organism and antibiotic susceptibility pattern in a given locality is essential to give proper antibiotic therapy and avoid resistance to ineffective drug.

Key words
Pyoderma, culture and sensitivity, *Staph aureus*.

Introduction

Pyoderma is one of the commonest clinical conditions encountered in a dermatology clinic. Though easily treatable, the condition is known for its chronicity, recurrence and other complications. Various factors like poverty, malnutrition, overcrowding and poor hygiene have been found to be responsible for its higher incidence in the lower socio-economic strata.[1] Climatic conditions also play a role with the hot and rainy seasons being the period of maximum occurrence.[3] Pyoderma, commonly caused by *S. aureus*, accounts for up to 17% of patients in dermatological practice.[3] *S. aureus* usually colonizes hospitalized as well as healthy people

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without any sign of infection.

The preferential sites of colonization are anterior nares, perineum, axilla, and web spaces which may act as reservoirs.[4] Resistance to penicillin was noted within 4 years of introduction of penicillin and was implicated to the production of enzymes called β-lactamase (penicillinase) by previously susceptible bacteria.[2] Most strains of *S. aureus* are encountered in patients and carriers outside hospitals, and around 90% of those found in hospitals have shown resistance to penicillin. Unfortunately these organisms also show cross-resistance to other penicillins such as ampicillin, amoxicillin, carbenicillin, azlocillin, and piperacillin.[5]

Methicillin-resistant *S. aureus* (MRSA) is notorious in causing serious infection among hospitalized patients, with outbreaks of such infections posing challenge in therapy and infection control. Methicillin, the first β-lactamase stable semi-synthetic penicillin was introduced in 1960.[6] Resistance was detected within a year of its introduction.[7]

Changing trends are being noted in the etiological aspect of primary pyodermas and the unconstrained use of antibiotics has resulted in a diligent spread of multi resistant strains.[8] It would be ideal to do culture and sensitivity tests before prescribing antibiotics, but as this is not always feasible, studies should be conducted at regular intervals to determine the changing trends in etiological agents and antibiotic resistance. Keeping this in mind the present study was carried out to know the culture and sensitivity pattern to routinely used antibiotics in dermatology clinic for the effective management of pyoderma.

Aims and Objectives

1. To study the frequency of various pyogenic skin infections.
2. To know the bacterial etiology of pyodermas.
3. To determine the antibiotic susceptibility profile of pyogenic isolates

Materials and Methods

It was a hospital based cross-sectional study conducted on 100 patients of pyoderma attending dermatology outpatient department of JJM Medical College, Davangere, Karnataka over a period of 6 months from Jan 2016 to June 2016. Patients of all age groups and of either sex were included. Patients already treated with topical or systemic antibiotics and who were not willing to be a part of the study were excluded. A detailed history and clinical examination including complete dermatological examination was carried out in every patient. Relevant details regarding the duration, progression of lesions, type of lesions, past and family histories were recorded. Relevant investigations, including complete blood count (CBC), blood sugar levels and urine examination were carried out whenever required. All these findings were recorded in a case proforma.

Specimen collection and processing of samples

Intact pustules were first cleaned with 70% alcohol. They were then ruptured with a sterile needle and the expressed pus was collected on two sterile cotton swabs. In case of ulcers and crusted lesions, normal saline was used to clean the wound, while the surrounding normal skin was cleaned with 70% alcohol. Two sterile swabs were rubbed over the pus or the advancing edge of the ulcer. In crusted lesions, the crusts were partly lifted and material was taken from underneath. Such pus samples collected under aseptic precautions from the purulent lesions using two sterile cotton swabs were transported to the laboratory within 30–45 minutes. Of the two swabs, one was used for making smear and gram staining while the other

was used for culture on blood agar and McConkey's agar. Culture plates were incubated aerobically at 37°C for 24–48 hours. Colonies were identified by gram staining, colony morphology and standard biochemical reactions according to standard methods.[9] Antibiotic susceptibility testing of isolated organisms was performed on Muller Hinton agar by Kirby-Bauer's disc diffusion method.

Results

Out of 100 cases of pyoderma, 57 were males and 43 were females with male:female ratio of 1.3:1. Maximum cases (29) were in the age group of 0-10 years followed by of 11 to 20 years **(Table 1)**. 18 cases were found to have diabetes mellitus. Out of 100 cases, 13 had history of recurrent episodes. Primary pyoderma constituted 80% of cases and rest 20% were secondary pyoderma **(Table 2 & 3)**. Single organism was isolated from 90% of cases and multiple organisms in 3% cases. 7% of cases showed no growth on culture.

Table 1 Age distribution of cases of pyoderma

Age group (years)	*Number of cases*
0-10	29
11-20	18
21- 30	11
31-40	15
41-50	11
51-60	07
61-70	06
71-80	02
81-90	01
Total	100 cases

Table 2 Distribution of cases of primary pyoderma

Primary pyoderma	*No. of cases*
Impetigo	30
Furuncle	20
Folliculitis	12
Ecthyma	5
Cellulitis	4
Carbuncle	2
Abscess	2
Misc	5
Total	80

Table 3 Distribution of cases of secondary pyoderma

Secondary pyoderma	*No. of cases*
Ulcers	5
Infected scabies	4
Infected contact dermatitis	3
Infected pemphigus	3
Misc	5
Total	20

Table4 Comparison of antibiotic susceptibility pattern with other studies

Antibiotics	*Present study*	*Other studies*
Penicillin	26.8	20.0[11]
Amoxicillin	29.4	40.7[23]
Ciprofloxacin	56	60.0[30]
Erythromycin	67.4	69.0[30]
Clindamycin	70.2	86.2[28]
Gentamicin	76.9	76.5[28]
Fusidic acid	78.6	79.8[28]
Mupirocin	79	85.3[31]
Tetracycline	89	60.0[29]

Staphylococcus species was the most prevalent causative agent found in 63% cases, of which coagulase positive were 52% and coagulase negative were 11%, streptococci being the second most common pathogen isolated in 15% of cases followed by *Klebsiella* in 7%, *E.coli* in 4% and *Proteus* in 4% **(Figure 1)**.

MRSA was isolated from single case. *Staph aureus* was found to be highly susceptible to tetracycline 89%, doxycycline 80.4%, mupirocin

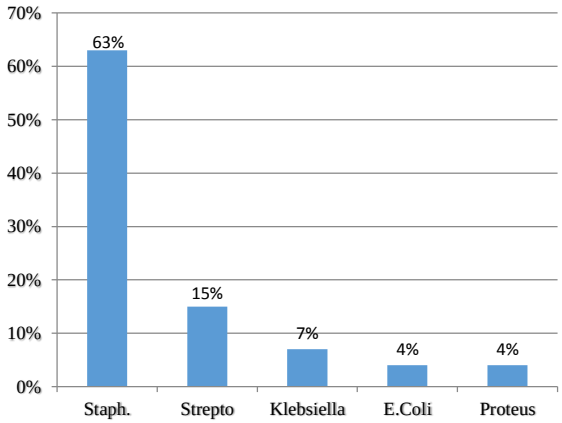

Figure 1 Percentage of different organisms isolated from pyoderma

79%, fusidic acid 78.6%, gentamicin 76.9%, clindamycin 70.2% and erythromycin 67.4% while resistance of staphylococcus aureus was found to penicillin in 73.2%, amoxicillin 70.6%, framycetin 68.4% and ciprofloxacin 44% **(Table 4)**. Most lesions were on the extremities.

Discussion

We found male preponderance as observed by other studies, except Ramani and Jayakar who noticed female preponderance.[10,17] Present study showed majority of cases in children and predominance of primary pyoderma inconsistent with previous studies.[3,4] Bhaskaran *et al.* have reported maximum cases in the 11-30 years age group.[11] The higher prevalence of pyoderma in children could be explained by the lower hygiene and increased risk of trauma associated with young age.[12] A higher prevalence of pyodermas in children is of significance as they are more susceptible to systemic complications such as glomerulonephritis.

In this study the extremities were the predominant sites of involvement similar to other studies.[13] Studies also showed a preponderance of lesions on the face, neck and scalp.[14] The proximity to the common carrier sites like nares and throat may be responsible for the increased incidence at these sites.[15]

Our finding of impetigo as the most common primary pyoderma was in concordance with other studies.[16-19] S. aureus followed by S. pyogenes as common pathogens isolated in present study were similar to previous studies.[21-23] 18 were known cases of diabetes mellitus. Out of 100 cases, 13 had history of recurrent episodes. Recurrent pyoderma was noted commonly in diabetics in this study. In a study, patients on treatment with steroids or chemotherapeutic agents and those with pre‑existing skin diseases, obesity, disorders of the immune system and diabetes are found to have bacterial skin infections more commonly.[20]

The rising prevalence of diabetes mellitus can complicate cutaneous infections and contribute to antibiotic resistance.[23] Staphylococcus species was the most prevalent causative agent seen in 63% cases of which coagulase positive were 52% and coagulase negative were 11% followed by streptococcus in 15%, klebsiella in 7%, E. coli in 4% and proteus in 4%. Parikh et al. and Jalan *et al*. found higher incidence of 97% and 88% coagulase positive *S. aureus* respectively in their studies.[24,25] Khandari et al. isolated S. aureus from 68% of the cases in concordance with our study.[25] Malhotra et al. isolated 42.62% coagulase positive and 16.39% coagulase negative *Staphylococcus aureus*, *Klebsiella* in 4.92% patients, *Streptococcus*, *Enterococcus* and *Proteus* 3.27% and *Citrobacter* and *E.coli* in (1.64%).[17]

A combination of *Staphylococcus*+ *Streptococcus* was found in one case (1.64%), and combinations of *Staphylococcus*+ *Enterococcus* and *E. coli* + Enterococcus in two patients each (3.28% each) and culture results were negative in nine patients (14.75%).[17] Similar studies by Baslas *et al*. and Rahul *et al*. reported negative culture results in 14.9% and 16.3% respectively.[26,27]

Though an increasing incidence of resistance to penicillin has been reported by various researchers across the world, it usually varied from 80% to 100%.[21,23,28] In a study by M. Wavare *et al*. and Mathew *et al*., *Staph Aureus* isolates were resistant to penicillin, ampicillin and tetracycline while most sensitive to gentamicin and erythromycin.[2,21] Most of these findings are in concordance with present study except higher susceptibility of *Staph Aureus* to tetracycline (89%) and doxycycline (80.4) which is in contrast to previous studies.[21,29] Also we

found marked and early clinical response of pyoderma to tetracycline group of drugs. We recommend routine pus culture and sensitivity tests in pyoderma to identify the commonly prevalent pathogens and to aid in the judicious and rational use of antibiotics.

Conclusion

Emergence of multidrug resistant strains has become a clinical challenge. Most of the bacterial strains were found to be resistant to one or more antibiotics probably due to indiscriminate use of antibiotics which must be avoided. Despite a number of newer antibiotics, the incidence of bacterial resistance is rising which has led to treatment failure in pyodermas. In order to reduce the problem of antibiotic resistance, it is mandatory to survey and screen clinical isolates for resistance at regular intervals. However, it may not be practical in an out-patient setting hence efforts must then be channelled towards prudent antibiotic use based on maximal susceptibility profile in a given locality, as documented in this study and thus minimises the development and persistence of infection and its resistant strains.

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