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Clinical and bacteriological profile of primary pyoderma: A cross sectional study

Arya James[1], Sandhya George[2], Puthenpurayil Ebrahimkutty Shanimole[3]

[1]Department of Dermatology, Aster Mother Hospital Areekode, [2]Department of Dermatology and Venereology, Government Medical College, Manjeri, Malappuram, [3]Department of Microbiology, Government Medical College, Kottayam, Kerala, India.

***Corresponding author:**
Arya James,
Department of Dermatology,
Aster Mother Hospital
Areekode, Malappuram, Kerala,
India.

aryajv95@gmail.com

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ABSTRACT

Objectives: To evaluate the clinical and bacteriological profile and antibiotic susceptibility pattern in primary pyodermas.

Materials and Methods: A descriptive cross-sectional study was carried out in patients with clinically diagnosed primary pyodermas and who attended the outpatient department of dermatology of a tertiary care center in South India from December 2017 to June 2019.

Results: During the study period, 180 patients received a clinical diagnosis of primary pyoderma. Most common clinical type was impetigo followed by folliculitis. Most common age group affected was children below ten years of age (74 cases, 41.1%). Sixty five patients (36.1%) had lesions confined to lower limbs. Among the study participants, 26 (14.4%) were on prolonged treatment with systemic corticosteroids. Gram stain study helped in the diagnosis in 115 (63.9%) patients. *Staphylococcus aureus* (*S. aureus*) was the predominant pathogen (92 cases, 51.1%). A significant proportion of *S. aureus* isolates showed resistance to penicillin (90/92, 97.8%) and erythromycin (36/92, 39.1%). The pathogen isolated was methicillin resistant *S. aureus* (MRSA) in 28 cases (28/92, 30.4%). All isolates of Group A *Streptococcus* were sensitive to penicillins and first generation cephalosporins.

Limitations: It was a single center study, conducted in a tertiary referral hospital; hence did not reflect the status of the disease in the community. Complete information on prior antibiotic treatment was not available in all patients.

Conclusion: Pyodermas showed a predilection for younger age group. Impetigo was the leading primary pyoderma. Gram stain is a valuable, but an often neglected tool to diagnose a bacterial infection. Many isolates of *S. aureus* showing resistance to penicillin and erythromycin and identification of MRSA as the pathogen in many patients highlight the need for periodic assessment of pathogens and drug susceptibility patterns in different population groups to ensure judicious use of antibiotics.

Keywords: Impetigo, Gram stain, *Staphylococcus aureus*, *Streptococcus pyogenes*, Antimicrobial susceptibility testing

INTRODUCTION

The patients with cutaneous bacterial infection constitute a significant portion of cases seen in dermatology practice.[1]

Primary pyoderma is a pyogenic infection of non-diseased skin and its appendages.[2] Primary bacterial infections of skin show a characteristic morphology and disease course, are incited initially by a single organism and arise in normal skin.[3] The underlying conditions that predispose to primary pyodermas include poverty, malnutrition, overcrowding, poor sanitation, illiteracy and poor hygiene.[4]

Identification of risk factors, early detection of the disease causing pathogen and information on antibiotic sensitivity pattern go a long way in effective management of the condition.[5] Emergence of pathogens that have acquired resistance against commonly used antibiotics poses a therapeutic challenge. Having awareness about the common pathogens in a locality and their drug sensitivity pattern is important. In this study we tried to evaluate the clinical profile, bacterial etiology and antibiotic susceptibility pattern of isolates in primary pyodermas.

MATERIALS AND METHODS

This descriptive, cross-sectional study was carried out after obtaining clearance from the institutional research and ethics committees of our tertiary referral center. All patients with clinically diagnosed primary pyodermas such as impetigo, folliculitis, furuncle, carbuncle, cellulitis, erysipelas and ecthyma attending the outpatient department of dermatology during the study period of 18 months were included. Patients who were already started on antibiotics (systemic or topical) were excluded. Individual study participant gave written, informed consent. A preset proforma was used to collect data regarding population characteristics, history of presenting illness with disease duration, constitutional symptoms, site of onset of lesions, treatment with immunosuppressive drugs, associated diseases such as diabetes mellitus, malignancies, and other immunosuppressive conditions, previous episodes of similar skin lesions, family history of similar illness and details of previous laboratory investigations. Level of personal hygiene was assessed by a hygiene score taken from a study conducted by Bhat *et al*., which considered parameters such as handwashing, showers per week, and shared items.[6] Hygiene score <6 was considered as indicative of poor hygiene practices.[6] A thorough clinical examination was done and we recorded the findings. We noted the clinical diagnosis based on morphology of the lesions in each patient.[7]

We did a Gram stain analysis and pus culture and sensitivity study on lesional swabs before starting treatment with antibiotics (lesions were first cleaned with sterile saline and then swabs/ aspirates were collected). Samples were sent to the microbiology department for culture and antibiotic sensitivity analysis. Antimicrobial susceptibility testing was done by CLSI (clinical and laboratory standards institute) guidelines.[8] Antibiotic susceptibility testing was carried out using disc diffusion technique with a set of antibiotics such as penicillin, cloxacillin, first generation cephalosporins, erythromycin, gentamicin, amikacin, vancomycin and linezolid for *S. aureus* and all except cloxacillin for *Streptococcus*. *S. aureus* resistant to cloxacillin was considered as MRSA.[9] Gram negative bacteria were tested for sensitivity to ampicillin, ciprofloxacin, gentamicin, amikacin, first and third generation cephalosporins, piperacillin, tazobactam, meropenem and imipenem. Patients underwent urine microscopy analysis, random blood sugar estimation and serology for human immunodeficiency virus infection as and when indicated.

The data were entered in Microsoft excel sheet and analysed. Categorical variables were expressed as frequency and percentage.

RESULTS

Among the 180 study participants with primary pyoderma, 101 (56.1%) were males. Most of the patients were children below the age of 10 years (74, 41.1%). Twenty three patients (23, 12.8%) had a history of recurrent episodes, 25 (13.9%) had associated diabetes mellitus, 16 (8.9%) had atopic dermatitis, and 26 (14.4%) were on systemic corticosteroids. History of similar lesions among family members were seen in 22 (12.2%) patients. Poor personal hygiene practices were observed in 43 (23.9%) patients.

Sixty five patients (65/180, 36.1%) had lesions confined to lower limbs. Most common primary pyoderma [Table 1] was impetigo (73 cases; 40.6%), followed by folliculitis (38 cases; 21.1%).

Male predilection was observed in folliculitis (22/38 cases, 57.9%) and impetigo (45/73 cases, 61.6%). Cellulitis (6/16, 37.5%) and erysipelas (4/12, 33.3%) were more common in study participants aged above 60 years.

Gram stain study detected gram positive cocci in 115 cases (63.9%). Seventy seven smears showed organisms which were morphologically suggestive of staphylococci (77/180, 42.8%). Thirty eight (38/180, 21.1%) gram positive cocci appeared in chains showing a morphological similarity to *Streptococcus* species. Gram negative bacilli was identified in one patient (1/180, 0.6%) with ecthyma gangrenosum.

S. aureus was isolated in pus culture from 92 (92/180, 51.1%) patients and *Streptococcus pyogenes* was isolated in 34 (34/180, 18.9%). *Pseudomonas aeruginosa* was isolated from

Table 1: Primary pyodermas in study participants

Clinical type	Number (percentage) 180 (100%)
Bullous impetigo	24 (13.3%)
Non-bullous impetigo	49 (27.2%)
Superficial folliculitis	20 (11.1%)
Deep folliculitis	18 (10%)
Carbuncle	12 (6.7%)
Furuncle	22 (12.2%)
Cellulitis	16 (8.9%)
Erysipelas	12 (6.7%)
Ecthyma	5 (2.8%)
Ecthyma gangrenosum	2 (1.1%)

the lesions of two (2/180, 1.1%) patients. Out of 16 cases of cellulitis, organism was isolated in 9 (9/16, 56.3%) cases- 7 cases (7/9, 77.8%) yielded streptococci, and 2 cases (22.2%) yielded *S. aureus*, out of which one was MRSA.

Gram stain identified the pathogen as *Staphylococcus* in 77 out of the 92 cases (83.7%), which were confirmed by pus culture. Gram stain identified the pathogen correctly in 34 out of the 38 (89.5%) culture proven cases of streptococci. Gram stain identified the organism as gram negative bacilli in 1 of the 2 patients with *Pseudomonas aeruginosa* associated disease.

Majority of the *S. aureus* isolates (90 cases, 97.8%) were resistant to penicillin and 39.1% (36 cases) were resistant to erythromycin. Most of the isolates were sensitive to cloxacillin (64, 69.6%) and first generation cephalosporins (88, 95.7%). All the isolates were sensitive to vancomycin and linezolid [Table 2].

All the isolates of *Streptococcus pyogenes* were sensitive to penicillin, first generation cephalosporins and vancomycin [Table 3]. The two strains of *Pseudomonas aeruginosa* were sensitive to piperacillin and tazobactam, but resistant to gentamicin, amikacin and ceftazidime. Out of the two isolates of *Pseudomonas aeruginosa*, one (1/2, 50%) was sensitive to ciprofloxacin [Table 4].

Table 2: Antimicrobial susceptibility pattern of *Staphylococcus aureus* isolates

Antibiotic	Sensitive isolates n=92 (100%)	Resistant isolates n=92 (100%)
Penicillin	2 (2.2%)	90 (97.8%)
Cloxacillin	64 (69.6%)	28 (30.4%)
Cephalosporin (first generation)	88 (95.7%)	4 (4.3%)
Erythromycin	56 (60.9%)	36 (39.1%)
Gentamicin	67 (72.8%)	25 (27.2%)
Amikacin	90 (97.8%)	2 (2.2%)
Vancomycin	92 (100%)	0 (0%)
Linezolid	92 (100%)	0 (0%)

Table 3: Antimicrobial susceptibility pattern of *Streptococcus pyogenes* isolates

Antibiotic	Sensitive isolates n=34 (100%)	Resistant isolates n=34 (100%)
Penicillin	34 (100%)	0 (0%)
Cephalosporin (first generation)	34 (100%)	0 (0%)
Erythromycin	31 (91.2%)	3 (8.8%)
Gentamicin	30 (88.2%)	4 (11.8%)
Amikacin	32 (94.1%)	2 (5.9%)
Vancomycin	34 (100%)	0 (0%)

Table 4: Antimicrobial susceptibility pattern of *Pseudomonas aeruginosa*

Antibiotic	Sensitive isolates n=2 (100%)	Resistant isolates n=2 (100%)
Gentamicin	0 (0%)	2 (100%)
Amikacin	0 (0%)	2 (100%)
Ciprofloxacin	1 (50%)	1 (50%)
Ceftazidime	0 (0%)	2 (100%)
Piperacillin Tazobactum	2 (100%)	0 (0%)

DISCUSSION

Impetigo (40.6%) being the most common primary pyoderma in our study followed by folliculitis (21.1%) was in accordance with previous studies.[5,10,11] The disease predilection noted in children was consistent with literature.[4] This is attributed to the poorly developed immune defense mechanisms against cocci in children.[12] Moreover, skin lipids which have a protective role against bacterial infection are less in the skin of children in comparison to adults. A slight male preponderance observed by us was concordant with other studies.[6]

Our observation of lower extremities as the predominant site for pyodermas was consistent with literature.[6] The predilection of pyodermas for lower extremities is attributed to the higher chance of sustaining trauma at these sites.

We noted recurrent pyodermas in 12.7% patients, which was lower than the 45% recurrence rate reported by Mathew *et al.* in children.[13] Our study documented a family history of pyodermas in 12.2% patients, which was comparable to previous studies.[13,14]

Poor personal hygiene practices were observed in 43 (23.9%) of our patients, which was lower than the same noted in a previous study (69%), probably owing to the high literacy rate in Kerala and hence better self-care behavior among study participants.[6,15]

Gram stain showed a sensitivity of 83.7% and 89.5% respectively to identify staphylococci and streptococci, against the gold standard of pus culture. This indicates that Gram stain can serve as a simple, less time consuming, and cost effective tool to identify the bacterial pathogen, especially staphylococci and streptococci. In addition, Gram stain was suggestive of infection due to *Streptococcus pyogenes* in four cases, in which culture returned negative results. This is in agreement with the statement by Moschella that culture does not substitute, but only supplements direct microscopy.[3]

Our observation of *S. aureus* as the common pathogen in pyoderma was comparable to the findings of Mathew *et al.*, who isolated *S. aureus* in 47.5% cases, *Streptococcus pyogenes* in 13.3% and both in 26.7%.[13] An interesting observation in our study was the isolation of *Streptococcus pyogenes* and *S. aureus* from the blister fluid in patients with cellulitis.

S. aureus showed resistance to many of the first line antibiotics in our study, while *Streptococcus pyogenes* was uniformly susceptible to them. Most of the *S. aureus* isolates were resistant to penicillin (97.8%). A significant proportion of *S. aureus* isolates were resistant to erythromycin (39.2%) as well, suggesting natural penicillins and macrolides to be less effective in the management of staphylococcal pyodermas. The high resistance rates of staphylococci for penicillin and erythromycin may be due to the widespread use of these antibiotics for several common ailments. The prevalent practice of over the counter use of many of these drugs in this part of the world might have contributed to the drug resistance. There were 28 cases (30.5%) of MRSA in our study which was higher than the same reported in previous studies (20%).[16,17]

CONCLUSION

Pyodermas were more prevalent in children and males. Impetigo was the most common cause of primary pyoderma. *S. aureus* was the predominant pathogen in pyodermas. Gram stain remains a valuable, but often neglected tool in identifying the pathogen in direct smear.

Streptococcus pyogenes was sensitive to most of the first line antibiotics, while a high percentage of *S. aureus* isolates was resistant to penicillin and erythromycin. Our study showed a high prevalence of MRSA. This highlights the need for periodic assessment of bacterial isolates, and their drug susceptibility pattern in different geographic regions so as to ensure judicious use of antibiotics for the optimal management of pyodermas.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

Dr Sandhya George is on the editorial board of the Journal.

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