Clinical and Bacteriological Aspects of Pyoderma

Pyoderma is one of the commonest clinical conditions encountered in dermatological practice.[1] Primary pyodermas are impetigo, follicultis, furuncle, carbuncle, ecthyma, erthyrasma, and sycosis barbae. Secondary pyodermas constitute tropic ulcer, infected pemphigus, infected contact dermatitis, infected scabies, and various other dermatoses infected with organisms. Various factors like poverty, malnutrition, overcrowding, and poor hygiene have been stated to be responsible for its higher incidence in the lower socio-economic class. Climatic conditions also play a major role.[2] Changing trends are being noted in the etiological aspects of primary pyoderma, and the problem of emergence of drug resistance strains is an even increasing one. Most common organism usually isolated in pyoderma is *Staphyloccus aureus*, which may be either methicilllin-sensitive (MSSA) or methicilllin-resistant (MRSA). MRSA is an important health care associated pathogen. Many of these isolates are becoming multidrug resistant. All β-lactams including carbapenams and high-end cephalosporins, piperacillin, tazobactum etc. are ineffective against MRSA. Knowledge of prevalence of MRSA and their current anti-microbial profile becomes necessary in the selection of appropriate empirical treatment of these infections.[3] Here, we report the clinical and bacteriological aspects of the pyodermas to guide for the selection of appropriate antibiotics and to prevent the emergence of resistant organisms. We found that the incidence of impetigo was maximum among pyoderma. The primary pyoderma cases were maximum in the age group of < 10 years, and prevalence rate was higher in male patients. Among the various diseases, scabies was found to be the commonest to be associated with primary pyoderma. Most common isolated organism was *Staphylococcus aureus*. Pyodermas are a common cause of skin infection in children and are associated with many multidrug-resistant organisms such as MRSA. A correct anti-microbial policy based on the knowledge of resistance patterns of the commonly isolated organisms is mandatory to prevent unnecessary medication and further emergence of drug-resistant organisms.

The study was conducted in the department of Microbiology, Gajra Raja Medical College, Gwalior, MP, India. A total of 200 patients were selected for study from department of Skin and VD, Gajra Raja Medical College, Gwalior from January 2009 to December 2010. Comprehensive history was taken along with physical and dermatological examination for all the patients. Patients with skin lesion with formation of pus were included and patients with lesion without pus were excluded for the study. All the samples were collected aseptically with two sterile cotton swabs for each sample from the lesion, which were processed for isolation and identification of bacterial pathogens, according to the standard microbiological techniques.[4] Gram stain preparations were made from one swab, and culture plates were inoculated from another swab. Each sample was inoculated on blood agar, MacConkey agar, and mannitol salt agar. All the above media and reagents were obtained from HiMedia, Mumbai, India. The media were prepared according to the manufacturers' instructions. The plates were incubated at 37°C for 18–24 hours in an incubator. The plates were observed for growth the following day but incubation was extended to 48 hours if there was no bacterial growth within 24 hours. Isolated colonies were subjected to Gram staining and biochemical tests for identification. Identification was carried out according to the standard biochemical tests.[4]

Anti-microbial susceptibility test was carried out on isolated and identified colonies using commercially prepared antibiotic disk (HiMedia) on Mueller Hinton agar plates by the disk diffusion method, according to the Central Laboratory Standards Institute (CLSI) guidelines.[5,6] Antibiotics used in our study were amoxycillin (100 μg), amoxyclav (20 μg), cefexime (5 μg), ceftrixone (30 μg), cefuroxime (30 μg), cefoperazone/sulbactam (75/10 μg), ciprofloxacin (5 μg), cotrimoxazole (25 μg), doxycyclin (30 μg), erythromycin (15 μg), gentamicin (10 μg), and vancomycin (30 μg). MRSA detection was done using oxacillin disc (1 μg), and using Mueller Hinton agar with 2% NaCl. The plates were incubated for 24 hours at 35°C, and zone diameter was measured. If zone diameter was ≥13 mm, it was considered as MSSA and if it was ≤10mm, then it was considered as MRSA.[5]

Out of 200 cases of pyoderma, impetigo constituted 106 (53%) cases, superficial folliculitis 78 (39%) cases, furunculosis 13 (6.5%) cases, and carbuncle 3 (1.5%) cases, respectively [Table 1]. The frequency of cases in relation to age is shown in Table 2. The number of cases were maximum in the age group of less than 10 years (48%), followed by the age group of 21–30 years (21%), 11-20 years (17%), 31-40 years (09%), 51-60 years (2.5%), 41-50 years (1.5%), and > 60 years (0.5%). We also

correlated the relationship between pyoderma and sex. The prevalence rate was higher in male (61.2%) patients compared with females (38.5%). Among the various diseases that were found to be associated with primary pyoderma, scabies was seen to be commonest in 17 (8.5%) cases. The other diseases in descending order of cases were vitiligo 3 (1.5%), diabetes mellitus 2 (1%), dermatophytosis 2 (1%), acne 1 (0.5%), and molluscum contagiosum 1 (0.5) [Table 3]. The study of body-wise distribution of pyoderma revealed that lower extremities were the most often affected site (60%), followed by head (47.5%), upper extremities (21.5%), and trunk (12.5%), respectively. The low socio-economic class was seen to be very commonly affected in 131 (65.5%) cases. The middle class was affected in only 60 (30%) while 9 (4.5%) cases belonged to the upper class. Out of 200 specimens, most common isolated organism was *S. aureus* (155, 77.5%), followed by β-hemolytic *Steptococci* (6, 3%), *Klebsiella* spp. (10, 5%), *E. coli* (6, 3%), *and P. aeruginosa* (4, 2%). There was no growth in 19 (9.5%) samples [Table 4]. The study of the individual pyoderma in relation to the causative organisms revealed that impetigo (106 cases) was found to be caused by *S. aureus* (86) followed by β-hemolytic *Steptococci* (05), *Klebsiella* spp. (02), *Escherichia coli* (02), *P. aeruginosa* (01), and sterile (10). Superficial follicultis (78) was found to be caused by *S. aureus* (56) followed by β-hemolytic *Steptococci* (01), *Klebsiella* spp (07), *E. coli* (04), *P. aeruginosa* (03), and 7 samples showed no growth. *S. aureus* was again the most common organism for furuncle. Furuncle (13) was found to be caused by *S. aureus* (10) followed by *Klebsiella* spp (01), and only 2 samples showed no growth. All the 3 cases of carbuncle showed yield of *S. aureus*.

In our study, *S. aureus* was sensitive to vancomycin (99.35%) followed by ceftriaxone (99.19%), cefoperzone/ sulbactum (99.19%), gentamicin (96.77%), amoxyclav (94.35%), doxycyclin (89.5%), ciprofloxacin (74.19%), cefuroxime (60%), erythromycin (58.06%), co-trimoxazole (50.32%), amoxicillin (34.84%), and cefixime (40%) respectively. Among the gram-negative bacteria, most isolates showed resistance to cefepime (80%), amoxicillin (75%), and cotrimoxazole (50%). Seventy percent of isolates were sensitive to ciprofloxacin and doxycycline. Out of 155 isolates of *S. aureus*, 124 (80%) were methicillin-sensitive (MSSA) and 31 (20%) were methicillin-resistant (MRSA). When comparing the different types of pyoderma and their association with MRSA, it was seen that out of 86 impetigo cases, 72 (83.72%) were MSSA and 14 isolates were MRSA, whereas out of 56 isolates of superficial folliculitis, MSSA found in 42 (75%) and MRSA in 14 (25%), 13 isolates of furunculosis, MSSA found in 7 (70%) and MRSA in 3 (30%), and all 3 isolates of carbuncles were MSSA. This data clearly indicates the increasing incidence of MRSA in cases from impetigo to furuncle i.e. 16.28%, 25%, and 30% respectively.

Table 1: Sex distribution of the primary pyoderma

Cases	Male (No./Percentage)	Female (No./Percentage)	Total
Impetigo	58 (54.72)	48 (45.28)	106
Superficial folliculitis	51 (65.39)	27 (34.61)	78
Furuncle	11 (84.62)	02 (15.38)	13
Carbuncle	03 (100)	0	03
Total	123	77	100

Table 2: Age distribution of the primary pyoderma

Age (Years)	No. of cases	Percentage
0-10	96	48
11-20	34	17
21-30	42	21
31-40	18	09
41-50	03	1.5
51-60	05	2.5
61-70	01	0.5
71-80	01	0.5
Total	200	100

Table 3: Distributions of associated diseases with pyoderma

Diseases	No. of cases	Percentage
Scabies	17	8.5
Vitiligo	3	1.5
Diabetes mellitus	2	1
Dermatophytosis	2	1
Acne	1	0.5
Molluscum contagiosum	1	0.5
Total	26	13

Table 4: Bacteriological analysis of the primary pyoderma

Organisms	Impetigo	Superficial folliculitis	Furuncle	Carbuncle
Staphylococcus aureus	86	56	10	03
β-hemolytic *Streptococci*	05	01	-	-
Klebsiella spp.	02	07	01	-
Escherichia coli	02	04	-	-
Pseudomonas aeruginosa	01	03	-	-
Sterile	10	07	02	-

Pyoderma has become a significant cause of skin infections. When the natural defense system of the body breaks down due to trauma, after invasive procedures, or chemotherapy, the normally benign bacteria can cause infection.[3] Our study showed that the overall incidence of impetigo was maximum among

pyoderma. Impetigo was mainly seen in first decade of life while the lesion of superficial folliculitis were found more in 2nd and 3rd decade of life. *S. aureus* was the most common causative agent in all types of primary pyoderma in this study. Maximum cases (53%) were of impetigo followed by superficial folliculitis (39%), furunculosis (6.5%), and carbuncle (1.5%) respectively. These findings are almost similar to Ghadage DP *et al.* who showed that the maximum cases included in their study were of impetigo (39%) followed by superficial folliculitis (13%), and carbuncle (1.5%), respectively.[7] Mathew *et al.* also concluded the same findings.[8] In contrast, Bhaskaran *et al.* found that superficial folliculitis (25.9%) was the most common pyoderma followed by impetigo (16.36%) and furunculosis (4%).[9] When factors such as age and sex of the patient were considered, we found the occurrence of pyoderma to be higher in males and in patients in the age group below 10 years. Lawrence *et al.* also observed in their study that children less than 5 years age had the greatest prevalence of lesions.[10] Recently, many authors also reported pyoderma to be more common in the first decade of life.[11,12]

In the present study, it was found that the lower extremities were involved in 60% cases followed by head (47.5%), upper extremities (21.5%), and trunk (12.5%) respectively. These results follow the trends seen in the older studies.[8,13,14] In our study, culture showed growth of *S. aureus* (77.5%) followed by β-hemolytic *Streptococi* (3%), *Klebsiella* spp (5%), *E. coli* (3%), *P. aeruginosa* (2%), and 9.5% were sterile. Bhaskaran *et al.* also reported 48.6% incidence of *S. aureus*.[9] Ghadage *et al.* and Parikh *et al.* found *S. aureus* in 67% and 97% cases, respectively.[7,15] *S. aureus* was sensitive to vancomycin (99.35%) followed by ceftriaxone (99.19%), cefoperzone/sulbactum (99.19%), gentamicin (96.77%), amoxyclav (94.35%), doxycyclin (89.5%), ciprofloxacin (74.19%), cefuroxime (60%), erythromycin (58.06%), co-trimoxazole (50.32%), amoxicillin (34.84%), and cefixime (40%) respectively. Thus, overall, it has been found to be more sensitive to vancomycin, gentamicin, ceftriaxone, and amoxyclav. Widespread amoxicillin and cefixime resistance have emerged due to their extensive use and the emergence of penicillinase producing strains. Ramana *et al.* also reported that *S. aureus* was 100% sensitive to vancomycin, gentamicin, ciprofloxacin, and 81% and 8% sensitive to cefdinir and ampicillin, respectively.[16] Many reports from India and Asia have highlighted the prevalence of MRSA in the hospital- as well as community-acquired pyoderma. In present study, methicillin sensitivity was done by oxacillin disc examination. MSSA and MRSA were found in 80% and 20% cases, respectively, of *S. aureus* isolates. Nagaraja *et al.* reported an isolation rate of MRSA as 10.9% from community-acquired infection in India.[17] However, Qureshi *et al.* from Pakistan reported a high isolation rate of up to 83% MRSA from pus samples.[18]

In conclusion, primary pyoderma most commonly affected children in their first decade of life, and males were more affected than females. The cases were commonly from the lower socio-economic strata of society. Lower limbs were more commonly affected site, and scabies was the most common associated diseases. *S. aureus* was the commonest causative agent, and the emergence of MRSA in the community is a warning. A correct antibiotic policy and the avoidance of inappropriate anti-microbial usage are mandatory to reduce the spread of MRSA in the community.

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