Bacteriological profile of pyoderma in children

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Abstract

Introduction: Pyoderma are cutaneous bacterial infections, commonly seen in India and it constitutes a major portion of patients attending the dermatological clinics. It has been found to be associated with the low socioeconomic status and more prevalent in paediatric age group.

Aim: To find out causative organisms and their latest antibiotic susceptibility patterns in pyodermas.

Materials and Methods:

All patients visiting, Dermatology Dept in Kamineni Institute of Medical Sciences, Narketpally were screened over 18 months and those with erosive skin lesions and/or purulent discharge were included in the study and swabs were received in Microbiology Department for culture and sensitivity.

Results: There were 92 isolates from 100 cases, Out of 92 cases the various organisms isolated,include S.aureus, Coagulase negative staphylococcus, group A Streptococci, E.coli, Klebsiella spp, Enterobacter cloaca and Pseudomonas aeruginosa. S.aureus was the commonest organism isolated accounting for 72.5% of the total no of cases. S.aureus was most sensitive to Clindamycin (94.6%), followed by Cefazolin (90.5%), Amikacin (85.1%) and Tetracycline (74.3%). It was least sensitive to Penicillin (2.7%), Ciprofloxacin (50%) and Erythromycin (59.5%). Pseudomonas aeruginosa (8.8%) was second most common isolate and was most sensitive to Imipenem, Piperacillin/ Tazobactum, Ceftazidime/ Clavulanic acid and Amikacin (100%) each. It was least sensitive to Ciprofloxacin, Piperacillin, Ceftazidime (77.7%) each and Gentamicin (66.6%).

Out of total 74 isolates of S.aureus 2 were resistant to Methicillin. Thus the percentage of MRSA isolated was 2.7%.

Conclusion: The gram positive organisms were more sensitive to cefuroxime, clindamycin, cafezolin. Gram negative organisms were most sensitive to piperacillin/tazobactum, ceftazidime/clavulanic acid and amikacin. Only two staph.aureus strains were methicillin resistant and they were sensitive to vacomycin, cpirofloxacin, tetracycline. The presence of inducible clindamycin resistance among Staph.aureus strains indicates the importance of identification of such strains by D-test to avoid treatment failures with clindamycin.

Keywords: Pyoderma, Bacteriological agents.

Introduction

Pyoderma is a cutaneous infection, caused by pus forming bacterial, commonly seen in India and it constitutes a major portion of patients attending the dermatological clinics.[1] It has been found to be associated with the low socioeconomic status and more prevalent in paediatric age group.[2-3] It has been associated with the climatic changes, particularly seen in summer and during monsoon.[4] 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, erthyrasma, 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 in 1990 studied 570 cases of pyoderma, in which 58.8% cases were of primary pyoderma, and rest were secondary pyoderma.[5] Chopra et al 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%).[6] Majority of cases belonged to age group of 0-10 years.[6] Several other Indian studies classified and demonstrated the presence of primary and secondary pyoderma from different regions.[7,8]

The bacterial etiological factors mainly includes Gram positive organisms among them *S.aureus* is the most common organism isolated,[9] with beta haemolytic Streptococci being the next common isolate,[10] Enterococcus has also been isolated from a few cases.[11] The various Gram negative organisms[6] isolated include *E.coli, Pseudomonas spp, Proteus spp, Citrobacter spp, Klebsiella spp, and Acinetobacter spp*.[12]

In the present study at was conducted in Microbiology department in collaboration with department of Dermatology Kamineni Institute of Medical Sciences aim to demonstrate the presence and distribution of the primary and secondary pyoderma cases in paediatrics as well as their bacterial etiological factors. The work has been approved by institutional ethical committee.

Materials and Methods

A hospital based cross sectional study was conducted. The study period was from Jan 2012 to Aug 2013. A total of 100 paediatric cases were included in the study and the history was taken along with physical and dermatological examination with the help of dermatologist for all the patients. Paediatric patients with skin lesion with formation

of pus were included. 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 isolates according to CLSI guidelines. Gram stain preparations were made from one swab, and culture plates were inoculated from the other swab. Each sample was inoculated on blood agar, MacConkey agar. The plates were incubated at 37°C for 18–24 hours in an incubator. The bacterial colonies were subjected to Gram staining and biochemical tests for identification. The identification was carried out according to the laboratory protocol. The pathogen isolated was subjected to antibiotic susceptibility test on Muller Hinton agar media according to CLSI guidelines. The antibiotics used in our study for gram positive cocci were, Penicillin (10units), gentamicin (10 µg), amikacin (30µg), ciprofloxacin (5 µg), cefazolin(30 µg), cefuroxime(30 µg), erythromycin (15 µg), co-trimoxazole (25 µg), tetracycline (30 µg), and vancomycin (30 µg), clindamycin (2 µg).

The drugs used for gram negative bacilli were, Ampicillin (10 µg), gentamicin (10 µg), amikacin (30 µg), ciprofloxacin (5 µg), piperacillin(100 µg), ceftazidime(30 µg), ceftazidime + clavulanic acid(30 + 10 µg), piperacillin + tazobactam (100+10 µg), co-trimoxazole (1.25+23.75 µg), tetracycline(30 µg), imipenem (10 µg).

Staphylococcus aureus strains which were erythromycin resistant were further subjected to double disc diffusion test (D-test) to detect inducible MLS_B (Macrolide-lincosamide-streptogramin B) resistance. Erythromycin (15µg) disc was placed at a distance of 15mm (edge to edge) from clindamycin (2µg) disc on a Mueller Hinton agar plate previously inoculated with 0.5 McFarland bacterial suspension. After overnight incubation at 37^0C, the plates were examined to detect flattening of the zone (D shaped) around clindamycin in the area between the two discs. Strains that were positive in the D-test were considered inducible MLS_B resistant, strains that were resistant to both erythromycin and clindamycin were considered constitutive MLS_B resistant and strains that were resistant to erythromycin but susceptible to clindamycin were considered MS(moderate sensitive) phenotype.[13]

Results

Out of 100 cases the primary pyoderma has been observed in 72% of cases and 28% of cases are with the secondary pyoderma. The folliculitis seen in 38% of cases, Impetigo in 17% of cases and remaining other primary pyoderma constitutes 17% of lesions. The major lesions of secondary pyoderma constitutes infected scabies 14%. The study includes 63 boys and 37 girls with the mean age of 12.2 years (0 days-14 years).(Fig. 1)

Fig. 1: a. Folliculitis b. Periporitis c. Dissecting cellulitis d. Infected Eczema

Of the total 72 cases of Primary Pyoderma most of the cases were seen in pre-school 1-5 years(41.6%), followed by 6-9 years(34.72%) of age group. Out of total 100 cultures 92 samples showed growth, among positive cases yielding growth 82 cases (89.1%) showed only one type of growth, whereas 10 cases (10.9 more than one types of organisms. Out of 102 total isolates from 92 cases, *S.aureus* showed 72.5% of growth, Coagulase negative *Staphylococci* (CONS) 4.9%, Group A Streptococci (GAS) 2.9%, *Pseudomonas aeruginosa*8.8%, *Klebsiella oxytoca* 3.9%, *Klebsiella pneumoniae* 2.9%, *Escherichia coli* 1.9%, *Enterobacter cloaca* 1.9%. *Staphylococcus aureus* was the commonest organism isolated 74 (72.5%) in, followed by *Pseudomonas aeruginosa* 9 (8.8%). MRSA has been noticed in 2 cases. The isolation of the organisms distributed among primary and secondary pyoderma has been seen in bar diagram Fig. 2 and Fig. 3.

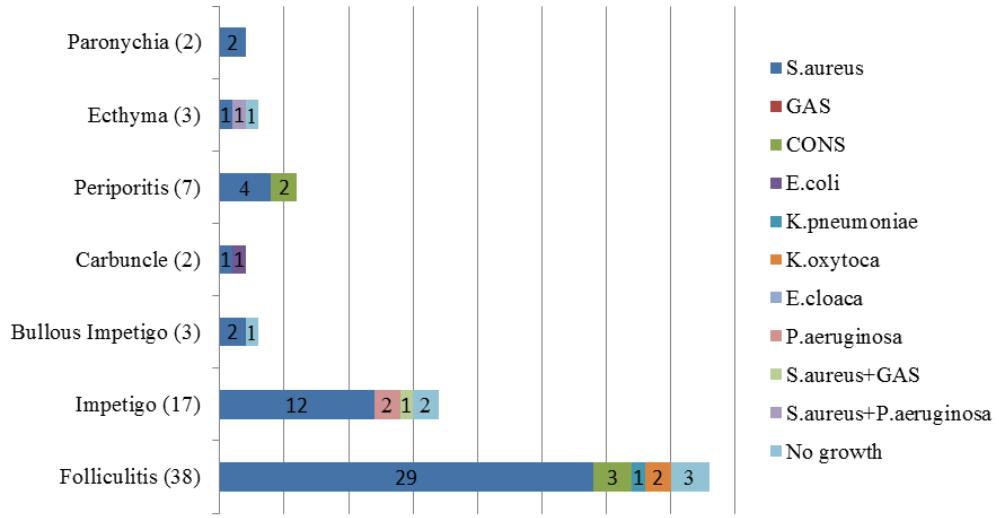

Fig. 2: Bar diagram showing distribution of type and number of isolates in primary pyoderma cases. (n=72)

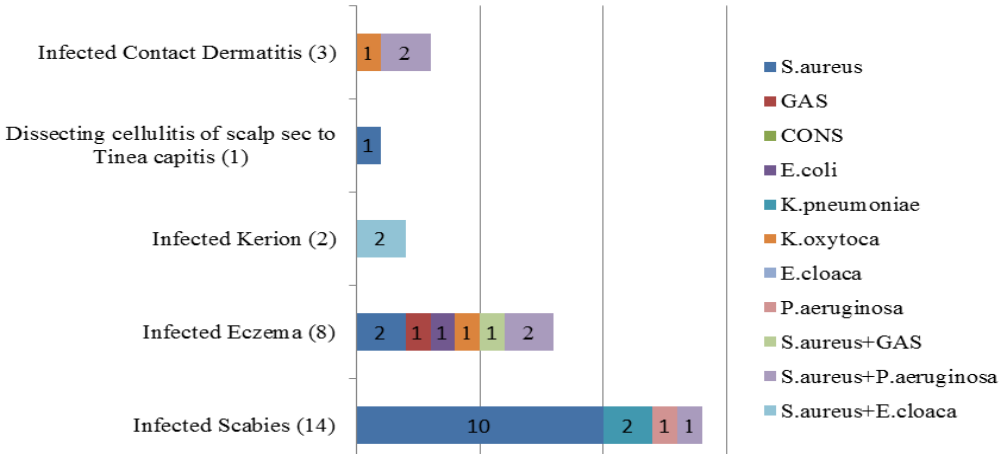

Fig. 3: Bar diagram showing distribution of type and number of isolates in secondary pyoderma cases. (n=28)

The gram positive bacteria isolated have shown resistance to penicillin (72%), Erythromycin (41%), Co-trimoxazole (30%), and ciprofloxacin (50%) and remaining are sensitive to most of other antibiotics. (Table 1) The Gram negative organisms were most sensitive to imipenem followed by piperacillin/tazobactum, ceftazidime/clavulanic acid and amikacin. (Table 2)

Table 1: Antibiotic Resistance Pattern in Gram Positive Isolates

Antibiotic tested	S.aureus	CONS	GAS
Penicillin	72(97.3%)	4(80%)	0
Gentamicin	20(27%)	1(20%)	0
Amikacin	11(14.9%)	1(20)	0
Ciprofloxacin	37(50%)	3(60%)	0
Erythromycin	30(40.5%)	3(60%)	0
Clindamycin	4(5.4%)	7(9.5%)	0
Cefazolin	7(9.5%)	0	0
Cefuroxime	0	0	0
Co-trimoxazole	22(29.7%)	0	0
Tetracycline	19(25.6%)	0	0
Cefoxitin	2(2.7%)	0	NA
Vancomycin	0	0	NA
Total no. of isolates	74	5	3

Table 2: Antibiotic resistance patterns in gram negative isolates

Antibiotic tested	P.aeruginosa	K.pneumoniae	K.oxytoca	E.coli	E.cloaca
Ampicillin	NA	NA	NA	2(100%)	1(50%)
Gentamicin	3(33.3%)	0	0	0	1(50%)
Amikacin	0	0	0	0	0
Ciprofloxacin	2(22.2%)	1(33.3%)	1(25%)	0	1(50%)
Piperacillin	2(22.2%)	1(33.3%)	1(25%)	0	1(50%)
Ceftazidime	2(22.2%)	1(33.3%)	1(25%)	1(50%)	0
Ceftazidime + Clavulanic acid	0	0	0	0	0
Piperacillin + Tazobactum	0	0	0	0	0
Co-trimoxazole	NA	0	0	0	2(100%)
Imipenem	0	0	0	0	0
Tetracycline	NA	0	1(25%)	2(100%)	1(50%)
Total no. of Isolates	9	3	4	2	2

Four Staphylococcus aureus strains were clindamycin resistant, all were inducible MLS_B, in which 2 strains were MRSA and remaining 2 were MSSA.

Discussion

Bacterial skin infections in children are a common problem encountered in clinical medicine. The present study was carried out on a group of 100 cases of pyoderma, visiting the Dermatology outpatient department of Kamineni Institute of Medical Sciences, to establish the bacterial causes of common primary and secondary pyodermas as well as to determine their antimicrobial susceptibility pattern against different antibiotics. Present study showed that majority of the patients belonged to lower income group (79%) followed by the middle income group (21%). None were from high income group. This has been noted by other workers also.[14]

In the present study conducted on 100 cases the most common pathogen isolated was *S.aureus* (72.5%). The same finding has been reported by other workers. Patil R, Baveja S et al[9] isolated 81.4% and Ramana KV et al[11] isolated 52.1%. In the present study 4.9% of CONS have been isolated. Percentage of CONS in other studies has been variable and includes 23.6% by D P Ghadage et al,[1] 19.2% K V Ramana et al,[11] 2.02% by A Chopra et al[6] and 2.5% by Neirita Hazarika et al.[15]

Isolation of *Streptococci* in the present study was 2.9% which is similar to the study of R Patil et al,[9] where the isolation rate was 2.3%, K Mariam Ali et al [16], where the isolation was also 2.3% and G Shashi et al[17] where isolation rate was 3%. However other studies[3] have shown a higher isolation rate. Among the gram negative isolates *Pseudomonas aeruginosa* were the commonest isolate in the present study (8.8%). This is similar to study conducted by D P Ghadage et al,[1] where the most common gram negative isolate was *Pseudomonas aeruginosa* (7.56%). The present study has shown that *Staphylococcus aureus*, the most common organism isolated, was most sensitive to Vancomycin (100%), Cefuroxime (100%), and Clindamycin (94.6%), followed by Cefazolin (90.5%), Amikacin (85.1%) and Tetracycline (74.3%). It was least sensitive to penicillin (2.7%), Erythromycin (40.5%) and Ciprofloxacin (50%). Similar findings have been shown by other workers,[3,5] however R Patil et al[9] and K V Ramana et al[11] have shown increased sensitivity to Ciprofloxacin.

Conclusion

We conclude that Primary pyoderma was common in children and the commonest clinical type was Folliculitis followed by Impetigo. Secondary pyoderma cases contributed only few cases where commonest type was Infected Scabies. The most common causative agent of pyoderma was *Staphylococcus aureus* followed by *pseudomonas aeruginosa*, *Klebsiella oxytoca*, Group A beta hemolytic *Streptococc*i, *Klebsiella pneumoniae, and Escherichia coli*. The gram positive organisms were most sensitive to vancomycin followed by cefuroxime, clindamycin, cefazoline, amikacin. The Gram negative organisms were most sensitive to imipenem followed by piperacillin/tazobactum, ceftazidime/clavulanic acid and amikacin. The presence of inducible clindamycin resistance among *Staphylococcus aureus* strains indicates the importance of identification of such strains by D test to avoid treatment failures with clindamycin.

Conflicts of Interest: None.

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