

Clinicobacteriological study of pyoderma in pediatric age group

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Abstract

Background: Pyoderma is the pyogenic infection of the skin and its appendages. In India, pyoderma account for 25% of the patients attending dermatological clinics. It is more common in paediatric age group. **Methodology:** The study was carried out in the Department of Microbiology, at SRTR GMC, Ambajogai. The study was carried out on 108 samples obtained from clinically diagnosed cases of pyoderma in paediatric age group. After a detailed history and complete clinical examination, sample was collected from site of lesion with the help of sterile cotton swab. Immediately after collection, sample was transported to the laboratory for further bacteriological processing and Antimicrobial susceptibility testing. **Result:** The age-group of patients was from 0-12 years and majority of patients (62.03%) belonged to low socioeconomic status. Commonest clinical type of pyoderma was impetigo. The *Staphylococcus aureus* (68.5%) was observed to be the most common pathogen followed by Beta haemolytic Streptococci. Antibiogram reveals that most of the GPCs showed resistance to commonly used antibiotics like Erythromycin, Tetracyclin, Co-trimoxazole. *E. coli* and *Klebsiella* species showed resistance to all antibiotics except Imipenem and Gentamicin. **Conclusion:** Continuous monitoring of antimicrobial susceptibility to prevent development of antimicrobial resistance should be done for better patient management.

Keywords: Impetigo, Paediatrics, Pyoderma, *Staphylococcus aureus*.

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INTRODUCTION

Pyoderma is the pyogenic infection of the skin and its appendages.¹ It is one of the commonest conditions encountered in dermatological practice in all age groups. In India, pyoderma account for 25% of the patients attending dermatological clinics. It is more common in paediatric age group.² There is a higher incidence of pyoderma in developing countries, particularly in children of lower socio-economic status. Various factors like poverty, malnutrition, overcrowding and poor hygiene

have been stated to be responsible for it.³ In paediatric age group, pyoderma is more common in preschool children than in school going children. Clinically pyoderma is divided into primary and secondary types. Primary pyoderma tends to have characteristic pattern and course. They are caused by single organism and arise in normal skin. Examples are folliculitis, impetigo, furuncles etc. Secondary pyoderma arises in diseased skin as a superimposed condition. The infection may not follow the characteristic course. Usually more than one organism is involved in their infections. Example is infectious eczematoid dermatitis. Coagulase positive staphylococci, group A Beta haemolytic streptococci and coagulase negative staphylococci are responsible for most of the primary as well as secondary pyogenic infections of the skin. Occasionally some Gram negative organisms like *Escherichia coli*, *Klebsiella* spp., *Pseudomonas aeruginosa* and few anaerobes like *Bacteroides* and *fusobacterium* spp. are also responsible.^{1,4} Changing trends are being noted in the aetiological aspect of primary pyoderma. *Staphylococcus aureus* was predominant causative organism found in most types of

pyoderma.² Nowadays, many cases of pyoderma do not respond to antibiotics like penicillin, streptomycin which were previously effective for such cases.^[5] Perhaps indiscriminate use of topical and systemic antibiotics has contributed to the situation. Therefore, for successful treatment of pyodermas, detailed knowledge of causative organisms and their antibiotic susceptibility pattern should be available; considering this the present study on pyoderma was undertaken, to find out the causative organism and their antibiotic susceptibility pattern.

MATERIAL AND METHODS

The present study was carried out in the Department of Microbiology, at SRTR Govt. Medical College, Ambajogai. The study was carried out on 108 samples obtained from clinically diagnosed cases of pyoderma in paediatric age group. Detailed history was obtained regarding the social status, overcrowding, family history, past history, presenting complains and treatment received if any. History of similar complains in the schoolmates was also asked. A thorough physical examination was done to characterize and classify the lesion. After complete clinical examination, sample was collected from site of lesion with the help of sterile cotton swab. In every case, immediately after collection, sample was transported to the laboratory for further bacteriological processing. In the laboratory, Gram staining was performed for each sample. Every sample was inoculated on a plate of nutrient agar, blood agar, crystal violet blood agar (Pikes medium) and MacConkey medium for isolation of bacteria. These inoculated plates were incubated aerobically at 37°C for 24 hours except crystal violet blood agar. It was incubated in candle jar at 37°C for 24 hours.^{[6][7]} After incubation, all inoculated plates were examined for growth. Growth characteristics were noted. Morphology, biochemical reactions and identifications of isolate was carried out as per standard protocol. After identification of each isolated organism, antibiotic susceptibility testing was done on Mueller Hinton agar except streptococci. For the sensitivity of streptococci Mueller Hinton Agar with blood was used. Antibiotic susceptibility was done by using Kirby-Bauer disc diffusion method according to CLSI guidelines.⁸

RESULT

The present study was carried out in the Department of Microbiology at SRTR Govt. Medical College, Ambajogai. The present study comprised of 108 pus samples from children clinically diagnosed of pyoderma. They were investigated to find out causative organism and its antibiogram.

Table 1: Age wise distribution of cases of pyoderma

Age group (yrs)	No. of patients		Total	
	Male	Female	Number	Percentage

				(%)
<1	9	6	15	13.88
1-4	30	22	52	48.14
5-8	20	9	29	26.85
8-12	7	5	12	11.11
Total no	66	42	108	100
Percentage (%)	61.10	38.88	100	-

The highest number of cases was found in preschool age group i.e 1-4 years. (48.14%), while lowest number of cases was found in 8-12 years age group. In the present study, male constituted 61.1% of cases and female 38.88%, giving male to female ratio of 1.57:1. (Table-1)

Table 2: Distribution of pyoderma cases according to Socioeconomic status (n=108)

Socioeconomic status	No. of cases	Percentage
Lower	67	62.03
Middle	33	30.55
Higher	8	7.40
Total	108	100

In the present study, maximum cases (62.03%) were belonged to lower socioeconomic group, followed by middle (30.55%) and (7.40%) in higher socioeconomic group. (Table-2) The socioeconomic status was decided on criteria like per capita income, housing and environment, access to healthcare and nutrition.

Table 3: Distribution of cases according to clinical type

Clinical type of lesion	No. of cases	Percentage
Impetigo	43	39.81
Folliculitis	21	19.44
Furunculosis	20	18.51
Infectious eczematoid dermatitis	10	9.25
Ecthyma	7	6.48
Secondary pyoderma	5	4.62
Cellulitis	2	1.85
Total	108	100

In the present study, out of 108 cases, 43(39.81%) were cases of impetigo, 21 (19.44%) were cases of folliculitis, 20 (18.51%) were cases of furunculosis, 10 were cases of infectious eczematoid dermatitis. (Table-3) Thus, it is seen that maximum number of cases was of impetigo, followed by folliculitis and furunculosis.

Table 4: Isolation of organisms from pyodermic cases

Organism	No. of cases	Percentage (%)
Coagulase positive staphylococci	63	58.33
Beta haemolytic streptococci	09	8.33
Coagulase negative staphylococci	07	6.48
Coagulase positive staphylococci and Beta haemolytic streptococci	11	10.18
Coagulase negative staphylococci and Beta haemolytic streptococci	4	3.70
Escherichia coli	2	1.85
Klebsiella aerogens	2	1.85
Sterile	10	9.25
Total	108	100

In the present study, *Staphylococcus aureus* alone was isolated in 63 (58.33%) cases, Beta haemolytic streptococci alone in 9 (8.33%) cases and coagulase negative staphylococci alone in 7 (6.48%). Both *Staphylococcus aureus* and Beta haemolytic streptococci were isolated from 11 cases (10.18%). Thus in the present study, it seems that *Staphylococcus aureus* is predominant pathogen responsible for pyoderma followed by Beta haemolytic streptococci and coagulase negative staphylococci.

Table 5: Showing Antibiotic susceptibility pattern of Gram Positive organisms

Antibiotic	Coagulase positive staphylococci N=74 (%)	Coagulase negative staphylococci (N=11)	Beta haemolytic streptococci (N=24)
Penicillin G	7 (9.46)	3 (27.27)	11 (45.83)
Cefoxitin	30 (40.54)	6 (54.55)	-
Vancomycin	74 (100)	11 (100)	24 (100)
Gentamicin	66 (89.19)	9 (81.82)	-
Erythromycin	37 (50)	6 (54.55)	14 (58.33)
Clindamycin	50 (67.57)	8 (72.73)	17 (70.83)
Tetracyclin	38 (51.35)	6 (54.55)	16 (66.67)
Levofloxacin	66 (89.19)	9 (81.82)	20 (83.33)
Co-trimoxazole	37 (50)	6 (54.55)	14 (58.33)
Chloramphenicol	35 (47.30)	6 (54.55)	14 (58.33)
Linezolid	74 (100)	11 (100)	24 (100)

Table 6: Showing Antibiotic susceptibility pattern of Gram negative organisms

Antibiotic	<i>E. coli</i> N=2 (%)	<i>Klebsiella aerogenes</i> N=2 (%)
Ampicillin	0 (0)	(0)
Piperacillin-Tazobactam	1 (50)	2 (100)
Ceftriaxone	1 (50)	1 (50)
Ceftazidime	1 (50)	1 (50)
Aztreonam	1 (50)	1 (50)
Imipenem	2 (100)	2 (100)
Gentamicin	2 (100)	2 (100)
Tetracyclin	1 (50)	1 (50)
Ciprofloxacin	1 (50)	1 (50)
Co-trimoxazole	0(0)	1 (50)

In the present study, the susceptibility pattern of *Staphylococcus aureus* revealed 100 % sensitivity towards vancomycin and linezolid, followed by high susceptibility for Gentamicin (89.19%) and levofloxacin (89.19%). Moderate susceptibility was noted for Clindamycin (67.57%), Tetracyclin (51.35%), Co-trimoxazole (50%), Erythromycin (50%) and Chloramphenicol (47.30%). Least sensitivity was noted against Penicillin G (9.46%). Rate of isolation of MRSA in this study was 59.46%. Analysis of susceptibility pattern of Coagulase negative staphylococci in the present study showed 100% sensitivity against Vancomycin and

Linezolid followed by high susceptibility against Gentamicin (81.82%), Levofloxacin (81.82%) and Clindamycin (72.73%). Moderate susceptibility was noted against Erythromycin (54.55%), Tetracyclin (54.55%), Co-trimoxazole (54.55%) and Chloramphenicol (54.55%). Least susceptibility was noted for Penicillin G. In the present study Beta haemolytic streptococci showed 100 % sensitivity for Vancomycin and Linezolid. They were sensitive for most of the antibiotics out of which high sensitivity was noted for Levofloxacin (83.33%) and least susceptibility was found for Penicillin G (45.83%). Strains of *E. coli* and *Klebsiella aerogenes* showed resistance to all antibiotics except Imipenem and Gentamicin.

DISCUSSION

In the present study, 108 cases of pyoderma including primary and secondary types, were studied in the Department of Microbiology, SRTR Govt. Medical college, Ambajogai. The study group included children (0-12 years). It was observed that maximum number of cases belonged to the preschool age group of 1-4 years accounting for 48.14% of the cases, followed by 5-8 years of age group. The least incidence was observed in 8-12 years of age group. The age group wise distribution seen in this study correlates with the finding of Shashi Gandhi *et al* (2012) and Mathew MS *et al* (1992), who reported that pyoderma is more common in the preschool age group.^{2,9} The preponderance in preschool age group could be due to the fact that these children are exposed to unhygienic conditions when left under improper supervision by parents who are working as laborers. In the present study, males constituted 61.1% cases and females 38.88% cases giving male: female ratio of 1.57:1. This finding corresponds to Verma KC *et al* (1981) and Janardhan B *et al* (2015) who reported the incidence as 2:1 and 1.5:1 respectively.^{10,11} In the present study, 62.03% cases belonged to low socioeconomic group, 30.55% belonged to middle socioeconomic group and 7.40% belonged to higher socioeconomic group. Basset DC *et al* (1972) and Gupta CM *et al* (2015) have also reported similar findings with maximum cases belonging to low socioeconomic group.^{[12][13]} This can be attributed to poverty, overcrowding, malnutrition, poor hygiene, ignorance and lack of education. In the present study, we observed that predominant type of lesion was impetigo (39.81%), followed by folliculitis (19.44%) and furunculosis (18.51%) which correlates with the finding of Janardhan B *et al* (2015) and Mathew MS *et al* (1992).^{2,11} Burnetti J W (1962) quoted that impetigo is less severe but more contagious disease than other types of pyoderma. This may explain higher incidence of impetigo in the present study.¹⁴ In the present study,

isolation rate of *Staphylococcus aureus* was 68.5%, which is more or less comparable to those of Tushar S *et al* (2012), Kar PK *et al* (1985) and Mathew MS *et al* (1992) who reported the incidence to be 78.82%, 74.5% and 74.2% respectively.^{2,15,16} Beta haemolytic streptococci were isolated in 22.2 % of cases, which correlates with the finding of Pasricha *et al* (1972) and Ramani and Jaykar (1980), who reported the incidence as 22% and 25% respectively.^{17,18} In the present study, Coagulase negative staphylococci were isolated in 10.18% of cases which correlates finding of Tushar S *et al* (2012) and Khare *et al* (1988), who reported the incidence to be 12.94% and 6.95% respectively.^{5,15} Isolation of Gram negative bacilli ranges from 0-10.77% in various reports. In the present study, it was 3.60% which correlates with findings of Bhaskaran *et al* (1979) and Kishor J *et al* (1989).^{19,20} From the present study, it seems that *Staphylococcus aureus* is the Predominant pathogen responsible for pyoderma followed by Beta haemolytic streptococci and coagulase negative staphylococci, as suggested by various workers like Kishor J *et al* (1989) and Mathew MS *et al* (1992).^{2,20} Antibiogram of the isolated strains revealed that, all Gram positive cocci were sensitive to Vancomycin and linezolid. Similar observation made by Gupta CM *et al* (2015) and Ramani *et al* (1980).^{13,18} *Staphylococcus aureus* was largely susceptible to Gentamicin (89.19%), Levofloxacin (89.19%) and Clindamycin (67.57%). Gupta *et al* (2015) observed 80% sensitivity for Gentamicin, while Mathew MS *et al* (1992) found it to be 100%.¹³ Moderate sensitivity was noted against Tetracyclin (51.35%), Co-trimoxazole (50%), Erythromycin (50%). Gupta CM *et al* (2015) observed (48.44%) and (50%) sensitivity for Erythromycin and Co-trimoxazole respectively.¹³ Least sensitivity was noted for Penicillin G (9.46%) which is comparable with findings with Futado *et al* (2014).²¹ Higher rate of MRSA was found in our study (59.46%). Rate of MRSA isolation varies from 15% (Kalshetty *et al* 2004) to 83% from pus samples by Quereshi *et al* 2004.^{22,23} Higher rate of MRSA at our center is matter of concern, as these isolates being resistant to all Beta lactam antibiotics, limits the therapeutic options for pyoderma. Beta haemolytic streptococci showed moderate susceptibility to commonly used antibiotics like Erythromycin (58.33%), Tetracyclin (66.67%), Co-trimoxazole (58.33%), Chloramphenicol (58.33%) and Penicillin (45.83%). Gupta CM *et al* (2015) reported the the susceptibility pattern for Clindamycin, Erythromycin, Co-trimoxazole and Penicillin G as 75%, 25%, 50% and 50% respectively.¹³ All isolated GNBs were 100% sensitive to Imipenem and Gentamicin and were least sensitive to Ampicillin. Gupta CM *et al* (2015) reported 100 % sensitivity for Imipenem followed by 87.5% of

GNB isolates were susceptible to meropenem, amikacin, ciprofloxacin and levofloxacin,¹³ while in our study, 50 % of sensitivity was found for Ciprofloxacin.

CONCLUSION

The present study comprised of total 108 cases of pyoderma including both primary and secondary pyoderma. The age-group of patients was from 0-12 years and majority of patients (62.03%) belonged to low socioeconomic status. Commonest clinical type of pyoderma was impetigo followed by folliculitis and furunculosis. The *Staphylococcus aureus* (68.5%) was observed to be the most common pathogen irrespective of clinical type of pyoderma. Beta haemolytic Streptococci were the next common organisms isolated from 22.2% of cases followed by Coagulase negative staphylococci isolated from 10.18% of cases. Antibiogram study reveals and concludes that most of the Gram positive organisms showed resistance to commonly used antibiotics such as Erythromycin, Tetracyclin, Co-trimoxazole, Chloramphenicol and Penicillin. Strains of *E. coli* and *Klebsiella aerogenes* showed resistance to all antibiotics except Imipenem and Gentamicin. Continuous monitoring of antimicrobial susceptibility against development of antimicrobial resistance should be done for better patient management.

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