

ORIGINAL RESEARCH

The antibiotic susceptibility patterns and assessment of the magnitude and clinical patterns of pyodermas

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ABSTRACT

Introduction: This study was carried out to assess the magnitude and clinical patterns of pyodermas, their causative micro-organisms, and the antibiotic susceptibility patterns. **Materials and Methods:** All cases of primary and secondary pyodermas in age group <15 years were included. A complete general, systemic, and dermatological examination was done. Relevant investigations, including complete blood count (CBC), urine examination, blood sugar [fasting and postprandial (F/PP)] in all cases and investigations like Human immunodeficiency virus (HIV) serology, peripheral blood film (PBF), liver function tests (LFTs), renal function tests (RFTs), and thyroid profile as and when indicated, were carried out. All these findings were recorded in a pro forma. **Results:** On categorisation of different pyodermas, primary pyodermas (58.4%) were more prevalent than secondary pyodermas (38.6%). Out of the primary pyodermas, impetigo was the most common (23.3%) followed by furunculosis (11.1%). Infected scabies (14.9%) was most frequently encountered cause of secondary pyoderma followed by infected atopic dermatitis (9.2%). **Conclusion:** Most of the bacterial strains were found to be resistant to one or more antibiotics. With knowledge of the likely causative organisms and their resistance patterns, the most suitable antibiotic therapy can be started without waiting for anti biogram results, and thus help avoid unnecessary medication with ineffective drugs.

Keywords: Pyodermas, Micro-organisms, Antibiotic Susceptibility Patterns, Bacterial strains

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INTRODUCTION

It is highly prevalent in pediatric age group.¹ Multiple factors like malnutrition, hot-humid climatic conditions, poverty, overpopulation and poor personal hygiene are the main culprits for making pediatric population more prone to both primary and secondary pyodermas.² Primary pyodermas include superficial bacterial infections like impetigo, folliculitis, furuncle, carbuncle etc. Whereas secondary pyodermas in children occur in diseased skin such as atopic dermatitis, scabies, insect bites etc. The injudicious use of antibiotics has resulted in emergence of resistant pyodermas.³ Despite discoveries of many new antibiotics, it is becoming difficult to curb the menace of resistant pyodermas. Thus it is mandatory to study the clinical and antibiotic spectra of common causative organisms. Various factors like poverty, malnutrition, overcrowding, illiteracy, customs, habits, and so on have been stated to be responsible for its high

incidence.⁴ Climatic conditions also play a role, with the hot and rainy seasons being the period of maximum occurrence.⁵ Besides, 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.⁶

Cutaneous bacterial infection is divided into primary and secondary types. The majority of the primary and secondary pyodermas are caused by either *Staphylococcus aureus* or group A *Streptococcus*. These bacteria cause a broad clinical spectrum of infections, ranging from superficial pyodermas to invasive soft tissue infections, depending on the organism, the anatomic location of infections, and host factors.⁷ The spectrum of cutaneous bacterial disease is forever changing.⁶ Increasing resistance to antibiotics seen in micro-organisms poses a big problem to the clinicians.

Many cases do not respond to some antibiotics which

were previously very effective for such cases, owing perhaps to the indiscriminate use of topical and systemic antibiotics. Therefore this study was carried out to assess the magnitude and clinical patterns of pyodermas, their causative micro-organisms, and the antibiotic susceptibility patterns.

METHODS

All cases of primary and secondary pyodermas in age group <15 years were included. Cases with history of any antibiotic use within last 7 days were excluded from the study. After thorough clinical examination of the skin lesions, under strict aseptic conditions, exudate from the lesions was collected with sterile swab and transported immediately to microbiology lab for further processing.

A complete general, systemic, and dermatological examination was done. Relevant investigations, including complete blood count (CBC), urine examination, blood sugar [fasting and postprandial (F/PP)] in all cases and investigations like Human

immunodeficiency virus (HIV) serology, peripheral blood film (PBF), liver function tests (LFTs), renal function tests (RFTs), and thyroid profile as and when indicated, were carried out. All these findings were recorded in a pro forma.

STATISTICAL ANALYSIS

For statistical analysis of the data, the software Epi Info version 6 was used, and Chi-square (χ^2) test was applied. The results were considered significant at $P < 0.05$.

RESULTS

Out of 476 cases of pyodermas in children, most cases (31.5%) were seen in the age group of 4-7 years followed by 12-15 years of age (26.4%). Males outnumbered females (M:F=1:7). Higher proportions (62.8%) of pyodermas were present in children belonging to lower socio-economic status. History of overcrowding was present in (57.2%) of pyoderma cases (Table 1).

Table 1: Demographic profile of cases.

Age group (years)	Number of cases	Percentage of total number of cases (%)
0-3	111	23.3
4-7	150	31.5
8-11	89	18.6
12-15	126	26.4
Gender		
Male	299	62.8
Female	177	37.1
Socio economic status*		
Upper	32	6.7
Upper middle	44	9.2
Lower middle	115	24.1
Upper lower class	183	38.4
Lower class	102	21.4
Overcrowding**		
Present	271	57.2
Absent	205	42.7

*Kuppuswami classification; **persons per bedroom >2 persons.

On categorisation of different pyodermas, primary pyodermas (58.4%) were more prevalent than secondary pyodermas (38.6%). Out of the primary pyodermas, impetigo was the most common (23.3%) followed by furunculosis (11.1%). Infected scabies (14.9%) was most frequently encountered cause of secondary pyoderma followed by infected atopic dermatitis (9.2%) (Table 2).

Table 2: Layout of different pyodermas.

Type of pyoderma	Number of cases	Percentage of total number of cases (%)
Primary pyoderma	278	58.4
Periporitis	30	6.3
Furuncle	53	11.1
Impetigo	111	23.3
Ecthyma	13	2.7
Cellulitis	26	5.4
Erysipelas	15	3.1
Folliculitis	33	6.9
Abscess	11	2.3
Total		

Secondary pyoderma	184	38.6
Infected scabies	71	14.9
Infected atopic dermatitis	44	9.2
Infected molluscum contagiosum	37	7.7
Infected acne	16	3.3
Infected SJS	11	2.3
Infected exfoliative dermatitis	9	1.8

Staphylococcus aureus (48.1%) was the most common organism isolated from these cases followed by *Streptococcus* (28.9%) (Table 3).

Table 3: Bacteriological analysis of pyodermas.

Gram status	Organism	Primary pyoderma	Secondary pyoderma	Total cases	Percentage of total isolate
Gram positive	<i>Staphylococcus aureus</i>	130	99	229	48.1
	<i>Coagulase negativestaphylococcus</i>	34	12	46	9.6
	<i>Streptococcus</i>	84	54	138	28.9
	<i>Staphylococcus + streptococcus</i>	11	5	16	3.3
	<i>Enterococcus</i>	4	3	7	1.4
	<i>Micrococcus</i>	3	1	4	0.8
Gram negative	<i>Klebsiella</i>	3	3	6	1.2
	<i>Escherichia coli</i>	4	4	8	1.6
	<i>Pseudomonasaeruginosa</i>	3	1	4	0.8
	<i>Citrobacter</i>	1	3	4	0.8
	<i>Proteus</i>	1	-	1	0.2
No organism isolated		7	6	13	2.7
		285	191	476	100

Majority of these gram positive organisms were sensitive to antibiotics like amoxiclav, ampicillin and linezolid. Whereas, amikacin, ceftriaxone and tobramycin remained antibiotic of choice for gram negative pyodermas caused by *Escherichia coli* (*E. coli*) and *enterococcus* (Table 4).

Table 4: Antibiotic sensitivity pattern of isolated organisms.

Antibiotic tested	<i>Staphylococcus aureus</i> (%)	Coagulase negative <i>staphylococcus</i> (%)	<i>Streptococcus</i> (%)	<i>Enterococcus</i> (%)	<i>E. Coli</i> (%)
Ampicillin+sulbactam	93	80	100	56	46
Levofloxacin	19	32	41	66	79
Amoxiclav	86	83	98	13	20
Azithromycin	57	34	64	35	50
Linezolid	79	80	67	66	57
Ofloxacin	11	13	31	45	44
Vancomycin	72	66	33	35	56
Amikacin	66	56	21	77	88
Tobramycin	68	44	25	81	80
Cefotaxime	82	53	63	82	78
Ceftriaxone	81	79	59	89	92
Erythromycin	66	57	44	51	52
Ciprofloxacin	35	42	53	62	70
Clindamycin	68	66	46	61	66

DISCUSSION

This finding is in concordance to various other studies where incidence of impetigo was (19.67%-24.2%).^{2,3,8,9,10} Whereas, in another study done on adult population commonest pattern observed was folliculitis.¹⁰ Scabies, molluscum contagiosum, atopic dermatitis with secondary infection are the common secondary pyodermas encountered in children. Incidence of secondary pyodermas was higher (39.6%) in the present study as compared to other studies done on mixed or adult population.⁹ Present

study correlated well with the various predisposing factors³ and their association with pyodermas as higher prevalence (81.9%) of bacterial skin infections was observed in children belonging to lower socioeconomic class. Pyodermas are seen more frequently in first decade of life as reported in many studies.¹⁰⁻¹³ Similarly, most cases in this study (31.7%) were seen in children belonging to age group 4-7 years followed by 12-15 years. In this study, males were affected more frequently than females as reported by others. Recurrent pyodermas in children

is becoming troublesome day by day due to increased antimicrobial resistance and changing pattern of microbiology of pyodermas.¹³ Hence it is important to perform culture and susceptibility tests and treat accordingly with adequate dosage and duration of appropriate antibiotic. In present study, all cases were subjected to gram staining and culture before starting any empirical treatment with antibiotics. On gram staining majority of organisms (93.3%) were gram positive with *S. aureus* as most common isolate (49.5%) followed by *Streptococcus*. These findings were in concordance with other studies where *Staphylococcus* was isolated in (40%) cases.¹⁴⁻¹⁷ Thus, currently there is a shift from streptococcus to *S. aureus* as the leading cause of pyoderma.¹⁴ Among gram negative organisms (6.7%) most cases were due to *E. coli* (3.1%). This finding is similar to other studies. Culture results were negative in 11 patients which is similar to other studies.¹⁴⁻¹⁸ Over the counter availability of antibiotics and their inadvertent use facilitates development of resistance. In this study, strains of coagulase positive *S. aureus* and streptococcus were susceptible to ampicillin, amoxiclav, linezolid, ceftriaxone and cefotaxime whereas low susceptibility was observed to ofloxacin and levofloxacin. Coagulase negative strains of *S. aureus* were largely susceptible to penicillin group of antibiotics.

On account of the high prevalence of pyoderma, changing pattern of causative micro-organisms, and the indiscriminate use of antibiotics leading to altered antibiotic susceptibility pattern, there is a constant need to obtain more information about etiological agents, predisposing factors, modes of transmission, and effective methods for control. Various studies have been carried out in India^{19,20} and abroad^{21,22} on epidemiology, clinical and bacteriological aspects of pyodermas, and antibiotic sensitivity patterns.

CONCLUSION

This study gives an indication of present pattern of bacterial infections in pyodermas. Multidrug resistance has become a clinical challenge. Most of the bacterial strains were found to be resistant to one or more antibiotics. With knowledge of the likely causative organisms and their resistance patterns, the most suitable antibiotic therapy can be started without waiting for anti biogram results, and thus help avoid unnecessary medication with ineffective drugs.

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