



## A STUDY OF BACTERIAL INFECTIONS (PRIMARY PYODERMAS) IN CHILDREN

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### ABSTRACT

**Introduction** The normal human skin is colonized by huge numbers of bacteria that live harmlessly as commensals on its surface and within its follicles. Cutaneous bacterial infections may be divided into primary and secondary types. Bacterial skin infection is the single most common diagnosis among those with skin problems, accounting for 17% of all clinic visits.<sup>5</sup> These infections are the most common cause of childhood morbidity and constitute one of the prime causes for hospital attendance in children.

**Aim of the study** To study the clinical profile of primary pyodermas in children.

**Materials and Methods Study Design:** Descriptive study **Study Setting:** Dermatology & Venereology department, Medical College hospital, Thiruvananthapuram. **Duration of study:** 1 year. **Inclusion criteria:** Clinically diagnosed cases of primary pyoderma of both sex and age between 1 to 12 years. **Exclusion criteria:** Those children between 1 to 12 years with primary pyoderma started on antibiotic therapy.

**Observation** Primary pyodermas were more common in children between 1 to 4 year age group (56%). Male to female sex ratio was 2.33:1. Children belonging to low socioeconomic status (64%) were more commonly affected by primary pyodermas. Primary pyodermas were seen more commonly in adequately nourished (76%) children. Children attending anganwadi, nurseries and schools (72%) were more commonly affected by primary pyodermas which points to the necessity of providing anganwadi and nursery teachers adequate awareness regarding pyodermas. Concurrent systemic diseases were present in 22% of cases. Among these the most common disease was febrile seizures (6%), Regional lymphadenopathy in 52% cases; most of such cases were impetigo contagiosa indicating that it is much more commonly associated with lymphatic spread than other pyodermas. Impetigo contagiosa (76%) was the most common clinical type of primary pyoderma in both boys (77.14%) and girls (73.34%) and also in both pre-school (75%) and school going children (77.27%).

**Conclusion** Impetigo contagiosa (76%) was the most common clinical type of primary pyoderma in both boys (77.14%) and girls (73.34%) and also in both pre-school (75%) and school going children (77.27%). Leukocytosis and elevated ESR in 42% cases and neutrophilia in 18% cases were noted. Lymphocytosis was also a consistent finding in 70% cases.

**KEYWORDS :** pyoderma, pediatric, bacterial infection

### INTRODUCTION

The normal human skin is colonized by huge numbers of bacteria that live harmlessly as commensals on its surface and within its follicles.<sup>1</sup> The cutaneous flora is composed of aerobic cocci, aerobic and anaerobic coryneform bacteria, gram negative bacteria and yeast.<sup>2</sup> Cutaneous bacterial infections may be divided into primary and secondary types. The majority of primary and secondary pyodermas (cutaneous bacterial infections) are caused by either *Staphylococcus aureus* or group A *Streptococcus*.<sup>3</sup> The primary pyodermas caused by *Streptococci* are impetigo, erysipelas and cellulitis. Those due to *Staphylococci* are impetigo, folliculitis, furuncle and carbuncle. Elaboration of toxins by *S.aureus* causes bullous impetigo and staphylococcal scalded skin syndrome.<sup>4</sup>

Bacterial skin infection is the single most common diagnosis among those with skin problems, accounting for 17% of all clinic visits.<sup>4</sup> They are the most common infections encountered in the pediatric age group especially in developing countries. This includes both primary and secondary infections. Recurrent pyoderma is a problematic infection experienced by children with or without underlying dermatological disorder or immunodeficient states. Among this, impetigo is most common in infants and children worldwide.<sup>5</sup> In the current settings, there are no appropriate studies regarding the epidemiological and clinical aspects of childhood impetigo in our society.

### AIMS OF THE STUDY

To study the clinical profile of primary pyodermas in children.

### MATERIALS AND METHODS

This was a descriptive study conducted over a period of 1 year. 50 Patients (children between 1 to 12) attending dermatology OP/IP, with clinical diagnosis of primary pyoderma were included in the study. As per the proforma informed consent was obtained from all

the cases. A detailed history was taken including socioeconomic status, personal hygiene, h/o any debilitating illness, h/o treatment with steroids, anti-cancer drugs, h/o any concurrent systemic or dermatological illness, past h/o recurrent pyoderma, family h/o concomitant pyoderma. A detailed dermatological examination was done in all the cases and the type of skin lesions and distribution of lesions were noted.

### OBSERVATION

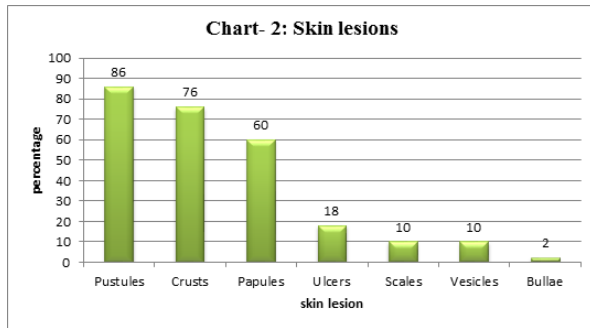
Primary pyodermas were more common in children between 1 to 4 year age group (56%) than children between 5 -12 year age group (44%). The mean age of the study population was 4.62 years. Boys were more commonly affected (70%) than girls with the male to female sex ratio of 2.33:1. Children belonging to low socioeconomic status (64%) were more commonly affected by primary pyodermas. Primary pyodermas were seen more commonly in adequately nourished (76%) children. Malnourishment was seen in 24% cases and it was probably not a predisposing factor for cutaneous bacterial infection. Children attending anganwadis, nurseries and schools (72%) were more commonly affected by primary pyodermas which points to the necessity of providing anganwadi and nursery teachers adequate awareness regarding pyodermas (Table-1). Focus of infection was present in 38% children. The most common focus of infection was caries tooth (14%) and most of them were associated with impetigo contagiosa.

**Table - 1 Educational status**

	Frequency	Percentage
Anganwadi	6	12
Nursery	8	16
School	22	44
Nil	14	28
Total	50	100

Past history of similar lesions were present in 54% cases probably indicating persistent colonization of the organisms. Concurrent systemic diseases were present in 22% of cases with primary cutaneous bacterial infection. Among these the most common disease was febrile seizures (6%). Regional lymphadenopathy was seen in 52% cases; most of such cases were impetigo contagiosa indicating that it is much more commonly associated with lymphatic spread than other pyodermas.

The most common skin lesions were pustules (86%) and crusts (76%) (chart-2).



Primary pyoderma lesions were more commonly distributed over the extremities and head and neck. Impetigo contagiosa (76%) was the most common clinical type of primary pyoderma in both boys (77.14%) and girls (73.34%) and also in both pre-school (75%) and school going children (77.27%).(Table:2)

**Table 2- Correlation of clinical diagnosis with age**

Diagnosis	Preschool group (n=28)		School going group (n=22)	
	Frequency	Percentage	Frequency	Percentage
Impetigo contagiosa	21	75	17	77.27
Bullous impetigo	2	7.14	0	0
Folliculitis	4	14.29	1	4.55
Furuncle	1	3.57	3	13.63
Ecthyma	0	0	1	4.55
Total	28	100	22	100

Blood routine investigations revealed leukocytosis and elevated erythrocyte sedimentation rate in 42% cases and neutrophilia in 18% cases. Lymphocytosis was also a consistent finding in 70% cases.

**DISCUSSION**

Primary pyodermas were seen predominantly in children between 1 to 4 year age group accounting for 56% of the study population. This was similar to the pattern seen in studies conducted in Pondicherry<sup>6</sup> (54.2%), Belgaum<sup>7</sup> (45%) and Delhi<sup>8</sup> (42%). Children between 5 to 12 years contributed to 44% of the study population. So primary pyodermas were common in children between 1to 12 years with a slight preponderance to 1 to 4 year age group. This may be due to the decreased immunity against bacterial infections seen in this age group and as the age advances probably the immunity increases.

The male to female sex ratio observed in this study was 2.33:1 which was almost similar to that observed by Kharel C<sup>9</sup> et al which were 1.48:1, with a male preponderance. In the present study, primary pyodermas were more common in boys accounting for 70%. A similar male preponderance was also seen in studies by Nagmoti MJ et al in Belgaum<sup>7</sup> (62%) and Kharel C et al in Nepal<sup>8</sup> (59.8%); but in another study of primary pyoderma in children in Pondicherry by Mathew S et al, girls were affected more commonly (60%)<sup>6</sup>. In this study the male preponderance as with several other studies may be due to the increased outdoor playing activities and exposure to unhygienic environment which enhances the chance for contracting infection.

Majority of the children with primary pyoderma in the study

population was from low socioeconomic status accounting for 64%. This was similar to that seen in most of the studies (58% by Kakar Net al<sup>8</sup>, 69% by Nagmoti MJ et al<sup>7</sup> and 74% by Kharel C et al<sup>9</sup>). The children from middle socioeconomic status contributed to 36%. Children from low socioeconomic status were most commonly affected probably because of their low standards of living conditions.

Though undernourishment is considered as a predisposing factor for bacterial infections in children, it was observed in only 24% of cases. This was similar to that as seen by Kharel C et al<sup>9</sup> (23.4%). This shows that cutaneous bacterial infections need not necessarily be seen with increased frequency in malnourished children. However in a study conducted in Delhi, 82% of pyoderma cases were observed to be undernourished. This points to the fact that the nutritional status of children affected by pyoderma vary with the environmental and economic standards of the population studied. Majority of the children (72%) in this study were attending anganwadi, nursery or school which shows that there is an increased chance of transmission of bacterial cutaneous infection from one infected child to another one due to close contact between them during various academic and sports activities. This point to the necessity of providing anganwadi and nursery teachers adequate awareness regarding early detection of infected children and providing them early medical care.

The observation of good personal hygiene in all the 50 patients (100%) in the study population stands in contrary to the conventional belief of lack of personal hygiene being an important risk factor for contracting bacterial infections. Hence it may be inferred that more than the personal hygiene, the innate immunity of the childhood population and the environmental factors are more important in the occurrence of bacterial infections in this age group.

One patient with cutaneous bacterial infection had concomitant dermatophytosis; also he was a known case of nephrotic syndrome on long term corticosteroid therapy. The occurrence of multiple cutaneous infections is probably due to suppressed immunity in this patient. Another patient was a known case of atopic dermatitis, the recurrent bacterial infections in him may be explained by the possible staphylococcal colonization in the skin. Otherwise no other predisposing factors were observed in this study.

The observation of focus of infection in 38% of cases in the study population shows that this may be the cause of cutaneous bacterial infection. The most common focus of infection observed was caries tooth (14%) and the next common was tonsillitis (10%). The observation of more cases of impetigo contagiosa associated with obvious infection may indicate that impetigo contagiosa is the type of primary pyoderma occurring with a focus of infection when compared to other types of pyoderma.

The duration of presenting illness was less than 2 weeks in the majority of cases (72%). There was only 16% cases whose duration extended more than 4 weeks. Such cases would have been treated at peripheral centres and were later referred to our centre due to inadequate clinical response.

There was a history of fever in 32% cases in the study population. This may be due to the inflammatory response associated with the cutaneous bacterial infections.

In the majority of cases (54%), there was a history of recurrent infections, which may be due to the low standards of living and exposure to unhygienic environment. In some cases, there may be inadequate treatment and persistent colonization of the organisms in the body. This also shows the lack of development of lasting immunity with an attack of bacterial infection unlike in the case of viral infections. The occurrence of recurrent infections in children children belonging to low socioeconomic status was not found to be statistically significant as the p value is 0.745. The occurrence of recurrent infections in malnourished children was not found to be

statistically significant as the p value is 0.325.

In 22% children with primary pyoderma there was a history of concurrent systemic illness. The commonly encountered systemic illnesses were febrile seizures (6%) and bronchial asthma (4%). The increased number of hospital visits and stay as inpatients for these illnesses in such children may have predisposed them to cutaneous bacterial infections.

The concurrent dermatological diseases observed such as molluscum contagiosum, acute urticaria and dermatophytosis do not show much of statistical importance due to decreased number of such cases in the study population. Gandhi S et al also observed molluscum contagiosum in 0.5% and dermatophytosis in 1% cases<sup>10</sup>.

The observation of family history of similar lesions in 28% cases in this study can be explained by the transmission of infectious organism by direct contact or through fomites. Nagmoti MJ et al also observed a positive family history in 21% cases<sup>7</sup>. In another study by Mathew SM et al, family history of concomitant pyoderma was observed in 27% of cases<sup>11</sup>.

In this study, regional lymphadenopathy was observed in the majority of cases (52%). It was commonly seen in impetigo contagiosa cases with extensive lesions. This points to the fact that impetigo contagiosa is a rapidly spreading pyoderma to invade the lymphatic system than the other type of pyodermas.

The cutaneous lesions observed in this study population includes pustules (86%), crusts (76%), papules (60%), ulcers (18%) and vesicles (10%) which are the common lesions occurring in cutaneous bacterial infections as mentioned in literature. Thus the commonest manifestations of most of the pyodermas are pustules followed by crusts.

The observation of distribution of skin lesions more commonly over the extremities and head and neck was similar to that observed by many other workers.<sup>8,7</sup> Extremities appear to be consistently affected in most cases but often in combination with other sites.

The normal systemic examination in all the cases in this study population indicates that pyodermas in children are restricted to the cutaneous system and usually devoid of any systemic effects.

Impetigo contagiosa was the most common clinical type of primary pyoderma encountered constituting 76% (38) of the study population. It was the most common pyoderma in boys (77.14%) and girls (73.33%) as well as in pre-school (75%) and school going children (77.27%). The next common primary pyoderma in children was folliculitis (10%). The others were furuncle (8%), bullous impetigo (4%) and ecthyma (2%). Mathew S et al also reported impetigo contagiosa (46%) and folliculitis (44.2%) as the common clinical types of primary pyoderma in children.<sup>10</sup> Kar PK et al noted impetigo in 47%, ecthyma in 13.5%, folliculitis in 12% and furunculosis in 4%.<sup>12</sup> Thus this study conforms with the results of most of the previous studies that impetigo contagiosa is the commonest type of pyoderma encountered followed by folliculitis, furuncle and bullous impetigo. Ecthyma, though a distinct streptococcal pyoderma is of rare occurrence. The other commonly described pyodermas in childhood like erysipelas, cellulitis, and perianal dermatitis are not at all encountered in this study.

This study shows an increase in the total leukocyte count in 42% cases whereas in another study by Ahmed K et al leukocytosis was reported in 14.5% cases.<sup>13</sup> Lymphocytosis (70%) and raised erythrocyte sedimentation rate (42%) are the other hematological associations of primary pyoderma among children. In contrary to the expectation, neutrophilia was observed in 18% cases only. So lymphocytosis can also be taken as a hematological abnormality in cases of pyoderma.

Raised antistreptolysin O titre was observed in one case and that too

in staphylococcal pyoderma. This may be explained by the coexistent acute tonsillitis in this patient. All the 3 cases of streptococcal pyoderma did not show a raise in ASO titre. Thus ASO titre may not be taken as a serological marker of cutaneous streptococcal infection. But this requires more studies incorporating different types of streptococcal pyoderma.

The renal function tests and 24 hour urine protein excretion were normal in all the cases in this study population including the single case of nephrotic syndrome. But the urine routine examination was abnormal in 10% cases.

## CONCLUSION

Primary pyodermas were more common in children between 1 to 4 year age group (56%) than children between 5 -12 year age group (44%). Primary pyodermas were seen more commonly in adequately nourished (76%) children. Malnourishment was seen in 24% cases and it was probably not a predisposing factor for cutaneous bacterial infection. Children attending anganwadis, nurseries and schools (72%) were more commonly affected by primary pyodermas which points to the necessity of providing anganwadi and nursery teachers adequate awareness regarding pyodermas. Focus of infection was present in 38% children. The most common focus of infection was caries tooth (14%) and most of them were associated with impetigo contagiosa. Past history of similar lesions were present in 54% cases probably indicating persistent colonization of the organisms. Concurrent systemic diseases were present in 22% of cases with primary cutaneous bacterial infection. Among these the most common disease was febrile seizures (6%). Regional lymphadenopathy was seen in 52% cases; most of such cases were impetigo contagiosa indicating that it is much more commonly associated with lymphatic spread than other pyodermas. Impetigo contagiosa (76%) was the most common clinical type of primary pyoderma in both boys (77.14%) and girls (73.34%) and also in both pre-school (75%) and school going children (77.27%). Blood routine investigations revealed leukocytosis and elevated erythrocyte sedimentation rate in 42% cases and neutrophilia in 18% cases. Lymphocytosis was also a consistent finding in 70% cases.

## REFERENCES

1. Hay RJ, Adriaans BM. Bacterial infections. In: Burns T, Breathnach S, Cox N, Griffiths C, editors. *Rook's Textbook of Dermatology*. 8th ed. Vol. 1. West Sussex: Wiley- Blackwell publishing; 2010. p.30.1-82.
2. Halpern AV, Heymann WR. Bacterial diseases. In: Bologna JL, Jorizzo JL, Rapini RP, Schaffer JV, editors. *Dermatology*. 2nd ed. Vol. 2. Philadelphia: Elsevier; 2008. p.1075-106.
3. Craft N. Superficial cutaneous infections and pyodermas. In: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff KW, editors. *Fitzpatrick's Dermatology in General Medicine*. 8th ed. Vol. 2. New York: McGraw Hill Publishing Inc; 2012. p.2128-47.
4. Thappa DM. *Clinical Pediatric Dermatology*. Noida: Elsevier; 2009. Chapter 8, Bacterial infections; p.43-9.
5. Palit A, Inamadar AC. Current concepts in the management of bacterial skin infections in children. *Indian J Dermatol Venereol Leprol* 2010;76:476-88.
6. Mathew SM, Garg BR, Kanungo R. A Clinico-bacteriological study of primary pyodermas of children in Pondicherry. *Indian J Dermatol Venereol Leprol* 1992;58:183-7. Nagmoti MJ, Mietgud SC. A bacterial study of pyoderma in Belgium. *Indian J Dermatol Venereol Leprol* 1999;65:69-71.
7. Kakar N, Kumar V, Mehta G, Sharma RC, Koranne RV. Clinico-bacteriological study of pyodermas in children. *J Dermatol* 1999;26:288-93.
8. Kharel C, Pandey CC, Agarwal S, Bhattarai M. Socioeconomic and nutritional status of children with pyodermas. *Nep J Dermatol Venereol Leprol* 2012;10:11-5.
9. Gandhi S, Ojha AK, Ranjan KP, Neelima. Clinical and bacteriological aspects of pyoderma. *N Am J Med Sci* 2012;4:492-5.
10. Mathew SM, Garg BR, Kanungo R. A Clinico-bacteriological study of primary pyodermas of children in Pondicherry. *Indian J Dermatol Venereol Leprol* 1992;58:183-7.
11. Kar PK. A combination of amoxicillin and clavulanic acid in the treatment of pyoderma in children. *Indian J Dermatol Venereol Leprol* 1996;62:91-4.
12. Ahmed K, Batra A, Roy R, Kalla G, Kh. Clinical and bacteriological study of pyoderma in Jodhpur-Western Rajasthan. *Indian J Dermatol Venereol Leprol* 1998;64:156-7.