



## PYODERMA AND ITS ASSOCIATION WITH ATOPIC DERMATITIS IN CHILDREN: A CLINICO-BACTERIOLOGICAL STUDY

### Dermatology

**Dr. Hosalli  
Amrutha**

Junior resident, Department of Dermatology, JJM Medical college, Davanagere

**Dr. Kavya K B**

Junior resident, Department of Dermatology JJM Medical College, Davanagere

**Dr. S B Murugesh\***

Principal and professor, Department of Dermatology JJM Medical College, Davanagere\*Corresponding Author

### ABSTRACT

**Background:** Bacterial infection are among the most common dermatologic problems observed in out patient clinics. Staphylococcus aureus is the most common cause of superficial pyoderma. Contributing factors include overcrowding, hygiene, poverty, malnutrition, atopic dermatitis, and preexisting injuries. Objectives: 1. To study the association of pyoderma and atopic dermatitis 2. To see for clinical profile of cases in the out patient department 3.to check antibiotic sensitivity and resistance and to isolate the organism 4. to determine the role of predisposing factors. Materials and methods: This is a cross-sectional descriptive study conducted for the duration of 8 months( june 2019 to january 2020). Study was conducted on 150 patients of 0- 16 years who had not taken antibiotic therapy prior. From each of them two swabs were taken and labelled as A and B, swab A was from the site of lesion and swab B was from the nasal cavity. Both swabs were sent for culture and sensitivity. Results: Out of 150 patients 82 were male and 78 were females. Primary pyoderma cases were more compared to secondary. 30% had history of atopic dermatitis. Most common organism isolated from pus culture was S.aureus (46.6%) followed by CONS( 26.6%), 18.6% of the cases showed no growth. Penicillin and amoxicillin resistance was found in 78.5% and 65.7% for S. aureus. Culture and sensitivity from nasal swab showed S.aureus in 45.3% of cases. CONS was isolated from 26.6% of cases There was no growth in 14%. Penicillin and amoxicillin resistance was found in 54.2% and 45.2% of cases for S. aureus. Conclusion: The prevalence of pyoderma are high among children of preschool going age group. There is need health education regarding resistance to antibiotic, hygiene, spread of the disease in order to reduce transmission, resistance and several clinical manifestations.

### KEYWORDS

pyoderma, atopic dermatitis, antibiotic sensitivity and resistance.

### INTRODUCTION

Pyoderma is bacterial infection of skin giving rise to lesions containing or exuding pus. In India, pyoderma are the one of the commonest childhood infections encountered in dermatologic practice(1). Pyoderma infection can occur at the level of both epidermis, dermis (bullous impetigo, impetigo contagiosa, erysipelas, cellulitis, ecthyma etc) and hair follicle (folliculitis and furunculosis)(2).

30% of the individuals are constantly colonized with S.aureus, and occasional carriage is found in upto 60% of healthy people. S. aureus pyoderma occur in individuals who are nasal carriers of the organisms, which, when translocated into the skin, is able to gain access via small breaks in the cutaneous integrity and cause superficial infections.(2). pyoderma are classified as primary and secondary, most commonly caused by staphylococcus aureus and Group A beta haemolytic streptococcus. As nasal carriage and skin carriage of S.aureus and Group A beta haemolytic streptococcus predisposes the individual to pyoderma and recurrent pyoderma, acute poststreptococcal glomerulonephritis and acute rheumatic fever(3). Hence in this study nasal swab is taken to see percentage of nasal carriers presenting with disease.

Pyoderma can be predisposed by variety of factors which include, poverty, overcrowded living condition, malnutrition, poor hygiene, hot humid climate, pre existing injuries, immunosuppressed state, atopic dermatitis.

Due to extensive use of antibiotics and ability of S. aureus to acquire resistance easily there have been increasing antibiotic resistance and recurrent infection. A knowledge of antibiotic resistance is hence important in selection of antibiotic for treatment.(4)

Hence this study includes studying of antibiotic sensitivity and resistance of the organism isolated from both nasal cavity and lesion, to see for nasal carriers of the organism and to see for association of atopic dermatitis with pyoderma, as atopic dermatitis is one of the predisposing factors of pyoderma.

### Materials and methods

This is a hospital based prospective descriptive study conducted in the out patient department of dermatology in davanagere for the duration

of 8 months from june 2019 to January 2020. Which includes 150 children of 0 to 16 years of age who has not taken any prior treatment. Children who have previous history of usage of topical and systemic medications and age above 16 years were excluded from study.

A detailed history following consent was taken as per standard proforma. History of socio economic status, living condition like crowded environment and hygiene, atopy, any past history of similar complaints in family, previous usage of medicines topically and systemically were taken specifically.

Examination include local examination to note down the morphology of the lesion, distribution and associated with erosion, crusting, scaling. General physical examination with emphasis to check malnutrition, anemia, lymph node examination. Systemic examination was done along with this.

Following examination 2 swabs were taken from each patient, one from the lesion and was labelled as swab A and the other from nasal cavity and labelled as swab B and sent for culture sensitivity which was done on blood and MacConkey agar by Kirby-bauer disc diffusion method.

### Results

Out of 150 children of pyoderma studied 82(54.67%) were male and 78(45.33%) were females.

**Table 1: age wise distribution of cases**

| age        | Number of cases | Percentage |
|------------|-----------------|------------|
| 0-1 years  | 23              | 15.3%      |
| 1-5 years  | 68              | 45.3%      |
| 5-10years  | 41              | 27.3%      |
| 10-16years | 18              | 12%        |

More number of cases were seen in 1-5 years age ( pre school) followed by 5-10 years(school ) of age( table 1). More number of cases were seen in lower socio economic status compared to higher socio economic status that is 77% of cases and 23% of cases respectively. Poor hygiene was seen in 69% of cases and malnutrition in 63% of cases.

Primary pyoderma cases were seen in 72% of cases and secondary pyoderma cases were seen in 28% of cases. Most common primary pyoderma recorded was impetigo, impetigo contagiosa more than bullous impetigo(5) followed by furuncle, folliculitis, perioritis, ecthyma, cellulitis and paronychia( table 2). Most common secondary pyoderma recorded was infected scabies followed infected eczema, infected insect bite, infected wound, infected tinea(table 3)

**Table 2: distribution and type of primary pyoderma according to age**

| Type of case       | 0-28 days | 28days - 1year | 1-5 Years | 5-10 Years | 10- 16 Years | Total | Percentage (%) |
|--------------------|-----------|----------------|-----------|------------|--------------|-------|----------------|
| Impetigocontagiosa | 2         | 3              | 15        | 10         | 4            | 35    | 32.7           |
| Bullous impetigo   | 2         | 4              | 12        | 8          | 4            | 30    | 27.7           |
| Furuncle           | -         | 1              | 10        | 4          | 2            | 18    | 16.6           |
| Folliculitis       | -         | 4              | 8         | 3          | 1            | 14    | 12.9           |
| Perioritis         | -         | 1              | 3         | 3          | 1            | 8     | 7.4            |
| Ecthyma            | -         | -              | 1         | -          | -            | 1     | 0.9            |
| Cellulitis         | -         | -              | -         | 1          | -            | 1     | 0.9            |
| Paronychia         | -         | -              | -         | 1          | -            | 1     | 0.9            |

**Table 3: distribution and type of secondary pyoderma according to age**

| Type of case         | 0-28 days | 28days - 1year | 1-5 Years | 5-10 Years | 10-16 Years | Total | Percentage (%) |
|----------------------|-----------|----------------|-----------|------------|-------------|-------|----------------|
| Infected scabies     | -         | 1              | 5         | 4          | 2           | 12    | 28.5           |
| Infected eczema      | 1         | 1              | 3         | 4          | 2           | 11    | 26.1           |
| Infected insect bite | 1         | 2              | 4         | 2          | -           | 9     | 21.4           |
| Infected wound       | -         | -              | 4         | 1          | 1           | 6     | 14.2           |
| Infected tinea       | -         | -              | 3         | -          | 1           | 4     | 9.5            |

Culture and sensitivity was done from both pus from the lesion and nasal cavity to see for sensitivity pattern of isolates and to see the role of endogenous nasal flora in the causation of pyoderma. Culture sensitivity report shows S.aureus in the isolate in most of the cases in 46.66% of cases, and coagulase negative S.aureus (CONS) in 26.66% of cases, next commonly seen is beta haemolytic streptococcus in 18.66% of cases and there was no growth in 7.3% of cases (table 4).

Culture sensitivity from nasal cavity showed S.aureus as the most common isolate seen in 45.33% of cases and next most common same as above CONS seen in 26.66% of cases, beta hemolytic streptococcus was seen in 14% of cases and there was no growth in 12.66% of cases. (table 5)

**Table 4: organism isolated in pus culture reports**

|                    | S. aureus (Number of cases) | CONS (Number of cases) | Beta haemolytic Streptococcus (Number of cases) | No growth (Number of cases) |
|--------------------|-----------------------------|------------------------|-------------------------------------------------|-----------------------------|
| Impetigocontagiosa | 17                          | 13                     | 4                                               | 1                           |
| Bullous impetigo   | 16                          | 11                     | 3                                               | 1                           |
| Furuncle           | 10                          | 4                      | 3                                               | 1                           |
| Folliculitis       | 5                           | 4                      | 3                                               | 2                           |
| Perioritis         | 2                           | 1                      | 4                                               | 0                           |
| Ecthyma            | 1                           | -                      | -                                               | -                           |
| Cellulitis         | 1                           | -                      | -                                               | -                           |
| Paronychia         | 1                           | -                      | -                                               | -                           |
| Infected scabies   | 4                           | 4                      | 2                                               | 1                           |

|                      |       |       |       |    |
|----------------------|-------|-------|-------|----|
| Infected eczema      | 5     | 1     | 3     | 2  |
| Infected insect bite | 3     | 1     | 4     | 1  |
| Infected wound       | 4     | 1     | 1     | 0  |
| Infected tinea       | 1     | -     | 1     | 2  |
| Total                | 70    | 40    | 28    | 11 |
| Percentage(%)        | 46.66 | 26.66 | 18.66 | 14 |

**Table 5: organism isolated in the culture reports of nasal swab**

|                      | S. aureus (Number of cases) | CONS (Number of cases) | Beta haemolytic Streptococcus (Number of cases) | No growth (Number of cases) | Others (Number of cases) |
|----------------------|-----------------------------|------------------------|-------------------------------------------------|-----------------------------|--------------------------|
| Impetigocontagiosa   | 14                          | 14                     | 3                                               | 4                           | -                        |
| Bullous impetigo     | 15                          | 10                     | 3                                               | 2                           | -                        |
| Furuncle             | 11                          | 5                      | 2                                               | 0                           | -                        |
| Folliculitis         | 6                           | 2                      | 2                                               | 4                           | -                        |
| Perioritis           | 2                           | 1                      | 3                                               | 1                           | -                        |
| Ecthyma              | -                           | -                      | -                                               | -                           | 1                        |
| Cellulitis           | -                           | -                      | -                                               | -                           | 1                        |
| Paronychia           | -                           | -                      | -                                               | -                           | -                        |
| Infected scabies     | 6                           | 2                      | 3                                               | 1                           | -                        |
| Infected eczema      | 4                           | 2                      | 2                                               | 3                           | -                        |
| Infected insect bite | 4                           | 1                      | 1                                               | 3                           | -                        |
| Infected wound       | 3                           | 2                      | 1                                               | 0                           | -                        |
| Infected tinea       | 1                           | 1                      | 1                                               | 1                           | -                        |
| Total                | 18                          | 8                      | 8                                               | 8                           | 2                        |
| Percentage(%)        | 45.3                        | 26.6                   | 14                                              | 12.66                       | 1.3                      |

**Table 6: pus culture and sensitivity reports**

| Drugs                | S. aureus Number of cases (%) | CONS Number of cases (%) | Beta haemolytic streptococcus Number of cases (%) |
|----------------------|-------------------------------|--------------------------|---------------------------------------------------|
| Azithromycin         | 36 (51.4)                     | 18 (45)                  | 3 (10.7)                                          |
| Amoxicillin          | 55 (78.5)                     | 11 (27.5)                | 8 (28.5)                                          |
| Cefoxitin            | 18 (25.7)                     | 4 (10)                   | 3 (10.7)                                          |
| Clindamycin          | 11 (15.7)                     | 4 (10)                   | 1 (3.5)                                           |
| Ciprofloxacin        | 44 (62.7)                     | 4 (10)                   | 1 (3.5)                                           |
| Cotrimoxazole        | -                             | -                        | -                                                 |
| Doxycycline          | -                             | -                        | -                                                 |
| Erythromycin         | 30 (42.8)                     | 15 (37.5)                | -                                                 |
| Framycetin           | 45 (64.2)                     | 6 (15)                   | -                                                 |
| Fusidic acid         | 8 (11.4)                      | 5 (12.5)                 | -                                                 |
| Genatamycin          | -                             | -                        | -                                                 |
| Linezolid            | -                             | 10 (25)                  | -                                                 |
| Mupirocin            | -                             | 12 (30)                  | 3 (10.7)                                          |
| Ofloxacin            | 34 (48.5)                     | 10 (25)                  | 6 (21.4)                                          |
| Tetracycline         | -                             | -                        | 2 (7.14)                                          |
| Silver sulphadiazine | 5 (7.14)                      | -                        | 5 (17.8)                                          |
| Nadifloxacin         | -                             | -                        | -                                                 |
| Penicillin           | 46 (65.7)                     | 18 (45)                  | 16 (57.1)                                         |

**Table 7: Culture and sensitivity reports of nasal swab**

| Drugs        | S. aureus Number of cases (%) | CONS Number of cases (%) | Beta haemolytic streptococcus Number of cases (%) |
|--------------|-------------------------------|--------------------------|---------------------------------------------------|
| Azithromycin | 5 (7.14)                      | 28 (70)                  | 5 (17.8)                                          |

|                      |    |        |    |        |    |        |
|----------------------|----|--------|----|--------|----|--------|
| Amoxicillin          | 32 | (45.7) | 13 | (32.5) | 7  | (25)   |
| Cefoxitin            | 6  | (8.5)  | 6  | (15)   | 4  | (14.8) |
| Clindamycin          | 6  | (8.5)  | 10 | (25)   | 4  | (14.8) |
| Ciprofloxacin        | 8  | (11.4) | 12 | (30)   | 3  | (10.7) |
| Cotrimoxazole        |    |        |    |        |    |        |
| Doxycycline          |    |        |    |        |    |        |
| Erythromycin         | 28 | (36.8) | 24 | (60)   | 2  | (7.14) |
| Framycetin           | 24 | (34.2) |    |        |    |        |
| Fusidic acid         |    |        | 5  | (12.5) | 2  | (7.14) |
| Genatamycin          |    |        | 10 | (25)   | 1  | (3.57) |
| Linezolid            |    |        |    |        |    |        |
| Mupirocin            |    |        |    |        |    |        |
| Ofloxacin            | 22 | (31.4) |    |        |    |        |
| Tetracycline         |    |        |    |        |    |        |
| Silver sulphadiazine |    |        | 10 | (25)   |    |        |
| Nadifloxacin         | 2  | (2.8)  |    |        |    |        |
| Penicillin           | 38 | (54.2) | 18 | (45)   | 16 | (57.1) |

30% of the cases in the study showed association with atopic dermatitis( table 8)

**Table 8: percentage of cases showing association with atopic dermatitis**

|                      | Atopic dermatitis<br>Number of cases | Percentage(%) |
|----------------------|--------------------------------------|---------------|
| Impetigocontagiosa   | 10                                   | 32.2          |
| Bullous impetigo     | 7                                    | 22.5          |
| Furuncle             | 6                                    | 19.3          |
| Folliculitis         | 5                                    | 16.1          |
| Periporitis          | 2                                    | 6.4           |
| Ecthyma              | 1                                    | 3.22          |
| Cellulitis           | -                                    | -             |
| Paronychia           | -                                    | -             |
| Infected scabies     | 3                                    | 21.4          |
| Infected eczema      | 4                                    | 28.5          |
| Infected insect bite | 3                                    | 21.4          |
| Infected wound       | 1                                    | 7.14          |
| Infected tinea       | 3                                    | 21.4          |

## DISCUSSION:

In Most of the studies shows pyoderma in children have reported its maximum in children below 5 years of age especially during hot and humid climate so as in our study. Superficial pyoderma is caused by *S. aureus*, beta haemolytic streptococcus or both. Primary pyoderma cases were significantly in higher number(72%) compared to secondary cases(28%), similar results seen by H H Tan et al where in *S. aureus* was the most common seen in 73.2% of cases including CONS and beta haemolytic streptococcus was seen in 18.66% of cases. Nasal carriers of *S. aureus* was seen in 72.8% of cases showing that endogenous infection could the major cause in pyoderma infection.

Predisposing factors for pyoderma and scabies in low socioeconomic status, animal and insect population in school and home, nutritional status, personal habits, improvement in personal hygiene and nutritional factors are necessary to combat pyoderma. If measures are taken properly, it would be better to prevent the occurrence of these disease"". Which would further prevent inadvertent use of antibiotics and hence can control increase of antibiotic resistance. More number of cases were seen in lower socio economic status compared to higher socio economic status that is 77% of cases and 23% of cases respectively. Poor hygiene was seen in 69% of cases and malnutrition in 63% of cases.

We have seen many number of cases coming to the hospital has history of atopic dermatitis along with pyoderma, hence we included in this study to see the association between the two. 30% association was found out. Among which 32.2% seen in impetigo contagiosa followed by bullous impetigo in 22.5%( table 8).

Pus culture and sensitivity should be performed specially in recurrent

cases so as to treat with appropriate antibiotics. In our study reports showed *S. aureus* is highest resistant to amoxicillin(78.5%) followed by penicillin(65.7%) and ciprofloxacin(62.7%), topically framycetin has 64.2% resistance, and no resistance to mupirocin. CONS shows highest resistance to penicillin and amoxicillin (45%), topically it shows resistance to framycetin(15%), mupirocin(12%). Beta haemolytic streptococcus shows highest resistance to penicillin(57.1%), followed by amoxicillin, no resistance was found in organisms for topical agents( table 7). Similar results were seen in nasal swabs except for the highest resistance is noticed for penicillin(54.2%) followed by amoxicillin(28.5%) and CONS shows highest resistance to azithromycin(70%) followed by erythromycin(60%) and then penicillin(45%).

The drug sensitivity pattern shows highest resistance to penicillin, this may be due to penicillinase producing strains(10). Hence combination with clavulanic acid can be used safely in moderate to severe pyoderma which is well tolerated with mild diarrhoea reported in some cases(5). In a study by Lisa M philis et al they have mentioned that mupirocin is the most effective topical agents among the available ones which is true even according to our study(13)

According to TV ramani et al they have found that coagulase positive *S. aureus* is high sensitivity to kanamycin, garamycin and erythromycin and high resistance to penicillin and streptomycin. Multiple drug resistance was also high among these strains. Coagulase negative staphylococci were found to be more sensitive with less incidence of multiple drug resistance.(14)

According to rahul patil et al they have found that all the strains of *S. aureus* were sensitive to vancomycin and sisomycin. They showed minimal resistance to first generation cephalosporins and gentamicin (1.4%). Resistance was greatest to penicillin (87.2%), followed by that to erythromycin (42.9%) and framycetin (35.7%), an antimicrobial used for topical application. Resistance to ciprofloxacin was 17.2%. In other studies too, an increasing resistance to erythromycin is being observed(15)

But in our study *S.aureus* is sensitive to cotrimoxazole, gentamycin, linezolid, tetracycline and among topical antibiotic to mupirocin. And beta haemolytic is still sensitive to almost all the antibiotic expect for penicillin and amoxicillin.

## CONCLUSION:

Prevention of these disease is better rather than treating so as to prevent further increase of antibiotic resistance by health education. To confirm association with atopic dermatitis further studies are needed. For recurrent cases, there is need to for culture and sensitivity testing to prescribe proper antibiotic. As most of the organism are sensitive to mupirocin this should reserved for refractory cases rather than inadvertent use.

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