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### RESEARCH ARTICLE

## STUDY OF PYODERMAS AND ITS BACTERIOLOGICAL ANALYSIS AT TERTIARY CARE HOSPITAL, NAGPUR

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#### Manuscript Info

##### Manuscript History

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#### Abstract

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#### Introduction:-

Pyogenic skin infection (pyoderma) is the bacterial infection of skin and its appendages.<sup>1</sup> Pyoderma is a common health problem in the low socioeconomic group, especially in the young children.<sup>2-4</sup> Various predisposing factors include immunosuppression, atopic dermatitis, scabies, pediculosis, pre-existing tissue injury and inflammation.<sup>1</sup> Primary pyodermas are caused by direct invasion of normal skin and have a characteristic morphology while Secondary pyodermas originate in the diseased skin as a superimposed condition like in scabies, pediculosis, wounds, insect bites, and eczema.<sup>5</sup> The source of infection are either family members, school mates, hostel inmates, military barracks, medical personnel, or inanimate objects like clothes, floors, walls and instruments used in hospitals. Person to person spread of the organism occurs due to hospitalisation of the sick person and otherwise crowded places.<sup>6</sup> Diagnosis is mainly based on clinical examination correlated with laboratory investigations like examination of the Gram stained smear of the purulent material along with culture and isolation of the causative organism and its identification by various biochemical tests.<sup>6</sup>

#### Material And Methods:-

##### Type of study

Prospective study

##### Number of cases

200

##### Inclusion criteria

All clinically diagnosed pyoderma cases of all age groups and either sex were included in the study.

##### Exclusion criteria

Patients having taken antimicrobial treatment (local or systemic) during the last 15 days were excluded from the study.

##### Sample collection

Samples were collected using sterile cotton swab stick after cleaning the area around the lesion with 70% ethyl alcohol after taking the informed verbal consent.

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**Transport of specimen**

Specimens were transported and processed within 2 hours of collection by the standard microbiological technique.  
7,8

Following procedures were performed:

1. Gram staining
2. Bacterial culture
3. Identification of pathogens

**Results-** Total 200 samples were collected of patients that were clinically diagnosed as pyoderma cases.

CLINICAL CONDITION	NUMBER OF CASES STUDIED (%)
Primary pyoderma	148 (74)
Secondary pyoderma	52 (26)
<b>Total</b>	<b>200 (100)</b>

**Table 1:-** Primary and secondary clinically suspected pyoderma cases Out of the 200 cases of pyoderma, primary pyoderma constituted 74% cases and secondary pyoderma 26% cases, thus primary pyoderma was more common than secondary pyoderma.

CLINICAL CONDITION	NO OF CASES STUDIED(%)
<b>PRIMARY PYODERMA</b>	
Impetigo	29(14.5)
Folliculitis	50(25)
Furuncle	27(13.5)
Carbuncle	02(1)
Paronychia	06(3)
Ecthyma	10(5)
Cellulitis	24(12)
<b>SECONDARY PYODERMA</b>	
Acne	7(3.5)
Hidradenitis suppurativa	06(3)
Infected eczema	15(7.5)
Infected sebaceous cyst	10(5)
Infected ulcer	06(3)
Infected pemphigus	04(2)
Infected scabies	04(2)
<b>TOTAL NO OF CASES STUDIED</b>	<b>200(100)</b>

**Table 2:-** Types of pyoderma. In primary pyoderma, folliculitis was most common(25%) cases while in secondary pyodermas, infected eczema was most common(7.5%).

AGE RANGE IN YEARS	NUMBER OF CASES(%)
0-10	36(18)
11-20	28(14)
21-30	24(12)
31-40	58(29)
41-50	18(09)
51-60	24(12)
61-70	06(03)
71 and above	08(04)
<b>Total</b>	<b>200(100)</b>

**Table 3:-** Age distribution in clinically suspected pyoderma cases Most of the patients belonged to the adult age group. Maximum number of cases fell in the age group 31-40 years (29%), followed by 0-10yrs age group (18%), where as the age group 61-70 years had the least number of cases (3%). The youngest case was a one month old baby and the oldest case was 76 years old.

CLINICAL CONDITION	MALE No, (%)	FEMALE No. (%)
<b><u>PRIMARY PYODERMAS</u></b>		
Impetigo	16(55.2)	13(44.8)
Folliculitis	40(80)	10(20)
Furuncle	18(66.7)	9(33.3)
Carbuncle	2(100)	0
Paronychia	2(33.3)	4(66.7)
Ecthyma	6(60)	4(40)
Cellulitis	12(50)	12(50)
<b><u>SECONDARY PYODERMAS</u></b>		
Acne	2(28.6)	5(71.4)
Hidradenitis suppurativa	4(66.7)	2(33.3)
Infected eczema	6(40)	9(60)
Infected sebaceous cyst	6(60)	4(40)
Infected ulcer	4(66.7)	2(33.3)
Infected pemphigus	2(50)	2(50)
Infected scabies	2(50)	2(50)
<b>Total (200)</b>	<b>122(61)</b>	<b>78(39)</b>

**Table 4:-** Sex distribution in clinically suspected pyoderma cases Out of 200 cases, 122 were male and 78 were female. Thus the Incidence was found to be more in males than in females, with the male to female ratio being 1.56:1.

SOCIO-ECONOMIC STATUS	NUMBER OF CASES (%)
Low income group	140 (70)
Middle income group	54 (27)
High income group	6 (03)

**Table 5:-** Socioeconomic status in clinically suspected pyoderma cases Out of a total of 200 cases 140 belonged to the lower income group, 54 to the middle income group and 6 to the high income group. High incidence of pyoderma was thus seen in the lower income group (70%) followed by the middle income group (27%) and least (3%) in high income group.

YIELD OF SAMPLES	NUMBER OF CASES(%)
Growth	178(89)
No growth	22(11)
Total	200(100)

**Table 6:-** Culture positivity Out of 200 samples processed 89% yielded growth where as 11% did not yield any growth.

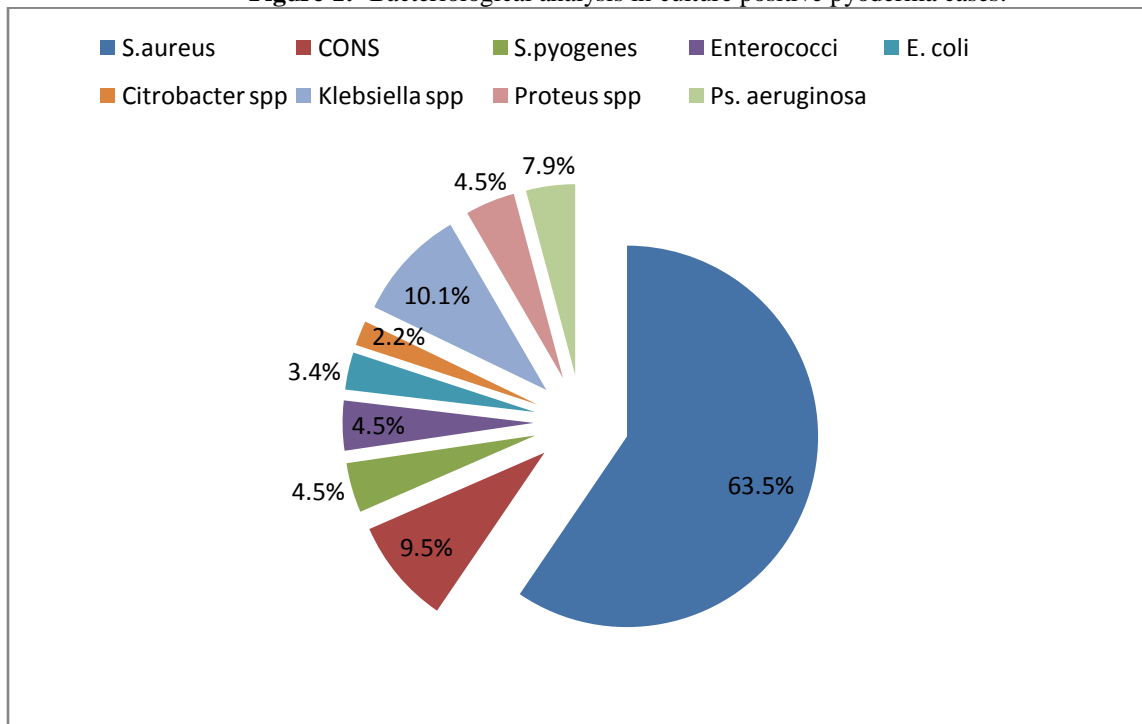
TYPE OF ISOLATE	NUMBER OF CASES(%)
Single isolate	160(89.9)
Multiple isolates(two types of organisms)	18(10.1)
<b>Total</b>	<b>178(100)</b>

**Table 7:-** Growth pattern in culture positive pyoderma cases Out of 178 positive cases yielding growth 160 cases (89.9%) showed only one type of growth whereas 18 cases (10.1%) showed two types of organisms. Thus a total of 196 organisms were isolated from 178 patients.

Pathogens	No. of pathogens		Total (%) n=200 (%)
	Primary pyoderma n=148 (%)	Secondary pyoderma n =52 (%)	
<i>Staphylococcus</i> spp	91 (61.4)	22 (42.3)	113(63.5)
CONS	11 (7.4)	06(11.5)	17(9.5)
<i>S.pyogenes</i>	06 (4.1)	02 (3.8)	8(4.5)
<i>Enterococcus</i> spp	08 (5.4)	0	8 (4.5)
<i>E. coli</i>	6(4.1)	0	6(3.4)
<i>Klebsiella</i> spp	12(8.1)	06 (11.5)	18 (10.1)
<i>K. pneumoniae</i>	12	03	
<i>K. oxytoca</i>	00	03	
<i>Citrobacter</i> spp	04(2.7)	0	4(2.2)
<i>Cit. koseri</i>	01		
<i>Cit. Freundii</i>	03		
<i>Proteus</i> spp	02 (1.3)	06(11.5)	8(4.5)
<i>P. Mirabilis</i>	00	05	
<i>P. Vulgaris</i>	02	01	
<i>Ps. Aeruginosa</i>	04 (2.7)	1 0 (19.2)	14(7.9)

**Table 8:-** Bacteriological analysis in culture positive pyoderma cases.

**Figure 1:-** Bacteriological analysis in culture positive pyoderma cases.



Out of 178 culture positivity 63.5% showed the growth of *S.aureus* , 9.5% CONS, 4.5% *S.pyogenes*, 4.5% Enterococcus, 3.4% *E.coli*, 2.2% *C. freundii* , 10.1% *Klebsiella* spp, 4.5% *Proteus* spp, and 7.9% *Ps.aeruginosa*. The difference between organisms causing Primary pyoderma and Secondary pyoderma was not statistically significant (p>0.005).

**Discussion:-**

In the present study, out of the 200 cases of pyogenic skin infections, primary pyoderma constituted 74% of the cases and the remaining 26% constituted secondary pyoderma. Thus showing that primary pyodermas are more common than secondary pyoderma. Similar findings were seen in the studies of-

Study series	Primary pyoderma	Secondary pyoderma
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Tushar et al <sup>9</sup>	64%	36%
Malhotra et al <sup>10</sup>	12%	80.33%
Paudel et al <sup>11</sup>	60%	40%
Present study	74%	26%

**Table 9:-** Occurrence of primary and secondary pyoderma in various studies.

In present study (Table 2), folliculitis constituted majority of the cases (25%) followed by impetigo(14.5%). It is consistent with the work of Patil et al (2006)<sup>12</sup> & Paudel et al (2013)<sup>11</sup> where folliculitis constituted 58.8% & 26.7% of the total cases respectively. Although a few studies have shown impetigo to be the commonest lesion, which might be because majority of their cases were of Paediatric age group.<sup>9</sup> In the present study majority of our patients were adults, which accounts for the high frequency of folliculitis. Folliculitis was the second commonest type in few other studies.<sup>3</sup> Tushar et al<sup>9</sup> demonstrated Maximum cases of Impetigo (26%) followed by boils, carbuncle, furuncle in 21% cases, folliculitis (14%), cellulitis (2%).

Most of our patients belonged to the adult age group (table 3). Maximum number of cases fell in the age group 31-40 years (29%). Similar finding has been noted by Ramana et al (2008),<sup>13</sup> where 64% of the cases were more than 40 years old. But many studies have found pyodermas to be more common in pediatric age group with higher incidence in < 10 years age group,<sup>14,15</sup> and in few studies >40% patients belonged to 1-4 years age group.<sup>2,4</sup> As most of the pediatric patients specifically visit the pediatric and surgical out-patient department for minor skin problems, this may be the reason for a low number of pyodermas in children in this study.

Incidence of pyoderma in the present study was found to be more (Table 4) in males (61%) than in females (39%). Though there are no explainable reasons for male preponderance in our context, increased outdoor activities of males that subjects them to micro-trauma may be a reason for this. This is comparable to other studies.

Study series	Male	Female
Baslas et al <sup>15</sup>	64.7%	35.3%
Ghadage et al <sup>16</sup>	62.5%	37.5%
Nagmoti et al <sup>2</sup>	62%	38%
Patil et al <sup>12</sup>	62.8%	37.2%
Ramana et al <sup>13</sup>	53%	46%
Tushar et al <sup>9</sup>	58%	42%
Malhotra et al <sup>10</sup>	67.21%	32.79%
Paudel et al <sup>11</sup>	65.3%	34.7%
Present study	61%	39%

**Table 10:-** Comparison of sex wise distribution.

Present study showed that majority of the patients belonged to the lower income group (70%) followed by the middle income group (27%). Only 3% of the higher income group presented with pyoderma. This has been note by other workers also.<sup>2</sup> Various factors like poverty, malnutrition, overcrowding, and poor hygiene have been stated to be responsible for its higher incidence in the lower socio-economic class.

Study series	Lower income Group	Middle income group	Higher income group
Nagmoti et al <sup>2</sup>	69%	27%	4%
Gandhi et al <sup>17</sup>	65.5%	30%	4.5%
Present study	70%	27%	3%

**Table 11:-** Comparison of socio economic status of the patients in various studies

Out of 200 samples processed in the present study 178 cases ( 89%) yielded growth where as 22 cases (11%) did not yield any growth. Similar findings were reported by Paudel et al<sup>11</sup> (93.3%)growth rate while Gandhi et al<sup>17</sup> observed culture positivity in 91.5% cases. Out of the 178 culture positive cases, a single infecting organism was isolated from 160 cases (89.9%) and mixed isolate were obtained from the remaining 18 cases (10.1%). Similar findings were noted by other workers.<sup>2,4,15</sup> A few workers, however have isolated a higher percentage of mixed organisms than single organism.<sup>16</sup>

Study series	Single isolate	Mixed isolate
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Baslas et al <sup>15</sup>	75.9%	24.1%
Ghadage et al <sup>16</sup>	46.9%	65.46%
Nagmoti et al <sup>2</sup>	86%	14%
Kakar et al <sup>4</sup>	84%	16%
Tushar et al <sup>9</sup>	97.6%	2.4%
Malhotra et al <sup>10</sup>	95.09%	4.91%
Paudel et al <sup>11</sup>	94.3%	5.7%
Present study	89.9%	10.1%

**Table 12:-** Comprision of single and mixed infections in various studies.

In the present study conducted on 200 cases the most common pathogen isolated was *S.aureus* (63.5%). Similar findings have been reported by other workers.<sup>2,13,15,16</sup> However, there was no significant difference between the isolation of *Staphylococcus aureus* in primary and secondary pyodermas, the percentage being 61.4% and 42.3% respectively with a P >0.005 which correlates with the study of Paudel et al.<sup>11</sup> In one study, even in chronic wound infections, *Staphylococcus aureus* was isolated in 70.8% of cases, though more number of Gram-negative bacilli have been isolated from secondary pyodermas and chronic wound infections as compared to primary pyodermas.<sup>11</sup>

Isolation of Streptococci in the present study was 4.5% which is similar to that of Patil et al,<sup>12</sup> where the isolation was 2.3%. However other studies<sup>2,12,13,15,16</sup> have shown a higher isolation rate. The reason behind this could be due to the change in the etiological agent or due to inhibition of *Streptococcus pyogenes* by secondary invasion of *Staphylococcus aureus* which is supposed to produce bacteriocins, toxic to Streptococci or due to bacterial interference.

In our study *Enterococcus* spp were isolated in 4.5% cases. In study conducted by Ramana et al<sup>13</sup> isolation rate of *Enterococcus* spp was 11.4%. As *Enterococcus fecalis* is a part of normal fecal flora, the isolation seen in this study may be due to contamination of the lesion or due to opportunistic infection.<sup>11</sup> In our study, 9.5% were CONS, 3.4% *E.coli*, 2.2% *C. freundii*, 10.1% *Klebsiella* spp, 4.5% *Proteus* spp, and 7.9% *Ps.aeruginosa* were found which are compared to other studies (Table 8).

### Conclusion:-

As most of the cases were culture positive, pyodermas should not be ignored and should be treated. *Staphylococcus aureus* remains still the most common bacteria causing pyoderma.

### Conflict Of Interest-

None.

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