Original Article

CLINICO-MICROBIOLOGICAL PROFILE OF PYODERMAS IN PATIENTS PRESENTING TO DERMATOLOGY OUTPATIENT DEPARTMENT

Dr. Jayshree Ahuja[1], Dr. Ankita Patil[2], Dr. Nandita Rajan[3], Dr. Hemant Talanikar[4], Dr. Ajay Kumar[5]

[1]Third Year Resident, Department of Dermatology, Dr. D.Y. Patil Medical College, Hospital, and Research Centre, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.
[2]Senior Resident, Department of Dermatology, Dr. D.Y. Patil Medical College, Hospital, and Research Centre, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.
[3]Third Year Resident, Department of Dermatology, Dr. D.Y. Patil Medical College, Hospital, and Research Centre, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.
[4]Professor, Department of Dermatology, Dr. D.Y. Patil Medical College, Hospital, and Research Centre, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.
[5]Professor and Head of Department, Department of Dermatology, Dr. D.Y. Patil Medical College, Hospital, and Research Centre, Dr. D.Y. Patil Vidyapeeth, Pune, Maharashtra, India.
Corresponding author: Dr. Nandita Rajan
Email id- nanditarajan1508@gmail.com

DOI: 10.47750/pnr.2022.13.S06.527

Abstract

Aim: To study the clinico-microbiological profile of patients presenting with pyodermas in dermatology outpatient department.

Materials and Methods: The study was conducted in Outpatient Department of Dermatology, Venereology & Leprology, Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune. The study was carried out over a period of two years, from August 2020 to July 2022. Clearance from the Institute's Ethics Committee (IEC) was obtained. In every patient, a detailed clinical history and examination with complete dermatological evaluation was done and accordingly the proforma was made. A record of all the relevant information such as period, type of lesions and their distribution over the body, progression, past and family histories were done. Pus culture and sensitivity was performed to know about the micro-organism involved & obtain its antibiotic susceptibility patterns.

Results: In our study, it was seen that majority of the patients were in the younger age group. There was male preponderance with 50 (56 %) patients presenting with pyodermas. 22 % reported school history and 18 % had family history for acquiring various pyodermas. The most commonly involved site as seen in maximum cases was multiple site involvement in 50 patients. The incidence of primary pyodermas (63%) was higher as compared to the secondary pyodermas (37%). Culture results showed that majority were positive culture results (87 %).

Conclusion: In accordance to the clinical diagnosis, primary pyoderma cases were higher as compared to the secondary pyodermas. Staphylococcus aureus was the most frequently isolated organism in majority of the cases from skin lesions of pyoderma patients. In our study, we found that vancomycin and ceftriaxone were the most effective antibiotics.

Keywords: pyodermas, antibiotic resistance, Staphylococcus aureus

INTRODUCTION

Bacterial infections of the skin account for a large portion of skin disease in India, contributing for 17% of all dermatology clinic visits.[1,2] Pyodermas are purulent skin infections that are among the most common clinical conditions seen by dermatologists on a daily basis. Excess humidity and moisture are the most common causes of cases during the rainy and hot seasons. Additional risk factors for pyodermas include clinical conditions that cause immunosuppression, such as cancer, diabetes, and HIV.[3,4]

Several factors can affect the occurrence of pyodermas. Its high prevalence in lower socioeconomic strata of developing countries has been attributed to poverty, malnutrition, overcrowding, poor hygiene, and environmental factors like hot and rainy seasons. The most common causative agents of pyodermas are Staphylococcus aureus as well as Streptococcus pyogenes.[5] Weather conditions also play a significant role, with the warm and humid seasons dominating.[6]

Furthermore, patients receiving steroid or chemotherapeutic treatment, as well as those who have pre-existing skin infections, obesity, immune system disorders, and diabetes, are more likely to develop bacterial skin infections.[7]

In these common dermatoses, appropriate treatment must be instituted. Antibiotic sensitivity patterns differ from region to region, and within the same region, they vary over time. Countless cases do not react to earlier highly effective antibiotics. The rising antibiotic resistance observed in the microorganism appears to be a major issue for clinicians.[8]

Shifting trends in the aetiologies of primary pyoderma have been observed, and the problem of antibiotic resistant strain emergence is becoming more prevalent. Staphylococcus aureus is the most commonly isolated organism in pyoderma, and it can be methicillin sensitive (MSSA) or methicillin resistant (MRSA). MRSA is a significant pathogen associated with health care. Several of these isolates have developed multidrug resistance. MRSA is resistant to all betalactams, including carbapenems and high end cephalosporins such as piperacillin, tazobactam, and others. Knowledge of MRSA prevalence and current antimicrobial profile is required in the choice of the appropriate empirical treatment for these infections.[9]

Primary infections have distinct morphological characteristics and course, are initiated by a single organism, and occur in healthy skin. Secondary infections begin as a superimposed condition in diseased skin, and the organism does not play a significant role in starting the disease but could be essential in prolonging or amplifying it.[10] There is a distinction between primary and secondary bacterial infections of the skin. Staphylococcus aureus or Streptococcus group A cause the vast bulk of primary and secondary pyodermas. Depending on the organism, the anatomic site of infections, and the host factors, these bacteria can cause a wide variety of infections, from superficial pyodermas to invasive soft tissue infections.[11]

The most common causative agents of pyodermas are Staphylococcus aureus as well as Streptococcus pyogenes. The scope of cutaneous bacterial disease is constantly evolving.[7] The antibiotic sensitivity trend varies by region, and it varies over time within a specific region.[12] Antibiotic resistance has drastically decreased the functionality of defined antibiotics and presents a serious threat to global public health. To successfully treat cases of pyodermas, thorough knowledge of the different influencing organisms and their sensitivity patterns is required.[13] The present study was carried out to study the clinico-microbiological profile of patients presenting with pyodermas in dermatology outpatient department.

MATERIALS AND METHODS

The study was conducted in Outpatient Department of Dermatology, Venereology & Leprology, Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune. The study was carried out over a period of two years, from August 2020 to July 2022. Clearance from the Institute's Ethics Committee (IEC) was obtained.

Sample Size

In a study carried out by YJ Bhat, the prevalence of pyodermas was found to be 9.1%. Assuming prevalence rate of 9.1 per 100 and acceptable difference of 6 per 100 at confidence level of 95% the required sample size came to 89. (Statistical package used was WinPepi software.)

Inclusion Criteria

• Patients presenting with pyodermas belonging to various age groups and of either sex.

• Clinically diagnosed, and untreated cases of primary and secondary pyoderma.

• Patients with skin erosions and exudative or serous discharge.

Exclusion Criteria

• Patients who had taken either of systemic or topical antimicrobial treatment in the past 2 weeks.

• Patients not willing to be a part of the study.

Data Collection

The patient was informed of the study's purpose in a language they could understand. After ensuring respondents that their information would be kept confidential, written informed consent was acquired. The patient was informed that the data collected might be used for publication of demographical data but their name or other specific identification details would not be revealed and only case number would be used for identification of the patient. A detailed history and complete physical examination of patients was undertaken. Through a thorough history and examination, the patient provided socio-demographic data and clinical information that was recorded in a proforma. Other necessary investigations were carried out whenever required. The cost of these investigations, as and when required, were borne by the patient. After fulfilling the selection criteria, all patients were counselled about the study and informed written consent was obtained.

Methodology

In every patient, a detailed clinical history and examination with complete dermatological evaluation was done and accordingly the proforma was made. A record of all the relevant information such as period, type of lesions and their distribution over the body, progression, past and family histories were done.

As and when required few investigations such as complete blood count (CBC), urine tests and serum blood sugar levels were performed. Pus culture and sensitivity was performed to know about the micro-organism involved & obtain its antibiotic susceptibility patterns.

Specimen Collection and Processing of Sample

➢ 70% alcohol was used to clean intact pustules. They were then punctured with a sterile needle, and the released pus was collected on two sterile cotton swabs.

➢ Normal saline was used to clean the wound in cases with ulcers and crusted lesions, whereas 70% alcohol was utilised to clean the surrounding normal skin.

➢ Two sterile swabs were applied to the pus or the ulcer's expanding edge.

➢ Material was obtained from beneath crusted lesions after the crusts were partially removed.

➢ These pus samples were extracted under aseptic conditions from the purulent lesions using two sterile cotton swabs, and they were then sent to the microbiology laboratory for additional processing within 30-45 minutes.

➢ One of these two swabs were used to prepare smear for gram staining and microscopy while the other one was utilized for doing culture on blood agar and McConkey’s agar

➢ Culture plates were kept for incubation in an aerobic environment at 37 degrees Celsius for 24 to 48 hours.

➢ Gram staining, colony morphology and standard biochemical reactions were used to identify colonies.

➢ Using control strains as per the Central Laboratory Standards Institute (CLSI) guidelines, the antibiotic susceptibility of isolated organisms was carried out on Muller Hinton agar by Kirby Bauer's disc diffusion method.

Statistical analysis

The data was pooled and analyzed, with the help of various tests of significance, wherever applicable, the observation and results were presented. Data entry was done in Microsoft Excel and analysis using SPSS (Statistical Package for Social Sciences) software version 20/Epi info/Primer/Win-Pepi. Categorical variables were expressed in terms of frequency and percentage and continuous variables in terms of mean and SD.

RESULTS

Table 1: Demographic and clinical profile

Age (In Years)	**N (%)**
0 to 10	39 (43.8)
11 to 20	11 (12.4)
21 to 30	8 (8.9)
31 to 40	8 (8.9)
41 to 50	11 (12.4)
51 to 60	10 (11.2)
60 and above	2 (2.2)
Gender	
Female	39 (43.8)
Male	50 (56.2)
Contact history	
No contact	53 (59.6)
Family	16 (17.9)
School	20 (22.5)
Sites involved	
Head and neck	9 (10.1)
Lower limb	19 (21.3)
Upper limb	11 (12.4)
Multiple	50 (56.2)
Co-morbidities associated	

Malnutrition	28 (31.4)
Hypertension	9 (10.1)
Diabetes mellitus	11 (12.4)
Multiple	9 (10.1)
None	32 (35.9)
Total	89 (100.0)

In our study, it was seen that majority of the patients were in the younger age group, i.e., 0-10 years (39) and the least common (2) were those in 60 years and above age group. Among the 89 patients, it was found that there was male preponderance with 50 (56 %) patients presenting with pyodermas. 22 % reported school history and 18 % had family history for acquiring various pyodermas. The most commonly involved site as seen in maximum cases was multiple site involvement in 50 patients and the least commonly seen was involvement of the head and neck as was seen in 9 cases. Maximum patients had associated malnutrition which was seen in the children age group (28 patients) followed by 11 patients having diabetes mellitus; hypertension and multiple co-morbidities association was found in 9 cases of each.

Table 2: Distribution of primary & secondary pyodermas

Primary pyoderma	**Number**
Folliculitis	22
Furunculosis	13
Impetigo	7
Ecthyma	2
Carbuncle	1
Erysipelas	4
Cellulitis	7
Total	56
Secondary pyoderma	
Infected scabies	9
Infected eczema	10
Infected pemphigus vulgaris	5
Infected ulcer	8
Infected bullous pemphigoid	1
Total	33

Out of the 56 cases of primary pyodermas, the most frequently occurring in our study was folliculitis seen in 22 patients and the least commonly found primary pyoderma was carbuncle seen only in one patient. Out of 33 cases of secondary pyodermas, maximum cases, i.e., 10 cases were of infected eczema, followed closely by 9 patients of infected scabies and 8 patients of infected ulcer. The least number of patients, i.e., one patient had infected bullous pemphigoid.

Table 3: Distribution of microbes

Organism isolated	**No. of patients**
Staphylococcus aureus	44
CONS	17
Escherichia coli	3
Klebsiella spp.	3
β hemolytic Streptococci	8
Pseudomonas aeruginosa	2
Sterile	12
Total	89

Out of the various organisms isolated from the cultures, culture obtained was sterile in 12 patients. The most commonly encountered organisms were Staphylococcus aureus, Coagulase negative Staphylococcus aureus and βhemolytic Streptococci. The least commonly isolated organisms were Escherichia coli and Klebsiella spp seen in 3 patients each followed by 2 patients having Pseudomonas aeruginosa isolated from their cultures.

Table 4: Antibiotic sensitivity trends

Antibiotic	**Sensitive**	**%**	**Resistant**	**%**
Vancomycin	89	100	0	0
Ceftriaxone	82	92.13	7	7.86
Cefoperazone + Sulbactam	81	91.01	8	8.98
Gentamicin	37	41.57	52	58.42
Amoxicillin + Clavulanic acid	80	89.88	9	10.11
Ciprofloxacin	77	86.51	12	13.48
Erythromycin	81	91.01	8	8.98
Cotrimoxazole	77	86.51	12	13.48
Amoxicillin	66	74.15	23	25.84

In our study, it was seen that most of the organisms were sensitive to vancomycin (100 %), ceftriaxone (92 %), Cefoperazone + Sulbactam (91 %) and only 41.5 % were sensitive to gentamicin. Rest 58% were resistant to gentamicin. Highest resistance was shown to gentamicin, followed by amoxicillin, ciprofloxacin and cotrimoxazole.

DISCUSSION

Skin infections make up a significant portion of skin illnesses, with pyoderma occupying a prominent position. Predisposing factors of pyoderma are male sex, poor nutritional status, young age and geographical distribution. Pyoderma is a significant public health issue with high economic and social repercussions.[12] The current study was conducted at Dr. D. Y. Patil Medical College, Hospital and Research Centre, considering the sample size of 89 patients during a period of two years. All out-patients as well as in-patients reporting to the Dermatology department were considered for being a part of the study.

We found in our study that pyoderma was commonly seen in children of age group 0-10 years (39 patients). This was in accordance with the findings of the study conducted by Gandhi et al, Mathew et al. and Lawrence et al.[4,6,14] which also had higher incidence of 0-10 years age group. Whereas, in a study conducted by Ramana et al.[15], there was prevalence of patients from more than 40 years age group. Most of these cases were noted in the hot and humid climate and were especially common in the lower socio-economic strata of the society.[4] It was also thought that children's skin is more prone to develop pyoderma attributing to their epidermis with less efficacious barrier zone, immaturity of the sebaceous glands and relatively less developed immune system.[16]

In the present study, we found that the number of males (56%) was higher as compared to the females (44%). Similar findings were observed in studies conducted by Gandhi et al. and Malhotra S.[4,13] On the contrary, female predominance was observed in a study carried out by Ramani and Jayakar et al, Mathew et al.[17,6] Male preponderances could be due to more involvement in the manual work and in turn more prone to trauma.[18] In our study, we found that majority of the cases (60%) had no history of contact prior to developing pyoderma, whereas school history was present in 22 % and family history was seen in 18 % of the patients.

We also found that in accordance to the involvement of sites observed in pyodermas, involvement was maximum at multiple sites (50 patients), followed by involvement of the lower limb seen in 19 patients, upper limb involvement seen in 11 patients and least common was head and neck involvement observed in 9 patients. In a study conducted by Gandhi et al.[4], lower extremities were the most commonly involved (60 %) followed by the head (47.5 %) and upper extremities (21.5 %)

There was seen association of various co-morbidities with presence of pyodermas including malnutrition seen in 28 patients which was followed by diabetes mellitus. Majority of the patients (32) had no associated co-morbidities. In our study, we observed that according to the clinical diagnosis, primary pyodermas constituted 63 % of the cases whereas secondary pyodermas constituted 37 %. This was similar to the findings of studies conducted by Kakar et al. and Janardhan et al.[19,20]

Out of the primary pyodermas, folliculitis contributed to the majority of the cases (22) followed by furunculosis (13 cases) and impetigo seen in 7 cases. These were consistent with the findings of Patil et al.[21] (2368) where predominance of folliculitis (58.8 %) and furunculosis (33.33 %) was seen. Studies conducted by Kakar et al., Gandhi et al. and Malhotra et al.[19,4,13] showed findings of mostly impetigo.

Under the secondary pyodermas, commonly seen was infected eczema in 10 patients followed by 9 patients with infected scabies. Our results were similar to those in studies conducted by Janardhan B et al. and Bhaskaran et al.[20,22] where scabies with secondary infection was the most common secondary pyoderma.

In the microbiological studies, we found culture positive results in the majority of the cases (87 %) and culture negative results in 13% of the cases. The most commonly isolated organism was Staphylococcus aureus in 44 patients followed by Coagulase negative Staphylococcus aureus (CONS) seen in 17 patients, β hemolytic

Streptococci in 8 patients, Escherichia coli and Klebsiella spp found in 3 patients each and two patients had Pseudomonas aeruginosa. Sterile culture was observed in 12 patients.

Our findings are in accordance with those of Janardhan et al., Khalil et al., Gandhi et al. and Kakar et al.,[20,23,4,19] who isolated majority of Staphylococcus aureus and β hemolytic Streptococci. On contrary to this, Malik et al.[24], had reported greater isolation of streptococci as compared to staphylococci.

In the current study, all Gram-positive organisms were found to be sensitive to vancomycin (100 %) followed by ceftriaxone (92 %), Cefoperazone + Sulbactam (91 %), Amoxicillin + Clavulanic acid (89 %). There was higher rate of resistance seen towards gentamicin, amoxicillin, ciprofloxacin and cotrimoxazole. Our results were consistent with the findings of Gandhi et al.[4] and Ramana et al.[15] who also reported that S. aureus was 100 % sensitive to Vancomycin.

Rampant use of amoxicillin and cefixime has led to the emergence of resistant strains due to penicillinase producing strains. Also, it may be due to frequent prescription of these antibiotics because they are available in oral form and misuse of these drugs in the community because of over-the-counter availability of drugs, which increases the selection pressure and thus the development of resistance.

CONCLUSION

In accordance to the clinical diagnosis, primary pyoderma cases were higher as compared to the secondary pyodermas. Folliculitis constituted the major portion of primary pyodermas followed by furunculosis, whereas, in the secondary pyodermas, commonly encountered were cases with infected eczema followed by cases of infected scabies. Staphylococcus aureus was the frequently isolated organism in majority of the cases from skin lesions of pyoderma patients. In our study, we found that vancomycin and ceftriaxone were the most effective antibiotics. With the current changing trends in the antibiotic sensitivity pattern, it is crucial to take into account the sensitivity and the resistance patterns of the causative organisms, avoidance of inappropriate and rampant use of antibiotics with the help of formulation of proper guidelines for use of antibiotic treatment and thereby help in overcoming the emerging resistant strains.

REFERENCES

1. Coulson IH, Benton EC, Ogden S. Diagnosis of skin disease. In: Griffiths C, Barker J, Bleiker T, Chalmers R, Creamer D, eds. Rook's Text Book of Dermatology. 9th ed. Blackwell Publication; 2016: 4.1-4.26.

2.Thapa DM. Bacerial Infections. In: Nashim S, Khanna M, eds. Clinical Pediatric Dermatology. Noida, India: Elsevier; 2009: 43-49.

3. Paudel U, Parajuli S, Pokhrel DB. Clinicobacteriological profile and antibiotic sensitivity pattern in pyodermas: A Hospital Based study. Nepal J Dermatol Venereol Leporal. 2013;11(1):49- 58.

4. Shashi Gandhi, A.K., Ojha, K.P., Ranjan, Neelima. 2012. Clinical and Bacteriological Aspects of Pyoderma. N. Am. J. Med. Sci., 4(10): 492–495.

5. Badabagni, P., Malkud, S. 2016. Clinico-etiological study of pyodermas in a tertiary care hospital. Ind. J. Clin. Experimental Dermatol., 2(2): 53-57.

6. Mathew MS, Garg BR, Kanungo R. A clinico-bacteriological study of primary pyodermas of children in Pondicherry. Indian J Dermatol Venereol Leprol. 1992; 58:183–7.

7. Singh G, Kaur V, Singh S. Bacterial Infections. In: Valia RG, Valia AR, editors. IADVL Textbook of Dermatology. 3rd ed. Mumbai: Bhalani Publishing House; 2008. pp. 223–51.

8. Mishra, D., Palo, S. 2016. Antibiotic resistance pattern of bacterial isolates from skin and soft tissue infections. Int. J. Res. Med. Sci., 4(5): 1458-1462.

9. Arora B, Ranjan KP, Arora DR. Prevalence of methicillin resistant Staphylococcus aureus (MRSA) in post operative wound infections in a referral hospital in Haryana, India. Infect Dis Antimicrob Agents 2008; 25:1237.

10. Maibach HI, Aly R. Bacterial infections of the skin. In: Moschella S, Hurley HJ, eds. Dermatology. 3rd ed. Philadelphia: WB Saunders; 1992: 710-750.

11. Craft N, Lee PK, Zipoli MT, Weinberg AN, Swartz MN, Johnson RA. Superficial cutaneous infections and pyodermas. In: Wolff K, Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, editors. Fitzpatrick's Dermatology in General Medicine. 7th ed. New York: Mc Graw Hill; 2008. pp. 1694–709.

12. Nandihal NW, Ravi GS. A clinico-bacterial profile of pyoderma. Int J Curr Microbiol App Sci. 2017;6(3):1575-80

13. Malhotra SK, Malhotra S, Dhaliwal GS, Thakur A. Bacteriological study of pyodermas in a tertiary care dermatological center. Indian J Dermatol 2012; 57: 358-61.

14. Lawrence JN, Facklam RR, Sttneck FO. Epidemiologic studies among Amerdician population of Amazonia. Pyoderma prevalence and associated pathogens. Am J Trop Med Hyg 1989; 28: 54-8.

15. Ramana KV, Mohanty SK, Kumar A. In-vitro activities of current antimicrobial agents isolates of pyoderma. Indian J Dermatol Venereol Leprol 2008; 74: 430.

16. Todd LK. 2000. Staphylococcal infections, Group B Streptococci. Nelson's Textbook of paediatrics. 16th Edn. WB Saunders. Singapore, Vol 1. 793-798. 810-815.

17. Ramani TV and Jaykar PA. 1980. Bacteriological study of 100 cases of Pyodermas with special reference to Staphylococci, their antibiotic sensitivity and phage pattern. Ind J Dermatol Venereol Leprol., 46: 282-286.

18. Vijayamohan N, Nair SP. A study of the prevalence of methicillin-resistant Staphylococcus aureus in dermatology inpatients. Indian Dermatol Online J 2014;5(4):441-5.

19. Kakar N, Kumar V, Mehta G, Sharma RC, Koranne, (1999), Clinico-bacteriological study of pyodermas in children, R. V. Journal of Dermatology: 26 (5): 288-293.

20. Janardhan B, Prasad GK, Nandeshwar AJ and Vidyavathi N. Clinicomicrobiological study of pyodermas International Journal of Recent Scientific Research 2015 May; 6 (5): 3820-3824.

21. Patil R, Baveja S, Nataraj G, Khopkar u, (2006). Prevalence of Methicillin-resistant Staphylococcus aureus (MRSA) in community-acquired primary Pyoderma. Indian J Dermatol Venereol; 72: 122-26.

22. Bhaskaran CS, Rao PS, Krishna Murthy T, (1989): Bacteriological study of Pyodermas. Ind J Dermatol Venereol Leprol; 45: 162-170.

23. Khalil Ahmed, Asheesh Batra, Renu Roy, G Kalla, Kh, (1998). Clinical and bacteriological study of Pyoderma in Jodhpur- Western Rajasthan (1e). Ind J Dermatol Venereol Leprol; 64: 156-157.

24. Malik Muhammad Hanif, Tariq Butt, Mohammad Amjad. Pathogens involved and antibiotic sensitivity pattern of isolates in community acquired common bacterial skin infections, Department of Dermatology and Pathology, Combined Military Hospital Peshawar. 2006; 3.