Content available at: https://www.ipinnovative.com/open-access-journals

Panacea Journal of Medical Sciences

Journal homepage: http://www.pjms.in/

Original Research Article

Bacteriological profile and antibiotic susceptibility pattern of community acquired Pyoderma cases in a tertiary care centre at North Karnataka

Rupali S Shinde[1], Aisha M Parande[1], Rubeena Ishrat Mulla[2], Mahantesh V Parande[1], Uma Chikkaraddi[3]*

[1]*Belagavi Institute of Medical Science, Belagavi, Karnataka, India*
[2]*Jawaharlal Nehru medical college, KLE University, Belgaum, Karnataka, India*
[3]*Karnataka Institute of Medical Sciences, Hubballi, Karnataka, India*

ARTICLE INFO

Article history:
Received 26-07-2023
Accepted 09-12-2023
Available online 21-12-2024

Keywords:
Pyoderma
Staphylococcus aureus
Streptococcus pyogenes
Antibiotic resistance

ABSTRACT

Background: Pyoderma is an infection of skin or its appendages. Staphylococcus aureus and Streptococcus pyogenes are most common causative agents of Community acquired Pyoderma and Gram negative bacilli are encountered to lesser extent. Emergence of drug resistance has caused increased morbidity and therapeutic challenge in the management of pyoderma cases. Hence the present study is undertaken to know the bacterial profile of Community acquired pyoderma and their antibiotic susceptibility pattern in our set up using conventional techniques.

Materials and Methods: Pus Samples were processed as per the standard microbiological procedures over a period of one and half year. Antibiotic susceptibility tests were performed by Kirby-Bauer disk diffusion method following CLSI guidelines.

Results: out of 150 pus samples, 105 (70%) were primary pyoderma cases and 45 (30%) were secondary. Most affected age group is 0 to 10 years (25.33%) followed by 11 to 20 years (18%). S.aureus (70%) is the most commonly isolated which showed highest resistance towards Penicillin (81.91%) followed by Erythromycin, Ciprofloxacin (55.24%), Amoxicillin-Clavulanic Acid and Ofloxacin (37.14%), Cefepime (29.53%), Cotrimoxazole (26.67%). Lesser resistance was shown against Tetracycline (14.29%), Gentamycin (11%), Clindamycin (06.67%) and Chloramphenicol (02.86%). No resistance was shown against Linezolid. Rate of MRSA was 24.76%.

Conclusion: Present study reveals that children are at higher risk of developing pyoderma and S. aureus is the commonest causative agent in our geographical area with considerably high prevalence of MRSA. Isolates are resistant to commonly used topical agents like erythromycin. Systematic surveillance of antimicrobial susceptibility will help in effective management of cases and emergence of drug resistance.

This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution 4.0 International License, which allows others to remix, and build upon the work. The licensor cannot revoke these freedoms as long as you follow the license terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Pyoderma is one of the most common public health concerns. It is the pyogenic infection of skin as a result of exogenous bacterial infection or imbalance between the commensal flora.[1] Pyoderma is classified into two main types as primary pyoderma and secondary pyoderma.[2] Primary pyoderma is infection of skin or its appendages with formation of pus in a previously non diseased skin whereas secondary pyoderma is pyogenic infection in a previously diseased skin as a secondary manifestation.[3] In developing countries; the hot and humid climate, low socioeconomic conditions, lack of hygiene, poor access to water, high interpersonal contact and household overcrowding and certain other pre-existing skin conditions like reactions to insects bites (scabies) play a

* *Corresponding author*.
E-mail address: ucumasiri@gmail.com (U. Chikkaraddi).

https://doi.org/10.18231/j.pjms.2024.145
2249-8176/© 2024 Author(s), Published by Innovative Publication.

significant role in aetiology of pyoderma.[4,5]

Spontaneous resolution of lesions may be a commonest prognosis expected in pyoderma, however rare complications include, superficial and septic dissemination to deep abscess, cellulitis or Sepsis. Occurrence of Glomerulonephritis and other delayed post-streptococcal complications can be observed in Group A Streptococcal infections.[4]

Among the causative bacteria, Staphylococcus aureus and Streptococcus pyogenes are two most common agents and many times Gram negative bacilli like Proteus species, Pseudomonas species and Coliforms are also encountered. Changing trends are being noted in the etiological aspects of primary pyoderma and also there is an emergence of drug resistant strains. Types of pyoderma, their causative agents and their antibiotic susceptibility pattern vary from region to region and time to time.[1] So the awareness about the regional pattern of antibiotic sensitivity of prevalent bacteria is of utmost importance in the diagnosis, treatment and most importantly to prevent inadvertent and indiscriminate use of antibiotics which would further lead to antimicrobial resistance.[3]

Hence the present study is undertaken to know the bacterial profile of Community acquired pyoderma and their antibiotic susceptibility pattern with special reference to MRSA and ESBL in our set up using conventional methodology.

2. Materials and Methods

2.1. Duration of study

One and half year.

2.2. Design of study

Cross sectional Study.

2.3. Inclusion criteria

1. Pus samples collected from clinically diagnosed outpatient pyoderma cases
2. Samples yielding bacterial isolate/isolates in Pure culture or mixed culture but not more than three isolates

2.4. Exclusion criteria

1. Pus samples from non pyoderma patients
2. Pus samples from of clinically diagnosed in patient pyoderma cases
3. Samples yielding bacterial isolates in mixed culture more than three isolates
4. Samples yielding no growth even after 48 hours of incubation.
5. Samples yielding known skin commensal flora with no probable pathogenicity are considered as skin contaminants and excluded from the study.
6. Samples yielding fungal growth.

2.5. Sample collection

Skin around the lesion was sterilized using 70% alcohol. In case of an intact pustular lesion, it was ruptured with a sterile needle and the material was collected. In case of open wounds, lesions were rinsed thoroughly with sterile saline after removing debris and then the material collected using sterile swabs. In crusted lesions, the crust was partially lifted and the specimen collected from underneath. Pus Samples were collected on two sterile swabs and placed in sterile test tubes following proper aseptic precautions and transported to the microbiology laboratory within one hour.[6,7]

2.6. Sample processing

Gram stain was done with the first swab. The second swab was inoculated in Chocolate agar and MacConkey agar and incubated at 37°C for 24-48 hours for isolation; further processing was done as per the standard microbiological procedures. The organisms were identified based on colony morphology, microscopy by Gram staining and a set of biochemical reactions.[6] Antibiotic susceptibility tests were performed by Kirby-Bauer disk diffusion method on Mueller Hinton agar using routine antibiotic panel. MRSA was detected by using Cefoxin (30μg) disc, Staphylococcus aureus isolates showing less than 21mm zone of inhibition around Cefoxitin disc were considered Methicillin resistant and ESBL production was detected by phenotypic screening and confirmatory methods as per CLSI guidelines.[8]

Permission was taken from the institutional Ethical clearance committee. (BIMS- IEC/152/2020-21)

2.7. Statistical analysis

The data arrived from the results of the study was analysed by descriptive statistics and presented in the form of proportions, percentages and Graphs.

3. Results

A total of 150 samples collected from clinically diagnosed pyoderma cases attending Outpatient Departments were included in the study out of which 105 (70%) were primary pyoderma cases and 45 (30%) were secondary pyoderma cases. All the age groups from 0 to 100 years were included in the study, of which the most affected age group was 0 to 10 years (25.33%) followed by 11 to 20 years (18%.) (Table/Image-1) Male to female ratio was 2.57:1. Incidence of pyoderma cases was more common in males as the affected males are 108 (72%) and females are 42 (28%). (Table 1) Out of 150 samples Pseudomonas aeruginosa.

Staphylococcus aureus showed highest resistance towards Penicillin (81.91%) followed by Erythromycin and

Ciprofloxacin (55.24%), Amoxicillin-Clavulanic Acid and Ofloxacin (37.14%),

None of the Enterobacteriaeceae were ESBL producers.

4. Discussion

The present study has studied 150 community acquired pyoderma cases. Bacteriological profile and antibiotic susceptibility testing was done using conventional methods and the results were analysed by comparing with other similar studies conducted across the country.

In the present study majority of the pyoderma cases were reported in the age group of 0 to 10 years (25.33%) this could be due to lack of hygiene among children and increased incidence of injuries. Similar occurrence of pyoderma cases in the early paediatric age group is seen in a study conducted by Nandihal W et al,[9] Gandhi S et al[10] and Badabagni P et al.[11] Whereas studies conducted by HulmaniM et al,[12] showed highest occurrence among 21-30 years of age group and Malhotra et al[13] in 31-40 years of age group. However, a study conducted by Singh N et al[14] showed uniform occurrence among the first three decades of age group. Male to female ratio was 2.57:1 in the present study with 72% of males and 28% of females being infected. Similar male preponderance is seen in studies conducted by most of the studies.[9–13] This can be attributed to males being more involved in increased outdoor physical activities than females as well as males seeking medical attention more than females.

Among the 150 samples received, 70% accounted for primary pyoderma cases and 30% for secondary in the present study. This data is in good correlation with studies conducted by Singh N. et al,[14] Ghadage et al[15] and Singh A et al.[15] However in a study conducted by Badabagni et al[11] primary pyoderma accounted for as high as 90% of cases and contrastingly in studies conducted by Malhotra et al,[13] only 19% of the cases are from primary pyoderma.

Among the causative bacteria Staphylococcus aureus was most frequently isolated in the present study accounting for 70% of the isolates followed by Coagulase Negative Staphylococcus (10.67%), Streptococcus Pyogenes (8.67%) and Enterococcus Species (4.67%). S. aureus remains the most frequently isolated causative agent of pyoderma in most of the studies conducted across India.[9,10,12,13,15,16] though the percentage of S. aureus is comparatively lower in the studies conducted by Nagmoti et al[17] and Badabagni et al[11] i.e 45% and 52.33% respectively, still S. aureus remains the most common isolate in their studies too. CoNS (10.67%) found to be the second most commonly isolated organism similar to the studies conducted by Singh N et al[14] (12.5%) and Kalashetti V et al[16] (8%). However in the various other studies[9,11,14,18] -haemol^{y}tic streptococci appears to be the second highest isolated organism. Whereas in the present study S. pyogenes remains the third commonest isolate (8.67%) which is in good correlation with studies conducted by Nandihal et al (11%),[9] Singh N et al (9.9%).[14]

Coming to the antibiotic susceptibility pattern of S. aureus isolates, maximum resistance was expressed against Penicillin (81.91%) which is comparable to the study conducted by Biradar S et al[19] and Hulmani M et al,[12] however many other studies,[20,21] Penicillin resistance is much higher than the present study. Similarly few studies[12,22] show relatively lesser resistance to Penicillin. Erythromycin being most commonly used topical antibiotic whose resistance was 55.24% in the present study, which is similar to the studies conducted by Singh N et al[14] and Biradar S et al[19] and contrasting with Studies conducted by Shilpa S H et al,[22] Paudel et al[19] and Badabagni et al[11] where Erythromycin is resistance is much lesser than the present study and Hulmani M et al[12] found more resistance. Similar resistance was expressed against Ciprifloxacin (55.28%) in the present study, which is correlating with the study conducted by Hulmani M et al,[12] Ruturaj et al[21] and Singh N et al[14] but study by Shilpa S H et al,[22] Paudel et al[18] and Badabagni et al[11] showed higher sensitivity towards Ciprofloxacin however, much higher resistance is seen in a study by Singh A et al.[15] Such higher resistance to Erythromycin and Ciprifloxacin could be due to irrational usage of these two antibiotics as they are easy available over the counter and easy to use antibiotics in the community set up. Cotrimoxazole, another important first line oral antibiotic against Community acquired infections is 26.67% of resistance which is comparable with most of the studies,[16,21,22] however few other studies[10,12,13,17] show much higher resistance than the present study. Gentamicin (11.43%), commonly used injectable in combination with -lactams and other agents turns out to be the quiet effective antibiotic in the present study similar to the studies conducted by Shilpa S H et al,[22] Singh N et al[14] and Biradar et al[19] however studies conducted by Nandihal W et al,[9] Badab‘agni et al[11] and Hulmani et al[12] showed much higher resistance than present study. Another commonly used topical agent Clindamycin (06.67%) is also effective antibiotic in the present study similar to the study conducted by Nandihal W et al[9] but in most of the studies.[12,13,17] Fortunately the higher antibiotics like, Linezolid, Vancomycin and teicoplanin are 100% sensitive in the present study, it is also shown in most of the similar studies,[16,17] however, Hulmani et al,[12] Singh A et al[15] and Kulkarni et al[23] reported emergence of Linezolid and Vancomycin resistant S. aureus isolates. Present study reports 24.76% of MRSA from pyoderma cases which is similar to the studies conducted by Hulmani M et al,[12] Gandhi S et al[10] and Singh Th N et al[24] however studies[9,11,13,14,18,21,23,25] across the country showed varied occurrence of MRSA causing Pyoderma. Occurrence of MRSA is substantially high among community acquired infections in the present study,

Table 1: Age and gender wise distribution of pyoderma cases

Age group	Number of cases	Percentage
0-10yrs	38	25.33%
11-20yrs	27	18%
21-30yrs	25	16.67%
31-40yrs	20	13.33%
41-50yrs	15	10%
51-60yrs	18	12%
>60yrs	07	4.67%
Male	108	72%
Female	42	28%
Total number of cases	150	-

Table 2: Bacteriological profile of pyoderma cases

Organisms	Numbers of cases	Percentage
Staphylococcus aureus	105	70%
Coagulase negative staphylococcus	16	10.67 %
Streptococcus pyogenes	13	8.67%
Enterococcus species	07	4.67%
Escherichia coli	03	2%
Klebsiella species	01	0.67%
Proteus species	01	0.67%
Pseudomonas aeruginosa	01	0.67%
No growth	03	2%
Total	150	-

Table 3: Antibiotic resistance pattern of Gram Positive Cocci:

Antibiotics	Number of Resistant S. aureus isolates (n=105)	Number of Resistant CoNS isolates (n=16)	Number of ResistantS. pyogenes isolates (n=13)	Number of Resistant Enterococcus isolates (n=07)
Penicillin	86(81.91%)	14 (77.78%)	06 (46.15%)	06 (75%)
Amoxicillin-Clavulanic Acid	39 (37.14%)	12 (66.67%)	01 (7.69%)	06 (75%)
Chloramphenicol	03 (02.86%)	1 (55.56%)	00	NT
Cotrimoxazole	28 (26.67%)	5 (27.28%)	04 (30.77%)	NT
Clindamycin	07 (06.67%)	5 (27.28%)	02 (15.39%)	NT
Erythromycin	58 (55.24%)	9 (50%)	05 (38.46%)	05 (62.5%)
Gentamycin	12 (11.43%)	3 (16.67%)	00	NT
High level Gentamycin	NT	NT	NT	01 (12.5%)
Ofloxacin	39 (37.14%)	10 (55.57%)	03 (23.08%)	04 (50%)
Ciprofloxacin	58 (55.24%)	12 (66.67%)	04 (30.77%)	05 (62.5%)
Tetracycline	15 (14.29%)	3 (16.67%)	00	01 (12.5%)
Cefepime	31 (29.53%)	00	NT	NT
Linezolid	00	00	00	01 (12.5%)
Teicoplanin	00	00	00	00
Vancomycin	00	00	00	00
Cefoxitin	26 (24.76%)	06 (33.33%)	NT	NT

NT = Not Tested

Table 4: Antibiotic resistance pattern of Gram negative bacilli:

Antibiotics	Number of Resistant Enterobacteriaeceaeisolates (E. coli, Klebsiella and Proteus)(3+1+1) (n=05)	Number of Resistant Pseudomonas aeruginosa isolates (n=01)
Ampicilillin	05 (100%)	NT
Amoxicillin-Clavulanic Acid	04 (80%)	NT
Cotrimoxazole	03 (60%)	NT
Ceftazidime	00	00
Ceftazidime-Clavulanic Acid	00	00
Gentamycin	00	00
Ofloxacin	02(40%)	00
Ciprofloxacin	03(60%)	01 (100%)
Tetracycline	01 (20%)	NT
Cefepime	00	NT
Aztreonam	00	00
Imipenem	00	00
Meropenem	00	00
Cefazolin	01 (20%)	NT
Cefuraxim	01 (20%)	NT
Piperacillin Tazobactam	00	00
Cefotaxime	00	NT
Ticarcillin	NT	01 (100%)
Ticarcillin-Clavulanic Acid	NT	00

which can be attributed to irrational use of over the counter available antibiotics leading to selection pressure among causative agents. Indiscriminate use of antibiotics at the primary health sectors can lead to emergence of such resistance mechanisms at community level.

CoNS (10.67%) being the next frequent isolate in the present study expressed an almost similar resistance pattern as that of S. aureus with a slightly higher rate of Methicillin resistance (33.33%). Antibiotic susceptibility patterns of other isolates are mentioned in Table-3 and Table-4. However as their number of occurrences is considerably low, the results of their Susceptibility could not be generalised.

5. Limitations

Though the study was conducted over a long period of one and half years the sample size appears to be relatively smaller looking into the proportion of the isolates. Extensive analysis regard to the Gram negative bacilli and their antibiotic susceptibility was not possible as their prevalence was very low.

6. Conclusion

The present study concludes that, S. aureus is the commonest causative agent of pyoderma cases which are more frequent in early paediatric age groups with male propendarence hence the preventive measures need to be directed towards this age group through primary education. Role of hygiene and attentiveness towards injuries and wounds needs to be stressed up on. Prevalence of MRSA in the present study is 24.76% and Erythromycin and Ciprofloxacin are least effective options against pyoderma infections and other commonly used topical, oral and injectable agents are promising options in treating these infections in the present set up. Study stresses upon systematic surveillance of antimicrobial susceptibility to help in effective management of clinical cases and detection of emergence of drug resistance along with antibiotic policy for empirical therapy of community acquired pyoderma cases.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Mathews MS, Garg BR, Kanungo R. A clinico-bacteriological study of primary pyodermas in children in Pondicherry. *Indian J Dermatol Venereol Leprol*. 1992;58:183–7.
2. Sacchidanand S, COberai, Inamadar AC. IADVL textbook of dermatology. vol. 1. 4th ed. Mumbai Bhalani Publishing House; 2015.
3. Jayaram DP. Abstract of Presentation in the Seminar on Pattern of Skin Disease in India. *Indian J Dermatol Venereol*. 1962;28(3):147–8.
4. Epidemiology and Management of Common Skin Diseases in Children in Developing Countries. Available from: https://www.who.int/publications/i/item/WHO-FCH-CAH-05.12.
5. Roberts SO, Highet AS. Bacterial Infections: Textbook of Dermatology. 5th ed. Blackwell: Oxford University Press; 1996. p. 725–90.

6. Orbes BA, Sahm DF, Weissfeld AS. Pseudomonas, burkholderia, and similar organisms. In: BA F, DF S, AS W, editors. Bailey and Scott's Diagnostic Microbiology. St. Louis: Mosby Inc; 2002. p. 448–61.
7. Behl PN, Aggarwal A, Srivastava G. Superficial bacterial and tropical infections. In: Practice of dermatology. New Delhi: CBS Publishers & Distributors; 2001. p. 150–62.
8. M100 Performance Standards for Antimicrobial Susceptibility Testing; 28th . Wayne, PA: Clinical and Laboratory Standards Institute; 2018. Available from: https://clsi.org/media/1930/m100ed28_sample.pdf.
9. Nandihal NW, Ravi GS. A clinico-bacterial profle of pyoderma. *Int J CurrMicrobiol App Sci*. 2017;6(3):1575–80.
10. Gandhi S, Ojha AK, Ranjan KP, Neelima. Clinical and Bacteriological Aspects of Pyoderma. *N Am J Med Sci*. 2012;4(10):492–5.
11. Badabagni P, Malkud S. Clinicoetiological study of pyodermas in a tertiary care hospital. *Ind J Clin Exp Dermatol*. 2016;2(2):53–7.
12. Hulmani M, Meti P, Kumar JV. Bacteriological and antibiotic susceptibility study of pyodermas at a tertiary care center in central Karnataka. *Int J Res Dermatol*. 2017;3(1):145–50.
13. Malhotra SK, Malhotra S, Dhaliwal GS, Thakur A. Bacteriological study of pyodermas in a tertiary care dermatological center. *Indian J Dermatol*. 2012;57(5):358–61.
14. Singh N, Pradhan SS, Sahoo TS, Mohapatra I, Jena J, Pattnaik D, et al. Bacteriological Profile of Pyoderma Cases Attending the Dermatology Department in a Tertiary Care Hospital. *J Clin Diagn Res*. 2020;14(12):19–23.
15. Singh A, Singh K, Kanodia S, Singh S, Singh J, Mohammad A, et al. Bacteriological study and antibiotic sensitivity patterns in cases of pyoderma. *Int Med J*. 2014;1(8):357–63.
16. Kalshetti VT, Bhate VM, Haswani N, Bothikar ST. Staphylococcus aureus: A Major Causative Agent of Community-Acquired Pyoderma. *Int J CurrMicrobiolApp Sci*. 2014;3(9):94–7.
17. Nagmoti JM, Patil CS, Metgud SC. A bacterial study of pyoderma in Belgaum. *Indian J Dermatol Venereol Leprol*. 1999;65(2):69–71.
18. Paudel U, Parajuli S, Pokhrel DB. Clinico-bacteriological profile and antibiotic sensitivity pattern in pyodermas: A Hospital Based Study. *Nepal J Dermatol Venereology Leprology*. 2013;11(1):49–58.
19. Biradar S, Nigudgi A, Kadaganchi C, Doddamani P. Bacteriological profile of pyoderma and its antibiotic sensitivity pattern in a tertiary care hospital in North Karnataka. *Indian J Microbiol Res*. 2021;8(2):135–8.
20. Ghadage DP, Salil YA. Bacteriological study of pyoderma with special reference to antibiotic susceptibility to newer antibiotics. *Indian J Dermatol Venereol Leprol*. 1999;65(4):177–81.
21. Ruthuraj MK, Surpam RB, Saileela K, Manderwad GP, Kumar HR. Bacteriological profile of pyoderma in children. *IP Int J Med Microbiol Trop*. 2019;5(1):4–8.
22. Haibat SS, Deshmukh A. Clinicobacteriological study of primary pyoderma with reference to antibiotic sensitivity. *Int Med J*. 2015;2(11):819–21.
23. Kulkarni V, Jayaraj YM, Shivannavar CT, Arali SM, Mohan R. Clinico-Bacteriological Studies On Pyoderma In Gulbarga Region (Karnataka State) Emphases To Methicillin Resistant Staphylococcus aureus. *Int J Pharm Bio Sci*. 2014;5(1):616–24.
24. Singh TN, Devi KS, Singh NB. Bacteriological study of pyoderma in RIMS hospital. *J Med Soc*. 2005;19(3):109–12.
25. Shilpashree UG, Dhanalakshmi TA, Venkatesha D. Clinico-bacteriological study of pyoderma with special reference to methicillin resistant Staphylococcus aureus. *Indian J Microbiol*. 2017;4(1):20–5.

Author's biography

Rupali S Shinde, Associate Professor

Aisha M Parande, Assistant Professor

Rubeena Ishrat Mulla, Assistant Professor

Mahantesh V Parande, Professor

Uma Chikkaraddi, Senior Resident

Cite this article: Shinde RS, Parande AM, Mulla RI, Parande MV, Chikkaraddi U. Bacteriological profile and antibiotic susceptibility pattern of community acquired Pyoderma cases in a tertiary care centre at North Karnataka. *Panacea J Med Sci* 2024;14(3):810-815.