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A BACTERIOLOGICAL STUDY OF PRIMARY PYODERMAS IN CHILDREN IN A TERTIARY CARE HOSPITAL

Dermatology

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ABSTRACT

Introduction: 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. Changing trends are being noted in the etiological aspect of primary pyodermas and the problem of emergence of drug resistant strains is an ever increasing one. Antibiotic resistance has become a clinically important consideration in many infections, but methicillin resistant S. auerus (MRSA) which has been a nosocomial problem for years, is now a common community acquired skin infection.

MATERIALS AND METHODS:

Study Design: Descriptive study. **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: Patients with primary pyoderma started on antibiotic therapy.

Sample collection: Smears made from the pus were stained with gram's stain. Pus was cultured on blood agar and Mackonkey's agar and incubated aerobically at 37^0 C for 48 hours. Sensitivity of the organisms to antibiotics was tested on Mueller Hinton agar. Antibiotic sensitivity was tested by disc diffusion technique using Kirby Bauer method.

Observation: Gram staining of the pus demonstrated organisms in 78% cases. Most common organism in gram staining was gram positive cocci. Culture positivity in this study was 84%. The most common organism isolated in the present study was Staphylococcus aureus accounting for 80.95%, with low percentage of Streptococcus pyogenes (2.38%) and Escherichia coli (2.38%) but with a higher percentage of mixed organisms (14.29%). The observation of methicillin resistant Staphylococcus aureus was observed in 9.52% of cases. Staphylococcus aureus showed sensitivity to cloxacillin (100%) followed by first generation cephalosporin (94.11%) and amikacin (73.53%). Streptococcus pyogenes showed sensitivity to penicillin and gentamicin in all the cases. MRSA was sensitive to amikacin, vancomycin and linezolid in all the cases.

Conclusion : The most common organism isolated in culture was Staphylococcus aureus. MRSA was isolated from 9.52% cases. Staphylococcus aureus showed sensitivity to cloxacillin (100%) followed by first generation cephalosporin (94.11%) and amikacin (73.53%). MRSA was sensitive to amikacin, vancomycin and linezolid in all the cases.

KEYWORDS

INTRODUCTION

Cutaneous bacterial infections may be divided into primary and secondary types. Primary infections tend to have a characteristic morphology and course, are incited initially by a single organism and arise in normal skin. Secondary infections originate in diseased skin as a superimposed condition and the organism do not play a prominent role in initiating the disease but may be important in protracting or intensifying it.[1] The majority of primary and secondary pyodermas (cutaneous bacterial infections) are caused by either Staphylococcus aureus or group A Streptococcus.[2] 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.[3]

Changing trends are being noted in the etiological aspect of primary pyodermas and the problem of emergence of drug resistant strains is an ever increasing one.[4] Antibiotic resistance has become a clinically important consideration in many infections, but methicillin resistant S. auerus (MRSA) which has been a nosocomial problem for years, is now a common community acquired skin infection.[5] It would be ideal to do culture and sensitivity tests before prescribing antibiotics, but as this is not always feasible, studies should be conducted to determine the etiological agents and antibiotic resistance.[6]

AIM OF THE STUDY

To study the bacteriological profile and antibiotic sensitivity.

MATERIALS AND METHODS

Study Design: Descriptive study

Study Setting: Dermatology & Venereology department, Medical College hospital, Thiruvananthapuram.

Duration of study: 1 year

Sample Population: Patients (children between 1 to 12) attending dermatology OP/IP, with clinical diagnosis of primary pyoderma.

Inclusion criteria:

- Clinically diagnosed cases of primary pyoderma of both sex and age between 1 to 12 years.
- Those who are willing for study.

Exclusion criteria:

- Those children between 1 to 12 years with primary pyoderma started on antibiotic therapy.

Sample collection:

The lesions were cleaned with normal saline and the pus was collected using two sterile cotton swabs. In the case with intact pustular lesions, the pustule was ruptured with a sterile needle and material was taken with sterile swab. In crusted lesions, the crusts were partly lifted and material was taken from underneath. The samples were sent to microbiology laboratory for gram staining and culture and sensitivity study.

Smears made from the pus were stained with gram's stain and examined under direct microscopy for organisms. Pus was cultured on blood agar and Mackonkey's agar and incubated aerobically at 37^0 C for 48 hours. Organisms grown were identified based on the basis of their morphology, cultural characteristics and biochemical reactions according to the standard methods. Sensitivity of the organisms to antibiotics was tested on Mueller Hinton agar. Antibiotic sensitivity was tested by disc diffusion technique using Kirby Bauer method.

OBSERVATION

Gram staining of the pus from the skin lesions demonstrated organisms in 78% cases. Most common organism in gram staining was gram positive cocci which was seen in all the Gram stain positive cases either with or without pus cells. In one case there was gram negative bacilli which correlated with isolation of Klebsiella sp. in culture.

In general, culture positivity in this study was 84%. This was similar to that observed by Patil R et al[7] (83.7%) and Tushar S et al[8] (83%).

In this study, single organism was isolated in 85.71% cases and mixed growths of organisms were observed in 14.29% cases. This pattern was similar to that observed by several other workers (Nagmoti MJ et al; 86% and 14%[9]) (Kakar N et al; 84% & 16%[10]).

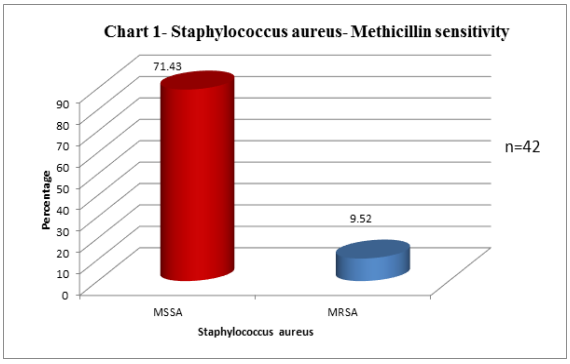
Table-1 Culture organism isolated

Culture organism	Frequency	Percentage
Staphylococcus aureus	34	80.95
Streptococcus pyogenes	1	2.38
Escherichia coli	1	2.38
Mixed organisms	6	14.29
Total	42	100

The most common organism isolated in the present study was Staphylococcus aureus accounting for 80.95%, with low percentage of Streptococcus pyogenes (2.38%) and Escherichia coli (2.38%) but with a higher percentage of mixed organisms (14.29%) (Table-1). This is in partial agreement with the study by Nagmoti et al[9], where S. aureus was isolated in 45% but with a higher percentage of Streptococcus pyogenes (35%) and E.coli (5%). The other study by Mathew S et al also isolated a higher percentage of Streptococcus pyogenes (13.3%)[11] than in this study. This leads to the interpretation that the frequency of streptococcal infection in our society is much less when compared with other population or the culture technique of streptococcal isolation may not be as perfect as compared with the technique of isolation of staphylococcus.

The observation of methicillin resistant Staphylococcus aureus in 9.52% of the study population (chart -1) was similar to that observed by Tushar S et al[8] (10.45%). But in another study of primary pyoderma by Patil R et al[7] MRSA was isolated only in 1.4% cases. In the study by Phakade RS et al,[12] no MRSA could be detected among CA-SSTI. But Ortega – Loayza AG et al in a study of bacterial infections in children isolated MRSA in 32% cases[13]. This shows that there are wide variations in the occurrence of methicillin resistant strains among various population and it is of relatively high occurrence in our population.

On correlation of culture pattern with the clinical diagnosis of pyodermas in children, the striking observation was that methicillin sensitive Staphylococcus aureus was the predominant organism in 67.89% of impetigo contagiosa cases, 50% bullous impetigo cases, 40% folliculitis cases and 50% furuncle cases. Thus it becomes evident that methicillin sensitive Staphylococcus aureus is the consistent pathogen in various forms of cutaneous pyodermas. MRSA was isolated from 7.89% of impetigo contagiosa and 20% of folliculitis.



In this study Staphylococcus aureus, the most common culture isolate, was found to be sensitive to cloxacillin (100%), first generation cephalosporin (94.11%),amikacin (73.53%) and gentamicin (58.82%). There was a high resistance to penicillin (97.06%) and erythromycin (76.47%). All the MRSA isolated were sensitive to vancomycin, amikacin and linezolid. (Fig:1)

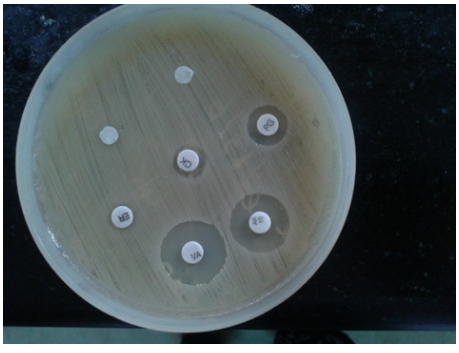


Fig.1. Antibiotic sensitivity of MRSA (Methicillin resistant Staphy lococcus aureus)

This shows that the best antibiotics for methicillin sensitive Staphylococcus aureus is cloxacillin followed by first generation cephalosporins and amikacin whereas for MRSA the ideal antibiotics are vancomycin, amikacin and linezolid. Streptococcus pyogenes showed sensitivity to penicillin and gentamicin in all the three cases hence they are the antibiotics to be chosen in such cases.

Table 2- Antibiotic sensitivity of culture organisms

	Staphylococcus aureus (n=34)	Methicillin - resistant S. aureus (n=3)	Streptococcus pyogenes (n=3)	Pseudomonas aeruginosa (n=1)	Klebsiella sp. (n=1)	Escherichia coli (n=1)
Cloxacillin	34 (100%)	-	-	-	-	-
Gentamicin	20 (58.82%)	1 (33.33%)	3 (100%)	1 (100%)	1 (100%)	1 (100%)
Amikacin	25 (73.53%)	3 (100%)	-	-	1 (100%)	-
Penicillin	1 (2.94%)	-	3 (100%)	-	-	-
Vancomycin	-	3 (100%)	-	-	-	-
Cefotaxime	-	-	-	-	1 (100%)	1 (100%)
Erythromycin	8 (23.53%)	-	-	-	-	-
Linezolid	-	3 (100%)	-	-	-	-
Cefoperazone sulbactum	-	-	-		-	1 (100%)
Ceftazidime	-	-	-	1 (100%)	-	-
1st generation cephalosporin	32 (94.11%)	-	-		-	-

The kappa coefficient value showing the strength of agreement between the results of direct microscopy using Gram stain and culture in the present study was 0.667. Hence, based on the scale of interpretation of kappa values, the two diagnostic test results were found to have a substantial agreement. This may provide a valuable interpretation that in resource poor settings Gram staining may be used as an effective tool in determining the causative organism and probably helps in accurate selection of antibiotic.

DISCUSSION

1. Gram staining revealed organisms in 78% cases. In this most common was gram positive cocci (78%). Gram negative bacilli were seen in one case along with gram positive cocci.
2. Culture positivity was observed in 84% cases. Out of the 42 culture positive cases, the most common organism isolated in culture was Staphylococcus aureus (80.95%).Methicillin-resistant Staphylococcus aureus was isolated from 9.52% cases. Streptococcus pyogenes was isolated from 2.38% cases.
3. Methicillin-sensitive Staphylococcus aureus is the commonest and consistent pathogen associated with the different types of pyoderma such as impetigo contagiosa, bullous impetigo, furuncle and folliculitis, as evidenced on correlation of culture results with the clinical diagnosis.
4. Staphylococcus aureus showed sensitivity to cloxacillin (100%) followed by first generation cephalosporin (94.11%) and amikacin (73.53%). Staphylococcus aureus also showed low sensitivity to gentamicin (58.82%) and erythromycin (23.53%). Thus cloxacillin appears to be the first antibiotic of choice in Staphylococcus aureus infection. Staphylococcus aureus was resistant to penicillin (97.06%) and erythromycin (76.47%).
5. Streptococcus pyogenes showed sensitivity to penicillin and gentamicin in all the cases.
6. MRSA was sensitive to amikacin, vancomycin and linezolid in all the cases.
7. The kappa coefficient value for measure of agreement between Gram staining and culture results were 0.667 showing a substantial agreement between the two diagnostic tests. This provides us the valuable interpretation that Gram staining may be used as an effective tool in determining the causative organism in resource poor settings.

CONCLUSION:

Primary pyodermas are the common infections in children between 1 to 4 years. Boys are more commonly affected than girls. They are seen in children of low socioeconomic status attending anganwadi centres, nursery or school. Recurrences are common in these children. Impetigo contagiosa is the most common clinical type in all age groups and both sexes. Staphylococcus aureus is the most common organism isolated in our setting. Staphylococcus aureus showed good sensitivity to cloxacillin and first generation cephalosporins. The resistance pattern of S. aureus is to penicillin and erythromycin. Based on the statistical tool used, Gram staining and culture showed a substantial agreement between them.

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