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BACTERIOLOGICAL & CLINICAL PROFILE OF PRIMARY PYODERMA AND ITS ASSOCIATION WITH NASAL CARRIAGE

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Conflicts of Interest: Nil

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Abstract:

Background: Pyodermas (pyogenic infection of skin) are one of the most common clinical conditions encountered in dermatological practice. *Staphylococcus aureus* (*S. aureus*) accounts for 30-50% of skin and soft tissue infections (SSTI), followed by the other bacteria. It is observed that nasal colonization with *S. aureus* occurs in up to 40% of patient population. Though there are many studies on nasal flora in normal and pyoderma patients, only few studies have compared the isolates from both sites in same patient. This study was conducted to determine, whether the isolates from both the sites are common in phenotypic characters and antimicrobial susceptibility pattern.

Materials and methods: The prospective study was done in the Department of Microbiology and Dermatology from September 2017 to August 2018.Pus Samples received in the microbiology laboratory was further processed according to standard microbiological techniques. Antimicrobial Susceptibility testing was performed by Kirby Bauer disc diffusion method. Zone diameters were interpreted according to CLSI guidelines.

Results: A total of 75 primary pyoderma cases and nasal samples were recruited for the study.
Majority of the samples collected for this study were from patients in the age group of 11-20 years
Among the primary skin infections, majority of patients had furuncle followed by folliculitis. *Staphylococcus aureus* was the predominant isolate followed by Coagulase negative Staphylococcus spp both in pus and nasal cultures. 42 (56%) samples yielded the growth of same organisms which were also same in their phenotypic characters and antibiotic sensitivity pattern. MRSA strains were 34(45.3%) in pus samples and 26(34.6%) in nasal specimens.

Conclusion: Correlation between organisms isolated from lesions and their carriage in the nasal specimen is very important for adequate treatment and also to prevent recurrent pyodermas caused by resistant organism

Keywords: PYODERMA - STAPHYLOCOCCUS AUREUS - MRSA - NASAL CARRIAGE –

Introduction

Pyodermas (pyogenic infection of skin) are one of the most common clinical conditions encountered in dermatological practice, especially in the pediatric age group. Primary pyodermas are impetigo, folliculitis, furuncle, carbuncle, ecthyma and cellulitis. The cause for pyodermas is generally bacterial infections with superadded factors in susceptible population like poverty, malnutrition, overcrowding, and poor hygiene. [1]
Most common organism associated with pyodermas in about 30-50% cases are *Staphylococcus aureus* (*S. aureus*). The least common organisms being *Enterobacteriaeceae, Non-fermenters, Streptococci and Anaerobes.* [2]
Colonization with *S. aureus* in the anterior nares is reported in many studies and is considered as a

significant risk factor for recurrent infections by the same strain, which may be either methicillin-sensitive *S. aureus* (MSSA) or methicillin resistant *S. aureus* (MRSA). [3]

The occurrence of recurrent infections is up to 4 times higher among methicillin-resistant *S. aureus* carriers than among methicillin-sensitive *S. aureus* carriers. [4]

Though nasal colonization with these bacteria is thought to be a predisposing factor, it has not been proved conclusively. Though there are many studies on nasal flora in normal and pyoderma patients, only few studies have compared the isolates from both sites in same patient.[4] This study envisages to determine, whether the isolates from both the sites are common in phenotypic characters and antimicrobial susceptibility pattern.

Materials and methods:

Institutional ethical clearance was obtained.

Patient's informed consent was taken.

A prospective cross-sectional study was conducted for a period of one year (September 2017 to August 2018) in the Department of Microbiology, Kamineni Hospitals, LB Nagar. All the patients attending out-patient Department (OPD) of Dermatology, at our tertiary care centre, with intact pustular lesions were included in the study. The patients who were already treated with antibiotics for various reasons in the past one month were excluded from the study.

A prestuctured questionnaire was applied to all study subjects to collect the demographic data for

Epidemiological analysis.

The pustules were ruptured with a sterile needle and the discharge was collected with a sterile swab. A second sample was collected from the anterior nares by rubbing a pre-moistened sterile swab. The samples were immediately transported to laboratory. [5, 6]

Samples received in the microbiology laboratory were further processed according to standard microbiological techniques. One swab was used for Gram's stain examination and the other swab was used for culture. Samples were inoculated on 5% sheep blood agar and MacConkey's agar. Plates were incubated in aerobic conditions at 37°C for 18-24 hours. Colony morphology was studied, and organisms were further identified by Gram stain smear and biochemical tests .[7]

Antimicrobial Susceptibility testing was performed by Kirby Bauer disc diffusion method. The antimicrobials tested were clindamycin (2 µg), erythromycin (15 µg), penicillin-G (10 units), chloramphenicol (30 µg), vancomycin (30 µg), linezolid (30 µg), ciprofloxacin (5 µg), trimethoprim - sulfamethoxazole (25µg), tetracycline (30µg), and gentamicin (10µg). The plates were incubated at 37°c for 24 hours. MRSA was detected by using Cefoxitin (30µg) disc. Zone diameters were interpreted according to CLSI 2018 guidelines. [8]

The results of antibiotic susceptibility testing of Staphylococcus aureus isolated from pus specimen and nasal specimen were analyzed

All collected data were stored in database in EPI INFO 3.5 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and analyzed using SPSS 19.0 (IBM, Armonk, NY, USA). Analysis was performed separately for two outcomes: (a) overall *S. aureus* infections and (b) carriage of MRSA. Multivariate analysis was performed using chi square test and $P<0.05$ was used for definition of statistical significance

Results:

A total of 75 primary pyoderma cases and nasal samples were recruited for the study.

Majority of the samples collected for this study were from patients in the age group of 13.2yrs

Among the primary skin infections, majority of patients had furuncle 40(53.3%) followed by folliculitis 15(20%), Impetigo13 (17.3%), carbuncle 2 (2.6%), paronychia 3(4%), abscess 1 (1.3%) and erysipelas 1(1.3%)

Skin Lesions involved in the sequence are legs 19(25.3%), face 13(17.3%), thigh 9(12%), scalp-7, forearm-5, gluteal region-4, neck-4, foot- 4, abdomen-3, genital area-3, hand-2, cheek-1, back- 1.

Staphylococcus aureus was the predominant isolate followed by *Coagulase negative Staphylococcus spp* both in pus and nasal

cultures.(table 1) Antimicrobial Susceptibility Pattern of *Staphylococcus aureus* in nasal culture showed sensitivity to various drugs like Linezolid & Vancomycin(100%), followed by Gentamicin (47.06%), Chloramphenicol (76.47%), Co-Trimoxazole (50%), cefoxitin (44.12%), Erythromycin(22.06%), Clindamycin (70.59%), Tetracycline (73.53%) and maximum resistance to Penicillin G(98.53%).

Antibiotic Susceptibility Pattern of *Staphylococcus aureus* in pus culture showed sensitivity to various drugs like Linezolid & Vancomycin (100%), Gentamicin (56.76%), Chloramphenicol (81.09%), Co-Trimoxazole (58.11%), Cefoxitin (52.7%), Erythromycin (22.97%), Clindamycin (64.87%), and Tetracycline (85.14%) and maximum resistant showed to Penicillin G (100%). 42 (56%) samples yielded the growth of same organisms which were also same in their phenotypic characters and antibiotic sensitivity pattern in both nasal and pus cultures. MRSA strains were 34(45.3%) in pus samples and 26(34.6%) in nasal specimens. However, all the isolates were sensitive to Linezolid & Vancomycin (100%). The association of *Staphylococcus aureus* in pus and nasal samples was found to be statistically significant (P<0.05) Hence the present study highlights that there is a significant concordance between pus and nasal carriage of same organism.

Table 1: Isolates from pus specimen and nasal swab

Organism	Pus specimen	Nasal specimen
MRSA	34(45.3%)	26(34.6%)
MSSA	21(28%)	20(26.6%)
MRCONS	4(5.3%)	9(12%)
MSCONS	9(12%)	19(25.3%)
Klebsiella spp	1(1.3%)	1(1.3%)
No growth	6(8%)	0
Total	75	75

Discussion:

Staphylococcus aureus causes most cases of superficial skin and soft tissue infections (SSTIs) in the clinical care. The severity of these infections can be mild to severe life-threatening systemic illnesses. The advent of methicillin resistant *Staphylococcus aureus* (MRSA) is a frightening sign and is threatening the effectiveness of many anti-microbial agents. Nasal Colonization with MRSA has been shown to increase the risk of infection with MRSA. 23% of the colonized patients can be at risk of recurrent MRSA infections. [9]

In India, there are no enough studies of prevalence of MRSA strains in community acquired primary skin infections in South India. In the present research an attempt was made to know the rate of the bacteriological primary pyoderma and its association with nasal carriage with special emphasis on Staphylococcal infections.

The prospective study was carried out in our Hospital with a compact sample size of 75 clinical samples. In our study the mean age of 13.2 yrs agrees with the study conducted by Paudel U *et al* who have reported pyodermas was more common in the same age group. [10]

Patil R *et al* and Paudel U *et al* reported that furuncle and folliculitis were the common clinical conditions associated with primary pyoderma as reported in our study .[10, 11]

Paudel U *et al* reported primary pyoderma was more frequently seen on the lower limbs followed by face, scalp, forearm, gluteal region and neck. We also observed the similar trend in our study .[10]

In our study, S*taphylococcus aureus* was the predominant isolate followed by CONS in both pus and nasal samples and it is in comparison with result shown by Rathna kumari *et al.* [12]andArucha Treesirichod *et al*. [7]

Staphylococcus aureus isolated in pus samples and nasal specimens showed almost similar antimicrobial susceptibility pattern to all the agents tested in the present study. In the present study *Staphylococcus aureus* isolated in pus and nasal culture was sensitive to Linezolid, Vancomycin, Gentamicin, Chloramphenicol, Co-Trimoxazole, Clindamycin, Tetracycline, and maximum resistance was noted to Penicillin G and Erythromycin.

Similar Antibiotic Susceptibility Pattern was reported by Patil R *et al*. In their study sensitivity to Vancomycin, Sisomycin, Gentamicin,

Ciprofloxacin, Framycetin, Erythromycin, were found to be in order 100%, 100%, 98.5%, 83%, 64%, 47%, and resistant was greatest to penicillin (87.2%).[11]

In the present study out of 75 samples 42 (56%) samples grew same organism same in their morphology and same antibiotic sensitivity pattern in both nasal and pus cultures. According to Rathna kumari *et al*, in their study, showed that *Staphylococci* in the lesion were significantly higher as compared to anterior nares and normal skin in cases. [12]

The main limitation of our study was that not all the patients in our study could be followed up after initiation of antibiotic treatment for the pyoderma and decolonization therapy. The patients who could be followed up were clinically and microbiologically cured after using the appropriate regimen.

Indisputably most of the *Staphylococcus aureus* diseases are caused by the patient's own flora. According to some studies, autoinfection ranges between 76% and 86%. [9, 13, 14] Decolonization of nasal *Staphylococcus aureus* can lead to a decreased extent of autoinfection. Mupirocin is a topical antimicrobial derived from a strain of *Pseudomonas fluorescens. It* has excellent activity of nasal decolonization of S. *aureus* carriage. About 81.5% to 100% of patients are successfully decolonized after completion of nasal mupirocin treatment. However, some studies reported antimicrobial resistance to mupirocin.

Quite a good number of more effective antibiotics than mupirocin are in the pipeline. The anti - MRSA drugs in the clinical trials are Replidyne's REP8839, Novabay's *N*, *N*-dichloro-2, 2- Also known as NVC-422, XF-73 and HT61. A bacteriophage approach can lead to >3 log reduction in viable counts of MRSA after 6 h. [15]

Conclusion:

Correlation between organisms isolated from lesions and their carriage in the nasal specimen is very important for adequate treatment and to prevent recurrent pyodermas caused by resistant organism.

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