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Clinico-Bacteriological Profile of Community Associated Skin and Soft Tissue Infection in Methicillin Resistant Staphylococcus Aureus

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Abstract – Staphylococcus aureus is one of the most common causes of skin and soft tissue infections (SSTIs). Methicillin resistant staphylococcus aureus (MRSA) is the resistant to all penicillinase stable penicillins, thus the acronym MRSA is still commonly used even though methicillin is no longer the agent of choice for treatment of community associated MRSA infection. Objective of this study was to determine prevalence of Staphylococcus aureus and methicillin resistance with antimicrobial susceptibility profile. This was a retrospective study (part of MSc dissertation) held for 6 months in Safdarjung hospital, New Delhi. Samples were collected from the dermatology out-patient department of VMMC & Safdarjung hospital, New Delhi, from patients with a variety of skin and soft-tissue lesions. The specimens were transported in sterile, leak-proof containers to the bacteriology laboratory. Samples were inoculated on blood and mac-conkey agar plates and confirmed through colony morphology, gram staining and biochemical test. MRSA -Screen was done through latex agglutination test for the detection of PBP2a present in isolates of Staphylococcus aureus in MRSA. During the study period, samples were collected from total 100 patients and result of this study conclude that in patients with primary SSTIs, can be considered as preferred first line systemic therapeutic agents and the first choice of topical therapy for primary staphylococcal SSTIs is mupirocin.

Keywords: Methicillin Resistant Staphylococcus Aureus, Skin and Soft Tissue Infections, CA-MRSA, Furuncles, Clinico-Bacteriological Profile

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INTRODUCTION

Staphylococcus aureus is a bacterium regularly found on the skin, axillae, perineum, and in the nares of sound people (1). Staphylococcus aureus is a standout amongst the most widely recognized reasons for skin and delicate tissue diseases (SSTIs). Staphylococcal SSTIs are among the most widely recognized clinical introductions of S. aureus disease and may show as cellulitis, bubbles, and furuncles , which, whenever delayed, may prompt osteomyelitis or the apparently uncommon instance of necrotizing fasciitis (2,3).

Methicillin-resistant Staphylococcus aureus (MRSA) is a set up pathogen that causes medical clinic and network gained contaminations around the world. The predominance rate of MRSA contaminations were accounted for to be the most noteworthy in Asia.The pervasiveness of MRSA in Malaysia extended from 17% in 1986 (4) to 44.1% in 2007 (5). MRSA is advanced from methicillin-defenseless S. aureus through the obtaining of Staphylococcal tape chromosome mec (SCCmec) which conveys mecA quality. mecA quality encodes the penicillin-restricting protein (PBP2a) which presents protection from all β-lactam anti-toxins (6).

Vancomycin is the medication of decision for treatment of diseases brought about by methicillin-safe staphylococci, both S. aureus and coagulase-negative strains. Vancomycin has demonstrated viability against methicillin-safe staphylococci for treatment of genuine diseases. Trimethoprim-sulfamethoxazole might be an option in contrast to vancomycin. Teicoplanin may give an antimicrobial option in contrast to treatment of genuine gram-positive diseases in patients who have restricted venous access or touchiness to, B-lactam anti-toxins. One of only a handful couple of medications that is as yet compelling against MRSA is mupirocin. Mupirocin was first presented in the United Kingdom in 1985 and due to its prosperity

has been broadly used to treat different staphylococcal and streptococcal skin diseases.

Multi year after its presentation, protection from mupirocin was accounted for (7). Two types of obstruction were noted, Low dimension opposition with least inhibitory fixations (MIC) of 8-256 mg/L because of change in irreversibly isoleucyl t-RNA synthetase and abnormal state obstruction (MIC>512 mg/L) because of obtaining of plasmid intervened mup A quality which encodes a second isoleucocyl t-RNA synthetase(8). Fusidic corrosive is likewise medication of decision however obstruction may develop if this medication is utilized alone, so it must be utilized in mix with a second medication, for example, rifampin.

Episodes of skin and delicate tissue diseases have happened among individuals from athletic groups, detainees of remedial offices, and benefactors of fitness centers. Current systems that give off an impression of being fruitful incorporate expanded mindfulness, early identification and fitting treatment, and keeping up a spotless domain.

The main aim of this study was to assess the clinico-bacteriological profile of community associated skin and soft tissue infections with special reference to methicillin resistant *Staphylococcus Aureus* (MRSA).

MATERIALS & METHODS

Study Population

This was a retrospective study (part of MSc dissertation) held for 6 months in Safdarjung hospital, New Delhi. Total 100 patients were enrolled and samples were collected from the dermatology department of VMMC & Safdarjung hospital, New Delhi, from patients with a variety of skin and soft-tissue lesions.

Inclusion Criteria- The study population comprised of patients suffering from skin and soft tissue infections of all age groups belonging to both sexes. Patients suffering from the following skin and soft tissue infections were included: Furuncle, Folliculitis, Carbuncle, Pyoderma, Impetigo, Skin abscess (boil), Soft tissue abscess and Wound infections.

Exclusion Criteria - Patient were excluded from the study if they had any of the following: Any history of hospitalization in past one year, history of chronic disease. history of major surgery, any history of antibiotic intake with in past four weeks (local/systemic antibiotics).

Specimen collection and Transport

Samples were collected from patients with a variety of skin and soft-tissue lesions. These included: Furuncle, Folliculitis, Carbuncle, Pyoderma, Impetigo, Skin abscess (boil), Soft tissue abscess, Wound infections.

Culture and Identification

Samples were inoculated on blood and mac-conkey agar plates and incubated at 37^0C. The identification of bacteria done based on colony morphology, gram staining and biochemical test.

Grouping of Streptococcus by *Streptex* latex test

Groping of *Streptococcus* done & 2 cases of *Streptococcus* group a found. *Streptex* is a rapid latex test system for use in the qualitative detection & identification of lancefied group of streptococci.

Antimicrobial Susceptibility

Antimicrobial sensitivity was performed on Mueller-Hinton agar (Hi-Media, India) by the standard disk diffusion method recommended by the National Committee for Clinical Laboratory Standards. (NCCLS). Standard strains *Escherichia coli* ATCC 25922, *Staphylococcus aureus* - ATCC 25923 and Pseudomonas aeruginosa -ATCC 27853 were used as controls. The diameter of the zone of inhibition of growth was recorded and interpreted as susceptible or resistant by the criteria of CLSI guidelines.

E test Method

E test is based on a combination of the concept of both dilution & diffusion tests.E test directly quantifies antimicrobial susceptibility in term of discrete MIC values. In this study oxacillin , penicillin, clidamycin, muprocine, vancomycin, Teicoplanin E testing done on MHA & 4% Nacl MHA media, for MIC values.

MRSA screening (mecA latex agglutination) Test

MRSA -Screen is a qualitative slide latex agglutination test for the detection of PBP2a present in isolates of Staphylococcus aureus and is thus useful as an aid in identifying methicillin – resistant *Staphylococcus aureus* (MRSA). MRSA – Screen consists of a latex reagent sensitized with monoclonal antibodies against PBP 2a together with reagents to rapidly extract PBP 2a from the bacterial membranes of MRSA .

RESULTS AND ANALYSIS

During the study period, samples were collected from a total of 100 patients and the number of pathogens isolated totaled 85 (Table 1).

Table 1. Number of pathogens (n=85) isolated from 100 patients

Microorganism	Total Number
Staphylococcus aureus	80
Streptococcus pyogenes	02
Coagulase negative *Staphylococcus*	01
Escherichia coli	01
Pseudomonas aeruginosa	01
Total	85

There were 73 male and 27 female patients. The age group of the patients ranged from 15 days of age to 80 years. The distribution of the age group of the patients were as follows: 0-15 yrs (05) patients, 15-60 years (92), and above 60 years (3). The clinical diagnosis of 100 patients with skin & soft-tissue infections has been shown in Fig. 1.

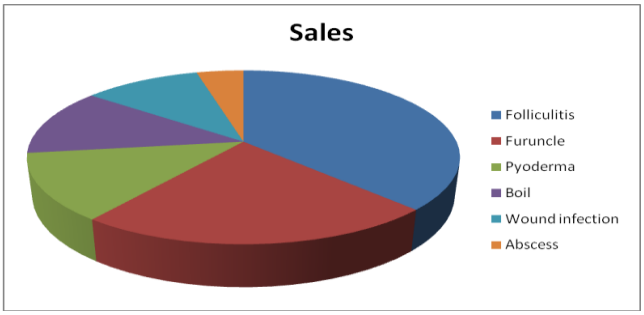

Fig. 1. Clinical diagnosis of 100 patients with skin & soft-tissue infections

Table 2. Shows the sites from where the samples were collected along with the number of pathogens.

Table 2. Sites of collection of samples from 100 patients with isolation

Sites	Number of samples collected	Number of pathogens isolated (%)
Leg	27	24 (88.8)
Face	25	20 (80)
Scalp	15	10 (66.6)
Foot	07	07 (100)
Arm	06	05 (83.3)
Neck	05	04 (80)
Thigh	05	05 (100)
Posterior (back side of chest)	04	04 (100)
Chest	03	03 (100)
Genital area / buttock	03	03 (100)

Susceptibility profile of *S. aureus*

A total of 80 S. aureus isolates were obtained from patients. Susceptibility data indicated that maximum number of isolates were resistant to penicillin, with varying rates of susceptibility to the other antimicrobial agents (Table 3). None of the isolates were resistant to vancomycin, teicoplanin, or linezolid (Table 3.).

Antimicrobial	Susceptible (%)	Intermediate (%)	Resistant (%)
Penicillin	03 (3.7)	0	77 (96.2)
Oxacillin	74 (92.5)	0	06 (7.5)
Cefoxitine	74 (92.5)	0	06 (7.5)
Erythromycin	46 (57.5)	17 (21.2)	17 (21.2)
Tetracycline	69 (86.2)	05 (6.2)	06 (7.5)
Clindamycin	73 (91.2)	02 (2.5)	05 (6.2)
Chloramphenicol	75 (93.7)	03 (3.7)	02 (2.5)
Gentamycin	71 (88.7)	0	09 (11.2)
Ciprofloxacin	30 (37.5)	11 (13.7)	39 (48.7)
Cotrimoxazole	43 (53.7)	08 (10)	29 (36.2)
Mupirocin	78 (97.5)	0	02 (2.5)
Fusidic acid	39 (48.7)	13 (16.2)	28 (35)

Susceptibility profile of *S. aureus* with special reference to CA-MRSA

Out of 100 patients, a total of 85 organisms were isolated of which *S. aureus* constituted 80 isolates. Of these 80 *S. aureus* isolates, 7 were found to be oxacillin resistant by both by disc-diffusion tests using oxacillin and cefoxitin and E test. All the 7 isolates were also confirmed to be oxacillin resistant by the mecA latex agglutination test. Thus, 7% of the *S. aureus* strains were observed to be CA-MRSA in our study.

Graph 1 shows the sites of isolation of 7 CA-MRSA isolates (n=7).

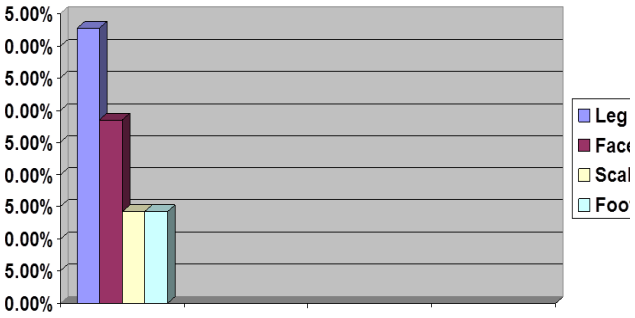

Table 4. Profile of CA-MRSA with relation to age, sex, and diagnosis

Sample S. No	Age (in years)	Sex(M/F)	Diagnosis
07SS	28	F	Wound infection
13SS	41	M	Folliculitis
17SS	20	M	Folliculitis
24SS	0.5	F	Folliculitis
50SS	19	M	Furuncle
65SS	54	F	Skin abscess (boil)
70SS	37	M	Wound infection

Table. 5. Antimicrobial Susceptibility result of CA-MRSA (n=7) to other antibiotics

Antimicrobial	Susceptible (%)	Intermediate (%)	Resistant (%)
Penicillin	0	0	7 (100)
Erythromycin	3 (42.8)	1 (14.2)	3 (42.8)
Tetracycline	6 (85.7)	0	1 (14.2)
Clindamycin	6 (85.7)	0	1 (14.2)
Chloramphenicol	7 (100)	0	0
Gentamycin	5 (71.4)	0	2 (28.5)
Ciprofloxacin	1 (14.2)	0	6 (85.7)
Cotrimoxazole	1 (14.2)	1 (14.2)	5 (71.4)
Mupirocin	7 (100)	0	0
Fusidic acid	4 (57.1)	2 (28.5)	1 (14.2)
Teicoplanine	7 (100)	0	0
Vancomycin	7 (100)	0	0
Linezolid	7 (100)	0	0

Table 6. MIC of S. aureus isolates (n=80) to selected antibiotics

Antimicrobial	MIC (µg/ ml), no. of isolates (%)		
	Susceptible	Intermediate	Resistant
Penicillin	≤ 0.12	-	≥ 0.25
	3 (3.7)	0	77 (96.2)
Oxacillin	≤ 2	-	≥ 4
	74 (92.5)	0	6 (7.5)
Clindamycin	≤0.5	1-2	≥ 4
	78(97.5)	2 (2.5)	0
Vancomycin	≤ 2	4-8	≥16
	80(100)	0	0
Teicoplanine	≤ 8	16	≥ 32
	80(100)	0	0
Mupirocin	≤ 8	8-256	≥ 256
	78(97.5)	0	2 (2.5)

Antimicrobial sensitivity profile of other pathogens

Out of 85 isolates total isolates of *Staph. aureus* was 80 and 5 isolates was of *CONS, E.coli, Streptococcus pyogenes and Pseudomonas.* Different antibiotics discs and E strips used for sensitivity profile of other pathogens.

Table.7 shows sensitivity profile of other pathogens with percentage (%).

CONS (100%) n=1	*E. coli* (100%) n=1	*St. pyogenes* (%) n=2	*Pseudomonas* (100%) n=1
Penicillin	Ceftazidime	Penicillin (100)	Ceftazidime
Oxacillin	Amikacin	Erythromycin (50)	Amikacin
Cefoxitin	Ciprofloxacin	Clindamycin (100)	Ciprofloxacin
Erythromycin	Cefoperazone sulbactum	Tetracycline (50)	Piperacillin
Tetracycline	Imipenem	Chloramphenicol (100)	Netilimicin
Clindamycin	Netilimicin	Ciprofloxacin (100)	Cefoperazone sulbactum
Chloramphenicol	Ertapenem	Vancomycin (100)	Meropenem
Gentamycin	Meropenem	D test (50)	Imipenem
Ciprofloxacin	-	-	-
Cotrimoxazole	-	-	-
Mupirocin	-	-	-
Fusidic acid	-	-	-
Teicoplanine	-	-	-
Vancomycin	-	-	-

DISCUSSION

Staphylococcus aureus is a commensal of the foremost nares in 25% of the human infection, and carriage is a hazard factor for contamination and transmission of S. aureus and progressively in charge of serious skin and delicate tissue diseases, necrotizing fasciitis, and a deadly type of necrotising pneumonia, in beforehand solid people. Currently, CA-MRSA are in charge of 15–74% of skin and delicate tissue contaminations among patients introducing to crisis offices in the USA (9,10).

The present investigation was embraced to decide the pervasiveness of MRSA in network obtained essential SSTIs in a tertiary consideration medical clinic of India. Folliculitis and furunculosis were the commonest essential SSTIs, seen in 32% and 24% of cases separately. These have likewise been accounted for to be the most regular essential pyodermas in some different examinations, (11, 12) while in one investigation in youngsters, impetigo was the commonest injury (12). Most of our patients were grown-ups, which could represent the high recurrence of folliculitis and furunculosis.

All examples in our examination yielded mono microbial greenery, with S. aureus detached from 80% of patients, Strepto. pyogenes from 2% and E. coli, Pseudomonas and coagulase-negative staphylococci in 1 % each.. Societies were negative in 15% of the patients. Baslas et al (12) also detailed negative societies in 14.9% of patients. S. aureus is the dominating pathogen detailed in different examinations also including instances of auxiliary pyodermas. Be that as it may, since Gram negative bacilli likewise represent auxiliary pyodermas, S. aureus is generally less often connected with optional pyodermas than with essential pyodermas(13).Other examines have revealed polymicrobial verdure running from 5-16% this isn't astonishing since just patients with essential bacterial contaminations were chosen for our investigation. In another investigation, Streptococcus pyogenes represented 26.98 % of the all-out detaches.

The present investigation exhibits that the commonness of CA-MRSA diseases in our populace with network gained SSTIs is 7% (7 out of 100 patients had CA-MRSA). Thinking about just S. aureus disengages, the commonness of CA-MRSA among all network related S. aureus remains at 8.75% (7/80). This is practically identical to a report by Nagaraju et al, 2004 7 on network procured pyodermas from Mangalore, wherein the creators announced that 11.8% of strains of 202 S. aureus strains were methicillin safe. Numerous different reports from India and Asia have additionally featured the pervasiveness of MRSA in the network just as in network gained pyodermas (14). In an investigation by Saxena et al an aggregate of 319 nasal swabs were taken from

both foremost nares of sound guardians going to a well-infant facility. Of these 94 yielded a development of S. aureus (29.4%), of which 17 (18.1%) were observed to be impervious to oxacillin (15).

An ongoing multi focus ponder in Southwestern Nigeria affirmed protection from methicillin by the discovery of the mecA quality by PCR and detailed a lower pervasiveness rate of 1.4%. In USA, the pervasiveness of CA-MRSA has been accounted for half with USA 300 clone of MRSA.

CONCLUSION

The emergence of antibiotic resistant strains represents a noteworthy issue both in community and clinic practice in choosing empiric treatment. It is in this way critical to screen the changing patterns in bacterial diseases and their antimicrobial defenselessness designs. As per conclusion of this study the patients with primary SSTIs, cephalosporins and penicillinase resistant penicillins (methicillin, cloxacillin) can be considered as preferred first line systemic therapeutic agents. Similarly, the first choice of topical therapy for primary staphylococcal SSTIs is mupirocin.

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