ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 02 | February - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PREVALENCE AND RESISTANT PROFILE OF SKIN AND SOFT TISSUE BACTERIAL INFECTIONS (SSTIS) AMONG SURAT REGION

Microbiology

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ABSTRACT

Skin and soft tissue infections (SSTIs) involve microbial invasion of the skin and underlying soft tissues with variable presentations, etiologies and severities. The increasing prevalence of multidrug-resistant pathogens associated with this leads higher morbidity and cost for cure. It is a serious clinical confront that demands efficient differentiation, immediate attention and intervention. The present study thus was aimed to determine the prevalence of bacterial etiological agents associated with, their response to antimicrobials and capabilities to produce ESBLs. A total of 251 isolates were isolated from various cases of SSTIs (125 cases) and were identified by standard microbiological procedures. Many cases of polymicrobial infections (59.83%) were found. Gram negative isolates found to be predominant (62.15%).Among gram positive, *Staphylococcusaureus* (27.1%) was prevalent as a cause of SSTIs. Higher rate of MRSA was found (57%) among all gram positive isolates. Most of isolates show resistance against amphicilline (61.06%) followed by Cefotizoxime (51.28%). The appalling feature of the study is strike out by higher prevalence of MDR (Multi Drug Resistant) isolates (68.52%) and 35.45% of ESBL producers. Thus SSIs demands a grave concern for determination of microbiological profile of the etiological agents associated with it.

KEYWORDS

Skin and soft tissue infections (SSTIs), Polymicrobial infections, antimicrobial resistance, MRSA, MDR, ESBL

1. INTRODUCTION:

Skin and soft tissue infections (SSTIs) are the infections of skin, subcutaneous tissue, fascia, and muscle that encompass a wide spectrum of clinical presentations, ranging from simple cellulites to rapidly progressive necrotizing fasciitis. These are common in outpatient clinic and emergency department visits[1]and usually result from traumatic, surgical or healthcare-related skin break down with secondary inflammatory microbial invasions (Skin and soft tissue infection: microbiology and epidemiology[2]. These (SSTIs) are a common reason to seek medical care worldwide[3]. That can lead to complications with significant morbidity, including hospitalization, surgical procedures, bacteremia, and death [4].

Infections of the skin and underlying soft tissues generally occur when microbial invasion of various layers overwhelm host defenses results in to variable presentations, causes, and levels of clinical severity [5]. Most bacterial SSTIs are caused by gram-positive organisms, including *Staphylococcus aureus, group A and B streptococci, Streptococcus viridans,* and *Enterococcus faecalis*. Less common causes of infection include gram negative organisms such *as Haemophilus influenzae, Pasteurella multocida, Capnocytophaga* species, *Vibrio species, Mycobacterium species, Pseudomonas species, Aeromonas species, Proteus species, Clostridium species*, and other anaerobes [6].There are two types infections, *Primary SSTIs* occur when ever microorganisms occupy healthy skin, whereas *secondary SSTIs* occur when, cause of underlying disease in which microorganisms infect already damaged skin. In the both cases, pathogens cause damage to the tissues, which leads to an inflammatory response which characterized by erythema, and pain [7].

The practical guideline provides recommendation for diagnosis and management of SSTIs in patients with healthy hosts or compromised host of all age groups. These infections have diverse etiologies that depend on the epidemiological view. Thus, obtaining a careful history, which include information about the patient's immunological status, the geographical location, travelling history, recent trauma or surgery, previous antimicrobial therapy, lifestyle, habits, and animal exposure or bites are key to developing a perfect differential diagnosis and an appropriate index of suspect clue for specific etiological agents [8].

The true prevalence of SSTIs is unknown because mild infections are typically self-limiting and patients do not seek medical attention. Nonetheless, SSTIs are encountered often in both the outpatient and inpatient settings.

2. MATERIALS AND METHODS:

2.1 Study Design and Area:

Present study was aimed to determine various aerobic and facultative anaerobic bacteria associated with SSTIs. Clinical samples were collected from various hospitals of Surat region from the suspected cases of SSTIs for duration of July 2016 to February 2017.

2.2 Collection of samples:

The present study was constructed by collecting the pus/purulent samples [9] with the help of sterile swab from different SSTI infected patients that were consulted in various hospitals of Surat.

2.3 Processing of samples:

The collected sample swabs were incubated in BHI broth for 24 hour at 37ºC for enrichment. After the enrichment, samples were processed for isolation and identification etiological agent present by standard Microbiological procedures (Bergey's manual of Determinative bacteriology, 9thedition, and Jean F. Macfardin, Biochemical Tests for Identification of Medical Bacteria, 3rdEdition).

2.4 Antibiotic Susceptibility test : (CLSI, 2011)

The isolates were further tested for their antimicrobial susceptibility towards commonly used different groups of antibiotics using standard disc with known concentration, commercially available. Antibiotic susceptibility test were performed by Kirby – Bauer disc diffusion method. Considering the zone size the bacteria were reported as sensitive, moderately sensitive or resistance. The results were interpreted as per the guidelines provided along with the susceptibility disc.

2.5 Prevalence of Multi Drug Resistant (MDR) isolates:

Multiple drug resistance (MDR), an antimicrobial resistance found in various species of microorganism to multiple antimicrobial drugs. Such bacteria are most threatening and result in to poor outcome of patients. We determined the prevalence of MDR among the isolates and further tested for their capabilities for Extended Spectrum Beta Lactamase production.

2.6 Detection of ESBL producers : (CLSI,2007)

The worldwide prevalence of extended spectrum beta lactamase (ESBL) producing *Enterobacteriaceae* group member is increasing making the need for optimized detection techniques. Discs containing 30µg concentration of aztreonam, cefriaxone, ceftazidime and cefotaxime + Clavunic acid were used. An inhibition zone of ≤27 mm for aztreonam, ≤25 mm for ceftriaxone, ≤27 mm for ceftazidime and ≤22 mm for cefotaxime was considered to suspect the strains probably produced ESBL.

2.7 Detection of MRSA:

Inducible resistance to methicillin was tested as per CLSI guidelines-2010[10] and references [11]. 0.5 McFarland turbidity inoculum of well isolated colony of *Staphylococcus aureus* from the plate incubated previously was prepared and inoculated the Muller Hinton Agar plates. After pre-diffusion time of 15 minutes, the methicillin disc (5µg) and Erythromycin (ER) disc (15µg) discs were placed 15 mm apart edge to edge manually with sterile forceps. Plates were incubated at 37°C for overnight and the plates were observed for the zone around methicillin in the area between the discs that indicated inducible methicillin resistance.

3. RESULTS AND DISCUSSIONS:

In the present study, total 122 samples were collected from patients of SSTIs that resulted in to 251aerobic/facultative anaerobic bacterial etiological agents. The prevalence of infections was studied as per the patient's age and gender. We found higher rate of infections among the age group above 40 years and more common in men (78.96%) than female. Further, the samples were analyzed as per the various types of SSTIs. We observed diabetic foot as most common infections amongst.

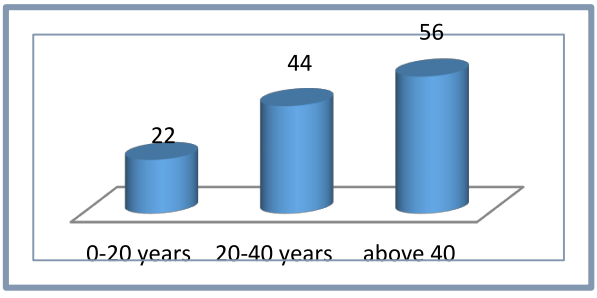

Figure 1: Age wise distribution

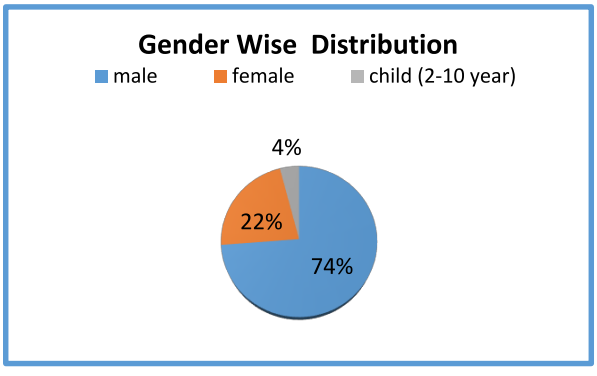

Figure 2: Gender wise distributions of SSTIs patients

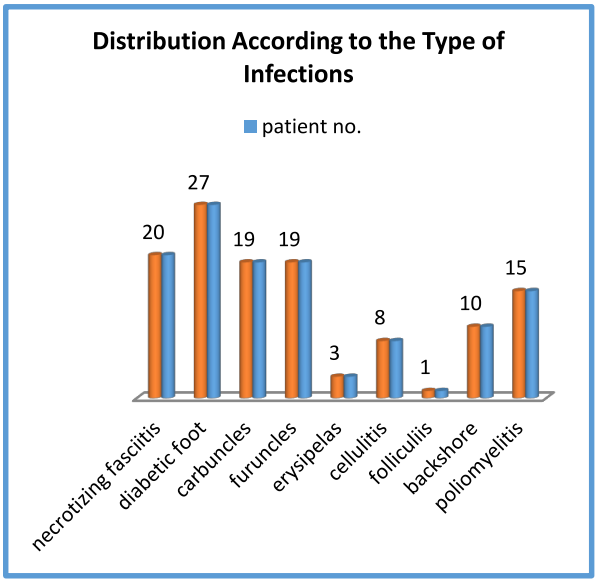

Figure 3: Distributions according to types of SSTIs

3.1 Bacteriological profile of SSTIs:

These isolates were identified by standard microbiological procedures. From a total 252 isolates, gram negative bacteria (156) were predominated gram positive (95). In present study, However *Staphylococcus aureus* found as a most prevalent with higher frequency (27%) among all the isolates.

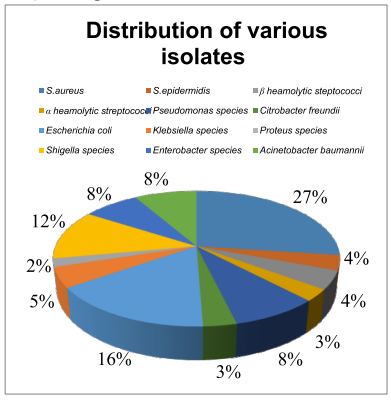

Figure 4: Frequency of Isolates

In our study, positivity was obtained in 100% of the cultures in terms of microbial growth. Similar to that 91.6% of culture was positivity was reported[12]. We reported *Staphylococcus aureus* as most prevalent, in contrast *Pseudomonas* species were reported as the most common isolates (48.9%) followed by *Citrobacter* species (13.3%) previous study[13].

3.2 Antibiogram of Isolates:

All isolates were tested for their sensitivity towards commonly used antimicrobials. We found cloxacillin and amphicillin as most effective antibiotics towards gram negative bacteria while amphicillin and tetracyclinas most resistant for gram positive isolates.

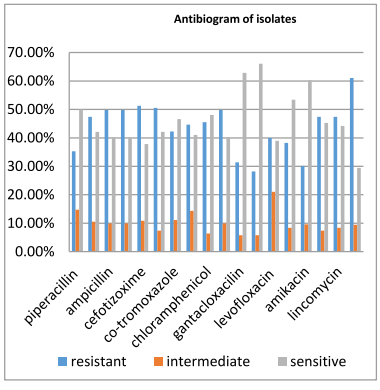

Figure 5: Antibiotic susceptibility test of all isolates

3.3 Detection of MDR:

Multi Drug Resistance is defined as the resistance of pathogens to the more than different two groups of antibiotics. In this study total 251 isolates are checked for their antimicrobial response and very high prevalence of MDR microorganisms (68.52%) were detected. This value is higher than comparative study done by other (25%) [14].

3.4 Detection of ESBL producers

ESBLs are Gram-negative bacteria producing beta-lactamase enzyme that render most commonly used antibiotics ineffective, such as penicillins and cephalosporins and results in to therapeutic challenges. IN present study, out of 156 gram negative bacteria 89 are detected as ESBLs producers (57%).In contrast, the prevalence of ESBLs was reported only 10% in east Europe, 3.5% in a Canadian study and 20-48.8% in Asia[15]. In study, within the Arabian Gulf region, ESBL prevalence reported very less (7.5%) while in Kuwait reported high (41%)[16]. In other studies, frequency of ESBLS was 15.8% and 8.9% in blood cultures and urinary isolates, respectively[17]. When compared to regional and international data, the ESBL prevalence in our institution tends to be towards the higher limit. This can be attributed to availability of broad spectrum antibiotics, the haphazard use of many of them with lack of strict antibiotic policy to control their use.

3.5 Detection of MRSA:

Methicillin-resistant *Staphylococcus aureus* are genetically distinct from other strains of *Staphylococcus aureus* and responsible for several difficult-to-treat infections in humans. *S.aureus* which are sensitive to methicillin is called MSSA (Methicillin Sensitive *Staphylococcus aureus*. We identified total 68 isolate as*S.aureus* and were checked for their sensitivity towards methicillin.

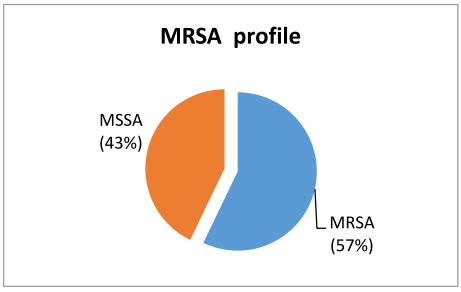

Figure 6: Frequency of MRSA

As represented in figure, we found 57 % of *Staphylococcus aureus* as MRSA , while 43% as MSSA. Similar results from India were reported in 2016[18]. Our results were in concordance with few of the studies reported previously [19] while Ajantha GS et al., reported very high frequency of inducible resistance MRSA[20].

4. CONCLUSION:

SSTI's is most common and significant medical confront that concern global economic burden in present study High prevalence of SSTI's was found in male (74%) and within age group of above 40 year. Among etiological agent, Gram negative (62.16%) isolate were predominated with higher prevalence of *E. coli* while *S.aureus* (27.10 %) found as predominant Gram positive bacteria. ESBL producers were serious clinical concern reported as high as (35.45%) with shocking higher frequency of MDR (68.52%). Resistance in etiological agents in SSTI's is increases day by day which suggest to take more accuracy and prevention of this infections during survival and hospitalization.

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