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AN REVIEW METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA): CHARACTERIZATION, PREVALENCE AND ANTIBIOTIC REACTIONS ON HUMAN IN INDIA

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ABSTRACT:

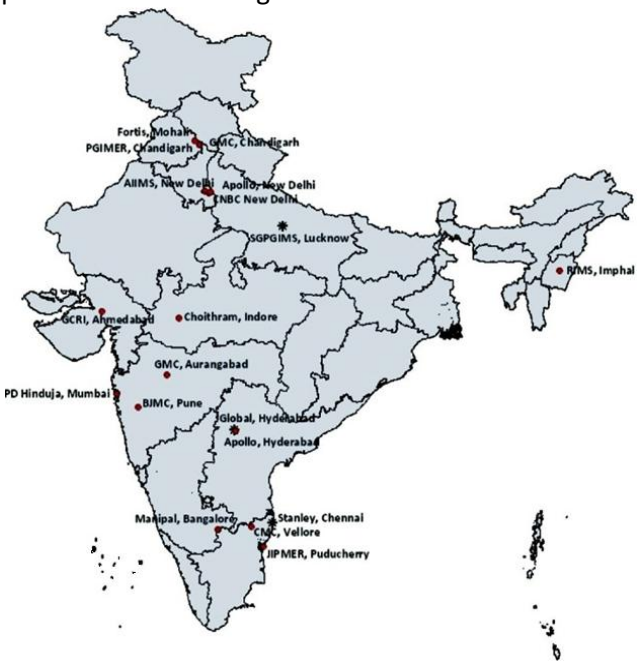
Introduction: Community acquired MRSA (CA-MRSA) has been increasingly examined from India[(4)]. A network of microbiology labs (Indian Organization for Surveillance of Antimicrobial Resistance - INSAR) at premier medical colleges and hospitals in India was assembled with support from the World Health Organization (figure). **Prevalence of Methicillin Resistant Staphylococcus Aureus:** A study displays an alarmingly high incidence of MRSA corruption in the BHU hospital. The prevalence rate is established to be 54.8%, which is much higher than most of the results where it ranged between 20% to 32.8%.[(17),(18)] The only report which has given somewhat similar result i.e. 51.6% is from LN Hospital, New Delhi.[(19)] Further, a study from Indore has shown a grow in MRSA prevalence from 12% in 1992 to 80.89% in 1999.[(20)] **Modes of transmission and virulence factors:** Due to its capability to colonize a wide range of strains (all mammals including rodents and lagomorphs), S. aureus can easily be transmitted from one species to another; from humans to animals and reverse. Staphylococcal infections are zoonotic in nature. **Antibiotic Reaction on Human:** The sensitivity patterns of divided to different antibiotic discs were read by measuring the diameter of area of inhibition in millimeter as per the chart provided by manufacturer and classified as Sensitive, Intermediate and Resistant based on CLSI guidelines.[(8)]

Keywords: Antimicrobial, Bugs, Lagomorphs, MRSA, Rodent, Sensitivity, Staphylococcus.

INTRODUCTION

Methicillin resistant *Staphylococcus aureus* (MRSA) is endemic in India and is a dangerous microorganism for hospital acquired infections. *Staphylococcus is a gram positive cocci arrange like in clusters. Staphylococcus aureus* progress to be a dangerous pathogen for both community-acquired as well as hospital-associated infections. *S. aureus* resistant to methicillin were examined soon after its introduction in October 1960[(1)]. Methicillin resistant *S. aureus* (MRSA) is now endemic in India. The frequency of MRSA varies from 25 per cent in western part of India[(2)] to 50 per cent in South India[(3)]. Community acquired MRSA (CA-MRSA) has been progressively reported from India[(4)]. A network of microbiology laboratories (Indian Organization for Surveillance of Antimicrobial Resistance - INSAR) at premier medical colleges and hospitals in India was formed with support from the World Health Organization (figure). The network ambition to monitor antimicrobial resistance and to review the magnitude of its complication in India. Initially, a some organisms of public health attention have been chosen for monitoring their prevalence and antimicrobial resistance patterns, with *S. aureus* being selected among the Gram-positive organisms. Methicillin-resistant *Staphylococcus aureus* (MRSA) is a accomplished pathogen capable of causing a more variety of human diseases. Increased frequency of *S. aureus* infections appoint a high and increasing burden on healthcare resources. In many countries, MRSA infections in hospitals are common. Data from the National Hospital Aquired Infections Surveillance system suggest that, in the United States, incidence of nosocomial MRSA infections is steadily increasing and that these infections

account for >60% of intensive care unit admissions (*5,6*). *S. aureus* has developed resistance to few antimicrobial drugs, including second- and third-line drugs. Only the some drugs, such as vancomycin (a glycopeptide), daptomycin (a lipopeptide), and linezolid (an oxazolidinone), have been approved for the treatment of serious infections caused by MRSA. Another drug, tigecycline (a glycylcycline), has appearance Fast activity against MRSA strains in vitro (*3*). The epidemiology of MRSA is continually changing, which results in variation in its drug-resistance patterns throughout regions and countries (*4*). Infected and colonized patients in hospitals mediate the dissemination of MRSA strains, and hospital staff is the main source of transmission. This leads to serious endemic and epidemic MRSA infections.[9] The possible predisposing factors that increase the chance of emergence and spread of MRSA are prolonged and repeated hospitalization, indiscriminate use of antibiotics, lack of awareness, intravenous drug abuse, and presence of indwelling medical devices.[10]



Characterization of Methicillin resistant Staphylococcus Aureus:

A gene known as *mec*A gene is responsible for the resistance to methicillin which codes for penicillin-binding protein PBP 2A[15]. Latterly, a new methicillin resistance mechanism gene, *mec*C was characterized in *S. aureus*. The reported MRSA isolates carrying *mec*C gene from humans and animals[12,14,16]. Suggested the public health hazard of *mecC*-positive MRSA isolates as it has been isolated in human case and their livestock.[11]

Prevalence of Methicillin Resistant Staphylococcus Aureus:

In one study shows an alarmingly high incidence of MRSA infection in the BHU hospital. The prevalence rate is found to be 54.8%, which is much higher than most of the reports where it ranged between 20% to 32.8%.[17],[18] The only report which has given somewhat similar result i.e. 51.6% is from LN Hospital, New Delhi.[19] Further, a study from Indore has shown a rise in MRSA prevalence from 12% in 1992 to 80.89% in 1999.[20] Such a high prevalence of MRSA in our study may be due to several factors. This hospital caters to the patients from eastern U.P., Bihar and adjacent areas. The extensive use of antibiotics, lack of awareness and unethical treatment before coming to the hospital might have been contributing factors.

Modes of transmission and virulence factors:

Due to its ability to colonize a wide range of species (all mammals including rodents and lagomorphs), S. aureus can readily be transmitted from one species to another; from humans to animals and reverse. Staphylococcal infections are zoonotic in nature. They can be transmitted from animals to humans through contamination of skin lesions while in contact with the animals having skin infections or the carrier animals, working with tissue or bones from infected animals and from bites and scratches [21]. From healthy food animals they may spread to a wide variety of food items and cause food poisoning [22].

The bacteria can spread from person to person by direct contact and also with the contaminated objects (such mobile phones, telephones, door handles, tap faucets, computer keyboards and mouse, knife, currency, medical equipments, etc). There is even a possibility of transmission by inhalation of infected droplets which are dispersed at the time of sneezing or coughing [23].

Contaminated hands of milker and contaminated milking equipments are also responsible for transmission of the organism between animals [24]

Antibiotic Reaction on Human:

The antibiotic sensitivity of the individual isolates was carried out *in-vitro* by disc diffusion method on Muller Hinton Agar plates with different antibiotic discs i.e., Cephalexin (30mcg), Cephadroxil (30mcg), Cefpodoxime (10mcg), Cefpodoxime and Clavulanic acid (10/5mcg), Enrofloxacin (10mcg), Ciprofloxacin (10mcg), Amoxicillin and Clavulanic acid (10mcg), Amoxicillin and sulbactum (30/15mcg), Lincomycin (15mcg), Co-Trimoxazole (25mcg), Amikacin (10mcg), Gentamicin (30mcg), Erythromycin (10mcg), Azithromycin (30 mcg), Chloramphenicol (10mcg) and Tylosine (15mcg). The sensitivity patterns of isolates to different antibiotic discs were read by measuring the diameter of zone of inhibition in millimeter as per the chart provided by manufacturer and classified as Sensitive, Intermediate and Resistant based on CLSI guidelines.[8]

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