PREVALENCE OF MRSA AND VRSA IN KALABURAGI REGION

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ABSTRACT

Objective: Prevalence of drug resistance in Staphylococcal infections is steadily increasing in global health care systems. The present study was conducted to determine the prevalence of MRSA and VRSA in Kalaburagi region.
Materials and methods: S.aureus were isolated from 120 clinical samples collected from primary health care and diagnostic centers of Kalaburagi region and were identified by standard microbiological techniques. Antibiotic susceptibility test was performed by Kirby Bauer disc diffusion method according to CLSI guidelines. Results: A total of 120 clinical samples were screened, of which 62 (51.6%) were confirmed for S.aureus. Antibiotic susceptibility test indicated highest resistance for penicillin (96.8%) and least for chloramphenicol (3.8%). The prevalence of MRSA was 38.7% and that of VRSA showed 4.8%. Conclusion: Prevalence of MRSA is predominantly observed in the developed countries. Unfortunately, the spread of drug resistance is affecting developing countries also. Strategies to control the spread of MRSA and emergence VRSA are the top priorities in the community and hospital settings.

KEY WORDS

Staphylococcus aureus, MRSA, VRSA, Multidrug resistance, Kalaburagi.

INTRODUCTION

S.aureus is an opportunistic commensal, emerging as an important human pathogen. Multi drug resistance of invasive *S.aureus* can cause life threatening infections such as endocarditis, osteomyelitis, surgical site infections, bloodstream infections, pulmonary abscesses and sepsis. *S.aureus* is also capable of producing septic shock. Unlike the structural components noted earlier, these superantigens can produce a sepsis-like syndrome by initiating a "cytokine storm." Some strains also produce epidermolysins or exfoliative toxins capable of causing scalded skin syndrome or bullous impetigo [1]. Methicillin was first introduced in 1959–1960 for the treatment of *Staphylococcal* infections, and, within a year, methicillin-resistant isolates were reported [2]. Recently MRSA has emerged as the major etiological agent in hospital and community acquired infections [3]. Antibiotic resistance in human pathogens has dominated worldwide [4]. Many MRSA outbreaks have been reported [3]. MRSA infections kill approximately 19,000 hospitalized American patients annually; this is similar to the number of deaths due to AIDS, tuberculosis, and viral hepatitis combined (5).

Later on, vancomycin was used as the drug of choice for treating MRSA infections. Vancomycin was discovered in 1950, a glycopeptide was isolated from *Streptomyces orientalis*. There has been increasing trend in the prevalence of vancomycin resistance among *S. aureus*. The increase in vancomycin resistance among MRSA and excessive use of antimicrobial agents has worsened the sensitivity, calls for further epidemiological studies. Alarmingly, the origin and spread of VRSA is being extensively reported across the globe including from the Indian subcontinent. First clinical isolate of vancomycin resistant *S. aureus* (VRSA) was reported from United States in 2002 [6]. More recently vancomycin resistant *Staphylococcal* stains from Brazil [7] and Jordan [8] has been reported.

Over the years, modulation of bacteria in emerging as a drug resistance has become one of the concerned topic in the current research. The present study was carried out to assess the trends in the prevalence and potential risk of MRSA and VRSA in Gulbarga region.

MATERIALS AND METHODS

Clinical samples such as pus, blood and urine were collected from diagnostic and primary health care centers in Kalaburagi region via, transport media and enriched in brain heart infusion broth overnight. Enriched cultures were inoculated onto the mannitol salt agar and baird parker agar plates and processed for coagulase test. Further *S.aureus* isolates were confirmed by standard biochemical tests (9).

Antimicrobial susceptibility test: Following are the antibiotics (Himedia, India) used in the present study – penicillin-P(10 units), oxacillin-OX (1mcg), cefoxitin-CX (30mcg), methicillin-MET(5mcg), amoxyclav (amoxicillin / calvunic acid)-AMC (20/10mcg), piperacillin / tazobactam-PIT (100/10mcg), cefmetazole-CMZ (30mcg), cefotaxime-CTX (30mcg), ceftazidime-CAZ (30mcg), cefpodoxime-CPD (10mcg), imipenem-IMP (10mcg), vancomycin-VA (30mcg), amikacin-AK (30mcg), tobramycin-TOB (10mcg), tetracycline-TET (30mcg), doxycycline-DO (30mcg), ciprofloxacin-CIP (5mcg), ofloxacin-OF (5mcg), clidamycin-CD (2mcg), clotrimoxazole-COT (1.25/23.75mcg), cloramphenicol-C (30mcg), rifampicin-RIF (5mcg), erythromycin-E (15mcg), linezolid-LZ (30mcg). Antibiotic susceptibility test was carried out by Kirby-Bauer disc diffusion method according to CLSI guidelines 2014(10).

RESULTS

A total of 120 clinical samples of pus, blood and urine were screened and 51% of samples were confirmed for *S.aureus.* Incidence of *S.aureus* is more in pus with 60.34% followed by urine 45.45% and Blood 42.5%. Antibiotic resistance patterns of *S.aureus* showed highest resistance for penicillin (98%) and least (4.8%) for chloramphenicol. All the isolates were susceptible to imipenem. Varying range of resistances were recorded for other antibiotics from 7.7% against tetracycline to 76.9% for amoxicillin (Fig.1).

About 38.7% of the isolates have been confirmed as MRSA and incidence of VRSA was 4.8% (Fig.2). Similarly, the incidence of MRSA and VRSA was more in urine samples (Table-1).

Table- 1: No. of isolates confirmed for *S.aureus*

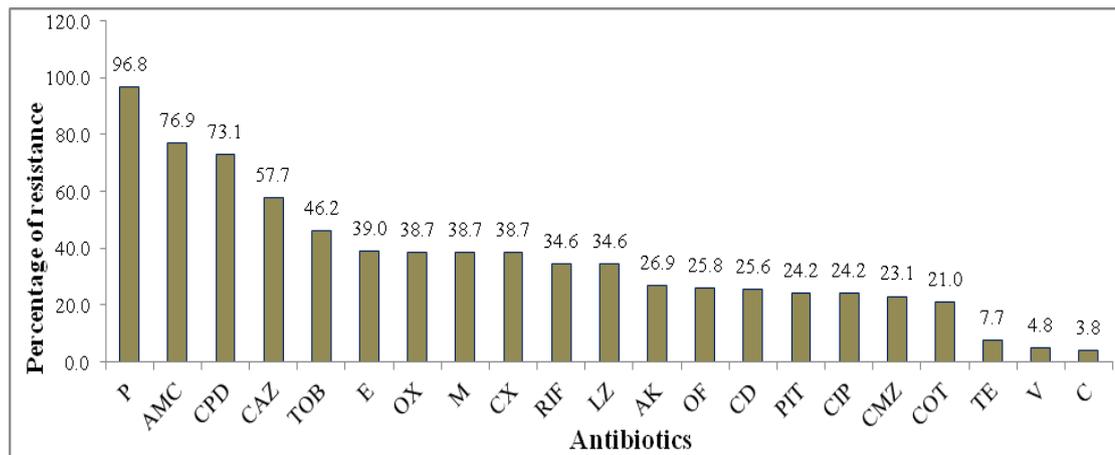| Sl.No	Nature of sample	Clinical isolates (n=120)	Positive no. of *S.aureus* isolates	MRSA	VRSA
1	Pus	58	35	13	2
2	Blood	40	17	5	0
3	Urine	22	10	6	1
4	Total	120	62	24	3

Fig-1: Antibiotic resistance patterns of *S.aureus* isolates from Kalaburagi region.
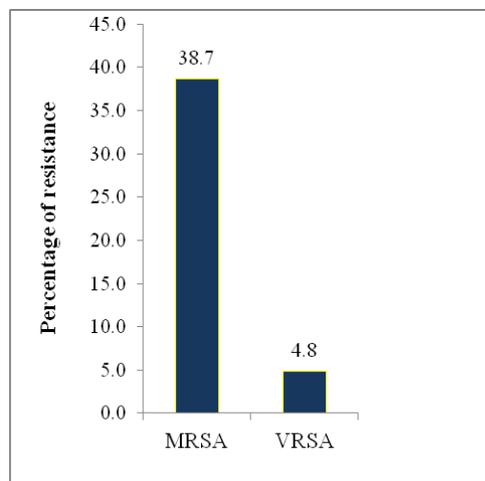

Fig-2: Prevalence of MRSA and VRSA

DISCUSSION

The present study provides the brief description of the present trend of MRSA infection and its prevalence in Kalaburagi region. Epidemiological studies on *Staphylococcal* infections are required since MRSA is one of the common causes of hospital-acquired infections. Reports ranging from 30 to 80 percent methicillin resistance in *S.aureus* have been reported from different hospitals (11). In US, MRSA prevalence in 2010 is higher than that reported in 2006 survey (12). The proportion of MRSA varied among countries ranging from 0.4 per cent in Sweden to 48.4 per cent in Belgium (13). A study from INSAR group India, reported MRSA prevalence of 42 per cent in 2008 and 40 per cent in 2009. In India MRSA prevalence was studied in South Gujarat, Tamil Nadu, Chandigarh, Assam, Varanasi, Nagpur, Vellore, Indore and was found to be 39.50%, 31.10%, 24%, 52.90%, 38.44%, 19%, 24%,80.89% respectively (14).

In the present study prevalence of antibiotic resistance patterns were determined among *S. aureus* isolates against 21 antibiotics [Fig.1]. Almost total (98%) resistance was observed against penicillin, and alarming very high resistance was observed other beta lactum antibiotics like amoxycillin and cefotaxime, 76.9 and 73.1%. The incidence of MRSA was 38.7% which almost comparable to the incidence of MRSA in other parts of India (15). Though the incidence of VRSA is very low (4.8%) it is alarming that both MRSA and VRSA combined will pose a greater threat for the treatment of staphylococcal infections.

Most MRSA isolates are resistant to multiple antibiotics and more than 50% are resistant to rifampicin, compared to methicillin-susceptible *S.*

aureus (MSSA) isolates. Significantly our study indicates rifampicin resistance of 34.6% (16).

Very few reports are available on prevalence of MRSA in Kalaburagi region. Recently, prevalence of MRSA in tertiary care hospital in Kalaburagi region has been reported [17]. The percentage of resistance was found higher to most of the antibiotics in tertiary care centers compared to out- patients departments in hospitals and diagnostic centers.

Previous study from this lab (18) also indicated that all MRSA reported were sensitive to vancomycin. However, a recent study (19) indicate a rise in the prevalence of VRSA among MRSA which is cause for utmost concern.

CONCLUSION

Variation in resistance patterns has been observed, this could be due to nature of samples and conditions of the patients while collecting the samples. While reporting we have to specify criteria of random sampling or specific sampling to determine accurate prevalence of the specific region. Quinapristin/ dalfopristin, quinupristin and newer generation fluoroquinolones, fusfomycin, fusicidic acid remained as a choice of drug for the treatment of MRSA infections. Careful monitoring of emergence of drug resistance pathogens is required to control the spread of infections.

REFERENCES

1. Ladhani S, Joannou CL, Lochrie DP, Evans RW, Poston SM. Clinical, microbial, and biochemical aspects of the exfoliative toxins causing staphylococcal scalded-skin syndrome. *Clin Microbiology Rev. 1*;12(2):224-42,(1999)
2. Jevons M.P""Celbenin"resistant staphylococci." *Br Med J;*1:124,(1961).
3. Chambers HF, DeLeo FR. Waves of resistance: Staphylococcus aureus in the antibiotic era. *Nat Rev Microbiol.1*;7(9):629-41,(2009)
4. World Health Organization. Antimicrobial resistance global report on surveillance: summary.(2014)
5. Boucher HW, Corey GR. Epidemiology of methicillin-resistant Staphylococcus aureus. *Clin Infect Dis,1*;46 (Supplement 5):S344-9,(2008)
6. Centers for Disease Control and Prevention. Staphylococcus aureus resistant to vancomycin--United States, 2002. MMWR. Morbidity and mortality weekly report.5;51(26):565,(2002)
7. Palazzo IC, Araujo ML, Darini AL. First report of vancomycin-resistant staphylococci isolated from healthy carriers in Brazil. *J.Clin.Microbiol.1*;43(1):179-85.(2005)
8. Bataineh HA. Resistance of staphyiococcus aureus to vancomycin in Zarqa, Jordan. *Pak J Med Sci.* 22(2):144.(2006)
9. Brown DF, Edwards DI, Hawkey PM, Morrison D, Ridgway GL, Towner KJ, Wren MW, Joint Working Party of the British Society for Antimicrobial Chemotherapy. Guidelines for the laboratory diagnosis and susceptibility testing of methicillin-resistant Staphylococcus aureus (MRSA). *J Antimicrob Chemother. 1*;56(6):1000-18,(2005)
10. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing. Supplement M100-S16. Clinical and Laboratory Standards Institute: Wayne, PA: Clinical and Laboratory Standards Institute,(2006)
11. Anupurba S, Sen MR, Nath G, Sharma BM, Gulati AK, Mohapatra TM. Prevalence of methicillin resistant Staphylococcus aureus in a tertiary referral hospital in eastern Uttar Pradesh. *Indian J Med Microbiol. 21*(1):49,(2003)
12. Jarvis WR, Jarvis AA, Chinn RY. National prevalence of methicillin-resistant Staphylococcus aureus in inpatients at United States health care facilities, 2010. *Am J Infect Control. 30*;40(3):194-200,(2012)
13. Sader HS, Farrell DJ, Jones RN. Antimicrobial susceptibility of Gram-positive cocci isolated from skin and skin-structure infections in European medical centres. Int J *Antimicrob Agents. 31;*36(1):28-32,(2010)
14. Parasa LS, Kumar LCA, Para S, Alturi VSR, Kumar PR, Shetty CR. Epidemiological survey of methicillin resistant staphylococcus aureus in the community and hospitals. RIF 2010; 1(2): 117-23.
15. Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group. Methicillin resistant Staphylococcus aureus (MRSA) in India: Prevalence & susceptibility pattern. *Indian J Med Res.1*;137(2):363,(2013)
16. Rahimi F, Bouzari M, Katouli M, Pourshafie MR. Antibiotic resistance pattern of methicillin resistant and methicillin sensitive Staphylococcus aureus isolates in Tehran, Iran. *Jundishapur J.Microbiol. 6* (2):144-9. (2013).
17. Chandrashekhar DK, Chandrakanth C, Sunilkumar B, Gangane R, Basavaraj P, Amaresh, VinodKumar CS. Prevalence of methicillin resistant Staphylococcus aureus in a tertiary care hospital in Gulbarga, Karnataka. *Journal of Pharmaceutical and Biomedical Sciences, 19*(19):1-3, (2012).

18. Maneesh Paul, Studies on the epidemiological typing and characterization of *S.aureus* in Gulbarga region.. PhD.Thesis. Dept. of Microbiology, Gulbarga University (2000).

19. Thati V, Shivannavar CT, Gaddad SM. Vancomycin resistance among methicillin resistant Staphylococcus aureus isolates from intensive care units of tertiary care hospitals in Hyderabad. *Indian J Med Res.134*:704–8. (2011).

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