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ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS

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ABSTRACT

The emergence of a community pathogen depends on its ability to survive in different environments & to interact successfully with the host. Staphylococcus aureus has a broad pathogenic potential causing a wide range of community acquired as well as nosocomial infections. *Staphylococcus aureus* infections are associated with morbidity in hospitals & community. The organism has been found to be the most common bacterial agent recovered from blood stream infections, skin & soft tissue infections, pneumonia & hospital – acquired post - operative wound infections. Study of early isolates of MRSA showed that a key genetic component responsible for resistance, *mecA*, is not native to the *S. aureus* genome. The main aim is to find out the antibiotic susceptibility patterns of methicillin resistant staphylococcus aureus. **Materials and methods:** A total of two hundred & five different samples from different clinical specialties like surgery, orthopedics, pediatrics etc. This study was carried out between the periods Jan 2015 to 2017. All clinical specimens such as urine, pus, sputum/throat swab, blood, pleural fluid etc. were collected. All the samples were aseptically handled and processed in the Department of Microbiology. **Result:** A total of 205 isolates from different clinical specimens were studied. This study was carried in the Department of Microbiology, at JLN Hospital and Research Centre, Bhilai. The distribution of cases from different clinical wards, majority were from **surgical wards** 34.14% (70), in that MRSA was 35.71% (25) & MSSA was 64.28% (45) followed by **medicine wards** 21.95% (45), in that MRSA & MSSA were 33.33% (15) & 66.66% (30), respectively **OBG wards** 14.63% (30), in that MRSA & MSSA were 23.33% (07) & 76.66% (23), **orthopedics wards** 12.19% (25), in that MRSA & MSSA were 48% (12) & 52% (13), **pediatrics wards** 04.87% (10),in that MRSA & MSSA were 40% (04) & 60% (06) respectively. Men were more prone to acquire the infection by MRSA strain. Among these most of the MRSA strain were from the men over the age of 61-70 & >70 yrs which shows that old age was a definite risk factor concerning MRSA infections. Followed by the age group between 51 – 60 years and 21.73% (10) in 21 – 30 years. The MRSA were seen to be highly sensitive to Vancomycin & Rifampicin which showed 100% sensitivity and also for Amoxicillin (77.77%), Amikacin (61.19%). **Conclusion:** *Staphylococcus aureus i*nfections are important causes of morbidity in hospitals & the community also. The spectrum of disease produced by this organism varies from toxin-mediated phenomenon to pyogenic, acute or chronic infections either primary or post-operative both in the community as well as in hospitals. *Staphylococcus aureus* has been known to acquire resistance to most antibiotics including the penicillinase resistant ones like methicillin, oxacillin. Methicillin resistant *Staphylococcus aureus* (MRSA) is known to be more virulent than the sensitive ones. MRSA strains have been responsible for outbreaks of nosocomial infection worldwide. As has happened several times in the antibiotic era, this will inevitably promote the emergence of the next wave of antibiotic-resistant *Staphylococcus aureus* strains.

KEYWORDS: MRSA, Antibiotics, *Staphylococcus aureus,* Nosocominal.

INTRODUCTION

The emergence of a community pathogen depends on its ability to survive in different environments & to interact successfully with the host. *Staphylococcus aureus* is one of the successful & adaptable human pathogens.[1] Staphylococcus aureus has a broad pathogenic potential causing a wide range of community acquired as well as nosocomial infections.[2] The organism has been found to be the most common bacterial agent recovered from blood stream infections, skin & soft tissue infections, pneumonia & hospital – acquired post - operative wound infections.[3] *Staphylococcus aureus* infections are associated with morbidity in hospitals & community.[4] Before the availability of antibiotics, invasive staphylococcal disease was often fatal, & the introduction of penicillin in the 1940s dramatically

improved survival. Although penicillinase- producing strains soon emerged, methicillin & other penicillinase – stable β- lactam agents filled the breach. Methicillin resistant *Staphylococcus aureus* infection was initially reported in 1961, the same year in which methicillin (a penicillinase – resistant semi synthetic penicillin) was introduced. In1982, a "community – acquired outbreak" of MRSA, outside of a hospital, was first reported in intravenous drug users in Detroit, Michigan. During the 1990s, numerous outbreak of community acquired MRSA (CAMRSA). Indeed, the initial publication in the medical literature describing CAMRSA skin infections as "an emerging epidemic".[5,6] With all the above facts in mind, the present study was undertaken to find out the prevalence of Methicillin resistance among *Staphylococcus aureus* isolates & also to find out drug resistance patterns among them.

MATERIALS AND METHODS

A total of two hundred & five different samples from different clinical specialties like surgery, orthopedics, pediatrics, gynecology & obstetrics, medicine, ENT departments, were collected and processed. This study was carried out in the dept. of Microbiology at JLN Hospital and Research Centre, Bhilai in collaboration with CCM medical College. All clinical specimens such as urine, pus, sputum/throat swab, blood, pleural fluid, catheter tip, tracheal & nasal swabs & vaginal swabs were collected for *Staphylococcus aureus* screening. All the samples were aseptically handled and processed in the department of microbiology. All the laboratory procedures and findings were followed in standard processure. All the specimens for microbiology were collected only in appropriate sterile containers & aseptically. Specimens were brought to the laboratory immediately & processed within two hours of collection. In Gram,s stain, the morphology types were done for all the samples based on the Gram's staining method to determine the likely organisms' present.[7] Smears were made from the all clinical samples except blood, heat fixed & stained by Gram's stain. Smears were examined for, presence of Gram-positive cocci in cluster, that means GRAPES like appearance. **Culture:** Subsequently, the clinical specimens, like sputum & pus were inoculated on to nutrient agar, blood agar plates (aerobic with 5% CO_2), MacConkey's agar, Robertson cooked meat medium, Glucose broth & some special media such as Manitol salt agar & milk salt agar, which were incubated at 37°C for 24 hours aerobically. Subculture from liquid media on to solid media was done after 24 hours of incubation.[7] Ultimately, on nutrient agar colonies produce golden yellow pigment, colonies on blood agar are hemolytic & on MacConkey's medium colonies are smaller & pink colors due to lactose fermentation. Urine samples were inoculated with standard calibrated loops for determination of significant bacteriuria on blood agar & MacConkey's agar. BHI broth of blood culture was inoculated on to blood agar & MacConkey's agar after 48 hours of incubation. If there was no growth, again BHI broth incubated & sub cultured successively with three successive subcultures. If there was growth, inoculated on blood & MacConkey's agar. **Biochemical tests:** The colonies of Gram positive cocci in clusters were isolated on the basis of colony morphology, cultural characters, Gram's staining, catalase test, oxidase test & also by some biochemical tests, like urease test. All strains were further tested for the production of free coagulase enzyme using tube coagulase & bound coagulase enzyme using slide coagulase test based on standard methods. Also identified by using Hugh Leifson's oxidative fermentation test.[7] **Antimicrobial susceptibility test:** All the confirmed *staphylococcus aureus* strains from different clinical samples were subsequently tested for methicillin resistance based on Kirby-Bauer disc diffusion method according to NCCLS guidelines, using oxacillin discs (1 µg) obtained from Hi-Media laboratories, in Mueller-Hinton agar with 4% NaCl. The plates were incubated at 30°C for 24-48 hours.[11,7] **MRSA testing:** The isolates were considered methicillin resistant if the zone of inhibition for oxacillin was 10mm or less. Further, the antibiotic susceptibility pattern of methicillin resistant *Staphylococcus aureus* strains was determined on the day of their isolation by the modified Kirby-Bauer disc diffusion method on Mueller-Hinton agar using the criteria of standard zone sizes of inhibition to define sensitivity or resistance to different antimicrobials. The antibiotics used were Penicillin-G (10 units), ampicillin(10µg), cephotaxime (30µg), erythromycin(15µg), gentamycin(10µg), amikacin(30µg), ciprofloxacin(5µg), co-trimoxazole(25µg), vancomycin(30 µg), Rifampicin (5mcg) etc.[7] The readings are noted after the incubation & the sensitivity & resistance pattern of each isolates are recorded.[10]

Finally, the data were recorded & analyzed at the completion of the study.[7] All the readymade media & antibiotics disc were procured from Hi-Media laboratories Pvt Ltd (Mumbai).

RESULT

A total of 205 isolates from different clinical specimens were studied. This study was carried in the Department of Microbiology, at JLN Hospital and Research Centre, Bhilai in collaboration with CCM Medical College, Kachandur, Durg. The patients admitted to different clinical wards like, surgical ward, ENT, ICU, orthopedics, gynecology, ophthalmology, pediatrics, etc. formed the study group.

Table No. 1: Department wise distribution of cases.

Department	No. of cases	%	MRSA	%	MSSA	%
Surgery	70	34.14	25	35.71	45	64.28
Medicine	45	21.95	15	33.33	30	66.66
OBG	30	14.63	07	23.33	23	76.66
Pediatrics	10	04.87	04	40	06	60
ENT	04	01.95	03	75	01	25
Orthopedics	25	12.19	12	48	13	52
ICU	03	01.46	03	100	00	00
Urology	08	03.90	03	37.5	05	62.5
Ophthalmology	02	0.97	00	00	02	100
Gynecology	05	02.43	03	60	02	40
DVL	03	1.46	01	33.33	02	66.66
Total	205	100	76	37.07	129	62.92

Table no. 1 shows the distribution of cases from different clinical wards, majority were from **surgical wards** 34.14% (70), in that MRSA was 35.71% (25) & MSSA was 64.28% (45) followed by **medicine wards** 21.95% (45), in that MRSA & MSSA were 33.33% (15) & 66.66% (30), respectively **OBG wards** 14.63% (30), in that MRSA & MSSA were 23.33% (07) & 76.66% (23), **orthopedics wards** 12.19% (25), in that MRSA & MSSA were 48% (12) & 52% (13), **pediatrics wards** 04.87% (10),in that MRSA & MSSA were 40% (04) & 60% (06), **urology wards** 3.90% (08), in that MRSA & MSSA were 37.5% (03) & 62.5% (05), **gynecology wards** 2.43% (05), in that MRSA & MSSA were 60% (03) & 40% (02), **ENT wards** 1.95% (04), in that MRSA & MSSA were 75% (03) & 25% (01), **ICU** 1.46% (03), in that MRSA are 100% (03), **DVL** 1.46% (03),in that MRSA & MSSA were 33.33% (01) & 66.66% (02), & 0.97% (02), in that MSSA 100% (02) were from **ophthalmology wards** respectively.

Table No. 2: Sex wise distribution of cases and MRSA percentage.

Sex	No of cases (%)	No. of MRSA (%)
Male	105(51.21)	47(44.76)
Female	100(48.78)	29(29)

Table No.2 shows sex wise distribution of cases of males accounting to 105 (51.21%) & females 100 (48.78%) here almost equal number of cases are seen in males and females. Numbers of MRSA cases are of 47 out of 105 men comprising 44.76%, whereas in case of females it was 29% i.e. 29 out of 100 cases. MRSA percentage of males was higher than the MRSA percentage of female. This therefore proves that men were more prone to acquire the infection by MRSA strain.

Table No. 3: MRSA isolation among different age groups.

Age in years	Total no. of cases	No. of MRSA	%
0-10	14	05	35.71
11-20	14	04	28.57
21-30	46	10	21.73
31-40	31	15	48.38
41-50	28	10	35.71
51-60	42	19	45.23
61-70	18	06	33.33
>70	12	07	58.33
Total	205	76	37.37

The percentage (%) of MRSA among the various age groups are as follows, 0-10 yrs: 35.71%, 11-20 yrs: 28.57%, 21-30 yrs: 21.73%, 31-40 yrs: 48.38%, 41-50 yrs: 35.71%, 51-60 yrs: 45.23%, 61-70 yrs: 33.33% & >70 yrs: 58.33%. Out of the 76 MRSA strains isolated, 45.23% (19), 33.33 %(06) & 58.33%(07) were from patients over the age of 51-60, 61-70 & >70 yrs. Among these most of the MRSA strain were from the men over the age of 61-70 & >70 yrs. This proves that old age was a definite risk factor concerning MRSA infections. Out of 46 MRSA isolates, 45.23% (19) were from patients in the age group between 51 – 60 years followed by 21.73% (10) in 21 – 30 years.

Table No. 4: Nature of clinical specimen.

Specimen	Total No.	%	MRSA	%	MSSA	%
Pus/Wound swab	85	41.46	32	37.64	53	62.35
Urine	55	26.82	20	36.36	35	63.63
Sputum	21	10.24	04	19.04	17	80.95
High vaginal swab	10	4.87	03	30	07	70
Blood	10	4.87	08	80	02	20
Suction tip	06	2.92	04	66.66	02	33.33
Pleural fluid	05	2.43	01	20	04	80
Bedsore	05	2.43	02	40	03	50
Cervical swab	02	0.97	02	100	00	00
Serous discharge	02	0.97	00	00	02	100
Throat swab	02	0.97	00	00	02	100
Conjunctival swab	01	0.48	00	00	01	100
Skin lesion	01	0.48	00	00	01	100
Total	205	100	76	37.07	129	62.92

A total of 205 clinical specimens were collected in the present study, the commonest samples were pus from wounds & wound swabs comprising 41.46%(85) followed by urine 26.82%(55), sputum 10.24%(21), high vaginal swab with 4.87%(10), blood 4.87%(10). The other samples were suction tip 2.92 %(06), pleural fluid 2.43 %(05) & bedsore 2.43 %(05). Rest of the samples, like conjunctival swab 0.48 %(01), skin lesion 0.48 %(01), cervical swab, throat swab, serous discharge were same, of 0.97 %(02) respectively.

Table No. 5: Antibiotic susceptibility patterns.

Antimicrobials	Total samples	Resistant	%	Sensitive	%
Penicillin –G (P)	205	132	64.39	73	35.60
Amoxicillin (Ac)	170	52	30.58	118	69.41
Co-Trimoxazole (Co)	205	123	60	82	40
Erythromycin (E)	205	57	27.80	148	72.19
Clindamycin (Cd)	200	54	27	146	73
Gentamycin (G)	205	91	44.39	114	55.60
Ciprofloxacin (Cf)	200	88	44	112	56
Amikacin (Ak)	203	34	16.74	169	83.25
Nitrofurantoin (Nf)	55	06	10.90	49	89.09
Nalidixic acid (Na)	55	43	78.18	12	21.81
Rifampicin (R)	205	00	00	205	100
Vancomycin (Va)	205	00	00	205	100
Oxacillin (Ox)	205	72	35.12	133	64.87
Teicoplanin (Te)	50	30	60	20	40
Norfloxacin (Nx)	55	39	70.90	16	29.09

Table no. 5 shows the pattern of Staphylococcus aureus isolated. 64.39% (132/205) resistance was noticed for penicillin followed by for Co-Trimoxazole 60% (123/205). In case of Erythromycin, Clindamycin and Gentamycine, the resistance percentage was 27.80% (57/205), 27% (54/200) & 44.39% (91/205) respectively. Resistance for Oxacillin was 35.12% (72/205). Least resistance was observed for Amikacin 16.74% (34/203). Of the 55 urine isolates, 78.18% resistance was for Nalidixic Acid & 70.90% for Norfloxacin. Good sensitivity was noticed for Nitrofurantoin, which was 89.09%. It was further seen that all the isolates were susceptible to Rifampicin & Vancomycin.

Table No. 6: Susceptibility to individual antimicrobials in MRSAs isolated from different clinical specimens.

Antimicrobials	Total No. of MRSA	Resistant	%	Sensitive	%
Penicillin –G (P)	76	68	89.47	08	10.52
Amoxicillin (Ac)	72	16	22.22	56	77.77
Co-Trimoxazole (Co)	69	62	89.85	07	10.14
Erythromycin (E)	76	52	68.42	24	31.57
Clindamycin (Cd)	76	57	75	19	25
Gentamycin (G)	76	38	50	38	50

Ciprofloxacin (Cf)	73	49	67.12	24	32.87
Amikacin (Ak)	67	26	38.80	41	61.19
Nitrofurantoin (Nf)	22	05	22.72	17	77.27
Nalidixic acid (Na)	21	18	85.71	03	14.28
Rifampicin (R)	76	00	00	76	100
Vancomycin (Va)	76	00	00	76	100
Oxacillin (Ox)	76	76	100	00	00
Teicoplanin (Te)	23	19	82.60	04	17.39
Norfloxacin (Nx)	24	21	87.5	03	12.5

Explanation of the 76 MRSA isolates:- 89.47% resistance was noticed for penicillin-G. followed by Co-Trimoxazole (89.85 %). Majority were multidrug resistant. The resistance to Erythromycin, Clindamycin, Gentamycin & Ciprofloxacin was 68.42%, 75%, 50% & 67.12% respectively. All the MRSA strains were highly resistant to Nalidixic Acid (85.71%) & Norfloxacin (87.5%) and least resistance was observed for the Nitrofurantoin (22.72%).

The MRSA were seen to be highly sensitive to Vancomycin & Rifampicin which showed 100% sensitivity and also for Amoxicillin (77.77%), Amikacin (61.19%).

Table No.7: Analysis of MRSA by different Authors.

Name of the Author	Year of study	MRSA (%)
Pulimood T.B. et al[17]	1996	24
Metha et al[15]	1998	33
S. Vidhani et al[18]	2001	51.6
Anupurba S. et al[16]	2003	54.85
Qureshi et al[14]	2004	83
Rajaduraipandi et al[13]	2006	33.6
Gregory J. Morgan et al[19]	2006	59
Present Study	2015	37.07

DISCUSSION

The epidemiology of MRSA has continued to evolve since its first appearance more than three decades ago. Initially, there were sporadic reports of methicillin resistance amongst nosocomial *Staphylococcus aureus* isolates but later MRSA became a well-established hospital acquired pathogens with a few reports of community-acquired isolates.[11]

MRSA strains in the hospitals are difficult to eradicate because usually they are multi drug resistant. Today MRSA is considered to be one among the most important nosocomial pathogens. MRSA strains have been responsible for outbreaks of nosocomial infections worldwide.

MRSA is a major nosocomial pathogen causing significant morbidity & mortality. The important reservoirs of MRSA in hospitals/institutions are infected or colonized patients & transient hand carriage on the hands of health care workers is the predominant mode for patient-to-patient transmission. In India, the significance of MRSA had been recognized relatively late & it emerged as a problem in the 80s & in the 90s.Epidemic strains of these MRSA are usually also resistant to several other antibiotics. During the past 15 years, the appearance & world wide spread of many such clones have caused major therapeutic problems in many hospitals, as well as diversion of considerable resources to attempts at controlling their spread.[7]

Risk factors that have been associated with MRSA acquisition include older age, prolonged hospitalization, prior antibiotic therapy, more severe underlying disease & degree of disability, surgical procedures, presence in an intensive care or burn unit, having a surgical wound infection, intravascular devices, mechanical ventilation, tracheostomy, pressure ulcers, or exposure to other infected or colonized individuals. Not only does antibiotic therapy predispose patients to colonization with MRSA, but it also increases the risk of invasive disease & infection. Other host factors associated with progression from colonization to infection include recent hospitalization, preceding surgical or wound debridement, & the number of invasive procedure.[4]

Isolated 46 MRSA strains from different 150 clinical specimens respectively, that means, out of which the proportion of MRSA was found to be 46(30.66%) & the rest, MSSA was found 104(69.33%).

Since the past decade there were reports by number of workers, some of which are shown in table-(6).The prevalence rate in the present study is 30.66%, which is comparable with the other reports where, it ranged between 32.8% in 1994 [Mathur SK, et al.1994], 24% in 1996 [Pulimood TB., et al.1996],32% in 1997[MRSA surveillance study group,1997] & 51.6% in 2001 [Vidhani S., et al.]. Similar observation was made by Mehta, who in his study ion control of MRSA in a tertiary care centre, had reported an isolation rate of 33% from pus & wound swabs [Mehta AP., et al.,1998]. However, Qureshi from Pakistan reported a high isolation rate of up to 83% MRSA from pus [Qureshi AH, et al, 2004]. This implies that the incidence of infection by MRSA isolates keeps changing every year & it is on a rise compared to last few years.[7]

A. Specimen wise distribution: In the present study, 12 of 45(26.66%) isolates from urine,22 of 65(33.84%) isolates from pus,4 of 8(50%) isolates from blood & of

the isolates from sputum 2 were (18.18%)positive for MRSA strains.2 of 4 (50%)isolates from suction tip,1 of 1(100%)from cervical swab,1 of 8 (12.5%) isolates from high vaginal swab & 1 0f 1 (100%)isolates from bedsore were MRSA strain.(Table No.3).

B. Age wise distribution: This present study shows that the MRSA strains affected all age groups, but almost half, that means (32.14%)of the patients were in the extremes of age group, that means [50 to 60 years],(younger than one or older than 50 years).

C. Sex wise distribution: In the present study shows that MRSA strains affected all the male & female sex groups, but the incidence of MRSA is more in the male sex groups, that means 27 of 76(35.52%).

D. Department wise distribution: The prevalence was highest in the gynecology ward,2 of 4(50%). followed by the urology,2 of 5(40%),medicine ward,10 of 35(28.57%),surgical,15 0f 50(30%),the intensive care unit,2 of 2(100%),orthopedics,6 of 20(50%) & so on. Approximately, two-third of cases represented infections & one-third represented colonization.

E. Clinical characteristics: In the present study the body sites that were most frequently affected by overt MRSA infection were surgical sites (most cases were Type II DM), the chest (pneumonia), & endovascular catheter sites (infections). The total mortality of patient of MRSA infections was high, as was the mortality attributable to MRSA infection. It was generally believe that MRSA strains were not more virulent than methicillin-susceptible *Staphylococcus aureus* (MSSA) strains.[4]

F. Antimicrobial susceptibility: An important feature of MRSA is their propensity to spread & colonize debilitated patients. Since these strains tend to be multiple antibiotic-resistant, they pose a major difficulty in treating systemic infections. MRSA are more pathogenic than methicillin-sensitive *Staphylococcus aureus*, especially in the seriously ill & immunosuppressed patients. Both can cause a spectrum of illnesses ranging from minor skin infections to life-threatening complication like bacteremia & pneumonia.[9]

In the present study, the antibiotic sensitivity results showed that all MRSA isolates were significantly more resistant to various antibiotics. The resistance of MRSA to β-lactams like Penicillin was 84.78% while co-trimoxazole resistance was seen in 80% of the isolates, which was much higher than the resistance obtained in another study in 1999 to 2004(13.3%) & in 1997 to 1998(45.4%)from the different institution.[3] In our study the spectrum of antimicrobial resistance among MRSA, quinolones (Ciprofloxacin) was also found to be high i.e 56.09%. This co-relates with an earlier finding where it has been shown that the resistance to ciprofloxacin is steadily increasing from 39% in 1992 to 68% in 1996.(5). In 1997 also a high incidence of ciprofloxacin resistance (95.8%) was reported.[18] Again the resistance to ciprofloxacin is decreasing from 59.1% in 1999 - 2004.[3] However, Pulimood had observed only 8% resistance of MRSA to gentamycin, as against 52.17% in our study. Gentamycin resistance is on rise since 1996. An increase of gentamycin o% before 1996 to 80% after 1996 has been reported. Qureshi had reported a gentamycin resistance of 97.8%, which is higher compared to our study.[7] But in the present study 65.21% of the strains were resistant to clindamycin, which is the same for erythromycin. The resistant rate to amikacin & nalidixic acid were 32.55% & 85.71%. All the MRSA isolates were found to be susceptible to vancomycin (100%) & rifampicin (100%), MRSA also showed high level of resistance to amoxicillin. Although MRSA from different clinical specimens showed higher susceptibly to individual antibiotics when compared with others, we obtained high percentage of multidrug resistant MRSA from these specimens. Majumdar from Assam had reported 23.2% of the MRSA isolated from clinical specimens to be multidrug resistant. Anupurba from Uttar Pradesh had reported a higher percentage of multidrug resistant MRSA. Vidhani from Delhi reported even a higher percentage of multidrug MRSA but from high risk patients admitted in burns & orthopedic units.[7] Knowledge of prevalence of MRSA & their antimicrobial profile becomes necessary in the selection of appropriate empirical treatment of these infections. The choice of appropriate antimicrobial agents for suspected Staphylococcus aureus infections of skin, soft tissue & also different organs in patients in the community must now take into account the emergence of community associated & also hospital associated MRSA: providers should be aware that several available antimicrobial agents should be effective in treating these infections. At last vancomycin seems to be the only antimicrobial agent which showed 100% sensitivity & may be used as the drug of choice for treating multidrug resistant MRSA infections. However, regular monitoring of vancomycin sensitivity & routine testing of other newer glycopeptides like teicoplanin should be carried out. Further, the regular surveillance of hospital associated infections including monitoring antibiotic sensitivity pattern of MRSA & formulation of definite antibiotic policy may be helpful for reducing the incidence of MRSA infection.[18]

CONCLUSION

Staphylococcus aureus *i*nfections are important causes of morbidity in hospitals & the community also. The spectrum of disease produced by this organism varies from toxin-mediated phenomenon to pyogenic, acute or chronic infections either primary or post-operative both in the community as well as in hospitals. Living at the edge between commensalism & pathogenicity. Staphylococci have developed interesting strategies to cope with numerous external conditions. Biofilm formation, the acquisition of resistance traits as well as

the enormous genome flexibility of Staphylococci are prerequisites to survive in specific environments, being the main reasons why Staphylococci have become such successful pathogens. Recent advances in genomic research during the past decade led to the development of novel tools & technologies for the investigation of many pathogenic bacteria.[2] *Staphylococcus aureus* has been known to acquire resistance to most antibiotics including the penicillinase resistant ones like methicillin, oxacillin. Methicillin resistant *Staphylococcus aureus* (MRSA) is known to be more virulent than the sensitive ones. MRSA strains have been responsible for outbreaks of nosocomial infection worldwide.

The present study was undertaken to ascertain the prevalence of MRSA in wound infections from patients attending to JLN Hospital and Research Centre, Bhilai & to detect the antimicrobial susceptibility of these strain so as to select the drug of choice in management of infections caused by this organism.

A total of one hundred & fifty clinical specimens from orthopedics, surgery, pediatrics, OBG, gynecology, ENT, ICU, medicine, ophthalmology, urology & DVL department, from 2015.were studied over a period of six months. Different clinical samples like, pus, urine, blood, throat swab, skin lesion, high vaginal swab, sputum, conjunctival swab etc. for bacteriological examination were taken & processed for the isolation of MRSA using the standard techniques. Then the MRSA isolates thus obtained were subjected to antibiotic sensitivity testing. The results was tabulated & recorded.

Out of the 150 clinical samples, 46 were identified as MRSA & resting all are MSSA. So, the prevalence rate was 30.66%. In that prevalence rate, both community associated MRSA & hospital associated MRSA was found. Almost all the MRSA strains showed multidrug resistance.

So, the future research will therefore focus specifically on the investigation of regulatory networks connecting virulence & metabolism & on the elucidation of mechanisms involved in evolution of virulence & resistance. In the light of increasing antibiotic resistance rates among Staphylococci, this research is an essential prerequisite for the development of urgently needed novel therapeutic & prevention strategies against both nosocomial & community acquired Staphylococcal infections.[2]

In conclusion, the degree of resistance or sensitivity of MRSA towards commonly used antibiotics is recognized to be diverse from region to region & vancomycin was the only antibiotic found to give uniform sensitivity (100%). When antimicrobials including vancomycin are considered for treatment, choice inevitably requires the need for in vitro susceptibility testing of every isolate of MRSA in the clinical laboratories[7]. The knowledge & determination of prevalence of MRSA & their current antimicrobial profile becomes necessary to the clinicians, in the selection of appropriate empirical treatment of the infections caused by the hospital acquired MRSA strains in referral hospitals. To avoid clinical complications from community-acquired MRSA infections, clinicians should now consider MRSA as a potential pathogen in patients with suspected Staphylococcus aureus infections in the community setting. Eventually, a large percentage of community-acquired *Staphylococcus aureus* infections from many geographically distinct regions will be caused by methicillin-resistant strains. At that point in time, the empirical treatment of essentially all community-acquired *Staphylococcus aureus* infections will have to be changed to vancomycin or newer non β-lactam antibiotics. As has happened several times in the antibiotic era, this will inevitably promote the emergence of the next wave of antibiotic-resistant *Staphylococcus aureus* strains.[8]

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