ORIGINAL ARTICLE

Prevalence of Nosocomial Infection by Methicillin Resistant Staphylococcus Epidermidis in Tertiary Care Hospitals of Karachi

MUHAMMAD IRFAN KHAN[1], MUHAMMAD FAIZ UDDIN[2], SYEDA ASIYA PARVEEN[3], *ZUMER NAYYER[4], YUSRA MASOOD[5], WAJIHA FATIMA[6], MARIUM HASHMI[7], SHAHBAZ AHMED[8], S. M. SAFDAR ALI[9]*

ABSTRACT

Aim: To determine the prevalence of nosocomial infections by methicillin resistant Staphylococcus epidermidis.

Place and duration of study: The study was conducted in the department of Microbiology, Basic Medical Sciences Institute, Jinnah Postgraduate Medical Centre, Karachi, during the period of February 2011 to February 2012.

Methods: A total of 250 subjects of all ages and gender were included. Blood samples, urine, sputum, swab from infected wounds, dialysis fluid, peritoneal fluid, and pleural fluid. CSF were collected from Jinnah Postgraduate Medical Centre, National Institute of Child Health, Karachi and processed according to standard laboratory methods.

Results: A total 98 methicillin resistant Staphylococcus, epidermidis, causing nosocomial infections isolated from 250 patients. MRSE were commonly isolated from patients of all ages who developed nosocomial infections.

Key words: Staphylococcus epidermidis, nosocomial infection.

INTRODUCTION:

Staphylococcus epidermidis belongs to Coagulase Negative Staphylococci[1]. The appearance of Staphylococcus epidermidis in literature could be dismissed as contamination (Rasheed et al., 2007)[2]. Staphylococcus epidermidis is a major nosocomial pathogen, frequently isolated from the normal skin microbiota of patients and healthy individuals(Cimiotti et al., 2004)[3]. It is one of the most significant bacteria in context of hospitalized infections (Nomura et al., 2010)[4].

Staphylococcus epidermidis is one of the five most common organisms that cause nosocomial infections[5]. Staphylococcus infection in hospitalized patients has been a major concern for well over a century[6]. According to Centers for Diseases Control and Prevention's National Nosocomial Infection Surveillance System, Staphylococcus epidermidis is responsible for 33.5% of nosocomial blood stream infections[7]. It is clear that Staphylococcus epidermidis is an important cause of bacteremia and has been correlated with the increase in the use of prosthetic and indwelling devices and the growing number of immunocompromised patients in hospitals[8]. The inherent capacity of this organism to cause infection derivsed primarily from its ability to form mucoid biofilms on inert synthetic surfaces of indwelling medical devices[9]. The biofilm forming property of Coagulase negative Staphylococcus is considered the most important virulence factor[10].

Methicillin resistance is mediated by mecA gene endocing a penicillin binding protein with reduced affinity to β-lactam antibiotics (Wilma et al., 2006)[11]. Methicillin resistant Staphylococcus epidermidis was proven to be an infection associated with hospitalization[12]. Premature neonates admitted in neonatal intensive care units are the most vulnerable to CoNS infections[13].

PATIENTS AND METHODS

The study was performed in Microbiology Department of BMSI, JPMC, Karachi from February 2011 to February 2012. Two hundred and fifty patients of all ages were selected from medicine, surgery, pediatric and urology Departments. Samples were collected by trained RMOs from medicine, surgery pediatric, urology departments of JPMC and NICH. Samples were immediately taken to Microbiology Department. Specimens were streaked on blood agar and MacConkey's agar plates and incubated overnight at

[1,2] *Department of Pathology, Karachi Medical & Dental College & ASH.*
[3] *Department of Biochemistry, Karachi Medical & Dental College & ASH.*
[4,5,8] *House officer KMDC & ASH.*
[6,7] *Students KMDC & ASH*
[9] *RMO ASH*
Correspondence to Dr. Syeda Asiya Parveen, Assistant Professor Flat A-31 Ashraf Square, Block 17 Gulshan-e-Iqbal, Karachi Email doctorasiya@yahoo.com Cell: 03365068055

37^{o}C aerobically. Phenotypic characteristics of the colonies were used for presumptive identification of Staphylococcus epidermidis.

Staphylococcus epidermidis identification was confirmed by gram staining, catalase test and coagulase test, then inoculating on Mannitol salt agar.The isolates were gram positive cocci with catalase positive, coagulase negative with no growth on Mannitol salt agar. Final identification was done by Kirby Bauer disc diffusion method as recommended by NCLSI (2005). The bacterial colonies introduced after following the procedure as described by McGarland. The following antibiotic discs (Oxoid-UK) were used; methicillin (10µg), oxacillin (1µg), novobiocin (5µg). The isolates were inoculated on Mueller Hinton Agar and incubated at 37^{o}C for 24 hours to assess the susceptibility of the isolates to methicillin the isolates were taken as methicillin resistant if the zone of inhibition was <10mm, for oxacillin <9mm and for novobiocin >16mm.

RESULTS

A total of 250 clinically suspected cases of nosocomial infections attending OPDs or indoor patients in departments of surgery, medicine, pediatrics and urology from JPMC and NICH were included in this study and isolated 98 (39.2%) methicillin resistant Staphylococcus epidermidis. Table 1 show out of 250 cases of Nosocomial Infections. 98(39.2%) methicillin resistant Staphylococcus epidermidis were isolated. No MRSE isolated in 152(60.8%) cases of Nosocomial infections. Table 2 shows hospital wise distribution of MRSE among Nosocomial infection patients. 200 samples from JPMC with 82 (41%) positive and 50 samples from NICH with 16 (32%) positive. Table 3 Age wise distribution of MRSE shows 0-12 (32%), 12-20 (38%), 20-35 (50.1%), 35-45 (44.1%), 45-60 (35.1%) and 60-80 (36.3%). Table 4 shows the results of MRSE isolated on the basis of sample type. 80 samples for blood culture and sensitivity showed 36(45%) positive for MRSE. 39 samples of urine showed 6 (15.3%) positive for MRSE. 20 samples of dialysis fluid showed 4 (20.1%) positive for MRSE. 51 samples of wound swabs showed 33 (64.7%) positive for MRSE. 05 samples of peritoneal fluid showed no positively for MRSE. 8 samples of pleural fluid showed 1(12.5%) positive for MRSE. 23 samples of sputum showed 4(17.3%) positive for MRSE. 4 samples of CSF showed no positive results for MRSE. 20 samples of Catheter tips, cannula tips and tubes showed 14(70%) positive for MRSE. Table 5 shows results of MRSE isolated on the basis of department 50 samples were taken from pediatric department showing 16(32%) positive for MRSE. 80 samples were taken from surgery department 45 (56.2%) positive for MRSE 50 samples from urology department showed 10(20%) positive for MRSE. 20 samples were taken from orthopedic department showing 6(30%) positive for MRSE. 50 samples were taken from medicine department showing 21(42%) positive. Table 6 shows result of MRSE isolated on the basis of nosocomial infection, 80 samples were taken from Bacteremia patients showing 36(45%) positive for MRSE. 59 samples were taken from UTI patients showing 10(35.5%) positive for MRSE. 51 samples were taken from wound infectious patients showing 33 (64.7%) positive for MRSE. 31 samples were taken from pneumonia patients showing 5(29.8%) positive for MRSE. 20 samples were taken from skin infectious patients showing 14(70%) positive for MRSE.

Table 1: Occurrence of MRSE in patients of nosocomial infections

No. of patients of nosocomial infection	Positive for MRSE	%age
250	98	39.2

Table 2: Distribution of MRSE positive specimens in nosocomial infection patients according to hospital

Hospital	No. of patients of Nosocomial infections	Positive for MRSE	%age
JPMC	200	82	41
NICH	50	16	32

Table 3: Age wise distribution of MRSE in different groups of nosocomial infection patients

Age Group (years)	No. of patients of Nosocomial infections	Positive for MRSE	%age
0-12	50	16	32
12-20	21	08	38
20-35	53	27	50
35-45	68	30	44.1
45-60	37	13	35.1
60-80	11	04	36.3

Table 4: Distribution of MRSE according to sample type in nosocomial infection

Sample	n	Positive for MRSE	%age
Blood	80	36	45
Urine	39	06	15.3
Dialysis fluid	20	04	20
Wound swab	51	33	64.7
Peritoneal fluid	05	0	0
Pleural fluid	08	01	12.5
Sputum	23	04	17.3
CSF	04	0	0
Catheter & cannula tips	20	14	70

Table 5: Distribution of MRSE in nosocomial infection patients according to department

Department	n	Positive for MRSE	Negative for MRSE
Medicine	50	21 (42%)	29 (58%)
Surgery	80	45 (56.2%)	35 (43.7%)
Pediatrics	50	16 (32%)	34 (68%)
Urology	50	10 (20%)	40 (80%)
Orthopedics	20	6 (30%)	14 (70%)

Table 6: Distribution of MRSE according to type of nosocomial infection

Nosocomial infection type	n	Positive for MRSE	%age
Bacteremia	80	36	45
UTI	59	10	35.3
Wound infection	51	33	64.7
Pneumonia	31	5	29.8
Skin infection	20	14	70

DISCUSSION

Methicillin resistant Staphylococcus epidermidis is proved to be the common cause of nosocomial infections both in outdoor and indoor patients. It is one of the most significant bacteria in context of hospitalized infection. The present study was conducted to determine the prevalence of nosocomial infections due to Methicillin resistant Staphylococcus epidermidis.

The purpose of this study was to assess the frequency of MRSE in nosocomial infections. Culture and biochemical tests were performed for isolation of MRSE. In this study out of a total 250 cases, 98 (39.2%) MRSE were isolated. This study support our finding that methicillin resistant Staphylococcus epidermidis as a common etiological agent of nosocomial infection. In accordance to a study conducted by Chaieb et al (2005)[14]. Staphylococcus epidermidis is responsible for 33.5% of nosocomial blood stream infections.

In another study of neonatal infections by Villari et al. (2000)[15], results indicated that Staphylococcus epidermidis was the pathogen leading to blood stream infections (39.8%), surface infections (29.8%) and meningitis (58.3%). According to the study conducted by Yameen et al. (2010)[16], the prevalence of staphylococcus epidermidis in hospitalized patients was 29.78%.

Kumar. M et al (2013)[17] mentioned that Staphylococcus epidermidis is responsible for 18.57% of suspected septicemic new born.

In a study conducted by Bilal et al (2013)[18], the results showed 40% prevalence of Staphylococcus epidermidis and De Paulis et al (2003)[19] showed 51% prevalence.

The study presented by Babay et al (2005)[20] showed 55% prevalence of MRSE in pediatric blood stream infections in Saudi Hospital.

In accordance to a study conducted by Manikandan et al in 2005[21], the prevalence of Staphylococcus epidermidis was 57.1% in hospitalized patients and is resistant to Methicillin and oxacillin.

In another study by Buonavoglia et al (2010)[22] Staphylococcus epidermidis showed a higher level of prevalence (60-70%) demonstrating the ability of Staphylococcus to spread from hospital environment to community.

Chang et al. (2010)[23] in their study showed that the prevalence of MRSE ranges from 11% to 60%. Maha et al. (2011)[24] showed 70% prevalence in neonates in Saudi Arabia. In another study carried by Chaieb et al. (2007)[25] in Tunisia high frequency of Staphylococcus epidermidis 72% was found.

The study conducted by Irum et al (2013)[26] showed 73% and Worthington et al. (2003)[27] showed 96% prevalence.

CONCLUSION

Methicillin resistant Staphylococcus epidermidis is a common cause of nosocomial infections. It has the ability to spread from hospital environment to the community and to colonize healthy individuals. Antibiotic resistance and ability of MRSE to form biofilms makes these infections hard to treat. MRSE is now establishing itself as a successful nosocomial pathogen in hospital settings.

MRSE has developed interesting strategies in conquering hospital environment as novel ecological niche. Therefore, patients suffering from nosocomial infections should be tested for MRSE, to determine its species prevention and treatment to reduce the morbidity and mortality.

Acknowledgement: We acknowledge the efforts of Hafiza Sidra Adil Siddique, Memoona Muhammad Rafique and Noor ul Huda for providing the technical support in writing the manuscript.

REFERENCES

1. Wisplinghoff H, Bischoff T, Tallent SM, Seifert H, Wenzel Edmond MB. nosocomial blood stream infections in US hospitals: analysis of 24,179 cases from a prospective nationwide surveillance study. Clin Infect Dis2004; 39:309-317.
2. Rasheed, M. Awole. M. Staphylococcus epidermidis Commensal Emerging as a Pathogen with increasing clinical significance especially in Nosocomial infections. JCM. 2007 Volume 3 Number 2. Dol: 10.5580/7cf.
3. Cimiotti JP, Wu. F, Larson E. Emergence of resistant Staphylococci on the hands of new graduate nurses. Infect Control HOspEpidemiol 2004;25:431-435.

4. Nomura K, Mizumachi E, Yamashita M, Oshiro M, Komori T, Sugai M, and et al. Drug susceptibility and clonality of methicillin resistant. Staphylococcus epidermidis in hospitalized patients with hematological malignancies. Ir J med Sci 2010; pp: 481-487.
5. Mack D, Davies A, Harris L, Rhode H, horskotte M, Knobloch J. Microbial interactions in Staphylococcus epidermidis biofilms. AnalytBiochem 2007; 387:399-408
6. Ekrami A, Samarbafzadeh A, Alavi M, Kalantar E and Hamzeloi F. prevalence of methicillin resistant staphylococcus epidermidis isolated from burn patients in a burn center, Ahvaz. Irfan Judishpur J Microbial 2010; 3(2): 84-91.
7. Chaieb K, Abbas MS, Touati A, Hassen AB Mahdouani K and Bakhrouf A. Molecular characterization of Staphylococcus epidermidis isolated from biomaterials in a dialysis service. Ann Microbiol 2005; 55 (4): 207-312.
8. Jeong J, Chang CL, Park TS, Lee SH, Kim SR, Jeong SH. Early screening of oxacilin resistant Staphylococcus aureus and Staphylococcus epidermidis from blood culture. J Korean Med Sci 2002;17:168-172.
9. O'gara JP and Humphreys H. Staphylococcus epidermidis biofilms importance and implications. J med Microbiol 2001;50:582-587.
10. Hira Vishal, S Marcel, Goessens. F. H. Wil, OttAlewijin, Grac de Ronald, Hermans M et al. Coagulase negative Staphylococcal skin carriage among Neonatal Intensive Units Personal: From population to infection JCM. 2010; 3876-3881.
11. Wilma Z, Susanne H, Martin E, Hennes K, Christoph B, Svetlana K. nosocomial infections by Staphylococcus epidermidis: How a commensal bacterium turns into a pathogen. J. Antimicrob Agents 2006; 1:14-20.
12. Nomura K, Mizumachi E, Yamashita M, Oshiro M, Komori T, Sugai M, and et al. Drug susceptibility and clonality of methicillin resistant Staphylococcus epidermidis in hospitalized patients with hematological malignancies. Ir J med Sci 2010; pp. 481-487.
13. Cheung C Y Gordon and Otto Micheal. Understanding the significance of Staphylococcus epidermidis bacteremia in babies and children. NIH Public Access. 2010; 23 (3): 208-2016.
14. Chaieb K, Abbas MS, Touati A, Hassen AB Mahdouani K and Bakhrouf A. Molecular characterization of Staphylococcus epidermidis isolated from biomaterials in a dialysis service. Ann Microbiol 2005; 55 (4): 207-312.
15. Villari P, Sarnataro C and Lucazio L. Molecular epidemiology of staphylococcus epidermidis in a neonatal intensive care unit over a three year period. J Clin Microbiol 2000; 38 (5):1710-1746.
16. Yameen MA, Nasim H, Akhtar N, Iram S, Javed I and Hameed A. antibiotic susceptibility profile of methicillin resistant Staphylococci isolated from nasal samples of hospitalized patients. AfrMicrobiol Res 2010; 4 (3):204-209.
17. Kumar M, Kanth N, Bhurguri A. Neel S. Prevalence of Staphylococcus epidermidis in suspected septicemic new born. MC2013; Vol. 19-No.3: 77-79.
18. Bilal Ahmed Mir, SRIKANTH. Prevalence of antimicrobial susceptibility of Methicillin resistant Staphylococcus Aureus and Coagulase Negative Staphylococci in a tertiary care hospital. Asian J Pharm CI Research. 2013; 6 (3):231-234.
19. De Paulis A, Predari S, Chazarreta C, Santoiani J. five test simple scheme for species level identification of clinically significant coagulase negative staphylococci. J CinMicrobiol 2003; 41:1219-24.
20. Babay HA, Twum-Danso K, Kambal AM, Al-Otaibi FE . Blood stream infections in pediatric patients. Saudi Med J2005; 26:1555-1561.
21. Manikandan P, Bhaskar M, Revathy R, John RK, Narendran K, Narendran V speciation of coagulase negative staphylococcus causing bacterial keratitis. Indian J. Ophthalmol 2005; 53:59-60.
22. Buonavoglia A, Latronico F, Greco MF, Abramo MD, Marinaro M, Mangini F,and et al. Methicillin resistant Staphylococci carriage in the oral cavity: a study conducted in Bari (Italy) Oral Dis 2010.
23. Chang AH Bacteriological Spectrum and susceptibility pattern of Clinical Specimens from cases of nosocomial infections in pediatric ICU. Thesis M. Phil University of Karachi, 2010.
24. Maha Abd El Hafez, Noha G. Khalaf, Mohamed El Ahmady, Ahmed Abd El Aziz Abd El Gawad Hashim. An outbreak of methicillin resistant staphylococcus epidermidis among neonates in a hospital in Saudi Arabia. J Infect Dev Ctries 2011; 5(10):692-699
25. Chaieb K, Zamantar T, Chehab O, Bovcham O, Hasen T, Mahdouani A, and et al. Antibiotic resistance genes detected by multiplex PCR assays in staphylococcus epidermidis strains isolated from dialysis fluid and needles in a dialysis service. Jap J Infect Dis 2007; 60:185-187
26. Irum Perveen, Abdul Majid, Sobia Kanwal, Iffat Naz Shama Sehar, Safia Ahmed et al. Prevalence and Antimicrobial susceptibility paten of Methicillin resistant staphylococcus aureus and caogulase negative Staphylococci in Rawalpindi, Pakistan. Br J Med Med Res 2013; 3(1):198-209.
27. Worthington T, Lambert PA Elliot TS. Is Hospital acquired intravascular catheter related sepsis associated without break strains of coagulase negative Staphylococci? J Hos infect 2000; 46:130-34.