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Methicillin-Resistant *Staphylococcus Aureus* (MRSA): Prevalence and Antimicrobial Sensitivity Pattern among Outdoor and Indoor Patients Dhaka City Hospital, Bangladesh

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Abstract

Methicillin-Resistant *Staphylococcus Aureus* (MRSA) is one of the significant pathogens with associated public-health concern in the world. This present study has been focused on the prevalence of MRSA and their antibiotic resistance of indoor and outdoor patients different age and gender in clinical history, Dr. Sirajul Islam medical college and hospital Dhaka, Bangladesh. We were performed during the period of January 2019 to July 2019. A total 964 samples which is outdoor 354 (36.72%) indoor 610 (63.27%). We were observation 5 days (BACTEC-9050 Machine) then inoculated selective onto Blood agar and MacConkey agar media and the culture plates were incubated at 37°C for 24 hrs. The *S. aureus* colonies showing golden yellow colour on Blood agar were primarily identified as *S. aureus*, which were then subjected for catalase and coagulase tests. The Methicillin-Resistant *Staphylococcus Aureus* (MRSA) could be detected only 42 (4.35%) into, males 18 (1.86%) and female 24 (2.48%) in total sample, on the other hand *Staphylococci aureus*. (MSSA) 50 (5.18%), *Pseudomonas* spp. 14 (1.45%), *Klebsiella* spp. 13 (1.34%), *Salmonella* spp. 27 (2.80%), *E. coli* 21 (2.17%), No MRSA, MSSA and other organisms are found 797 (82.67%), Standard antimicrobial disks representing multiple sixteen drug were, Sensitive-381 (56.69%), Resistance-284 (42.26%), as well as Intermediate-7 (1.04%) against antibiotics, Oxacillin, Vancomycin, Erythromycin, Co-trimoxazole, Ciprofloxacin, Gentamicin, Linezolid, Amoxicillin, Amoxycylate, Azithromycin,

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Imipenem, Meropenem, Netilmicin, Gatifloxacin, Cloxacillin, Sparfloxacin. In this review, we describe the current burden of MRSA infections in healthcare and community of Bangladesh. And settings across other country the main threats caused by recent changes in the epidemiology of MRSA. This data has important implication for quality of patients care antibiotic selection and infection control practices.

Keywords

Methicillin-Resistant *Staphylococcus Aureus*; Hospital; Indoor Outdoor Patients; Blood; Antimicrobial Sensitivity

Introduction

In today's world Antimicrobial Resistance (AMR) is a vital public-health concern. It is true that Methicillin-Resistant *Staphylococcus Aureus* (MRSA) is one of the significant pathogens in worldwide as well as is associated with high morbidity and mortality amount with rapid development of resistance [1,2]. Since 1960s, *S. aureus* initially described, on the other hand, *S. aureus*, is principally amalgamated with skin, skin glands and mucous membrane of warm-blooded animals so an adaptable microbe as well as a frequent invader of animals, and humans [3]. The organism is favour nosocomial bacteria implicate with several infections, including pneumonia, septic arthritis, osteomyelitis, endocarditis, toxic-shock syndrome and food poisoning [4-7]. Many scientists are of the opinion that, (healthcare associated methicillin-resistant *S. aureus*, HA-MRSA), the burden of MRSA colonisation and infection has recently enlarged to further ecological slot [8]. After that 1990s, an increasing prevalence of MRSA infections emerge in the community (Community Associated Methicillin-Resistant *Staphylococcus Aureus*, CA-MRSA), has been described from many countries globally [9,10]. Research show that, Bangladesh is a high prevalence of MRSA infection, where the proportion is greater than three quarter has been observed in Asian several countries, including Japan, India, Pakistan, Thailand and Vietnam [11]. Those countries as well experience a high incidence of MRSA infection [12,13]. In the present study, we estimated the prevalence of *S. aureus* and MRSA in blood sample indoor as well as outdoor medical patient whereas antimicrobial resistance typing was used to determine the relatedness among the MRSA isolates.

Material and Method

Sample Collection

A total of 964 blood sample were cultured for the isolation of *S. aureus* from patients in hospitals, (out door and in door) Dr Sirajul Islam medical college and hospital Ltd. *S. aureus*

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was identified and antibiotic susceptibility tests were performed in the Department of Microbiology. The tests were performed during the period of January 2019 to July 2019. Records including clinical history, type of infection, gender, age, consumption of antibiotics, were obtained from patients whose sample *S. aureus* (MRSA) had been isolated from Blood agar and MacConkey agar media [14].

Isolation and Identification of *S. aureus*

Isolation and enumeration of staphylococci was carried out as previously described. Enumeration was performed only in blood sample. At first, we were collected blood sample from collection department, then we were preserving blood sample 5 days (BACT 9050 machine) while as is observed machine called positive signal, we were sub culture selective on Blood agar and MacConkey agar media. Then microorganism's primary identified by aerobically incubated for 24 hours at 37°C golden yellow colony. Secondary recognized by characterization on blood agar were subjected to gram staining, catalase test, and coagulase test [15].

Antimicrobial Sensitivity Testing

Antimicrobial susceptibility of the *S. aureus* against 16 antimicrobials was determined by the agar-dilution method in Mueller-Hinton agar. According to the Clinical and Laboratory Standard Institute (CLSI) guidelines and the results were appraised after incubation at 37°C for 24 hours [16]. The final plate combination (mg/mL) were used (Oxoid, UK) antibiotics, Oxacillin, Vancomycin, Erythromycin, Co-trimoxazole, Ciprofloxacin, Gentamicin, Linezolid, Amoxicillin, Amoxycylave, Azithromycin, Imipenem, Meropenem, Netilmicin, Gatifloxacin, Cloxacillin, Sparfloxacin.

Results and Discussion

Isolation of Methicillin Resistant *Staphylococcus Aureus*

Methicillin-Resistant *Staphylococcus Aureus* (MRSA) (green yellowish colony) was isolated from 42 (4.35%) out of the 964 blood samples analysed. The isolation frequencies outdoor and indoor patient Dr Sirajul Islam Medical College and Hospital Ltd. Sample type is shown in (Table 1). January was the first month we were collected 86 blood sample in which present 3 (0.31%) patients MRSA, and February 79 sample were present 1 (0.10%) patients MRSA in indoor patients. On the other hand, the number of MRSA is present indoor & outdoor patients is 5 (0.51%) and 1 (0.10%) in March out of 112 sample. Between April and May, the number

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of MRSA blood sample was same indoor patients 4 (0.41%), 4 (0.41%) as well as outdoor patients in April was 1 (0.10%) and May is 0 (0.00%) from 103 and 117 blood sample. The number of MRSA abruptly increased from indoor patients 10 (1.03%) and 11 (1.14%) outdoor patients 2 (0.20%), 0 (0.00%) between June and July in Sirajul Islam Medical College and Hospital Ltd.

Period	Total Blood Sample	Identify MRSA Indoor Patients		Identify MRSA Out-door Patients	
		Present	Absent	Present	Absent
January	86	3 (0.31%)	53 (5.49%)	0 (0.00%)	30 (3.11%)
February	79	1 (0.10%)	38 (3.94%)	0 (0.00%)	40 (4.14%)
March	112	5 (0.51%)	65 (6.74%)	1 (0.10%)	41 (4.25%)
April	103	4 (0.41%)	79 (8.19%)	1 (0.10%)	19 (1.97%)
May	117	4 (0.41%)	83 (8.60%)	0 (0.00%)	30 (3.11%)
June	131	10 (1.03%)	65 (6.74%)	2 (0.20%)	54 (5.60%)
July	336	11 (1.14%)	189 (19.60%)	0 (0.00%)	136 (14.10%)
Total	964	38 (3.94%)	572 (59.33%)	4 (0.41%)	350 (36.30%)

Table 1: Prevalence of methicillin-resistant *Staphylococcus aureus* isolates and classified by period of collection, indoor & outdoor patients. Dr Sirajul Islam medical college and hospital Ltd.

Antibiotic Susceptibility of MRSA Isolates:

According to antibiogram outline, the 42 (4.35%) MRSA isolates from 964 (100%) indoor and outdoor patients blood sample. The fact of the matter is, Cefoxitin disk dispersion test we were used to screen all *S. aureus* isolates. Isolates with a zone of growth inhibition ≥ 22 mm are defined as methicillin-sensitive *S. aureus* (MSSA), and those with a zone diameter < 21 mm as Methicillin Resistant *S. Aureus* (MRSA) [16]. Where resistant and sensitive against Oxacillin S=4 (0.59%), R=38 (5.65%), Ciprofloxacin S=33 (4.91%) R=8 (1.19%) I=1 (0.14%), Gentamicin S=22 (3.27%) R=20 (2.97%), Amoxicillin R=30 (4.46%) S=12 (1.78%), Cloxacillin S=5 (0.74%) R=37 (5.50%), Sparfloxacin S=24 (3.57%) R=18 (2.67%), Vancomycin S=40 (5.95%) R=2 (0.29%), Erythromycin R=10 (1.48%) S=30 (4.46%) I=2 (0.29%), Co-trimoxazole R=17 (2.52%) S=25 (3.72%), Linezolid S=36 (5.35%) R=6 (0.89%),

Amoxyclave R=14 (2.08%) S=28 (4.16%), Azithromycin I=3 (0.44%) S=22 (3.27%) R=17 (2.52%), Imipenem R=9 (1.33%) S=33 (4.91%), Meropenem S=21 (3.12%) R=21 (3.12%), Netilmicin I=1 (0.29%) R=4 (0.59%) S=37 (5.50%), Gatifloxacin S=34 (5.05%) R=8 (1.19%). (R=Resistance, S=Sensitive, I=Intermediate) (Table 2).

Antibiotic	Indoor and Outdoor Patients (MRSA) 42 (4.35%)		
	Sensitive	Resistant	Intermediate
Oxacillin	4 (0.59%)	38 (5.65%)	
Vancomycin	40 (5.95%)	2 (0.29%)	
Erythromycin	30 (4.46%)	10 (1.48%)	2 (0.29%)
Co-trimoxazole	25 (3.72%)	17 (2.52%)	
Ciprofloxacin	8 (1.19%)	33 (4.91%)	1 (0.14%)
Gentamicin	22 (3.27%)	20 (2.97%)	
Linezolid	36 (5.35%)	6 (0.89%)	
Amoxicillin	12 (1.78%)	30 (4.46%)	
Amoxyclave	28 (4.16%)	14 (2.08%)	
Azithromycin	22 (3.27%)	17 (2.52%)	3 (0.44%)
Imipenem	33 (4.91%)	9 (1.33%)	
Meropenem	21 (3.12%)	21 (3.12%)	
Netilmicin	37 (5.50%)	4 (0.59%)	1 (0.29%)
Gatifloxacin	34 (5.05%)	8 (1.19%)	
Cloxacillin	5 (0.74%)	37 (5.50%)	
Sparfloxacin	24 (3.57%)	18 (2.67%)	
Total = 672	381 (56.69%)	284 (42.26%)	7 (1.04%)

Table 2: Isolated drug Methicillin resistance *S. aureus* sensitivity pattern blood sample. Identify drug Methicillin resistance *S. aureus* sensitivity pattern 42 (4.35%) blood sample.

Prevalence of Methicillin-Resistant *Staphylococcus Aureus* of Age and Gender

Research show that, A total of 964 patients' (outdoor and indoor) blood sample were raised of which 18 (1.86%) were males and 24 (2.48%) were female. The age range of the study members was from <10 year to >80 year. In a more recent time of the study participants Methicillin Resistant *Staphylococcus Aureus* (MRSA) most were between the age groups of 31–60. After that, lowest percentage participant's methicillin resistant *Staphylococcus aureus* was between the age group of 10-30 and 71-90 (Fig. 1).

Figure 1: The MRSA percentage of Age and Gender.

Total Bacterial Count of Indoor and Outdoor Patients

Although this study presents Methicillin-Resistant *Staphylococcus Aureus* (MRSA) nevertheless, we were found different type of microorganisms among the Methicillin-Resistant *Staphylococcus Aureus* (MRSA) 42 (4.35%), were produce *Staphylococci aureus*. 50 (5.18%), were produce *Salmonella* spp. 27 (2.80%), were produce *E. coli*, 21 (2.17%), were found *Klebsiella* spp. 13 (1.34%), were produce *Pseudomonas* spp. 14 (1.45%), as well as we were not identified (no growth) 797 (82.67%) (Fig. 2 and Table 3) [17-19].

Figure 2: Total count blood sample.

Identify Organisms in Total Blood Sample	In-door Patients	Out-door Patients	Total Count
<i>E. coli</i>	15 (1.55%)	6 (0.62%)	21 (2.17%)
<i>Salmonella spp.</i>	10 (1.03%)	17 (1.76%)	27 (2.80%)
<i>Klebsiella spp.</i>	8 (0.82%)	5 (0.51%)	13 (1.34%)
<i>Staphylococci aureus. (MSSA)</i>	40 (4.14%)	10 (1.03%)	50 (5.18%)
<i>Pseudomonas spp.</i>	8 (0.82%)	6 (0.62%)	14 (1.45%)
Methicillin-Resistant <i>Staphylococcus Aureus</i> (MRSA)	38 (3.94%)	4 (0.41%)	42 (4.35%)
No MRSA, MSSA and other organisms are found (no growth)	491 (50.93%)	306 (31.74%)	797 (82.67%)
Total	610 (63.27%)	354 (36.72%)	964 (100%)

Table 3: Total bacterial count of indoor and outdoor patients.

Conclusion

Methicillin resistant *Staphylococcus aureus* has been a cause of human disease comprehensively recorded history. Methicillin Resistant *Staphylococcus Aureus* (MRSA) infections constitute a vital and still developing public health challenge for globally. This current circumstance applies to MRSA. In this study, we presented data on the frequency of MRSA in Dr. Sirajul Islam Medical Collage and Hospitals Ltd in Dhaka, the capital city of Bangladesh. As a matter of fact, we were identifying most of the affected (MRSA) indoor patients while low affected outdoor patients (Table 1). The common perception is, the greater portion invaded (MRSA) female (2.48%) patients on the other hand, few portions invaded male (1.86%) patients (Table 3). The antibiotic period was perhaps extremely prospective to eliminate *S. aureus* (MRSA) as a leading cause of human infections. (Table 2) However, *S. aureus* has remarkable efficiency to develop resistance to antibiotics, which have been the impulse for waves of antibiotic resistance over the past 50 years. We were found Methicillin-Resistant *Staphylococcus Aureus* (MRSA) 42 (4.35%) and other organisms *E. coli* 21 (2.17%), *Salmonella* spp. 27 (2.80%), *Klebsiella* spp. 13 (1.34%), *Pseudomonas* spp. 14 (1.45%), *Staphylococcus Aureus* (MSSA) 50 (5.18%), No MRSA, MSSA and other organisms are found (no growth) 797 (82.67%) (Table 3). The public health department may have information on other prevalence within the same community or new information on resistance or treatment patterns. These efforts should begin with an agreement upon definitions for outdoor and indoor patients and continue with the improvement of record-based guidance and the implementation of preventive measures to result in better prevention and control of MRSA in our country.

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