Original Article

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Drug Resistance Patterns of Acinetobacter Baumanii Infection in Intensive Care Unit of a Tertiary Care Hospital of Sindh

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ABSTRACT

Objectives: The present study evaluated the drug resistance patterns of Acinetobacter baumanii infection in Intensive care unit of a tertiary care hospital of Sindh.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at Indus Medical College Hospital, Tando Muhammad Khan, Sindh, Pakistan from June 2015 to November 2016.

Materials and Methods: Of 521 samples, the A. baumaniiwere detected in 95 samples. API 20 E kit (Biomeriuex,USA) was used for the bacterial identification. Antibiotic susceptibility was checked by the Kirby-Bauer disk diffusion method (Oxoid, UK) and E- test (AB BIODISK, Sweden). E-test was used for the intermediate drug sensitivity or resistance was noted. Data was analyzed on GraphPad Prism software.

Results: Of 521 samples inoculated the A.baumanii was isolated from the 95 samples, this yielded a frequency of 18.23%. Drug resistance was noted for the amikacin, minocycline, tazocin, imipenem, meropenem, ceftazidim, cefixime, ceftriaxone and cefepime. A.baumanii showed no resistance for the Colistin.

Conclusion: The present study shows drug resistant A. baumanniiin intensive care units of a tertiary care hospital. A. baumanniishows drug resistance against the aminoglycosides, tetracylcines and cephalosporins.

Key Words: Acinetobacterbaumanii, Drug resistance, Intensive care units Sindh

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INTRODUCTION

Acinetobacter baumannii (A. baumannii) is a notorious microorganism known to cause infections in the intensive care units. It is a common cause of nosocomial and community infections. It is a gram negative obligate aerobic bacterium. A. baumanniiis catalase positive, non-motile, non-fermenting and peroxidase negative cocco-bacilli. Approximately >30 species are recognized.[1,2] Route of transmission includes the burn and skin wounds, mucosal tears, urinary catheters and intravenous catheters.[2,3] Nosocomial infection by A. baumanniiare contracted by fomites, resuscitation devices, infusion pumps, contaminated instruments, etc.[4] Worldwide nosocomial infections by A. baumanniinow account for most of the morbidities and mortalities particularly in the intensive care unit settings.[5,6]A. baumanniimay cause community acquired infections.[1,5] A. baumanniimay cause bacteremia, septicemia, urinary infections, infective endocarditis, and respiratory infections.[7]A. baumannii is specially geared with methods of virulence, such as the adhesions to mucosa, epithelia, skin colonization, iron chelation, and bio-film formation. Gelatinase and protease enzymes are also produced by the A. baumannii. These methods of virulence are essential for the pathogenicity of A. baumannii.[8] Iron is essential for the growth of A. baumannii similar to many of other microorganisms.[5] A. baumannii is responsible for life threatening serious infections usually ventilator associated pneumonia, skin and soft tissue infections, post surgical meningitis, etc.[9,10] Moreover, A. baumanniihas primarily emerged as a nosocomial bacterium. Primary infections occur in the immunocompromised patients in hospital intensive care units (ICUs).[11,12] A. baumannii spread occurs from intensive care units to the medical wards by direct person to person contact of an infected patient, a staff member, a nurse and fomites. Such type bacterial contamination may result in the sequential infection outbreaks, ICU dispersal, endemicity and clonal spread between hospitals and cities.[13,14] The present study was conducted to evaluate the frequency and drug sensitivity and resistance patterns of A. Baumannii infection at our tertiary care hospital of Sindh.

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MATERIALS AND METHODS

The present cross sectional study was conducted at the Indus Medical College Hospital, Tando Muhammad Khan,Sindh, Pakistan from June 2015 to November 2016.The hospital is equipped with modern facilities of Pathology laboratory. State of the Art facility of intensive care unit and blood testing are matchless. Our hospital caters bothindoor and outdoor patients including surgical and medical emergencies. Pathology laboratory has blood sampling facilities and collection of bacterial isolates from ICU patients. The patients proved A. baumanii infection after blood culture was included in the study protocol. Samples accepted for the inoculation included the blood, urine, pus, intravenous catheters, urinary catheters, or any other body fluid. The samples were inoculated on the blood culture media. Of 721 samples, the A. baumanniiwere isolated from 95blood samples. Criteria of Clinical and Laboratory Standards Institute (CLSI) were followed for the sample processing, isolation and identification of microorganism and drug sensitivity. Samples were inoculated on the MacConkey and Bloodagar media (Oxoid Ltd., Cambridge, UK) for the bacterial growth. Bacterial isolates were stained with Gram's staining and identified by standard microbiological methods.API 20 E kit (Biomeriuex,USA) was used for the purpose of bacterial isolate identification.[15] Bacterial drug sensitivity and resistance was run on the Phoenix BD Automated Microbiology system.MIC (minimum inhibitory concentration) of antibiotics was used on the Phoenix system and included;imipenem, meropenem, cefixime, cefepime, ceftazidim, piperacillin/tazobactam and amikacin. Antibiotic susceptibility was checked by the Kirby-Bauer disk diffusion method (Oxoid, UK) and E- test(AB BIODISK, Sweden). E-test was used for the intermediatedrug sensitivity or resistance was noted. All methods were in accordance to the CLSI criteria.[16]Reference bacterial strains were used to ensure the quality control.Written informed consent of patients or attendants was taken. Prior ethical permission was taken from the institute`s research ethics committee. All the data kept in pre structured proforma. Confidentiality of personal data of patients was ensured. Statistical analysis was performed on GraphPad Prism online Software.Continuous and categorical variables were analyzed by the Student`s t - test and Chi-square test. Data was analyzed at 95% Confidence interval ($p \leq 0.05$).

RESULTS

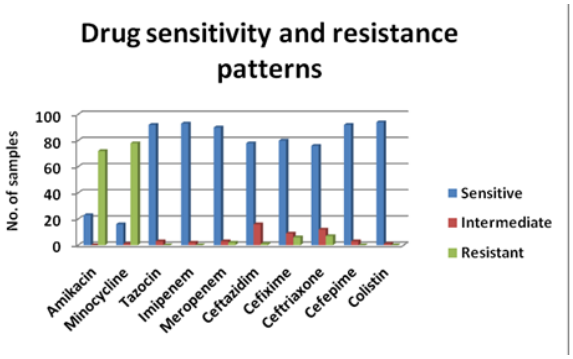
Mean ± SD age of study subjects was 50.5 ± 13.8 years. Of 95 subjects, 53 (55.7%) were male and 42 (44.21%)were female (p=0.012) (table I).Of 521 samples inoculated the A.baumanii was isolated from the 95 samples, this yielded a frequency of 18.23%.MIC concentrations were categorized as sensitive, intermediate sensitive and resistant for E- test and Disk diffusion technique as shown in table II. A.baumaniishowed no resistance for the Colistin. Drug resistance was shown for the amikacin, minocycline, tazocin, imipenem, meropenem, ceftazidim, cefixime, ceftriaxone and cefepime. Bar graph 1 shows the drug sensivity, intermediate sensitivity and resistance patterns.

Table No. I: Demographic characteristics of study subjects (n=95)

	No.	%
ICU	100	100
Male	53	55.7
Female	42	44.21
Blood	95	100
Sputum	33	34.73
Urine	78	82.10
Catheters	67	70.52
Pleural fluids	09	9.47
Secretions	37	38.94

Table No.2: Drug sensitivity patterns of A. baumanii by E-test and disk diffusion technique (n=95)

Antibiotics	Sensitive	Intermediate	Resistant
Amikacin	23(24.2%)	0(0%)	72(75.7%)
Minocycline	16(16.84%)	1(1.05%)	78(82.1%)
Tazocin	92(96.84%)	3(3.15%)	0(0%)
Imipenem	93(97.89%)	2(2.1%)	0(0%)
Meropenem	90(94.73%)	3(3.15%)	2(2.1%)
Ceftazidim	78(82.1%)	16(16.84%)	1(1.05%)
Cefixime	80(84.21%)	9(9.47%)	6(6.31%)
Ceftriaxone	76(80%)	12(12.63%)	7(7.36%)
Cefepime	92(96.84%	3(3.15%)	0(0%)
Colistin	95(100%)	0(0%)	0(0%)



Graph No.1: Drug sensitivity and resistance patterns

DISCUSSION

Acinetobacter baumannii has emerged globally as a target pathogen of critically sick patients in intensive care units.[17] The present study is the first of its design conducted at intensive care unit of Indus Medical College Hospital. We are the first reporting on the frequency and drug susceptibility patterns of A.

baumanii in the ICU patients at our tertiary care hospital. Of 521 samples inoculated the A.baumanii was isolated from the 95 samples, this yielded a frequency of 18.23%.A.baumanii showed no resistance for the Colistin. Drug resistance was noted for the amikacin, minocycline, tazocin, imipenem, meropenem, ceftazidim, cefixime, ceftriaxone and cefepime. The findings are in agreement with previous studies.[17,18]The frequency of18.23%is comparable finding to a previous report of 16% per patient-year.[19]However, the true frequency and prevalence of A. baumanniiis not known in Pakistan. The findings of present study are in consistent with previous reports.[20,21] Previous studies[17,22,23] have reported A baumannii bacteremia in 82.2% and 15.8% in children in intensive care unit.These findings are in keeping with the present study. The meropenem and imipenem resistance was found in 2.1% which is in agreement with previous studies,[24,25] they reported the A. baumanniihave acquired carbapenems resistance. The findings are in support to the present study. Drug resistance was observed against the amikacin and Cephalosporins in present study which is in agreement with previous studies.[24-26]A recent study[26]showed grave observations on the resistance patterns of A.baumannii.This previous study[26]showed severe drug resistance against the imipenem, meropenem, cefepime and gentamicin. In present study A. baumannii showed drug resistance against meropenem but not the imipenem.The drug resistance of A. baumannii against imipenem and meropenem of present study is very low and inconsistent to a previous study[27] which reported high drug resistance A. baumanii against imipenem and meropenem. The same study[27] reported high drug resistance against ceftazidim, cefepime, amikacin, and tazocin. The finding of cephalosporin and amikacin of present study is in agreement with above study. A previous study[28] reported 100% susceptibility of A. baumannii to imipenem; the finding is consistent to present study (table II). They reported approximately 69% drug resistance for the ceftazidim and gentamicin[28] which is low compared to the present study. In the present study, the Abaumanii susceptible to imipenem, amikacin and ceftazidim were noted in was noted as 24%, 82% and 97% respectively. This shows high drug resistance against the aminogly cosides and Cephalosporins. Another previous study[29] noted 38.3% imipenem drug resistance which is very high and inconsistent to present study. A recent study[30] has reported high drug resistant strains of A.baumaniiagainst the aminoglycosides and cephalosporins, the findings of present study are in support with above report. However, they[30] reported A. baumanii strainsexhibited approximately 70% resistance against imipenem and meropenem, this finding is in contrast to present study. However, it is worth to report that the present study has reported on very important health problem of drug resistant A. baumaniiwhich needs to be visited from time to time as new drug resistant strains always emerge suddenly, this increases the mortality rates in the intensive care units. In conclusion, drug resistantA. baumannii infections are noted in intensive care units and emergence of multi drug resistance and extensively drug resistant strains is a major risk for patients.A restrictive use of antimicrobials is recommended with prior culture and sensitivity testing to prevent further drug resistance.

CONCLUSION

The present study showsdrug resistant A. baumanniiin intensive care units of a tertiary care hospital. A. baumannii shows drug resistance against the aminoglycosides, tetracylcines and cephalosporins. A. baumanniineeds further studies for drug susceptibility patterns to estimate the magnitude of problem. Antibiotic use should be strictly controlled and drugs be prescribed only after culture and sensitivity results are available

Conflict of Interest: The study has no conflict of interest to declare by any author.

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