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Prevalence of multi-drug resistant Acinetobacterbaumannii in intensive care units of a tertiary care hospital in western odisha.

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ABSTRACT; Background: In the hospital environment, Acineto bacterbaumannii (A. baumannii) commonly colonizes the respiratory, urinary, and wounds of the patientscauses infections inmechanically ventilated and immune compromised patients. It shows a special predilection for the ICU patients. Hence, the purpose of this study was to find out the prevalence of multi-drug resistant A.baumannii in all clinical samples from intensive care units of a tertiary care hospital in western Odisha.

Methods: All clinical samples were collected aseptically, cultured and identified adhering to standard microbiological protocols. Antibiotic sensitivity test was done by Kirby-Bauer disk diffusion method according to CLSI guidelines.

Results: During the one year study period from Nov 2019 to Oct 2020, a total of 1181 clinical samples from intensive care units were studied, out of which 54 Acinetobacterbaumannii isolates were obtained. Most isolates were from pus samples followed by respiratory tract samples. Out of the 54 isolates, 40 (74%) were multi-drug resistant. Maximum percentage of MDR isolates were among the respiratory tract samples i.e. 90.9% followed by pus samples i.e. 81.8%. High rate of drug resistance to gentamycin (85.1%) followed by ciprofloxacin (81.4%), ceftazidime (79.6%) and piperacillin-tazobactam (77.7%) was seen in the present study. However, it showed highest sensitivity of about 90.75% to Imipenem.

Conclusion: Multi-drug resistant Acinetobacterbaumannii presents a grave challenge for the clinicians as it has a negative impact on clinical outcomes among ICU patients. There is need of strategies to counter its emergence. Hence, judicious use of antibiotics, efficient infection control program and antimicrobial stewardship can certainly help to counter the emergence of this organism in the ICU setting.

Keywords: Acinetobacterbaumannii, multi-drug resistant, intensive care units, Imipenem

I. INTRODUCTION

Members of the genus Acinetobacter have emerged from organisms of questionable pathogenicity to resistant health-care associated pathogens worldwide in the past two or three decades.[1]Acinetobacterbaumannii is an ubiquitous, oxidase-negative and strictly aerobic gram-negative coccobacillary rod that grows at 20 to 30ºC on usual laboratory media.[2,3]It can colonize the respiratory tract, urinary tract and wounds of mechanically ventilated and immunocompromised patients in the ICU setting.[4]Hence, A.baumannii usually contributes to respiratory tract, urinary tract, blood stream and surgical site infections.The major problems encountered are the organism's virulence factors, its ability to acquire various mechanisms of resistance and the emergence of strains that are resistant to all commercially available antimicrobials coupled with the lack of new antimicrobial agents.[5]Until the 1970's, A.baumanniiwas considered to be an uncommon etiological agent of health-care associated infections in the intensive care unit (ICU).[6]In recent years, however,the incidence of Acinetobacter infections have increased dramatically and pose a serious threat to ICU patients around the globe.[7]This organism is responsible for 2–10% of gram-negative bacterial infections in ICUs in Europe and the United States.[8] There are reports of A.baumannii infection rate in Indian ICU's of 12—41%.[9,10]In this study, we decided to determine prevalence of multi-drug resistant A. baumanniiin all the clinical samples obtained from ICU patients in a tertiary care hospital of western odisha.

II. MATERIALS AND METHODS

The present study was carried out in the Department of Microbiologyof a tertiary care hospital in western Odisha. In the study period (Nov 2019- Oct 2020) 1181 samples from patients in various ICUs of the hospital were processed and evaluated during the course of routine diagnostic work. The ICUs included in the study were

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categorized as SNCU, NICU, PICU and other ICU. The samples were processed as per standard microbiological protocols for bacteriological culture and identification. The samples received and processed immediately were blood, pus, urine and respiratory tract samples. All suspected colonies were identified by Gram-staining, colonial morphology, oxidase test and other biochemical reactions.[11,12,13]The bacterial isolates were then subjected to antibiotic susceptibility testing by standard Kirby Bauer Disc Diffusion method according to latest CLSI guidelines.[14] Zone diameter was measured in mm, interpreted as per CLSI guidelines too.[15]The entire testing was done under strict internal quality control using the American type culture collection (ATCC) strains.

III. RESULTS

A total of 1181 clinical samples from ICU patients of our hospital were processed and evaluated. Out of these samples, 428 were obtained from SNCU, 424 from NICU, 64 from PICU and 265 from other ICU. Among the samples 972 were blood samples, 88 pus samples, 68 urine samples and 53 respiratory tract samples. 54 Acinetobacterbaumanniiisolates were obtained from all the clinical samples processed of which, 22 were isolated from pus samples, 11 each from respiratory tract and urine samples and 10 from blood samples. Out of the 54 Acinetobacter isolates 40 (74%) were multidrug resistant. Among the samples, 90.9% MDR isolates were obtained from respiratory tract samples followed by 81.8% from pus samples, 80% from blood samples and 36.4% from urine samples.The antibiotic sensitivity profile of the A.baumannii isolates showed 85.1% resistance to gentamycin, 81.4% to ciprofloxacin, 79.6% to ceftazidime, 77.7% to piperacillin-tazobactam and 75.9% to ceftriaxone. However, the organism was least resistant to Imipenem i.e. 9.25%.

Tables and charts

TYPE OF ICU	NO. OF SAMPLES
SNCU	428
NICU	424
PICU	64
OTHER ICU	265

FIG. 1: No. of samples from different ICU

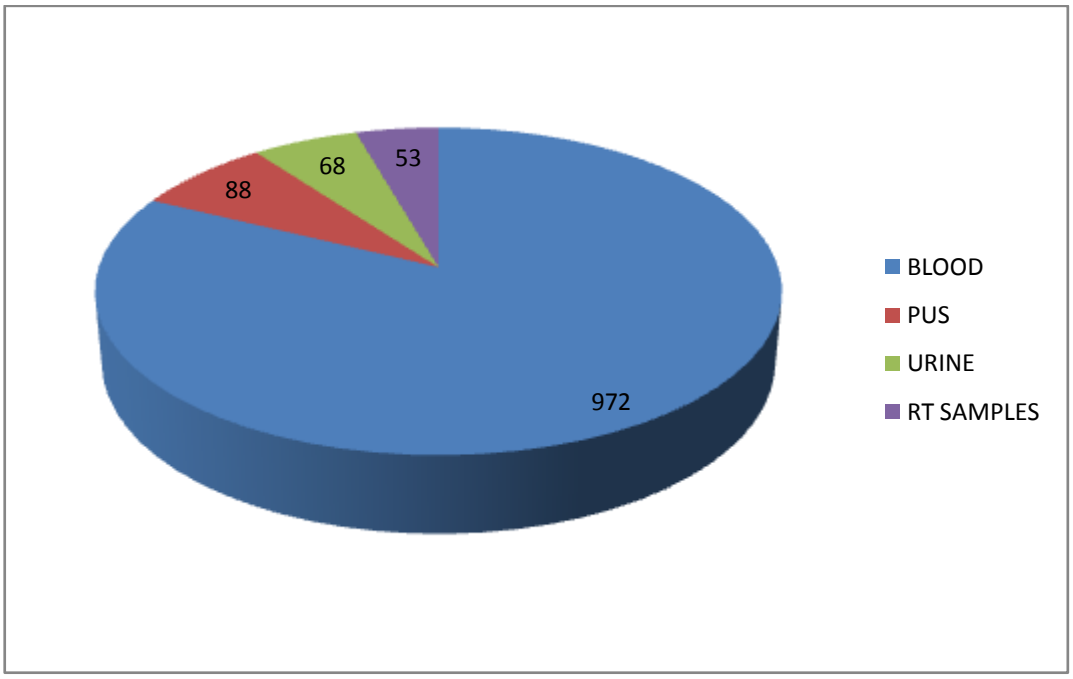

FIG. 2: No. of different types of samples received and processed

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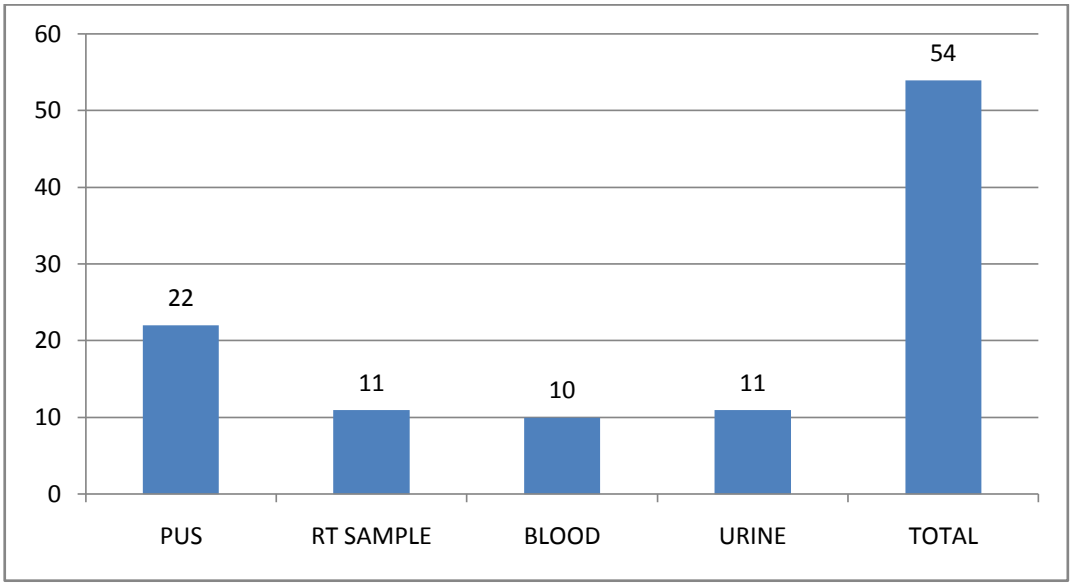

FIG. 3: No. of Acinetobacterbaumannii isolated from different clinical samples

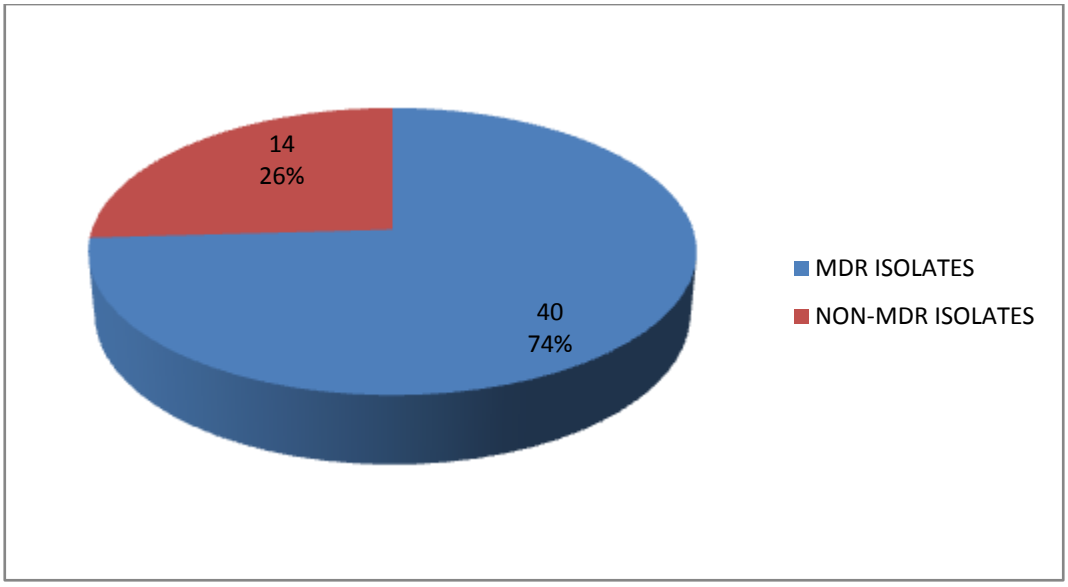

FIG. 4: No. and percentage of MDR A. baumannii isolated

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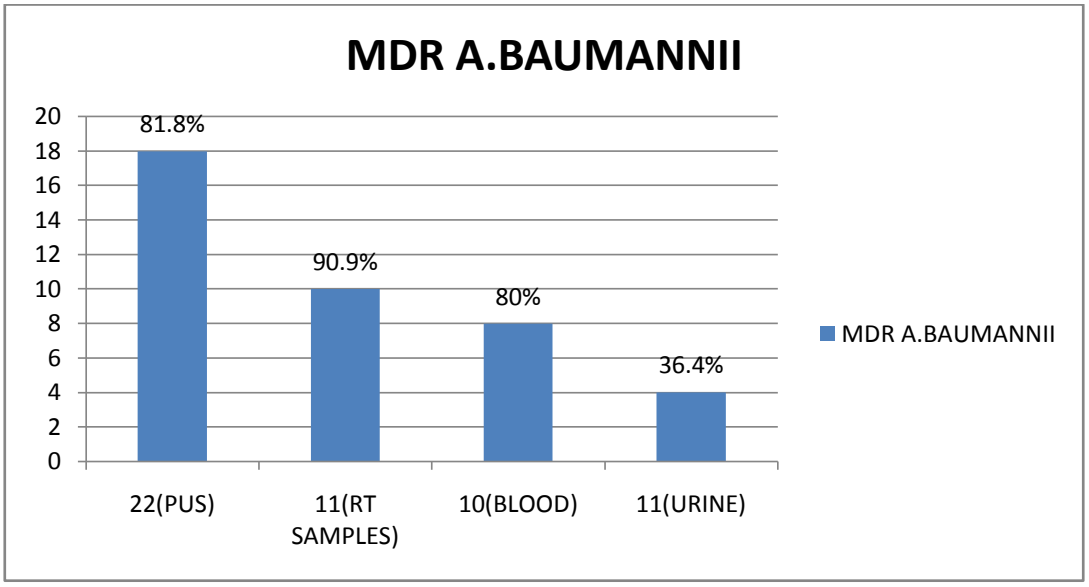

FIG. 5: Percentage of MDR A. baumannii isolated from different clinical samples

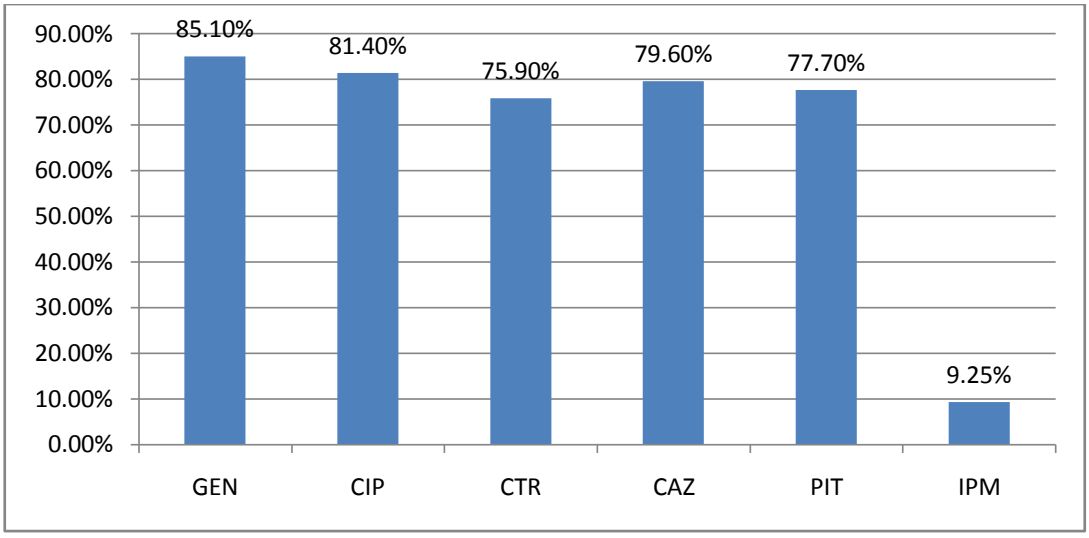

FIG. 6: Percentage of resistance of A. baumannii to different antibiotics

IV. DISCUSSION

The isolation rate of Acinetobacterbaumannii from ICUs of our set up was found to be 4.6% which is lower to 10% as reported by A.S. Mathai et al.[16] In our study maximum number of A.baumanni were isolated from pus samples (25%) and respiratory tract samples (20.75%) respectively as compared to a study conducted by Kanafani et al which showed maximum isolates from respiratory tract samples (53.1%) and pus samples (18.8%) respectively.[17]This result corroborates thefact that a lot of risk factors associated with Acinetobacterinfection in the ICU is because the heath care environment is a reservoir for this organism and isresponsible for cross- transmission and considerable morbidity and mortality. Other than the patients with comorbidities who are colonized, factors like patients with multiple wounds and devices implanted in them, inadvertent use of broad spectrum antibiotics and frequent contamination by the hands of health care workers while caring for the patients play a role for spreading the Acinetobacter infection in the ICU.[18,19,20]Our study revealed a multidrug resistance rate of 74% whichis very similar to a study done by A.S. mathai et al which showed 70% MDR rate.High drug resistance to gentamicin,

ciprofloxacin, piperacillin-tazobactam and ceftazidime seen in the current study is almost similar to a study done by Shrivastavaet al.[21]The susceptibility rate of A.baumannii to Imipenem in the present study was found to be 90% which is very similar to a study done by Rahbar et al which showed 95.5% susceptibility rate.[22]

V. CONCLUSION

We conclude that there is a significant prevalence of MDR Acinetobacterbaumannii in the ICU. MDR A.baumanniiinfection presents a serious challenge for the clinicians in the treatment of ICU patients. Injudicious use of antibiotics, longer duration of ICU stay and mechanical ventilation are the major risk factors for emergence of drug resistance in A.baumannii. Hence, judicious use of antibiotics, efficient infection control program and antimicrobial stewardship may surely help curb its emergence.

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