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Evaluation of Acute Physiology and Chronic Health Evaluation Score II in *Acinetobacter baumannii* Infection/Colonization and its Antimicrobial Resistance Profile in Kanpur, India

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A B S T R A C T

Acute Physiology and Chronic Health Evaluation Score II (APACHEII) is one of the well-known scoring systems that is used to rule out severity of illness and *Acinetobacter baumannii* causes severe morbidity especially in ICU. The aim of this study is to evaluate APACHE II score in *A. baumannii* infected or colonized patients and find out the antimicrobial resistant pattern of isolates. In this case control study, clinical details were recorded among patients admitted to ICU. All the clinical samples like tips (endotraceal aspirates, tips, central line tips, and catheters tips), aspirates, blood, urine, fluid and pus were collected. *A. baumannii* and other isolates (infection or colonizer) were identified by different biochemical tests. All the clinical details were recorded to calculate APACHE II score. Antimicrobial resistance pattern was performed by disk diffusion method and resistant pattern were analysed according to CLSI guideline 2016. Total of 34 *A. baumannii* was isolated from critically ill patients. Clinically and microbiologically analyzed that 20 *A. baumannii* caused infections and rest 14 was isolated as a colonizer. Mean APACHE II Score was 23.94±3.78. While Mean APACHE II score of control cases were 20.01±4.11. *A. baumannii* causing infections were highly resistant. They showed 100% sensitivity against polymyxins only and 79.4% resistant for imipenem. But colonizers showed better sensitive for amikacin also. APACHE II Score can be a useful tool to predict *A. baumannii* infections. All the isolated Acinetobacter were highly resistant isolates which restrict the treatment options so it is very essential to treat patients by following all the infection control practices and provide more attention to patients with high APACHE II Score.

Introduction

Acinetobacter baumannii is highly resistant pathogen and widely distributed in different hospitals as nosocomial pathogen (Ian *et al*., 2016). This is mostly isolated from intensive care units. In the last decades, the emergence and rapid spread of Multidrug-resistant *A. baumannii* have caused a serious clinical problem worldwide (Peleg *et al*., 2008). In a developing country concerns about the high costs in the ICU are increasing. Thus illness severity scoring systems have been devised depending on therapeutic, anatomical and physiological basis. Acute Physiology and Chronic Health Evaluation Score II (APACHE II) is one of the well-known scoring systems that are used to rule out severity of illness. This scoring system has been shown to provide objective discrimination between low-risk and high-risk groups of patients (Knaus *et al*., 1985).

Severity scoring systems in the intensive care unit have been developed in response to an increased emphasison the evaluation and monitoring of health care services. There are three major purposes of severity-of-illness scoring systems: Scoring systems are used to assess the prognosis of individual patients, to quantify severity of illness and assess ICU performance and compare the quality of care (Gunning *et al*., 1993).

Currently the APACHE II scoring system is widely used. The APACHE II is measured during the first 24 h of ICU admission; the maximum score is 71. The APACHE II severity score has shown a good calibration and discriminatory value across a range of disease processes, and remains the most commonly used international severity scoring system worldwide (Knaus *et al*., 1985; Gunning *et al*., 1999). The APACHE II index consists of a score that takes account of the patient's age, chronic health condition and physiological variables (internal temperature, heart rate, respiratory rate, oxygenation, arterial pH, sodium, potassium, creatinine, hematocrit, white blood cells and Glasgow coma score).

The aim of the study is to evaluate APACHE II score in *Acinetobacter baumannii* infected or colonized patients and antimicrobial resistant pattern of isolates.

Materials and Methods

This case control study 200 cases were observed as a test group and another 200 cases for control group (non Acinetobacter infection) from six different hospitals of Kanpur.

Sample collection

First ten cases from ICU of each hospital were considered as test cases and observed for only *A. baumannii* infections while next ten cases were considered as control group and observed for other than Acinetobacter infection.

All clinical details including temperature, arterial pressure, arterial pH, Na+, K+ values, any underlying diseases and any type of surgeries were recorded within 24 hours of admission in ICU to calculate APACHE Score II (Gunning *et al*., 1999).

All the clinical samples like endotracheal tips or aspirates, central line tips, blood sample, catheter tips, urine, pus and any fluid samples were collected from test cases and control cases for detection of Acinetobacter and other than Acinetobacter isolates respectively. *Acinetobacter baumannii* was phenotypically and genotypically identified (Sastry *et al*., 2016; Bailey and Scott; Howard *et al*., 2012). Antimicrobial resistant pattern of Acinetobacter baumannii was performed by disk diffusion method and resistant pattern were analyzed according to CLSI guideline 2016 (CLSI, 2013).

Results and Discussion

In this study 200 each test and control cases were observed. Total 34 Acinetobacter were isolated as infection/colonizer from test cases. The mean APACHE II score of Acinetobacter infected/colonized patients (23.94±3.78) was more as compared to other than Acinetobacter infected patients (20.01±4.11) (Table 1). There were 27 patients with *A. baumannii* colonization/infection had APACHE II score > 21 and found to be a statistically significant risk factor for Acinetobacter infection/colonizer (Table 2). Mortality rate was 41.17% (Fig. 1). Among all isolated *A. baumannii* 27 strains were extreme drug resistant *A. baumannii* (XDR AB). High APACHE II score (>21) were found to have significant (P=0.0494) and associated with

mortality (Table 3). Isolated Acinetobacter causing infection or colonization were highly resistant to number of antimicrobial drugs (Fig. 2). Although APACHE II was one of the first systems described, it is still the most widely used. Its calculation is simple, well defined, reproducible, and collected on a routine basis during intensive care service provision. Several studies concerning APACHE II score and increased risk of *A. baumannii* colonization/infection and mortality rate were well documented (Sunenshine *et al*., 2007; Anunnatsiri *et al*., 2011; Ntusi *et al*., 2012). Higher mean of APACHE II score in patients with *A. baumannii* colonization/infection were also documented previously and in accordance with the result of this present study (Emine *et al*., 2009).

Table.1 APACHE II score of patients

S.N.	**APACHE II Score**	Test group (Acinetobacter infection/colonization) *n=34*	Control group (other than Acinetobacter) *n=75*
	Mean ± SD	**23. 94±3.78**	**20. 01 ± 4.11**
1.	>15	-	8 (10.6%)
2.	16-20	9 (2.6%)	40(53.3%)
3.	21-25	18 (52.9%)	22(29.3%)
4.	>26	7 (20.5%)	5(6.6%)

Table.2 Patients having APACHE Score >21

APACHE II score (> 21)			
No. of isolates	ODD RATIO	95% Cl	p-VALUE
25(73.5%)	4.9383	2.0158 to 12.0977	0.0005

Table.3 APACHE Score II (>21) relationship with mortality

	Test group with >21 APACHE II score (Acinetobacter infection/colonization)	**Control group with >21 APACHE II score (other than Acinetobacter)**	**ODD RATIO**	**95% Cl**	***p*-Value**
Death	14	26	2.6600	1.0028-7.0561	0.0494

Fig.1 Mortality Rate among *A. baumannii* isolated patients

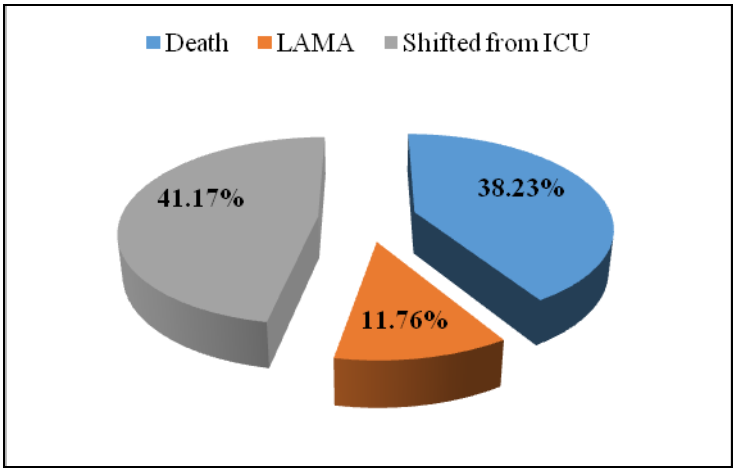
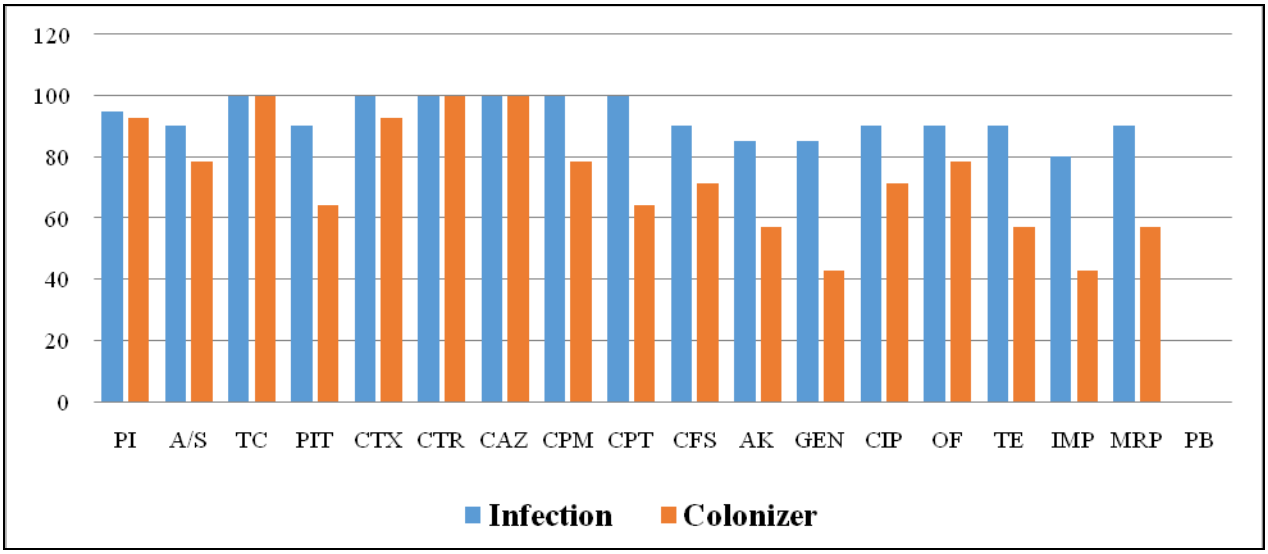


Fig.2 Antibiotic resistance pattern of *A. baumannii* causing Infection and colonization



Out of 34 *A. baumannii* strains, 27 were XDR in this study. In the present study, there were 27 cases with >21 APACHE II score, among these from 9 cases were XDR AB. The result of odd ratio may depict risk of *A. baumannii* colonization/infection.

Inappropriate treatment directly affects the mortality of the patients (Michalopoulos *et al*., 2010). In this study, rate of mortality was found as 41.17%. In the other studies, mortality rate of the patients due to *A. baumannii* infections was reported between 22-44% (Cisneros *et al*., 1996; Asmita *et al*., 2012).

In the present study it was observed that all the 14 death cases of *A. baumannii* infection/colonizer were with high (>21) APACHE II score. Its association with mortality was checked with univariate analysis and >21 APACHE score (p=0.0494) were found to have significant association with mortality. Lee *et al.,* has recorded that mortality due to *A. baumannii* can be decreased with a proper antimicrobial treatment (Lee *et al*., 2012). Isolated Acinetobacter causing infection showed maximum susceptibility to polymyxins only (Vithal *et al*., 2015). Among isolated strains were 80% resistant to imipenem and 90%, 100%, 85%, and 90% were resistant to piperacillin-tazobactam, 3rd generation cephalosporins, amikacin and ciprofloxacin respectively which was contrast to other studies (Ntusi *et al*., 2012; Emine *et al*., 2009). While colonizer *Acinetobacter* show better sensitivity to piperacilline with tazobactum and amikacin (Ismail *et al*., 2013).

The issue of increased resistance to antibiotics poses difficulty in treatment of *A. baumannii* infections which in turn increases the rate of mortality and cost. In order to prevent development of resistance, antibiotics must be used in an appropriate way in accompanied with proper guidance. If ICU admissions could be prioritized based on scoring systems, the use of limited financial, medical and human resources can be optimized and will allow the best usage in the ICU. Such studies are very few in the developing countries.

In conclusion, APACHE II Score can be a useful tool to predict *A. baumannii* infections. All the isolated Acinetobacter were highly resistant isolates which restrict the treatment

option so it is very essential to treat patients by following all the preventive measures through proper infection prevention & control practices and provide more attention to patients with high APACHE II Score.

References

Anunnatsiri, S., and P. Tonsawa. 2011. Risk factors and clinical outcomes of multidrug-resistant *Acinetobacter baumannii* bacteremia at a university hospital in Thailand. *Southeast Asian J. Trop. Med. Public Health*, 42(3): 693-703.

Asmita, A., Mehta, V., Anil Kumar, Kumari Indira, K., Suresh, G., Nair, Kavitha, R. Dinesh, Sanjeev K. Singh. Risk factors for mortality in Acinetobacter calcoaceticus–baumannii bacteraemia. *Asian Pacific J. Trop. Biomed.,* S1852-S1857.

Bailey and Scott. Diagnostics of Medical Microbiology. Elsevier publication, 13thEdn.

Cisneros, J.M., Reyes, M.J,. Pachon, J., Becerril, B., Caballero, F.J., García-Garmendía, J.L. *et al.* 1996. Bacteriemia Due to *Acinetobacter baumannii*: Epidemiology, Clinical Findings, and Prognostic Features. *Clin. Infect. Dis*., 22: 1026–1032.

CLSI. 2016. Performance standard for Antimicrobial susceptibility testing; twenty third informational supplements. M100-S26, Vol 33 No.1.

Emine, A.L.P., M. Yerer, S. Kocagö, G. Metan, and D. Esel *et al.* 2009. The risk factors and spread of multidrug-resistant *Acinetobacter baumannii* in intubated patients in a medical intensive care unit. *Turk. J. Med. Sci.*, 39(5): 761-769.

Emine, A.L.P., M. Yerer, S. Kocagö, G. Metan, and D. Esel, *et al.* 2009. The risk factors and spread of multidrug-resistant *Acinetobacter baumannii* in intubated patients in a medical intensive care unit. *Turk. J. Med. Sci.*, 39(5): 761-769.

Gunning, K., Rowan, K. 1999. ABC of intensive care Outcome data and scoring systems. *BMJ*, 319: 241-244.

Howard, A., *et al.* 2012. Acinetobacter baumannii: An emerging opportunistic pathogen. *Virulence*, 3(3): 243–250.

Ian Huang, *et al.* 2016. The Role of APACHE-II Score in predicting *Acinetobacter baumannii* Colonization/Infection and Its Antimicrobial Resistance Pattern in Indonesian Teaching Hospital. *American J. Infect. Dis. Microbiol.*, 4(3): 56-60.

Ismail Necati Hakyemez, Abdulkadir Kucukbayrak,Tekin Tas, Aslihan Burcu Yikilgan, Akcan Akkaya, Aliye Yasayacak and Hayrettin Akdeniz. 2013. Nosocomial *Acinetobacter baumannii* Infections and Changing Antibiotic Resistance. *Pak. J. Med. Sci.*, 29(5): 1245–1248.

Jung, J.Y., M.S. Park, S.E. Kim, B.H. Park, J. Y. Son, and E.Y. Kim *et al.* 2012. Risk factors for multi-drug resistant *Acinetobacter baumannii* bacteremia in patients with colonization in the intensive care unit. *BMC Infect. Dis*., 10: 228.

Knaus, W.A., Draper, E.A., Wagner, D.P., Zimmerman, J.E. 1985. APACHE II: a severity of disease classification system. *Crit. Care Med*., 13(10): 818-29.

Lee, Y.T., Kuo, S.C., Yang, S.P., Lin, Y.T., Tseng, F.C., Chen, T.L., *et al.* 2012. Impact of appropriate antimicrobial therapy on mortality associated with Acinetobacter baumannii bacteremia: relation to severity of infection. *Clin. Infect. Dis.*, 55(2): 209–215.

Michalopoulos, A., Falagas, M.E. 2010. Treatment of *Acinetobacter* infections.

Expert Opin. Pharmacother., 11(5): 779–788.

Ntusi, Badri, M., Khalfey, H., Whitelaw, A., and Oliver, S., *et al.* 2012. ICU-associated *Acinetobacter baumannii* colonization/Infection in a high HIV prevalence resource-poor setting. *PLoS ONE*, 7(12): e52452.

Ntusi, N.B.A., M. Badri, H. Khalfey, A. Whitelaw, and S. Oliver, *et al.* 2012. ICU-associated *Acinetobacter baumannii* colonization/Infection in a high HIV prevalence resource-poor setting. *PLoS ONE*, 7(12): e52452.

Peleg, A.Y., Seifert, H., *et al.* 2008. *Acinetobacter baumannii*: emergence of a successful pathogen. *Clin. Microbiol. Rev*., 21(3): 538-82.

Sastry, A.S., *et al.* 2016. Essentials of Medical microbiology. First Edition. Jaypee brothers medical Publishers.

Sunenshine, R.H., *et al.* 2007. Multidrug-resistant Acinetobacter infection mortality rate and length of hospitalization. *Emerg. Infect. Dis.*, 13(1): 97-103.

Vithal Narayan Dhadke, Shubhangi Dhadke and Vrushali Bhoite. 2015. To Study Ventilator Associated Pneumonia Incidence, Risk Factors and Outcome in Patients on Mechanical Ventilation in Medical Intensive Care Unit. *Int. J. Curr. Res. Aca. Rev.*, 3(10): 35-53.

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