IJABBR- 2014- eISSN: 2322-4827

International Journal of Advanced Biological and Biomedical Research

Journal homepage: www.ijabbr.com

Original Article

Comparative Frequency Evaluation of Bacterial Organisms Isolated from Clinical Samples of ICU Admitted Patients and Related Factors in Ardabil-Iran

Mojtaba Didar shetaban[1*], Jafar Mohammadshahi[2], Shahram Habibzadeh[3], Maryam Pourhallaji[4], Mohammad Bagher Didar shetaban[5]

[1] Medical student at Ardabil University of Medical Sciences and health care services, Ardabil, Iran Associate Professor
[2] Assistant Professor at Ardabil University of Medical Sciences and health care services, Ardabil, Iran
[3] Associate Professor at Ardabil University of Medical Sciences and health care services, Ardabil, Iran
[4]Master student in Health Education, Department of Public Health, Faculty of Health, Guilan University of Medical Sciences, Guilan, Iran
[5]General physician at Guilan University of Medical Sciences, Guilan, Iran

ARTICLE INFO

Article history:
Received: 06 July, 2014
Revised: 29 July, 2014
Accepted:20, August, 2014
ePublished: 30 September, 2014

Key words:
ICUS
Bacterial cultures
Mortality

ABSTRACT

Objective: Microbiological infection plays vital role in determining the outcome as well as cost and duration of the hospital stay for patients admitted in ICU setup. Therefore regular surveillance of important pathogens and its related factors are mandatory. The objective of this study was to find out the organisms causes infection in patients admitted in different Trauma-surgery, medical and neurology ICUs and related factors. **Methods:** Our study was a prospective descriptive-analytic study. During the period from January 2013 to January 2014, total of 520 samples (blood, respiratory tract, urine etc.) from patients admitted in Trauma-surgical, medical and Neuro-ICUs of Ardabil city-Iran were collected and processed for culture, identification and antibiotic susceptibility. The medical and microbiological information were recorded from all patients whose samples were positive. **Results:** Out of 520 positive cultures the most frequent organisms isolated were Pseudomonas spp 24.6% (n=128), followed by Klebsiella spp 18.63% (n=97), Acinetobacter spp 15% (n=78) and S.aureus 17.1%. The mortality rate of patients with positive cultures was 13.67% (n=71) with a mean length of stay of 13.7±12.04 days compared to 7.5±8.5 days in survived. Mortality rate was 15.79% in neurology, 15.54% in surgical-trauma and 11.05% in medical patients. A significant relation between surgeries, CVS and mechanical ventilation with mortality (P<0.001) was found. No significant relation between each type of ICUs and microbiology was detected. **Conclusions:** This report reveals the Microbiology profile in patients in ICUs. Regular microbiological surveillance help in implementing better therapeutic strategies to reduce the high morbidity and mortality associated among the patients in critical care setting.

1. INTRODUCTION

Various microorganisms have survived for thousands of years by their ability to adapt to antimicrobial agents. They do so via spontaneous mutation or by DNA transfer. This process enables some bacteria to oppose the assault of certain antibiotics, rendering the antibiotics ineffective. [1] Intensive Care units (ICUs), despite their apparent impact on patient outcome, have become high-

***Corresponding Author:** Mojtaba Didar shetaban, Medical student at Ardabil University of Medical Sciences and health care services, Ardabil, Iran (mbdsh86703@Gmail.com)

risk areas for nosocomial infections. The patient in the ICU has a 5 to 7 fold higher risk of a nosocomial infection compared with the average patient and 20–25% of all nosocomial infections develop in ICUs. [2] Critically ill patients admitted in intensive care units (ICUs) are always at a higher risk of developing infections with various antibiotic resistant organisms. Infection caused by multidrug-resistant bacteria constitutes a serious problem for intensive care patients throughout the world. The mortality rate associated with multidrug-resistant bacteria in these patients is high in some intensive care units (ICUs). Surveys of the prevalence and susceptibility patterns of bacterial isolates are important in determining optimum empirical therapy for infections in critically ill patients. The purpose of study was, to find out the organisms causing infection in patients admitted in ICUs and to know the resistance pattern of isolates.

The objective of this study was to investigate the microbiological profile in association with clinical factors among patients consecutively admitted to different the Surgical-Trauma, Medical and Neuro -ICUs

2. MATERIALS AND METHODS

Our study was a prospective descriptive-analytic study in educational ICUs of Ardabil city-Iran.A total of 520 positive samples of patients admitted in Trauma-surgical, medical and Neuro-ICUs during the period of January 2013 to January 2014 were recorded. Processing of the sample for culture and isolate identification was done by standard methods. All isolated organism's antibiotic susceptibility testing done with method according to Clinical and Laboratory Standards Institute (CLSI) recommendations. Clinical data of all the 520 cases collected.

3. RESULTS

A total of 520 positive samples collected. Table1 shows Details of various clinical samples received from different ICUs in our study. In this the most frequent organisms isolated were Pseudomonas spp 24.6% (n=128), followed by Klebsiella spp 18.63% (n=97), Acinetobacter spp 15%9 (n=78) and S.aureus 17.1%.(Table2). The expired patients had longer ICU stays (13.7±12.04) and for the survived, the mean ICU stay was 7.5±8.5 days ($p<0.001$). Urinary tract samples with a prevalence of 40% were the most common site of infection. Other common sites were sputum (21.34%), blood (13.26%) and wound (10.26%).The factors linked to higher mortality rates in the multivariate analysis of the infected patients were mechanical ventilation ($p<0.001$), surgeries ($p<0.001$) and CVS ($p<0.001$) (Table3).

Table 1. Details of various positive clinical samples received from different ICUs

Type of sample	Total Sample	Percent
Urine	210	40
Res. samples	111	21.34
Blood	69	13.26
Wound	53	10.20
Chest tube	51	9.80
Peritoneal fluid	18	3.46
CSF	8	1.53
Type of ICU		
Trauma-Surgery	283	54.42
Medical	218	41.92
Neurology	19	3.65

Table 2.

Bacteriologic pattern of various ICUs

Organism	Neurology	Medical	Trauma-Surgery	Total %
S.aureus	12	35	42	89 (17.11%)
Staph.CON	6	15	17	38 (7.30%)
Strep.pneumonia	1	9	3	13 (2.5%)
Entrococcus	1	7	7	15 (2.88%)
E.coli	5	23	71	53 (10.2%)
Entrobacter spp	5	27	13	48 (9.23%)
Klebsiella spp	8	41	48	97 (18.63%)
Acintobacter spp	8	28	42	78 (15%)
Peudomonas aeroginosa	11	70	57	12 (24.6%)
Candidia spp	10	31	27	68 (15%)

4. DISCUSSION

The present study found a mortality rate of 13.65% associated with positive cultures. These numbers are lower than those reported in the literature, which are approximately 30% for mortality [3-7].This can be due to the accuracy of cultures or lesser cases in our study. International data have shown that infection incidence varies according to the origin of the patient (emergency room, operating room, or infirmary) and the type of ICU. Medical ICU patients have higher incidences of infection (41%), while those destined for elective surgeries have the lowest incidence (12.1%).[8] These data are not consistent with the findings of the present study probably because of availability of invasive procedures and emergent surgeries IN Trauma-surgical ICU.

The risk of hospital mortality in those who had elective or urgent operations was higher than that in those who had no operation. Moreover, some other factors (e.g., underlying disease, preoperative antibiotics use, and length of ICU stay) [9] might contribute to the high risk of hospital mortality in those who had operations. Each device use was significantly associated with hospital mortality. The risks of hospital mortality in users of ventilators and central venous catheters were 1.8 and 1.2 times higher than that in non-users (table3). Because we could not take into account duration of device use, the impact of device use on hospital mortality might be underestimated or overestimated. Moreover, the longer a device is used, the more likely it is to cause infections.[10]The primary site of infection was the urinary tract (40% of the cases), which is consistent with previously published results [6,7,11-13]and In contrast to previous publications[4,6,7,11,.12,14].that the respiratory infections was the second most common site. The literature identifies pulmonary infections, peritonitis, primary bacteremia, and microbiological isolation of gram-positive cocci and gram-negative bacilli as risk factors for increased symptom severity and progression to sepsis.[6,8]

The microbial present in sputum and urine are the same organisms that may produce a florid VAP or UTI at a later date, so the results from trapped sputum and urine cultures will accurately reflect nosocomial infections in the ICU. The incidence of positive cultures will, however, be higher than those reported for nosocomial infections.Gram-negative bacilli remain the most commonly isolated organisms in our study. *Pseudomonas aeruginosa* remains the most frequently isolated (24.6%) gram-negative bacillus. [13] Our research findings also showed that the most derived infection in surgery-trauma, medical and Neuro ICUS are Pseudomonas spp, Klebsiella spp and afterwards S.aureus. A large number of sputum and urine cultures grew yeast, which may be due in part to the immunocompromised state of many of the patients (as a result of, for example, poor nutritional state, diabetes mellitus and steroid use) and the use of broad-spectrum antibiotics. This may, however, also indicate an overuse of antibiotics and the need for stricter control measures, especially as positive yeast cultures were commoner during the earlier stages of admission.[15,16]The quandary is whether these infections should be treated with antifungal agents. If yeast is isolated from a blood culture, treatment should be started and the CVP line removed. Yeast cultured from urine in the asymptomatic patient may be due to catheter colonization. The catheter should be changed and the culture repeated. If the second culture is also positive, or the patient is unstable, neutropenic or a transplant recipient, a blood culture should be done and treatment commenced. Yeast grown from sputum is also usually due to colonization, and treatment is only commenced in severely ill, neutropenic or immunocompromised patients.[17]

Table 3.

Relationship between operation or device use and hospital mortality*

	Alive	**Dead**	**% of dead**	
[Operation]				
without	**157**	**40**	**20.30**	
with	**292**	**31**	**9.59**	**p<0.001**
[Central Venous Catheter]				
Non-user	**153**	**11**	**5.58**	
user	**296**	**60**	**16.85**	**p<0.001**
[Mechanical Ventilation]				
Non-use	**108**	**11**	**9.24**	
user	**341**	**60**	**14.96**	**p<0.001**

*Distributions were compared by chi-square tests.

CONCLUSION

In conclusion, the use of a ventilator or a central venous catheter, and ICU-acquired drug-resistant infection are associated with a high risk of hospital mortality in ICU patients. The potential impact on hospital mortality emphasizes especially those caused by drug-resistant pathogens. Because drug resistance is largely due to inadequate administration of antibiotics, clinicians should consider drug resistance as part of their routine treatment plans. Quality control of antibiotics use by

providing locally adapted guidelines for prudent antibiotics use is recommended. As a matter of course, basic infection control practices are indispensable to combat the spread of drug-resistant infections. Surveillance systems contribute to detecting drug-resistant infections, feedback on infection control performance, and promoting research to prevent drug-resistant infections. Paying careful attention to this problem at the local ICU level, using a multidisciplinary approach, will have the greatest likelihood of limiting the development and spread of drug-resistant infections that Emphasizes the importance of preventive measures against ICU-acquired infections.

RFERENCES

Bennett PM. Plasmid encoded antibiotic resistance: acquisition and transfer of antibiotic resistance genes in bacteria. British Journal of Pharmacology. 2008; 153 (Suppl. 1): S347–S357.

Iliz Günseren, Latife Mamıkoğlu, Süheyla Öztürk, Mine Yücesoy, Kadir Biberoğlu, Nuran Yuluğ, et al. A surveillance study of antimicrobial resistance of Gram-negative bacteria isolated from intensive care units in eight hospitals in Turkey. *J. Antimicrob. Chemother.* 1999; 43(3d): 373-378.

Molina FJ, Díaz CA, Barrera L, De La Rosa G, Dennis R, Dueñas C, et al. [Microbiological profile of infections in the Intensive Care Units of Colombia (EPISEPSIS Colombia)]. Med Intensiva. 2011;35(2):75-83. Spanish.

Vincent JL, Sakr Y, Sprung CL, Ranieri VM, Reinhart K, Gerlach H, Moreno R, Carlet J, Le Gall JR, Payen D; Sepsis Occurrence in Acutely Ill Patients Investigators. Sepsis in European intensive care units: results of the SOAP study. Crit Care Med. 2006;34(2):344-53. Comment in Lee WL, Ferguson ND.SOAP and sepsis--analyzing what comes out in the wash. Crit Care Med. 2006;34(2):552-4.

Luzzaro F, Ortisi G, Larosa M, Drago M, Brigante G, Gesu G. Prevalence and epidemiology of microbial pathogens causing bloodstream infections: results of the OASIS multicenter study. Diagn Microbiol Infect Dis. 2011;69(4):363-9.

Levy MM, Dellinger RP, Townsend SR, Linde-Zwirble WT, Marshall JC, Bion J, et al. The Surviving Sepsis Campain: results of an international guideline-based performance improvement program targeting severe sepsis. Intensive Care Med. 2010;36(2):222-31. Review.

Zahar JR, Timsit JF, Garrouste-Orgeas M, Français A, Vesim A, Descorps-Declere A, et al. Outcomes in severe sepsis and patients with septic shock: pathogen species and infection sites are not associated with mortality. Crit Care Med. 2011;39(8):1886-95

Alberti C, Brun-Buisson C, Burchardi H, Martin C, Goodman S, Artigas A, et al. Epidemiology of sepsis and infection in ICU patients from an international multicentre cohort study. Intensive Care Med. 2002;28(2):108-21. Erratum in Intensive Care Med. 2002;28(4):525-6.

Craven DE, Kunches LM, Lichtenberg DA, Kollisch NR, Barry MA, Heeren TC, McCabe WR. Nosocomial infection and fatality in medical and surgical intensive care unit patients. Arch Intern Med 1988; 148: 1161–1168.

Kollef MH, Fraser VJ. Antibiotic resistance in the intensive care unit. Ann Intern Med 2001; 134: 298–314.

Millikan J, Tait GA, Ford- Jones EC. Nosocomial Infections in a Pediatric Intensive Care Unit. 16th ed. Crit Care Med;1988. P.233-237.

Silva E, Pedro Mde A, Sogayar AC, Mohovic T, Silva CL, Janiszewski M, Cal RG, de Souza EF, Abe TP, de Andrade J, de Matos JD, Rezende E, Assunção M, Avezum A, Rocha PC, de Matos GF, Bento AM, Corrêa AD, Vieira PC, Knobel E; Brazilian Sepsis Epidemiological Study. Brazilian Sepsis Epidemiological Study (BASES study). Crit Care. 2004;8(4):R251-60. Comment in Linde-Zwirble WT, Angus DC. Severe sepsis epidemiology: sampling, selection, and society. Crit Care. 2004;8(4):222-6.

Alberti C, Brun-Buisson C, Chevret S, Antonelli M,Goodman SV, Martin C, Moreno R, Ochagavia AR, Palazzo M, Werdan K, Le Gall JR; European Sepsis Study Group. Systemic inflammatory response and progression to severe sepsis in critically ill infected patient. Am J Respir Crit Care Med. 2005;171(5):461-8.

Eliézer Silva, Luiz Dalfior Junior, Haggéas da Silveira Fernandes,et al. Prevalence and outcomes of infections in Brazilian ICUs: a subanalysis of EPIC II study. Rev. bras. ter. intensiva vol.24 no.2 São Paulo Apr./June 2012

Richards MJ, Edwards JR, Culver DH, Gaynes RP. Nosocomial infections in medical intensive care units in the United States. National Nosocomial Infections Surveillance System. Crit Care Med 1999; 27: 887–92.

Ponce de Leon-Rosales SP, Molinar-Ramos F, Dominguez-Cherit G, Rangel-Frausto M, Vazquez-Ramos VG. Prevalence of infections in intensive care units in Mexico: A multicentre study. Crit Care Med 2000; 28: 1316–21.

Avecillas J, Mazzone P, Arroliga A. A rational approach to the evaluation and treatment of the infected patient in the intensive care unit. Clin Chest Med 2003; 24: 645–69.