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Acinetobacter baumannii in ICU patients: A prospective study highlighting their incidence, antibiotic sensitivity pattern and impact on ICU stay and mortality

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ABSTRACT

Background: Acinetobacter baumannii (*A. baumannii*) was considered as a leading cause of nosocomial respiratory infection and bacteremia in many hospitals all over the world. However, there was still a debates whether colonization and/ or infection with *A. baumannii*, increase morbidity and mortality independently of the effect of other risk factors.

Aim of the study: 1. To detect the incidence & mortality rate of the acinetobacter among ICU patient. 2. To compare between colonization and infection by *A. baumannii* in mortality and outcome. 3. To find the rate of nosocomial respiratory infections from acinetobacter baumannii.

Patients and methods: A prospective study was carried out at Al-Adwani General Hospital in Al Taif region, KSA in the ICU department from April 2014 to March 2015. In this study (1280) patients were enrolled after informed consent. only 40 case positive culture of *A. baumannii* were evaluated. We classified the positive cases into 2 groups. Group (1): Patients who developed nosocomial infection (18 patients). Group (2): Patients who developed colonization from all studied cases (22 patients). All patients were under strict infection control practice and take the antibiotic treatment.

Results: Nosocomial respiratory tract infections were the commonest (79.5%), followed by urinary tract infections (14.1%) in relation to other nosocomial infection. Acinetobacter infection was statistically significant among all the infections ($P < 0.05$). The mortality from acinetobacter infection group (1) was 50% and from colonization group (2) was 13.6% with overall mortality 30%. The antibiotics such as tigecyclin and colistin showed high curability and high sensitivity rate ($p < 0.01$). The mortality rate, comorbidities, ICU stays (days) after acinetobacter, CRP and WBCs were the significant predictors for group (1) patients.

Conclusion: Acinetobacter baumannii is not so far as a cause of nosocomial respiratory infection with subsequent long ICU stays and high mortality. Emerging *A. baumannii* resistant strains is considered a real threat in ICU.

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Introduction

Acinetobacter baumannii is aerobic Gram-negative, non-fermenting bacteria associated with multiple resistances to many antibiotics. The organism has considered as an important nosocomial causing bacteria, during the past decades. It affects mostly the debilitating patients in the intensive care unit (ICU) setting all over the world [1].

It was detected that *A. baumannii* is a causative micro organism of nosocomial pneumonia and bacteremia (caused by central venous catheters or not) in many hospitals in different sites of the world. There has been a debate whether colonization and/or infection with *A. baumannii* increase morbidity and mortality independently of the effect of other risk factors [2].

Many studies detected that *A. baumannii* infections may be associated with considerable mortality, however some of them support the possibility that the clinical course of debilitating patients may be influenced by many factors that subsequently the infection with *A. baumannii* may not independently lead to worst results [3].

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This debate caused more conflict among physicians and investigators about *A. baumannii* infection's deaths. So, we decided to confirm the available evidence about the mortality caused *A. baumannii* micro-organism whether colonized or infected in debilitated patients. Colonization with *A. baumannii* is more common in a great number of ICU patients especially in respiratory tracts or associated devices like ETT or ventilator or intercostal tube, etc. Prevention of the infections by strict infection control measures like sterile aseptic technique and improving hand washing among all health care workers, antibiotic prophylaxis for acinetobacter is a one of controversy [4].

Aim of the work

1. To detect the incidence & mortality rate of the acinetobacter among ICU patient.
2. To compare between colonization and infection by *A. baumannii* in mortality and outcome.
3. To find the rate of nosocomial respiratory infections from acinetobacter baumannii.

Patients and methods

The study involved a prospective analysis of medical records of ICU patients after informed consent, admitted at Al-Adwani General Hospital in Al Taif region, KSA, during a one year period between April 2014 to March 2015.

1280 patients were enrolled in this study, only 650 medical records of patients with more than 48 h of ICU stay, were analyzed for detection of new infections. Of these 650 patients, 78 patients were developed nosocomial infections as regard definition of Louis et al. (1995) [5]. Only 18 cases from the nosocomial infection patients (78 cases) had a positive culture for *A. baumannii*, and were considered as **group (1)**. The patients who developed colonization with *A. baumannii* from whole enrolled patients in the current study (22 patients) were considered as **group (2)**. All patients were under strict infection control practice and received the antibiotic treatment according to the results of culture and sensitivity.

Methods

The following information was detected, for each patient admitted in ICU: age, ICU days of stay, days required for mechanical ventilation and survival till discharge from hospital. Also, the results of microbiology were done for detecting positive cultures for acinetobacter baumannii.

A positive culture for *Acinetobacter baumannii* patients, the result of cultures were classified either due to infection or colonization. *Acinetobacter* positive culture isolated from normally sterile sites, including blood, were considered infected.

The definition of respiratory tract infections was a positive culture of sputum if accompanied by a new radiological lesions in chest X-ray; a change in amount or consistency of sputum; and two of the following: impaired oxygenation (by either PaO₂ or O₂ saturation), new fever (>37.8 °C), or new leukocytosis (WBC > 11,000 cells/dL). In addition, patients presented with inhalational injury who had a positive culture from respiratory tract and developed new fever associated with purulent sputum detected by bronchoscopy were evaluated as a pulmonary infection. Isolates from non sterile sites, as urine or wounds, were considered as infections, if they were presented with symptoms and signs of infection and at the site of isolation. A positive cultures patients but did not meet the definitions for infection, were considered colonized. If positive culture for *A. baumannii* were detected

at the first 24 h of hospitalization, the Patients were considered as a colonized on admission [6].

A positive culture for *A. baumannii* patients were evaluated for the following data: the duration before occurrence of colonization and infection time. Patients found to be colonized on admission were further examined to study the impact of colonization on subsequent development of infection. Patients at (group 1) were evaluated for effective antibiotic treatment. Effective treatment was considered when prescribing at least one antibiotic.

The parameters assessed:

1. *Diagnosis of the case*: Clinical, laboratory and radiology evidence
2. *Comorbidities upon admission*: Assessed by history, clinical examination, radiology, laboratory evidences. Every comorbidity assessed take one point.
3. *ICU stays total days*: Number of days of admission in ICU
4. *ICU stays before acinetobacter*: Number of days the patient was admitted before he acquires the acinetobacter baumannii infection.
5. *Antibiotics on admission*: Number and type of antibiotic taken by the patient since admission
6. *Artificial airways (intubation and mechanical ventilation)*: All patients with intubation or ventilation or tracheotomy are at high risk of acquiring infection like acinetobacter. All patients with ventilator are included in the high risk group.
7. *Culture & sensitivity on admission*: Through disc diffusion method a lot of antibiotic had been enrolled in the study. The procedure had been controlled and calibrated [7]
8. *Radiological evidence of hospital acquired pneumonia*: Through chest X-ray and CT scan of chest.
9. *C reactive protein (CRP)*: Done through Cobas c 501 automated analyzer by nephelometry method [8]. CRP levels had been done to the entire patient groups at admission and after acquiring the infection.
10. Complete blood count (CBC)
11. *Patient temperature*: Done by digital calibrated ear thermometers
12. *Kidney Function test*: Creatinine and urea and uric acid were done in the laboratory by automated machine (ROCHE Cobas C 6000). The entire test is quality controlled and calibrated before testing.
13. *Liver Function test*: ALT, AST, total bilirubin and alkaline phosphatase done in the laboratory by automated machine (ROCHE Cobas C 6000).

Outcomes

The ICU and/or in-hospital mortality of cases were considered as the outcomes in this study were, as well as the deaths related to acquisition of or infection with *A. baumannii*. In addition, secondary outcome was defined as the total days stay in ICU or in the hospital.

Statistical methods

Statistical comparison between group1 and group 2 was done by using the tests of both Kruskal-Wallis ANOVA and Mann-Whitney for all continuous variables and tests of Pearson chi-square for the proportions. The impact of colonization on admission on the further occurrence of infection was evaluated by using test of Pearson's chi-square. The comparison of time to development of infection between those colonized (group 2) and infected group 2 was done by an independent sample *t*-test. Fisher's exact test was used to detect the impact of appropriate treatment on mortality. The univariate analysis of risk factors for mortality

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