Epidemiology of *Acinetobacter baumannii* Infections in Siriraj Hospital 2002

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ABSTRACT

Objective: To determine the epidemiology of *A.baumannii* infections in Siriraj Hospital in 2002.
Methods: From January to December 2002, we prospectively studied hospitalized patients in Siriraj Hospital who had *A.baumannii* isolated from their clinical specimens.
Results: During the study period, *A.baumannii* was isolated from clinical specimens of 208 cases. Eighty-six patients (41.3%) had *A.baumannii* infections whereas 122 patients (58.7%) had *A.baumannii* colonization. Of the 86 patients with *A.baumannii* infections, 54.7% were males and 45.3% were females. The mean age of patients was 56.1 years. Ninety-eight percent of the infections were hospital-acquired. The patients developed infection after an average of 26 days of hospitalization. Fifty-two percent of the patients were in the general wards, whereas 48% of them were in ICU. The common sites of infection were respiratory tract and skin and soft tissues. Factors associated with *A.baumannii* infection were identified in 98.8% of the patients. The most common factors were prior use of antibiotics especially ceftazidime and indwelling medical devices. The susceptibility of *A.baumannii* to carbapenems, aminoglycosides, beta-lactam/ beta-lactamase inhibitors, co-trimoxazole, fluoroquinolone, 4th generation cephalosporins and 3rd generation cephalosporins was 32%, 16%, 12 %, 9%, 7%, 4% and 3%, respectively. Fifty-seven percent of *A.baumannii* isolates were resistant to all antimicrobials currently available in Thailand. The overall mortality rate of the patients infected with *A.baumannii* was 54.7%.
Conclusion: Most *A.baumannii* infections in Siriraj were hospital-acquired. The most common site of infection was the respiratory tract. The majority of *A.baumannii* isolates was multi-drug resistant. The mortality rate of *A.baumannii* infections was high.

Keywords: *Acinetobacter baumannii* infections; Epidemiology

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Acinetobacter spp. is aerobic gram negative bacilli. Healthy individuals can harbor this organism on their skin especially over the moist areas. Skin colonization rate of in hospitalized patients was significantly more than that in healthy individuals.[1,2] This observation implies that the patients should acquire the organism while hospitalization. *Acinetobacter* spp. is also commonly found in hospital environments and it can be transmitted to the patients via hospital personnel and contaminated instruments or devices.[1,2] *Acinetobacter baumannii* is the most common species of Acinetobacter causing infections in human. Over the past decade, there have been many reports on *Acinetobacter* spp. as a common causative pathogen in intensive care unit patients and the infection was associated with indwelling medical devices, e.g., ventilator-associated pneumonia, catheter-associated urinary tract infection, blood stream infection associated with intravascular devices.[1,2] *Acinetobacter* spp. is usually resistant to many antibiotics including cephalosporins, aminoglycosides and fluoroquinolones due to various resistance mechanisms.[3] *Acinetobacter* spp. is one of the most common causes of hospital acquired infections in Thailand.[4] To our knowledge there has been no report on epidemiology of *Acinetobacter baumannii* infections in Thailand. Therefore, this study attempted to determine the clinical features, risk factors, clinical course and outcomes of patients infected with *A.baumannii* in Siriraj Hospital in 2002.

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MATERIALS AND METHODS

This is a prospective study conducted in Siriraj Hospital, a tertiary care university hospital, from January to December 2002. The hospitalized patients who had *A. baumannii* isolated from their clinical specimens submit-

TABLE 1. Underlying diseases of 86 patients with *A.baumannii* infections.

Diseases	N (%)*
Cerebrovascular disease	27 (31.4)
Hypertension	24 (27.9)
Diabetes mellitus	23 (26.7)
Cancer	14 (16.3)
Chronic renal failure	14 (16.3)
Ischemic heart disease	10 (11.6)
Chronic obstructive pulmonary disease	9 (10.5)
Neutropenia	4 (4.7)
Cirrhosis	1 (1.2)
Others	23 (26.7)

* The patient could have more than one disease.

ted to Microbiology Laboratory were notified to the investigators. Then clinical information and microbiological information of the patients were collected, and the patients were followed until they left the hospital or died. The collected information was analyzed by descriptive statistics.

RESULTS

A. baumannii was isolated from clinical specimens of 208 patients during the study period. Eighty-six patients (41.3%) were infected, i.e. the patients who had clinical features of infection at the site where *A. baumannii* was isolated, whereas 122 (58.7%) were colonization, i.e., the patients who did not have clinical features of infection at the site where *A. baumannii* was isolated or the patients who had clinical features of infection at the site where the organism was isolated but the infection was caused by other organisms. Patients with *A. baumannii* infections were males in 54.7% and the mean age was 56.1 years with a range from 6 days to 91 years. Ninety percent of *A. baumannii* infected patients had underlying diseases as shown in Table 1. The common underlying diseases were cerebrovascular diseases, hypertension and diabetes mellitus. Forty-eight percent of the patients were hospitalized in general wards whereas 52% were in intensive care units. The patients were admitted to medical, surgical and pediatrics department in 61%, 23% and 9%, respectively. Almost all infections (97.7%) were hospital-acquired: which were those occurred in patients after hospitalization for longer than 48 hours. Almost all patients (98.8%) had factors that might be associated with A. baumannii infections as shown in Table 2. The most common factors

TABLE 2. The factors associated with *A.baumannii* infections in 86 patients.

Factors	N (%)*
Antibiotics	85 (98.8)
Peripheral intravascular devices	82 (95.3)
Urinary catheter	73 (84.9)
Nasogastric tube	69 (80.2)
Endotracheal tube	62 (72.1)
Ventilator	62 (72.1)
Surgery	39 (45.3)
Central intravascular devices	38 (44.2)
Immunosuppressives	9 (10.5)
Chemotherapy	5 (5.8)
Parenteral nutritution	5 (5.8)
Others	27 (31.4)

* The patient could have more than one factor.

TABLE 3. The sites of *A.baumannii* infections in 86 patients.

Sites of infection	N (%)*
Respiratory tract	59 (68.6)
Skin and soft tissues	17 (19.8)
Bacteremia	6 (7.0)
Urinary tract	4 (4.7)
Nervous system	3 (3.5)
Gastrointestinal tract	3 (3.5)
Others	1 (1.2)

* The patient could have more than one site of infection.

were prior use of antibiotics especially ceftazidime and indwelling medical devices. The patients developed infections after an average of 26 days of hospitalization. The sites of A. baumannii infections are shown in Table 3. The common sites were respiratory tract and skin and soft tissues. Seventy-one percent of the patients had *A. baumannii* as a single pathogen, whereas 29% had mixed infections with others such as *Pseudomonas aeruginosa* and *Staphylococcus aureus.* Patients with respiratory tract infections tended to have mixed infections more often than infections in other sites. Almost all patients (98.8%) received various antibiotics prior to having *A. baumannii* infections as shown in Table 4. Ceftazidime was an antibiotic commonly given to the patients. The susceptibility of *A. baumannii* to carbapenems, aminoglycosides, beta-lactam/ beta-lactamase inhibitors, co-trimoxazole, fluoroquinolone, 4th generation cephalosporins and 3rd generation cephalosporins was 32%, 16%, 12 %, 9%, 7%, 4% and 3%, respectively. *A. baumannii* was resistant to all antimicrobials currently available in Thailand in 57% of the isolates. The patients with *A. baumannii* infections were usually treated with meropenem, imipenem and cefoperazone/sulbactam as shown in Table 5. The overall mortality rate of patients infected with *A. baumannii* was 54.7% and most of them died of multi-drug resistant *A. baumannii* infections. The mortality rate in those patients infected with pan-drug resistant *A. baumannii* was higher than those infected with sensitive strains.

DISCUSSION

Our study found that less than 50% of the patients whose *A. baumannii* was present in their clinical speci-

TABLE 4. Antibiotics given to the patients prior to developing *A.baumannii* infections in 86 patients.

Antibiotics	N (%)*
Ceftazidime	28 (32.6)
Meropenem	21 (24.4)
Ceftriaxone	18 (20.9)
Amikacin	14 (16.3)
Vancomycin	14 (16.3)
Imipenem	11 (12.8)
Metronidazole	11 (12.8)
Cefoperazone/sulbactam	10 (11.6)
Ciprofloxacin	9 (10.5)
Cefotaxime	7 (8.1)
Netilmicin	7 (8.1)
Clindamycin	6 (7.0)
Cefepime	5 (5.8)
Amphotericin B	5 (5.8)
Fluconazole	1 (1.2)
Others	23 (26.7)

* The patient could have more than one antibiotic.

TABLE 5. Antibiotics for treating *A.baumannii* infections in 86 patients.

Antibiotics	N (%)*
Meropenem	23 (26.7)
Imipenem	14 (16.3)
Cefoperazone/sulbactam	9 (10.5)
Amikacin	8 (9.3)
Netilmicin	5 (5.8)
Ciprofloxacin	4 (4.7)
Ceftazidime	3 (3.5)
Others	29 (33.7)

* The patient could have more than one antibiotic.

mens were infections, whereas the majority were colonization. Therefore, healthcare providers should be aware of this observation and should avoid antibiotic treatment of patients with *A. baumannii* colonization. *Acinetobacter* spp. has been recognized as an important nosocomial pathogen over the past decade. It is usually resistant to many antibiotics empirically used for infections caused by other aerobic gram negative bacilli such as cephalosporins. As a result, the mortality of patient infected with *Acinetobacter* spp. is rather high. A report in Thailand revealed that *Acinetobacter* spp. was the most common cause of ventilatory associated pneumonia in a university hospital.[5] Our study observed that *A. baumannii* infections are more common in middle-age males. However, the patients could be babies and the elderly as seen in other studies.[6-10] This study also confirmed the observations made by others that almost all patients infected with *A. baumannii* were hospitalized longer than 48 hours. The other two patients who developed *A. baumannii* infections within 48 hours of hospitalization were those who were transferred to Siriraj Hospital from other hospitals. However, our study revealed that *A. baumannii* infections were similarly distributed in general wards and intensive care units (ICU) that was different from other studies.[11] This discrepancy could be explained by the fact that many patients in general wards in Siriraj Hospital were seriously ill but they were unable to be transferred to ICU due to a limited number of ICU beds. The average duration of hospitalization until developing *A. baumannii* infections in our study was 26 days that was longer than 10 to 14 days found in other studies.[8,12,14] However, is has been found that a long duration of hospitalization was associated with *A. baumannii* infections.[6,14] Although *A. baumannii* can cause infections in any organs, the common sites of infections seen in our study were respiratory tract and skin and soft tissues similar to other studies.[14,15] Factors found to be associated with *A. baumannii* infections were, namely: cancer, indwelling medical devices, antibiotics, parenteral nutrition, surgery, severe underlying diseases and duration of hospitalization.[12-15] Our study also observed that antibiotics, especially ceftazidime, and indwelling medical devices were common in patients infected with *A. baumannii*. In vitro susceptibility of *A. baumannii* revealed that the pathogen was usually resistant to antibiotics active for other aerobic gram negative bacilli and more than 50% of the isolates were resistant to all antibiotics currently available in Thailand. Therefore, antibiotics to be used for treating *A. baumannii* infections were limited. These included carbapenems, aminoglycosides and beta-lactam/ beta-lactamase inhibitors. An overall mortality of patients with *A. baumannii* infections was 54.7% and most of them died of multi-drug resistant *A. baumannii* infections. Polymyxins were found to be safe and effective for treatment of multi-drug resistant *A. baumannii* infections.[16] *In vitro* studies of polymyxins against *A.baumannii* resistant to all antibiotics currently available in Thailand revealed that all isolates were susceptible to polymyxins.[17] Polymyxin E has just been available in Thailand since January 2005 and the clinical trial on safety and efficacy of polymyxin E for treatment of A.baumannii infections is being conducted in Siriraj Hospital. New antibiotics such as glycylcycline were found to be active against multi-drug resistant *A.baumannii* and these antibiotics should have a role in treatment of *A.baumannii* infections in the near future.

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บทคัดย่อ

ระบาดวิทยาของการติดเชื้อ *Acinetobacter baumannii* ในโรงพยาบาลศิริราช พ.ศ. 2545

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วัตถุประสงค์: เพื่อทราบระบาดวิทยาการติดเชื้อ *A.baumannii* ในผู้ป่วยที่รับไว้รักษาในโรงพยาบาลศิริราชในปี พ.ศ. 2545

วิธีการ: เฝ้าระวังการตรวจพบเชื้อ *A.baumannii* ที่ห้องปฏิบัติการจุลชีววิทยาจากตัวอย่างตรวจที่เก็บจากผู้ป่วยที่รับไว้รักษาโรงพยาบาลศิริราชตั้งแต่วันที่ 1 มกราคม ถึง 31 ธันวาคม 2545 แล้วติดตามผู้ป่วยที่มีการติดเชื้อดังกล่าวโดยเก็บข้อมูลต่าง ๆ ที่เกี่ยวข้องเพื่อนำมาวิเคราะห์

ผลการศึกษา: มีผู้ป่วยที่แยกได้เชื้อ *A.baumannii* จากสิ่งส่งตรวจจำนวน 208 ราย ในจำนวนนี้เป็นการติดเชื้อจำนวน 86 ราย (ร้อยละ 41.3) ส่วนอีก 122 ราย (ร้อยละ 58.7) เป็น colonization, ผู้ป่วยที่ติดเชื้อ 86 รายเป็นชายร้อยละ 54.7 และหญิงร้อยละ 45.3, ผู้ป่วยมีอายุเฉลี่ย 56.1 ปี, การติดเชื้อร้อยละ 98 เป็นการติดเชื้อในโรงพยาบาล, ระยะเวลาเฉลี่ยของการอยู่ในโรงพยาบาลก่อนมีการติดเชื้อ 26 วัน, ผู้ป่วยร้อยละ 52 อยู่ที่หอผู้ป่วยสามัญและผู้ป่วยร้อยละ 48 อยู่ที่หออภิบาล, ตำแหน่งที่มีการติดเชื้อบ่อยคือระบบการหายใจและบาดแผล, ผู้ป่วยร้อยละ 98.8 มีปัจจัยที่สัมพันธ์กับการติดเชื้อโดยปัจจัยที่พบบ่อยคือการได้รับยาต้านจุลชีพโดยเฉพาะอย่างยิ่ง ceftazidime และการมีสายเข้าสู่ร่างกาย, อัตราการดื้อยาของเชื้อ *A.baumannii* ต่อ carbapenems, aminoglycosides, beta-lactam/beta-lactamase inhibitors, co-trimoxazole, fluoroquinolone, 4th generation cephalosporins และ 3rd generation cephalosporins เป็นร้อยละ 32, 16, 12, 9, 7, 4 และ 3 ตามลำดับ เชื้อ *A.baumannii* ร้อยละ 57 ดื้อต่อยาต้านจุลชีพทุกขนานที่มีในประเทศไทย และผู้ป่วยที่ติดเชื้อ *A.baumannii* เสียชีวิตร้อยละ 54.7

สรุป: การติดเชื้อ *A.baumannii* ในผู้ป่วยที่รับไว้รักษาในโรงพยาบาลศิริราชเกือบทั้งหมดเป็นการติดเชื้อในโรงพยาบาล การติดเชื้อส่วนมากเป็นที่ระบบการหายใจ เชื้อก่อโรคส่วนมากดื้อต่อยาต้านจุลชีพทุกขนานที่มีในประเทศไทย และผู้ป่วยที่ติดเชื้อนี้มีอัตราตายสูง