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Acinetobacter bacteraemia in patients with diarrhoeal disease

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SUMMARY

In 1994, 171 (27%) of all positive blood cultures in our hospital were due to *Acinetobacter* species. Of these, 138 cultures were considered significant, 91 (66%) were community-acquired and 47 (34%) were nosocomial. Most acinetobacter bacteraemia in children $\leqslant 1$ year old was community-acquired, while nosocomial infection was more common in children > 1 year old ($P = 0{\cdot}01$). Most children $\leqslant 5$ years old were severely malnourished. The incidence of bacteraemia was lowest during the post-monsoon to early winter months. Acinetobacter bacteraemia associated mortality was twice (16%) that of all other patients (7·7%, $P < 0{\cdot}0005$) and accounted for 4·5% of all hospital deaths during the study period. Bacteraemia caused by *Acinetobacter* species is an important cause of morbidity and mortality among our patient population with diarrhoeal disease.

INTRODUCTION AND METHODS

Over the last few years we have noted an increased incidence of bacteraemia caused by *Acinetobacter* species (5, 9, 8, 11 and 23% respectively in the years 1989–93) in our patients with diarrhoea. Though bacteraemia caused by *Acinetobacter* species is reported in the literature, there is a scarcity of reports from south-east Asia and from patients with diarrhoeal diseases. Cases of acinetobacter bacteraemia (AB) were reviewed over a 1-year period with the aim of identifying the incidence, significance, seasonality, age distribution, nutritional status and susceptibility pattern to antibiotics in patients admitted to the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) located in Dhaka, from 1 January to 31 December 1994. The Centre treats over 110000 patients annually from urban and semi-urban areas of Dhaka, a city with a population of approximately eight million. The majority of patients are children with diarrhoea and associated illnesses and nearly all patients are from the poorest section of the community. Approximately 5–8% of all patients presenting to the ICDDR, B require admission. A microscopic stool examination, stool or rectal swab culture for *Vibrio cholerae*, *Salmonella* spp. and *Shigella* spp., a complete blood count and serum electrolytes were performed on nearly all in-patients. Blood for culture and sensitivity was obtained from patients with suspected sepsis. Blood was cultured and organisms identified by standard techniques [1] and antimicrobial susceptibility was determined by the Kirby–Bauer disk diffusion technique [2]. Most patients had intravenous lines open for initial rehydration, maintenance of antibiotic treatment or both. Patients were given ampicillin and gentamicin for suspected sepsis, before culture and sensitivity results were known.

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Definitions

Significant acinetobacter bacteraemia (AB): *Acinetobacter* species isolated from blood culture with a clinical picture suggestive of sepsis [3].

Community-acquired acinetobacter bacteraemia (CAB): Significant acinetobacter bacteraemia within 72 h of admission to hospital.

Nosocomial acinetobacter bacteraemia (NAB): Significant acinetobacter bacteraemia after 72 h of admissions to hospital.

Statistical method: Categorical data were evaluated by χ^2 tests and continuous data by Student's t tests. P values less than 0·05 were considered significant.

RESULTS

During the 1-year study period, 136/6261 (2·2%) of inpatients (2 each with 2 episodes) had AB. The male:female ratio of AB patients was 1·4:1, and did not differ significantly from that of the total admitted patients, 1·7:1. Children 5 years or younger constituted 82% of all cases, comparable to the 81% of all admitted patients in this age range. CAB was more common than NAB in $\leqslant 1$ year age group, 53% *vs.* 30% ($P = 0{\cdot}01$). However NAB was more common than CAB in > 2 years age group, 70% *vs.* 47% ($P = 0{\cdot}01$). Subtyping of *Acinetobacter* spp. was done in 25 AB patients [12 *A. lwoffii* (11 CAB and 1 NAB); 12 *A. baumannii* (5 CAB and 7 NAB) and 1 *A. haemolyticus* (CAB)]. No significant differences were observed among different *Acinetobacter* spp. in relation to antimicrobial susceptibility and clinical outcome. Nine (6·5%) of 138 ABs were polymicrobial. In addition to *Acinetobacter* spp., the co-pathogens were *Klebsiella* spp. in 4 patients, *Streptococcus* spp. in 2 patients, *Enterobacter* spp. and *Staphylococcus aureus* in 1 patient each, and *Citrobacter* spp. and *Pseudomonas* spp. together in 1 patient. Of the 9 patients, 3 had nosocomial episodes of AB and *Klebsiella* spp. was the associated micro-organism in all of these. According to Gomez classification 98% of children aged less than 5 years had mild to severe grades of protein–energy malnutrition and according to Waterlow classification 86 and 80% were mild to severely stunted and wasted respectively (Table 1). Among AB patients 56 and 26% had leucocytosis (> 15000/cu mm) and immature neutrophils (bands $\geqslant 4\%$) respectively. Ninety-five percent of AB patients had an abnormal temperature at presentation (81% with > 38 °C and 14% with < 36 °C). *Shigella* spp. *Vibrio cholerae* or *Salmonella* spp. were isolated from stool or rectal swab culture in 18, 15 and 7% of AB patients respectively. The incidence of AB was lowest (1·3% of 1470 inpatient admissions) during October to December compared with other quarters (Jan–Mar, 2·8%; Apr–Jun, 2–3%; and Jul–Sep, 2·4%; $P < 0{\cdot}05$). Nosocomial isolates were significantly less frequently susceptible to all antimicrobials than community-acquired isolates (Table 2); the only exception was ceftriaxone to which the susceptibility pattern was comparable. Onset of bacteraemia in CAB patients was (mean ± S.D.) 0·4 ± 0·7 days and 7·6 ± 4·2 days in NAB patients ($P < 0{\cdot}001$). The duration of hospitalization of NAB patients was significantly longer than CAB patients: (mean ± S.D.) 15 ± 7 *vs.* 6 ± 6 days ($P < 0{\cdot}005$). Twenty-four AB patients died. Two deaths were considered not directly due to AB. Of these two, 1 patient who died had negative repeat blood cultures 5 and 8 days after the initial acinetobacter positive blood culture and the cause of death was considered to be severe bronchopneumonia associated with persistent diarrhoea, hypokalaemia and hypercalcaemia. In the other patient the cause of death was ascribed to amoebic intestinal perforation. The attributable case fatality rate of 16% (22 of 136) was significantly higher in AB patients than the fatality rate in all other admitted patients 7·7% (470

Table 1. *Nutritional status of AB patients aged under 5 years*

Anthropometry	AB*
Weight for age†	$n = 101$
> 90	2 (2)‡
76–90	8 (8)
60–75	36 (36)
< 60	55 (55)
Mean ± S.D.	60·0 ± 13
Height for age†	$n = 51$
$\geqslant 95$	7 (14)
90–94·9	22 (43)
85–89·9	12 (24)
< 85	10 (20)
Mean ± S.D.	89·9 ± 6
Weight for height†	$n = 50$
> 90	10 (20)
80–89·9	5 (10)
70–79·9	16 (32)
< 70	19 (38)
Mean ± S.D.	76·3 ± 12

* AB, significant acinetobacter bacteraemia.
† Percent NCHS median.
‡ Numbers in parentheses are percentages.

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Table 2. *Antimicrobial susceptibility pattern of* Acinetobacter *spp. isolated from blood cultures of bacteraemic patients*

Antimicrobial	CAB* *n* (%)	NAB† *n* (%)	*P*	Total *n* (%)
Ampicillin	53 (60)	9 (20)	< 0·001	62 (46)
Chloramphenicol	53 (60)	7 (16)	< 0·001	60 (45)
Cotrimoxazole	50 (65)	8 (18)	< 0·001	58 (44)
Gentamicin	74 (83)	10 (22)	< 0·001	84 (63)
Ciprofloxacin	80 (90)	15 (34)	< 0·001	95 (71)
Ceftriaxone	76 (86)	36 (84)	0·889	112 (85)
Ampicillin + Gentamicin	79 (89)	11 (24)	< 0·001	90 (67)
Ampicillin + Ciprofloxacin	81 (91)	15 (34)	< 0·001	96 (72)
Ceftriaxone + Gentamicin	84 (94)	31 (84)	0·057	120 (91)
Ampicillin + Chloramphenicol	62 (71)	9 (28)	< 0·001	71 (53)

* CAB, Community-acquired acinetobacter bacteraemia.
† NAB, Nosocomial acinetobacter bacteraemia.

of 6125), $P < 0{\cdot}0005$. The case fatality rate, body temperature and rectal swab culture were comparable between CAB and NAB patients. Death due to AB accounted for 4·5% of all hospital deaths during the study year.

DISCUSSION

This retrospective study confirms our clinical impression that AB is emerging as a significant disease associated with diarrhoeal illness in our patients. Overall, every fourth positive blood culture of diarrhoeal patients admitted to our hospital was positive for *Acinetobacter* sp. The high incidence of AB in our population may be explained by two factors. Malnutrition, a known cause of immune deficiency [4, 5], was coexistent in most of our patients. Decreased host resistance secondary to a variety of conditions has been previously noted to be associated with AB [6–9]. Another possible factor contributing to the high incidence may be the relatively frequent use of intravenous catheters for medication and/or fluid administration in those patients deemed ill enough to require admission to the hospital. Indwelling intravenous catheters have been identified as an important risk factor for AB in other studies [10, 11]. In most of the published reports *Acinetobacter* spp. infections were nosocomial in origin. As we used a 72 h gap from admission to define nosocomial infection this may explain the observed higher incidence of community-acquired acinetobacter bacteraemia in this study; alternatively our population and epidemiology may differ from other reports. Although the great majority of our subjects were children, this may be a reflection of the demographics of our patient population, the majority of whom are also children, rather than representing a genuine risk factor. Higher temperature and humidity of ambient air have also been postulated to be important factors [6]. Retailliau and colleagues reported that the incidence of AB was highest in summer and lowest in winter [12], comparable to the lowest incidence in our population which occurred during the early months of the cool season in a period of lower humidity. In our study the duration of hospitalization of patients with nosocomial infection was more than twice that of patients with community-acquired infection. This was not unexpected because prolonged hospital stay predisposes to nosocomial infections which in turn further prolongs hospitalization. Although all of our patients had diarrhoea, no enteric pathogen was isolated from faecal or rectal swab culture in 60% of the AB patients. This may be because cultures were done routinely only for *V. cholerae*, *Salmonella* spp., and *Shigella* spp. Stool microscopic examination for parasites and protozoa was not done routinely and data were not analysed. Alternatively, it is conceivable that AB itself might cause watery stool, a condition sometimes referred to as 'parenteral diarrhoea' believed to occur in children with a variety of systemic infections [13]. The high case fatality rate of 16% in our study population is consistent with other reports [7, 14] and emphasizes the need for prompt recognition and treatment. The nosocomial-acquired organisms exhibited a greater range of antimicrobial resistance than community-acquired organisms except to ceftriaxone, a broad-

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spectrum and relatively expensive antibiotic. Nonetheless, our results suggest that ceftriaxone could be a good choice in the treatment of patients with suspected serious nosocomial acinetobacter infection in Bangladesh. The retrospective nature of our study has clear limitations and several potential risk factors relevant to clinical and management issues could not be evaluated. There is a need for prospective studies to address these issues. We conclude that acinetobacter bacteraemia has become a major problem in association with diarrhoea in our patient population.

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