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BACTEREMIA DUE TO BURKHOLDERIA CEPACIA COMPLEX - A CASE SERIES

Microbiology

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ABSTRACT

Prevalence of bacteremia caused by non-fermentative gram-negative bacteria (NFGNB) has been increasing over the past decade. We report an outbreak of blood stream infection in four adults with *Burkholderia cepacia complex*. It has always been a tedious task for a routine microbiological laboratory to identify the nonfermenting gram-negative bacilli, and poor laboratory proficiency in identification of this nonfermenter worldwide still prevails. This report raises concern regarding the potential severity of *Burkholderia cepacia* complex bacteremia in ICU set up and the need to broaden clinicians' suspicion for this multidrug resistant bug as they are often resistant to most commonly used antibiotics and an early use of effective antimicrobial therapy can decrease morbidity and mortality.

KEYWORDS

Bacteremia, Non-fermentative gram-negative bacteria, Burkholderia cepacia complex

INTRODUCTION

Burkholderia (formerly *Pseudomonas*) *cepacia* is an aerobic, Gram negative, non fermentative bacillus widely distributed in the environment, including water, soil, fruits and vegetables [1]. The ability for *Burkholderia* species to thrive in the diverse range of environments is testament to the fact that they can be considered as one of the most versatile groups of Gram negative bacteria. *Burkholderia cepacia* complex (BCC) survives and multiplies in aqueous hospital environments, including detergent solutions and intravenous fluids, where it may persist for long periods [2]. BCC is known to cause a wide variety of infections ranging from superficial to deep seated & disseminated infections such as pneumonia, (especially in patients with cystic fibrosis), meningitis, peritonitis (in patients undergoing peritoneal dialysis), septicemia and bronchiectasis [3]. The greatest concern of pulmonary BCC infection is its potential to cause Cepacia syndrome, a fatal combination of necrotizing pneumonia, rapid respiratory decline and bacteremia [4].

Outbreaks of BCC septicaemia have been documented in intensive care units (ICUs), oncology units and renal failure patients [5] Small hospital outbreaks are frequent and are usually due to a single contaminated source such as disinfectant[6], intravenous solutions [7], and medical devices, including respiratory therapy equipment [8].

The authors report a nosocomial outbreak of *B. cepacia* bacteremia in Medicine ICU of our hospital.

Case History

Four adults, in the medical intensive care unit of Chatrapati Shivaji Subharti Hospital, Meerut were clinically diagnosed with blood stream infection due to *B. cepacia complex* in the month of May, 2019.

Case no. 1:

A 38 years old male patient presented with fever and headache for 3 days in the emergency unit of our hospital. His past medical history was significant for systemic arterial hypertension and type 2 diabetes mellitus. Vital signs on arrival: blood pressure of 120/70mmHg, heart rate of 110 beats/minute and respiratory rate of 24 breaths/minute, and temperature of 100.8°F.

His oxygen saturation by pulse oximetry was 88% while breathing ambient air. Empiric intravenous antimicrobial therapy was initiated comprising ceftriaxone (2 grams every 12 hours) and azithromycin (500 milligrams daily) along with 500 ml Normal Saline.

Case no. 2:

A 70 years old female patient presented with signs of sepsis in the emergency with high grade fever (102 F), blood pressure of 110/60 mm of Hg, pulse rate of 110/min, CRP was positive (60µg/L). Empirically injection ceftriaxone was started along with 500 ml Normal Saline.

Case no 3:

A 50 years old male patient presented with cough and fever for 1 week with blood pressure of 110/90mmHg, heart rate of 100 beats/minute, respiratory rate of 20 breaths/minute and temperature of 100 F. Empirically injection ceftriaxone was started along with 500 ml normal saline.

Case no 4:

A 58 years old male patient presented with breathlessness and fever for 4 days with blood pressure of 130/60mmHg, heart rate of 88 beats/minute, respiratory rate of 26 breaths/minute, and temperature of 99.6°F. Empirically intravenous Gentamicin was started along with 500 normal saline.

All the patients had biological signs of sepsis (reduced platelet count and elevated C-reactive protein, raised WBC count).

Blood culture of these patients was carried out in the Clinical Microbiology laboratory as a part of routine diagnostic protocol. Blood culture was performed in automated instrument, BACT/ Alert 3D (Biomerieux).

Blood culture positivity was detected within 24 hours of incubation in all the samples. Subculture was done by conventional method on Sheep Blood agar, Chocolate agar and MacConkey's agar; incubated aerobically at 37°C. The clinician was alerted immediately. After 24 hours typical large, circular, low convex, moist β haemolytic colonies was observed on Blood agar (BA) & non-lactose fermenting pigment colonies on MacConkey's agar (MAC).

Gram stain was performed on culture smear, which revealed Gram negative bacilli. The isolates were oxidase and catalase positive and motile. Identification and antimicrobial susceptibility of all the isolates was done by Vitek 2 Compact system (Biomerieux) using card GN23141 and AST281 respectively. They were identified as *Burkholderia cepacia* complex with similar multi drug resistant pattern. [Table/Figure-1]

Table-1: Antimicrobial Susceptibility Pattern Of All Isolates.

Drugs	Isolate 1		Isolate 2		Isolate 3		Isolate 4	
	*MIC	Interpret-ation	*MIC	Interpret-ation	*MIC	Interpret-ation	*MIC	Interpret-ation
Levofloxacin	≤2	R	≤2	R	≤2	R	≤2	R
Cotrimoxazole	≤2/38	R	≤2/38	R	≤2/38	R	≤2/38	R
Ceftazidime	≥32	R	≥32	R	≥32	R	≥32	R
Chloramphenicol	≤8	R	≤8	R	≤8	R	≤8	R
Minocycline	≤4	R	≤4	R	≤4	R	≤4	R
Meropenem	≤4	S	≤4	S	≤4	S	≤4	S

*MIC: Minimum Inhibition Concentration (µg/ml)

On observing isolation of same organism with similar antimicrobial susceptibility pattern from blood samples from patients admitted in MICU within a month, raised our suspicion and the Hospital Infection Control team was informed. Environmental surveillance was conducted to identify the source and route of infection. Environmental samples included tap water, respiratory devices, suction machine, and intravenous normal saline, surface swabs from bed rails, tables and antiseptic solutions. They were inoculated on Blood Agar and MacConkey's agar and incubated at 37^0 C. The culture from the intravenous normal saline grew Non lactose fermenting, onion peel pigmented colonies which revealed Gram negative bacilli and was oxidase positive and motile. The isolates were further identified by Vitek 2 compact system as *B. cepacia* using card GN23141. Antimicrobial susceptibility was performed on Vitek 2 using card AST281 and similar pattern was obtained. Rest all environmental samples were found to be sterile.

The cases clustered in a very short period pointing to direct access of the pathogen to the blood stream. Repeat blood sample for culture was collected from all the four patients. We could re-isolate the same pathogen with similar antimicrobial susceptibility pattern from all the patients. Two patients who were in septic shock expired within 5 days of admission. But we were able to save the other two patients who responded well to the therapy chosen according to in vitro susceptibility.

DISCUSSION

Burkholderia cepacia is an aerobic Gram-negative rod that causes healthcare associated infections through contaminated disinfectants, fluids and medical equipment. This bacterium shows resistance to various antibiotics. For this reason, available therapeutic antimicrobial agents are limited.

Raad *et al* , reported several perfusion-related outbreaks of bloodstream infection involving *Staphylococci* or *Candida* spp [9]. Frean *et al* have also incriminated Gram-negative bacilli such as *Enterobacter*, *Pseudomonas*, *Citrobacter*, and *Serratia* spp, as the major cause of nosocomial outbreak due to parenteral fluids [10]. Unlike other gram negative non fermenters, *Burkholderia cepacia* is resistant to disinfectants and antiseptic solutions [11] have unique ability to survive in standing water and significant cause of health care associated infection as a result of contamination.

Bhise S. M *et al* , reported an outbreak of 10 cases of neonatal septicemia in which *B. cepacia* colonized the indwelling intravenous catheters [12]. BCC bacteremia in cancer patients (undergoining haemodialysis) is most often polymicrobial and catheter related [13]. Other reported sources within hospitals described in the literature include disinfectants, antiseptics, topical anesthetics, respiratory therapy equipment, mouthwash, and lotions [14].

CONCLUSION

Our cases highlight the importance of Prompt implementation of infection control strategies which effectively controlled the outbreak and also the role of automation in early identification of the pathogen. Contaminated intravenous fluids are a rare source of bacteremia, but this possibility should be borne in mind, especially when bacteremia is due to an environmental microorganism. Strict hospital surveillance and infection control practices should be implemented to avoid hospital acquired cross infection with such pathogens. This report raises concern regarding the potential severity of *Burkholderia cepacia* complex bacteremia in ICU set up and the need to broaden clinicians' suspicion for this multidrug resistant bug as they are often resistant to most commonly used antibiotics and an early use of effective antimicrobial therapy can decrease morbidity and mortality.

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