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OUTBREAK OF *BURKHOLDERIA CEPACIA* BACTERAEMIA IN CARDIAC CARE UNIT OF A TERTIARY CARE HOSPITAL

Clinical Microbiology

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ABSTRACT

Introduction: *Burkholderia cepacia complex* (BCC) is a group of gram negative bacteria previously reported from cystic fibrosis cases but now increasingly reported from various health care associated infections. This opportunistic pathogen shows intrinsic resistance to many antibiotics leading to morbidity and mortality in hospitalized patients. Here we present an outbreak of *B. cepacia* bacteraemia in cardiac care unit in a tertiary care hospital. **Material And Methods:** This prospective study was conducted over a period of one year with 34 patients who presented with febrile episodes after undergoing cardiac procedures at cardiac care unit (CCU). Blood cultures were done in BD BACTEC™ FX 40 and minimum inhibitory concentration (MIC) values for antibiotics were determined by Microscan WalkAway40 Plus. The demographic details, co morbidities, antibiotic regimen used, duration of their treatment were collected. **Results:** Out of 34 febrile patients in CCU, eight patients (23.5%) had *B. cepacia* bacteraemia. Diabetes (37.5%) and chronic renal failure (25%) was the most common co morbidity found among them. Most of the isolates were susceptible to ceftazidime, minocycline, trimethoprim-sulfamethoxazole, meropenem and quinolones. Overall clinical outcome was favourable.Source of *B. cepacia could not be traced even after thorough* environmental sampling. **Conclusion:** *B. cepacia* is an opportunistic pathogen initially reported from cystic fibrosis cases but now increasingly getting reported from non-respiratory samples of immunocompetent individuals. Blood stream infection due to *B. cepacia* in any ward of hospital should be red flagged as it indicates breaches in IPC measures. These outbreaks can be checked by continuing stringent infection control measures.

KEYWORDS

B. cepacia, Bacteraemia, Cardiac care unit, antimicrobial susceptibility.

INTRODUCTION:

Burkholderia(previously Pseudomonas) *cepacia* is an aerobic, gram negative,motile,glucose non-fermentative bacillus commonly inhabits in soil and moist environment and remain alive in nutrient-poor water [1].The *Burkholderia cepacia complex* (BCC) consist of 17 closely related species of Gram-negative rods that are scattered in theenvironment, *B. cepacia* is one of them[2].*B.cepacia* often settles in the lung of patients with cystic fibrosisand has revealed as an important opportunistic pathogen in hospitalized and immunocompromised patients (debilitated elderly people, HIV-positive individuals, cancer patients undergoing chemotherapy, etc)[1,3,4,5]. Repeated small hospital outbreaks are usually due to a single contaminated source such as disinfectant,mouth wash, medical devices including respiratory-therapy equipment nebulizer solutions, intravenous solutions[5, 6, 7, 8, 9, 10]. As they remain alive in presence of disinfectants, they behave as potential nosocomial infections [6].Multiple studies suggest thatpatients are at increased risk of BCCrelated nosocomial infections with debilitating underlying diseases, those with prolonged intensive care unit stay or those with an indwelling device.BCC infections are intrinsically resistant to many antimicrobial agents thus restricting the therapeutic options[11,12,13]. *B. cepacia* true bacteremia is rare but, pseudo-bacteremia is specified in several reports [6, 14, 15].

In this study, we present a health care associated outbreak of *B. cepacia* bacteraemia in cardiac care unit in our hospital.To the best of our knowledge; this is the first report of *B. cepacia* bacteremia in resource limited setting in West Bardhhaman region of West Bengal.

Methods:

Study Design And Setting:

This is a prospective study over a period of one year from September 2023 to August 2024 with 34 patients who presented with febrile episodes after undergoing cardiac procedures at cardiac coronary unit (CCU). The CCU is a third level facilityof our tertiary care hospital which is 15 bedded and gives care to post operative patients with coronary bypass surgery,cardiac implantable electrophysiological devices (CEID)implantation and arrhythmia patients.

Clinical Data:

The demographic details, comorbidities, indwelling catheters at the time of positive blood culture, prior procedure, antibiotic regimen used, duration of their treatment were collected from the Hospital information system.

Blood Culture And Identification:

10 ml of blood was collected aseptically from all febrile patients and were sent inBD BACTEC™ FX 40 (Becton Dickinson, New Jersey, US) blood culture bottles. Conventionally culture was doneon blood agar, MacConkey agar and chocolate agar and *B. cepacia* was identified as per standard laboratory methods.All isolates were subjected to Microscan WalkAway40 Plus (Beckman Coulter, California, USA) for confirmation of identification and antimicrobial susceptibility test. Minimum Inhibitory Concentration (MIC) values were determined for the following antibiotics:ceftazidime, trimethoprim-sulfamethoxazole, meropenem, levofloxacin, minocycline, colistin, polymyxin B.

Outbreak Investigation And Environmental Sampling:

Patients of *B. cepacia* infection were discussed with thehospital infection control committee.Field investigation was performed by the infection prevention and control (IPC) team.Followingpotential reservoirs were identified and screened: Oxygen mask, Chlorhexidine soap, chlorhexidine mouth wash, ultrasound gel, Intravenous (IV) fluid, venous catheter, IV set and antiseptic solution, wash basin, water tap. Hands of the health care workers in CCU were also screened.

These environmental samples were primarily cultured in10 ml Brain Heart Infusion broth (HIMEDIA LAB, INDIA)and *B.cepacia* agar base and *B.cepacia* selective supplement (Code:MU2089-500G and FD361-5VL manufactured by HIMEDIA LAB, INDIA). Inoculated plates were incubated at 37^{0}C for 72 hours. Growth of colony was detected according to manufacturer's instructions.

Statistical Analysis:

Data were entered in MS excel sheet and analysed in the statistical package for social sciences (SPSS) version 16. The continuous and categorical variables were presented as mean + standard deviation and frequencies/percentages.

RESULTS:

Out of 34 febrile patients admitted in CCU during the study period, eight patients (23.5%) had *B. cepacia* bacteremia. These positive patients had mean age of 56 +17 years and males (75%) outnumbered females (25%). Diabetes (37.5%) followed by chronic renal failure (25%) was the most common comorbidity found among these positive patients. The median length of hospital stay was 15 days. Out of eight *B. cepacia* positive patients, three had MI,three had CAD and two had

arrythmia. Seven patients were discharged from the hospital, where one patient succumbed. Information regarding the patient characteristics are showed in table 1. Among the baseline characteristics total lymphocyte count, absolute lymphocyte count, platelet count and CRP were also recorded (Table 2).

Table 1: Characteristics Of Patients With *B. cepacia* Infection

Patient	Age (years)	Gender	Comorbidities	Admission diagnosis	LOS in CCU	Treatment and duration	Outcome
1	58	Female	Diabetes	Arrythmia	15	Carbapenem for 8 days	Discharged
2	56	Male	Chronic renal failure	CAD	12	Ceftazidime for 10 days	Discharged
3	80	Male	COPD	MI	17	TMP-SMX and Quinolone for 15 days	Discharged
4	65	Male	Chronic liver disease	CAD	13	Ceftazidime for 10 days	Discharged
5	70	Female	Cerebral vascular accident	MI	15	Ceftazidime for 10 days	Deceased
6	61	Male	Chronic renal failure	MI	12	Carbapenem for 8 days	Discharged
7	36	Male	Diabetes	Arrythmia	16	Carbapenem for 8 days	Discharged
8	25	Male	Diabetes	CAD	15	TMP-SMX and Quinolone for 15 days	Discharged

LOS, length of stay; CCU, Cardiac care unit; CAD, Coronary artery disease; MI, Myocardial infarction; TMP-SMX, trimethoprim-sulfamethoxazole.

Table 2: Baseline Characteristics Of The Patients (n=8) With *B.cepacia*

Characteristics	Mean value	Range
Median age	59.50	25-80 yrs
Haemoglobin	10.425(g/dl)	10-18(g/dl)
Total leucocyte count (TLC)	12,405/µl	4000-11000/µl
Absolute neutrophil count (ANC)	11,219/µl	2500-7000/µl
Platelet count	200,000/µl	150,000-450,000/µl

Antimicrobial Susceptibility *B. cepacia* Isolates:

The percentages of susceptibility to ceftazidime, minocycline, trimethoprim-sulfamethoxazole, meropenem were87.5 % (7/8), 62.5% (5/8), 75% (6/8), 87.5 % (7/8) respectively.All isolates were tested forsusceptibility to piperacillin-tazobactam of which four (50%) were resistant. Majority of isolates were sensitive to quinolones (87.5%, 7/8).

Clinical Outcome:

Majority of the patients (3/8, 37.5%)were started on meropenem or ceftazidime and continued for 8-10 days. Majority of these patients responded to the treatment and discharged.

Outcome Of Outbreak Investigation:

After a thorough environmental sampling, no sources of *B. cepacia* could be traced out. The hands of HCWs revealed no significant growth.

DISCUSSION:

B. cepacia complex comprises of nine different recognized genomovars, including *Burkholderia multivorans*, *Burkholderia cenocepacia*, *Burkholderia stabilis, Burkholderia vietnamiensis*, *Burkholderia dolosa, Burkholderia ambiferia, Burkholderia arthina and Burkholderia pyrrocinia*[16].*B. cepacia* bacteremia cases have been reported worldwide among patients with cystic fibrosisand immunocompromised condition. Outbreaks among immunocompetent individualsmay happen due to contaminated antiseptics, disinfectants, ventilators and other types of medical equipments [17].

Some Studies S. shridharan et al [18] reported drug-related outbreaks. Studies like doit c et al [19] with *B. cepacia*. Higher mortality was observed with contaminated red blood cells or total parenteral nutrition as a part of outbreak investigation reported that majority of patient care substances were contaminated formula and with the use of multi-dose vials. Abiding basic hygienic measures and avoiding the use of multi-dose vialscan prevent drug-related nosocomial infections.

In our study, all *B. cepacia* bacteraemia patients had mean ANC of 11,219/ul (range 2500-7000/ul) and mean TLC of 12,405/ul (range 4000-11000/ul) which is attributed to triggered immune system. This is contrary to studies like Baul S. N et al [20] who reported neutropenia among *B. cepacia* infected patients.

Diabetes and chronic renal failure were the most common comorbidity found among *B. cepacia* bacteraemia patients. However, these patients did not have malignancies, transplantation and were minimally exposed to invasive procedures. Study by Bilgin H. et al [21] reported COPD and chronic renal failure to be the most common comorbidity among *B. cepacia* infected patients. Poor glycaemic control might predispose to such infection. Patients with chronic renal failure are prone to develop such infection to factors like contaminated medical devices.

B. cepacia is innately resistant to various antimicrobial agents including polymyxins, aminoglycosides, chloramphenicol and beta-lactams. Co-trimoxazole is used for the treatment of *B. cepacia* infection along with ceftazidime and meropenem, alone or in combination with other antibiotics [22]. Our study revealed majority of these isolates were susceptible to ceftazidime, minocycline, trimethoprim-sulfamethoxazole and meropenem which is correlating with other studies like Kwayess R et al [23] and Baul S.N et al [20] In our study, we found that the clinical outcome was favourable and only one patient succumbed which cannot be attributed to *B. cepacia* alone which is correlating with Baul S.N et al [20]

Majority of the studies have revealed contamination of antiseptic solution, mouth wash, IV fluid after environmental surveillance which is contrary to our study where even after a thorough environmental sampling source of *B. cepacia* could not be ruled out. As a part of infection prevention and control measures,all the health care workers of cardiac care unit were advised to strictly abide by hand hygienepractices and compliance of the unit was monitored by IPC team. Having achieved a good compliance in IPC measures no cases were identified with *B.cepacia* colonization in next three months.

CONCLUSION:

B.cepacia is an opportunistic pathogen initially reported from cystic fibrosis cases but now increasingly getting reported from non-respiratory samples of immunocompetent individuals. Intrinsic resistance to various antibiotics have made the treatment difficult. Blood stream infection due to *B.cepacia* in any ward of hospital should be red flagged as it indicates breaches in IPC measures. By continuing stringent infection control measures these outbreaks can be checked.

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