Original Article

Epidemiology of *Burkholderia cepacia* complex infections in a tertiary care centre

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Abstract

Burkholderia cepacia complex (BCC), is increasingly recognized as an important cause of infections in immunocompromised and other hospitalized patients[1]. The present study aims at isolation of BCC from clinical samples as well as to find out the risk factors associated with such infections. We could obtain 49 isolates of BCC from 8929 clinical samples with a maximum number of isolation (35) from blood culture. 20% of isolates were from patients above 60 years and 59.1% were from ICU cases. Based on the biochemical reactions performed on 22 BCC isolates, 20 belongs to *Burkholderia cepacia* genomic species, one was *B. cenocepacia* genomic species and the remaining one *B. stabilis*. Central venous /intravenous cannula, Foley's catheter, prolonged hospital stay, and prior antibiotic therapy were the predominant risk factors associated with. As a part of the surveillance study subsequent to the alarmingly increased BCC infections, we could isolate BCC from a hand rub used in the ICUs and instructions were given to change the hand rub. There after the isolation of BCC had decreased to a significant level. Continuous environmental surveillance and strict infection control policies have to be taken to prevent infections with this hospital pathogen.

Keywords: *Burkholderia cepacia complex* infections- risk factors- infection control policies.

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INTRODUCTION

Burkholderia cepacia complex (BCC), a phytopathogen first described in 1950 as the causative agent of onion rot [3], is emerging as an important cause of morbidity and mortality associated with infections in immunocompromised hospitalized patients. The original *Pseudomonas cepacia*, was renamed as *Burkholderia cepacia* in 1992 based on DNA-DNA hybridization studies and 16S r RNA sequence alignments[3]. BCC survives and multiplies in aqueous hospital environment, including detergent solutions and intravenous fluids where it may persist for long periods. 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. BCC has been reported as a cause of bacteremia, particularly in patients with indwelling catheters, urinary tract infection, septic arthritis, peritonitis and respiratory tract infections[1,4]. Among the Non Fermenting Gram Negative Bacilli (NFGNB), BCC is the fourth most common pathogenic, worldwide, after *Pseudomonas aeruginosa, Acinetobacter calcoaceticus-baumannii complex* and Stenotrophomonas maltophilia.[1] It has always been a tedious task for a routine microbiological laboratory to identify the NFGNBs, and poor laboratory proficiency in identification of BCC prevails worldwide, including our own country. For this reason, reports of disease due to this organism are less in India[5] It needs to be differentiated from Pseudomonas species as BCC has inherently contrasting susceptibility pattern to that of Pseudomonas species. Early detection and treatment with appropriate antibiotics of this organism is important because of its high transmissibility in the hospital setting, intrinsic resistance to many antibiotics and association with a poor prognosis.

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MATERIALS AND METHODS

The present study was conducted at Jubilee Mission Medical College and Research Institute, Thrissur, Kerala during the period from January 2012 to July 2012. Samples were collected from patients presented with the following clinical conditions: septicemia, wound infection, burn cases, cellulitis, UTI and respiratory tract infections including pulmonary tuberculosis. A total number of 8929 samples including blood, sputum, urine, catheter tips and pus were processed as per the standard procedures. BCC were isolated and data regarding the patient demographics, clinical profile and predisposing factors were collected and analysed. Identification and speciation of isolates were carried out by conventional laboratory techniques and were confirmed using Vitek 2 automated bacterial identification and susceptibility test system (Biomerieux).

RESULTS

Table No: 1: Sample wise distribution of BCC isolates

Sample	No. of samples	No. of BCC isolates	Percentage (%)
Blood	2771	35	1.26
Sputum	1026	4	0.39
Urine	3688	6	0.16
Pus	1444	4	0.28
Total	**8929**	**49**	**0.55**

Of the 49 clinical isolates of BCC 35 were from blood cultures (71.4%), six from urine and four each from sputum and pus.

Table 2: Age wise distribution of the patients

Age group	No. of patients	Percentage (%)
0-15	2	4
15-40	11	22
40-60	16	33
above 60	20	41

Table 3: Sex wise distribution of the patients

No. of patients	Male	Female
49	34 (69%)	15 (31%)

Table 4: Location wise distribution of the patients

Location		No. of patients	Percentage (%)
Intensive Care Unit (ICU)	Surgical ICU	8	16.33
	Coronary Care Unit	4	8.16
	Pediatric ICU	2	4.08
	Medical ICU	10	20.41
	Neuro Surgery ICU	1	2.04
	Critical Care Unit	4	8.16
	Total	29	59.18
Wards		19	38.78
Burns unit		1	2.04

Table 5: Risk factors associated with the BCC isolates

Risk factor	No. of patients	Percentage (%)
Diabetes mellitus	16	32.65
CVC/IV cannula	43	87.76
Urinary catheter	31	63.27
Ventilator	6	12.24
Malignancy	7	14.29
Surgery	17	34.69
Renal failure	12	24.49
Haemodialysis	2	4.08
Hepatic failure	6	12.24
Prolonged hospital stay	35	71.43
Prolonged ICU stay	25	51.02
Prior hospitalization	28	57.14
Prior antimicrobials	33	67.35

Based on the biochemical reactions performed on 22 BCC isolates, 20 were identified as *Burkholderia cepacia* genomic species, one as *B. cenocepacia* genomic species and the remaining one as *B.stabilis* genomic species[1,2].

DISCUSSION

Infections due to *Burkholderia cepacia complex* are seen mostly in cystic fibrosis patients and infections in immunocompetent patients occur only sporadically, but several cases of pseudo-epidemics and nosocomial infections, often caused by contaminated disinfectants and anesthetic solutions, have been reported[7]. BCC causes infections that include bacteremia, urinary tract infection, septic arthritis, peritonitis and respiratory tract infection. The present study was undertaken to identify BCC isolates, to analyze the patient demographic features, the clinical profile, risk factors associated with such infections from patients admitted at Jubilee Mission Medical College Hospital, Thrissur, Kerala. During the period of study, we have processed a total number of 8929 samples including blood, sputum, urine, catheter tips and pus from which we obtained 49 BCC isolates. In a similar study conducted at PGIMER, approximately 150 isolates of BCC were obtained within a period of four years (2006-2009)[9]. In comparison with the previous isolation rates of BCC in this institution, the isolation rate has increased alarmingly for the last 6 months which can be considered as an outbreak of BCC infections. The present study correlates well with the study conducted by Berkelman RL, who reported pseudo-bacteremia in four hospitals in New York over 6 months from April through October in which BCC was recovered from blood culture of 52 patients[10]. Outbreaks have been reported originating from diverse sources such as contaminated nebulisers, chlorhexidine solution, alcohol-free mouth wash, multi dose albuterol vials used amongst multiple patients, indigo-carmine dye used in enteral feeding, tap water, bottled water, cosmetics, napkins, nasal sprays and ultrasound gel[8]. Among the total number of 49 BCC

isolates, 35 (71.44%) were from blood culture. The study of ours correlates well with the study conducted by Gautam V, et al who reported that all BCC isolates from Escorts Heart Institute and Research Centre (EHIRC), Delhi were from blood cultures[8]. BCC bacteremia, most often in association with polymicrobial catheter-related infection, has been reported in patients with cancer and in patients undergoing hemodialysis[7]. On analyzing the age group of the patients, majority of isolations were from above 60 year age group which constitutes 41%. The rest of distribution was 4% in 0-15 year age group, 22% in 15-40 year age group and 33% in 40-60 year age group. Of the 49 isolates, 69% was from male patients. In an analysis of BCC isolates from the patients admitted in the different wards of PGIMER, Chandigarh by V Gautam et al an increased isolation rate was obtained from children admitted in the Advanced Pediatric Centre[9]. In the location wise distribution of the 49 patients, 59.18% was from ICUs, followed by 38.79% in wards and 2.04% in burns unit which correlates with the study conducted by Murat Dizbay et al in which the distribution of the patients was 61.5% in ICUs, followed by 38.46% in wards[11]. BCC being low virulent, infections are mostly seen in high risk patients only. Many of our patients had several predisposing factors such as diabetes, malignancy, renal failure, hepatic failure etc. The most frequent risk factors were invasive procedures such as intravenous catheters, mechanical ventilation, urinary and central venous catheters which might have enhanced the susceptibility of already compromised patients in the ICUs. In our study, other risk factors associated with the BCC isolated patients included urinary catheter (63.27%), ventilator (12.24%), surgery (34.69%), hemodialysis (4.08%), diabetes mellitus (32.65%) and malignancy (14.29%). Some more risk factors were also present in the study including renal failure (24.49%), hepatic failure (12.24%), prolonged hospital stay (71.43%), prolonged ICU stay (51.02%), prior hospitalization (57.14%) and prior antimicrobial use (67. 35%). In a study conducted by Murat Dizbay, et al the risk factors associated with infection includes urinary catheter (76.9%), ventilator (64.1%), malignancy (28.2%), diabetes mellitus (15.3%) and hemodialysis (12.8%)[11]. All the isolates which were preliminarily identified as BCC were further identified using automated ID system (Vitek 2). Such isolates were again subjected to various biochemical tests for confirmation of the identification and categorization into different genomic species. Based on the tests performed, twenty isolates can be included in the *Burkholderia cepacia* genomic species, one in the *B. cenocepacia* genomic species and the remaining one can be included in the *B.stabilis* genomic species. Of the 49 patients, 6 patients expired during the period of hospitalization, 43 patients recovered and were discharged. As the number of BCC isolation increased alarmingly in this institution during the last several months, the infection control committee formulated strategies to investigate the source of BCC isolates. As a part of this, a surveillance study was conducted and samples were collected from the hospital environments including different ICUs, wards, OTs and diverse sources such as detergent solutions, intravenous fluids, anesthetics, disinfectants, nebulizer solutions, mouthwash, distilled water and medical devices. We could isolate BCC twice from a hand rub used in the ICUs and instructions were given to change the hand rub. There after the isolation of BCC had decreased to a significant level. Continuous environmental surveillance and strict infection control policies have to be taken in all the health care settings in order to prevent infections with this saprophyte which is seen ubiquitously including the hospital premises. Isolates of BCC should be considered as non pathogenic unless proven otherwise. Appropriate isolation procedures rather than antimicrobial therapy should be used to control the spread of BCC colonization among patients.

CONCLUSION

BCC, a devastating pulmonary pathogen in cystic fibrosis patients, has also been reported as an emerging hospital pathogen. Due to its ability to thrive in the diverse range of environments, and being one of the most antimicrobial-resistant organisms encountered in the clinical laboratory, BCC contributes to increased morbidity and mortality in hospitalized patients. Various outbreaks and pseudo-outbreaks of BCC septicemia have also been documented in these patients. In the present study, in most of the patients there was a history of indwelling catheters, surgeries and other invasive procedures. Lack of proper asepsis during the procedures might have precipitated the infections. Therefore, strict reinforcement of infection control practices only can prevent nosocomial infections with BCC in the health care settings.

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