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Burkholdaeria Cepacia Infection In Immunocompetent Children: A Clinical Analysis Of 20 Cases

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ABSTRACT

Background: Burkholderia cepacia is an emerging opportunistic pathogen causing nosocomial infection in pediatric patient having cystic fibrosis and other underlying disease condition causing immunodeficiency. The clinical diagnosis and treatment of B. cepacian infection remains poorly studied. Burkholderia cepacia complex (Bcc) is a Gram-negative, oxidase-positive, non-fermenting saprophytic bacilli, belonging to the Burkholderiaceae family comprising twenty taxonomically valid species. Bcc is a devastating pulmonary pathogen in cystic fibrosis patient and has also been reported with increasing frequency as a cause of bacteremia, particularly in patients with indwelling catheters, urinary tract infection and peritonitis. This study will analyze the risk factors, antimicrobial sensitivity pattern, and clinicopathological spectrum of Burkholderia cepacia infection, aiming to improve the treatment of B. cepacia infection. Unlike other studies, we are studying B. Cepacia infection in immunocompetent children, as most of the patients were admitted for Lower respiratory tract infection and other infection without any chronic disease and immunodeficiency.

Objectives: Primary - To Analyze the clinical spectrum of Immuno-competent patients infected by B. cepacian.

Methods: This study has been approved by Institution and Ethics Committee (IEC) of IMS and SUM Hospital. In this retrospective analytical study based on the 20 cases of infection caused by B.cepacia in children (1 month to 14 years) without Immuno-deficiency, who were admitted in IMS and SUM Hospital since Past 6 Months showing any Culture (B.cepacia) Positive were included .Children having any underlying Immunodeficiency, Chronic Liver Disease and Chronic Kidney Disease were excluded.

Conclusion: B.Cepacia generally causes opportunistic infection in immuno- compromised children unlike our study which shows infection in immuno-competent children as well. A multi drug resistance is a challenging issue in such type of infections. Therefore, a high index of suspicion is required to monitor B.Cepacia infection and early institution of appropriate antimicrobial therapy.

Keywords: *Burkholderia cepacia , opportunistic pathogen, antimicrobial susceptibility, Immunocompetent*

1. INTRODUCTION

Burkholderia cepacia complex (Bcc) was named after Burkholder, a plant pathologist at Cornell University, who discovered it in 1949 as the cause of onion skin rot.1 Bcc was first described pathogenic in humans in the 1950s.[1] It was formerly known as Pseudomonas cepacia.[2] Bcc is a ubiquitous non-glucose fermenter aerobic Gram-negative bacillus composed of at least 20 different but phylogenetically closely related bacterial species. [3]

Burkholderia cepacia (*B. cepacia*) is the fourth most common pathogenic non-fermenting gram-negative bacillus (NFGNB) isolated from samples from hospitalized patients.[3] It is found ubiquitously in soil, water, fruits, and vegetables.[3–4] It is an emerging opportunistic pathogen causing variety of infections in immunocompromised and hospitalized patients having bacteraemia in patients with indwelling catheters, urinary tract infections, septic arthritis, peritonitis, and respiratory tract infections.[4,5] *B. cepacia* survives and multiplies in the aqueous hospital environment for a prolonged period. There are many nosocomial outbreaks documented in contaminated disinfectants, distilled water, 0.5% chlorhexidine solution, nebulizer solution, medical devices, and intravenous solution.[5,6] *B. cepacia* shows resistance to commonly used antimicrobial agents.[7] They can survive and multiply in the presence of disinfectants and indwelling invasive medical devices, thus acting as a potential reservoir for infections in the hospital setting (Donlan and Costerton, 2002). [8]. This group of pathogens is emerging and is of increasing concern in trauma patients with multiple injuries (Kim et al., 2016, de Oliveira and Lisboa Lde, 2010).[9] Inherent resistance to polymyxin & other antibiotics further complicate the clinical management of these infections (Rhodes and Schweizer, 2016).[10] Very few outbreaks due to this organism, involving contaminated water, contaminated medication, nebulization solution, antiseptic solution, and intravenous (IV) fluids, have been reported (Memish et al., 2009, Lucero et al., 2011, Martins et al., 2010).[11] Emerging amounts of clinical publications have attempted to demonstrate the clinical manifestation and management of paediatric B. cepacia infection. Several severe infections caused by B. cepacia have been reported in children, including sepsis, pneumonia, CNS infections, and urinary tract infections.[12, 13] Our study was performed to find out the risk factors, clinical presentation antimicrobial susceptibility of B. cepacia infection in immunocompetent children, in order to improve the strategies for treatment and outcomes.

2. RESULTS

MATERIALS & METHODS

Place of Study: Department of Paediatrics, IMS & SUM hospital.

Study Design: Retrospective analytical Hospital base study.

Study Period: April 2024 to April 2025.

Study Population and patient's selection: The study was conducted on a total number of 20 confirmed culture positive cases. All cases in the paediatric age group 1 months to 14 years of age.

Inclusion Criteria: BCC Culture positive cases admitted under department of paediatrics at IMS & SUM hospital. All cases in the paediatric age group 1 months to 14 years of age. Those patients who given consent to be included in the study.

Exclusion Criteria: Children aged <1 month and >14 years of age. Those patients who refuse to be included in the study

Clinical Characteristic	Value
Median Age	16 Months
Female /Male	7/13
Hospital Acquired	4(20%)
Nosocomial infection	16(80)
Urban	14(70%)
Rural	6(30%)

Table 1: Demographic Profile

In our study median age of presentation was 16 months, male outnumbered the female, Nosocomial infection was found to be more common than hospital acquired infection, maximum number of were from urban population as depicted in table no-1

Table 2: Scocio-Economic Status

VARIABLRS	Value
Upper Class	1(5%)
Upper middle	2(10%)
Lower middle	3(15%)
Upper lower	4(20%)
Lower	10(50%)

Most of our cases (50%) belong to low socioeconomic status as described in table 2.

TABLE 3: Clinical characteristics

Clinical Characteristics	Value
RespiratoryTract infection	11(55%)
Bloodstream Infection	4(20%)
UTI Infection	2(10%)
CNS Infection	3(15%)

In our study it is found that BCC is most commonly associated with respiratory tract infection (55%), next is blood stream infection (20%). Urinary tract infection is also seen in 10% cases (Table no 3).

TABLE 4: Comorbidities

Underlying Comorbidities	Value
Cardiovascular Disorders	1(5%)
Respiratory Disorders	3(15%)
CNS Disorders	1(5%)
GI Disorders	1(5%)
Urinary T abnormality	1(5%)

Malignancy	1(5%)
No Underlying disease	12(60%)

In our study it is found that maximum number of cases (60%) were seen in immunocompetent children without any underlying illness. (Table no 4)

Antibiotics	**Sensitive %**	**Inter-mdiate**	**Resistant %**
Ceftazidime	17 (85%)	1 (5%)	
TMP-SMX	14 (70%)	-	2 (11%)
Meropenem	16 (80%)	1 (5%)	1 (5%)
Cefepime	6 (30%)	1 (5%)	1 (5%)
Levoflaxin	12 (60%)	2 (10%)	8 (40%)
Piperacillin tazobactum	7 (35%)	-	8 (40%)
Doxycycline	18 (90%)	1 (5%)	1 (5%)
Aztreonam	2 (10%)	1 (5%)	2 (10%)

TABLE 5: Culture and antibiotic sensitivity Patterns

Our study clearly shows that Doxycycline is the most sensitive antibiotic (90%), next to it is Ceftazidime (85%). Most of the cases showed resistance to Levofloxacin and Piperacillin tazobactam (40%) as depicted in Table 5.

TABLE 6 Outcome

Clinical Outcome	Cure	Death
With Disease	8	1
Without Underlying cause	12	0
ICU Stay	16	1

In our study it is found that out of total 20 cases all cases without any underlying disease got cured ,one case with underlying comorbidities died and 16 cases required ICU stay with one mortality as depicted in table 6.

3. DISCUSSION

B. cepacia is one of the major causes of Hospital acquired outbreaks owing to its resistance to a number of antimicrobial agents and disinfectants [14]. In our study hospital acquired infection was seen in only 20% cases it may be due to better infection control measures taken in our hospital. It has been reported that *B. cepacia* causes various infections in children, including bacteremia, pneumonia, urinary tract infection, endocarditis, meningitis, and brain abscess. [15]. According to

SirinavinS et al.'s study, respiratory tract infections (15/16) were the most common, followed by blood infections (5/16) [16]. In a study by Tugba et al., 37% of children presented with bacteraemia, and 25.9% with pneumonia (including ventilator-associated pneumonia)[17]. In our study most of the children's presented with respiratory tract infection (55%) followed by Blood Stream infection (20%) and CNS infections (15%). Few cases also presented with UTI (10%). In healthy individuals B. Cepacia rarely causes Life threatening infection. In Recent times incidence of B. cepacia is more common in the children who have been admitted in a Pediatric intensive care unit for a Prolonged Period and undergone invasive procedures especially Endotracheal intubation followed by Central venous catheter.

According to the Sanford guide to antimicrobial therapy, the recommended antimicrobial agents against *B. cepacia* were levofloxacin, TMP-SMX, meropenem, ceftazidime, and minocycline [18]. According to a Korean study [19], the antibiotic susceptibility rates of *B. cepacia* were compared to our results including meropenem (78.57% vs. 82.98%), TMP-SMX (71.43% vs.88.68%), minocycline (66.67% vs. 42.86%), ceftazidime (64.29% vs. 95.65%), and levofloxacin (50% vs. 55.85%).A study by Chun-Hsing Liao and colleagues[20] found that *B. cepacia* isolates were sensitive to meropenem (100%), ceftazidime (97.3%), levofloxacin (5.5%) and minocycline (5.5%). In our study doxycycline and Ceftazidime was found to be sensitive in 90% and 85% cases respectively. Most of the cases were resistant to piperacillin tazobactam(40%) and Levofloxacin (40%). As a result of our study, the most frequent isolation of *B. cepacia* culture was the respiratory tract secretions (55%), followed by the blood (20%) and urinary tract (10%).

Conclusion: B.Cepacia generally causes opportunistic infection in immuno- compromised

children unlike our study which shows infection in immuno-competent children as well. A multi drug resistance is a challenging issue in such type of infections. therefore, a high index of suspicion is required to monitor B.Cepacia infection and early institution of appropriate antimicrobial therapy to prevent morbidity and mortality.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships with no conflict of interest.

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