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Study of *Burkholderia cepacia* Complex Isolated from Clinical Infections in a Tertiary Care Hospital in Telangana

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ABSTRACT

Background: *Burkholderia cepacia* complex (Bcc) has often been associated with opportunistic infections in immunocompromised patients. The members of this genus are intrinsically resistant to the polymyxin and a few other groups of drugs. BCC is often associated with infections in patients with cystic fibrosis, and it can cause infections after invasive procedures such as urethral instrumentation and indwelling central venous catheters (CVCs) in intensive care units.
Aims and objectives: We studied isolates belonging to Bcc and analysed their antibiotic profiles. The objective of the study is to assess the distribution of *B. cepacia* isolates according to clinical specimen categories, hospital wards, patient gender and age.
Methods: A retrospective observational study was conducted at our institute. All clinical specimens from inpatients and outpatients from whom *Burkholderia cepacia* complex (Bcc) was isolated were included in this study.
Results: A total of 7855 clinical samples were received for culture. Of these, 1171 specimens were found to be positive in culture, and out of these, 41 Burkholderia cepacia complex (0.52%) were isolated. These isolates showed susceptibility to ceftazidime in 83%, meropenem in 74%, levofloxacin in 47%, minocycline in 41%, and trimethoprim-sulfamethoxazole combination in 91%. Almost 44% isolates were from urine, around 32% from blood and 15% from respiratory samples; the remaining were from other samples.
Conclusion: Bcc is gaining importance as a nosocomial pathogen, and another worrying factor is that these isolates usually exhibit multidrug resistance.

Keywords: Burkholderia cepacia complex; multidrug resistance; nosocomial

INTRODUCTION

Burkholderia cepacia complex (Bcc) is emerging as an important cause of morbidity and mortality associated with infections in immunocompromised hospitalised patients[1]. Bcc complex comprises Gram-negative bacilli, which are motile and oxidase positive and frequently misidentified as non-fermenting Gram-negative bacilli[2]. Bcc survives, multiplies and may persist for long periods in moist hospital environments, including detergent solutions and intravenous (IV) fluids[3]. Infections caused by *Burkholderia cepacia*

include bacteremia, urinary tract infections, septic arthritis, peritonitis and respiratory tract infections, particularly in patients with Cystic Fibrosis (CF)[4]. They have been known to cause outbreaks in the ICU, dialysis units, transplant patients, etc. Bcc's endurance to pharmaceutical products and devices makes them function as a potential reservoir of infection in hospital settings, facilitating outbreaks in the event of breaches in infection prevention and control practices (IPC). The patient-to-patient transmission also contributes to Bcc colonisation. Bcc often exhibits intrinsic resistance to several antibiotics, such as penicillin, aminoglycosides, polymyxins, fosfomycin, and first and second-generation cephalosporins, limiting the available treatment options [5]. We aimed to ascertain the prevalence and antimicrobial resistance pattern of B. cepacia at our tertiary care teaching hospital and advance our understanding of infections caused by Bcc.

MATERIALS & METHODS

A retrospective observational study was conducted after approval by the Institutional Ethics Committee. Study was done on samples received for one year (2024) at our tertiary care teaching hospital All specimens such as urine, respiratory samples (sputum, endotracheal and tracheal aspirate, and broncho-alveolar lavage), pus, blood, and sterile body fluids (pleural fluid, cerebrospinal fluid, ascitic fluid) received for culture and antimicrobial susceptibility test were included in the study. The samples were processed in the microbiology laboratory at our institute. The specimens were processed as per standard operating procedure. Cultures were streaked on appropriate media, e.g., blood and McConkey's agar for all samples except urine, where CLED medium (Cystein Lactose Electrolyte Deficient medium) was used. Identification and antimicrobial susceptibility tests were performed using the Vitek 2 Compact system (BioMérieux, Marcy-l'étoile, France) as per the Clinical and Laboratory Standards Institute (CLSI) guidelines. The antimicrobials tested were ceftazidime, meropenem, minocycline, levofloxacin, and trimethoprim–sulfamethoxazole. The patient's demographic details and location in the hospital were collected from the request forms. Duplicate isolates from the same patient specimen were excluded from the study. The data was analysed using Microsoft Excel.

RESULT

A total of 7855 samples were received during the period of the study. 41 Bccs isolates were recovered during this period, and the isolation rate was 0.52% (Table 1). The most common patient age group was ≥46 - ≤60 years (37%), followed by ≥60 years (32%), ≥19 - ≤45 (24%) and < 18 (7.3%) (Table 2). Males (*n*=20) were almost equal in number to females (*n*=21). Urine specimen (44%) were the most common specimens from which *B. cepacia* was isolated followed by Blood and body fluids (29%) respiratory specimens (15%), pus (7%) and other miscellaneous samples were (5%) (Figure 1) 32% *B.cepacia* isolates were received from intensive care units(ICU), 17% from surgical wards, 12% from medical wards, 10% were from TB &chest department, 7% from high dependency units, urology (5%), cardiothoracic and vascular surgery (CTVS) 5%t, orthopaedics 5% and 7% from other wards followed by those from the medical intensive care unit (Figure 2). *B. cepacia* antimicrobial resistance was seen more commonly to levofloxacin (40%), minocycline (35%), ceftazidime and meropenem (17%) and least in trimethoprim–sulfamethoxazole (8%) (Figure3).

Table 1. Isolation of Bcc

Total sample	7855
Positive isolates	1911
Bcc	41

Table 2. Age wise distribution of Bcc isolates

Age Range	Number
Age<18 years	7
≥19 - ≤45 years	24
≥46 - ≤60 years	37
>60 years	32

Fig 1: Isolation of Bcc from different clinical specimens

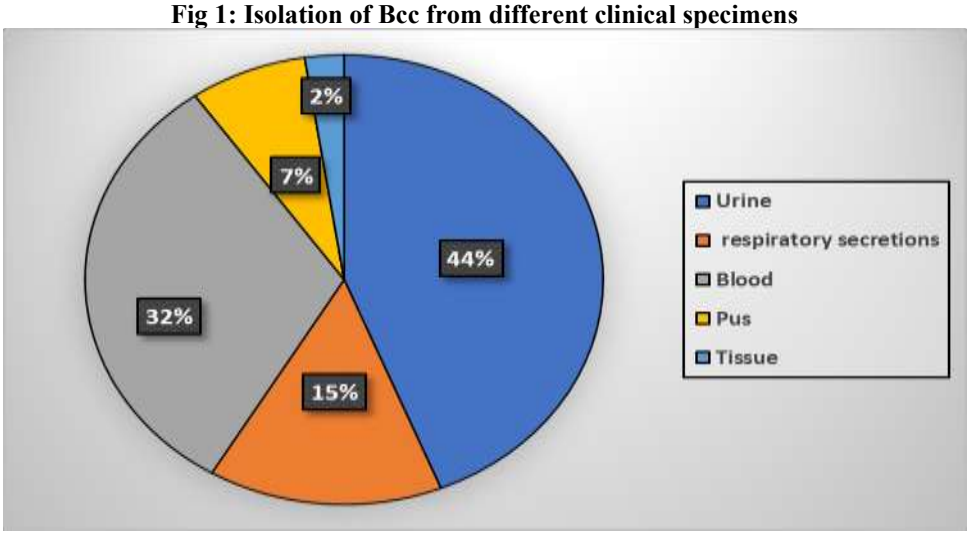


Figure 2. Isolation of *B. cepacia* according to location

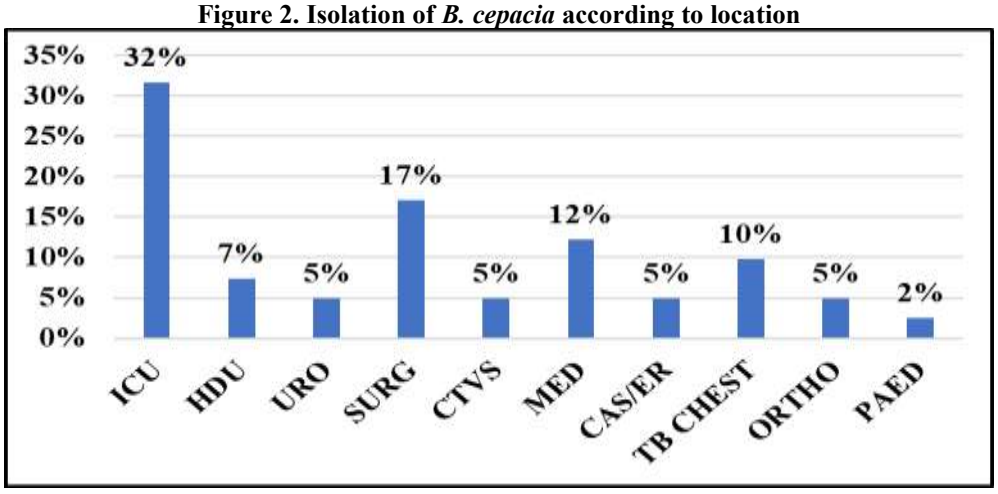
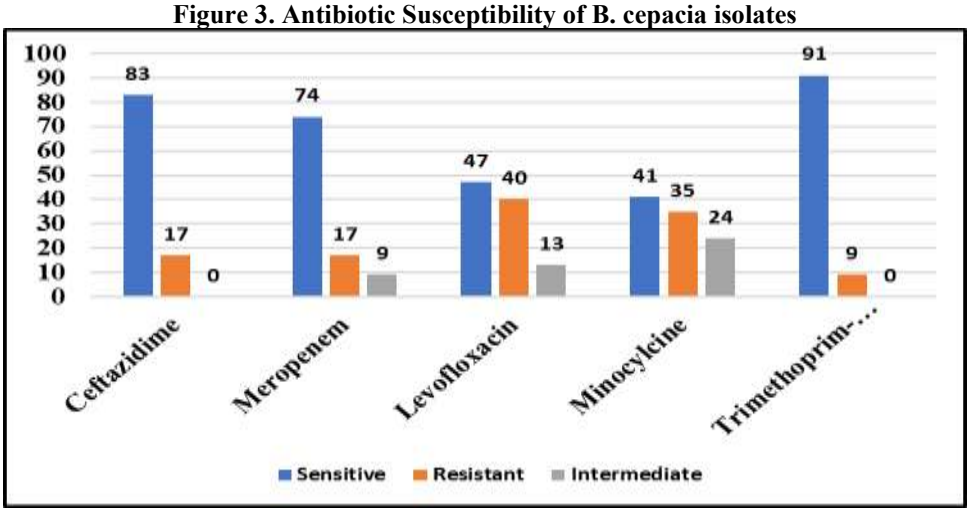


Figure 3. Antibiotic Susceptibility of B. cepacia isolates



DISCUSSION

Burkholderia cepacia complex (Bcc) nosocomial infections are not routinely reported and documented due to the difficulty in identification by routine biochemical tests. They are usually identified as Pseudomonas species or non-fermenters in many microbiology labs. The rate of isolation in our hospital was 0.54%, which is comparable to a study by Patel N et al. (0.54%) [3] and a study by Shukla et al. (0.9%) [2]. Some studies have reported higher isolation rates than ours, like Kady et al (5.3%)[6.] The geographical region, sample size, demographic difference and duration of study may all have contributed to this variation. The number of males and females from whom Bcc was almost the same, whereas most studies, e.g. Gangaram et al and Kumar et al, report male preponderance over females[7]. The patients of the age group of ≥ 46 to ≤ 60 years were the most common 37% from whom Bcc was isolated, followed by the age group of > 60 years 34% and then 19 to ≤45 years (24%), which is similar findings by Mohankumar et al[1].

The present study showed that the highest isolation was from urine samples (44%), followed by blood (32%), and then respiratory secretion (about 15%). Other studies have isolated the Bcc from blood and respiratory tract more commonly like Padma SS et al[8]. About 32% Bcc isolates were from specimens received from intensive care units (ICU), which is about 1/3rd of the total, which is similar to studies by Shukla et al [2] and Mohan Kumar et al[1]. The prevalence in ICU could be more due to increased usage of invasive procedures.

The Bcc isolates were most susceptible to trimethoprim-sulphamethoxazole (91%), which is similar to a study by Bhavana et al[9].This was followed by Ceftazidime (83%), Meropenem (74%), Levofloxacin (47%) and Minocycline (41%), respectively. This is similar to a study by Kumaresan M et al [10]. Our study did not find any multidrug-resistant isolates of Bcc at our institute. This study provides valuable insights into the prevalence and antibiotic susceptibility of Bcc at our institute. Our isolates were mostly susceptible to trimethoprim-sulfamethoxazole and ceftazidime; as a result of this study, our clinicians can make an empirical choice in treating the Bcc isolates.

As it was a retrospective study, we were unable to correlate them and study the outcome clinically. Cystic fibrosis, chronic granulomatous disease, immuno-compromised individuals, infants, elderly are all known to be susceptible to Bcc infection[11]. In the case of hospitalized non-cystic patients, the risk factors commonly noted are catheterization (venous or bladder), endotracheal tubes in mechanical ventilated patients, hemodialysis, and long hospitalization periods in intensive care units[12]. Sudden outbreaks are also increasingly being reported both in immunocompromised and hospitalized patients, mostly because of various contaminations during hospitalization[7]. Bcc survives in moist environments in hospitals and has been isolated from disinfectants, distilled water, nebulizer liquid and intravenous solutions[13,14].

The limitations of this study are that we could not perform molecular confirmation of these isolates due to a lack of funds. We plan to study the possible sources of infection further and identify any lapses in infection prevention and control practices

CONCLUSION

Burkholderia cepacia complex are a group of nosocomial agents with high mortality and they are known to exhibit multidrug resistance. Although the prevalence of Bcc was only 0.54% at our institute, more than 30% isolates were from ICUs. Bcc is known to cause septicaemic outbreaks in intensive care settings, which would require rational and prompt treatment. Strict infection prevention practices and periodical antibiograms will in addition play a significant role in controlling these infections.

Declaration by Authors
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