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Original Research Article

Burkholderia cepacia an emerging cause of septicaemia, in an intensive care unit from a tertiary care hospital, Nellore, India

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ABSTRACT

Background: *Burkholderia cepacia* is highly virulent and multidrug resistant organism to cause fatal and serious infections in ICUs leads to rise in mortality and morbidity. aim of present study was to know the prevalence of *Burkholderia cepacia* in blood stream infection in Intensive Care Unit and to know the drug susceptibility.
Methods: This is a prospective study was carried out in the Intensive Care Unit and Department of Microbiology, Narayana Medical College, Nellore, from February to March 2018. As a part of routine investigations Blood, urine, sputum or tracheal secretions sent for culture and sensitivity to the Microbiology laboratory. By conventional method, all the samples were cultured (except blood) onto Blood agar, Chocolate agar and MacConkey, s agar; incubated for 18-24 hours at 37^0C. Blood cultures were performed in BACT/ Alert 3D (Biomeriux), only positives were subculture by conventional method. Further analysis was done in culture positive samples only.
Results: A total of 448 patients admitted in ICU were included in the study, from them 586 samples were collected. out of which we got 238 culture positives. Among them 19 patients were positive for *Burkholderia cepacia*, most of them isolated from blood (78.9%), followed by respiratory secretions (21.1%) and none of them were isolated from urine samples. Most of the isolates were sensitive to Meropenam and Tigecycline (89.4%) followed by minocycline (84.2%), ceftazidime (73.6%), levofloxacin (63.1%). While *B. cepacia* isolates showed high resistance to cefaperazone-sulbactam, ciprofloxacin, ticarcillin-clavulanic acid with (84.2%), (89.4%), (89.4%) respectively.
Conclusions: To conclude that, *Burkholderia cepacia* is one of the emerging causes of septicemia with multidrug resistance, cross contamination may be the root cause so it should be treated quickly and effectively.

Keywords: *Burkholderia cepacia*, Drug susceptibility, Intensive care unit, Septicaemia

INTRODUCTION

In 1950 *Burkholderia cepacia* an aerobic, non fermenter gram negative bacilli is first recognized as a phytopathogen causes onion rot.[1] *Burkholderia cepacia* in the last few decades evolved as an important opportunistic human pathogen, in particular as a cause of life-threatening lung infections in individuals with Cystic Fibrosis (CF) and chronic granulomatous disease.[2,3] Eradication of *B. cepacia* is difficult because of its innate multidrug resistance. The intrinsic resistance is because of mechanisms of resistance include changes in lipopolysaccharide structure, the presence of several multi drug efflux pumps, altered penicillin binding proteins and also strongly associated with the development of biofilms.[4,5]

Infections caused by *Burkholderia cepacia* include bacteremia, urinary tract infections, septic arthritis, peritonitis and respiratory tract infections; particularly in patients with Cystic Fibrosis (CF). Outbreaks of *Burkholderia cepacia* septicemia have been documented

worldwide in ICUs, oncology units and renal failure patients.[6,7] Here authors report a prevalence of BCC from an intensive care unit over a period of 2 months.

METHODS

The present hospital based cross sectional study was carried out in the intensive care unit and Department of Microbiology, Narayana Medical College, Nellore, from February to March 2018. Among 448 patients aged above 20 years who were admitted in Intensive care unit in the month of February- March 2018 were included in this study. As a part of routine investigations Blood, urine, sputum or tracheal secretions sent for culture and sensitivity to the Microbiology laboratory. By conventional method, all the samples were cultured (except blood) onto Blood agar, chocolate agar and MacConkey,s agar; incubated for 18-24 hours at 37^0c. Blood cultures were performed in BACT/ Alert 3D (Biomeriux), only positives were subculture by conventional method. Further analysis was done in culture positive samples only.

Figure 1: Non-hemolytic colonies of *Burkholderia cepacia* on blood agar.

Figure 2: Non-lactose fermenting colonies of *Burkholderia cepacia* on MacConkey's agar.

In positive cases the isolates were identified to the species level by conventional biochemical tests. After 24 hours of aerobic incubation, typical large, circular, low convex, moist β hemolytic colonies was observed on Blood agar (Figure 1) and non-lactose fermenting colonies on MacConkey's agar (Figure 2). On Gram staining Gram negative bacilli were seen, they were motile, oxidase positive. *B. cepacia* isolates were confirmed by Vitek 2 compact system. Antibiogram of the isolate was performed in accordance with CLSI-2018 guidelines Antibiotic susceptibility tests (MIC) were performed by Vitek 2 compact system on Tigecycline, minocycline, meropenem, ceftazidime, levofloxacin, cotrimoxazole, cefoperazone-sulbactam, ciprofloxacin, ticarcillin-clavulanic acid. The data was analyzed and interpreted.

RESULTS

A total of 448 patients who were admitted in ICU are included in the present study, from them 586 samples were collected, out of which authors had 238 culture positives. Among them 19 patients show typical colony morphology of *B. cepacia*, later confirmed by Vitek 2 compact system, the rate of isolation was 7.9% which was shown in the Pie diagram (Figure 3).

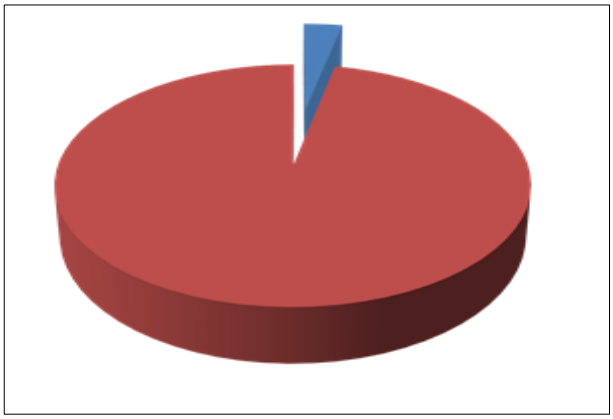

Figure 3: Rate of isolation of *Burkholderia cepacia*.

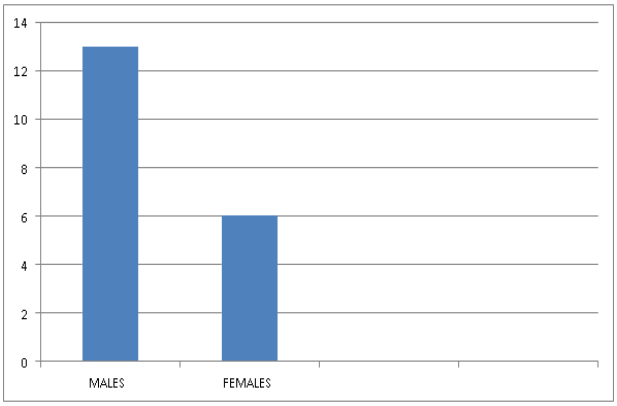

Figure 4: Sex distribution of *Burkholderia cepacia* isolates.

Among the isolates which were showed positive for *Burkholderia cepacia*, in the present study Males were

predominantly affected, i.e. 13 patients (68.4%) when compared to Females were 6 patients (31.6%). Male to Female ratio was 2.1:1 (Figure 4).

Out of 19 patients who were shown positive for *Burkholderia cepacia*, highest rate of isolation were from Blood cultures 15 patients (78.9%), followed by Endotracheal Tube cultures 3 patients (15.7%), one patient from tracheal secretion (5.2%), and none of the patients were shown positive from urine samples which were represented in Bar diagram (Figure 5).

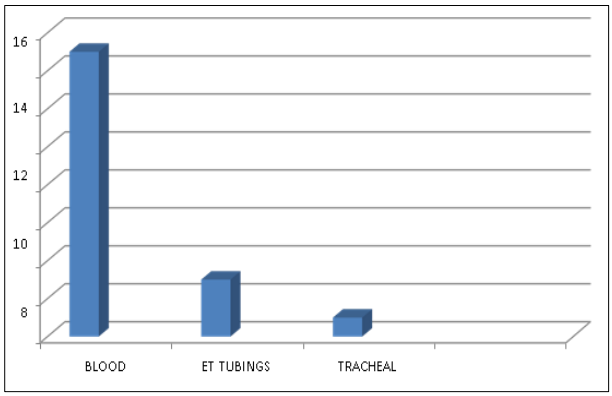

Figure 5: *Burkholderia cepacia* isolates from different samples.

Antibiotic susceptibility tests (MIC) were revealed that Tigecycline, Meropenam were the most effective antibiotics against *B. cepacia* with susceptibility percentage (89.4%) followed by minocycline (84.2%), ceftazidime (73.6%), levofloxacin (63.1%). They exhibited moderate sensitivity to cotrimoxazole (47.3%), while *B. cepacia* isolates showed high resistance to cefaperazone-sulbactam, ciprofloxacin, ticarcillin-clavulanic acid with (84.2), (89.4), (89.4) respectively (Table 1).

Table 1: Percentage of antibiotic sensitivity.

Antibiotics	Percentage of sensitivity	Percentage of resistance
Tigecycline	89.4	10.6
Meropenam	89.4	10.6
Minocycline	84.2	15.8
Ceftazidime	73.6	26.4
Levofloxacin	63.1	36.9
Co. Trimoxazole	47.3	52.7
Cefaperazone-Sulbactam	15.8	84.2
Ciprofloxacin	10.6	89.4
Ticarcillin-Clavulanic acid	10.6	89.4

DISCUSSION

Septicemia will occur when rate of multiplication of bacteria in blood is more than that of body defense mechanism. According to many studies, most of septicemia in ICUs are because of ESKAPE organisms, but occurrence of *B. cepacia* is rare.[8] But nowadays incidence of *B. cepacia* in the form of sudden outbreaks are increasing both in immunocompromised and hospitalized patients, mostly because of various contaminations during hospitalization.[9-11] Isolation and identification of *Burkholderia cepacia* is difficult because of its slow growing nature and variable biochemical reactions.

In many hospitals reports of sporadic cases of *B. cepacia* nosocomial infections are rare, mostly due to poor laboratory ability in detection of this organism in routine testing, they are simply reported as Pseudomonas species.[12,13] This explains there is a lack in reporting the incidence of *B. cepacia*, so this study aimed to report the rate of isolation of *B. cepacia* in patients admitted to the ICU of Narayana Medical college and Hospital. The rate of isolation of *B. cepacia* was found to be 7.9% (19), that to males were predominantly affected 68.4% (13) than females 31.6% (6). In a study done by Bhise et al, show 100% isolation rate of *B. cepacia* in cases of neonatal septicemia in the ICU.[14] Gales et al, show the *B. cepacia* rate of isolation was found to be 47%.[15] In comparison to the above studies, this study shows the prevalence rate of 7.9% (19) which was low.

But when compare to Omar et al, the isolation rate was 1.7%, this study shows high prevalence rate.[16] The rate of isolation (7.9%) of this study nearly correlates with the study done by Hadir El Kady et al, found that *B. cepacia* rate of isolation was 5.3% (8/150).[17] The reasons for varying in results may be attributed to the fact that variation in geographical distribution, sample size, duration of study period, socioeconomic factors, infection control practices in various hospitals.

In the present study, out of 19 patients who were shown positive for BCC, highest rate of isolation were from Blood 78.9% (15), followed by ET tubing 15.7% (3), 5.2% (1) from tracheal secretions and none of the urine samples were isolated *Burkholderia*. The study done by Gales et al, found that 62.7% of BCC were isolated from blood, 30.1% from sputum, 3.6% from skin and soft tissue infection and 3.6% from urine. According to Omar et al, the highest percentage of *B. cepacia* was isolated from pus (85.7%) followed by sputum (11.4%) and urine (2.9%). By this to say that *Burkholderia* most commonly a bloodstream infection, followed by respiratory, genitourinary and local site infection.

Burkholderia cepacia (BCC) is an intrinsically resistant to antimicrobial agents such as aminoglycosides, first and second generation cephalosporins antipseudomonal penicillin's and polymyxins. As per the CLSI 2017 guidelines, the drugs recommended against BCC are Levofloxacin, meropenem, cotrimoxazole ceftazidime, minocycline and chloramphenicol.[18]

In the current study antibiotic susceptibility tests (MIC) were revealed that Tigecycline, Meropenam were the most effective antibiotics against *B. cepacia* with susceptibility percentage (89.4%) followed by minocycline (84.2%), ceftazidime (73.6%), levofloxacin (63.1%). They exhibited moderate sensitivity to cotrimoxazole (47.3%), while *B. cepacia* isolates showed high resistance to cefoperazone-sulbactam, ciprofloxacin, ticarcillin-clavulanic acid with (84.2), (89.4), (89.4) respectively.

The study done by Omar et al, reported that *B. cepacia* isolates 88.5% susceptibility to Meropenem, 60% ceftazidime, followed by 40% Chloramphenicol, 5.8% Tetracycline. All are 100% resistant to both Co-trimoxazole and Ciprofloxacin. Hadir El Kady et al, found that *B. cepacia* isolates were 100% susceptible to ceftazidime, meropenem and piperacillin-tazobactam, followed by cefepime (87.5%), co-trimoxazole and minocycline (50%) and colistin (37.5%). All strains (100%) were resistant to both ciprofloxacin and ticarcillin-clavulanate.

Comparing the results of this study most of the isolates were sensitivity to Meropenem and Ceftazidime which were suggested by the CLSI 2017 guidelines, with varying sensitivity to other drugs.

On the other hand, this study showed highly resistance (89.4%) to Ciprofloxacin, which was almost similar to Omar et al, and Hadir El Kady et al, (100%). From various studies finally we want show that there were variations in the results of drug susceptibility which may be because of various antibiotic policies followed in different countries. So, there is need to properly isolate and test more strains of *B. cepacia* to gain therapeutic benefit.

Authors conducted routine surveillance to find out source of infection, so authors collected samples from tap water, water from nephrocabin oxygen flowmeter, sink drains, incubator surfaces, respiratory devices, suction machine, suction catheter and swabs from various high touched and low touched areas and antiseptic solutions.

They were inoculated in blood culture bottles in bact/ alert 3d (biomeriux) for 6 days. Water which was used in Nephrocabin oxygen flowmeter culture incriminated as the source of bacteremia. All the patients recovered on antibiotic therapy chosen according to in vitro susceptibility.

CONCLUSION

The prevalence of *B. cepacia* in hospital is not so high but they were mostly responsible for septicaemia. Ongoing surveillance and prompt investigation of unusual diseases outbreak are vital for identifying sources of contamination of *B. cepacia* and avoiding undesirable consequences for immunocompetent and immunocompromised patients. Effective antibiogram is needed to control the *B. cepacia* like opportunistic infections.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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