Microbiological and Clinical profile of *Burkholderia cepacia* infection in patients admitted at Rural based teaching Multispeciality hospital

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Abstract

INTRODUCTION: Non fermenting Gram negative bacilli have emerged as significant pathogen causing life threatening infections in hospital settings. Among these *Burkholderia cepacia* complex is an important nosocomial pathogen .BCC causes spectrum of clinical infections that include bacteraemia, urinary tract infection, septic arthritis, peritonitis and respiratory tract infections.BCC shows intrinsic resistant to many β-lactam drugs, aminoglycosides, colistin, and polymyxin B. This is a retrospective laboratory-based study conducted at rural based multispeciality hospital in Vadodara. BCC was isolated among 27 patients. Its clinical spectrum and antibiotic sensitivity pattern was studied and analysed. **MATERIAL AND METHOD:** The retrospective study was conducted in the Department of Microbiology for a period of 11 months from January to November 2020. The isolates were identified through biochemical tests. Confirmative diagnosis for *B. cepacia* isolates was done by automated Vitek2 Compact system Biomerieux. Antibiotic susceptibility test of *B. cepacia* isolates were determined by Kirby's Bauer disc diffusion method according to CLSI 2020. **RESULTS:** *Burkholderia cepacia* was isolated among 27 patients .Male to female ratio 2:1. Highest prevalence 33% was noted in age group 20-40.BCC was potent pathogen causing blood stream infection among ICU patients. BCC were most susceptible to Minocycline (93%) followed by Co-trimoxazole (67%) followed by Meropenem (60%), Ceftazidime (60%) . All strains (100%) were resistant Amikacin and Ciprofloxacin. **CONCLUSION:** BCC has emerged as potent nosocomial pathogen and plays important role in causing blood stream infections among ICU patients.BCC showed intrinsic resistance to various antibiotics which leads to therapeutic failure. Thus prompt diagnosis is essential step to reduce mortality and establish infection control practices.

KEYWORDS: Burkholderia cepacia , Bacteremia,Minocycline

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INTRODUCTION:

Non fermenting Gram negative bacilli have emerged as significant pathogen causing life threatening infections in hospital settings.Among these *Burkholderia cepacia* complex is an important nosocomial pathogen .*Burkholderia cepacia* complex (BCC) are a taxonomically diverse group of gram negative bacteria that do not utilize glucose as a source of energy or utilize it oxidatively.[1,2]BCC causes spectrum of clinical infections that include bacteraemia, urinary tract infection, septic arthritis, peritonitis and respiratory tract infections.BCC is widely distributed in the natural environment such as soil and water.[3] It has ability to survive and multiply in the diverse range of hospital environments such detergent solutions, intravenous (IV) fluids, and antiseptic solutions.[4,5] BCC is commonly isolated from instruments such as ventilator machine, humidifiers, mattresses, and other equipment as well as from the skin of health-care workers.[6]

BCC shows intrinsic resistant to many β-lactam drugs, aminoglycosides, colistin, and polymyxin B.Due to high intrinsic resistance encountered in the clinical laboratory this infections can prove fatal. Various mechanisms like antibiotic efflux pumps, biofilm formation, impermeability of the cell wall, alterations of intracellular targets and inactivation of drugs or enzymic degradation are responsible for high degree of resistance.[5]

This is a retrospective laboratory-based study conducted at rural based multispeciality hospital in Vadodara.BCC was isolated among 27 patients. Its clinical spectrum and antibiotic sensitivity pattern was studied and analysed.

MATERIAL AND METHOD:

The retrospective study was conducted in the Department of Microbiology for a period of 11 months from January to November 2020. Clinical samples were collected under strict aseptic precautions before starting antimicrobial treatment .The blood culture bottels were incubated in BACTEC 9050.The sample was inoculated on MacConkey Agar and Blood Agar plates. The culture plates were incubated aerobically for 24 hrs at 37 ^{o}C . Growth and cultural characteristic were observed next day. Non lactose fermented colonies on MacConkey's agar were selected and sub cultured to obtain pure

culture. Various morphological characteristics of colonies including size, shape, colour, pigmentation and odor were recorded. The isolates were identified through biochemical tests. Confirmative diagnosis for *B. cepacia* isolates was done by using Gram-negative GN identification card automated Vitek2 Compact system Biomerieux.

To check the disc potency representative discs were tested against reference strains *E. coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC 27853.The zone of inhibition was compared with standard value as recommended by CLSI (2020).Antibiotic susceptibility test of *B. cepacia* isolates were determined by Kirby's Bauer disc diffusion method according to CLSI 2020 (Clinical and Laboratory Standard Institute) guidelines. Mueller-Hinton plates were inoculated with a 0.5 McFarland standard suspension of *B. cepacia* organisms, and antibiotic disks were placed. Zones of growth inhibition were recorded in millimeters after overnight incubation.

The following antibiotics were used:

1) Ceftazidime (30ug) -CAZ

2) Meropenem (10ug)- MRP

3) Minocycline(30ug)- MINO

4) Levofloxacin MIC (0.002-32ug/ml)- LEVO

5) Trimethoprim-sulfamethoxazole(1.25/23.75ug)- COT

6) Amikacin (30ug) -AK

7) Ciprofloxacin(5ug) -CIPRO

RESULTS:

This retrospective study was carried out from January to November 2020 at Department of Microbiology. Total 2844 clinical sample were processed. Out of which *Burkholderia cepacia* was isolated among 27 patients .Among 27 patients 8 were female and 19 were male .Male to female ratio 2:1.

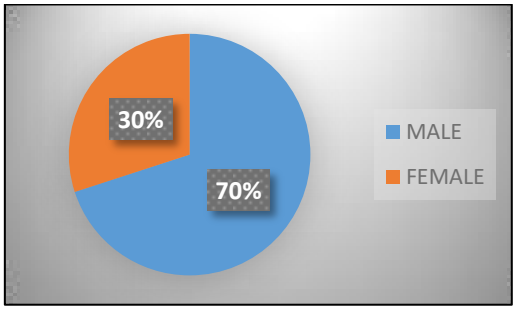

Figure 1: Distribution of *B. cepacia* isolates according to gender

In the present study prevalence of *Burkholderia cepacia* was studied according to age of patient. Highest prevalence 33% was noted in age group 20-40 followed by 26% in age group 41-60, 19% in age group <20 and equal prevalence of 11% in age group <1 and >61 years.

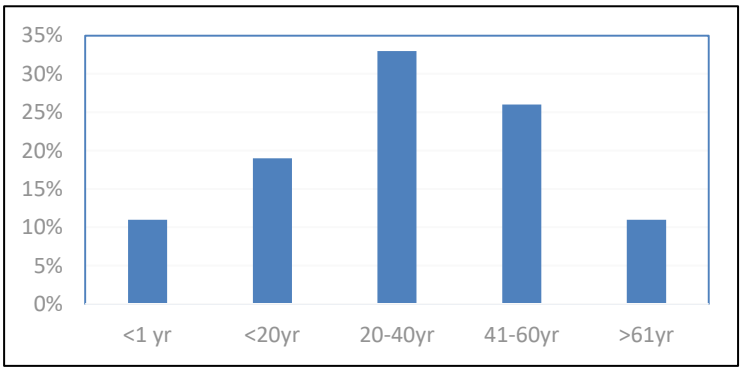

Figure 2: Distribution of *B. cepacia* isolates according to Age

The clinical samples included BAL fluid, blood culture, aspirated pus, sputum, central tip, tracheal aspirate and urine. Prevalence of Burkholderia isolates was highest from blood culture.

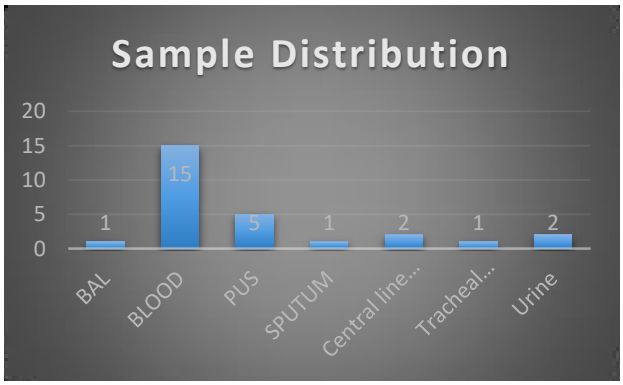

Figure 3: Distribution of *B. cepacia* isolates in different clinical specimens .

Among 27 patients 3 were admitted at Neonatal ICU,5 at Paediatric ICU,9 in Medical ICU,3 in Male medicine ward, 6 in Male surgical ward and 1 in OBGY ward. Out of 3 neonates 2 were having low birth weight at the time of delivery. Among neonates clinical features like respiratory distress, decreased food intake and reduced activity were observed. Out of 5 patients at PICU 2 were on mechanical ventilation. Out of 9 patient admitted at MICU 3 were immunocompromised and 2 were on central venous catheter.In male surgical ward 2 had history of post operative wound infection.

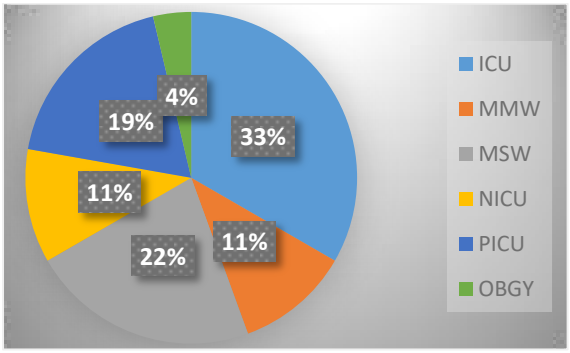

Figure 4: Distribution of *B. cepacia* isolates in different clinical wards

Burkholderia cepacia exhibits wide range of resistant to many antimicrobial agents which limits the therapeutic options.In the current study isolates of BCC were most susceptible to Minocycline (93%) followed by Co-trimoxazole (67%) followed by Meropenem (60%) , Ceftazidime (60%) .BCC isolates showed 20% susceptibility to Levofloxacin. All strains (100%) were resistant Amikacin and Ciprofloxacin. Thus Minocycline is drug of choice for *Burkholderia cepacia* infections.

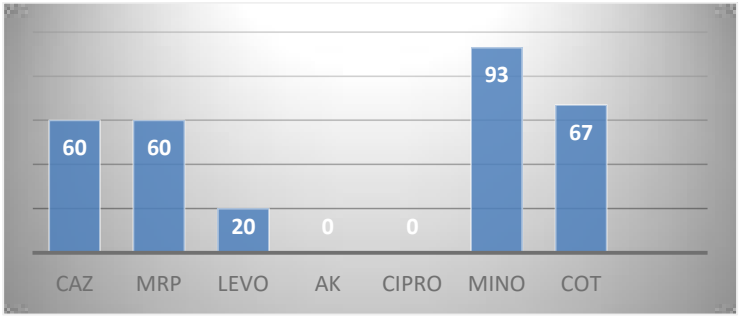

Figure : 5 % Antibiotic Sensitivity of *B. cepacia* isolates

DISCUSSION:

Burkholderia cepacia has emerged as important nosocomial pathogen of humans .It leads to life threatening infections due to its intrinsic resistant properties to various antibiotics. BCC causes fatal infections especially among those who have an indwelling catheter, are on ventilators, have cystic fibrosis, or have immune dysfunction. In the present study 70% of BCC isolates were from male patient and 30% from female patient.This gender distribution was compatible with Keating and Schaffer 2015 [6]who reported similar findings. In the present study highest prevalence of *Burkholderia cepacia* infection was observed in age group of 20-40 years(33%).The findings of this study are similar to study conducted by Alla Fahim Abbas [5] were highest prevalence of 40% was obsereved in age group of 20-40 years. The present study revealed that the highest percentage of *B. cepacia* isolates were isolated from blood culture specimens 15/27(55.5%) followed by pus swabs 5/27(18.5%).These findings are similar to study carried out by Tseng *et al*., 2014[8] that showed significant higher proportion of *B. cepacia* isolates were recovered from blood (68.2%).While study carried out by Gospodarek *et al*.[9] reported that *B. cepacia* is responsible for (70.2%) of urinary tract infections, (7%) of surgical wound infections, and (8%) of CSF, while no *B. cepacia* were detected in sputum and blood . Our present study revealed that Minocycline is the most effective antibiotic against *Burkholderia cepacia* with (93%) of antimicrobial sensitivity followed by Co-trimoxazole (67%) , Ceftazidime (60%) and Meropenem (60%). All strains were resistant to Amikacin and Ciprofloxacin.The similar findings were establised in study conducted by Samia kirmani et al[1] were Minocycline showed 95% sensitivity among BCC isolates. In our study Meropenem showed 60% sensitivity while in study conducted by Dizbay et al[13] and Gautam et al[12] it was 51.3% and 36.7% respectively. The present study showed 60% sensitivity to Ceftazidime which was similar to findings of Omar et al [7] .Dizbay et al [13] showed lower Ceftazidime sensitivity of 38.5%. These variations of antibiotic susceptibility results are probably explained by the different antibiotic policies used in the hospital.These findings also emphasize even more the need to isolate and test reliably more strains of BCC to review the therapeutic measures.

CONCLUSION:

Among gram negative bacteria BCC has emerged as potent nosocomial pathogen. BCC played important role in causing blood stream infections among ICU patients.BCC showed intrinsic

resistance to various antibiotics which leads to therapeutic failure.Thus prompt diagnosis is essential step to reduce mortality and establish infection control practices.

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