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A MICROBIOLOGICAL STUDY OF BURKHOLDERIA CEPACIA ISOLATED IN BLOOD CULTURES OVER PERIOD OF TWO YEARS

Microbiology

Rajani Chavan Consulting Microbiologist, MicroPath Laboratory, Kolhapur
Manisha Kulkarni Consulting Pathologist, MicroPath Laboratory, Kolhapur
Vijay Kulkarni* Assistant Professor, Dept. of Microbiology, RCSM, GMC, Kolhapur *Corresponding Author

ABSTRACT

Introduction: Burkholderia cepacia is aerobic, non spore forming, straight, slender, Gram negative bacilli, its transmission usually involves human contact with heavily contaminated medical devices or substances encountered in hospital settings. Burkholderia cepacia copmplex (BCC) has been isolated from various water sources, wet surfaces including detergent and disinfectants and intravenous solutions. Hospital outbreaks are often associated with single contaminated source. **Material And Methods**: In our laboratory we have received total 4248 samples for automated blood culture in BacT/ALERT 3D (BioMérieux, Inc, Durham, NC) system in the period from January 2019 to December 2020 , blood cultures indicating growth has been processed for Gram staining and subcultured on MacConkey agar, Blood agar. Identification of organism was done by biochemical reactions and Vitek 2 (BioMerieux, France). **Results:** Out of 4248 blood culture samples, 529 were found to be positive for bacterial growth. Total 147 blood cultures were positive for B. cepacia. All stains of B. cepacia were resistant to Polymyxin B and Colistin. Majority strains were susceptible to Meropenem, Ceftazidime, Ceftazidime Tazobactum. **Conclusion:** As patient to patient or healthcare worker to patient transmission occurs, contact with contaminated surfaces and exposure to B. cepacia in the environment, outbreak prevention is important. Strengthening of Infection control practices such as hand hygiene and active surveillance has major role. Improved antibiotic stewardship and infection-control measures are also important.

KEYWORDS

Burkholderia cepacia, Blood Culture, Hospital outbreaks, HAI, Antibiotic Susceptibility

INTRODUCTION

Burkholderia species is aerobic, non spore forming, straight, slender, Gram negative bacilli, motile with polar flagella. It is inhabitant of environment and not considered as part of human flora. Their transmission usually involves human contact with heavily contaminated medical devices or substances encountered in hospital settings.[1]

Burkholderia cepacia which is among the *Burkholderia* species is complex of 10 distinct genomic species isolated from clinical specimens. These organisms are able to survive on or in medical devices and disinfectants. Intrinsic resistance to multiple antimicrobial agents contributes to organisms survival in hospitals.

B. cepacia has emerged as cause of opportunistic infections especially in patients with chronic granulomatous diseases and cystic fibrosis. These bacteria often associated with spread of 'Cepacia syndrome' which is manifested as severe respiratory failure and bacteremia.[1]. *B. cepacia* is capable of person to person transmission and cross infections occurs within patients. Virulence of this bacteria is due to cblA Cable associated pilin subunit gene that mediated adherence to mucus glycoproteins and epithelial cells.[1]

BCC has been isolated from various water sources, wet surfaces including detergent and disinfectants and intravenous solutions. Hospital outbreaks are often associated with single contaminated source such as anesthetic solutions, IV fluids, Nebulizers, disinfectants, mouthwashes, medical devices including respiratory therapy devices.[1,3] This bacteria grows well in povidine-iodine, chlorhexidine, quaternary ammonium compounds.[4]

Clinical infections includes pneumonia and pneumonitis in patients receiving contaminated anaesthetics, urinary tract infections in patients receiving contaminated irrigation fluids following catheterization or cystoscopy, septicemia, endocarditis, septic arthritis may occur surgery. Peritonitis may occur following peritoneal dialysis with contaminated povidine iodine solution.[1,4]

Early detection and treatment with appropriate antibiotics of this organism are important because of its high transmissibility in the hospital setting, intrinsic resistance to many antibiotics, and association with poor prognosis.

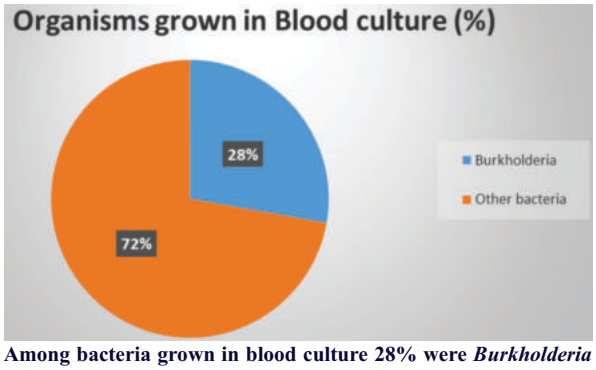
MATERIALS AND METHODS

In our laboratory we have received total 4248 samples for automated blood culture in BacT/ALERT 3D (bioMérieux, Inc, Durham, NC) system in the period from January 2019 to December 2020 , blood cultures indicating growth has been processed for Gram staining and subcultured on MacConkey agar, Blood agar. *Identification of organism was done by biochemical reactions and* Vitek 2 (BioMerieux, France).

B. cepacia was isolated on aerobic MacConkey agar, Blood agar. The bacteria were motile, non-lactose fermenting, catalase and oxidase positive, identification of organism is done on Vitek 2. Antibiotic susceptibility test was done by using Kirby–Bauer disk diffusion methods as per the Clinical Laboratory Standards Institute (CLSI) guidelines.

RESULTS

Out of 4248 blood culture samples, 529 were found to be positive for bacterial growth. Total 147 blood cultures were positive for *B. cepacia*, rest 382 grown other organisms which includes *Salmonella typhi, Klebsiella pneumoniae, E.coli, Enterobacter species, Acinetobacter species, Pseudomonas aeruginosa, Staphylococcus aureus* and *Candida* species.

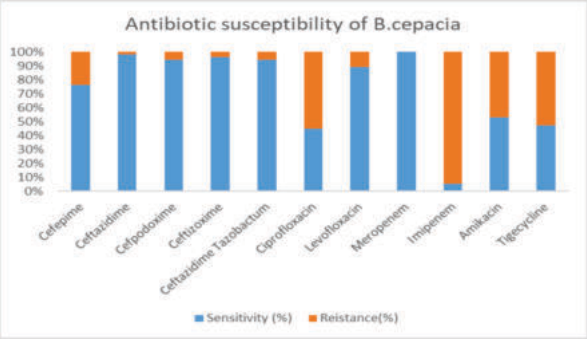


Among bacteria grown in blood culture 28% were *Burkholderia cepacia*.

Antibiotic susceptibility testing of *B. cepacia* done and results were as follows:

Antibiotics	Susceptibility (%)
Cefepime	76.36
Ceftazidime	98.18
Cefpodoxime	94.54
Ceftizoxime	96.36
Ceftazidime Tazobactum	94.54

Ciprofloxacin	45
Levofloxacin	89.09
Meropenem	100
Imipenem	5.45
Amikacin	52.72
Tigecycline	47.27



All stains of *B.cepacia* were resistant to Polymyxin B and Colistin. Susceptibility to Meropenem was 100%. Majority strains were susceptible to Ceftazidime, Cefpodoxime, Ceftizoxime and Ceftazidime Tazobactum.

DISCUSSION

Gram negative bacteremia is one of important nososcomial infections. Non fermenters like *Acinetobacter, Pseudomonas, Burkholderia, Stenotrophomonas* are important pathogens causing nososcomial infections and are multidrug resistant, and hence difficult to treat.[5]

B.cepacia is being increasingly recognized as an important pathogen of humans in both immunocompromised and immunocompetent patients who are infected by contact with contaminated equipment during hospitalization. Several predisposing factors are causative for developing *B.cepacia* bacteremia. Outbreaks can occur through exposure to contaminated solutions such as antiseptics, disinfectants, nebulizer solution, and dextrose solution in hospitalized patients. This organism colonizes water supplies, filter membranes, and antiseptic solutions. Inadequate catheter care, defects in membrane integrity, and the reprocessing of dialyzers have all been implicated in outbreaks in hemodialysis units.[6]

In a study by Gomez et al. surveillance was carried out after *B.cepacia* bacteremia outbreak in hemodialysis unit, This organism was detected in the 2.5% chlorhexidine solution and in the water used to dilute the chlorhexidine at station.[7] An outbreak has also occurred because of Multidose Amikacin vials.[8]

In this study all strains of *Burkholderia* were susceptible to Meropenem. Sensitivity to Piperacillin tazobactum, Ceftazidim, ceftazidim tazobactum is also good. A study by Meena et al. which shown sensitivity to Piperacillin/tazobactam (100%), levofloxacin (100%).[9] Maximum resistance was observed against ceftazidime (93%) followed by meropenam (53%) In study by Baul et al, *Burkholderia* strains sensitive to Piperacillin tazobactum and Meropenem, but very less strains were sensitive to ceftazidim.[10] Sensitivity to Amikacin was 52% and ciprofloxacin 45%. In study by Grover et al all strains were strains were resistant to Amikacin and ciprofloxacin. In our study all strains were resistant to colistin which is in contrast to study by Srinivasan et al where sensitivity to colistin was 93%.[11]

In our study majority *B.cepacia* were isolated from patients from Hemodialysis units and ICUs. As bacteraemia due to Burkholderia cepacia is quite in high in this study and indicates hospital outbreak, we have done outbreak investigation in hospitals and related units also. We are presenting study from laboratory where we are receiving samples from different hospitals and clinics, detail history of patients is limited.

CONCLUSION

As these strains are multidrug resistant and patient to patient or healthcare worker to patient transmission occurs, contact with contaminated surfaces and exposure to *B. cepacia* in the environment outbreak prevention is important. Strengthening of Infection control practices such as hand hygiene and active surveillance has major role. Improved Antibiotic Stewardship and infection-control measures will be needed to prevent or slow the emergence and spread of multidrug-resistant, nonfermenting Gram negative bacilli in the healthcare setting.

Early detection and treatment with appropriate antibiotics of this organism are important because of its high transmissibility in the hospital setting, intrinsic resistance to many antibiotics, and association with poor prognosis.

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