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ORIGINAL ARTICLE

Burkholderia Cepacia, an Emerging Nosocomial Pathogen in Neonates

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ABSTACT

Aim: To determine the prevalence of burkholderia cepacia infection at neonatal intensive care unit at Liaquat University Hospital Hyderabad/ Jamshoro.

Study Design: Retrospective study

Place and Duration: Department of Pathology Diagnostic and Research Laboratory LUMHS, Hyderabad. August 2017-September 2018.

Methods: Total 140 neonates were presented in this study. Each case's blood sample was extracted and prepared for five days of incubation on the BACT ALERT 3D at 37 degrees Celsius. Blood culture-verified BCC infections were examined in this investigation within the first 72 hours of admission. Analysis has been done on the nosocomial B. cepacia pattern's antibiotic susceptibility. All data was analysed using SPSS 23.0.

Results: There were 85 (60.7%) females and 55 (39.3%) males among all cases. Neonates mean age was 9.25±4.31 days. Most of the neonates had normal mode of delivery 90 (64.3%) and C-section was in 50 (35.7%) cases. According to antibiotic susceptibility in our study, most sensitive antimicrobial agents were Piperacillin/tazobactam 98%, Meropenem 98%, Minocycline 85% and Cefotaxime 80% and resistant agents were resistivity of Amikacin 99%, Ampicillin 99%, Cefixime 95% and Aztreonam 90%.

Conclusion: This study revealed the high prevalence of Burkholderia cepacia infection in neonatal intensive care unit patients, and urgent need for an effective Intervention to control this outbreak.

Keywords: Burkholderia cepacia, Neonates, Antibiotic susceptibility, Nosocomial infection

INTRODUCTION

Nosocomial infections are caused by the opportunistic pathogen Burkholderia cepacia, a member of the Pseudomonas species. It is an aerobic, motile, non-lactose fermenting bacillus. It most often occurs in intensive care units and produces lethal necrotizing pneumonia and bacteremia, particularly in immunocompromised patients and those with cystic fibrosis and chronic granulomatous illness.

Extended hospital stays, greater use of broad-spectrum antibiotics, and infections associated with indwelling devices have all contributed to a rise in Burkholderia cepacia infections. It has been discovered that this bacterium taints nebuliser solutions, dextrose solutions, disinfectants, and antiseptic solutions. Burkholderia cepacia infections should be considered because of their high mortality rate in ICU settings because to antibiotic resistance.

Pseudomonas cepacia has been identified as B. cepaci, after being distinguished from Pseudomonas by molecular analysis. At first, one particular kind of bacterium was suspected. Nevertheless, 24 closely related Burkholderia species, including B. multivorans, B. cenocepacia, and others that can be distinguished by biochemical and molecular techniques, are currently included in the BCC [1,2]. BCC members are aerobic, catalase-producing, Gram-negative bacteria that are not thought to be typical components of the human flora [3]. They have a lengthy water survival time and natural resistance to a number of antibacterial substances [4]. BCC strains are nosocomial opportunistic bacteria that can lead to serious infections in children, particularly in those with immunodeficiency, cancer, congenital heart disease, or long-term respiratory conditions. These infections most frequently manifest as bloodstream, urinary tract, and respiratory tract infections and can cause outbreaks from a variety of causes [5]. Neonatal critical care unit (NICU) outbreaks involving BCC infections are typically documented. BCC is a significant infectious agent category that can potentially cause community-acquired infections in places with poor access to healthcare, according to a small number of studies in the literature [6]. These infections can also be nosocomial infections.

The B. cepacia complex consists of 17 genetically different but phenotypically related species. B. cenocepacia, B. multivorans, B. dolosa, and B. gladioli are the species having the most medical significance. B. multivorans and B. cenocepacia are responsible for around 90% of human infections[7,8].

Small hospital outbreaks happen frequently and are typically caused by a single contaminated source, such as mouthwash, medical devices, nebuliser solutions, disinfectants, and respiratory therapy equipment. Since B. cepacia contamination linked to medical equipment or disinfectants has been linked to false-positive bacteremia and pseudo-outbreaks, the isolate's relevance must be evaluated in relation to the patient's clinical features [9].

Because the microbes are inherently resistant to the majority of antibiotics, including polymixins, suitable antimicrobial treatment is difficult to implement. Meropenem, a carbapenem, seems to be the most effective agent. Unfortunately, unless combinations of up to four medications are administered, human illnesses are typically incurable. To stop the spread of extremely transmissible strains, strict controls on infection, such as segregation, are required [10].

MATERIALS AND METHODS

This retrospective study was conducted at Department of Pathology Diagnostic and Research Laboratory LUMHS, Hyderabad and comprised of 140 neonates of B. cepacia infection.

Blood agar, Cystine Lactose Electrolyte Deficient (CLED) agar, and aerobic MacConkey agar were used to isolate B. cepacia from urine samples. Each case's blood sample was extracted and prepared for five days of incubation on the BACT ALERT 3D at 37 degrees Celsius. Little gram-negative rods were visible with gramme stain. The Vitek 2 (BioMerieux, France) was utilized for the identification of bacteria and the assessment of antimicrobial drugs' in vitro activity against clinical isolates of B. cepacia. Vitek is an automated method that assesses antibiotic susceptibility by phenotype, identifies the tested organisms, and analyses MIC patterns. Due to the limitations of automated

technologies, traditional biochemical testing was used to authenticate the isolates' identities. Only isolates that passed both tests were included in the study. The bacteria were motile, positive for both catalase and oxidase, and did not digest lactose. Utilised oxidatively were lactose, glucose, and maltose. In accordance with the requirements of the Clinical Laboratory Standards Institute (CLSI), an antibiotic susceptibility test was also conducted using Kirby-Bauer disc diffusion methods. Between the two approaches, no significant differences were discovered. All data was analysed using SPSS 23.0.

RESULTS

There were 85 (60.7%) females and 55 (39.3%) males among all cases. Neonates mean age was 9.25±4.31 days. Mean gestational age at the of delivery was 37.12±8.43 weeks. Most of the neonates had normal mode of delivery 90 (64.3%) and C-section was in 50 (35.7%) cases.(Table 1)

Table-1: Demographics of the neonates

Variables	Frequency	Percentage
Gender		
Male	85	60.7
Female	55	39.3
Mean age (days)	9.25±4.31	
Mean gestational age at the of delivery (weeks)	37.12±8.43	
Mode of delivery		
Normal	90	64.3
C-section	50	35.7

Neonates with burkholderia cepacia has respiratory infection in 48 (34.3%) cases, neoplasm in 22 (15.7%) cases, dengue and malaria in 25 (17.9%) cases and head injury in 17 (12.1%) cases.(table 2)

Table-2: Patients' clinical diagnosis when Burkholderia was identified

Variables	Frequency (140)	Percentage
respiratory infection	48	34.3
neoplasm	22	15.7
dengue and malaria	25	17.9
head injury	17	12.1
other	28	20

According to antibiotic susceptibility, most sensitive antimicrobial agents were Piperacillin/tazobactam 98%, Meropenem 98%, Minocycline 85% and Cefotaxime 80% and resistant agents were Amikacin 99%, Ampicillin 99%, Cefixime 95% and Aztreonam 90%.(figure 1)

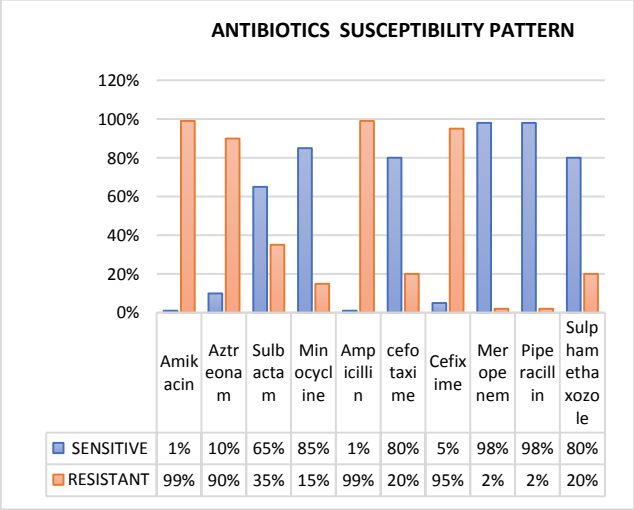

Figure-1: Pattern of antibiotic susceptibility

DISCUSSION

In healthy persons, B. cepacia rarely causes infection; but, in those with underlying disorders like cystic fibrosis, cancer, or CGD, it can cause potentially fatal infections.As stated in [11]. In children with weakened immune systems and previously healthy paediatric patients admitted to the intensive care unit, B. cepacia may be the source of hospital infections, according to a study by Kim et al.In [12]

Between 0.05 and 0.12 instances of infective endocarditis were reported annually per 1000 paediatric hospital admissions in a study that used data from a paediatric health information system database (2003 to 2010) [13]. CHD, rheumatic heart condition, and central venous catheterization are among the well-known risk factors for paediatric infective endocarditis. A primary risk factor for paediatric infective endocarditis is an indwelling central venous catheter, as was the situation with our child [14]. Premature and critically unwell babies are at risk. Premature babies' undeveloped immune systems are considered to be one of the risk factors. The development of infective endocarditis in these paediatric populations appears to be significantly influenced by the increased use of indwelling catheters. Other intracardiac devices including implanted cardioverter-defibrillators, pacemakers, prosthetic valves, and ventriculoatrial shunts also enhance the risk [15, 16].

In our study 140 neonates burkholderia cepacia infection were included. There were 85 (60.7%) females and 55 (39.3%) males among all cases. Neonates mean age was 9.25±4.31 days. Most of the neonates had normal mode of delivery 90 (64.3%) and C-section was in 50 (35.7%) cases. Results were inline with the previous studies.[17,18] Although Pseudomonas species or Burkholderia cepacia are frequently classified as NFGNB in microbiological studies, their treatment choices and susceptibility to antibiotics differ. Variable resistance to β-lactams, chloramphenicol, fluoroquinolones, and trimethoprim, and intrinsic resistance to aminoglycosides and polymyxins are observed in BCC. Multidrug resistance was found in our isolates when we determined their Minimum Inhibitory Concentration. Studies have demonstrated that despite the great resistance of BCC species, several antibiotic combinations have demonstrated a satisfactory response. Ceftazidime, minocycline, meropenem, and cotrimoxazole are the recommended medications for treating BCC. Treatments using meropenem, ciprofloxacin, and tobramycin, as well as ceftazidime and tobramycin, have been reported to be successful.[19,20]

According to antibiotic susceptibility in our study, most sensitive antimicrobial agents were Piperacillin/tazobactam 98%, Meropenem 98%, Minocycline 85% and Cefotaxime 80% and resistant agents were resistivity of Amikacin 99%, Ampicillin 99%, Cefixime 95% and Aztreonam 90%. Our results were comparable to the studies conducted in past[21-23] Due to their innate resistance to the majority of antibiotics, including antibiotics, polymyxins B, and colistin, BCC infections present a challenge for appropriate antimicrobial therapy [24]. Ceftazidime, meropenem, and co-trimoxazole, either separately or in combination, have been identified as prefered medications [25]. Depending on the centre, antibiotic resistance may vary. Five years of monitoring data from Turkey revealed that 50% of BCC infections (mostly pneumonia) had resistance to amikacin, carbohydrates, cefepime, ciprofloxacin, & co-trimoxazole; 61% had resistance to ceftazidime [26].

Multi-drug-resistant bacteria should also be treated with empirical antibiotic therapy when treating a case that is referred from another medical centre and for which enough information is unavailable. During this cluster, we had to employ meropenem in clinical trials because our centre took a large number of cases from across borders. The clinician may consider changing to a narrower-spectrum antibiotic (e.g., ceftazidime if a BCC is discovered) or stopping the antibiotic completely if there is no infection in order to prevent an increase in resistance to antibacterial agents.

For the purpose of early identification and outbreak resolution, it is imperative to conduct continuous surveillance for BCC and to promptly initiate infection control investigations into any clusters of infection and colonisation. In order to stop patients from contracting BCC, strict infection control procedures are essential. Patients can be cohorted to stop the spread if isolating them is not practical.

CONCLUSION

This study revealed the high prevalence of Burkholderia cepacia infection in neonatal intensive care unit patients, and urgent need for an effective Intervention to control this outbreak.

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