

Outbreak of bloodstream infection with extended-spectrum β -lactamase-producing *Klebsiella pneumoniae* at a Teaching Hospital

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Abstract

Introduction: *Klebsiella pneumoniae* (*K. pneumoniae*) is an important hospital-acquired pathogen causing severe infections in neonatal units. Several outbreaks of infection caused by multi-drug-resistant *K. pneumoniae* isolates have been widely reported among neonates. The aim is to investigate an outbreak of blood stream infection caused by Extended-Spectrum β -Lactamases (ESBL) producing *K.pneumoniae* in a Neonatal Intensive Care Unit (NICU) at Teaching Hospital Kandy, Sri Lanka.

Materials and Methods: Blood culture samples were collected from the neonates on admission to the NICU and 2 to 3 days later on clinical suspicion of blood stream infection. The blood culture samples were processed according to the standard methods and the antibiotic susceptibility tests were carried out as per Clinical Laboratory Standards Institute (CLSI) guidelines. **Results:** Of the 140 blood cultures 36 were identified as Extended-Spectrum β -Lactamases (ESBL) producing *K.pneumoniae*. All the isolates were susceptible to ciprofloxacin, amikacin, netilmicin, imipenem and meropenem. Twenty eight of the 36 patients responded to treatment with a combination of amikacin and meropenem.

Conclusion: ESBL producing *K.pneumoniae* was responsible for this outbreak at the NICU. Knowing the susceptibility patterns of clinical isolates will allow the rational use of antibiotics, which is important in the treatment of infections with multi-drug-resistant bacteria.

Key words: Blood stream infections, *Klebsiella pneumoniae*, Neonatal intensive care unit

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Introduction

Klebsiella pneumoniae is an important hospital-acquired pathogen with the potential of causing severe infections in neonatal units^{1,2}. For neonates in high-dependency units, hospital acquired bloodstream infections are an important cause of morbidity and mortality³.

Several outbreaks of infection caused by *K. pneumoniae* isolates that are simultaneously resistant to broad-spectrum cephalosporins and aminoglycosides have been widely reported¹.

Some of these multidrug-resistant isolates produce extended-spectrum β -lactamases (ESBLs) that are able to hydrolyze extended-

spectrum cephalosporins (eg. ceftriaxone, cefotaxime, and ceftazidime), aztreonam, and related oxyimino- β -lactams. (4)

The objective of this study was to investigate an outbreak of blood stream infection caused by extended-spectrum β -lactamases (ESBL) producing *K.pneumoniae* in a neonatal intensive care unit (NICU) at Teaching Hospital Kandy, Sri Lanka during the period December 2009 to January 2010.

Materials and Methods

This study was carried out at the NICU at the Teaching Hospital Kandy, Sri Lanka, which experienced an outbreak of blood stream infections during the period 2nd December 2009 to 17th January 2010.

Blood culture samples were taken from all the neonates who were admitted to the NICU during this period. The blood cultures were taken on admission to the NICU and 2 to 3 days later on clinical suspicion of blood stream infection. The clinical diagnosis or suspicion of neonatal septicaemia was made by the paediatric unit responsible for the care of the patient.

Blood culture samples were collected aseptically and bottles showing evidence of growth after overnight incubation at 37°C were promptly sub-cultured into MacConkey, Blood and chocolate agar media and incubated in appropriate temperature, atmospheres according to established methods. The clinical isolates were identified by Gram's staining, colony characteristics and the findings were confirmed by the API 20E system. The antibiotic susceptibility tests and the detection of ESBL were carried out as per Clinical Laboratory Standards Institute (CLSI) guidelines.

Results

During this period 145 neonates were admitted to the NICU at Teaching Hospital Kandy, and a total of 140 blood cultures were collected from them. All the initial blood culture samples collected from the neonates on admission to the NICU were negative. Seventy six (54.28%) of the 140 blood culture samples which were collected 2 to 3 days after admission to the NICU became positive for bacterial growths, while 64 (45.71%) yielded no growth. Of the 76 positive cultures 48 (63.15%) were pure growths. Of the 48 pure cultures 36 (75%) isolates were identified as ESBL producing *K.pneumoniae* and 12 (25%) isolates were identified as coagulase negative staphylococcal species.

All the isolates of *K pneumoniae* shared the in vitro susceptibility to gentamicin, amikacin, netilmicin, imipenem and meropenem. All the clinical isolates were resistant to cefotaxime, ceftazidime and ceftriaxone.

Twenty eight of the 36 patients responded to treatment with a combination of amikacin and meropenem. Eight of the 36 patients died of sepsis in spite of appropriate antibiotics.

Discussion

The Neonatal Intensive Care Unit (NICU) at the Teaching Hospital Kandy, Sri Lanka experienced an outbreak of 36 cases of *K.pneumoniae* blood stream infections during the period 2nd December 2009 to 17th January 2010.

The most significant finding of this study was that all the *Klebsiella pneumoniae* isolates were resistant to commonly used antibiotics and were extended spectrum β -lactamase producers (ESBL).

The significant morbidity and mortality arising from intra-hospital infection with multi-drug-resistant strains of *K.pneumoniae*, as seen in this report, is reason for alarm.

The high incidence of ESBL producing *K.pneumoniae* septicaemia and the antibiotic susceptibility pattern, indicate that the infection was most probably nosocomial in origin.

It appears that the lack of control of contamination sources and hand hygiene has caused the dissemination of the microorganisms among patients. However, there was no direct evidence of the source of contamination or transmission of the multidrug-resistant strains, although it was possibly due to transitory hand contact through health care workers⁵.

Conclusion

Knowing the susceptibility and resistance patterns in these types of clinical isolates will allow the implementation of improved therapeutic measures and the rational use of antibiotics, which are indispensable tools in fighting infectious diseases caused by multidrug resistant bacteria.

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