

**CASE REPORT**

Enterobacter Hormaechei: New Neonatal Infection in Morocco

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Abstract:**Introduction:**

Enterobacteria are gram-negative bacilli, found in soil, water, and especially in humans and animals gut. They include a very large number of genera and species, often involved in human clinical specimens, predominately *E. cloacae* and *E. aerogenes*. *Enterobacter hormaechei* was suggested in 1989 as a new member of enterobacter family, during the last twenty years they were responsible for nosocomial infection in hospitalized adult patients, some information is available on their virulence-associated properties. They are very rare in the newborn.

Case Reports:

We report five cases of *E. hormaechei*'s infection; first case in our department: neonatal ICU, at Mohamed VI University Hospital, Marrakesh, Morocco. Five newborns were aged between eight hours and ten days, two of them were from multiple pregnancies, and gestational age was less than 36 weeks in three cases. Clinical presentation was variable and respiratory distress was found in four patients as the most frequent sign. Multidrug-resistant *E. hormaechei* was isolated from the blood culture in all cases. One newborn showed on his second day of life a cutaneous necrosis, the necrosis's swab culture isolated also an *E. hormaechei*. Patients were treated by the combination of Tienam and Amikacine. The progress was favorable in two patients. However, three of our patients died.

Results:

We found that *E. hormaechei* can be responsible for nosocomial infection in vulnerable patients. It can be transferred between patients when hygiene measures are not respected.

Keywords: Enterobacter, Hormaechei, Bloodstream infection, Neonatal intensive care unit, Morocco, Neonatal infection.

1. INTRODUCTION

Enterobacter hormaechei has been proposed in 1989 as a new bacterial species [1], causing nosocomial infections in hospitalized adult patients. Little information is available on their virulence in newborns. It has been reported as a healthcare-associated infection among neonates in the US and Brazil [2, 3] and among adults in France [4].

No previous reports have described *E. hormaechei* isolation in Morocco. We report five case-patients of *E. hormaechei* bloodstream infection; it's the first time in our unit: Neonatal Intensive Care Unit (NICU), University Hospital, Mohamed VI, Marrakesh.

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2. CASE REPORTS

We report the cases of five newborns admitted to the neonatal ICU department; aged at their admission from eight hours to ten days. The gestational age was less than thirty-six weeks in three cases. Three patients were male (Table 1).

Table 1. Clinical characteristics of case patients.

Clinical Characteristics						
Case Patient	Age of Admission (days)	Birth Weight (g)	Gestational Age (wk)	Comorbidity	Evolution	Others
1	1	2250	35	-	Death	-
2	1	1000	30	Patent ductus arteriosus	Death	Twin pregnancies
3	3	2600	33	-	Death	-
4	1	1650	35	-	Favorable	Twin pregnancies
5	10	3100	37	-	Favorable	-

All patients were admitted for early neonatal bacterial infection management, and they all had maternal risk factors for early-onset neonatal sepsis.

Two of these patients were from multiple pregnancies; each newborn comes from a mother with a separate twin pregnancy. The second twin of one of them was also hospitalized for early neonatal bacterial infection with a good clinical outcome, discharged after seven days, while the other second twin had no indication for hospitalization.

The clinical presentation upon admission was variable, respiratory distress was observed in four patients as the most frequent sign. Four newborns were placed on Mechanical Ventilation.

All patients were put on empiric antimicrobial therapy; ampicillin and aminoglycoside in three patients, while a third-generation cephalosporin with aminoglycoside was prescribed in two cases. Two patients had a Central Vascular Catheter (CVC) by the time we diagnosed the nosocomial infection. First blood cultures performed on all newborns upon admission were all negative for *E.hormaechei*.

After initial clinical improvement, signs of sepsis appeared in our patients between the third and seventh days of hospitalization. An infectious assessment was carried out showing an increase in the C-reactive protein in all cases, a predominantly neutrophilic leukocytosis in four patients and leuko-neutropenia in one patient.

Multidrug-resistant *E. hormaechei* was isolated in blood culture in all cases. Strain typing was done according to cultural and biochemical morphological characteristics by automated identification and susceptibility testing system (phoenix BD). Drug resistance was detected and interpreted according to the recommendations of the Comité de l'Antibiogramme de la Société Française de Microbiologie (CA-SFM / EUCAST). The turn-around time from sample to results is 48 hours.

After delivery of the babies, one mother got treated for chorioamnionitis with good progress, none of the mothers presented sepsis. A complete blood count, c-reactive protein, blood culture, cytobacteriological examination of urine were taken; none of the mothers carried *E. hormaechei*.

The treatment was based on the combination of Imipenem and Amikacin. The progress was favorable in two cases. However, we lost three patients.

This is the first epidemic of *E. hormaechei* nosocomial infection reported in Morocco. Over a 2-month period (August and September 2017) an epidemiological survey was conducted by the Nosocomial Infection Control Committee in collaboration with the clinical microbiology laboratory, and the Technical Service, included microbiological research in the environment and epidemiological study on file with a prevalence study, whose results concluded that the origin of the epidemic is environmental.

The first two newborns in whom the nosocomial infection with *E.hormaechei* was declared, were contaminated in the delivery room while in the other cases. the infection was secondary to manual transmission during their hospitalization at Neonatal ICU department.

Following these conclusions; in combination with standard hygiene precautions, additional measures were applied to the delivery room and Neonatal ICU including a COHORTING of patients and staff which helped to put an end to this epidemic. And it is planned to make future studies of the incidence of the germ in order to monitor it continuously

3. DISCUSSION

Species of the genus *Enterobacter* are frequently responsible for nosocomial infections, particularly in intensive care units mainly *E. cloacae* and *E. aerogenes* [5]. *E. hormaechei* is rarely isolated [6]

In 1989 *E. hormaechei* was recognized as a new species [1], since then little clinical observations of nosocomial infection due to this germ have been reported [7].

E. hormaechei is a Gram-negative bacillus among the *Enterobacter cloacae* complex. He is frequently related with extended-spectrum beta-lactamase production, which limits the therapeutic options [7]. Predisposing factors for infection include immunosuppression, having an important underlying illness, having an indwelling catheter or having recently undergone an invasive procedure, hospitalization in an intensive care unit, and receiving antimicrobials [5, 8].

The transmission from patient to other by health care workers is facilitated by environmental contamination and lapses in infection control measures [4] No deaths related to *E. hormaechei* bacteremia occurred in a series of six newborns at neonatal intensive care units in Brazil [3]. The same was observed by Wenger *et al.* 2 in a series of five *E. hormaechei* bacteremia cases in premature infants [2] three patients died in our series.

After this series of mortality The measures proposed to monitor and prevent infection of vulnerable patients were:

- Closer clinical and biological surveillance for suspected cases of nosocomial infection
- Strengthening standard and complementary hygiene measures
- Protective isolation of vulnerable and at-risk patients

CONCLUSION

E. hormaechei appears as an emerging agent responsible for healthcare-associated infections, particularly in the intensive care unit. It can infect vulnerable hospitalized patients, especially premature infants. It can be transferred from one patient to another when the infection control measures are inappropriate. Carbapenems are the first-choice antibiotics for severe infections caused by *E. hormaechei*

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals/humans were used for studies that are the basis of this report.

CONSENT FOR PUBLICATION

A written informed consent was obtained from the parents.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

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