

## Nosocomial Infections and Antibiotic Administration in Pediatric Department, Imam Reza Hospital, Mashhad-Iran

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### **Abstract**

#### **Introduction:**

Nosocomial Infections (NI) are a frequent and relevant problem, in other hands; those are responsible of mortality especially in pediatric ICU( Intensive Care Unit) and NICUs (Neonatal Intensive Care Unit). Healthcare-associated infections are important in wide-ranging concern in the medical field. The most cause of nosocomial infection include: bloodstream infection, urinary tract infection, pneumonia, and wound infection. The purpose of this study was to determine the epidemiology of the three most common NI in the Pediatric department.

#### **Materials and Methods:**

We performed a prospective study in a single pediatric department during 12 months. Children were assessed for 3 NI: wound infections, pneumonia and Urinary Tract Infections (UTI), as the same method as Center of Disease Control criteria(CDC). All patients were followed up and individuals who had have NI and their treatment was entered in this study.

#### **Results:**

In this study 811 patients were hospitalized that 60% of them were male and were older than 60 months. The main causes of hospitalization include: toxicity, seizure, respiratory infection and fever. Among them 15 cases had NI (1.87%). The most NI occurred in pediatric intensive care unit (PICU) and it was followed in aspect of intubation. The most cultured organism was pseudomonas that they suspected to ceftazidime and isolate from blood and endotracheal tube.

#### **Conclusion:**

NI presence was associated with increased mortality and length of stay in hospital. This study highlights the importance of NIs in children admitted to a pediatric department especially Pediatric Intensive Care Unit (PICU) in a developing country. Clinical monitoring of NIs and bacterial resistance profiles are required in all pediatric units.

**Keywords:** Antibiotic, Nosocomial Infection, Pediatric Department.

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## Introduction

Nosocomial infections represent an important cause of morbidity and mortality of hospitalized population. Mean percent of incidence was 5% to 10% but it may be up to 28% in ICU. The overall mortality that was attributable in pediatric nosocomial infections has been estimated of 11 %. Nosocomial infections (NI) was a frequent and relevant problem and it was especially responsible of mortality in pediatric ICU and NICUs. Healthcare-associated infections are of high important concern in the medical field. They can be systemic or localized and may involve any system of the body and it may be associated with medical devices or blood product transfusions. The most causes of nosocomial infection include: bloodstream infection, urinary tract infection, pneumonia, and wound infection. Attack with antibiotics to most of them is difficult, and antibiotic resistance is spreading to many bacteria especially Gram-negative bacteria that can infect people outside the hospital. Correct and logical antibiotic administration is important to reduce antibiotic resistance. They estimated roughly 1.7 million hospital-associated infections in the United States in the Centers of Disease Control and Prevention (CDC) and each year, NI contributes to 99,000 deaths (1-5).

In Europe where hospital surveys have been conducted, the category of Gram-negative infections are estimated to account for two-thirds of the 25,000 deaths each year. NI is one of the most serious healthcare issues have affected healthcare costs and direct patients costs increased (5-7).

Factors predisposing in patient to infection can be divided into three conditions: 1- Poor state of individual health admitted in hospital, 2- Invasive devices such as: intubation tubes, catheters, surgical drains, and tracheostomy tubes, all provide an easy route for infection, 3- Patients' treatments can leave vulnerable to infection of them. Risk factors for the host

are age, nutritional status and co-existing disorders. Prevention: Hospitals have sanitation protocols regarding uniforms, equipment sterilization, washing, and other preventive measures. Hand washing with soap and disinfecting with alcohol, before and after for contact with patients change administration sets of intra venous every 72 hours can prevent of nosocomial infections (4,7-10).

In a retrospective cross-sectional study that was conducted on patients under 12 years old in Iran, 61 (0.17%) patients were children under 12 years old age with nosocomial infection. *Pseudomonas* and *Acinetobacter* were the most common bacteria isolated from the clinical specimens. All the gram negative and gram positive bacterial had high resistance to antibiotics (11).

Increased resistant microorganisms, higher morbidity and mortality rates, is associated with an inadequate antibiotic use. A program aimed at improving the use of antibiotics in hospitalized patients at Hospital Garrahan, was effected a reduction in inadequate antibiotic prescription was observed (12).

Despite increased resistant microorganisms, the antimicrobial efficacy of meropenem compared to other broad-spectrum agents against both Gram-negative and Gram-positive germs that isolated at pediatric intensive care units, it has excellent potency and spectrum of activity (13).

The purpose of this study is to evaluate the incidence of nosocomial infection and identification the site of nosocomial infection; pathogens were isolated and antibiotic administration in our pediatric department.

## Materials and Methods

We were performing a prospective study in a single pediatric department during 12 months (April 2011-2012) in Pediatric Department of Imam Reza Hospital in Mashhad-Iran. Children were assessed for

3 NI: wound infections, pneumonia and Urinary Tract Infections (UTI), according to Center for Disease Control criteria. All patients who had NI and their treatment were assessed and they were followed up. Criteria set nosocomial infections was the infection in at least 4 days after hospitalization and the other criteria was a new infection that was found within 20 days after discharging from hospital.

### Results

In this study, 811 hospitalized patients were entered that 60% of them were male and, 40 % female and age of them were up of 60 months. The main cause of hospitalization include: toxicity, seizure, respiratory infection and fever. Among them 15 cases had NI (1.87%). The most NI was occurred in PICU and was following intubation. The most cultured organism was pseudomonas

suspected to ceftazidime and isolated from blood and endotracheal tube. Antibiotics consumed in treatment of NI were vancomycin, amikacin, ceftriaxone and keflin (Table 1,2).

**Table1:** Distribution of patients according to sex and age.

SEX,	N (%)
Male	9(60)
Female	6(40)
Age, N (%)	
> 1 month	2(13.3)
2-12 months	2(13.3)
13-60 months	3(20)
< 60 months	8(53.3)
Total	15(100)

**Table 2:** Frequency of patients according to: Admission diagnosis, Site of positive culture and Organism.

Diagnosis, Site of infection and isolated germ	N (%)
Admission diagnosis	
septicemia	2(13.3)
Encephalitis	3(20)
Loss of consciousness	3(20)
Heart failure	3(20)
diabetes	1(6.6)
Wound infection	1(6.6)
Endotracheal tube	6(4)
Site of positive culture	
Blood	4(26.6)
Urine	4(26.6)
Wound	1(6.6)
Organism	
Staphylococcus	5(33.3)
Pseudomonas	6(40)
Klebsiella	1(6.6)
Enterobacter	1(6.6)
Acinetobacter	1(6.6)
Candida	1(6.6)
Total	43

## Discussion

In a study of New York that it was reported in according to the CDC, it was 1.7 million healthcare-associated infections and 99,000 deaths from those infections in 2002. A CDC report lately estimated the annual medical costs of healthcare-associated infections to U.S. hospitals to be between \$28 and \$45 billion in 2007 dollars (8). In a study in Shiraz, NI was reported 17.59% in surgery department (5,9).

In the study of Wikipedia, they found that contaminated surfaces increase cross-transmission and risk factors can be divided into three areas: one; Hospitalized people are usually in a 'poor state of health' invasive devices, usage of intubation tubes, catheters, surgical drains in these patients, all bypasses of the natural lines of body defenses against pathogens and also they provide an easy route to infection in patients. Hospitals have sanitation protocols, regarding uniforms, gloves and equipment sterilization, washing, and other preventive measures, in other hands, to wash hand and/or use of alcohol rubs by all medical personnel before and after each contact with patient is also one of the most effective ways to prevent NI. Logical and careful use of antimicrobial agents such as antibiotics, is also should be considered (5).

In the study of Washington, the results of Singh-Nas et al demonstrated that three factors are as independent risk factors; to use Invasive device, parenteral nutrition, and the interaction between severity of illness and postoperative care associated with 2,6, and 1.5 times the risk of developing nosocomial infection, respectively. The Pediatric Nosocomial Infection Risk assessment (PNIR) model was performed well in this study in both the training and validation samples as indicated by the goodness-of-fit test which they evaluated standardized nosocomial infection rates (14).

Antibiotic resistance in nosocomial infection is an important problem and

dangers especially in children. Several adaptive resistance mechanisms allow organisms that survive in an environment in which extensive antibiotic use, thus result in clinically significant infections. Multi resistant bacteria were observed in some units with high frequency. Clinical monitoring of NIs and bacterial resistance profiles are required in all pediatric units (15,16).

Presence of NI associated with increasing of mortality and length of stay. In some studies different ways suggested and evaluated to decrease NIs rate. In WakeMed Hospital a study was performed to evaluate the efficacy of probiotics in reducing the rates of NIs in pediatric intensive care units. In this study they found that probiotics administration is not effective in reducing the incidence of nosocomial infections (17).

Clinical monitoring of NIs, the proper administration of antibiotics and the monitoring of bacterial resistance profiles are necessary to decrease bacterial resistance in all pediatric units.

## Conclusion

Nosocomial Infection is unavoidable; therefore it can be partially controlled by using of preventable methods.

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