Bacterial Pattern and Antibiotic Susceptibility in the Perinatology Unit of Haji Adam Malik General Hospital Medan, Indonesia

Nisa Nurjannah[1*], Beby Syofiani Hasibuan[2]
[1]*Faculty of Medicine, Universitas Sumatera Utara, Dr. Mansyur st. 5, Medan, Indonesia*
[2]*Department of Pediatrics, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia*

**Corresponding author*

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Abstract: Neonatal sepsis affects the high mortality and morbidity rates of the newborns. The causative bacteria are different between countries or hospitals, it affects the choice of antibiotics usage. Irrational antibiotic administration can cause resistance problem and aggravate patients' conditions. Culture and sensitivity test can be done to determine the species of bacteria and their antibiotic susceptibilities, allowing appropriate and rational antibiotic administration. This is a retrospective observational descriptive study, describing the bacterial pattern and antibiotic susceptibility of patients admitted to the perinatology ward at Haji Adam Malik General Hospital in 2016. Neonates suspected with sepsis underwent blood culture and sensitivity test. Secondary data from the medical record was obtained using total sampling method**.** Of 97 subjects, and neonatal sepsis patients were found predominantly in males (68%). Aterm neonates who had sepsis (75.3%) with late-onset sepsis were more dominant (87.6%). Mean age of neonatal sepsis patients was 14.9 days. *Acinetobacter baumannii* was the most common etiology (19.6%), the most sensitive antibiotics were amikacin (57.7%) and levofloxacin (57.7%). In addition, antibiotic with the highest resistance is cefotaxime (74.2%).

1 INTRODUCTION

The first 28 days of life are the most vulnerable periods in human's life. One of the main causes of neonatal death is sepsis and with lack of proper treatment, the mortality rates will increase. Therefore, sepsis is still a problem in the field of neonatology to date (Rasyidah, 2014; Wardlaw *et al.*, 2014; World Health Organization, 2016).

Bacteria that cause sepsis are different for each country and each hospital so that will affect the selection of antibiotics. The Centers for Disease Control and Prevention (CDC) estimates that as many as 50% of antibiotics prescriptions are not optimal or not necessary (Rasyidah 2014; Schulman et al. 2015).

Antibiotics are drugs commonly used in the Neonatal Intensive Care Unit (NICU). Irrational use of antibiotics at the NICU will increase the adverse events, such as increased morbidity, mortality, costs, hospital length of stay and is also associated with antibiotic resistance problem.

In order to use antibiotics rationally, the most likely etiology and the susceptibility patterns should first be identified (Irene et al. 2013; Katarnida et al. 2013; Schulman et al. 2015). This study objective is to describe the bacterial pattern of neonatal sepsis and antibiotics susceptibility in Perinatology of Unit Haji Adam Malik General Hospital, Medan, Indonesia in 2016.

2 METHOD

This study was a retrospective observational descriptive study based on medical records in Haji Adam Malik General Hospital, Medan, Indonesia in 2016. All perinatology unit patients in Haji Adam Malik General Hospital suspected with sepsis who underwent blood culture and sensitivity test during 2016 was included in this study, using total sampling technique. If data from medical records were not complete or could not be read, the samples were excluded. Data were then analyzed with statistical software. This study was approved by the Research

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3 RESULTS

Table 1 shows the baseline characteristics of patients. Male patients were more common in this study (68%), 75.3% were term neonates, and late-onset sepsis was more commonly found (87.6%). The subject's mean of age was 14.8 days.

Table 1: Characteristics of neonates with positive blood culture in Haji Adam Malik General Hospital during 2016.

Characteristics	*n*=97
Gender, n (%)	
Boys	66 (68)
Girls	31 (32)
Gestational week, n (%)	
Preterm	24 (24.7)
Atom	73 (75.3)
The onset of sepsis, n (%)	
Early	12 (12.4)
Late	85 (87.6)
Mean of age, days (SD)	14.88 (8.14)

Table 2 shows the cause of neonatal sepsis in this study. Gram-negative bacteria were the most common etiology found in neonatal sepsis, with *Acinetobacter baumanii* as the leading organism (19.6%), followed by *Klebsiella pneumonia* (16.5%). The most common gram-positive bacteria found in neonatal sepsis was *Staphylococcus haemolyticus* (6.2%) followed by *Bacillus* spp (4.1%).

Table 2: Bacteria and the etiology of neonatal sepsis in Haji Adam Malik General Hospital.

Bacteria		Percentage (%)
Gram-negative	*Acinetobacter baumannii*	19.6
	Klebsiella pneumonia	16.5
	Enterobacter cloacae	8.2
	Burkholderiacepacia	4.1
	Pantoeaspp	4.1
Gram-positive	*Staphylococcus haemolyticus*	6.2
	Bacillus spp	4.1
	Staphylococcus epidermidis	3.1
	Clostridium spp	2.1
	Enterococcus faecium	2.1

Table 3 shows that amikacin (57.7%) and levofloxacin (57.7%) as the most sensitive antibiotics obtained from the susceptibility test on bacteria that cause neonatal sepsis on the perinatology unit. Those were followed by meropenem and ciprofloxacin, and cefoperazone/sulbactam with sensitivity rates of 45.4%, 41.2%, and 35.1%, respectively.

Table 3: Antibiotic susceptibility in neonatal sepsis in Haji Adam Malik General Hospital.

Antibiotics	n (%)
Amikacin	56 (57.7)
Levofloxacin	56 (57.7)
Meropenem	44 (45.4)
Ciprofloxacin	40 (41.2)
Cefoperazone/Sulbactam	34 (35.1)
Doxycycline	33 (34.0)
Imipenem	31 (32.0)
Gentamicin	27 (27.8)
Tetracycline	21 (21.6)
Fosfomycin	21 (21.6)

Table 4 showed that cefotaxime, as one of the cephalosporin group antibiotics, had the highest resistance rate in this study (74.2%), followed by ampicillin and ceftriaxone with resistance rates of 73.2% and 72.2% respectively.

Table 4: Antibiotic resistance in neonatal sepsis in Haji Adam Malik General Hospital.

Antibiotics	n (%)
Cefotaxime	72 (74,2)
Ampicillin	71 (73,2)
Ceftriaxone	70 (72,2)
Ceftazidime	66 (68,0)
Gentamicin	55 (56,7)
Ampicillin/Sulbactam	53 (54,6)
Tetracycline	47 (48,5)
Amoxicillin / Clavulanic acid	44 (45,4)
Netilmicin	41 (42,3)
Meropenem	37 (38,1)

In this study, we found that *Klebsiella pneumonia* and *Enterobacter cloacae* were still sensitive to amikacin (100%). On the other hand, *Bacillus* spp. had a high sensitivity rate to Ciprofloxacin (100%). *Enterobacter cloacae* had the highest resistance to antibiotics such as cefotaxime, ampicillin, and ceftriaxone, with resistance rate to each antibiotic at 100%, respectively.

4 DISCUSSION

Neonatal sepsis in this study was found to be more common in males. This is similar to other studies which stated that males were more common to have neonatal sepsis than females. There are several factors that might be associated with it. First is Glucose-6-Phosphate Dehydrogenase (G6PD) deficiency. It is a genetic defect that affects males more than females and this defect increases the risk of infection. Other studies showed that factors associated with gamma globulin synthesis were located on the X chromosome so that immunological protection on females was better than males (Far Z et al. 2016; Verma et al. 2017).

Neonatal sepsis in this study was more predominant in term neonates. It was similar to the study by Afridi, in 2015 where a term neonates were more commonly found to have neonatal sepsis than preterm neonates. It might be due to the more vulnerable preterm babies to have neonatal sepsis with higher mortality rates which caused them a delay to reach the health facilities. This situation caused more a term neonates to be more often to be diagnosed with neonatal sepsis.

Late-onset sepsis was associated with horizontal transmissions, such as very low birth weight in preterm neonates. It was due to the immaturity of the immune system, prolonged mechanical ventilation, prolonged length of hospital stay, vascular catheterization, and other invasive procedures. Those factors made opportunist pathogens, like *Acinetobacter baumannii,* could infect neonates easier (Shah and Padbury 2014; Wei et al. 2015).

The most common bacteria isolated from neonatal sepsis in this study was *Acinetobacter baumannii*, an opportunist bacteria that become pathogen in immunocompromised subjects and worsen in neonatal infection (Wei et al. 2015). Study in Iran comparing bacterial patterns in two decades found that in 1992 the most common bacteria were *Staphylococcus aureus* (59%) while in 2015 the most common was coagulase-negative *Staphylococci* (CoNS) (33.9%). It showed that bacterial pattern changed over time and was different in every center (Radfar et al. 2017).

Most bacteria isolated from this study were still sensitive to amikacin and had a high resistance to cefotaxime. The previous study in Haji Adam Malik General Hospital Medan showed that vancomycin had high sensitivity rate while ampicillin, gentamicin, and cefotaxime had high resistance rates. It explained that there were no significant antibiotics susceptibilities changes in neonatal sepsis during these recent years in Haji Adam Malik General Hospital Medan (Sianturi *et al*. 2012).

5 CONCLUSION

The most frequent etiology of neonatal sepsis was *Acinetobacter baumannii.* Amikacin and levofloxacin were the most sensitive antibiotics while cefotaxime was the least.

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