

Nosocomial Infections In NICU: Profile And Risk Factors

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Abstracts: **Background:** Nosocomial infections (NIs) in Neonatal Intensive Care Unit (NICU) are one of the leading causes of mortality and long term morbidity in developing countries. We retrospectively analyzed data of NICU patients from June 2013- June 2014. Total 120 patients met inclusion criteria. 73 episodes of nosocomial infections were documented in 67 patients. Eye infection and umbilical sepsis was most common infection followed by systemic blood infection. *Klebsiella Pneumoniae* and *E. coli* were the most common organisms causing sepsis. *Chlamydia trachomatis* and *Staphylococcus aureus* were the most common organisms responsible for eye infection and umbilical sepsis respectively. Imipenem, Amikacin and Vancomycin showed good sensitivity against most of gram negative and gram positive organisms respectively. [Pandey N NJIRM 2016; 7(3): 30 - 33]

Key Words: Nosocomial infection, Umbilical sepsis, Eye infection.

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Introduction: Nosocomial infections (NIs) in NICUs have become increasingly responsible for associated morbidities and often adversely affecting outcome of NICU graduates. This increases the cost of health care delivery by increasing the resource consumption and prolonging the hospital stay. Although NIs occur universally, their prevalence varies greatly being much more in developing countries.

Newborns are the most vulnerable population in pediatric age group, especially those requiring NICU admission, where use of therapeutic interventions, antibiotics and immature immune system increase the risk of NIs. The major organisms responsible varies from place to place and time to time in same NICU as well^{1,2}.

Hence effective surveillance is important to evaluate the risk factors associated with NIs.

Material and Methods: Retrospective analysis of data from June 2013 to June 2014 was carried out for patients admitted in NICU. All the babies admitted in NICU who were born after 32 weeks of gestational age, not meeting the exclusion criteria, were included in study.

The CDC-NNIS system defines NIs as a localized or systemic condition¹ that results from an adverse reaction to the presence of an infectious agent or its toxin and² that was not present or included at the time of admission to the hospital. Patients who had not been infected³ nor have they been in the incubation period at the time of admission.

Exclusion criteria:-

1. Born by emergency lower segment Cesarean section
2. History of leaking per vaginum, fever, chorioamnionitis in mother
3. History of trial of labor or instrumentations before coming to hospital.
4. Patients with less than 72 hrs stay in NICU
5. Suspected/or proven sepsis at admission
6. Patients developing sepsis within 72 hrs of admission.

Suspected / proven sepsis (definition):- Baby who was admitted to NICU with blood culture positive at admission or sepsis screen positive at admission.

Babies who had positive blood culture after 3rd day of admission were defined as patients with NI in present study. The data included patient's name, age, gender, mode of delivery, history of maternal sepsis.

Descriptive statistics were used and there was no conflict of interest. No external funding was done.

Results:

Total of 480 patients were admitted in NICU, out of which 360 patients met exclusion criteria and were not included in the study, so data of total 120 patients was analyzed for NIs. 73 episodes of NIs were documented in 67 patients.

Infection was more common in males (55.8%) compared to females (44.16%). Most of them were premature neonates (60%) and low birth wt. (63%) (Table 1).

Table 1: Demographic profile of neonates with Nosocomial Infection

Character	Categories	No.	%
Gender (n=67)	Male	38	55.6
	Female	29	44.16
GA	>32-36.6	40	60
	>37- who	27	40
Mode of delivery	NVD	39	58.3
	LSCS	28	41.66
Birth wts	1000-1500	08	11.67
	1500-2500	35	52.5
	>2.5 kg	24	35.8
Length of Hospital stay	4-10 days	29	42.5
	>10 days	38	57.5
Outcome at discharge	Recovery	53	78.3
	Death	5	7.5
	LAMA/Absconded	9	14.16

Most common organism causing NI was *Chlamydia trachomatis* causing neonatal conjunctivitis followed by umbilical sepsis. Fifteen episodes of nosocomial

blood stream infections were found followed by positive endotracheal (ET) tube culture and urinary tract infection (UTI). Meningitis was least commonly documented in our study. Fungal culture was not sent. Most common organism causing systemic NI were *Klebsiella pneumoniae* and *E. coli*, whereas *Staphylococcus aureus* was the most common organism responsible for umbilical sepsis and positive ET tube culture (Table 2).

Antibiotic sensitivity pattern revealed that *Staphylococcus aureus* was nearly 100% sensitive to Vancomycin with moderate sensitivity to Imipenem and Aminoglycosides. Whereas Gram negative organisms were 100% sensitive to Imipenem and Amikacin with moderate sensitivity to cephalosporin. *Staphylococcus epidermidis* sensitivity pattern is not done at our centre (Table 3).

Table 2: Distribution of organisms causing NIs (n=73)

Organism infection	Umbilical sepsis	Blood stream	ET tube culture	Meningitis	UTI	Eye infection
<i>Staph aureus</i>	12		3			
<i>Staph epidermidis</i>	6					
<i>Klebsiella</i>		7	1	1	1	
<i>E. coli</i>	3	5	1		1	
<i>Acinetobacter</i>		3			1	
<i>Chlamydia trachomatis</i>						28

Table 3

	Gm+ve <i>Staph. Aureus</i> (n=15)		Gm-ve <i>E.coli</i> (n=10)		Gm-ve <i>Klebsiella</i> (n=10)	
	S	R	S	R	S	R
<i>Ampicillin</i>	0	15	0	10	0	10
<i>Cefotaxime</i>	5	10	7	3	6	4
<i>Vancomycin</i>	15	0	0	10	0	10
<i>Gentamycin</i>	1	14	5	5	3	7
<i>Amikacin</i>	1	14	8	2	10	0
<i>Piperillin tazobactam</i>	4	11	9	1	9	1
<i>Imipenem</i>	14	1	10	0	10	0

Discussion: NI in ICU is a major world health problem. In our study, incidence of NIs was 15.2% as compared to 38.5% reported by Mohammed et al³. Incidence

rates vary from 6.2 -50.7% as reported by various studies⁴⁻⁷.

In our study LBW and prematurity were the most important risk factors for NIs. Similar findings have been reported by other studies too⁸⁻¹¹. These babies have immature immune system and they are more exposed to various therapeutic interventions, exposing them to higher risk of NIs^{12,13}.

We found that males were more prone to NIs compared to females, similar findings have been reported by other studies too¹⁴. However study at Zig Zag University revealed no effect of gender on NIs³.

Most common NIs were eye infection and umbilical sepsis. Others have reported blood stream infection and respiratory infection as common NIs³. Gram negative organisms (*Klebsiella pneumonia* & *E.coli*) were most commonly responsible for NIs, *Staphylococcus aureus* was the next in frequency. Similar findings were reported from the study at Zaga Zig University³. Whereas other studies have reported Gram positive organisms as the most common isolate in developed countries^{6,24-34}.

All the isolates of *Staphylococcus aureus*⁶ were sensitive to Vancomycin, followed by Imipenem and Cefotaxime. Among Gram negative organism *E. coli* and *Klebsiella* were responsible for nearly equal number of NIs and were universally sensitive to Imipenem and Piperacillin+Tazobactam.

Least sensitivity was shown for Ampicillin and Gentamycin, which has implications in starting empirical antibiotic at NICU admission pending culture sensitivity reports. According to our study, possibly due to over prescription, Ampicillin is no longer preferred option as first line therapy though Amikacin has retained good sensitivity against *E. coli*^{8/10} and *Klebsiella*^{9/9}.

Conclusion: NIs in NICUs are an important factor deciding outcome and surveillance is needed to formulate effective empirical antibiotic policy pending culture reports.

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