Original Article

Risk factors for nosocomial sepsis in NICU

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Abstract

Nosocomial infection is defined as an infection occurring at any site, which was acquired during a hospitalization and results from inoculation with an organism that was not present or incubating in a patient at the time of admission. Patients with sepsis requiring mechanical ventilation in form of bag and tube, endotracheal tube tip culture was sent, angiocath tip culture were also done . The study was conducted to evaluate risk factors for nosocomial sepsis in neonates admitted in NICU. Total 1580 neonates were admitted during the study period. Out of these 223 met the inclusion and exclusion criteria and either of their parents gave consent to participate in the study. Seven neonates were lost during follow up. Fifty neonates of nosocomial infection died during the study period.
Keywords: Nosocomial Sepsis, Neonatal, Risk Factor.

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INTRODUCTION

As many as 2% of fetuses are infected in utero, and up to 10% of infants have infections in the 1st mo of life. Infections are a frequent and important cause of neonatal and infant morbidity and mortality. There is a wide variation in the reported incidence of NI rates between NICUs. In the United States, NI rates vary from 6% to greater than 40%. Internationally, the incidence has been reported to be as high as 69%. There are differences in reporting NI, particularly the timing of onset. There appears to be no clear-cut delineation for the optimal cutoff time for identification of an infection as perinatally acquired or nosocomial in origin. As previously discussed, National nosocomial infection survillance identified 48 hours and the National institute of child health and human development, Neonatal Research Network uses 3 days as the cutoff for perinatally acquired infections. However, neonatal textbooks determine 5 to 7 days to be the cutoff time for perinatally acquired infections with late-onset NIs occurring after that. Less mature infants are being cared for in neonatal intensive care units (NICUs), neonatal nosocomial infection (NI) rates are increasing with an incidence inversely proportionatal to the gestational ages of the infants populating the NICUs. Considering that the smallest, least- mature infants often require the most invasive procedures, have sensitive and immature skin that does not provide a strong barrier against environmental organisms, and immune systems that are marginally responsive to infection from any portal of entry, high-infection rates seem inevitable; but are they? Because neonatal NIs are known causes of morbidity and mortality in all neonates, but particularly in the smallest, most immature infants, it is important to determine whether the infection risk is inherent to the infant or can be affected by the environment and treatment received in the NICU.

MATERIAL AND METHOD

Place of study: The study was carried out in level II NICU department of paediatrics Government medical college Aurangabad.

Study Period: The study was carried during the period of January 2008 to October 2009.

Study design: Prospective case-control study.

Sample Size: All babies who were admitted in NICU during study period and showing clinical features of sepsis >48 hrs of admission.

Statistical Analysis

The data was obtained and arranged according to characters during hospitalisation, risk factors for sepsis, symptoms of sepsis duration of development of sepsis, duration of stay, blood culture, organism and outcome.
All data was analysed by using SPSS software and chi-square test, unpaired t-test, multiple logistic regression was applied for significance.

REVIEW OF LITERATURE

Historical Aspect

Hospitals are places where sick people go with the expectation that they will get better. Unfortunately, however there is a risk that hospital patients may become infected because of their stay in hospital. Infections that are acquired while a patient is in hospital are referred to as nosocomial infections. Often nosocomial infections become apparent while the patient is still in hospital but in some cases symptoms may not become manifest until after the affected patient is discharged from hospital. Nosocomial infections are infections which are a result of treatment in a hospital or a healthcare service unit, but secondary to the patient's original condition. Infections are considered nosocomial if they first appear 48 hours or more after hospital admission or within 30 days after discharge. Nosocomial comes from the Greek word nosokomeion (νοσοκομείον) meaning hospital (nosos = disease, komeo = to take care of). This type of infection is also known as a hospital-acquired infection (or more generically healthcare-associated infection. Doctors took an increasing role in childbirth from the eighteenth century onwards. However, the care of newborn babies, sick or well, remained largely in the hands of mothers and midwives. It wasn't until after the Second World War that special care baby units (SCBUs) were established in many hospitals. A neonatal intensive care unit, usually shortened NICU (sometimes pronounced "Nickyou") and also called a newborn intensive care unit. NICUs were developed in the 1950s and 1960s by pediatricians to provide better temperature support, isolation from infection risk, specialized feeding, and greater access to specialized equipment and resources. Cross-infection between babies was greatly feared. Strict nursing routines involved staff wearing gowns and masks, constant hand washing and minimal handling of babies. Parents were sometimes allowed to watch through the windows of the unit. Over the last 10 years or so, SCBUs have become much more 'parent friendly', encouraging maximum involvement with the babies. Routine gowns and masks have gone and parents are encouraged to help with care as much as possible. Cuddling, and skin-to-skin contact, also known as Kangaroo care, are seen as beneficial for all but the frailest (very tiny babies are exhausted by the stimulus of being handled, or larger critically ill infants). Our understanding of nosocomial infection pre-dates the infancy of microbiology as a discipline. During the 1840's, Ignaz Semmelweis was working in the Vienna General Hospital and was pioneer of nosocomial sepsis. Another important pioneer in understanding and containing nosocomial infection was the surgeon Joseph Lister. He pioneered the use of antiseptics. He used to spray phenolic solutions over open surgical wounds to minimise the risk of infection. In 1960, the terms "neonatology" and "neonatologist" were Introduced and is attributed to Alexander Schaffer. Ana Carolina et al done retrospective cohort included all the neonates admitted to the NICU from January 1st to December 31st, 2003. Their medical records were reviewed until discharge from the unit or death. For each patient, data on birth weight, adequacy for gestational age, gender, Apgar score at one and five minutes, neutrophil count at 12 hours of life, medical devices used (central venous catheter, umbilical catheter, percutaneous catheter, total parenteral nutrition, mechanical ventilation), other relevant medical conditions and length of stay were collected. The mother's medical records were also analyzed with respect to maternal age, chronic medical conditions, past pregnancy history, antenatal care, pertinent aspects of the social history, peripartum events of importance and intrapartum assistance. Maternal age was arranged in quartiles: <19 years, 19-23 years, 24-29 years and >29 years. A positive history for antenatal care was defined as ≥4 antenatal visits. Gestational age was classified into five distinct groups: <29 weeks, 29-33 weeks, 34-36 weeks, 37-42 weeks, >42 weeks. Birth weight categories were: ≤1,000 g, 1,001-1,500 g, 1,501-2,500 g, >2,500 g. Newborns were stratified based on three Apgar score groups: 0-3, 4-6, 7-10. Multivariate analysis identified seven independent risk factors for NIs: birth weight, exposure to parenteral nutrition, percutaneous catheter, central venous catheter or mechanical ventilation.

Table 1: Maternal Risk Factor Associated With Nosocomial Sepsis

Sr. No.	Maternal Factor	With Nosocomial Sepsis (n=223)		Without Nosocomial sepsis (n=250)		P value	Odd Ratio	Relative Risk
		Frequency	Percentage	Frequency	Percentage			
1	Gravida							
	G1	129	57.8	122	48.8	<0.05		
	G2	41	18.4	90	36			

	G3	44	19.7	35	14			
	G4	9	4	3	0.1			
2	Booked							
	No	90	40.3	41	18.4	<0.05	0.29	0.57
	Yes	133	59.6	209	83.6			
3	Antenatal TT							
	Yes	223	100	45	18	<0.05		
	No	0	0	205	82			
4	Blood Group							
	A+ve	13	5.8	-	-			
	AB+ve	4	1.8	43	17.2	<0.05		
	B+ve	126	56.5	99	39.6			
	O-ve	2	0.9	-	-			
	O+ve	78	35.0	108	43.2			
5	History of PIH							
	No	169	75.8	229	91.6	<0.05	3.42	1.69
	yes	53	23.8	21	8.4			
6	Spontanteous / Induced							
	Induced	14	6.3	26	104	>0.05	0.58	0.73
	Spontaneous	209	93.7	224	89.4			
7	Mode of Delivery							
	Instrumental	3	1.3	14	5.6	<0.05		
	Cesarean	2	0.9	20	8			
	Vaginal	218	97.7	216	86.4			
8	Vaginal examination							
	>3	86	38.5%	66	26.4	>0.05 (0.41)	1.75	1.33
	<3	137	61.4%	184	73.6			
10	Liqour							
	Clear	204	91.5%	186	74.9	<0.05	0.27	0.44
	Meconium stained	19	08.5%	64	75.6			
11	Multi pregnancy							
	No	172	77.1%	215	86	<0.05	1.82	1.33
	Yes	51	22.9%	35	14			

Pregnancy induced hypertension, multiple pregnancy, were significantly associated with development of nosocomial sepsis(P value < 0.05.)

DISCUSSION

The present study was carried out in level II NICU of a tertiary care hospital. Various risk factors associated with development of nosocomial sepsis, clinical features, micro-organisms isolated, laboratory investigations, blood cultures were evaluated.

Inicidence of nosocomial sepsis in present study was 14.11%. This incidence was compared with various studies **General Characteristics**

Sex: In present study amongst 223 neonates, 135 (60.5%) were males and 88 (39.5%) were females M:F=1.5:1. In a study by Nawshad et al (2002)52 found sepsis to be common in males (63%) than females (37%) (M: F=2:1). In another study Anil Kumar Pawa et al (1997)16 found sepsis to be common in males. (M:F =1.18:1). In a study by Fanaroff39 et al concluded that male gender was a significant risk factor for nosocomial sepsis.

Prematurity: In present study gestational age between 34-36 weeks was most commonly affected. 80.3% were preterms. Similar study done by Gerardo Martinez et al (2001)56 found 34-36 weeks (66.7) most commonly affected for nosocomial sepsis. In another study by Inh Book Jeong et al (2006)28, Jia-Horng et al (2004)53 observed that gestational age less than 32 wks was a predisposing factor for nosocomial sepsis. In a study by Anil Kumar Pawa16 et al 1997 observed that mean gestational age 33.5 wks (+3.4). In another study by Edison Nagata et al (2002)6 studied that gestational age less than 32 was significantly associated with nosocomial infection. In a study by Nawshad52 et al found that blood culture positive nosocomial sepsis was common in term neonates (38%) than pre-term neonates (31%). In another study by Anil Kuruvilla42 et al stated that mean gestational age was 36.1 (+3.5) wks in sepsis. In a study by Bashir Ahmad Charoo et al (2009)55 concluded that mean gestational age was 36.09 (+3.16) weeks. In present study it was observed that 34-36 weeker neonates had more risk of nosocomial infection due to large number of same gestation were admitted during study period.

Observational differences may be due to sample size included in various studies.

RESUSCITATION

In present study resuscitation required at birth was significantly associated with nosocomial sepsis(n=80 i.e.35.9%).Various forms of resuscitation were studied like, Bag & mask, endotracheal intubation, O2 required with nasal cannulation, chest compression drugs given. Out of which chest compression was not significantly associated with nosocomial sepsis. In a study by Edison Nagata6 et al found 22.9%, Anil Kumar16 5%, Annette H18. 22.9%, Sharon23 et al (67.3%). studied that resuscitation required babies had nosocomial infection. In another study by Edison Nagada6 et al studied nasal CPAP 39.8% was significantly associated with nosocomial sepsis. Various types' resuscitative measures were not studied independently in other studies.

SUMMARY AND CONCLUSION

- Total 1580 neonates were admitted during the study period. Out of these 223 met the inclusion and exclusion criteria and either of their parents gave consent to participate in the study.
- Seven neonates were lost during follow up.
- Fifty neonates of nosocomial infection died during the study period.
- Pregnancy induced hypertension,Instrumental delivery were signifantly associated with nosocomial sepsis.
- Vaginal examinations was statistically significantly in maternal risk factors.
- Neonatal factors such as gender, weight, prematurity,asphaxia, resuscitation(bag and mask, endotracheal intubation,o2 by nasal canulation,needle pricks, TPN were statistically significantly associated with nosocomial sepsis.

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