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Original Research Article

A Hospital Based Observational Study of the Clinical Profile and Outcomes among Neonatal Pneumonia

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Abstract

Background: Neonatal period (0-28 days of life) is the most susceptible period of life due to different diseases, which in most cases are preventable. In the developed countries, the main cause of morbidity and mortality in the neonatal period is congenital abnormalities which are mostly non-preventable, but in the developing countries the common causes such as infections, jaundice, birth asphyxia and pneumonia predominate .

Aim: To study the clinical profile and outcome of neonatal pneumonia.

Material & Methods: This descriptive observational study enrolled 168 neonates admitted to newborn intensive care unit(NICU) Department of Pediatrics, NMCH, Patna, Bihar, India. The study was conducted during one year of time period. Neonates were observed on day of admission, on day of deterioration and on day of discharge from NICU. Neonates in NICU evaluated for clinical profile of pneumonia and for maternal and neonatal risk factors for pneumonia.

Results: In our study out of 168 neonates, total 50 patients classified as a pneumonia patient as per definition criteria mentioned in methodology section. Low birth weight (LBW) ,birth weight (BW <2.5 kg) neonates found to have pneumonia significantly as compared to non-pneumonia patients (p=0.001). Hence low birth weight was one of the risk factors for development of pneumonia.

Conclusion: There was no single parameter which can be used for diagnosis of neonatal pneumonia. Clinical features with chest X-ray with sepsis markers have to be considered in diagnosing pneumonia.

Keywords: Neonatal pneumonia, ARI, Outcome

Introduction

Neonatal period (0-28 days of life) is the most susceptible period of life due to different diseases, which in most cases are preventable. [1] Almost 50% of deaths in

our country occur in the neonatal period [2]. Though considerable improvement in the survival of newborn in developed countries has been made but the mortality rate is still very high in the developing countries [3]. One of the Millennium Development Goals is to reduce the number of deaths in children under 5 years to two third by the year 2015, and to achieve this goal a substantial reduction in neonatal deaths will be required especially in the developing countries [4]. In the developed countries, the main cause of morbidity and mortality in the neonatal period is congenital abnormalities which are mostly non-preventable, but in the developing countries the common causes such as infections, jaundice, birth asphyxia and pneumonia predominate [5]. The neonatal disease pattern is a sensitive indicator of availability, utilization and effectiveness of mother and child health services in the community. Of the 130 million neonates born every year Globally, about 4 million die in the first 4 weeks of life [6]. Most of the neonatal deaths (99%) occur in the lower to middle income countries and half of them occur at home. The risk of a newborn dying is 24 per 1,000 live births in the first week of life, 3 per 1,000 per week during the rest of the first month, and 0.12 per 1,000 per week after the first year of life [7].

Many of these admitted newborns are critically sick and require mechanical ventilation. The survival of sick neonates have improved significantly with the widespread use of mechanical ventilation in NICUs [8-9]. Several studies show that weight and gestational age are major determinants of neonatal mortality [9]. It is also related with severity of illness at admission, complications related to ventilator techniques and strategies and occurrence of co-morbid conditions like sepsis, coagulopathy, multi organ dysfunction, congenital malformations etc. [10-11].

Thus, we aim to study the clinical profile and outcome of neonatal pneumonia.

Material & Methods:

This descriptive observational study enrolled 168 neonates admitted to NICU Department of Pediatrics, NMCH, Patna, Bihar, India. The study was conducted during one year of time period. Neonates were observed on day of admission, on day of deterioration and on day of discharge from NICU.

Neonates in NICU evaluated for clinical profile of pneumonia and for maternal and neonatal risk factors for pneumonia. Neonates also searched for etiology of pneumonia. We have also observed for intervention required at the time of deterioration. We have divided patients with pneumonia in two groups early onset and late onset as who develops pneumonia in first 72 hours of life early onset and who develops after 72 hours of life as late onset. We have observed for etiology, clinical profiles and outcome in each group.

Inclusion criteria:

All neonates included in study were admitted in NICU at NMCH and whose guardian gave written consent were included in this study. Asymptomatic high risk patients such as having history of premature rupture of membranes (PROM) , foul smelling liquor, meconium stained liquor, maternal fever, LBW, preterm neonates. Symptomatic high risk patients such as having symptoms of respiratory distress (difficult, noisy, rapid breathing), Respiratory rate (RR) >60/min, sub costal retractions (SCR), grunting, cyanosis, other signs of infections like poor feeding, poor reflexes, temperature disturbances, other clinical nonspecific features were included in study.

Exclusion criteria:

Neonates having congenital/severe life threatening anomalies, neonates whose parents have taken DAMA (discharge

against medical advice), neonates who had taken treatment outside NMCH and born to other hospital were excluded from the study.

Investigations:

Chest X-rays PA view of neonate taken at NICU or radiology department NMCH and reporting of chest X-ray were done by consultants of radiology not knowing clinical profile of patients.

The diagnosis of neonatal pneumonia was established using clinical presentation and septic screen markers like total blood count, platelet count, C - reactive protein (CRP). As per inclusion criteria all symptomatic patients were immediately evaluated with X-ray chest and blood investigations whereas asymptomatic high risks were screened clinically. In case of deterioration those group were immediately investigated as per protocol. The criterion for early-onset neonatal pneumonia was when neonates present within first 72 hours of life and late-onset neonatal pneumonia when neonates present after 72 hours of life.[5] We have considered a pneumonia case in our study as a neonate with respiratory distress (any of rapid noisy or difficult breathing, respiratory rate >60/min, chest retraction, grunting) who has a positive blood culture or any two or more of the following: predisposing factors (any one or more) like maternal fever (>38°C), foul smelling liquor, prolonged rupture of membranes (>18 hours); clinical picture of sepsis (any one or more) like poor feeding, lethargy, poor reflexes, hypothermia or hyperthermia; radiograph suggestive of pneumonia (nodular or coarse patchy infiltrate, lobar or segmental consolidation) not resolved within 48 hours and positive sepsis screen (any one or more) like raised CRP, leucocytosis (TLC >20000) or leucopenia (TLC <5000) or platelet count <150000.[5]

Statistical analysis:

Data was entered in Microsoft excel worksheet. Descriptive statistics have been presented as frequencies (percentage). calculated by Statistical package for the social sciences (SPSS version 25 .Chi-square test was applied to find factors associated with pneumonia. A p value of <0.05 was considered to be statistically significant.

Results:

In our study out of 168 neonates, total 50 patients classified as a pneumonia patients as per definition criteria mentioned in methodology section. Hence incidence of pneumonia in our study was 29.76% In clinical features wise difficult breathing, RR >60/min, sub costal retractions and poor feeding were significantly present in patients of pneumonia. Above 4 clinical features found statistically significant in pneumonia patients (p=0.001) (Table 1).

Table 1: Distribution of clinical features between pneumonia and non-pneumonia patients (n=168).

Clinical features	Pneumonia (n=50)	Non pneumonia (n=118)
Difficult or labored breathing	32	32
RR >60/min	34	20
Cyanosis	14	14
SCR	25	23
Grunting	16	12
Lethargy	16	20
Poor feeding	36	46
Poor reflexes	11	24
Temp disturbances	2	8
Other nonspecific	4	21

In birth weight wise distribution of patients with pneumonia, 5 were extremely low birth weight (<1.0 kg), 6 were very low birth weight (between 1.0 to 1.5 kg), 12 were low birth weight (between 1.5 to 2.5 kg), 27 were >2.5 kg. LBW (BW <2.5 kg) neonates found to have pneumonia significantly as compared to non-pneumonia patients (p=0.001). Hence low birth weight was one of the risk factor for development of pneumonia. Among various risk factors only PROM (premature rupture of membrane >18 hours) were found significant (p=0.0001), other risk factors FSL (foul smelling liquor) p value 0.527, MF (>38°C), p value 0.221, MSL, p value 0.280, HMC (high maternal count) p value 0.4, so none was found statistically significant in our study. Among pneumonia patients 27 patients shows changes on X-ray, X-ray positivity were more in late onset. Probable etiology included aspiration, meconium, sepsis, congenital and ventilator associated infection. Average days of stay in NICU in pneumonia patients was 7.6 days and mean of day of deterioration was 4th day. In our study mortality was ~~30%~~ 32% (Table 2).

Table 2: Clinical profile, risk factors, investigations and outcome among patients with neonatal pneumonia (n=50).

Variables	Number
Onset	
Early onset	18
Late onset	32
Maturity	
Full Term	38
Pre Term	12
Mode of delivery	
Vaginal	38
Forceps	5
Caesarean Section	7
Birth weight	
<1 kg	5
1-1.49 kg	6
1.5-2.49 kg	12
=2.5 kg	27
Maternal risk factors	
Foul smelling liquor	10
Maternal fever (>38°C)	9

Meconium stained liquor	14
PROM	21
High maternal count	3
Etiology	
Aspiration	7
Congenital	2
MAS	11
Sepsis	25
Vent ASSO sepsis	5
Average days of stay in NICU in pneumonia patients: 7.3 (mean) days. Mean of day of deterioration: 4th day	
Investigations	
TLC <5000	3
TLC >20000	21
PLT <150000	31
CRP positivity	22
Chest X-ray suggestive	27
Outcome	
Recovered	34
Died	16

In early and late onset distribution of risk factors was almost similar, only PROM was more in early onset which was significant (p value 0.0002) and high maternal count was in late onset but was not significant but MSL which is found in late onset more was statistically significant (p value 0.0001). In early and late onset there was no significant difference in distribution of clinical features. Ventilator associated sepsis also more in late onset. Major cause of death was septicemia followed by pneumothorax and Disseminated intravascular coagulation(DIC) . Incidence of pneumothorax in cause of death was more in late onset pneumonia (Table 3).

Table 3: Comparison of clinical factors between early and late onset of pneumonia among study population (n=50).

Variable	Early onset (n=21)	Late onset (n=29)
Maternal risk factors		
Maternal fever	2	1
Foul smelling liquor	6	3
PROM	7	5
High maternal count	2	10
Meconium stained liquor	1	4
Etiology		
Aspiration	1	5
Congenital	5	0

MAS	8	4
Sepsis	11	19
Vent ASSO sepsis	2	3
Investigations		
TLC<5000	0	6
TLC>20000	8	16
PLT<150000	15	20
CRP positivity	3	21
Chest X-ray suggestive	9	18
Cause of death		
Septicemia	5	7
Pneumothorax	1	3

Discussion:

In Nepal a study done by Shrestha S et al ., showed reason of NICU admission are clinical sepsis in 50% of cases followed by birth asphyxia 17.6% and prematurity in 6.7% of cases. [12] There are some other studies confirming respiratory distress is common in neonates and occurs in approximately 7% of babies during the neonatal period. [13-14] Another study done by Malik et al. showed 47.2% incidence of respiratory distress of NICU admissions. [15]

Prematurity was found to be the next common cause–24% for admission in our study This is similar to finding of Hoque M et al,from South Africa they found the most common causes of admission were birth asphyxia (38.2%), prematurity (23.5%), and infection (21%) [16]. Conversely, a much higher incidence(42.8%) has been reported from other neighboring countries [17].

Methicillin resistant staphylococcus aureus was detected in 43.3% of cases followed by pseudomonas species, Klebsiella pneumoniae, Enterococcus, Acinetobacter. Other authors reported Staphylococcus aureus, Coagulase Negative Staphylococcus (CoNS) and Klebsiella pneumoniae as the three predominant pathogens in their studies. However, they did not mention regarding methicillin resistance in Staphylococcal isolates [12, 18].

The presenting complaints in neonates with pneumonia included rapid breathing, poor feeding and difficult breathing, SCR. These findings are similar to an earlier series. [16, 19] In primary neonatal care rapid breathing, poor feeding and difficult breathing are useful symptoms suggestive of respiratory distress. The clinical diagnosis of pneumonia remains subjective and unreliable for a scientific study. We therefore thought it necessary to use an objective tool such as chest radiography for the diagnosis. The difficulty, inconsistency and large interobserver difference in eliciting chest findings among physicians and occurrence of pneumonia in the absence of classic signs such as fever, cough, and rales are well documented. Moreover, radiological evidence of pneumonia may be absent in many young infants with any combination of pulmonary findings such as tachypnoea, crepitations, or decreased breath sounds.

Overall mortality in our study were 32.81% which was similar to studies conducted by Mishra et al 32% and Mathur et al 31%. [20,21]

Conclusion:

There was no single parameter which can be used for diagnosis of neonatal pneumonia. Clinical features with chest X-ray with sepsis markers have to be considered in diagnosing pneumonia.

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