



A PROSPECTIVE DESCRIPTIVE STUDY OF REFERRED NEONATES ADMITTED TO A TERTIARY CARE CENTER OF NORTH INDIA

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ABSTRACT

Objectives: The Study was conducted with an objective to analyze the important contributors of neonatal mortality and outcome of referred neonates admitted to intensive care unit of a tertiary care centre.

Methods: In this prospective observational study conducted over one year period included extramural neonates only. Respiratory and hemodynamic status of all neonates at admission was assessed and outcome was evaluated.

Results: At admission 80 % of neonates were hypothermic, hypoxic – 37 %, prolonged capillary filling time (CFT)- 85% and hypoglycemic – 28 %. Sepsis was the most common final diagnosis followed by birth asphyxia and neonatal jaundice. 39% of neonates had poor outcome whereas 61% had good outcome. Culture positivity was 40 % for at risk neonates for sepsis. Among these, most common organism was klebsiella pneumoniae followed by Staph aureus.

Conclusion: This prospective study reveals the need of better neonatal transport facility from labor room to intensive care unit and from periphery to tertiary centers.

KEYWORDS : Neonates referred Sepsis outcome

INTRODUCTION

There is a significant improvement in neonatal care in last decade due to better availability of resources along with regionalization, referral and transport systems which led to increased survival of very preterm and low birth neonates across India. In our country, a dramatic increase in the number of special care neonatal units (SCNUs) at the district level, has taken place in the last decade due to the commitment of government and other agencies. In parallel, the awareness and willingness to get treatment for even very preterm infants has increased in our community. The SCNUs have been designed as level II units so that they would be sending the sicker, complex, and extremely low birth weight infants to tertiary care centres in medical colleges and apex institutions. Our country has witnessed significant decrease in infant mortality rate (IMR) over the last few years, however, the same is not true for neonatal mortality rate (NMR) [1]. This is because majority of child health programs were focusing on post-neonatal mortality in all these years. The cause of death in the neonatal period is different from those in post-neonatal period. Diarrhoea, pneumonia and malnutrition are important cause of deaths in early post neonatal period whereas prematurity, asphyxia and sepsis are the most common contributors of neonatal mortality in India [2]. In A study conducted at a tertiary care hospital of New Delhi in 2014, it was observed that most important cause of death in early neonatal period is asphyxia and low birth weight while most important cause of death in late neonatal period is sepsis. Most of deaths (43%) took place in first 24 hours of life. Severe hypothermia, severe respiratory distress, admission within first 24 hours of life, absence of health personnel and referral from any hospital had significant correlation with mortality [3]. The pillars for decreasing neonatal mortality are universal; good ante-partum and intra-partum care for the mother and quality facility based neonatal care for the sick newborns. We conducted this study to analyse the important contributors of neonatal mortality for newborns transported to our setting. We also analysed the factors which affects the neonatal outcome.

MATERIALS AND METHODS

The study was conducted at neonatal intensive care unit (NICU) of Nalanda Medical College and hospital, Patna Bihar. The study was a prospective observational study. In this study, we enrolled 382 neonates from November 2013 to October 2014 who were referred and transported to our institute. The study was approved by Institute Ethics Committee and a written informed consent was obtained from one of the parents before enrolment. The interview was conducted in a separate quiet room within 24 hours of admission in NICU. The interview was done, only after treatment had been initiated, the situation had stabilized, and parents/guardians were in a comfortable state of mind. At arrival in the NICU, the treating team stabilized and initiated treatment. The investigator reviewed the admission record, respiratory and hemodynamic status of each neonate at arrival in NICU was assessed by the receiving physicians. A newborn was categorized as hemodynamic stable if heart rate was >100, capillary refill time <3seconds, pulse oximeter saturation (SpO₂) ≥ 90% and both central and peripheral pulses were well palpable. Temperature, oxygenation, perfusion, and sugar (TOPS) score, a good predictor of mortality were calculated at admission in NICU. TOPS score comprises of four parameters –temperature, oxygenation, perfusion, and sugar. Temperature was measured by thermometer in axilla, saturation by pulse oximeter, perfusion by capillary filling time (CFT) at sternum, and blood sugar by glucometer. Hypothermia is defined as temperature below 36.5°C and assigned score 1 while temperature ≥36.5°C is normal and given score 0. Hypoxia is defined as saturation <90 % and assigned score 1 and saturation ≥90 % is assigned score 0. Prolonged CFT is defined as CFT ≥3s and assigned score 1 and while normal CFT is <3s and assigned score 0. Hypoglycemia is defined as random blood sugar below 40 mg/dl (milligram per deciliter) and assigned score 1 while euglycemia is defined as random blood sugar ≥ 40 mg/dl and assigned score 0 [4,5]. TOPS score for every baby was calculated at admission. On the basis of birth weight and gestational age neonates were classified into SGA (small for

gestational age), AGA (appropriate for gestational age), LGA (large for gestational age) based on Fenton's chart. ELBW (extremely low birth weight) is defined as weight less than 1000 gram. LBW (low birth weight) is defined as weight less than 2500 gram. Normal birth weight is weight between 2500 gram – 4000 grams. Illiterate means the parents were unable to write their names. Primary education was defined as educated up to 7th standard.

The outcome was classified as good outcome & poor outcome. Good outcome included discharge to home, back referral, DOR (Discharge on Request) in the stable state. Poor outcome included DAMA (Discharge Against Medical Advice) in unstable state and death. Statistical analysis was done using SPSS IBM version 24.

RESULTS

During our study period three hundred and eighty-two (382) newborns were brought to NICU. Ninety-two newborns were discharged after initial observation. They have minor illnesses like nose block -43, excessive cry - 21, jaundice not requiring phototherapy 28. They were observed for few hours in NICU and discharged after initial observation and parents were reassured.

Demographic profile of neonates admitted to NICU consists of male -56 %, term - 70 %, extremely low birth weight – 2 %, small for gestational age - 28 %. Most of the parents (70 %) were educated up to primary and majority of parents (90 %) were farmer or daily wage laborer. Demographic details are shown in table 1.

Table 1: Demographic details

Gender	Male	Female	Intersex
	162(56 %)	128(44 %)	0
Gestational Age	Extreme Preterm (< 28 weeks)	Preterm (28- <37weeks)	Term (≥ 37 weeks)
	6(2 %)	81(28 %)	203(70 %)
Birth Weight	ELBW	LBW	Normal weight
	6(2 %)	67(23 %)	217(75 %)
Intrauterine Growth Status	SGA	AGA	LGA
	81(28 %)	203(70 %)	6(02 %)
Educational Status	Illiterate	Primary	Above primary
	29(10 %)	203(70 %)	58(20 %)
Occupational status Of Father	Farmer	Labor	Others
	203(70 %)	58(20 %)	29(10 %)

TOPS score was calculated for every neonate who was admitted to NICU. At admission, 80 % (232) neonates were hypothermic, 37% (107) hypoxic, 85% (247)with Prolonged CFT and 28% (81) with hypoglycemia. TOPS score was Four – 28 %, three – 35 %, two – 30 %, one – 7 %. As expected, mortality increased with increasing TOPS score. Mortality trend is shown in figure 1.

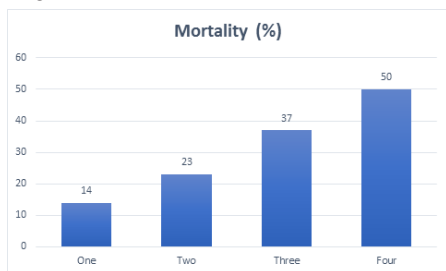


Figure 1: TOPS Score and Mortality

Immediately after admission to NICU, Neonates were started on appropriate treatment. We also studied immediate intervention required. Immediate intervention was defined as intervention required within one hour of admission. One third of neonates required CPAP support. Details of immediate intervention is shown in figure 2.

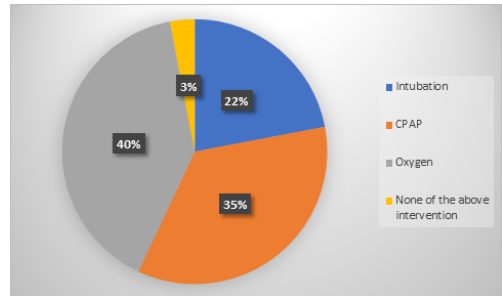


Figure 2: Immediate Intervention at admission

Final diagnosis of the neonates was noted and analyzed. Sepsis was the most common final diagnosis followed by birth asphyxia and neonatal jaundice. Details of final diagnosis is given in the table 2 below.

Table 2: Final Diagnosis

Final Diagnosis	N (%)
Sepsis	116 (40)
Birth asphyxia	46 (16)
Neonatal Jaundice	43 (15)
Respiratory distress syndrome (RDS)	35 (12)
Congenital malformation	09 (03)
Metabolic disorder	06 (02)
Meconium aspiration syndrome (MAS)	06 (02)
Others	29 (10)

In our study, 39 % (113) of neonates had poor outcome whereas 61 % (177) had good outcome. Among those who had poor outcome, 35% (102) of neonates expired and 4 % (12) of babies were discharged against medical advice in hemodynamically unstable condition with high probability of death. Neonates having good outcome included neonates discharged to home or referred neonates in hemodynamically stable state.

We also analyzed the blood culture at admission. Out of 290 admitted neonates, Blood culture was sent for 85% of neonates as those neonates were started on antibiotics. 32 % (93) neonates were culture positive. Most common organism was Klebsiella pneumoniae followed by Staph aureus.

DISCUSSION

Neonates are at much higher risk than any other ages for life threatening events and it is the highest mortality period of human development. Sick neonates, in addition, are much more susceptible to clinical deterioration if adequate treatment is not initiated timely. At risk fetuses, identified during intrauterine evaluation need to be delivered at medical centers where intensive care can be provided at birth itself. This is in relation to the fact that the neonates are susceptible not only to their diseases or disorders but also likely to worsen during transportation.

Temperature of babies was recorded at admission and we found statistically significant difference between outcome of euthermic and hypothermic babies. Euthermia is defined as temperature range between 36.5°C - 37.5° C while hypothermia is temperature <36.5° C. In hypothermic group 39% had poor outcome, whereas in euthermic group poor outcome was found in 21% neonates. Other studies also support that hypothermia in neonatal period is associated with poor outcome [6]. In a study conducted at JIPMER by

Rathod *et al*, among neonates who died 76% were hypothermic [7]. SpO₂ was recorded at admission and compared with outcome. There was a significant relationship between hypoxia at admission and poor outcome. Incidence of poor outcome in hypoxic group was 42%, while it was only 18% in non-hypoxic group. Prolonged CFT was associated with poor outcome in 39% whereas incidence of poor outcome in babies with normal CFT group was 16%. Poor outcome was seen in 23 % of euglycemic babies whereas it was seen in 33% of hypoglycemic group. In this prospective observational study, more than half of newborns were males. Similar results have been seen in previous study conducted at Tamilnadu, India [8]. This may be attributed to gender bias though higher morbidity among neonates of male gender may also contribute.

We have observed that more than 2/3rd neonates are term while extremely premature babies are very few which is consistent with the study conducted by Rathod *et al* [7]. In our study, 70 % of the neonates were of normal AGA, which is similar to the study conducted at Tamilnadu, India [8]. In this study 3/4th of the neonates was AGA.

We have recorded educational and occupational status of parents and found that more than 3/4th of parents was educated till primary only. Fathers of the newborns were mostly farmers and laborers and all mothers were housewives. The social status of parents clearly implies that these neonates belong to poor socioeconomic strata. Socioeconomic status is also an important determinant of health and important predictor of outcome of neonates [9].

Sepsis, jaundice, and birth asphyxia contributed to more than 2/3rd of the admissions. A study conducted at Tamilnadu, India also had almost similar percentage of above mentioned diagnosis at admission [8]. This suggests that disease profile of neonates admitted to NICU is not so different in North from South India.

More than half of the babies (61%) had good outcome. These neonates included those who were discharged to home or referred to a nearby local hospital. We referred the neonates to local hospital for continuation of care like weight gain or antibiotic completion. This is extremely helpful for the parents and family. It decreases the cost of care as well. Among admitted newborns, 35% died and 4% discontinued treatment due to poor expected outcome and went discharge against medical advice. A study conducted by Rathod *et al* found 76.2% discharge and 19.8% deaths among admitted newborns [7]. In study done at Tamilnadu, India, 93.4% were discharged and 6.6% died [8]. The differences are likely to be related to the differences in severity of illness or facilities available during transportation.

In our study, culture positive rate was 32 % which is higher as compared to other studies. Among the organism grown, *Klebsiella pneumoniae* remains the most common organism (28%), followed by *Staph* species (6%). Other organisms isolated were *Acinetobacter*, *Enterobacter*, *Burkholderia* and yeast species. Study conducted by Rathod *et al* had found 24% blood culture positive sepsis with common organism being *E. coli* and *Staph aureus* [7]. The Study conducted at Tamilnadu India had found 12% septicemia among morbid patients and 7% septicemia contributed to mortality profile among neonates. Isolated organism is not discussed in the article [8]. The probable reason for higher culture positive rate in our study is overcrowding and lack of resources including human resources like shortage of resident doctors and nursing staff in our NICU. The profile of bacteria is also different which may be due to difference in geographical location.

This prospective observational study reveals the need of better neonatal care in our setting. Care of neonates who is sick requires multidisciplinary approach and prompt intervention. Transportation facilities with proper communication before referral, staffing pattern of NICU as per guidelines, which is rarely seen in a resource limited setting, sepsis measures are some areas in which great improvement is needed and can be done. There should be enough resident doctors and consultants to take care of sick newborns. There should be a protocol in place for the admission, treatment, and discharge of neonates with a proper plan for follow up. Implementation of these recommendation will provide the path for better neonatal care and concept of happy family with baby will be rediscovered.

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CONCLUSION