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CLINICAL PROFILE AND OUTCOME OF NEONATES ADMITTED IN A NEONATAL INTENSIVE CARE UNIT OF A TERTIARY CARE CENTRE

Paediatrics

Dr. Anish Chatterjee	Dr. B. C. Roy Post Graduate Institute Of Pediatric Sciences, Kolkata
Dr. Meenakshi Biswas*	Dr. B. C. Roy Post Graduate Institute Of Pediatric Sciences, Kolkata *Corresponding Author
Dr. Debarshi Jana	Institute of Post-Graduate Medical Education and Research, A.J.C. Bose Road, Kolkata-700020, West Bengal, India

ABSTRACT

It has been estimated that about 70% of neonatal deaths could be prevented if proven interventions are implemented effectively with high coverage. This study aims at assessing the clinical profile and outcome of babies admitted to Neonatal Intensive Care Unit of out Institute i.e. Dr B. C Roy Post Graduate Institute of Paediatric Sciences which is level III NICU with 20 beds equipped with 10 mechanical ventilators, 4 CPAP machines, besides phototherapy units, cardio respiratory monitors, availability of ABG facility, Surfactant therapy, 24 hr radiology facility and a very dedicated and competent staff.

There were total 2292 neonatal admissions in the Hospital from 1st January 2017 till 31st December 2017, of which 518 (22.6%) required NICU admission. In our study, Birth asphyxia accounts for the major cause of admission i.e 188, (36.3%) followed by prematurity with low birth weight 107(20.7%), sepsis 84(16.2%),neonatal jaundice 34(6.6%), Respiratory distress syndrome 25(4.8%), meconium aspiration syndrome 20(3.9%),surgical causes 18(3.5%), congenital heart diseases 14(2.7%), Transient tachypnea of newborn 11(2.1%), congenital anomalies 7(1.4%) and others including neonatal varicella 7(1.4%). Among the babies with birth asphyxia, 40.7% had HIE I, 45.2% had HIE II and 14.1% had HIE III. According to outcome, of the 518 admitted babies, 252 babies i.e (48.6%) were discharged, 260 (50.2%) were expired and 6 of them i.e. (1.2 %) left against medical advice.

In our study, Birth asphyxia, Sepsis, Prematurity with low birth weight are the leading causes of NICU admission, and the leading cause of mortality being birth asphyxia, prematurity and sepsis.

KEYWORDS

Neonates, Clinical Profile, Intensive Care Unit, Outcome

INTRODUCTION

Neonatal period is the most vulnerable period of human life. Each year about 2.8 million newborns die before they are 4 weeks old and half of them die in their 1st 24 hours. 98 percent of these deaths occur in developing countries. Newborn deaths contribute to about 44 % of all deaths in children under five years of age globally and more than half of the infant mortality.[1]

As per Govt. of India (2017), sample registration system[2] statistical report 2016, neonatal mortality rate in India was 24 (varying from 14 in urban and 27 in rural areas). The percentage of neonatal deaths to total infant deaths was 68.8% at national level and varied from 60.4%in urban areas to 70.7% in rural areas somewhere indicating the impact of socioeconomic status and Education on Neonatal Mortality.

It has been estimated that about 70% of neonatal deaths could be prevented if proven interventions are implemented effectively with high coverage[3] .It was further estimated that health facility based interventions can reduce neonatal mortality by 20 to 50% in different settings. Facility based new born care[4], thus has a significant potential for improving the survival of newborns in India. In order to improve the survival of neonates the concept of NICU has come up.

New born babies who need intensive medical attention are often admitted into a special area of the hospital called the Neonatal Intensive Care Unit (NICU). The NICU combines advanced technology and trained health care professionals to provide specialized care for the tiniest patients. Levels of NICU. India has got a three tier system of neonatal care[6,5]. Newborn Care corners are established at every level to provide essential care at birth, including resuscitation.

Level I care includes referral of sick newborns from Primary Health Centres(PHCs) to higher centres and care at Neonatal Stabilisation Units (NSUs) in the first referral units. Care in the NSUs includes stabilisation of the sick newborns and care of low birth weight (LBW) babies not requiring intensive care.

Level II care includes functioning of Special Care Newborn Units (SNCUs) at the District Hospital level. These units are equipped to handle sick newborns other than those who need ventilator support and surgical care.

Level III units are the Neonatal Intensive Care Units.

This study aims at assessing the clinical profile and outcome of babies admitted to Neonatal Intensive Care Unit of out Institute i.e. Dr B. C Roy Post Graduate Institute of Paediatric Sciences which is level III NICU with 20 beds equipped with 10 mechanical ventilators, 4 CPAP machines, besides phototherapy units, cardio respiratory monitors, availability of ABG facility, Surfactant therapy, 24 hr radiology facility and a very dedicated and competent staff. This study is being carried out as there is lack of study in this field especially in Eastern India. Such type of study if carried out at various other centres will generate data which will help in improved neonatal care, formulation of better management protocols, need for increased collaboration with the obstetricians so as to improve the perinatal care and overall decrease the neonatal morbidity and mortality**.**

AIMS AND OBJECTIVES
- TO ASSESS THE PROPORTION OF NEONATES REQUIRING NICU CARE
- TO ENUMERATE THE DISEASE SPECTRUM FOR WHICH INTENSIVE CARE IS REQUIRED
- TO ENUMERATE THE TREATMENT PROVIDED TO THE ADMITTED PATIENTS FOLLOWING THE STANDARD NICU PROTOCOL
- TO DETERMINE THE OUTCOME (DEATH / DISCHARGE) OF THE ADMITTED PATIENTS.

MATERIALS AND METHODS

It is a prospective observational study of all neonates admitted in the NICU of B C Roy Hospital from January 2017 to December 2017. 518 patients neonates admitted to NICU were included in the study and the data was recorded in a pre designed proforma and then analyzed using appropriate statistical tool.

All neonates admitted to the NICU during the study period were included in the study. After obtaining permission of Head of the Institute and taking informed consent from parents of the baby or any guardian, data of all the admitted babies were recorded by visiting baby

at least 3 times. Prestructured-pre tested closed ended questionnaire was used to collect the data e.g. admission, sex, gestational age, weight for gestation, referral centre, age at presentation, indications for admission, duration of hospitalization, complications encountered, procedures done during hospitalization and outcome. Ethical clearance was obtained by Institutional ethical committee. Data were entered and analyzed using excel spread sheet.

STATISTICAL ANALYSIS
For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0. and Graph Pad Prism version 5. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. One-way analysis of variance (one-way ANOVA) was a technique used to compare means of three or more samples for numerical data (using the F distribution). Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. p-value ≤ 0.05 was considered for statistically significant.

RESULTS AND ANALYSIS
There were total 2292 neonatal admissions in the Hospital from 1st January 2017 till 31st December 2017, of which 518 (22.6%) required NICU admission. Of the 518 neonates, 320(61.8%) were males, 196(37.8%) females and 2(0.4%) had ambiguous genitalia. The mean age at which patients were admitted was 5 days.

306(59.1%) of the admitted neonates were from Rural area, 171(33.0%) from suburbs, and only 41 (7.9%) were from urban region. Of the total neonates admitted, 412(79.5) were appropriate for gestational age, (1.2) were large for gestational age and 100(19.3) were small for gestational age. 157(30.3) of the admitted babies were preterm i.e less the 38 weeks calculated from the 1st day of the last menstrual period, (Naegele's formula), and 361(69.7) were term babies. Of the total babies admitted, 253(48.8%) were having normal birth weight, 194(37.5%) were having low birth weight, 51(9.8%) were very low birth weight and 20 (3.9%) were extremely low birth weight babies. The mean birth weight on admission was 2.3 kg. According to the mode of delivery, 225(43.4) were delivered by Caeserian section and the rest i.e. 293(56.6) were delivered by normal vaginal delivery. The mean duration of hospital stay was 10.79 days. The mean occipitofrontal circumference was 32.1 cm 64.9 percent of the blood cultures show no growth, the reason behind this might be that most of the babies have already received antibiotics prior to referral to NICU. Of the culture positive cases, the commonest isolate was Klebsiella(40.79%) followed by Acinetobacter(11.84%).

398(76.8%) had normal blood counts, 75(14.5%) had leucocytosis, 24(4.6%) had leucopenia, and the rest had various combinations of thrombocytopenia with leucocytosis/ leucopenia.

Of the total 518 babies, 232(44.8%) had positive C reactive protein and rest were negative for CRP.s CSF study was done in 362(70%) of babies and 349(67.4%) came out to be normal, 10(1.9%) had raised protein in CSF, and only 3(0.6%) had increased cell count ABG was done at least once on admission, and the distribution based upon the initial ABG shows normal ABG in 249(48.1%), 206(39.8%) had acidosis, 22(4.2%) had hypoxemia, 21(4.1%) had respiratory alkalosis and 18(3.5%) had hypercarbia.

Chest X ray was normal in 398(76.8 %) of babies, 33(6.4%) each had hyperinflated lungs and patchy consolidation. 26(5%) had white out lungs. Neuroimaging was normal in 498(96.1%) followed by cerebral oedema in 12(2.3%), rest had dilated ventricles (0.2%), intraventricular hemorrhage (0.6%), periventricular leucomalacia (0.4%), hypoechoic grey matter (0.4%).

The distribution according to diagnosis shows the main causes of admission include Birth Asphyxia 188(36.3%), Prematurity 107(20.7%), sepsis 84(16.2%), Neonatal jaundice 34(6.6%), respiratory distress syndrome25(4.8%), meconium aspiration syndrome 20(3.9%), surgical causes 18(3.5%), congenital heart disease 14(2.7%).

Among the babies with birth asphyxia, 40.7% had HIE I, 45.2% had HIE II and 14.1% had HIE III. According to the treatment received, 407 out of 518 (78.6%) required oxygen, 256(49.4%) required invasive ventilation, 58(11.2%) required non invasive ventilation, and rest i.e

204(39.4%) did not require ventilation.100 % of the babies were treated with antibiotics.

Among the admitted babies, 104(20.1%) were treated with blood products, (10.6%) were treated with pentaglobin, 191(36.9%) required antiepileptic drugs, 266(51.4%) were treated with ionotropes, 43(8.3%) required glucose infusion due to hypoglycemia, of which 2(0.4%) required octreotide for refractory hypoglycemia.

60(11.6%) of the babies required phototherapy and only 14(2.7%) required exchange transfusion for neonatal jaundice.Of the 518 babies 23(4.4%) were given surfactant.

According to diagnosis, Birth asphyxia constitutes the lion share of cause of admission i.e 188, (36.3%) followed by prematurity with low birth weight 107(20.7%), sepsis 84(16.2%), neonatal jaundice 34(6.6%), Respiratory distress syndrome 25(4.8%), meconium aspiration syndrome 20(3.9%), surgical causes 18(3.5%), congenital heart diseases 14(2.7%), Transient tachypnea of newborn 11(2.1%), , congenital anomalies 7(1.4%) and others including hemorrhagic disease of newborn and neonatal varicella 7(1.4%).

Association between Birth weight vs Outcome

birth weight	OUTCOME			
	Discharged	Expired	LAMA	TOTAL
ELBW	3	17	0	20
Row %	15.0	85.0	0.0	100.0
Col %	1.2	6.5	0.0	3.9
LBW	98	93	3	194
Row %	50.5	47.9	1.5	100.0
Col %	38.9	35.8	50.0	37.5
Normal	127	124	2	253
Row %	50.2	49.0	0.8	100.0
Col %	50.4	47.7	33.3	48.8
VLBW	24	26	1	51
Row %	47.1	51.0	2.0	100.0
Col %	9.5	10.0	16.7	9.8
TOTAL	252	260	6	518
Row %	48.6	50.2	1.2	100.0
Col %	100.0	100.0	100.0	100.0

Chi-square value: 11.1085; p-value: 0.0851

Distribution of mean Birth weight vs Outcome

	Number	Mean	SD	Minimum	Maximum	Median	p-value
Discharged	252	2.3977	.6661	0.8800	4.3000	2.5000	0.2079
Expired	260	2.3065	.7353	0.6500	4.0000	2.4000	
LAMA	6	2.0667	.5377	1.2500	2.6000	2.2000	

DISCUSSION
There were total 2292 neonatal admissions in the Hospital from 1st January 2017 till 31st December 2017, of which 518 (22.6%) required NICU admission.

In our study, Birth asphyxia accounts for the major cause of admission i.e 188, (36.3%) followed by prematurity with low birth weight 107(20.7%), sepsis 84(16.2%),neonatal jaundice 34(6.6%), Respiratory distress syndrome 25(4.8%), meconium aspiration syndrome 20(3.9%),surgical causes 18(3.5%), congenital heart diseases 14(2.7%), Transient tachypnea of newborn 11(2.1%), congenital anomalies 7(1.4%) and others including neonatal varicella 7(1.4%). Among the babies with birth asphyxia, 40.7% had HIE I, 45.2% had HIE II and 14.1% had HIE III.

Case fatality rate in decreasing order shows highest mortality in Meconium aspiration syndrome (CFR 80%), followed by hypoglycemia (CFR 66.7%), surgical causes (CFR 61.1%), prematurity (CFR 56%), congenital heart disease(50%), neonatal jaundice (CFR 50%), varicella (50%), Birth asphyxia (48.9%), congenital anomalies (42.8%), sepsis (41.7%), Resp distress syndrome (36%), Transient tachypnea of newborn (18.2%).

According to outcome, of the 518 admitted babies, 252 babies i.e (48.6%) were discharged, 260 (50.2%) were expired and 6 of them i.e. (1.2 %) left against medical advice.

In our study the Birth asphyxia (35.4%), prematurity (23.08%) and

sepsis (13.46%) were found to be the leading cause of mortality which is quite comparable.

Morbidity pattern and Hospital outcome of Neonates admitted in a tertiary care teaching Hospital, Mandya done by Sridhar *et al* [7] identified prematurity, low birth weight, Neonatal sepsis, and Birth asphyxia as major causes of morbidity and RDS, and Birth asphyxia as the major contributors to the Neonatal Mortality.

A study by Shah GS *et al* [8] in a neonatal intensive care unit of tertiary care Hospital in Eastern Nepal showed of the 361 neonate Eighty six neonates (23.8%) were admitted due to prematurity and 73 (20.2%) with birth asphyxia. Among birth asphyxia, 40(54.8%) were in HIE III, 27.4% and 17.8% in HIE II and HIE I, respectively while in our study 40.7% had HIE I, 45.2% had HIE II and 14.1% had HIE III, i.e most having HIE I AND II.

One hundred eighteen (32.6%) cases were diagnosed as sepsis. The overall mortality was 20.2% during hospital stay. Sepsis, prematurity and birth asphyxia were major causes for admission in NICU.

In a study done by Kumar *et al* [9], the results were as follows : of the 279 neonates were admitted in NICU during the study period. A total of 244 (87%) were inborn and 35 (13%) were outborn neonates. The major cause of morbidity was neonatal sepsis (25%), permaturity (19%), neonatal jaundice (18%), birth asphyxia (5%) and cardiac anomaly = 4%. The overall mortality rate was 11%. Most deaths were due to sepsis (28%), prematurity with RDS (18%) and birth asphyxia (9%), concluding that good antenatal care, proper nutrition to pregnant women, timely referral, prevention of preterm delivery are important steps to decrease neonatal morbidity and mortality.

Morbidity and mortality pattern in a Tanzanian special care baby unit (SCBU) done by Klingenberg C *et al* [10]. During a 3-month period, 246 consecutive admissions to the SCBU at Kilimanjaro Christian Medical Centre were audited. Prematurity, low birthweight and suspected infection accounted for 61% of all admissions. The overall mortality rate was 19%, but varied considerably according to gestational age, birthweight and diagnosis. Thirty-one neonates (two-thirds of all deaths) died during the 1st 24 hours of life. Of 27 infants admitted on grounds of perinatal asphyxia, 11 (41%) died, and, of 19 infants with a gestational age <31 weeks, 13 (68%) died. More than two-thirds of all infants were treated with antibiotics. Septicaemia confirmed by blood culture was found in 16 cases. The susceptibility pattern of bacterial isolates did not indicate high rates of resistance to commonly used antibacterial agents. A reduction in the number of preterm deliveries and improved perinatal care to avoid and treat perinatal asphyxia would be the two most important measures in reducing neonatal mortality in this setting.

Neonatal morbidity and mortality in a Rural Tertiary Hospital in Nigeria done byUmma Idris Abdullahi [11] shows : 205 neonates were admitted to SCBU during the study period with the ratio of the males to females admitted was 2.1:1. The major causes of morbidity were neonatal sepsis (32.2%), birth asphyxia (29.3%), and prematurity (18.5%). In this study, overall mortality rate was 7.16% with birth asphyxia accounting for 13 (40.6%) of the total deaths ($\chi^2 = 1.50$, $P = 0.68$). One hundred and fifty-nine (77%) were discharged, 12(6%) were discharged against medical advice, while 2(1%) were referred, concluding that Neonatal sepsis, birth asphyxia, and prematurity were the major causes of neonatal morbidity and mortality in that locality.
Morbidity pattern and mortality of neonates admitted in a tertiary level teaching hospital in Bangladesh by Islam MN *et al* [12] shows A total of 4826 neonates were admitted and reviewed during the period January 2003 to December 2003 in MMCH. Neonatal admission comprises 31.6% of total paediatric admission. Majority of the patients were 1 to 3 days of age and male. The top five causes for neonatal admission in MMCH were perinatal asphyxia (38.7%), low birth weight (25.7%), septicemia (19.2%), neonatal jaundice (5.9%), meconium aspiration syndrome (2.9%). The death rate of neonatal admission was 20.6%. The mortality was found among the neonates admitted with low birth weight (28.1%), perinatal asphyxia (22.8%), septicemia (18.9%). The average duration of hospital stay was higher among the septicemia patients than neonates suffering from other diseases. The finding of this study could be used by professionals, managers and policy makers to design neonatal health programmes.

Pattern of morbidity and mortality of newborns admitted into the sick

and special care baby unit of Enugu State University Teaching Hospital, Enugu state doneby Ekwochi U *et al* [13] shows of 261 neonates admitted during the period under review, the common causes of admissions seen from the study were perinatal asphyxia (80, 30.7%), low birth weight (64, 24.5%), neonatal sepsis (44, 16.9%), and neonatal jaundice (16, 0.06%). A total of 37 (14.2%) deaths were recorded during the period. The leading causes of deaths were severe form of perinatal asphyxia (18, 52.9%), neonatal sepsis (10, 29.4%), and very low birth weight (two, 0.06%). Fifty-five percent of all the deaths occurred within 24 h of admission. Death due to asphyxia was more in babies born outside the hospital (outborn) than in babies born within the hospital (inborn). Equal number of outborn and inborn babies died from neonatal sepsis. The age at presentation to the sick baby unit was significantly lower in inborn (P = 0.004), while age at death was not different in both group of newborns (P = 0.876).

Pattern of morbidity and mortality of neonates admitted in tertiary level neonatal intensive care unit in Nalanda Medical College and Hospital, Patna, Bihar, India by Amitabh Ranjan and Alka Singh [14] ' have found that of the total 4457 neonates' morbidity pattern showed maximum share of prematurity 1762 cases, sepsis 1157 cases, birth asphyxia 1162 cases, meconium aspiration syndrome 304 cases, congenital malformations 98 cases, neonatal jaundice 614 cases, and 319 IUGR case. Mortality was 1043 cases. Out-born cases 83%, early neonatal mortality was 638 cases. Case fatality for prematurity was 25.93%, birth asphyxia 20.99%, congenital malformations 14.28%, sepsis 17.98% and MAS 15.46%. Conclusions: Prematurity, neonatal sepsis and birth asphyxia are leading causes of neonatal mortality in their study. Interventions to reduce preterm delivery, low birth weight and birth asphyxia should be planned and implemented by health care managers at community level. Mortality is still unacceptably high; improvements in neonatal care at different levels will definitely reduce the neonatal deaths.

Compared to the above mentioned studies the mortality in our study is very high and the main reason may be that we don't have an inhouse delivery room facility/obstetric unit and all the babies are outborn and most of the referrals (around 60%) are from rural areas in which case there is a lot of valuable time lost in transit, where as in all the above studies, there is an attached obstetric unit and it has been mentioned in the studies that the mortality of the outborn babies are significantly higher, around double of that of the inborn babies thus explaining such high mortality in our study.

CONCLUSION

- Since all the babies are outborn, the golden hour is lost during transit as most referrals are from rural area adding the morbidity and mortality of already asphyxiated babies in whom every minute counts.
- Hypothermia is also very common during longer transit periods which is again an independent risk factor for neonatal mortality.
- Interventions to reduce preterm deliveries, antenatal screening, identification and timely referral of high risk pregnant women and those who are likely to deliver prematurely, treatment with antenatal corticosteroids to prolong their pregnancy and speed up maturation of fetal lungs and also intrapartum monitoring to detect fetal distress.

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