



ORIGINAL RESEARCH PAPER

Paediatrics

CLINICAL PROFILE AND PREDICTORS OF MORTALITY OF EXTRAMURAL NEONATES ADMITTED IN NICU OF TERTIARY CARE HOSPITAL IN CENTRAL RAJASTHAN : PROSPECTIVE OBSERVATIONAL STUDY

KEY WORDS: Extramural newborns, neonatal morbidity, neonatal mortality

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ABSTRACT

OBJECTIVE: This study was undertaken to know the clinical profile and predictors of mortality of outborn neonates admitted in Neonatal Intensive Care Unit (NICU).
METHOD: This prospective study was conducted in NICU of department of pediatrics, JLN medical college & hospital, Ajmer from January 2019 to December 2019.
RESULTS: Of the 2250 neonates admitted, There was male preponderance (64%), male:female ratio was 1.78:1. Majority of neonates (68.4%) were term while 31.2% were preterm and 0.4% were post term gestation. Majority of neonates (79.8%) were admitted in early neonatal period while 20.1% neonates were admitted in late neonatal period. As per birth weight, 44.1% neonates were between 1.5-2.49 kg, 42.6% neonates had birth weight more than 2.5 kg while 3.4% neonates were <1 kg. Majority of neonates (88.7%) were delivered vaginally while 11.3% were delivered by caesarean section. Majority of neonates (85.1%) were delivered at govt. hospitals while 11% and 3.9% neonates were delivered at private hospitals and at home respectively. Rural residency (73.7%) was far more as compared to urban residency (26.3%). 42.8% mothers had primary education and 47.7% mothers had secondary education while 3.8% mothers were illiterate. Majority of cases (66.1%) belonged to middle socioeconomic class. Major causes of NICU admission were birth asphyxia / HIE of newborn (21.11%), neonatal sepsis (16.36%), neonatal jaundice (12%), RDS of newborn (8.6%), and prematurity (7.7%). Out of 2250 neonates admitted, 70.1% babies were successfully discharged while 29.9% neonates died during treatment. Birth Asphyxia / HIE of Newborn (22.25%), RDS of Newborn (20.47%), Neonatal Sepsis (16.02%), Shock (10.98%), Congenital Malformations (6.82%), and ELBW (6.38%) were found to be major causes of mortality among neonates admitted in NICU.
CONCLUSION: The majority of morbidities and subsequently the mortalities can be reduced by improving maternal care and essential newborn care, appropriate primary interventions and timely referral to tertiary care centers for high risk cases, with better transport facilities for sick neonates.

INTRODUCTION

Childhood mortality and morbidity reflect overall development of a nation. Globally 2.5 million children died in the first month of life in 2018, out of them approximately 1 million dying on first day and close to 1 million dying within the next 6 days. Of these about 6 lakh are Indian (UNICEF 2018) [1]. UNICEF (2014) estimate that leading causes of newborn deaths are-

- Prematurity (35%).
- intrapartum complications like asphyxia(24%).
- Infections (23%).
- Other causes such as birth defects etc (18%).

After the launch of Janani-Shishu Suraksha Karyakram (JSSK), Institutional deliveries doubled between 2005-06 to 2015-16, from 39% to 79% (NFHS-4). The rollout of Integrated Management of Newborn and Childhood Illness (IMNCI) has also leads to increased contact of newborns at their households and improved detection and referral of sick newborns to health facilities. The proportion of postnatal care increase from 37% in 2005-06 to 65% in 2015-16 (NFHS-4) [2]. It has been estimated that health facility based interventions can reduce neonatal mortality by as much as 25-30% [3].

In this regard it would be useful to have insight into demographic and clinical profile of outborn (extramural) neonates requiring NICU admission. Therefore the present study was carried out at tertiary care hospital in central Rajasthan.

MATERIALS AND METHODS

This prospective study was conducted in neonatal intensive care unit (NICU) of department of pediatrics, JLN medical college & hospital, Ajmer from January 2019 to December 2019.

After taking informed consent from mothers of the neonates, their details were recorded on a specially designed pretested performa. These include residential address with distance from

NICU, age, parity, previous obstetric history, socioeconomic status (assessed by Kuppuswamy scale), education status, associated medical or obstetrical illness, antenatal care during pregnancy and the duration of gestation.

Labour and delivery details about presentation and duration of labour, peripartum complications were recorded. Details regarding newborn like birth weight, gestational age, cry status at birth, neonatal reflexes, cord condition, congenital abnormalities etc were also recorded.

Thorough physical examination was done and findings were recorded. Gestation age was assessed by new Ballard scoring system for those newborn who were admitted at birth [4]. For those who presented after 72 hours of birth it was estimated by calculation from last menstrual period. Cause of admission viz. Prematurity, low birth weight, birth asphyxia, sepsis, respiratory distress, neonatal jaundice, hypoglycemia, hypothermia, intracranial hemorrhage, congenital heart disease etc. was recorded. Any relevant investigations done during hospital stay were also recorded.

Data entry and statistical analysis was performed with the help of Microsoft Excel and SPSS version 25 (IBM SPSS Statistics inc. Chicago, Illinois, USA). Categorical variables were presented as number and percentage. Chi-square test was used to compare differences in categorical variables and independent t-test, p value < 0.05 (at 95% confidence interval) was considered to indicate statistical significance.

Prior approval for the study was taken from institutional ethical committee of JLN Medical collage Ajmer. Informed consent was taken from mothers.

RESULTS

Among 2250 neonates admitted in NICU, 64% were males and 36 were females. High Male:Female ratio (1.78:1) was observed.

majority of neonates (68.4%) were term while 31.2% were preterm and 0.4% were post term gestation. Majority of neonates (79.8%) were admitted in early neonatal period while 20.1% neonates were admitted in late neonatal period. As per birth weight, 44.1% neonates were between 1.5-2.49 kg, 42.6% neonates had birth weight more than 2.5 kg while 3.4% neonates were <1 kg. Majority of neonates (87.5%) were delivered vaginally while 11.3% were delivered by caesarean section. Majority of neonates (85.1%) were delivered at govt. hospitals while 11% and 3.9% neonates were delivered at private hospitals and at home respectively. Rural residency (73.7%) was far more as compared to urban residency (26.3%). 42.8% mothers had primary education and 47.7% mothers had secondary education while 3.8% mothers were illiterate. Most of the Neonates belonged middle class. Major causes of NICU admission were Birth asphyxia / HIE of Newborn (21.11%), Neonatal sepsis (16.36%), Neonatal Jaundice (12.0%), RDS of newborn (8.6%), Prematurity (7.7%). Birth Asphyxia / HIE of Newborn (22.25%), RDS of Newborn (20.47%), Neonatal Sepsis (16.02%), Shock (10.98%), Congenital Malformations (6.82%), and ELBW (6.38%) were found to be major causes of mortality among neonates admitted in NICU.

Table 1 Sociodemographic and neonatal profile of the study population

Variables	total admission (n=2250)	Percents (%)
Gender		
Male	1441	64
Female	809	36
Gestational age		
Fullterm (37-42 Weeks)	1538	68.4
Preterm (<37 Wee s)	704	31.2
Postterm (>42 weeks)	08	0.4
Postnatal age		
0 - 3 days	1523	67.7
4 - 7 days	273	12.1
8 - 14 days	214	9.5
15 - 28 days	233	10.4
> 28 days	7	0.3
waight on admission		
< 1 kg.	77	3.4
1 - 1.49 kg.	223	9.9
1.5 - 2.49 kg.	991	44.1
≥ 2.5 kg.	959	42.6
Mode of delivery		
Normal vaginal delivery	1970	87.5
Cesarean section	253	11.3
Assisted vaginal delivery	27	1.2
Place of delivery		
Hospital	2163	96.1
Home	87	3.9
Area of residence		
Rural	1659	73.7
Urban	591	26.3
Education status of mothers		
Graduates	131	5.7
Secondary education	1074	47.7
Primary education	956	42.8
Illiterate	89	3.8
Socio Economic status		
Lower class	621	27.6
middle class	1585	70.4
Upper Class	44	1.9

Table 2 Morbidity and mortality pattern of outborn referral neonate

Clinical Diagnosis	Total Admission (n=2250)	Mortality (n=674)
Birth Asphyxia: P 21.0 / HIE of Newborn: P 91.6	475	150 (22.25%)

RDS of Newborn (HMD): P 22.0	197	138 (20.47%)
Neonatal Sepsis: P 36.9	368	108 (16.02%)
Shock: R 57	76	74 (10.98%)
Congenital Malformation	92	46 (6.82%)
E.L.B.W. (999 gm or less): P 07.0	46	45 (6.38%)
Neonatal Aspiration of Meconium: P 24.0	89	37 (5.49%)
Prematurity (28-<37 Weeks): P 07.3	176	25 (3.71%)
DIC: P 60	15	15 (2.22%)
Acquired Pneumonia: J 15	68	10 (1.48%)
Meningitis: G 00	26	8 (1.19%)
Extreme Immaturity (<28 Weeks) : P 07.2	7	7 (1.04%)
Other Low Birth Weight(1000 gm - 2499 gm): P 07.1	70	4 (0.59%)
Acute Renal Failure: N 17	37	2 (0.29%)
Convulsions of Newborn: P 90	27	2 (0.29%)
Intraventricular Hemorrhage: P 52.3	2	2 (0.29%)
Congenital Pneumonia: P 23	3	1 (0.15%)
Environmental	90	0 (0.00%)
Hyperthermia of Newborn: P 81.0		
Hemolytic Disease of Newborn: P 55	14	0 (0.00%)
Hypothermia of Newborn: P 80	11	0 (0.00%)
Neonatal Diarrhoea: A 09	23	0 (0.00%)
Neonatal Jaundice: P 59	273	0 (0.00%)
Small for Gestational Age (IUGR): P 05.1	10	0 (0.00%)
Transient Tachypnoea of Newborn: P 22.1	55	0 (0.00%)

Table 3

Association of Gestational Age with Outcome (n=2250)			
Gestational Age	Outcome (Indicator of Mortality)		
	DISCHARGED	EXPIRED (n=674)	Total
FULLTERM (37- <42 Weeks)	1184 (76.99%)	354 (23.01%)	1538
PRETERM (<37 Weeks)	388 (55.12%)	316 (44.88%)	704
POSTTERM (= >42 Weeks)	4	4	8
Total	1,576	674	2250

Out of 704 Preterm neonates, 316 (44.88%) neonates expired as compared to 1538 Term neonates, out of which 354 (23.01%) neonates expired.

Table 4

Association of postnatal age at admission with Outcome (n=2250)				
Age (days)	Outcome (Indicator of mortality)		Total	P value
	DISCHARGED	EXPIRED (n=674)		
0-3	995	528	1523	<0.001
4-7	226	47	273	<0.001
8-14	155	59	214	
>15	200	40	240	
Total	1,576	674	2,250	

Majority of neonatal mortality belonged to early neonatal age group, as the results are statistically significant (p value <0.001)

Table 5

Association of Birth wt. of neonates with outcome (n 2250)			
Birth weight	Outcome (Indicator of mortality)		Total
	DISCHARGED	EXPIRED	
< 1 kg.			77
1 - 1.49 kg.	5	72	
1.5 - 2.49 kg.	111	112	223
≥ 2.5 kg.	706	285	991
Total	1576	674	2250

Majority of neonatal mortality belonged to low birth weight neonates

DISCUSSION

There was total of 2250 babies admitted in NICU during period of 12 months. The demographic distribution of population in this study finds that 1441 (64%) male and 809 (36%) female neonates were admitted which is in concordance to National Neonatal-Perinatal Database (NNPD) and other studies of rural India^[5,6]. This study shows a high male : female ratio (1.78:1). Further studies are needed to determine whether this is due to gender bias prevalent in India where male children are given more care or greater tendency of male children to face neonatal complications.

In this study about two third of the neonates were of full term (68.4%) gestation and about one third were preterm (31.2%) which is similar to another study conducted by Gauchan et al^[7] in which there were 67.5% term babies and 31.3% preterm babies. In contrast to this finding, A study conducted by Seyal et al found that 42.8% neonates were preterm.^[8] Finding in this study is understandable because probably Janani Suraksha Yojana (JSY) and Janani Shishu Suraksha Karyakram (JSSK) Scheme of National Rural Health Mission (NRHM) has enhanced the ante-natal check up, hospital deliveries and neonatal care among the general population.

This study finds that 67.7% neonates were admitted within 3 days of birth, 12.1% neonates were age group of 4-7 days, 9.5% neonates were age group of 8-14 days, 10.4% neonates were age group of 15-28 days. Similar findings are found in study by Anjum et al (2009)^[9] and by Kotwal YS (2017).^[10] These findings are expected as neonates in early neonatal period are at risk of contracting diseases and at risk neonates are identified by healthcare workers immediately if they are born in hospitals.

The weight parameter analysis revealed that the number of neonates having extremely low birth weight (<1000 gm) were 3.4%, very low birth weight (1000-1499gm) were 9.9%, low birth weight (1500-2499 gm) were 44.1%, normal weight (>2500 gm) were 42.6%. According to the United Nations International Children's Education fund (UNICEF), The state of world's children's report 28% of neonates born with low birth weight in India.^[11] But in our study total 57.4% of neonates were low birth weight, this pattern of admission in NICU is in concordance with National Neonatal Perinatal Database (NNPD).^[12] The results of this study are also comparable with similar study done by Rakholia R et al (2014) which revealed that extremely low birth weight were 3.19%, very low birth weight were 15.40%, low birth weight were 42.02% and normal weight were 39.39%.^[13]

This study revealed that most of the admitted neonates were delivered in health institutions (96.1%) out of which 85.1% at govt. hospitals and 11% delivered at private nursing homes. Only small number of babies were born at home 3.9%. Similarly Kotwal YS et al (2017) finds in their study at Govt. medical college Srinagar, Jammu and Kashmir that 90% babies were delivered at health institutions and 10 % were delivered at home.^[10] The finding of more number of health institutional deliveries are probably due to Janani Suraksha Yojana and Janani Shishu Suraksha Karyakram scheme of National Rural Health Mission.

It was observed that 73.7% patients admitted were from rural areas and 26.3% were from urban areas. This finding is understandable as the rural population outnumber the urban population in the catchment area of the NICU of JLN medical college Ajmer. These findings are corroborating with the study of Salve et al who reported the morbidity pattern of neonates admitted at tertiary care hospital, Dr. S.C. Government Medical College, Nanded, Maharashtra and observed that the 76% neonates were from rural areas and only 24% from urban areas.^[14]

In this study literacy rate of mothers is 96.2%, out of which 42.8% have primary education, 47.7% have secondary education and 5.7% were graduated. In the present study, most cases (92%) belonged to the socioeconomic class Upper middle, Lower middle and lower. This may be due to the fact that representation of most of the population belongs to these classes. Purohit et al (2014) finds in his study that health and survival of the newborn babies depends upon the education, socioeconomic status and health status of mothers.^[15]

Top five causes of admission of neonates in this study are Birth asphyxia / HIE of Newborn (21.11%), Neonatal sepsis (16.36%), Neonatal Jaundice (12.0%), RDS of newborn (8.6%), Prematurity (7.7%). The other cause of admission are Congenital malformations (4.1%), Environmental hyperthermia of newborn (4.0%), Shock (4%), neonatal aspiration of meconium (3.9%), Low birth weight (3.2%), Acquired pneumonia (3.0%), Transient tachypnoea of newborn (2.1%), Extremely low birth weight (2.1%), Acute renal failure (1.6%), Convulsions of newborn (1.2%), and others (4.07%).

The type of diseases in this study is similar to other studies conducted by prakash et al,^[16] Islam et al,^[17] Anjum et al,^[9] Elhassan et al,^[18] Hoque et al,^[19] Gauchan et al,^[7] Prasad et al,^[20] Seyal et al,^[8] Narayan et al,^[21] Aijaz et al,^[22] and Kotwal et al.^[10]

However, the pattern of disease in this study was not similar to the above mentioned studies, which is probably due to different racial stock, socioeconomic status, education status, health care facilities and climatic conditions at Ajmer region. The major causes of morbidity were birth asphyxia (30%), neonatal sepsis (30%) and prematurity along with jaundice, pneumonia, meningitis, congenital heart disease, diarrhoea and haemorrhage disease of newborn in Anjum ZM and Shamoon.^[9] The commonest indications for admission were neonatal jaundice (24.7%), sepsis (21.4%), and perinatal asphyxia (19.2%) in Gauchan et al study.^[7] In Seyal et al^[8] study the main cause of admission was prematurity (23.5%), sepsis (21.9%), birth asphyxia (18%) and neonatal jaundice (11.3%) respectively. The most common disease was sepsis (19.9%), followed by respiratory distress syndrome (18.9%), birth asphyxia (17.02%), meconium aspiration syndrome (15.2%), neonatal jaundice (9.44%), pneumonias (3.46%) in Aijaz et al.^[22] In Kotwal et al^[10] study the main cause of admission was neonatal jaundice (26.7%), septicaemia (19.1%), prematurity (12.5%), birth asphyxia (7%) Respiratory Distress Syndrome (5.7%). In this study it was observed that out of 2250 neonates admitted, 1576 (70.1%) of the neonates were discharged and 674 (29.9%) expired.

The mortality rate observed in this study was 29.9% which is similar to study conducted by Prakash et al (25.5%),^[16] Tallat-seyal et al (30.9%)^[23], Malik S et al (26.6%)^[24] 2016, Soni LK et al (20.19%)^[25], Preeti Anil Bhai Shah et al (29.5%)^[26]. Much lower mortality rates were observed in study by Kotwal YS et al (9.73%),^[10] Sarkar et al (7.5%),^[27] Ravi Kumar SA (10.45%),^[28] and Sridhar PV et al (7.16%).^[29] In above studies both inborn and outborn neonates were included in observations and higher mortality was observed in outborn neonates as compared to inborn neonates. Higher mortality in this study is understandable as only outborn neonates are admitted at NICU of JLN medical college Ajmer which are referred from other health centers mainly in serious conditions.

Disease specific mortality revealed that three common causes of death are birth asphyxia/HIE of Newborn (22.25%), RDS of Newborn (20.47%) and Neonatal sepsis (16.02%) which is similar to different studies Baruah MN et al^[30] Ranjan et al^[31], Kumar R et al^[32] though incidence of these three causes vary among studies.

CONCLUSION

Present study revealed that birth asphyxia, RDS of newborn,

neonatal jaundice, prematurity were common causes of morbidities in newborn babies. RDS of newborn, neonatal sepsis, birth asphyxia and congenital malformations were leading causes of neonatal mortality.

The majority of morbidities and subsequently the mortalities can be reduced by improving maternal care and essential newborn care, appropriate primary interventions and timely referral to tertiary care centers for high risk cases, with better transport facilities for sick neonates.

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DECLARATIONS

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