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CLINICO-EPIDEMIOLOGICAL PROFILE AND OUTCOME OF VERY LOW BIRTH WEIGHT NEONATES ADMITTED IN A TERTIARY CARE CENTRE.

Paediatrics

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ABSTRACT

This study was done to study the clinical and sociodemographic profile of VLBW neonates admitted in the neonatal wards i.e SNCU, NICU and neonatal HDU of DR. B. C. ROY POST GRADUATE INSTITUTE OF PEDIATRIC SCIENCES, to determine the outcome of these neonates and to study their morbidity and mortality profile. It was a prospective longitudinal observational study. Total number of subjects in this study was 150. Out of 150 VLBW infants enrolled in this study 63.3% were male & 36.7% were female with a male to female ratio of 1.7: 1. Out of the total of 150 babies, 117 survived and 33 died. Thus, the survival in the present study was 78% where as the mortality was 22%. Sepsis was the most common cause of mortality(54.5%) followed by Respiratory distress syndrome(15.1 %), disseminated intravascular coagulation (15.1 %) and perinatal asphyxia, congenital heart disease, congenital anomalies, intraventricular hemorrhage and prematurity were the cause of mortality in 1 case each. The overall survival of VLBW neonates in this study was 78%. The significant risk factors for mortality were-maternal history of PROM, PN bleeding, medical illness during pregnancy. Mortality decreased as birth weight and gestational age increased. Shock and sclerema were the strongest clinical predictors for mortality. Sepsis, neonatal hyperbilirubinemia and perinatal asphyxia were the commonest morbidities while sepsis and RDS were the commonest causes of mortality.

KEYWORDS

Epidemiological Profile, Outcome, Very Low Birth Weight, Neonates

INTRODUCTION

Low birth weight (LBW) is defined by the World Health Organization (WHO) as weight at birth less than 2500 g (5.5 lb). Low birth weight continues to be a significant public health problem globally and is associated with a range of both short- and long-term consequences.

Overall, it is estimated that 15% to 20% of all births worldwide are LBW, representing more than 20 million births a year.

As per the World Health Assembly Global Nutrition Targets 2025: Low Birth weight Policy Brief, the goal is to achieve a 30% reduction of the number of infants born with a weight lower than 2500 g by the year 20251.This would translate into a 3.9% relative reduction per year between 2012 and 2025 and a reduction from approximately 20 million to about 14 million infants with low weight at birth. [1]

Very low birth weight is less than 1,500 g (up to and including 1,499 g). Extremely low birth weight is less than 1,000 g (up to and including 999 g). The definitions of 'low', 'very low', and 'extremely low' birth weight do not constitute mutually exclusive categories. Below the set limits they are all inclusive and therefore overlap (i.e., 'low' includes 'very low' and 'extremely low', while 'very low' includes 'extremely low,).[2]

A baby's low weight at birth is either the result of pre term birth (before 37 weeks of gestation) or due to restricted fetal (intrauterine) growth.' Low birthweight is closely associated with fetal and neonatal mortality and morbidity, inhibited growth and cognitive development, and chronic diseases later in life.[3-4] Many factors affect the duration of gestation and fetal growth, and thus, the birthweight. They relate to the infant, the mother, or the physical environment and play an important role in determining the birthweight and the future health of the infant.[5]

India accounts more than 40% of the global burden of low birth weight babies with 7.5 million babies (or 30% of the country's total annual live births) being born with a birth weight less than 2500 grams. Of these 7.5 million babies, 60% are born at term after fetal growth restriction, while the remaining 40% are born preterm, constituting a quarter of the global burden of preterm births. Pretenn babies, in addition to being at a higher risk of neonatal mortality, are at an increased risk of post-neonatal mortality, stunting, and long- term neurodevelopmental impairment during childhood."[6]

The major causes of newborn deaths in India are pre-maturity/preterm (35%); neonatal infections (33%); intra-partum related complications/ birth asphyxia (20%); and congenital malformations (9%).[7]

Apart from increased mortality, LBW babies are more prone to develop senous morbid conditions that may warrant long hospital stay and long-time sequlae to those conditions.

As regards to ELBW babies, the mortality still remains high in most part of India and adequate services for this group is restricted to only advanced neonatal centres.

This study targets the VLBW (very low birth weight) group as this proportion of LBW babies has potential to benefit from improvement in understanding of epidemiological profile and actions taken thereof. There are very few studies on LBW babies from this institute and this study is an attempt to improve the services towards this group of patients at this tertiary care centre.

The objectives of the study were

1. Study the clinical profile of VLBW neonates admitted in Neonatal Wards i.e Sick Newborn Care Unit, Neonatal High Dependency Unit, Neonatal Intensive Care Unit of Dr. B. C. Roy Post Graduate Institute of Pediatrics Sciences.
2. Assess the sociodemographic profile of these patients and its correlation with VLBW neonates.
3. Determine the outcome of these neonates and to study their morbidity and mortality profile.

MATERIALS AND METHODS

Study site

The study was conducted in the Neonatal Wards- SNCU, NHDU and NICU of Dr. B. C. Roy Post Graduate Institute of Pediatric Sciences, Kolkata. This is a tertiary care centre. Neonates as well as pediatric patients from different districts of West Bengal are referred to our institute.

Study population

The inborn facility of of Dr. B. C. Roy Post Graduate Institute of Pediatric Sciences, Kolkata is at a distance of 2 kms from the campus, all the babies included in this study were outborn. We included all very low birth weight neonates admitted in Neonatal Wards between the birth weights 1000 gms to 1499 gms.

Study design

It was a prospective longitudinal observational study cross - sectional design. All neonates fulfilling the inclusion criteria were enrolled for

the study until the sample size was achieved.
This study was done between 15t July 2014 to 30th June 2015 (12 months).

Inclusion criteria
All neonates with very low birth weight with birth weight between 1000 grams and 1499 grams admitted in the Neonatal Wards of Dr. B. C. Roy Post Graduate Institute of Pediatric Sciences.

Exclusion criteria
a) Neonates weighing 1500grams or more.
b) Neonates with severe congenital malformations.
c) Unwillingness of the parents to participate in the study.

Methodology
After approval from the institutional ethics committee, the study was initiated. The parents of VLBW neonates referred to our institute who were fulfilling the inclusion criteria were informed about this study. Written informed consent from the parents of very low birth weight neonates admitted in neonatal wards of Dr. B. C. Roy Post Graduate Institute of Pediatric Sciences were taken. History regarding birth weight, gestational age, assessment as per New Ballard Score, clinical signs and symptoms at presentation, morbidities during hospital stay, values of laboratory investigation were obtained from bed head tickets. Of the babies in whom multiple observations of the same laboratory parameter were done, the mean value was taken. Maternal history as well as sociodemographic history was obtained from history sheet of these neonates which is routinely filled while receiving a neonate at neonatal wards by the attending doctor present at that time. Mother or an accompanying guardian was interviewed for missing data, if any. Outcome - Discharged/Died was obtained from hospital records and primary cause of death in case of outcome 'Death' was obtained from death certificate and final diagnosis in case of discharge was obtained from hospital records.

Statistical methods
For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 20.0.1 and GraphPad Prism version 5. Data have been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. The median and the interquartile range have been stated for numerical variables that are not normally distributed. Student's independent sample's t-test was applied to compare normally distributed numerical variables between groups; Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. Z-test (Standard Normal Deviate) was used to test the significant difference between two proportions.

p-value s 0.05 was considered for statistical significance

RESULTS AND ANALYSIS
We found that 55(36.7%) patients had female and 95(63.3%) patients had male. It was found that 13(39.4%) patients had female and 20(60.6%) patients had male. We found that 93(62.0%) patients had rural and 57(38.0%) patients had urban. We found that 117(78.0%) patients had alive or discharged and 33(22.0%) patients had death. It was found that 113(75.3%) patients had 1-3 days age at presentation, 20(13.3%) patients had 4-7 days age at presentation and 17(11.3%) patients had >7 days age at presentation. It was found that 128(85.3%) patients had institutional birth and 22(14.7%) patients had home birth. We found that 27(18.0%) patients had LUCS, 123(82.0%) patients had NVD. It was found that 8(36.4%) patients had trained attendant and 14(63.6%) patients had untrained attendant. We found that 32(21.3%) patients had ≤20 years of mother age, 108(72.0%) patients had 21-29 years of mother age and 10(6.7%) patients had ≥30 years of mother age. It was statistically significant (p<0.0001). It was found that 108(88.5%) patients had ≤2 child birth and 14(11.5%) patients had 3-4 child birth. It was statistically significant (p<0.0001). It was found that 141(94.0%) patients had none medical illness during pregnancy and 4(2.7%) patients had pre-eclampsia during pregnancy.

We found that 13892.0%) patients had congenital malformations absent, 1(0.7%) patients had Congenital hydrocephalus, 1(0.7%) patient had Down's syndrome, 3(2.0%) patients had Duodenal atresia, 1(0.7%) patient had Gut malformation, 1(0.7%) patient had Hydrocephalus, 1(0.7%) patient had Meningomyelocele –lumbosacral, 1(0.7%) patient had Micrognathia cleft palate, 1(0.7%) patient had Mid line cleft lip, 1(0.7%) patient had Pre auricular Tag and 1(0.7%) patient had Tracheoesophageal Fistula.

It was found that 73(48.7%) patients had AGA and 77(51.3%) patients had SGA. It was not statistically significant (p=0.64552).We found that 14(42.4%) patients had AGA of death and 19(57.6%) patients had SGA of death. It was not statistically significant (p=0.2187).

We found that 57(48.7%) patients had sepsis, 28(23.9%) patients had Neonatal hyperbilirubinemia, 20(17%) patients had Perinatal asphyxia, 15(12.8%) patients had Respiratory distress syndrome, 14(11.9%) patients had Prematurity, 12(10.2%) patients had Intra-ventricular hemorrhage, 8(6.8%) patients had Congenital heart disease, 8(6.8%) patients had Apnea of prematurity, 8(6.8%) patients had Necrotizing enterocolitis and 6(5.1%) patients had Congenital anomalies.

It was found that 18(54.6%) patients had sepsis, 5(15.2%) patients had Respiratory distress syndrome, 5(15.2%) patients had Disseminated intravascular coagulation, 1(3.0%) patient had Perinatal asphyxia, 1(3.0%) patient had Congenital heart disease, 1(3.0%) patient had Congenital anomalies, 1(3.0%) patient had Intraventricular hemorrhage and 1(3.0%) patient had Prematurity. It was found that in alive/discharge, 71 patients had rural and 46 patients had urban. In death, 22 patients had rural and 11 patients had urban. Association of residence vs. outcome was not statistically significant (p=0.5317).We found that in alive/discharge, 42 patients had female and 75 patients had male. In death, 13 patients had female and 20 patients had male. Association of sex vs. outcome was not statistically significant (p=0.7127). We found that in alive/discharge, 102 patients had institutional birth and 15 patients had home birth. In death, 26 patients had institutional birth and 7 patients had home birth. Association of place of birth vs. outcome was not statistically significant (p=0.2288). It was found that in alive/discharge, 29 patients had LUCD and 98 patients had NVD. In death, 8 patients had LUCD and 25 patients had NVD. Association of mode of delivery vs. outcome was not statistically significant (p=0.2906). We found that in alive/discharge, 29 patients had adequate ANC and 88 patients had inadequate ANC. In death, 10 patients had adequate ANC and 23 patients had inadequate ANC. Association of ANC vs. outcome was not statistically significant (p=0.5234).

We found that in alive/discharge, 89 patients had Rs. 10000 family income, 27 patients had Rs. 1000-2000 family income and 1 patient had Rs. >2000 family income. In death, 21 patients had Rs. 10000 family income, 11 patients had Rs. 1000-2000 family income and 1 patient had Rs. >2000 family income. Association of family income vs. outcome was not statistically significant (p=0.2829). It was found that in alive/discharge, 45 patient's mother had illiterate, 53 patient's mother had primary, 14 patient's mother had secondary and 5 patient's mother had higher secondary. In death, 12 patient's mother had illiterate, 10 patient's mother had primary, 10 patient's mother had secondary and 10 patient's mother had higher secondary. Association of mother's education vs. outcome was not statistically significant (p=0.0746). We found that in alive/discharge, 19 patient's father had illiterate, 65 patient's father had primary, 22 patient's father had secondary, 10 patient's father had higher secondary and 1 patient's father had graduate. In death, 9 patient's father's had illiterate, 13 patient's father had primary, 6 patient's father had secondary and 5 patient's father had higher secondary. Association of father's education vs. outcome was not statistically significant (p=0.3568).

It was found that in alive/discharge, 113 patient's mother had housewife, 2 patient's mother had office worker and 2 patient's mother had other occupation. In death, 32 patient's mother had housewife and 1 patient's mother had other occupation. Association of mother's occupation vs. outcome was not statistically significant (p=0.6740).

We found that in alive/discharge, 19 patient's father had farmer, 51 patient's father had labourer, 14 patient's father had office worker, 15 patient's father had business and 18 patient's father had other occupation. In death, 8 patient's father had farmer, 14 patient's father had labourer, 5 patient's father had office worker, 4 patient's father had business and 18 patient's father had other occupation. Association of father's occupation vs. outcome was not statistically significant (p=0.5886).

It was found that in alive/discharge, 25 patient's mother had ≤20 years of age, 86 patient's mother had 21-29 years of age and 6 patient's

mother had ≥30 years of age. In death, 7 patient's mother had ≤20 years of age, 22 patient's mother had 21-29 years of age and 4 patient's mother had ≥30 years of age. It was found that in alive/discharge, 22 patients had 1st birth order, 53 patients had 2nd birth order and 42 patients had ≥3rd birth order. In death, 8 patients had 1st birth order, 14 patients had 2nd birth order and 11 patients had ≥3rd birth order. Association of birth order vs. outcome was not statistically significant (p=0.7881).

We found that in alive/discharge, 85 patient's last child had ≤2 years of years and 11 patient's last child had 3-4 years of age. In death, 23 patient's last child had ≤2 years of years and 3 patient's last child had 3-4 years of age. Association of last child birth vs. outcome was not statistically significant (p=0.9909). It was found that in alive/discharge, 8 patients had h/o foul smelling liquor. In death, 1 patient had h/o foul smelling liquor. Association of h/o foul smelling liquor vs. outcome was not statistically significant (p=0.4160). We found that association of PV bleed vs. outcome was statistically significant (p<0.0001).

It was found that in alive/discharge, 7 patients had repeated vaginal examination. In death, 3 patients had repeated vaginal examination. Association of Repeated vaginal examination vs. outcome was not statistically significant (p=0.5272). We found that in alive/discharge, 22 patients had h/o PROM. In death, 18 patients had h/o PROM. Association of PROM vs. outcome was statistically significant (p<0.0001). It was found that in alive/discharge, 113 patients had none, 2 patients had pre-eclampsia, 1 patient had epilepsy and 1 patient had heart disease. In death, 28 patients had none, 2 patients had pre-eclampsia, 2 patients had UTI and 1 patient had polyhydraminos.

We found that association of h/o delayed cry vs. outcome was not statistically significant (p=0.6296). It was found that association of respiratory distress vs. outcome was not statistically significant (p=0.2097). We found that association of CRT vs. outcome was statistically significant (p<0.0001).We found that in alive/discharge, 19 patients had normal activity, 75 patients had irritable activity and 23 patients had depressed cry/activity. In death, 3 patients had normal activity, 9 patients had irritable activity and 21 patients had depressed cry/activity. Association of cry/activity vs. outcome was statistically significant (p<0.0001). It was found that association of sucking vs. outcome was not statistically significant (p=0.1344). We found that association of temperature instability vs. outcome was statistically significant (p<0.0001). It was found that association of pallor vs. outcome was statistically significant (p<0.0001). We found that association of plethora in two groups was not statistically significant (p=0.0910). It was found that association of icterus in two groups was not statistically significant (p=0.8212).

We found that association of cyanosis in two groups was statistically significant (p<0.0001). It was found that association of AF in two groups was not statistically significant (p=0.43336). We found that association of bleeding spots on skin in two groups was statistically significant (p<0.0001). We found that association of pustules in two groups was not statistically significant (p=0.9125). It was found that association of edema in two groups was statistically significant (p=0.0215).

It was found that in alive/discharge, 1 patient had Sclerema present. In death, 13 patients had Sclerema present. Association of Sclerema vs. outcome was statistically significant (p<0.0001). We found that association of congenital malformations in two groups was statistically significant (p=0.0026). It was found that association of umbilical discharge in two groups was not statistically significant (p=0.8832). It was found that in alive/discharge, 28 patients had convulsion present. In death, 16 patients had convulsion present. Association of convulsion vs. outcome was statistically significant (p=0.0062). We found that in alive/discharge, 26 patients had Apnea present. In death, 28 patients had Apnea present. Association of Apnea vs. outcome was statistically significant (p=0.0001). We found that in alive/discharge, 11 patients had abdominal distention present. In death, 14 patients had abdominal distention present. Association of abdominal distention vs. outcome was statistically significant (p<0.0001).

It was found that association of organomegaly in two groups was statistically significant (p<0.0001). We found that association of shock in two groups was statistically significant (p<0.0001).We found that in alive/discharge, 21 patients had ≤4000TLC and 96 patients had >4000 TLC. In death, 18 patients had ≤4000TLC and 15 patients had >4000 TLC. Association of TLC vs. outcome was statistically significant (p<0.0001).It was found that in alive/discharge, 14 patients had ≤1500 absolute neutrophil count and 103 patients had >1500 absolute neutrophil count. In death, 18 patients had ≤1500 absolute neutrophil count and 15 patients had >1500 absolute neutrophil count. Association of absolute neutrophil count vs. outcome was statistically significant (p<0.0001).

We found that in alive/discharge, 9 patients had <50000 total platelet count, 3 patients had 50000-100000 total platelet count and 105 patients had >100000 total platelet count. In death, 11 patients had <50000 total platelet count, 7 patients had 50000-100000 total platelet count and 15 patients had >100000 total platelet count. Association of total platelet count vs. outcome was statistically significant (p<0.0001).We found that association of CRP in two groups was statistically significant (p=0.0053).It was found that association of CSF in two groups was not statistically significant (p=0.8744).We found that association of blood C/S in two groups was not statistically significant (p=0.1338).It was found that association of AGA/ SGA in two groups was not statistically significant (p=0.4165).We found that association of required mechanical ventilation in two groups was statistically significant (p=0.0037).It was found that distribution of mean age at presentation in day in two groups was not statistically significant (p=0.3424).We found that distribution of mean family monthly income in Rs in two groups was not statistically significant (p=0.1611).It was found that distribution of mean age of mother in years in day in two groups was not statistically significant (p=0.1383).We found that distribution of mean gestational age in weeks in two groups was not statistically significant (p=0.0965).It was found that distribution of mean gestational age in weeks in two groups was statistically significant (p<0.0001).We found that distribution of mean SpO2 in room air in two groups was not statistically significant (p<0.0001).It was found that distribution of mean Hb in two groups was statistically significant (p=0.0254).We found that distribution of mean TLC in two groups was not statistically significant (p=0.2808).It was found that distribution of mean Neutrophil in two groups was statistically significant (p=0.2557).We found that distribution of mean L in two groups was not statistically significant (p=0.5462).It was found that distribution of mean M in two groups was not statistically significant (p=0.4358).We found that distribution of mean total platelet count in two groups was statistically significant (p<0.0001).It was found that distribution of mean capillary blood glucose in two groups was statistically significant (p=0.0239).We found that distribution of mean total bilirubin in two groups was not statistically significant (p=0.8379).It was found that distribution of mean hospital stay in two groups was statistically significant (p<0.0001).

DISCUSSION

Out of 150 VLBW infants enrolled in this study 63.3% were male & 36.7% were female with a male to female ratio of 1.7:1. 60.6% of the babies who died during treatment were male which was significantly higher than the proportion of female babies (39.4%).

62.0% neonates belonged to rural areas, which was a significantly higher proportion than those residing in urban areas (38.0%). However, there was no significant association between the place of residence and outcome of the neonates. 85.3% neonates had institutional delivery while rest 14.7% neonates were delivered at horne. Of the institutionally delivered babies (128 of 150 babies), 82% were born via normal vaginal delivery while 18% were born via LUCS. Majority of the 22 home delivered cases (63.6%) were conducted by untrained birth attendants while the rest were conducted by trained birth attendants.

Comparing the above findings with a recent study done by Ahmed et al [8] in Bangladesh, the male female ratio was 1.6: 1 which is similar to the present study. 43.3% of the babies were delivered at horne which is a much higher percentage than that in the present study (14.7%) probably because of the difference in healthcare and socioeconomic difference between these two nations. Among the horne delivered cases in the study by Ahmed et al [8], majority were delivered by trained birth attendants. In the present study however, majority of the home delivered babies (63.6%) were conducted by untrained birth attendants.

In this study, total number of illiterate mothers was 57 (38%). Of the

mortality group of babies, 36.4% were having illiterate mothers. However, this proportion was not significantly higher in the mortality group. Also, the percentage of deaths showed the decreasing trend with the increased level of mother's education but that was not statistically significant. 18.7% of the babies were having an illiterate father. There was no significant association between father's education and outcome. Majority of mothers (96.7%) were housewives. In the mortality group, 97% were housewives. However, there was no significant association between mother's occupation and outcome. There was no significant association between father's occupation and outcome. 61.4% of the babies were from a family with monthly family income <Rs.1000. There was no significant association between monthly family income and outcome.

Parker et al [9] compared the association between five indicators of socioeconomic status (maternal education, paternal education, maternal occupation, paternal occupation, family income) and their reproductive outcomes (low birth weight, small for gestational age, preterm delivery). Nearly all socioeconomic indices were associated with low birth weight among both black and white women. However, there was no consistent pattern between the socioeconomic indices and the other outcomes. This finding is similar to that in the present study.

In the present study, 21.3% of the mothers' age was less than 20 years and 72% of the mother's age was between 21 to 29 years. There was no significant association between maternal age and outcome. 88.5% of the mothers had pregnancy spacing of ~ 2 years, significantly higher than the mothers with pregnancy spacing 2: 3 years. (35.3%) babies had birth order 2: 3, which was not significantly higher than babies with lower birth order.

74.0% of the mothers were having inadequate antenatal care (ANC) and 69.7% of the mothers in the mortality group of babies were having inadequate ANC. Only 26.0% of the mothers were having adequate ANC. Inadequate ANC was not identified as a significant risk for poor outcome. 6.0% of the babies were having maternal history of foul smelling liquor. The present study showed its association with poor outcome was not significant. 54.5% of the babies who died during treatment were having maternal history of prolonged rupture of membranes. The study revealed that babies with positive maternal history of PROM had a significant risk of death of 5.18 times than those babies who did not have positive maternal history for PROM. 18.0% of the babies were having maternal history of per vaginal bleeding. Babies whose mother had a positive history of P/V bleeding had a significant risk of 7.29 times for poor outcome than babies without maternal history of PN bleeding. 6.7% of the babies were having maternal history of repeated vaginal examination. They did not have a significant risk for poor outcome. Most of the mothers did not have any medical illness during pregnancy. Of the 6% of the mothers who had some medical illness during pregnancy, 5% had associated death of their baby. There was significant association between the presence of medical illness during pregnancy and poor outcome of their babies.

75.3% of the babies presented between 1-3 days of life. The proportion of babies presenting at 1-3 days of life was significantly higher than babies who were 2: 4 days old at presentation.

This showed that majority of the babies presented within 3 days probably due to the early associated complications with very low birth weight. The mean gestational age (mean± s.d.) of the babies who were discharged alive was 31.165±1.75 weeks with a range of 27.0-35.0 weeks whereas that for the mortality group, during treatment was 30.59±1.62 weeks with a range of 27.0-34.0 weeks showing that the mean gestational age of the mortality group was lower than that of babies who were discharged alive, though not statistically significant.

The mean birth weight of the mortality group (1.207±0.122 Kg with range 1.1-1.45 kg) was significantly lower than that of the babies who were discharged alive (1.3513±0.08 Kg with range 1.1-1.48 Kg). 51.3% of the babies were small for gestational age i.e intra- uterine growth retarded whose proportion was not significantly higher than those babies with birth weight adequate for gestational age (48.7%). Also, although majority (57.6%) of the babies who died were small for gestational age, they were not significantly of higher proportion than the babies who were appropriate for gestational age (42.4%).

In the study by Ahmed et al [8], survival increased with increasing birth weight and gestational age. Survival increased at or above 1250 grams and 28 weeks. Survival rates of neonates below these figures declined noticeably. 27% of the enrolled infants of gestational age above 33 weeks' died as compared to 33% whose gestational age was between 30 and 33 weeks and 65% of infants below 30 weeks. Almost 58% of the infants who died were below 1250 grams birth weight and 65.4% were below 30 weeks of gestation. The present study also shows a similar picture. Similarly, an increase in the gestational age of preterm neonates led to a rapid decline in mortality rate. Fifty-two babies (86.7%) were appropriate for gestational age and 8 babies (13.3%) had intra-uterine growth retardation (IUGR). Eight babies (8/60,13.3%) were IUGR. Survival of IUGR babies was 62.5% (5/8), slightly higher than the overall survival (56.7%).

This is different from what the present study revealed. This difference may be due to smaller sample size and inclusion of inborn neonates in the study by Ahmed et al [8]. The present study showed a higher mortality among the babies who were SGA. This difference in results is probably because of fewer number of SGA babies in the study by Ahmed et al.

Basuet at [10] also found in their study that survival rate increased with increase in birth weight and gestational age. Gera et al [11] concluded that birth weight and gestational age were significantly associated with early neonatal mortality. Roy et al [12] in their studies showed that the mortality rate was highest in 26 to 30 weeks gestation babies and in babies weighing <800 gms.

Most of the babies (91.3%) had poor suck on presentation. A majority presented with cold stress (73.3%) and prolonged capillary refill time (73.3%). 66.7% of the babies had respiratory distress, 56% were irritable. 36% were apneic, 29.3% were convulsing, 29.3% were lethargic and 22.6% were icteric. This shows that a large proportion of babies had temperature instability on presentation probably because all the babies in the present study were outborn and improper transportation resulted in their temperature instability. This signifies the need for proper transport facilities.

In the study done by Ahmed et al [8], common clinical presentations were prematurity (36.7%) and its complications like delayed crying (25.0%), feeding problem (23.3%), lethargy (16.7%), hypothermia (10.0%) and respiratory problems (8.3%). This difference in results may be because study population in this study included both inborn as well as outborn neonates while in the present study, all the newborns enrolled were outborn and many of them were referred from other centers with complications thus higher percentage of severe symptoms.

The babies who were hemodynamically compromised were 123.25 times at a higher risk for dying. In the present study, the presence of shock was the strongest predictor of mortality. The babies who developed sclerema were 75.4 times more likely to die than those babies who did not have sclerema. Babies who developed bleeding manifestations had 25 times the risk of dying. Apneic babies were 19.6 times more likely to die than babies with normal breathing pattern.

Also, the mean saturation of O2 was significantly lower in babies who died (80.5455%) as compared to those babies who survived (88.1966%). 8.7% of the babies required mechanical ventilation. The risk of death was 4.98 for babies requiring mechanical ventilation and the risk was significant. Babies who developed abdominal distention (early sign of necrotizing enterocolitis) had 7.1 times the risk of poor outcome than those babies who did not develop abdominal distention. An episode of convulsion increased the likelihood of dying by 2.99 times. Amongst other clinical features, there was significant association between lethargy, temperature instability and poor outcome. Also, of the 12 babies who had congenital malformations, 7 died which was significant. Features such as- respiratory distress and history of delayed cry at birth were not significantly associated with poor outcome. Mean duration of hospital stay of the mortality group was 6.0±5.0125 days with range 2- 21 days which was significantly lower than the mean duration of stay in hospital of the babies who were discharged alive (11.5983 ±4.5087 days with range 5-26 days). This was probably because those VLBW of the mortality group with severe clinical features and complications could not survive long enough and thus the shorter hospital stay as compared to those babies who improved and were discharged alive.

Comparing the present study to that done by Basuet at al [13] showed similar results where there was established association between the

presence of apnoea, neonatal septicemia, shock and neonatal mortality. Gera et ae [1] in their study concluded that need for assisted ventilation at birth, need for supplemental oxygen and mechanical ventilation in first 24 hours, presence of shock, hypoxia and acidosis were significantly associated with neonatal mortality. This is similar to the present study where requirement of mechanical ventilation was significantly associated with poor outcome and shock was the strongest predictor of mortality.

Out of the total of 150 babies, 117 survived and 33 died. Thus, the survival in the present study was 78% whereas the mortality was 22%. Of the 117 babies who survived, sepsis was the most common morbidity affecting almost half the number of surviving babies (48.7%). 23.9% had neonatal hyperbilirubinemia, 17% had perinatal asphyxia, 12.8% had respiratory distress syndrome, intra-ventricular hemorrhage occurred in 10.2%, apnea of prematurity and necrotizing enterocolitis contributed 6.8% each and congenital anomalies were present in 5.1%. Of the 33 babies who died, in more than half the babies, sepsis was the cause of death (54.5%). Thus, sepsis was the commonest cause of mortality. Respiratory distress syndrome and disseminated intravascular coagulation contributed to 15.1 % each of the total number of deaths followed by perinatal asphyxia, congenital heart disease, congenital anomalies, intra-ventricular hemorrhage and prematurity - 0.3% each.

In the study by askaret a1[14], jaundice (43.31 %), apnoea (26.34%), birth asphyxia (20.43%), RDS (19.89%) and sepsis (18.82%) were the main morbidities. RDS was the main cause of death (46.15%) followed by birth asphyxia (23%), sepsis (19.2%) and IVH (11.5%). This disparity might be because our institute is a referral center and all the babies under study were out born who were handled in the place of delivery prior to being referred to our institute. Also, percentage of home delivered babies (14.7%) were at a higher risk for sepsis.

In the study done by Kaur et a1[15] in Amritsar in 2015, sepsis was the major cause (77.3%) of morbidity in VLBW neonates followed by HMD (66.7%) and NNJ (65.3%) of the neonate.

Sepsis along with other factors like IVH, Pneumothorax, NEe played an important role in neonatal mortality. The present study had similar causes for the same.

In the study done by Bansal et al [16] , neonatal hyper-bilirubinemia, HMD/RDS and neonatal sepsis were the commonest causes of morbidity. Among 80 premature babies 15 (18.7%) died. The results were similar to those in the present study.

CONCLUSION

The overall survival of VLBW neonates in this study was 78%. The male: female ratio was 1.7: 1. The significant risk factors for mortality were-maternal history of PROM, PN bleeding, medical illness during pregnancy. Mortality decreased as birth weight and gestational age increased. Shock and sclerema were the strongest clinical predictors for mortality. Sepsis, neonatal hyperbilirubinemia and perinatal asphyxia were the commonest morbidities while sepsis and RDS were the commonest causes of mortality.

Table: Distribution of all parameters

		Frequency	Percent
Sex	**Female**	55	36.7%
	Male	95	63.3%
Residence	**Rural**	93	62.0%
	Urban	57	38.0%
Outcome	**Alive/ Discharged**	117	78.0%
	Death	33	22.0%
Age at presentation (Days)	**1-3**	113	75.3%
	4-7	20	13.3%
	>7	17	11.3%
Place of Birth	**Institutional**	128	85.3%
	Home	22	14.7%
Mode of delivery	**LUCS**	27	18.0%
	NVD	123	82.0%
Type of attendant	**Trained**	8	36.4%
	Untrained	14	63.6%
Age of mother	**≤20**	32	21.3%
	21-29	108	72.0%
	≥30	10	6.7%
Last child birth	**≤2**	108	88.5%
	3-4	14	11.5%
Medical illness during pregnancy	**NONE**	141	94.0%
	PRE ECLAMPSIA	4	2.7%
Congenital malformations	**Absent**	138	92.0%
	CONGENITAL HYDROCEPHALUS	1	0.7%
	DOWN'S SYND	1	0.7%
	DUODENAL ATRESIA	3	2.0%
	GUT MALFORMATION	1	0.7%
	HYDROCEPHALUS	1	0.7%
	MENINGOMYELOCELE- LUMBOSACRAL	1	0.7%
	MICROGNATHIA CLEFT PALATE	1	0.7%
	MID LINE CLEFT LIP	1	0.7%
	PRE AURICULAR TAG	1	0.7%
	TRACHEOESOPHAGEAL FISTULA	1	0.7%
AGA/ SGA	**AGA**	73	48.7%
	SGA	77	51.3%
AGA/ SGA for death	**AGA**	14	42.4%
	SGA	19	57.6%
Clinical symptoms and signs	Sepsis	57	48.7%
	Neonatal hyperbilirubinemia	28	23.9%
	Perinatal asphyxia	20	17.0%
	Respiratory distress syndrome	15	12.8%
	Prematurity	14	11.9%
	Intra-ventricular hemorrhage	12	10.2%
	Congenital heart disease	8	6.8%
	Apnea of prematurity	8	6.8%
	Necrotizing enterocolitis	8	6.8%
	Congenital anomalies	6	5.1%
Clinical symptoms and signs	Sepsis	18	54.6%
	Respiratory distress syndrome	5	15.2%
	Disseminated intravascular coagulation	5	15.2%
	Perinatal asphyxia	1	3.0%
	Congenital heart disease	1	3.0%
	Congenital anomalies	1	3.0%
	Intraventricular hemorrhage	1	3.0%
	Prematurity	1	3.0%

Table: Association of parameters vs outcome

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
Place of Birth	**Institutional**	102	26	1.83(0.68, 4.95)	1.4483	0.2288
	Row %	79.7	20.3			
	Col %	87.2	78.8			
	Home	15	7			
	Row %	68.2	31.8			
	Col %	12.8	21.2			
Mode of delivery	**LUCS**	19	8	0.61(0.24, 1.54)	1.1170	0.2906
	Row %	70.4	29.6			
	Col %	16.2	24.2			
	NVD	98	25			
	Row %	79.7	20.3			
	Col %	83.8	75.8			
ANC	**Adequate**	29	10	0.76(0.32, 1.78)	0.4072	0.5234
	Row %	74.4	25.6			
	Col %	24.8	30.3			
	Inadequate	88	23			
	Row %	79.3	20.7			
	Col %	75.2	69.7			
Family income	**1000**	89	21		2.5251	0.2829
	Row %	80.9	19.1			
	Col %	76.1	63.6			

	1000-2000	27	11			
	Row %	71.1	28.9			
	Col %	23.1	33.3			
	>2000	1	1			
	Row %	50.0	50.0			
	Col %	0.9	3.0			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
Father's occupation	**Farmer**	19	8		2.8185	0.5886
	Row %	70.4	29.6			
	Col %	16.2	24.2			
	Labourer	51	14			
	Row %	78.5	21.5			
	Col %	43.6	42.4			
	Office Work	14	5			
	Row %	73.7	26.3			
	Col %	12.0	15.2			
	Business	15	4			
	Row %	78.9	21.1			
	Col %	12.8	12.1			
	Others	18	2			
	Row %	90.0	10.0			
	Col %	15.4	6.1			
Age of mother in Years	**≤20**	25	7		2.0555	0.3578
	Row %	78.1	21.9			
	Col %	21.4	21.2			
	21-29	86	22			
	Row %	79.6	20.4			
	Col %	73.5	66.7			
	≥30	6	4			
	Row %	60.0	40.0			
	Col %	5.1	12.1			
Birth Order	**1st**	22	8		0.4763	0.7881
	Row %	73.3	26.7			
	Col %	18.8	24.2			
	2nd	53	14			
	Row %	79.1	20.9			
	Col %	45.3	42.4			
	≥3rd	42	11			
	Row %	79.2	20.8			
	Col %	35.9	33.3			
Last child birth in Years	**≤2**	85	23	1.01(0.26, 3.92)	0.0001	0.9909
	Row %	78.7	21.3			
	Col %	88.5	88.5			
	3-4	11	3			
	Row %	78.6	21.4			
	Col %	11.5	11.5			
h/o foul smelling liquor	**Yes**	8	1	0.4258 (0.0513, 3.5328)	0.6616	0.4160
	Row %	88.9	11.1			
	Col %	6.8	3.0			
	No	109	32			
	Row %	77.3	22.7			
	Col %	93.2	97.0			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
PV bleed	**Yes**	12	15	7.2917 (2.9381, 18.0964)	21.6054	<0.0001
	Row %	44.4	55.6			
	Col %	10.3	45.5			
	No	105	18			
	Row %	85.4	14.6			
	Col %	89.7	54.5			
Repeated vaginal examination	**Yes**	7	3	1.5714 (0.3831, 6.4461)	0.3996	0.5272
	Row %	70.0	30.0			
	Col %	6.0	9.1			
	No	110	30			
	Row %	78.6	21.4			
	Col %	94.0	90.9			
h/o PROM	**Yes**	22	18	5.1818 (2.2654, 11.8527)	16.8150	<0.0001
	Row %	55.0	45.0			
	Col %	18.8	54.5			
	No	95	15			
	Row %	86.4	13.6			
	Col %	81.2	45.5			

Medical illness during pregnancy	**NONE**	113	28		13.4049	0.0199
	Row %	80.1	19.9			
	Col %	96.6	84.8			
	PRE ECLAMPSIA	2	2			
	Row %	50.0	50.0			
	Col %	1.7	6.1			
	UTI	0	2			
	Row %	0.0	100.0			
	Col %	0.0	6.1			
	EPILEPSY	1	0			
	Row %	100.0	0.0			
	Col %	0.9	0.0			
	HEART DISEASE	1	0			
	Row %	100.0	0.0			
	Col %	0.9	0.0			
	POLYHYDR AMINOS	0	1			
	Row %	0.0	100.0			
	Col %	0.0	3.0			
h/o delayedcry	**NO**	95	28	0.77(0.27, 2.22)	0.2326	0.6296
	Row %	77.2	22.8			
	Col %	81.2	84.8			
	YES	22	5			
	Row %	81.5	18.5			
	Col %	18.8	15.2			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
respiratory distress	**NO**	42	8	1.75(0.72, 4.22)	1.5734	0.2097
	Row %	84.0	16.0			
	Col %	35.9	24.2			
	YES	75	25			
	Row %	75.0	25.0			
	Col %	64.1	75.8			
CRT	**Normal**	83	10	**5.61** (2.42, 13.04)	18.0418	<0.0001
	Row %	89.2	10.8			
	Col %	70.9	30.3			
	Prolonged	34	23			
	Row %	59.6	40.4			
	Col %	29.1	69.7			
Cry/ activity	**Normal**	19	3		24.1032	<0.0001
	Row %	86.4	13.6			
	Col %	16.2	9.1			
	Irritable	75	9			
	Row %	89.3	10.7			
	Col %	64.1	27.3			
	Depressed	23	21			
	Row %	52.3	47.7			
	Col %	19.7	63.6			
Sucking	**Normal**	12	0		4.0146	0.1344
	Row %	100.0	0.0			
	Col %	10.3	0.0			
	Poor	105	33			
	Row %	76.6	24.1			
	Col %	89.8	100.0			
Temperature instability	**Normal**	22	2		37.3812	<0.0001
	Row %	91.7	8.3			
	Col %	18.8	6.1			
	Cold Stress	92	18			
	Row %	83.6	16.4			
	Col %	78.6	54.5			
	Hypothermia	3	13			
	Row %	18.8	81.3			
	Col %	2.6	39.4			
Pallor	**Absent**	110	17	**14.79** (5.31, 41.20)	35.8160	<0.0001
	Row %	86.6	13.4			
	Col %	94.0	51.5			
	Present	7	16			
	Row %	30.4	69.6			
	Col %	6.0	48.5			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
Plethora	**Absent**	114	30	3.80 (0.73, 19.79)	2.8555	0.0910
	Row %	79.2	20.8			
	Col %	97.4	90.9			
	Present	3	3			
	Row %	50.0	50.0			
	Col %	2.6	9.1			

Icterus	**Absent** Row % Col %	90 77.6 76.9	26 22.4 78.8	0.89 (0.35, 2.29)	0.0511	0.8212
	Present Row % Col %	27 79.4 23.1	7 20.6 21.2			
Cyanosis	**Absent** Row % Col %	114 86.4 97.4	18 13.6 54.5	31.67 (8.33, 120.40)	44.8400	<0.0001
	Present Row % Col %	3 16.7 2.6	15 83.3 45.5			
AF	**Normal** Row % Col %	105 78.9 89.7	28 21.1 84.8	1.56 (0.50, 4.81)	0.6138	0.43336
	Bulging Row % Col %	12 70.6 10.3	5 29.4 15.2			
bleeding spots on skin	**Absent** Row % Col %	115 83.3 98.3	23 16.7 69.7	25.00 (5.13, 121.72)	28.5936	<0.0001
	Present Row % Col %	2 16.7 1.7	10 83.3 30.3			
Pustules	**Absent** Row % Col %	113 77.9 96.6	32 22.1 97.0		0.0121	0.9125
	Present Row % Col %	4 80.0 3.4	1 20.0 3.0			
Edema	**Absent** Row % Col %	114 79.7 97.4	29 20.3 87.9	5.24 (1.11, 24.73)	5.2846	0.0215
	Present Row % Col %	3 42.9 2.6	4 57.1 12.1			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
Sclerema	**Absent** Row % Col %	116 85.3 99.1	20 14.7 60.6	75.40 (9.34, 608.75)	45.1784	<0.0001
	Present Row % Col %	1 7.1 0.9	13 92.9 39.4			
Congenital malformations	**Absent** Row % Col %	112 81.2 95.7	26 18.8 78.8		27.0312	0.0026
	CONGENITAL HYDROCEPHALUS Row % Col %	1 100.0 0.9	0 0.0 0.0			
	DOWN'S SYND Row % Col %	1 100.0 0.9	0 0.0 0.0			
	DUODENAL ATRESIA Row % Col %	0 0.0 0.0	3 100.0 9.1			
	GUT MALFORMATION Row % Col %	0 0.0 0.0	1 100.0 3.0			
	HYDROCEPHALUS Row % Col %	1 100.0 0.9	0 0.0 0.0			
	MENINGOMYELOCELE-LUMBOSACRAL Row % Col %	0 0.0 0.0	1 100.0 3.0			
	MICROGNATHIA CLEFT PALATE Row % Col %	0 0.0 0.0	1 100.0 3.0			
	MID LINE CLEFT LIP Row % Col %	1 100.0 0.9	0 0.0 0.0			
	PRE AURICULAR TAG Row % Col %	1 100.0 0.9	0 0.0 0.0			
	TRACHEOESOPHAGEAL FISTULA Row % Col %	0 0.0 0.0	1 100.0 3.0			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
Umbilical discharge	**Absent** Row % Col %	114 78.1 97.4	32 21.9 97.0	1.18 (0.12, 11.81)	0.0216	0.8832
	Present Row % Col %	3 75.0 2.6	1 25.0 3.0			
Convulsion	**Absent** Row % Col %	89 84.0 76.1	17 16.0 51.5	2.99 (1.34, 6.68)	7.4860	0.0062
	Present Row % Col %	28 63.6 23.9	16 36.4 48.5			
Apnea	**Absent** Row % Col %	91 94.8 77.8	5 5.2 15.2	19.60 (6.88, 55.82)	43.8166	0.0001
	Present Row % Col %	26 48.1 22.2	28 51.9 84.8			
abdominal distention	**Absent** Row % Col %	106 84.8 90.6	19 15.2 57.6	7.10 (2.81, 17.97)	20.2098	<0.0001
	Present Row % Col %	11 44.0 9.4	14 56.0 42.4			
organomegaly	**Absent** Row % Col %	113 81.9 96.6	25 18.1 75.8	9.04 (2.52, 32.38)	15.1650	<0.0001
	Present Row % Col %	4 33.3 3.4	8 66.7 24.2			
Shock	**Absent** Row % Col %	116 87.9 99.1	16 12.1 48.5	123.25 (15.34, 989.97)	62.5580	<0.0001
	Present Row % Col %	1 5.6 0.9	17 94.4 51.5			
TLC	**≤4000** Row % Col %	21 53.8 17.9	18 46.2 54.5	5.4857 (2.3869, 12.6076)	17.9179	<0.0001
	>4000 Row % Col %	96 86.5 82.1	15 13.5 45.5			

		Alive/ Discharged	Death	Odds Ratio	Chi-square value	p-value
Absolute neutrophil count	**≤1500** Row % Col %	14 43.8 12.0	18 56.3 54.5	8.8286 (3.6478, 21.3673)	27.8076	<0.0001
	>1500 Row % Col %	103 87.3 88.0	15 12.7 45.5			
Total platelet count	**<50000** Row % Col %	9 45.0 7.7	11 55.0 33.3		32.4301	<0.0001

	50000-100000 Row % Col %	3 30.0 2.6	7 70.0 21.2			
	>100000 Row % Col %	105 87.5 89.7	15 12.5 45.5			
CRP	**Positive** Row % Col %	71 86.6 60.7	11 13.4 33.3	3.08 (1.37, 6.96)	7.7696	0.0053
	Negative Row % Col %	46 67.6 39.3	22 32.4 66.7			
CSF	**Normal** Row % Col %	109 77.9 93.2	31 22.1 93.9	0.88 (0.18, 4.35)	0.0250	0.8744
	Abnormal Row % Col %	8 80.0 6.8	2 20.0 6.1			
Blood C/S	**No Growth** Row % Col %	109 79.6 93.2	28 20.4 84.8	2.43 (0.74, 8.01)	2.2477	0.1338
	Growth Present Row % Col %	8 61.5 6.8	5 38.5 15.2			
AGA/ SGA	**AGA** Row % Col %	59 80.8 50.4	14 19.2 42.4	1.38 (0.63, 3.01)	0.6599	0.4165
	SGA Row % Col %	58 75.3 49.6	19 24.7 57.6			
Required mechanical ventilation	**NO** Row % Col %	111 81.0 94.9	26 19.0 78.8	4.98 (1.54, 16.06)	8.4122	0.0037
	YES Row % Col %	6 46.2 5.1	7 53.8 21.2			

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