Original Research Article

Survival and morbidities in very low birth weight (VLBW) infants in a tertiary care teaching hospital

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ABSTRACT

Background: Very low birth weight (VLBW) infants often need institutional advanced neonatal care. There is paucity of literature about the survival and morbidities of this very vulnerable group of preterm very low birth weight infants in tertiary care teaching hospitals. The aim of the study was to measure the outcome of VLBW infants in terms of survival and various short-term morbidities in a tertiary care teaching hospital.

Methods: This was a retrospective data analysis of all VLBW infants born in a tertiary care teaching hospital of eastern India, between 01 July 2014 and 31 December 2016. 35 VLBW infants were studied for the outcomes in terms of survival and morbidities like respiratory distress, apnoea of prematurity, intra ventricular haemorrhage, necrotizing enterocolitis, patent ductus arteriosus, retinopathy of prematurity and broncho pulmonary dysplasia.

Results: The overall survival rate of VLBW infants weighing >750 g (n=30) was 96.6% and <750 gm (n=5), was 40%. The commonest complications were respiratory distress (65.7%), neonatal hyperbilirubinemia (74.3%) and suspect early onset sepsis (51.4%) based on maternal risk factors.

Conclusions: The majority of VLBW infants above 750 g at birth or ≥ 26 weeks POG, survived in a tertiary care teaching hospital.

Keywords: Extremely low birth weight, Morbidities, Survival, Very low birth weight

INTRODUCTION

About two third of infant deaths and about half of under 5 child deaths are during the neonatal period and of all the components of the under 5 mortality, neonatal mortality rate is the slowest to decline over the years in India.¹

One of the leading causes of neonatal mortality is preterm birth complications and hence progress in child survival and health cannot be achieved without addressing preterm births.² Though about 85% of all preterm births occur between 32 and 37 weeks period of gestation

(POG) and most of these infants can survive with essential new born care, the rest who will mostly be very low birth weight (VLBW) (less than 1500 g) will need institutional advanced neonatal care.³

There is paucity of literature about the survival and morbidities of this very vulnerable group of preterm very low birth weight infants from Indian hospitals. Therefore, we planned to study retrospectively, the outcome of VLBW neonates in terms of survival and various short-term morbidities unique to this population in a tertiary care teaching hospital of eastern India.

METHODS

All VLBW infants born in a tertiary care teaching hospital of eastern India, between 01 July 2014 and 31 December 2016 formed the study subjects. The neonatal intensive care unit (NICU) of the hospital is a 10-bedded unit with facility of CPAP and ventilation, continuous pulse oximetry, non-invasive blood pressure measurement and total parenteral nutrition in addition to other basic essential facilities. Care intermediate between level II and level III care facility is provided to the admitted infants with round the clock support of residents of Paediatrics and on call availability of neonatologist, paediatric surgeon, vitreoretinal surgeon, cardiologist and radiologist. At all times, utmost efforts are taken by all care givers to ensure that oxygen saturation is maintained between 91% to 95%.⁴ All VLBW infants are regularly screened for retinopathy of prematurity at 4 weeks of postnatal age. All VLBW infants are also periodically screened for intra ventricular haemorrhage. They undergo echocardiography for patent ductus arteriosus on clinical suspicion. Hearing screening is done post discharge at about 3 months of corrected gestational age.

Medical records of all inborn VLBW infants were retrieved retrospectively from the records in delivery register, high risk neonatal register, case files and computerised database and discharge papers. Data was entered from these records onto a Microsoft Excel database and further analysed.

Maternal information included age, parity, gravidity, antenatal risk factors in mother and antenatal corticosteroids usage. The infant's weight, details of delivery room resuscitation, Apgar scores, growth status (Lubchencho charts) were also recorded.⁵ Gestational age (GA) was ascertained from the first day of the last menstrual period or by first trimester ultrasound or by the Expanded New Ballard Score (ENBS) performed within

24 hours of birth in that order of preference.⁶ Neonatal information included type of respiratory support, duration of oxygen use, use of total parenteral nutrition, initiation of feeds and time to reach full feeds (100 ml/kg/day), duration of antibiotics, incidence of apnoea, anemia needing transfusion etc. Standard criteria were used for definition of common morbidities. Intra Ventricular Haemorrhage (IVH) was graded using Volpe's classification.⁷ Necrotizing Entero Colitis (NEC) was defined as per modified Bell's staging.⁸ Retinopathy of Prematurity (ROP) was classified using International Classification of Retinopathy of Prematurity (ICROP) classification.⁹ Broncho Pulmonary Dysplasia (BPD) was defined based on the criteria of receiving oxygen therapy of >21% for ≥ 28 days.¹⁰

Statistical analysis

Descriptive statistics was used to describe the baseline variables. All data were analysed using a statistical software (Epi Info™ ver 7.0, CDC, Atlanta). For categorical variables Chi square test was used and for continuous variables independent t test or Mann Whitney U test was used. A p value of <0.05 was considered significant.

RESULTS

A total of 1943 neonates were born during the study period and a total of 35 infants were born VLBW. The baseline characteristics of VLBW infants (n=35) are shown in Table 1.

Out of these infants, 10 (28.5%) infants were IUGR. 30 (85.7%) mothers had received antenatal steroids and commonest maternal co-morbidity was hypertension in 17 (48.5%) mothers. 10 (28.5%) mothers had preterm premature rupture of membranes.

Table 1: Baseline characteristics of VLBW infants (n=35).

Characteristics	Overall incidence	VLBW infants (survived) (n=31)	VLBW infants (fatal) (n=4)	P value
Gestation ≤ 25 weeks	6 (17.1)	2 (6.4)	4 (100)	<0.001
Birth weight < 750 gm	5 (14.2)	2 (6.4)	3 (75)	<0.001
Male sex	18 (51.4)	17 (54.8)	1 (25)	0.26
Intra uterine growth restriction (IUGR)	10 (28.5)	10 (32.2)	0	0.18
Vaginal Delivery	21 (60)	17 (54.8)	4 (100)	0.08
Antenatal steroids administered	30 (85.7)	29 (93.5)	1 (25)	<0.001
Resuscitation at birth	9 (25.7)	6 (19.3)	3 (75)	0.018
Maternal hypertension	17 (48.5)	15 (48.3)	2 (50)	0.94
Maternal gestational diabetes	7 (20)	7 (22.5)	0	0.29
Twin pregnancy	9 (25.7)	7 (22.5)	2 (50)	0.24
Preterm premature rupture of membranes	10 (28.5)	9 (29)	1 (25)	0.86

Data represented as n (%)

The distribution and survival of the VLBW infants have been depicted both birth weight wise (Table 2) as well as gestation wise (Table 3).

Out of 35 VLBW infants, 9 were ELBW and 5 survived among the ELBW babies. A total of 6 infants were born at less than 26 weeks and 2 of these babies survived. All infants weighing more than 999 g at birth survived.

Table 2: Distribution of VLBW infants (birth weight wise) (n=35).

Birth Weight (g)	Number of infants	Survival
<750	5	2
750-999	4	3
1000-1250	6	6
1251-1500	20	20

Table 3: Distribution of VLBW infants (gestation wise) (n=35).

Gestation (weeks)	Number of infants	Survival
≤ 25	6	2
26-27	1	1
28-29	6	6
30-31	9	9
32-33	8	8
≥ 34	5	5

The complications developed among these VLBW infants are depicted in Table 4. The common complications were neonatal hyperbilirubinemia needing phototherapy in 26 (74.3%) neonates, respiratory distress needing CPAP in 23 (65.7%) neonates and suspect sepsis needing antibiotics in 18 (51.4%) neonates.

Table 4: Complications in VLBW infants (n=35).

Complication	Overall incidence	VLBW infants (survived) (n=31)	VLBW infants (fatal) (n=4)	p value
Respiratory distress syndrome	8 (22.8)	4 (12.9)	4 (100)	<0.001
Transient tachypnea of newborn	14 (40)	14 (45.1)	0	0.08
Need of CPAP	23 (65.7)	19 (61.2)	4 (100)	0.12
Need of surfactant	8 (22.8)	4 (12.9)	4 (100)	<0.001
Need of intravenous fluid	19 (54.2)	15 (48.3)	4 (100)	0.054
Hypoglycemia	6 (17.1)	4 (12.9)	2 (50)	0.06
Apnea	10 (28.5)	6 (19.3)	4 (100)	<0.001
Any sepsis	18 (51.4)	16 (51.6)	2 (50)	0.95
Culture positive sepsis	2 (5.7)	1 (3.2)	1 (25)	0.08
Neonatal hyperbilirubinemia	26 (74.3)	22 (70.9)	4 (100)	0.21
Parenteral nutrition	13 (37.1)	9 (29)	4 (100)	0.006
Patent ductus arteriosus	5 (14.2)	3 (9.6)	2 (50)	0.03
Necrotizing enterocolitis (stage 2 and beyond)	2 (5.7)	1 (3.2)	1 (25)	0.08
Anemia	5 (14.2)	4 (12.9)	1 (25)	0.52
Bronchopulmonary dysplasia	2 (5.7)	2 (6.4)	-	-
Retinopathy of prematurity	0	0	-	-
Intra ventricular hemorrhage	4 (11.4)	0	4 (100)	<0.001

Data represented as n (%)

DISCUSSION

In this study we tried to estimate the survival and morbidity of VLBW infants. The overall survival rate of VLBW infants weighing above 750 g is 96.6 percent and similar is the survival beyond 25 weeks POG. Even at 25 weeks POG 2 out of 3 neonates survived. However, none of the infants born before 25 weeks POG (n=3) survived. Among those born with a birthweight <750 gm (n=5), 2 neonates survived. The survival data is comparable with the leading institutes from India and also the developed nations.¹¹⁻¹⁸ One of the earliest data of survival shown in Extremely Low Birth Weight (ELBW) infants is from pre surfactant era, at a tertiary care teaching hospital of

northern India where the survival in infants >750 g at birth was 61% and those weighing <750 g at birth was 23%.¹¹ Similarly survival rate of ELBW infants reported in a level III NICU from western India was at 56% overall with significantly higher mortality at <750g.¹² Even recent data from a level III referral neonatal unit of a teaching hospital in northern India showed the adjusted survival in ELBW infants to be 57% in infants weighing >750 g, 32% in 500-750 g and none at <500 g.¹³ Survival rate as per Korean Neonatal Network in less than 700 g and similarly in less than 25 weeks POG was about 60%, which rises to about 80% in infants weighing more than 800 g at birth or POG of 26 weeks or beyond.¹⁴ Even recent data from USA, Canada, and European countries

also suggest the survival below 750 g at birth to be around 65%, increasing to about 90% at or above 750 g at birth.¹⁵⁻¹⁷ In present study, all baseline characteristics were comparable between those who survived and those who did not survive, except POG ≤ 25 weeks ($p < 0.001$), birth weight < 750 g ($p < 0.001$), maternal administration of antenatal steroids ($p < 0.001$) and resuscitation at birth ($p = 0.018$).

In addition to the adherence to best practices followed in NICUs today, most important evidence based strategy for survival of VLBWs is administration of antenatal corticosteroids.¹⁹ In present study about 85% of mothers received either complete or partial course of corticosteroids, which is comparable to the best of centres in the world and better than many middle income countries.^{20,21} Most of the infants needing respiratory support were managed by Continuous Positive Airway Pressure (CPAP) alone and only about one third of them required surfactant and most of them underwent INSURE (intubation, surfactant instillation, extubation). The proportion of infants managed only by CPAP is higher in our study as compared to data from other studies, the reason may be infants in our study had higher POG and increased incidence of Intra uterine growth restriction in our population.^{12,13,20} Present data suggests that good antenatal corticosteroids coverage and early CPAP can salvage most of the infants above 750 g birthweight.

The morbidities noticed in our population were mainly respiratory distress, neonatal hyperbilirubinemia and early onset sepsis (based on risk factors) which are comparable with the recent data from India.^{12,13} The cause of respiratory distress was predominantly transient tachypnoea of newborn as there were lesser radiological proven respiratory distress syndrome (RDS). This is also the reason why surfactants were required lesser in our study. The decreased incidence of RDS is because of near universal antenatal steroid usage and relatively higher POG in our population. Neonatal hyperbilirubinemia was an expected morbidity, but was easily manageable by phototherapy. About a third of all the VLBW infants, predominantly ELBW infants, were born with preterm premature rupture of membranes (PPROM) of more than 24 hours. About a half of all VLBWs were subjected to antibiotics at some point of postnatal life, which were stopped once culture reports came negative. This rate is also comparable with the recent data of Indian NICUs.^{12,13} However only about 6% of all VLBWs had culture positive or screen positive sepsis. The decline in culture positive sepsis was due to increased use of antibiotics in mothers with PPRM and better hand hygiene by all caregivers. The average duration of exposure to antibiotics in the infants who were subjected to antibiotics was for 72 to 96 hours only, till the time of written culture reports. BPD is another expected complication in very preterm population and the incidence in our study was less too. The reason for this is infants with relatively higher POG in our population, avoidance of invasive ventilation, use of caffeine,

aggressive nutrition and strict titrating of oxygen saturations to 91% to 95%. We did not find a single case of ROP needing intervention, in the infants who survived, though all were routinely screened for. The reason possibly is judicious use of oxygen, and strict adherence to optimum saturations in NICU. There was similarly no IVH in the infants who survived till discharge. The incidence of IVH among infants who were ELBW was about 40% and all these infants were of POG ≤ 25 weeks and none survived. The infants with PDA were all ELBW and were managed with single or repeat courses of paracetamol. Though a few cases could qualify for suspect NEC/feed intolerance, only two could meet the criteria for definite NEC. The reason for decreased incidence of NEC was exclusive use of human milk for feeding the infants in our NICU. Almost one third of all VLBW infants had apnoea of prematurity and majority were managed with caffeine alone and CPAP if needed.

The strength of our study is that standard definition of morbidities has been used and these have been well documented. However, the limitation of this study is that long term data of growth and neurodevelopment is not included which are equally important end points of care of such small infants. Data on hearing screening is not mentioned as well. The design is retrospective and the sample size is possibly small.

CONCLUSION

To conclude, majority of VLBW infants above 750 g at birth or ≥ 26 weeks POG, survived in this tertiary care teaching hospital of eastern India. There is a need to assess long term morbidities, particularly regarding growth and neurodevelopmental outcome.

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