

Outcome of very low birth weight infants in a tertiary neonatal care centre in Colombo, Sri Lanka: A preliminary study

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Abstract

Introduction: The number of preterm deliveries in Sri Lanka has increased during the last 2 decades and Sri Lankan data regarding their outcome is sparse.

Objectives: To describe short-term outcomes of very low birth weight (VLBW) neonates in Sri Lanka

Method: A prospective observational study was conducted on all neonates weighing from 500-1500g born at De Soysa Hospital for Women, Colombo from 01.01.2020 – 30.06.2020. Babies who were transferred into and out of DSHW were excluded from the study. Data were collected using an interviewer-administered questionnaire and a data recording form at different stages of hospital stay.

Results: Our study population contained 48 babies with birth weights between 500g-1500g, of which 47.9% were males and 52.1% were females. Mean gestational age was 29.7±3.07 weeks with a range of 24+6 to 33+3 weeks. Mean birth weight was 1026±354.6g with a range of 505-1490g. Overall survival rate was 83.3%. Gestation specific mortality rates were 50% for <26 weeks, 22% for 26-29 weeks and 10% for 30-31 weeks. There were no deaths between 32-34 weeks. Mortality was 40%, 19% and 4.5% for birth weights 500-750g, 751-1000g and 1001-1500g respectively. Respiratory distress syndrome was seen in 83% and surfactant was required in 58%. Non-invasive and invasive ventilation were used in 60% and 40% respectively. Patent ductus arteriosus (37.5%), neonatal sepsis (29.1%), retinopathy of prematurity (18.7%),

bronchopulmonary dysplasia (14.5%), intraventricular haemorrhage (14.5%), periventricular leucomalacia (4.2%) and necrotizing enterocolitis (4.2%) were all significantly higher ($p<0.05$) in babies with gestation <28 weeks and birth weight <1000g compared to babies with gestation 28-34 weeks and birth weight 1001-1500g.

Conclusions: The survival rate of VLBW in DSHW, Colombo, Sri Lanka was 83.3%. Survival decreased at lower gestational ages and lower birth weights. Complications were significantly higher in the extreme preterm and ELBW groups compared to babies with gestation between 28-34 weeks and babies with birth weights between 1001-1500g.

(Key words: Very low birth weight, Extreme prematurity, Outcome, Complications, Sri Lanka)

Introduction

Prematurity is defined as a birth that occurs before 37 completed weeks of gestation¹. Preterm birth rate is around 11% with approximately 15 million babies born each year² of which 84% are born at 32-36 weeks of gestation, 10% at 28-32 weeks and 5% at less than 28 weeks of gestation. Degree of prematurity can be defined by gestational age or by birth weight. According to the WHO classification¹, extreme preterm is less than 28 weeks gestation, very preterm is between 28-32 weeks gestation, moderate to late preterm is gestation between 32-37 weeks, extreme low birth weight (ELBW) is less than 1kg, very low birth weight (VLBW) is less than 1.5 kg and low birth weight (LBW) is less than 2.5 kg.

Multiple gestation and assisted reproductive technology have been associated with increased preterm deliveries^{3,4}. Most preterm deliveries are the result of spontaneous onset preterm labour or preterm rupture of membranes. Fetal and maternal interventions account for a minority⁵. Preterm mortality and morbidity are affected by the degree of prematurity, level of neonatal care and congenital anomalies. The risk of complications increases with the degree of immaturity. Complications detectable at the time of discharge include hypothermia, respiratory distress syndrome (RDS), retinopathy of prematurity (ROP), patent ductus arteriosus (PDA), bronchopulmonary dysplasia (BPD), neonatal sepsis, necrotizing enterocolitis (NEC),

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intraventricular haemorrhage (IVH), periventricular leucomalacia (PVL) and hyperbilirubinaemia². Currently, only a limited number of studies have been conducted in Sri Lanka with regard to short-term outcome in preterm neonates, especially VLBW babies, compared to numerous studies done globally.

Objectives

The aim of this study was to assess the neonatal outcome of VLBW neonates managed at De Soysa Hospital for Women (DSHW), Colombo

Method

A prospective observational cohort study was conducted among all neonates born with birth weights between 500–1500g, at DSHW, Colombo from 01.01.2020 –30.06.2020. All neonates, born at DSHW, with birth weights between 500–1500g, whose parents gave informed written consent were included in the study. Babies who were transferred into and out of DSHW were excluded from the study.

Ethical issues: Approval for the study was obtained from the Ethics Review Committee of the Sri Lanka College of Paediatricians (Ref. No. SLCP/ ERC/ 2019/20). Written informed consent was obtained from all the parents of the neonates included in the study

Data were recorded at different stages of hospital stay, using an interviewer-administered questionnaire and data recording forms. Clinical assessment was done daily until demise or discharge by the investigator. Data analysis was done using SPSS version 22. Comparison of outcomes between gestation <28 weeks vs 28-34 weeks and birth weight <1000g vs 1001-1500g was done using the independent samples t-test.

Gestational age was calculated from the antenatal dating scan performed between 8-13 weeks. Last regular menstrual period was taken in instances where antenatal scans were not available.

The following **definitions** were used in assessing the neonatal outcome:

- *Respiratory distress syndrome* (RDS) was diagnosed in babies with radiological evidence of RDS in the presence of respiratory distress that required respiratory support.
- *Bronchopulmonary dysplasia* (BPD) was diagnosed according to the 2011 National Institute of Child Health and Human Development (NICHD) criteria; oxygen supplementation either at 28 days of

postnatal age or 36 days of postmenstrual age².

- *Intraventricular haemorrhage* (IVH) and *periventricular leucomalacia* (PVL) were diagnosed as per ultrasound scan (USS) of brain classified according to the Levene classification⁶. USS brain was done by the consultant radiologist.
- *Retinopathy of prematurity* (ROP) was diagnosed by the consultant ophthalmologist, after screening all infants born with a weight less than 1.5kg or with a period of gestation less than 32 weeks⁷.
- *Patent ductus arteriosus* (PDA) was diagnosed by clinical examination and confirmed by 2D echocardiogram by a consultant paediatric cardiologist.
- *Necrotising enterocolitis* (NEC) was diagnosed in conjunction with the paediatric surgeon, in babies with clinical symptoms and confirmed by abdominal x-ray according to Bell's classification⁸.
- *Sepsis* was diagnosed using a positive blood culture in the presence of clinical features. Culture negative sepsis was diagnosed using two positive abnormal laboratory investigations in addition to clinical suspicion, in the absence of a positive blood culture⁹. Sepsis that occurred within the first 72 hours of life was considered early onset sepsis and sepsis that occurred after 72 hours of life was considered late onset sepsis⁹.

Results

Our study population consisted of 48 babies with birth weights between 500–1500g of which 23 (47.9%) were male and 25 (52.1%) were female. Mean gestational age was 29.7±3.07 weeks with a range of 24 weeks + 6 days to 33 weeks + 3days. Mean birth weight was 1026 ± 354.6 g with a range of 505-1490g. Thirty-six (75%) babies were delivered by emergency caesarean section (EM LSCS). While 28 (58.3%) mothers did not have an underlying medical condition, 4 (8.3%) had gestational diabetes mellitus (GDM), 8 (16.7%) had pregnancy induced hypertension (PIH), 5 (10.4%) had both GDM and PIH and 3 (6.3%) had other maternal diseases.

Our study population of VLBW babies had an overall mortality rate of 16.7%. Major congenital anomalies were present in 25% of the infants who died. Details regarding survival and mortality are given in Table 1.

Table 1: Characteristics of the VLBW in the study population

Characteristics	Number	Percentage	
Overall survival rate to discharge	40	83.3	
Overall mortality rate	08	16.7	
<i>Gestation (weeks)</i>	Number of live births	Number of deaths	Percentage
<26	06	03	50.0
26-27	09	02	22.2
28-29	09	02	22.2
30-31	10	01	10.0
32-34	14	00	00
<i>Birth weight (g)</i>			
500-750	10	04	40.0
751-1000	16	03	18.8
1001-1500	22	01	04.5

Antenatal corticosteroid regime was completed in 41(85.2%) mothers. Complications observed and comparison between extreme preterm and 28-34

weeks as well as ELBW and 1000-1500g are shown in Table 2.

Table 2: Comparison of complications according to period of gestation and birth weight

Complication	Period of gestation (weeks)		p-value	Birth weight (g)		p-value
	< 28 (n=16)	28-34 (n=32)		500-1000 (n=24)	1001-1500 (n=24)	
Respiratory distress syndrome	16 (100.0%)	24 (75.0%)	0.028	24 (100.0%)	16 (66.6%)	0.002
Pneumothorax	01 (6.25%)	01(03.1%)	0.617	02 (08.3%)	00	0.149
Invasive ventilatory support	11 (68.8%)	08 (25.0%)	0.003	14 (58.3%)	05 (20.8%)	0.008
Need for surfactant	16 (100.0%)	12 (37.5%)	<0.005	16 (66.6%)	02 (08.3%)	<0.005
Bronchopulmonary dysplasia	07 (43.0%)	00	<0.005	07 (29.1%)	00	0.004
Patent ductus arteriosus	12 (75.0%)	07 (21.8%)	<0.005	18 (75%)	01 (04.1%)	<0.005
Sepsis	08 (50.0%)	06 (18.8%)	0.025	12 (50.0%)	02 (08.3%)	0.001
Retinopathy of prematurity	08 (50.0%)	01 (03.1%)	<0.005	09 (37.5%)	00	0.001
Necrotising enterocolitis	02 (12.5%)	00	0.041	02 (08.3%)	00	0.149
Hyperbilirubinaemia	10 (62.5%)	20 (62.5%)	1.00	14 (58.3%)	16 (66.6%)	0.551
Hypothermia	15 (93.7%)	12 (37.5%)	<0.005	22 (91.6%)	05 (20.8%)	<0.005
Intraventricular haemorrhage	05 (31.3%)	02 (06.3%)	0.021	07 (29.1%)	00	0.004

P<0.05 significant

RDS was present in 40 (83.3%) where surfactant therapy was used in 28 (58.3%), one dose of surfactant in 18 (64.2%) infants and two doses in 10 infants (35.8%). Respiratory support was predominantly non-invasive (60%) [Continuous positive airway pressure (CPAP) and non-invasive positive pressure ventilation (NIPPV)] whilst invasive ventilation was required in 40% of VLBW. All extreme preterm babies developed RDS, required invasive ventilation as well as surfactant. Pneumothorax occurred in 2 (4.1%) infants. BPD was diagnosed in 7 (14.5%) infants all of whom were ELBW and extreme preterm.

Intraventricular haemorrhage (IVH) was present in 7 (14.5%) infants of whom 2 (4.2%) were diagnosed to have severe IVH (grades 3 and 4) and later those 2 babies were found to have PVL in follow up ultrasound scans. All babies who developed IVH were ELBW. IVH was significantly higher in extreme preterm compared to 28-34-week-old babies. ROP was diagnosed in 9 (18.7%) infants, where it was found to be severe in 2 (4.2%) babies who required laser treatment. ROP was exclusively

seen in ELBW babies compared to VLBW. PDA was seen in 18 (37.5%) babies, of which 16 (85.8%) responded to medical treatment with paracetamol and 2 (11.2%) infants needed surgical ligation. NEC was diagnosed in 2 (4.1%) infants who were both ELBW and extreme preterm.

Hyperbilirubinaemia was seen in 30 (62.5%) infants where all of them managed with phototherapy. There was no significant difference between ELBW vs VLBW and extreme preterm vs 28-34 weeks. Early sepsis was found in 4 (8.3%) (culture negative: 2, culture positive: 2) babies while 10 (20.8%) infants developed late sepsis (culture negative 6, culture positive 4). Sepsis was significantly higher in the extreme preterm and ELBW group. Only 4 (8.3%) babies were found to have normothermia (36.5-37.5°C) on admission. Cold stress (36-36.5°C) was seen in 52% and moderate hypothermia (32°C-36°C) in 40% of VLBW on admission. Severe hypothermia (<32°C) was not detected in any baby. Hypothermia was significantly higher in extreme preterm (p<0.005) and ELBW (p<0.005).

Discussion

Our study population demonstrated that survival increased with higher gestational age and higher birth weight. Our data also revealed that the rate of all complications was higher in the extreme preterm and ELBW groups compared to the 28-34 and 1001-1500g except for hyperbilirubinaemia and pneumothorax. The high rate of hypothermia noted in our study, despite using pre-warmed plastic bags and pre-warmed transport incubator is probably due to keeping the portholes of the incubator open, to manually work the T-piece device to give CPAP, while being transported to the neonatal unit.

VLBW survival (83.3%) in our study population was similar to India (83%)¹⁰ and Saudi Arabia (82.8%)³ and markedly higher than Jordan (64.8%)¹¹. Similar to our study population (75%), majority of VLBW babies were delivered by EM/LSCS in India (73.5%), Jordan (71.8%)¹¹ and Saudi Arabia (86%)³. Antenatal corticosteroid usage was significantly higher in our country (85.2%) whereas a very low percentage of antenatal corticosteroid usage was reported in India (37.4%)⁹ and Jordan (29.6%)¹¹. Mean birth weight 1026g (505g – 1490g) of the VLBW babies in our study was slightly lower when compared to India (1121g)¹⁰ and Saudi Arabia (1062g)³. Mean gestational age (weeks) of our study population was 29.7 which was slightly higher than that of India (28+4)⁹, Jordan (28+6)¹¹ and Saudi Arabia (29+0)³.

RDS was diagnosed in 83.3% of infants which was lower than recent NICHD data which was 93%² and Saudi Arabia (78%)³. Surfactant usage was lower in our study population (58.3%) compared to Jordan (67%)¹¹ and Saudi Arabia (67%)³. The use of invasive ventilation was lower in our study population (40%) compared to Jordan (66%)¹¹ and Saudi Arabia (47%)³. The use of non-invasive ventilation in our study population (60%) was higher than Jordan (31%)¹¹ and Saudi Arabia (53%)³. Our study population had a lower rate of pneumothorax (4.1%) compared to Saudi Arabia (9.1%)³ and India (5.4%)¹⁰. The rate of BPD (14.5%) was similar to the BPD rates in in India (16%)⁹ and Saudi Arabia (17.7%)³ but markedly lower than NICHD (42%)². Early use of CPAP immediately after birth in our study population would probably account for the lower requirement of surfactant, higher rate of non-invasive ventilation and lower use of invasive ventilation in our study population.

PDA was diagnosed in 37.5% of babies, which is lower than NICHD (46%)². All diagnosed babies in our study population were given needed medical therapy of which 88% responded and 11.2% needed surgical ligation. In comparison, all PDA had responded to medical therapy in Jordan¹¹ whereas Saudi Arabia had a much higher rate of surgical

ligation at 34%³. IVH was seen in 14.5% in our study population which was similar to Saudi Arabia (12.7%)³ and Jordan (36.4%)¹¹. Severe IVH (grade III–IV) observed in 4.2% in our study population was lower than NICHD (7-9%), India (8.2%) and Saudi Arabia (8.1%)³. Late onset sepsis (20.8%) was similar to Saudi Arabia (21.7%)³ and was lower than the NICHD cohort (36%)². NEC (4.1%) was lower in our study population compared to Saudi Arabia (7.5%)² and India (12.3%)¹⁰ but was higher than in Jordan (2.1%)¹¹. Higher breastfeeding rates in our study population may account for the lesser NEC seen in our study population. ROP (18.7%) was lower in our study population when compared to the NICHD cohort (59%)² and Saudi Arabia (28.3%)³. However, our ROP rates were higher than India¹⁰ (12.9%) and Jordan (7.8%)¹¹.

Limitations of this study include the small study population and being confined to a single tertiary care centre in Sri Lanka.

Conclusions

The survival rate of VLBW in DSHW, Colombo, Sri Lanka was 83.3%. Survival decreased at lower gestational ages and lower birth weights. Complications were significantly higher in the extreme preterm and ELBW groups compared to babies with gestation between 28-34 weeks and babies with birth weights between 1001-1500g.

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