

Original Research Article

Study on prevalence of maternal risk factors, morbidity and mortality in very low birth weight neonates

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ABSTRACT

Background: Very low birth weight babies with respiratory complications are the commonest reason for admission in NICU. We wanted to identify maternal risk factors associated with it and ways to prevent it. The objective of the current study was to study the prevalence of maternal risk factors, morbidity and mortality in VLBW babies admitted in tertiary care hospital NICU.

Methods: Cross sectional observational study performed on all very low birth weight (VLBW) neonates admitted in neonatal intensive care unit of tertiary care hospital attached with Smt. Kashibai Navale medical college, Pune from January 2019 to March 2020.

Results: In our study VLBW babies were 2.2% (78/3545). Mean gestational age was 31.15±3.21 weeks; mean birth weight was 1226.24±250.95 grams. Small for gestational age (SGA) babies were 41% and 96% were preterm. Maternal risk factors were present in 61.53% of deliveries, commonest were anaemia in 30.06 % and preeclampsia in 24.35%. Resuscitation at birth was required in 30.76% babies. Morbidity profile showed respiratory distress syndrome in 46.15%, neonatal sepsis in 19.23% and patent ductus arteriosus in 16.66% babies. Overall survival was 74.35%. Prematurity and its complications like RDS requiring surfactant therapy and mechanical ventilation were significant contributors for mortality but only 23.07% mothers were found to have received antenatal steroids in the hospital.

Conclusions: Anaemia and preeclampsia were commonly found risk factors present in 61.53% of mothers of VLBW babies. Use of antenatal steroids in mothers should be made compulsory to decrease mortality in VLBW preterm newborns.

Keywords: Very low birth weight, NICU, Neonatal mortality, Maternal risk factors

INTRODUCTION

Very low birth weight (VLBW) (birth weight <1500 gram) babies constitute approximately 4-7% of all live births and mortality amongst this subgroup of neonates is very high, contributing as much as 30% to the early neonatal mortality.¹ Survival of these babies is inversely

associated with their birth weight, gestation and illness severity.²

Preterm delivery is the leading cause of neonatal mortality and morbidity globally. Maternal anaemia, previous preterm delivery and pregnancy-induced hypertension (PIH) are the common predisposing factors for preterm delivery.³ Advances in the field of neonatology lead to improved quality of neonatal care

reducing perinatal mortality among premature babies particularly in developed countries.⁴ However, despite all the advances in neonatal and perinatal care the morbidity among preterm babies still remains significantly high in developing countries. Some of these babies die during or after delivery, with surviving babies developing complications.^{5,6} Primary complications include infections, respiratory distress syndrome (RDS), bronchopulmonary dysplasia (BPD), necrotising enterocolitis (NEC), intraventricular haemorrhage (IVH), patent ductus arteriosus (PDA) and retinopathy of prematurity (ROP).⁵ While data on these premature infant complications are retained better in developed countries with a high number of relevant publications, there is insufficient data available from developing countries. Hence we decided to study the prevalence of maternal risk factors, morbidity and mortality in VLBW babies admitted to our tertiary care hospital NICU.

METHODS

It was an observational study on very Low birth weight neonates (birth weight <1500 g) admitted in tertiary care hospital NICU attached with Smt. Kashibai Navale medical college, Pune from January 2019 to March 2020. All the data was collected in a pre-designed proforma. Proforma had 3 parts. First part had details of the mother like - age, obstetrics history, and presence of risk factors such as sepsis, urinary tract infection, anaemia, and ante partum haemorrhage, premature rupture of membranes and use of drugs such as antibiotics, tocolytics and steroids. Second part had details of the baby APGAR score, gestational age (using new Ballard score), birth weight, need of resuscitation and general condition of the baby on day one. Third part had details of course in NICU, complications like RDS, hyperbilirubinemia, PDA, intra ventricular haemorrhage (IVH), shock, sepsis, necrotising enterocolitis (NEC), feed intolerance, congenital anomaly, congenital heart disease etc. Treatment details, investigations, length of stay and outcome were also noted. Data collected was entered in MS-excel and analysed statistically. Descriptive statistics included the percentage of different categories for categorical variables. Group comparisons were done by the chi-squared (χ^2) test for categorical variables. A probability value ($p < 0.05$) was considered significant. Epiinfo software was used for statistical analysis.

RESULTS

During the period of 15 months, total 3545 babies were delivered in our tertiary care centres. Total 78 babies were found to be of VLBW (2.2 %) and out of them 47.53% were males. Vaginal delivery were 62.82%, twin delivery were 29.49% and 30.76% required resuscitation at birth (Table 1).

Maternal risk factors were present in 61.53% of deliveries. Preeclampsia was present in 24.35%, anaemia in 30.76%, premature rupture of membranes in 7.69%,

prolonged labour was seen in 11% and abruption placenta was present in 5.12% mothers.

Table 1: Antenatal and perinatal characteristics of VLBW babies.

Characteristics	N	(%)
Delivery mode		
Caesarean	29	37.17
Vaginal	49	62.82
Plurality		
Singleton	55	70.51
Twin	23	29.49
Antenatal steroids	18	23.07
Resuscitation at birth	24	30.76

Table 2: Maternal risk factors in VLBW babies.

Characteristics	N	(%)
Maternal risk factors	48	61.53
Preeclampsia	19	24.35
Premature rupture of membranes	6	7.69
Prolonged labour	9	11
Abruptio placenta	4	5.12
Anaemia	24	30.76

Table 3: Demographic and morbidity profile of VLBW babies.

Characteristics	N	%
Gender		
Male	37	47.43
Female	41	52.56
Birth weight in grams (mean±SD); 1226.24±250.95		
<750	6	7.69
751 -1000	11	14.11
1001-1250	17	21.79
1251-1500	44	56.41
Gestational age in weeks (mean±SD); 31.15±3.21		
≤28	19	24.35
29-32	34	43.58
33-37	22	28.21
≥37	3	3.84
AGA	46	58.97
SGA	32	41.02
RDS	36	46.15
PDA	13	16.66
NEC	6	7.69
IVH	5	6.41
Pulmonary haemorrhage	2	2.94
Infection (sepsis/pneumonia/meningitis)	15	19.23
ROP	5	6.41
Anaemia	27	34.62

Mean birth weight was 1226.24±250.95 grams and mean gestational age was 31.15±3.21 weeks. SGA babies were 41.02%. Preterm babies were 96.16%. Out of total babies (78) admitted in NICU 46.15% babies had RDS, 19.23%

babies had neonatal infection, 16.66% of babies had PDA, 34.62% babies had anaemia, 6.41% had ROP, 6.41% babies had IVH and 2.94% babies had pulmonary haemorrhage.

Table 4: Antenatal and perinatal characteristics of alive and dead VLBW babies.

Parameter	Characteristic	Alive (N= 58)	Dead (N= 20)	Chi square value	P value
Gender	Female	29	12	0.23	0.608
	Male	29	8		
Birth weight (grams)	Mean birth weight	1305.67± 189.25	995.4± 269.48	t test value 5.557	<0.001
	<750	1	5	20.032	<0.001
	751 -1000	5	6		
	1001-1250	13	4		
	1251-1500	39	5		
Gestational age (weeks)	Mean	32.31±2.72	27.8± 1.91	t test value 6.842	<0.001
	≤28	6	13	27.314	<0.001
	29-32	27	7		
	33-37	22	0		
	≥ 37	3	0		
Gestational age (weeks)	≤28	6	13	21.236	0.001
	≥ 28	52	7		
Gestational age	AGA	30	16	3.815	0.051
	SGA	28	4		
Delivery mode	Caesarean	22	7	0.001	0.973
	Vaginal	36	13		
Plurality	Twin	10	13	14.098	<0.001
	Singleton	48	7		
Maternal risk factors	Yes	38	10	0.928	0.335
	No	20	10		
Preeclampsia	Yes	15	4	0.05	0.822
	No	43	16		
PROM	Yes	5	0	0.685	0.408
	No	53	20		
Abruptio placenta	Yes	3	1	0.311	0.577
	No	55	19		
Anaemia in mother	Yes	6	4	0.527	0.468
	No	52	16		
Resuscitation	Yes	6	18	40.632	<0.001
	No	52	2		

p<0.05; statistically significant

Average gestational age (32.31±2.72 vs. 27.5±2 weeks was significantly higher in those who survived than in those who died. Similar pattern was noticed for birth weight (average birth weight 1305.67±189.25 vs. 995.4±269.48 grams for survived and dead babies respectively. In contrast, need for resuscitation was significantly higher in later group p<0.001. Also twin pregnancy was significant risk factor for mortality with p<0.05. Complications associated with increase in mortality included respiratory distress syndrome and

sepsis. In treatment modalities; surfactant replacement therapy and mechanical ventilation emerged as significant risk factors contributing to increase in mortality (Table 5).

Overall survival was 74.35%; in ELBW (extremely low birth weight <1000 g) newborns survival was 35.3% and in infants with birth weight between 1001-1500 grams it was 85.24%. Respiratory failure resulting from RDS and sepsis were the major factors leading to death in ELBW babies.

Table 5: complications and its treatment in neonatal period as risk factors in dead neonates.

Parameter	Characteristic	Alive (N= 58)	Dead (N= 20)	Chi square value	P value
RDS	Yes	20	16	10.634	0.001
	No	38	4		
Surfactant	Yes	13	16	18.722	<0.001
	No	45	4		
Mechanical ventilation	Yes	13	20	33.567	<0.001
	No	45	0		
O2 therapy	Yes	17	3	2.19	0.139
	No	41	17		
CPAP therapy	Yes	14	9	0.935	0.334
	No	44	11		
PDA	Yes	7	6	2.273	0.132
	No	51	14		
NEC	Yes	5	1	0.001	0.97
	No	53	19		
IVH	Yes	2	3	1.663	0.197
	No	56	17		
Pulmonary haemorrhage	Yes	0	2	2.632	0.105
	No	58	18		
Infection (sepsis/pneumonia/ meningitis)	Yes	5	10	13.838	<0.001
	No	53	10		
Anaemia	Yes	17	10	1.973	0.16
	No	41	10		

DISCUSSION

Prevalence of VLBW babies was 2.2% in our study. Worldwide prevalence of VLBW babies has been reported between 1 to 7%.⁷⁻¹⁰ Majority of babies in this study (Table 3) were preterm 96.16 % and SGA babies were 41.02%, these results were similar to previous studies.^{7,11,12,15} Out of total 78 admissions 47.42% were male babies (Table 3) this percentage is low as compared to 57.53% by Naskar et al and 62.86% by Mannan et al.^{7,11}

Maternal diseases are linked with neonatal mortality and morbidity.¹² We collected the details of maternal risk factors after the birth of a VLBW baby. The risk factors were present in 61.53% of VLBW deliveries (Table 2). Analysis of maternal risk factors showed 30.76% had anaemia, 24.35% had preeclampsia, 5.12% had abruptio placenta and 7.69% had PROM (Table 2). Study by Seyyed-Abolfazl et al found maternal risk factors in 58.9%. It showed pre-eclampsia in 22.2%, abruptio placentae in 10.5%, infertility in 23.6%, premature rupture of membranes (PROM) in 8.7%, prolonged labour in 5.9% and chorioamnionitis in 2% of deliveries.¹³ Only 30.76 % had maternal anaemia in our study which is similar to study by K.K. Roy et al. who found anaemia during pregnancy in 32.6%.¹² But Sehgal et al found that 65% of patients in their study had anaemia.¹⁴ Maternal risk factors like primiparity, poor

socio economic status, multiple gestations, PROM, hypertension and under-nutrition were also studied by others.^{7,11,12,15}

According to some authorities caesarean section is the method of choice for delivery in VLBW babies but optimal mode of delivery is still a debate.¹⁶⁻¹⁹ In current study babies delivered by caesarean section were 37.17 % only (Table 1). The incidence of caesarean section was 67.3% in study done by Roy et al and 73.8% in a study done by Seyyed-Abolfazl et al who found normal vaginal delivery as independent risk factor for mortality in VLBW neonates.^{12,13}

Prematurity (gestational age <28 weeks), extremely low birth weight (<750 g), twin delivery and need of resuscitation at birth were significant risk factors ($p<0.05$) associated with death in our study (Table 4). Out of 78 babies 46.15% (36) babies developed RDS and 37.18% (29) received surfactant (Table 5). Overall incidence of RDS was higher in our study which may be due to large number of preterm babies (96.16%) and low rate of administration of antenatal steroids to mothers in hospital. In similar study by Naskar et al 19.89% babies had RDS and 41% of them received surfactant therapy.⁷ Study by Reempts et al showed that overall 62.5% of very low birth weight babies in Belgium developed RDS.¹⁹

We found sepsis in 19.3% babies, which increased their risk of mortality (Table 5). Similar incidence of infection was found in other studies.^{12,14} We found birth asphyxia, anaemia, IVH, ROP, PDA, NEC as other risk factors associated with increased mortality in VLBW babies which was similar to other studies.^{12,14} Prevalence of ROP, NEC, IVH was low in our study as compared to other studies.^{8,10,18} Mean duration of hospital stay was similar to other studies.¹²⁻¹⁴

The percentage of mothers receiving antenatal steroids in our study was less 23.07 % as against Neubauer et al in whose study 72% of mothers received antenatal corticosteroids for neonatal RDS prophylaxis (Table 1).¹⁸ Average coverage of antenatal steroids is around 70-80% in developed countries.^{6,8} Antenatal steroids betamethasone/dexamethasone given to mothers with preterm labour is known to prevent RDS and IVH in preterm babies. Use of antenatal steroid in mothers with expected preterm delivery should be discussed and stressed on obstetricians conducting deliveries.

Well trained personnel are required for resuscitation, as establishment of adequate respiration is essential for survival of VLBW babies. In our study 30.76% babies required resuscitation at birth (Table 4) and 41% required mechanical ventilation at the time of birth or subsequently. This clearly indicates that availability of trained personnel, surfactant and good neonatal ventilator are important determinants for survival in VLBW babies. These deliveries should ideally be conducted in tertiary care hospitals with good NICU facilities.

Better understanding of pathophysiology of the premature infant, availability of trained personnel, surfactant, mechanical ventilator and ability of neonatal intensive care unit to handle sick infants will decide the outcome of VLBW babies. The overall survival rate was 73.35% (<1000 g: 35.3% 1000-1500 g: 85.24%), which is similar to survival rates reported by other studies.^{13,20,21} It was higher than reports made by other developed countries.^{6,8,16} This may be due to difference in patient population, standard of antenatal and intranatal care and availability of NICU facilities. On univariate analysis low gestational age, low birth weight, requirement of resuscitation, mechanical ventilation, RDS, twin delivery and infection were found significant factors increasing mortality. Low gestational age, low birth weight, low APGAR scores as important predictors of poor outcome were also quoted by other studies.^{13,14,21}

Prevention is always better than cure. Obstetricians should identify mothers with risk factors, monitor growth of their babies, take active interventions to prevent preterm deliveries and use timely antenatal steroids, all these interventions will definitely reduce admissions of VLBW babies in NICU thereby reducing morbidity and mortality in neonatal period.

Limitations

Limitations of current study were small sample size and retrospective collection of maternal data. If it would have been a prospective cohort study of all high risk mothers we would have understood significant risk factors affecting VLBW babies better and taken appropriate measures to reduce morbidity and mortality in them.

CONCLUSION

The present study assessed prevalence of maternal risk factors, morbidity and mortality profile of VLBW infants in the NICU. The findings indicate that maternal risk factors like anaemia and pregnancy induced hypertension were more prevalent in VLBW babies. Also use of antenatal steroids should be improved to decrease incidence of RDS in VLBW preterm babies. Better survival and reduced complications are possible by adequate antenatal care, antenatal steroids use, and presence of trained person at the time of delivery for neonatal resuscitation and well equipped NICU with mechanical ventilator and surfactant therapy.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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