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Original Research Article

Clinical profile and factors determining outcome of intramural very low birth weight babies in a tertiary care centre: a retrospective study

Devi Meenakshi K.[1]*, Arasar Seeralar A. T.[1], Srinivasan Padmanaban[2]

[1]Department of Paediatrics, Government Kilpauk Medical College, Chennai, Tamil Nadu, India
[2]Scientist B (Non-Medical), NIRRH Field Unit, ICMR, Government Kilpauk Medical College, Chennai, Tamil Nadu, India

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***Correspondence:**
Dr. Devi Meenakshi K.,
E-mail: drdevi_1804@yahoo.in

ABSTRACT

Background: Very low birth weight (VLBW) babies are at increased risk of a number of complications both immediate and late. Worldwide it has been observed that these babies contribute to a significant extent to neonatal mortality and morbidity. Aim of the study was to study the risk factors contributing to mortality in VLBW babies and to evaluate the morbidity pattern in these infants.
Methods: A retrospective analysis of data retrieved from the case records of VLBW babies admitted in the NICU of Kilpauk Medical College between January 2015 to December 2015. Out of the 2360 intramural babies admitted during the study period, 99 babies were less than 1500 gms. The risk factors for these babies were analyzed for their association with the outcome. Data were statistically analyzed.
Results: In present study, we found that sex of the baby, gestational age, obstetric score, birth asphyxia, pulmonary haemorrhage, ROP and presence of shock were found to be associated with increased mortality. By logistic regression analysis it was observed that birth weight of the baby (p value 0.002), duration of stay (p value 0.0006), presence of shock ($p<0.0001$), were the risk factors significantly associated with poor outcome.
Conclusions: Among the maternal and neonatal factors analyzed in the study using logistic regression analysis, birth weight, duration of hospital stay and presence of shock were significantly related to poor outcome. Of these presence of shock was the single most important factor that predicted increased mortality.

Keywords: Morbidity pattern, Mortality, VLBW

INTRODUCTION

According to the WHO, a baby who weighs less than 1500 gm at birth is termed VLBW. Birth weight is an important parameter that predicts the outcome of the baby. Very low birth weight babies (VLBW) are at increased risk of a number of complications both immediate and late. Worldwide it has been observed that these babies contribute to a significant extent to neonatal mortality and morbidity. The immediate complications seen in these babies include recurrent apnoea, sepsis, jaundice, convulsions, anemia, IVH, RDS etc.[1,2] The common causes of mortality in these babies include sepsis, RDS and extreme prematurity.[3] The risk of developing complications is inversely related to the gestational age and birth weight.[4] These babies are also prone to repeated hospital admissions.[5] In developing countries due to limited health care resources many of the NICU s are striving hard to balance available resources to effectively manage these babies who require prolonged intensive care.

Advances in neonatal intensive care like use of antenatal steroids, mechanical ventilation, surfactant replacement therapy, parenteral nutrition, judicious and rational use of antibiotics etc., have helped us to salvage more immature

babies.[6] However these babies are more prone to develop a number of handicaps which may affect the quality of life. Studies have shown that VLBW babies are prone to developmental delay, bronchopulmonary dysplasia, retinopathy of prematurity, hearing impairment, periventricular leucomalacia etc.[7] Also these babies need structured follow up care to identify the morbidity early and to effectively rehabilitate them.

We wanted to review our data related to the VLBW babies to identify the morbidity pattern and factors that influence mortality. This may help us to plan strategies to reduce mortality and prevent /minimize morbidity in these babies.

METHODS

The study was conducted at the tertiary referral Neonatal Intensive Care unit located at the Government Kilpauk Medical College Hospital, Chennai, Tamil Nadu, India. The study was retrospective in nature with analysis of case records of VLBW neonates delivered at Kilpauk medical college hospital and admitted to the level III care during the period January 2015 to December 2015.

Extramural babies were not included in the study. During the study period there were a total of 2360 intramural admissions to the NICU. Of these 99 were VLBW and were evaluated. A standard data entry card was utilized for retrieving the relevant data regarding the mother and baby. The maternal data included the age of the mother, maternal illnesses complicating pregnancy like pregnancy induced hypertension diabetes, bad obstetric history(BOH), anemia, antepartum haemorrhage(APH), prolonged rupture of membranes(PROM >18 hour), etc., The neonatal morbidities include respiratory distress syndrome (RDS), neonatal hyperbilirubinemia, metabolic complications like hypoglycemia, hypocalcemia, etc., The basic details like birth weight, gestational age, duration of stay, outcome and the cause of death in babies who expired were also collected.

All the collected data were analyzed by using SPSS 17 and MED CALC software. Univariate analysis of the various parameters was compared to the outcome using Chi square test. A p value <0.05 was taken as significant. Stepwise multiple logistic regression analysis was carried out to find out the independent predictors of mortality and morbidity.

RESULTS

The mean birth weight in our study was 1135 gms. There were 16 babies below 1000 gm and 83 babies between 1000 and 1500 gm birth weight. The gestational age of the preterm babies ranged from 24 weeks and 36weeks. There was one term baby (37weeks). This was calculated by using the New Ballard Score for gestational age. The mean gestational age was 30 weeks (24 to 37 weeks). There were 85 (86%) singletons and 10 (10%) twins while triplets were 4 in number (4%) There were 14 (14%) babies with intrauterine growth restriction (IUGR).

Table 1: Comparison of demographic profile of VLBWs improved with those expired.

Factors	Improved N (%)	Expired N (%)	Total	p value
Sex				0.024
Male	11 (24)	35(76)	46	
Female	28(53)	25 (47)	53	
AGA/SGA				0.458
AGA	28 (37)	47 (63)	75	
SGA	11 (46)	13 (54)	24	
Birth weight				0.065
<500 gm	0 (0)	2 (100)	2	
500 to 800 gm	0 (0)	8 (100)	8	
800 to 1000 gm	1 (17)	5 (83)	6	
1000 to 1200 gm	7 (37)	12 (63)	19	
1200 to 1500 gm	34 (64)	19 (36)	53	
Gestational age				0.001
<28 weeks	1(5)	18 (95)	19	
28-30weeks	6 (33)	12 (67)	18	
30-32 weeks	11 (44)	14 (56)	25	
32-34 weeks	16 (62)	10 (38)	26	
34-36 weeks	50 (91)	5 (9)	55	
37 weeks	0 (0)	1 (100)	1	
Age of mother				0.741
< 20 years	3 (43)	4 (57)	7	
21-25 years	19 (36)	34 (64)	53	
26-30 years	14 (41)	20 (59)	34	
>30 years	2 (4)	3 (6)	5	
Mode of delivery				0.146
LSCS	18 (46)	21 (54)	39	
Normal labour	20 (34)	38 (66)	58	
Breech	1 (50)	1 (50)	2	
Obstetric score				0.045
Primi	18 (43)	24 (57)	42	
G2	16 (44)	20 (56)	36	
G3	4 (22)	14 (78)	18	
G4	1 (33)	2 (67)	3	

10 (10%) babies were small for gestational age (SGA). Thirty nine (39%) babies were delivered by caesarean section while 2 (2%) babies were delivered by assisted breech and 58 (58%) babies were delivered by normal vaginal delivery.

The maternal risk factors that were identified in present study were PIH in 24 (24%) cases, Diabetes in one (1%) baby, BOH in one (1%) baby, anemia in 4 (4%) babies, APH in 5 (5%) babies, oligohydramnios in 3 (3%) babies,

PROM in 8 (8%) babies. The mean maternal age in this study was 24 years (18 to 37 years) (Table 1). It was observed that presence of maternal factors like APH, anemia, BOH, PROM and oligohydramnios increased the risk of death.

Table 2: Comparison of maternal risk factors among VLBWs improved and expired.

Risk factor	Improved N (%)	Expired N (%)	Total	P value
PIH				0.605
Yes	8 (35)	15 (65)	23	
No	31 (41)	45 (59)	76	
Diabetes mellitus				0.213
Yes	1 (100)	0 (0)	1	
No	38 (39)	60 (61)	98	
BOH				0.418
Yes	0 (0)	1 (100)	1	
No	39 (40)	59 (60)	98	
Anemia				0.548
Yes	1 (25)	3 (75)	4	
No	38 (40)	57 (60)	95	
APH				0.064
Yes	0 (0)	5 (100)	5	
No	39 (41)	55 (59)	94	
Oligohydramnios				0.827
Yes	1 (33)	2 (67)	3	
No	38 (40)	58 (60)	96	
PROM				0.696
Yes	3 (33)	6 (67)	9	
No	36 (40)	54 (60)	90	

The common neonatal morbidities that we identified in our study were respiratory distress syndrome, sepsis, seizures, shock, metabolic problems (hypoglycemia, hypocalcemia), neonatal hyperbilirubinemia, birth asphyxia etc. RDS was seen in 44 (44%) babies and surfactant was used successfully in 28 (28%) babies and 32 (32%) babies were managed with CPAP. Sepsis was observed in 48 (48 %) babies and culture positive sepsis was seen in 16 (16 %) babies.

The common organisms were- *coagulase negative staphylococcus, Klebsiella, staphylococcus aureus, acenetobacter, Candida*. Neonatal hyperbilirubinemia was observed in 64 (64%) babies of which only 2 (2%) babies required exchange transfusion. Birth asphyxia was observed in 22 (22%) babies.

Complications like pulmonary haemorrhage were seen in 14 (14%) intraventricular haemorrhage in 10 (10%) babies. Retinopathy of prematurity was seen in 17 (17%), 57 (57%) babies developed shock and required inotropic support and 38 (38%) babies required blood transfusion, 56 (56%) babies required mechanical ventilation. The common causes of death identified in our study were RDS, birth asphyxia, sepsis and pulmonary haemorrhage etc. It was observed that presence of birth asphyxia; shock and pulmonary haemorrhage were associated with an increased risk of mortality.

Table 3: Morbidity profile among VLBWs improved and expired.

Factor	Improved N (%)	Expired N (%)	Total	P value
Birth asphyxia				0.047
Yes	4 (20)	16 (80)	20	
No	35 (44)	44 (56)	79	
RDS				0.300
Yes	16 (34)	31 (66)	47	
No	23 (44)	29 (56)	52	
Sepsis				0.717
Yes	19 (41)	27 (59)	46	
No	20 (38)	33 (62)	53	
Neonatal hyperbilirubinemia				0.157
Yes	27 (45)	33 (55)	60	
No	12 (31)	27 (69)	39	
Metabolic (hypoglycaemia, hypocalcemia)				0.658
Yes	2 (50)	2 (50)	4	
No	37 (39)	58 (61)	95	
Shock				0.000
Yes	8 (15)	45 (85)	53	
No	31 (67)	15 (33)	46	
Seizure				0.158
Yes	1 (17)	5 (83)	6	
No	38 (41)	55 (59)	93	
Pulmonary haemorrhage				0.007
Yes	0 (0)	10 (100)	10	
No	39 (0)	50 (56)	89	
ROP				0.000
Yes	16 (94)	1 (6)	17	
No	23 (28)	59 (72)	82	
Intraventricular haemorrhage				0.104
Yes	1 (13)	7 (87)	8	
No	38 (42)	53 (58)	91	

DISCUSSION

The various demographic factors that were studied include the sex of the baby, birth weight, gestational age etc. Female babies had a better chance of survival as compared to their male counterparts. Male babies had a mortality risk of 76% as compared to female babies who had a risk of 47%. Comparing birth weight with outcome it was observed that with increasing birth weight the mortality decreased. In babies with weight less than 800 gm the mortality was 100% while it was only 36% in babies with birth weight between 1200 and 1500 gm. Regarding gestational age it was found that mortality decreased with increasing maturity. The mortality was 95% in babies less than 28 weeks while it was only 9% in babies between 34-36 weeks. In a study done by Mohapatra SK, et al it was observed that 64 % of VLBW

babies survived to discharge and male babies and those with a lower gestational age had a poor outcome.[8] In present study also male babies and babies with lower gestational age did poorly. In the study by Roy KK, et al the mortality was highest in babies less than 800 gm and in lower gestational age between 28 and 30 weeks and this was similar to present observation.[1] Among AGA - VLBW babies, 28 (37%) improved and 47 (63%) expired when compared to 11 (46%) improved and 13 (54%) expired among SGA-VLBWs. The slight increase in the mortality among AGA - VLBWs was found to be not statistically significant (P 0.45) (Table 1).

The mortality in VLBW babies born to mothers with PIH was 65% while it was 59% among babies born to mothers without PIH. The mortality in VLBW babies born to mothers with anemia was 75% while it was 60% among babies born to mothers without anemia. The mortality in VLBW babies born to mothers with APH was 100% while it was 59% among babies born to mothers without APH. The mortality in VLBW babies born to mothers with PROM was 67% while it was 60% among babies born to mothers without PROM. The mortality in VLBW babies born to mothers with oligohydramnios was 67% while it was 60% among babies born to mothers with normal liquor volume. The mortality in VLBW babies born to mothers with BOH was 100% while it was 60% among babies born to mothers with normal obstetric history.

Observations made by Malaysian Pediatric Association in their study where they had compared maternal risk factors like maternal age, parity, mode of delivery, hypertension in pregnancy, maternal diabetes mellitus, maternal anaemia, placenta praevia, abruption placentae, PROM, maternal infection, prolonged rupture of membranes , use of prenatal steroids etc. showed that mode of delivery, PIH in the mother and use of prenatal steroids resulted in better outcome.[9]

It was also observed in this study that VLBW babies of mothers with PIH had a better survival rate than those whose mothers did not have hypertension in pregnancy. This was contrary to our observation that outcome was better in babies who were born to mothers without pregnancy induced hypertension. In a study done in Eastern Nepal by Poudel P et al it was observed that maternal risk factors like APH, PROM, twin pregnancy, inadequate antenatal care, PIH, maternal age <20 years, BOH were associated with VLBW preterm babies.[10] Roy KK et al in their study observed that anemia, gestational hypertension, bacterial vaginosis, previous history of preterm delivery, UTI, multiple pregnancy, heart disease, diabetes and antepartum haemorrhage were the common maternal risk factors in VLBW babies (Table 2).[11]

The mortality in babies with birth asphyxia was 80% as compared to 56% in babies without asphyxia. The mortality in babies with RDS was 66% as compared to 56% in babies without RDS. The mortality in babies with shock was 85 % as compared to 33% in babies without shock. The mortality in babies with seizures was 83% as compared to 59% in babies without seizures. The mortality in babies with pulmonary haemorrhage was 100% as compared to 56% in babies without pulmonary haemorrhage. The mortality in babies with intraventricular haemorrhage was 87% as compared to 58% in babies without IVH. Complications like seizures, shock, pulmonary and intraventricular haemorrhage were associated with an increased risk of mortality. Study conducted by Acharya N, et al revealed that the common neonatal morbidities were seizures, RDS, hypothermia, anemia, shock, CHD, birth asphyxia and NEC.[5] In present study we observed that RDS, asphyxia, sepsis, shock, seizures, etc. were common morbidities. In the study done by Vidyasagar, et al the overall survival rate was 72.12% and birth weight and gestational age were the common determinants of survival.[11] The morbidities identified in this study 3 were sepsis, RDS, NEC and pulmonary haemorrhage and this was similar to our observation. In the study done by Roy KK the common neonatal problems were RDS, jaundice and sepsis as in our study.

Mannan MA, et al in their study found that the clinical outcome depends on maturity, birth weight, centile for weight, maternal age, parity, maternal nutrition and socio-economic status, antenatal care, place and mode of delivery, maternal problems during antenatal and perinatal period, number of gestation, fetal condition, presentation at admission, postnatal problems, time of start of management and referral and level of care.[2] Some of these factors like birth weight, maturity, postnatal problems had an impact on the outcome. Poudel P et al 10observed that clinical sepsis, hyperbilirubeinemia, apnoea, shock, anemia, hyaline membrane disease, patent ductus arteriosus, retinopathy of prematurity, severe hypothermia etc., were the common neonatal morbidities (Table 3).

By univariate analysis the various parameters were compared to the outcome using Chi square test. It was found that sex of the baby, gestational age, obstetric score, birth asphyxia, ROP, pulmonary haemorrhage and presence of shock were found to be associated with increased mortality and this was statistically significant (p value <0.05). However by logistic regression analysis it was observed that only factors like birth weight, duration of stay and presence of shock were significantly associated with the outcome (Table 4).

Table 4: Logistic regression analysis.

Variable	Co efficient	Std Error	p value
Birth weight	-0.0081289	0.0026340	0.0020
Duration of stay	-0.11978	0.034885	0.0006
Shock	2.72164	0.66977	<0.0001
Constant	10.6150		

Among 53 VLBW babies who had shock, 8 (15%) improved and 45 (85%) expired when compared to 31 (67%) improved and 15 (33%) expired among those without shock (Table 3). Odds of having shock is 15 times in babies who had expired when compared to those improved [OR (95% CI) = 15.21 (4.09 -56.51)] (Table 5).

Table 5: Odds ratios and 95% confidence intervals.

Variable	Odds ratio	95 % CI
Birth weight	0.9919	0.9868 to 0.9970
Duration of stay	0.8871	0.8285 to 0.9499
Shock	15.2052	4.0914 to 56.5087

CONCLUSION

From present study we have observed that among the maternal and neonatal parameters studied, sex of the baby, gestational age, obstetric score, birth asphyxia, ROP, pulmonary haemorrhage and presence of shock were found to be associated with increased mortality. However by logistic regression analysis it was observed that only factors like birth weight, duration of stay and presence of shock were significantly associated with poor outcome. Of these presence of shock was the single most important factor that predicted increased mortality.

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