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Study to Find Out the Risk Factors and Prevalence of Very Low Birth Weight and Extremely Low Birth Weight Babies in Terms of Mortality in Early Neonatal Period in Babies Admitted to a Tertiary Care Teaching Hospital in Eastern India

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Original Research Article

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Abstract: Preterm birth is one of the major clinical problems in neonatology as it is commonly associated with perinatal mortality, serious neonatal morbidity. To find out the risk factors and morbidities of very low birth weight and extremely low birth weight babies in terms of morbidity and mortality in early neonatal period in babies admitted to SNCU, Department of Paediatrics, M.K.C.G. Medical College, Hospital, Berhampur. One hundred six cases of very low birth weight and extremely low birth weight babies from birth to 7 days of life, admitted to SNCU, Department of Paediatrics, M.K.C.G. Medical College &Hospital, Berhampur were enrolled in this study. Details of risk factors and morbidities developed during the hospital stay were noted. High mortality was seen in babies with weight between 500-749 gm (87.5%) and lowest in babies with weight between 1250-1499 gm (25.80%). Mortality of babies was inversely related to gestational age with highest (80%) in babies with gestational age <28 weeks and lowest (28.57%) in babies with gestational age >32 weeks. Mortality of inborns was slightly lower (34.78%) than the outborns (43.33%). Respiratory distress syndrome (40.48%), perinatal asphyxia (21.43%) and sepsis (19.05%) were the common causes of death in babies with weight <1500 gm. Caesarean delivery, low APGAR score at 5 min., meconium stained amniotic fluid and ETT resuscitation at birth were the risk factors for death in very low birth weight as well as extremely low birth weight neonates. Mortality was higher in babies who developed respiratory distress syndrome, shock and perinatal asphyxia.

Keywords: Very low birth weight (VLBW), extremely low birth weight babies (ELBW), risk factors, morbidity, outcomes.

INTRODUCTION

Preterm birth is one of the major clinical problems in neonatology as it is commonly associated with perinatal mortality, serious neonatal morbidity and in some cases it leads to childhood disability. It is reported that 60% to 80% of all neonatal mortality and morbidity is due to preterm birth [1]. Duringthe last two decades the survival of premature infants has significantly increased due to advancement in perinatal and neonatal treatment expertise and improvement in the care of high risk mother. The survival rate of low birth weight infants is reported to have increased from 10% to 50-60% [2, 3].

Very low birth weight (VLBW) babies constitute approximately 4%-7% of all live births but need a major share of effort, time and resources for their care. Despite the efforts and attention by various organisations like NRHM, NIPI, the mortality in this sub-group is still high, contributing to as much as 30% of early neonatal deaths. Survival is directly associated with their birth weights and inversely related to the illness severity and gestation [4]. Babies weighing 1000 gm to 1500 gm have >90% survival rate whereas babies <1 Kg have ≤ 80% survival rate. VLBW and ELBW infants are always at increased risk for complications like developmental delay, mental retardation, visual problems, learning impairment, chronic lung disease and SIDS [5].

Due to poor socio-economic status, poor hygiene, illiteracy etc. the number of VLBW babies are much more. The people of south Odisha is mostly populated with poor tribal people with lack in

knowledge in care of newborns especially very low birth weight babies. There is a need to know the morbidity and mortality burden of these babies for planning and monitoring of the healthcare and to modify the management policies. To find out the risk factors and prevalence of very low birth weight and extremely low birth weight babies in terms of morbidity and mortality in early neonatal period in babies admitted to SNCU, Department of Paediatrics, M.K.C.G. Medical College, Hospital, and Berhampur.

MATERIALS & METHODS

One hundred six cases of very low birth weight and extremely low birth weight babies from birth to 7 days of life, admitted to SNCU, Department of Paediatrics, M.K.C.G. Medical College &Hospital, Berhampur were enrolled in this study as per the inclusion criteria. The study protocol was approved by Institutional Ethical Committee of` M.K.C.G. Medical College and Hospital and required informed consent were obtained in the informed consent form from parents/guardians of the babies. Data were collected in a pre-designed case record form.

Study design

A cross sectional, prospective, hospital based study

Study period: October 2011 to September 2013

Selection of study subject

Inclusion Criteria

- Birth Weight < 1500 gm.
- Age: 0 day to 7 days of life
- Hospitalised Cases
- With informed consent

Exclusion Criteria

- Birth weight ≥ 1500 gm

Data Collection

Data regarding mother's name, age, sex, anthropometry, parity was taken. Socioeconomic status of mother was taken in to account as per modified Kuppuswamy scale and classified under upper/middle/lower category. Antenatal history included were the LMP, EDD. Details of antenatal check up including the no. Of visits, no of TT taken, multivitamin (iron, folic acid) supplementation received was recorded. Complications of pregnancy during 1st, 2nd and 3rd trimester such as preeclampsia, gestational DM, antepartum haemorrhage, anemia, threatened abortion, and history of prolonged rupture of membrane were noted. History of foetal distress if present was taken. Whether mother has received two doses of antenatal steroid before 24 hours of delivery or not was reported. Details of time, place and mode of delivery were noted. Any significant history in past pregnancy including recurrent abortion, intrauterine foetal death was recorded.

Anthropometry of all very low birth weight and extremely low birth weight babies was taken which included were weight, length, head circumference and chest circumference. Digital pan type of weighing scale was used for measuring weight. Harpenden's infantometer was used for length measurement. Head and chest circumference were measured by measuring tape. Gestational age in weeks was calculated from modified Ballard's scoring and Dubowitz scoring. In new Ballard's scoring, 6 physical and 6 neuromuscular signs were evaluated. Total score ranged from -10 to 50 corresponded to 20 to 44 weeks of gestation respectively. Babies of birth weight below 10th centile of reference standard above 90th centile using Lubchenco intrauterine growth chart were termed as small for gestational age and large for gestational age respectively. Birth weight between 10th and 90th centile were taken as appropriate for gestational age. Details of neonatal resuscitation including APGAR score at 1 min, 5 min, presence of meconium stained amniotic fluid were noted. Examination of baby included was general examination, systemic examination and presence of any congenital anomalies. Routine clinical examination was done at regular interval to find out any significant abnormal findings during the hospital stay.

Laboratory investigations included were complete haemogram (Hb%, DC, TLC, TPC, CPS), sepsis screen (ANC, band cell count, CRP, micro ESR) serum bilirubin, blood culture and sensitivity, CSF studies, urine routine, microscopy and culture sensitivity, presence of occult blood in stool were done in selected babies as per the clinical scenario. Imaging studies like chest x ray, TF USG, ECG and Echocardiography were done in specific cases. Any abnormalities detected in laboratory investigations were recorded.

All deliveries of inborn babies were attended. Immediately following delivery all babies were evaluated and appropriate decision was taken and necessary resuscitation was adopted as and when required. Details of morbidities developed during the hospital stay were noted. RDS was defined as presence of respiratory distress within few hours of birth and classic radiological findings without any other associated respiratory or cardiac anomalies. Babies with absence of cry at 1 min and 5 min APGAR score ≤ 5 were taken under perinatal asphyxia. Intraventricular haemorrhage was confirmed by transcranial ultrasound. Shock was defined as CRT >3 seconds, tachycardia and cold, clammy extremities recordings associated with the presence of other clinical features. The categorical data were expressed as proportions and numerical data were expressed as mean ± SD by using descriptive statistics.

RESULTS

Total one hundred and six number of preterm babies of weight <1500 gms were selected cross-sectionally in the SNCU ward of MKCG medical college and hospital, Berhampur. Following observations are derived as noted down in the tables.

Table-1: Different ranges of birth weights and its mortality in newborns

Birth Weight (gm)	No. Of babies	Survived	Mortality	Mortality (%)
500-749	8	1	7	87.50
750-999	28	13	15	53.57
1000-1249	39	27	12	30.76
1250-1499	31	23	8	25.80

The above table shows the maximum number of mortality in the weight range of 500-749 gm. i.e. 87.5% as shown in table 1.

Table 2 shows the percentage of deaths in babies wt. < 1000 gms is 61.11% which is significantly higher than the no. of deaths in the babies with wt. between 1000-1499 gms which is 20.57%.

Table-2: Mortality in VLBW and ELBW neonates

Birth weight(gm)	Babies Expired		Babies Survived		Total		P Value
	No.	%	No.	%	No.	%	
<1000	22	61.11	14	38.89	36	100	P<0.001
1000-1499	20	20.57	50	79.43	70	100	*

** Highly significant

Table-3: Mortality of babies according to gestational age

Gestational period	Total No. Of babies	Survived	Mortality	
			No.	%
<28 Wks	10	2	8	80
28-30 Wks	36	17	19	52.77
31-32 Wks	42	31	11	35.48
>32 Wks	18	14	4	28.57
Total	106	64	42	100

The above table illustrates that the maximum percentage of death is in babies born to < 28 weeks of gestation. i. e. 80% and the mortality are least in babies of > 32 weeks of gestation. i.e. 28.57%.

Table-4: Distribution of babies in relation to gestational age and birth weight

Birth weight (g)	Gestational Age (weeks)												Total	Survival No. (%)
	24-25		26-27		28-29		30-31		32-33		34-35			
	T	S	T	S	T	S	T	S	T	S	T	S		
601-700	6	0	1	0	-	-	-	-	-	-	-	-	7	0(0.0)
701-800	-	-	2	2	1	0							3	2(66.67)
801-900	-	-	1	0	4	2	1	1	-	-	-	-	6	3(50.0)
901-1000	-	-	-	-	10	5	10	4	-	-	-	-	20	9(45.0)
1001-1100	-	-	-	-	4	2	8	3	3	3	-	-	15	8(53.33)
1101-1200	-	-	-	-	1	0	13	11	5	4	-	-	19	15(78.94)
1201-1300	-	-	-	-	-	-	5	4	7	4	1	0	13	8(61.54)
1301-1400	-	-	-	-	-	-	-	-	11	8	-	-	11	8(72.73)
1401-1499	-	-	-	-	-	-	-	-	8	8	4	3	12	11(91.67)
TOTAL	6		4		20		37		34		5		106	64(60.38)

T: Total; S: Survived

Table-5: Mortality babies with weight<1500 gm in inborns and outborns

No. of babies	Total	Expired	Mortality (%)
Inborns	46	16	34.78
Outborns	60	26	43.33
Total	106	42	39.62

The above table 4 shows that in lower gestational age and lower weight group, the survival of the babies is less as compared to higher survival in higher gestational age and weight.

The above table 5 shows the number of deaths in inborn babies is 34.78% and in outborns is 43.33%.

Table-6: Effect of socioeconomic status on mortality of VLBW and ELBW neonates

Socio-Economic Status	No. of Deaths	No. of Survived	Total	P Value
Upper	2(33.33%)	4(66.67%)	6	ns
Middle	10(33.33%)	20(66.66%)	30	
Lower	30(42.85%)	40(57.15%)	70	

Ns: Non Significant

The above table 6 illustrates that more no. of cases are seen in low socioeconomic group but there is not much difference in mortality and morbidity pattern.

The above table 7 shows that parity of mother doesn't significantly differ between the expired and survived babies.

Table-7: Comparison of parity between survived and expired groups

Parity Of Mother	Expired (n= 42)	Survived (n= 64)	'p' Value
Primipara	22(52.38%)	31(48.44%)	ns
Multipara	20(47.62%)	33(51.56%)	
Total	42(100%)	64(100%)	

ns =non-significant

Table-8: Sex of VLBW and ELBW neonates affecting mortality

Sex	Survival	Mortality	Total (%)	P value
Male	29	20	49 (46.22%)	ns
Female	35	22	57 (53.88%)	
Total	64	42	106 (100%)	

ns= non-significant

The above table 8 illustrates that there is no significant difference between male and female in the expired and survived group of very low birth weight and extremely low birth weight neonates.

Table-9: Maternal age affecting mortality of VLBW and ELBW neonates

Maternal age (Yrs.)	Expired No.(%) (n=42)	Survived No.(%) (n=64)	'p' Value
18-35	31(73.80%)	54(84.37%)	P<0.05*
<18	4(9.52%)	8(12.5%)	
>35	7(16.66%)	2(3.12%)	
total	42(100%)	64(100%)	

*significant

The above table 9 shows that maternal age >35 yrs was significantly associated with the mortality of the very low birth weight and extremely low birth weight neonates i.e.16.66% (n=7) as compared to 3.12% (n=2) in the survived group.

Table-10: Comparison of maternal variables between survived and expired groups

Maternal & Foetal Variable	Deaths (n= 42)	Survived (n= 64)	'p' value
Antepartum			
Heart Disease	2 (4.76%)	2(3.12%)	ns
PIH	5(11.9%)	5(7.81%)	ns
DM	1(2.38%)	0(0%)	ns
APH	7(16.66%)	2(3.12%)	P<0.05
ANEMIA	14(33.33%)	7(10.94%)	P<0.001
Bad Obstetric History	4(9.52%)	1(1.56%)	ns
History Of PROM	11(26.91%)	6(9.38%)	P<0.05

P<0.05 ⇒ statistically significant; P<0.001 ⇒highly significant; ns ⇒ not significant

The above table 10 shows that the significant no. of deaths in antepartum hemorrhage, maternal anemia and h/o PROM in the VLBW and ELBW weight group i.e. 16.66% (n=7), 33.33% (n=14), and 26.99% (n=11) respectively.

Table-11: Comparison of perinatal variables between survived and expired groups

Perinatal variable	Expired (n= 42)	Survived (n= 64)	'p' value
Antepartum			
Foetal distress	2(4.76%)	7(10.93%)	ns
Intrapartum			
Obstructed labour	3(7.14%)	1(1.56%)	ns
Antenatal steroid	8(19.04%)	28(43.75%)	P<0.05

P<0.05=significant

The above table 11 shows more survivors in patients received antenatal steroids 43.75% (n=28) but other parameters like foetal distress and obstructed labour don't show any significant difference.

Table-12: Comparison of perinatal variables between survived and expired groups

Neonatal Variable	Expired (n= 42)	Survived (n= 64)	'p' value
Mode of delivery			
VD	22(52.38%)	37(57.81%)	ns
LSCS	27(64.28%)	20(31.25%)	<0.001
APGAR 1 MIN	5.095 ± 2.448	5.656 ± 2.412	ns
APGAR 5 MIN	6.689±2.032	7.844 ± 1.819	P<0.05
Maturity			
AGA	32(76.19)%	51(79.86%)	ns
SGA	10(23.80%)	13(20.31%)	ns
Post-Partum			
MSAF	7(16.80%)	5(7.81%)	P<0.05
ETT RES	11(26.19%)	5(7.81%)	P<0.05

Data expressed either in mean ± SD [range] or number (%).P<0.05 ⇒ statistically significant; P<0.001 ⇒highly significant; ns ⇒ not significant

The above table 12 shows high expiry rate in LSCS i.e. 64.28% (n=27) than vaginal delivery 52.38% (n=22).shown in fig. 12. APGAR score at 5 min. is lower i.e. 6.689± 2.032(n=42) than survivor 7.844±1.819. In maturity, there was no significant difference in mortality and survival in SGA and AGA. Both in MSAF and ETT resuscitation groups has shown higher death rate than survival (p<0.05).

Table-13: Outcome of VLBW and ELBW babies in neonatal period

Outcome	Weight in Gm.		
	<1000	1000-1499	Total
Death	22(61.11%)	20(28.57%)	42((39.62%)
Sequeale	2(5.55%)	6(8.57%)	8(7.54%)
Cured and Discharged	12(33.33%)	44(62.85%)	56(52.83%)

The above table 13 shows more no. of cured and discharge in weight between 1000-1499 gm group i.e. 62.85% (n=44) than 33.33% (n=12) in babies with weight < 1000 gm group. Similarly more no. of deaths in ELBW babies i.e. 61.11% (n=22) than VLBW babies i.e. 28.57% (n=20) respectively.

DISCUSSION

Survival of very low birth weight babies is 79.43% as compare to 38.89% in extremely low birth weight babies. A study at AIIMS from 2001 to 2005 found 84.25% survival in very low birth weight babies and 69.2% in extremely low birth weight babies [6]. A study at PGIMER from 2009-2011 found 48% mortality in extremely low birth weight babies [7]. The variations in mortality in our set up are due to lack of infrastructure and sophisticated instruments. The mortality of very low birth weight babies is much lower than extremely low birth weight babies as observed in other studies.

Babies with < 28 weeks of gestation had 80% mortality, 28-30 weeks had 52.77% mortality, 30-32 weeks had 35.48 mortality and babies with > 32 weeks of gestation had 28.57% mortality. Data from NICHD neonatal research network in 2003- 2007 found 6%

survival at 22 weeks of gestation to 92% at 28 weeks of gestation [8]. EPIPAGE study on preterm infants born between 22 to 32 weeks in France in 1997 found survival rate 31% in infants born at 24 weeks to discharge, 78% at 28 weeks, and 97% at 32 weeks [8]. In another study mortality of baby's ≤28 week's gestation was 50% as compared to 11% in babies born with 32- 34 weeks of gestation [1]. Our study correlates well other studies in increased survival with advanced gestational age. However the percentage of survival of babies in our study is lower probably due to absence of well equipped intensive care units to handle sick infants.

The mortality in inborn babies was 34.78% and in outborn babies was 43.33%. Mortality in outborns was relatively higher than in inborn. A study of infants with birth weight ≤ 1000 gm in Israel found no significant difference in mortality in inborn and outborns[9]. NEOPAIN trial by Palmer *et al*. found no significant differences in morbidity and mortality of inborn and outborn ventilated preterm infants (23-32 weeks)[10]. Many studies found higher survival rates and improved outcome of preterm and VLBW infants born in tertiary perinatal centers (inborn) than of ouborn infants who were delivered in primary and secondary care facilities and later transferred to intensive care units [11-13]. The most likely explanation of little difference in mortality in inborn and outborn in our hospital is due to absence of intensive care settings.

There was no difference in mortality in babies in upper, middle and lower socioeconomic classes of families in our study. In another study, mortality was found to be higher in lower socioeconomic classes [8]. Less number of babies were from upper socioeconomic classes and therefore the morbidities were less also in that group. This could be the likely explanation for no effect of socioeconomic status on mortality.

There was no sex predilection in the expired and survived group of babies. Similar findings were observed in one study [7]. Gender differences favouring girls with improved survival was seen in some studies [14]. This is in contrast to one study which showed better survival in boys [15]. Variable findings of relation of gender with survival are most likely due to variation in male: female ratio in different regions along with differences in approach to the health care of the babies.

Maternal age > 35 yrs was significantly associated with mortality in babies. It was associated in 16.66% in the expired group as compared to 3.12% in the survival group of babies. Similar observations were noted in one study [8]. In the present study maternal age < 18 yrs was not related to mortality. The possible reason for it was the less no. of babies were born from mother with age <18 yrs. There were no differences in mortality in babies with primiparous and multiparous woman in the expired and survived groups. Similar findings were observed in another study [16].

Maternal anemia was found 33.33% in the death group as compared to 10.94% in the survived group of babies. Association of anemia with death was observed in one study [17]. Another study finds no difference in the expired group and survived group of neonates [16]. The likely explanation of some studies with no effect of anemia with mortality is inclusion of mild anemia which posed no differences in mortality. Presence of antepartum haemorrhage was found 16.66% in the expired group as compared to 3.12% in the survival group of babies which was significant. Similar observations were reported in another study [16].

History of prolonged rupture of membrane was present in 26.91%of expired babies which was significantly higher than 9.38% in the survived neonates. Presence of PROM as a risk factor for mortality was previously reported in many studies [12]. Presence of pregnancy induced hypertension, bad obstetric history were significantly associated with mortality in one study [13]. In the present study, presence of heart disease, pregnancy induced hypertension, diabetes mellitus; bad obstetric history of mother had no impact on survival of babies. This is most likely due to less number of mothers with these complications were present in the study group.

Babies who received antenatal steroid completed doses 24 hours prior to delivery had 43.75% association with survival as compared to 19.04% in the expired group which is statistically significant. These findings were similar to other studies [12, 16]. Babies who received antenatal steroid had less chances of developing respiratory distress syndrome and death due to it.

Presence of foetal distress was found in 4.76% of expired babies and 10.93% in survived babies which was non-significant. In contrast presence of foetal distress was a significant risk factor for death in another study [16]. In the present study, early intervention by emergent caesarean section, better care in the delivery room and postnatal ward could be the possible reason for fewer deaths in babies with foetal distress. Obstructed labour was found to be 7.14% in the mortality group and 1.56% in survived group of very low birth weight and extremely low birth weight babies which was not significant. The no. of babies with history of obstructed labour was low in the present study. This could account for no significance in outcomes of babies in the neonatal period.

Caesarean delivery was associated negatively with the survival of babies. 64.28% of babies in the expired group were delivered through LSCS where as 31.25% of survived babies were delivered through

LSCS. LSCS had highest odds for mortality. It was also reported in a study [12]. Maternal and foetal risk factors necessitating emergency caesarean section could explain this unexpected finding. Mean APGAR score at 5 min. was 7.844±1.819 which was significantly higher in the survived group than 6.689±2.032 in the expired group. Low APGAR score at 1 min. had no significance on increased risk of death. Similar findings were suggested by different studies [8,12,16]. Survival of babies was not altered in small for gestational age and appropriates for gestational age neonates. In contrast to this other studies find lower mortality in small for gestational ages babies [7,16]. The possible explanation for similarities in survival and deaths in SGA and AGA babies is most likely due to less number of babies in the study population.

Presence of meconium stained amniotic fluid increased the risk of death by 16.80% as compared to 7.81% in the survived group of neonates. This is in agreement with other studies [18]. Babies those required ETT resuscitation at birth had higher mortality i.e. 26.19%. Several other studies reported similar results [7, 8]. Babies developing perinatal asphyxia at birth were more likely to die could be the possible explanation for it.

CONCLUSION

High mortality was seen in babies with weight between 500-749 gm (87.5%) and lowest in babies with weight between 1250-1499 gm (25.80%). Mortality of babies was inversely related to gestational age with highest (80%) in babies with gestational age <28 weeks and lowest (28.57%) in babies with gestational age >32 weeks. Mortality of inborns was slightly lower (34.78%) than the outborns (43.33%). Sex of the baby had no impact on the survival of the babies. Maternal age > 35 yrs, antepartum haemorrhage, anemia in mother, and prolonged rupture of membrane were significant risk factors for mortality of very low birth weight and extremely low birth weight neonates.

Caesarean delivery, low APGAR score at 5 min., meconium stained amniotic fluid and ETT resuscitation at birth were the risk factors for death in very low birth weight as well as extremely low birth weight neonates.

Extremely low birth weight babies have shown high mortality and morbidity compared to very low birth weight babies and its related death multiply when associated with complications like Hyaline Membrane disease, Hypoxicischemic encephalopathy, sepsis and meconium aspiration syndrome. This also concludes that the out born mortality is higher than inborn babies. Death rate and the complications of very low birth weight and extremely low birth weight babies can be reduced by improving the standards of existing management system of newborn care. Further researches are also to be carried out to bridge up the gaps and to find out the preventable factors which will help to decrease the preterm mortality.

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