

Preterm Very Low-Birth Weight Babies: Outcome of Admitted Newborns at A Community-Level Medical College Hospital in Bangladesh

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Summary:

Very low birth weight (VLBW) premature infants are at increased risk of morbidity and mortality, mainly due to infections and complications of prematurity. The present article is a descriptive analysis of the most common reasons for hospital admission of VLBW infants, morbidity during hospital stay, and their immediate outcome at a community level medical college hospital in Bangladesh. Sixty VLBW neonates (< 1,500 grams weight), 37 males and 23 females, < 72 hours of age were enrolled prospectively from March 2005 to February 2007; 4 babies were excluded. Thirty-four babies were hospital born and 26 home delivered cases admitted postnatally. The mean birth weight and gestational age of the newborns were 1270 ± 169 grams and 30.9 ± 2.9 weeks respectively. Forty-one of 60 cases (68.3%) mothers received at least one antenatal care visit. Common clinical

presentations were prematurity alone (36.7%) and its complications like delayed crying (25.0%), feeding problem (23.3%), lethargy (16.7%), hypothermia (10.0%) and respiratory problem (8.3%). The commonest morbidity during hospital stay was neonatal hyperbilirubinemia requiring phototherapy (26.7%), apnoea of prematurity (15.0%), and septicaemia (11.7%). The overall survival rate was 56.7%; most of the deceased cases were those < 1250 grams (15/28, 53.6%) and < 30 weeks of gestation (17/30, 56.7%). No infant with a birth weight < 850 grams or a gestational age < 28 weeks survived. The most common cause of death was birth asphyxia (38.5%), followed by extreme prematurity (26.9%), and septicaemia (19.2%). Very low birth weight infants had relatively higher survival rates probably due to low infection rate.

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Introduction:

Over the past 40 years, although under-five and infant mortality declined in developing countries, neonatal mortality rates remain static. Approximately 3.9 of the 10.8 million annual deaths in under-fives are neonatal, mostly in rural areas, 50 – 70% during the first week of life.^{1,2} Like any other part of the

developing world, in Bangladesh also there has been a substantial reduction in under-five and infant mortality. Under-five mortality has been reduced from 248 per 1000 live births in 1960 to 69 per 1000 live births in 2005, and infant mortality from 149 per 1000 live births in 1960 to 46 per 1000 live births in 2005.³ Major declines in infant mortality, however, has occurred in post-neonatal period, i.e., after the first 28 days of life.⁴ In Bangladesh neonatal mortality accounts for about two-thirds of infant deaths and about half of deaths among children aged under 5 years. The Bangladesh Demographic and Health Surveys (BDHS) indicate that the neonatal mortality rate (the number of deaths of children under 28 days of age, per 1,000 live births) declined in the early 1990s, but remained at 41 – 42 between 1995 – 1999 and 1999 – 2003.⁵⁻⁷ Reducing neonatal mortality in Bangladesh will be necessary for achievement of the targets for child mortality reduction under the United Nations Millennium Development Goals.⁸

The direct causes of neonatal deaths in high mortality countries are preterm births (27%), sepsis (26%), perinatal asphyxia (23%), tetanus (7%) and diarrhoea

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(3%).⁹ Very low birth weight (VLBW) is defined as a birth weight of less than 1500 grams and is an important determinant of neonatal morbidity and mortality.^{10,11} Its prevalence is directly correlated with the developmental state of a country and it is associated with poverty. Bangladesh is a developing country and an estimated 20% of babies are born prematurely and 30% have low birth weight (LBW).¹² In order to sustain gains in child survival and achieve Millennium Development Goals, extra efforts should be given to reduce the neonatal deaths which is 10 – 15-fold higher than the risk during the post-neonatal period of infancy (2 – 12 months) and approximately 30-fold greater than during young childhood (13 – 60 months). Despite constituting a small portion of LBW newborns, VLBW infants demand high technology health care delivery and consume a great amount of resources. Although outcomes of VLBW infants have been reported extensively from industrialized countries, less is known about the outcome of such infants in the developing world.¹³⁻¹⁶

The purpose of this study was to report on the morbidity and mortality associated with VLBW infants cared for at a community level medical college hospital in Bangladesh.

Materials and methods:

Study site: This hospital based prospective study was conducted in the neonatal ward of Kumudini Hospital in a cohort of preterm neonates admitted between March 2005 and February 2007. Kumudini Hospital is a 70 years old, 750-bedded non-profit private hospital, with laboratory and radiology facilities in Mirzapur, a rural sub-district (Thana) of Bangladesh, located 60 km north of Dhaka. Mirzapur has an estimated total population of 400,000, distributed in 13 unions and 219 villages. The hospital is staffed by specialists of all disciplines. A medical college, Kumudini Women's Medical College, is affiliated to the hospital. As the major referral hospital, Kumudini Hospital serves most patients throughout the Mirzapur sub-district.

Study Population: Newborn infants weighing < 1500 grams and \leq 72 hours old and whose parent or guardian provided informed consent were eligible for enrolment. The data evaluated in this analysis

comprised 60 admissions weighing between 800 and < 1500 grams, born in hospital as well as home delivered babies admitted postnatally. Weight was taken on admission using a baby scale and gestational age was determined on the basis of maternal dates (time from the first day of the last menstrual period) and further confirmed by Ballard scoring system.¹⁷ Weight < 1500 grams were considered as VLBW and gestational age of < 37 weeks were categorized as preterm. We excluded babies in moribund condition and those who had a major congenital anomaly. *Reuse:* Four Very Low-Birth Weight babies admitted during the study period could not be enrolled; two of them with severe perinatal asphyxia (home delivered), one with extremely low birth weight (600g) and one with major surgical problem (omphalocele major). The first 3 babies died within 24 hours of admission and the baby with omphalocele was referred to Dhaka Shishu Hospital after resuscitation. Due to difficulty in obtaining thorough history and consent, proper physical examination including assessment of gestational age, and adequate laboratory investigations, these babies were excluded. Including the first three babies, the outcome does not have significant impact; we do not know the outcome of the fourth baby.

Patient management: The enrolled newborns were resuscitated on admission and cared in incubator in most cases. Due to lack of incubator more than one baby, up to three, were cared in a single incubator. Babies were initially given intravenous fluids, followed by gavage feeding, feeding with cup and spoon and finally breast feeding. Antibiotic was usually prescribed on admission even in the presence of minimum suspicion of infection. Ampicillin and gentamicin was the most common first line of antibiotic of choice, followed by a third generation cephalosporin (usually cefotaxime) with or without gentamicin, depending on patient's condition. Other supportive therapy such as correction of acidosis, maintenance of fluid and electrolyte balance, phototherapy and blood transfusion was given as required. Laboratory investigations were done depending on clinical judgment. Acidosis was corrected empirically.

Data collection: The parents of the neonates were explained about the study and then witnessed verbal

consent was taken. The detail history was taken about history of the pregnancy, delivery and immediate postnatal period for each subject by interviewing the parents and thorough clinical examination was conducted by one of the investigators and findings were recorded in a structured questionnaire.

Statistical analysis: The data were subjected to statistical analysis according to standard procedure. SPSS version 12.0 for Windows (SPSS Inc, Chicago, IL, USA) software was used for data recording and analysis. Results of the findings were verified by doing standard test for significance like unpaired student "t" test and chi-square (χ^2) tests, as appropriate. A p-value of < 0.05 was considered as statistically significant.

Results:

During the study period, a total of 60 VLBW babies fulfilled the enrolment criteria, of which 37 were males and 23 females; male female ratio of 1.6: 1. Four VLBW babies admitted during the study period could not be enrolled due to moribund condition, two with severe perinatal asphyxia, one with extremely low birth weight (600g), and one with major surgical problem (omphalocele major). The first 3 babies died within 24 hours of admission and the baby with omphalocele was referred to Dhaka Shishu Hospital after resuscitation. The mean birth weight of enrolled neonates was 1270 ± 169 grams (range 800 – 1475 grams) and mean gestational age 30.9 ± 2.9 weeks (range 27 – 36 weeks). Forty-seven percent of the infants were less than 1250 g and 50% were below 30 weeks of gestation. Figures 1a and 1b show the distribution of all infants admitted by birth weight and gestational age respectively. Fifty-two babies (86.7%) were of appropriate for gestational age and 8 babies (13.3%) had intra-uterine growth

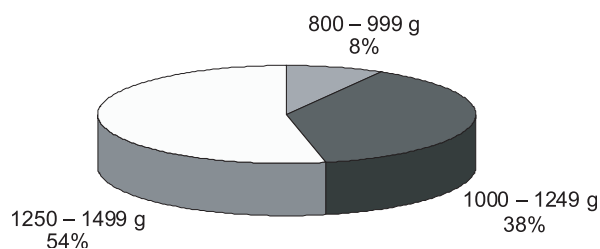


Fig.-1a: Distribution of All Infants Admitted by Birth Weight.

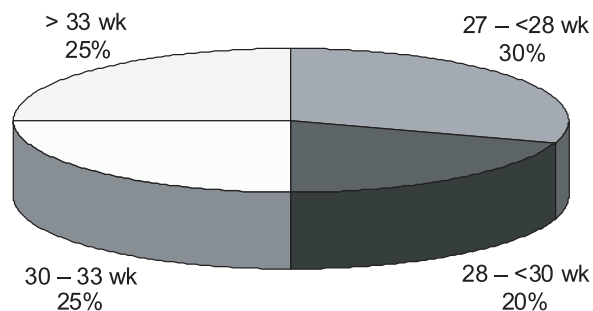


Fig.-1b: Distribution of All Infants Admitted by Gestational Age.

retardation (IUGR). Eight babies (8/60, 13.3%) were of IUGR. Survival of IUGR babies were 62.5% (5/8), slightly higher than the overall survival (56.7%), but the difference is not significant statistically. Twenty-six (43.3%) babies were delivered at home and 34 (56.7%) at Kumudini Hospital. Among the home delivered cases, 20 babies were delivered by traditional birth attendants, three by nurses and three by the relatives. Forty-two percent (25/60) of the babies were born to primigravida mother. Ten babies were given prelacteal feeding, especially those born at home, and sugar water was given in most cases (7/10), formula milk in two and honey in one. (Table I)

Forty-one of 60 cases (68.3%) mothers received antenatal care visit, ranging from one to five (mean 2.0 ± 1.5). Four mothers had ante-partum haemorrhage, three had toxemia of pregnancy and one had laboratory confirmed urinary tract infection. Thirteen mothers had prolonged rupture of membranes, eight mothers had fever during delivery and prolonged labour was present in two cases. (Table I)

Prematurity alone was the most common reason for admission (22/60, 36.7%). Other reasons for admission, in addition to prematurity, were delayed crying (15/60, 25%), feeding problem (14/60, 23.3%), lethargy (10, 16.7%), hypothermia (6/60, 10%) and respiratory problem (5/60, 8.3%). (Table II) Most babies (55/60, 91.7%) were cared at incubator, 39 babies (65%) required oxygen, 16 babies (26.7%) were given phototherapy and 8 (13.3%) were given blood transfusion. Twenty-seven percent (7/26) of home-born babies suffered from birth asphyxia, which is more compared to 23.5% (8/34) in hospital-

Table-I*Perinatal Information and Patient Profile (n=60).*

Characteristics		Number of infants	Percentage
Infants			
Birth weight (grams)			
	800 – 999	5	8.3
	1000 – 1249	23	38.3
	1250 – < 1500	32	53.3
Gestational age (weeks)			
	27 – <28	18	30.0
	28 – <30	12	20.0
	30 – 33	15	25.0
	> 33	15	25.0
Gender			
	Male	37	61.7
	Female	23	38.3
Mothers			
Place of delivery			
	Home	26	43.3
	Hospital	34	56.7
Mode of delivery			
	Normal	56	93.3
	Caesarean	4	6.7
Primiparous	25	41.7	
Previous neonatal deaths	9	15.0	
Antenatal care	41	68.3	
Maternal illness during pregnancy			
	Eclampsia	3	5.0
	UTI	1	1.7
Maternal fever during labour	8	13.3	
Prolonged labour	11	18.3	
Prolonged rupture of membranes	13	21.7	

Table-II*Clinical Profile of Enrolled VLBW Neonates (n=60).*

Characteristics	Number of infants	Percentage
Prematurity	22	36.7
Birth asphyxia	15	25.0
Feeding problem	14	23.3
Less movement	10	16.7
Hypothermia	6	10.0
Respiratory problem	5	8.3
Jaundice	2	3.3
Convulsion	2	3.3
Fever	1	1.7
Recurrent apnoea	1	1.7

born babies, though the difference is not significant statistically ($p>0.05$). One-third (20/60) of the babies were not given any antibiotic during their hospital stay. Among those who received antibiotics, the first line of choice was ampicillin plus gentamicin in 21 cases, cefotaxime in 18 cases and ciprofloxacin in one case. The morbidity during hospital stay was neonatal hyperbilirubinemia requiring phototherapy in 16 cases (26.7%), apnoea of prematurity in 9 cases (15.0%), and suspected septicaemia in 7 cases (11.7%), of which in one case *Klebsiella pneumoniae* was isolated from blood.

Overall, 56.7% (34/60) of patients enrolled in the study survived until discharge and about three-fourths (19/26) of the deaths took place within 24 – 72 hours of admission. Mortality was higher in males (17/37,

46%) as compared to females (9/23, 39%), the difference is not statistically significant ($p>0.05$). The highest mortality was seen in babies weighing less than 1250 grams (15/28, 53.8%) and those below 28 weeks of gestation (11/18, 61%). This study revealed that an increase in the birth weight of preterm neonates leads to a significant simultaneous decline in mortality rates ($p<0.05$). Mortality rates for VLBW infants by birth weight and gestational age are shown in Figures 2a and 2b.

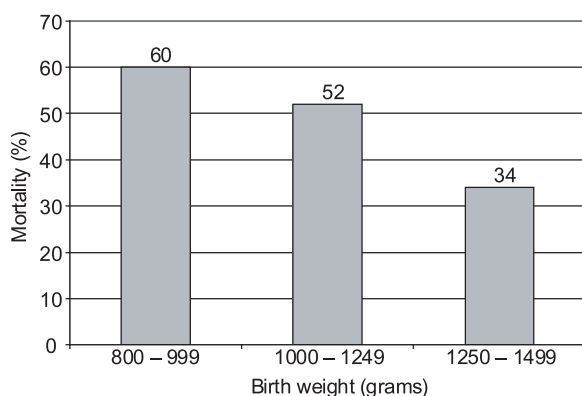


Fig.-2a: Mortality Rates for VLBW Infants by Birth Weight.

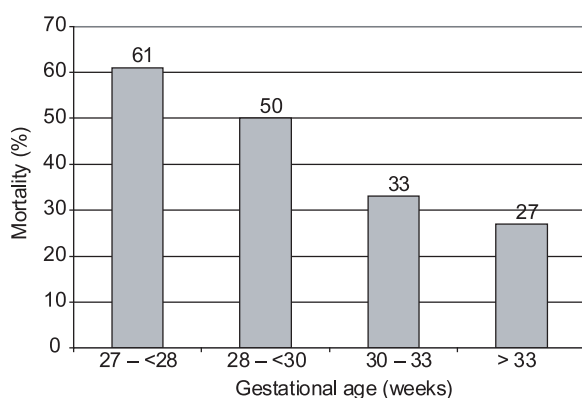


Fig.-2b: Mortality Rates for VLBW Infants by Gestational Age.

Thirty-two percent (19/60) mothers did not receive antenatal care and babies born to them had unfavourable outcome (mortality 9/19, 47.4%) as compared to those who received antenatal care (17/41, 41.5%), though the difference is not statistically significant ($p>0.05$). Forty-two percent (11/26) of home-born babies died compared to 44%

(15/34) in hospital-born babies, again the difference is not significant statistically.

The mean duration of hospital stay was 6.0 ± 5.9 days (range 2 to 41 days). Birth asphyxia (10/26, 38.5%), extreme prematurity (9/26, 34.6%), and septicemia (5/26, 19.2%) were the main contributors to mortality (with multiple causes in some).

Discussion:

This prospective, observational study provides evidence, from a community level hospital in Bangladesh, of differential neonatal morbidity and mortality of the VLBW babies from March 2005 to February 2007. With respect to birth weight specific distribution of VLBW infants, our unit cares for less extremely low birth weights (ELBW) compared to the infants reported from the developed countries.¹⁸ Infants who are small or are born earlier have increased morbidity and mortality, and the more extremely small or early they are, the higher the risk.¹⁹ According to birth weight and gestational age, survival increases at or above 1250 grams and 28 weeks. Survival rates of neonates below these figures decline noticeably. The present study also shows the similar picture, there was a gradual decline in mortality with increasing birth weight. During the study period, overall 56.7% of VLBW infants survived to discharge; among them 40% of infants weighing < 1000 grams, 48% weighing 1000 – 1249 grams, and 66% of infants weighing 1250 – < 1500 grams. Similarly an increase in the gestational age of preterm neonates leads to a rapid decline in mortality rate. Twenty-seven percent among the enrolled infants of gestational age above 33 weeks died, compared to 33% among gestational age 30 – 33 weeks, and 65% of infants below 30 weeks. Almost 58% of the infants who died were below 1250 grams birth weight and 65.4% were below 30 weeks of gestation. Lowest gestational age of survival was 27 weeks and lowest weight of 850 grams. So measures to prevent preterm births are important in reducing neonatal mortality. A strong effort and improvement of care at and after birth must also be made for these smallest infants.

The survival rate in present study is comparable to other similar studies, though there are few reports of ~70% survival.^{20,21} Gestational age and birth weights

in survivors was higher as compared to non-survivors while the overall values of these variables were similar to an earlier study.²² The increase in survival from 35% at 27 – 29.9 weeks to 67% at 30 – 33 weeks, and 73% at > 33 weeks is reflective of the fact that those with higher gestational age had more mature organs and were better equipped to withstand the transition from intrauterine to extrauterine life. These findings are in conformity to work previously reported.²³

Gender difference in present study favoured females; mortality was higher in males (46%) as compared to females (39%). This finding is in conformity to another study, which also had reported improved survival in girls as compared to boys.²⁴ Those born to mothers with inadequate antenatal care had a higher mortality, though not statistically significant. There was slightly increased mortality of home-born compared to hospital-born babies (44% vs. 42%), this is due to the fact that mothers having perinatal risk factors were delivered at hospital and in some cases they were brought to hospital when failed to deliver at home.

Unfortunately still now an important cause of neonatal morbidity as well as mortality in our country is perinatal asphyxia. Home delivery by untrained birth attendants is the main reason for perinatal asphyxia, where more than 90% of all births occur.^{25,26} Though in present study 56.7% of the deliveries were conducted at Kumudini Hospital, many cases attended late or when home trial failed. One-fourth of enrolled neonates suffered from significant asphyxia and was an important cause of mortality. Encouraging institutional delivery and training of traditional birth attendants in identification of high-risk deliveries, safe delivery practice and neonatal resuscitation can do much improvement. Care of preterm babies especially prevention of hypothermia, hypoglycaemia, infection, and early referral for facility care are also important.

The most important reason of mortality in VLBW infants is infections. Immature host defence mechanisms and invasive life support systems make the premature neonate particularly susceptible to overwhelming infection. Unpublished data from Kumudini Hospital shows that infections, particularly

nosocomial infections, are relatively less in the paediatric department, still seven neonates were diagnosed as septicaemia and a high mortality (5/7, 71.4%) among those. Several other studies has also reported similar findings of excess mortality among VLBW infants associated with septicaemia^{27,28}

We could not enrol four babies due to moribund condition and major surgical problem. But including the first three babies also, the outcome does not have significant impact; we do not know the outcome of the fourth baby (omphalocele major). The IUGR babies have not been shown separately. Survival among 8 IUGR babies was 62.5%, slightly higher than the overall survival (56.7%) but not significant statistically.

Conclusion:

Even in the absence of advance life saving interventions for care of these vulnerable newborns, a better outcome is found because of overall cleanliness, strict control of visitors thus reducing nosocomial infection & rational use of antibiotic preventing emergence of antibiotic resistance & very close nursing care for these tiny babies.

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