

Clinico-epidemiological study of low birth weight newborns in the Eastern part of Nepal

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ABSTRACT

Low birth weight (LBW) remains an important cause of newborn morbidity and mortality. A hospital based prospective and descriptive study was conducted at Paediatric wards, Nursery, Neonatal intensive unit (NICU) and Post natal ward during period of June to October 2010 to note the clinico-epidemiological profile of Low Birth Weight (LBW) newborns. Incidence of the LBW babies in our hospital was 14.45%; more than four fifth (82.2%) baby's mothers were primigravida. Eighty two percent mothers had unbooked pregnancies. Twenty and half percent LBW babies were twins. The mean duration of hospital stay of the subject was 7.4 (± 5.5) days. The mean birth weight of LBW babies was 1648 (± 344) grams. Clinical sepsis, non physiological jaundice and hypoglycaemia were the three most common complications of LBW babies. Antibiotics, oxygen and phototherapy were the three commonest modes of therapy. Majority of children (82.0%) improved and were discharged. Birth weight and gestational age were significantly different between survivors and babies who expired. Primigravida and lesser antenatal visits were important risk factors for Low birth weight babies. Birth weight, gestational age, apnoea and mechanical ventilation were the predictors of outcome.

Keywords: Newborn, Pre-term, LBW.

INTRODUCTION

Low birth weight (LBW) has been defined by the World Health Organization (WHO) as weight at birth of less than 2500 grams (5.5 pounds).¹ This practical cut off for international comparison is based on epidemiological observations that infants weighing less than 2500 grams are approximately 20 times more likely to die than heavier babies.² More commonly in developing countries, a birth weight below 2500 grams contributes to a range of poor health outcome.³ A low birth weight is either the result of preterm birth (before 37 weeks of gestation) or of restricted fetal (intrauterine) growth.³ LBW is closely associated with fetal and neonatal mortality and morbidity, inhibited growth and cognitive development, and chronic disease later in life.

Worldwide about 16.0% of the live births or some 20 million infants per year are low birth weight.⁴ Incidence of LBW in developed countries is less than 10%, whereas in developing countries it is in the range of 15-30% of total birth.⁵ Though low birth weight is a common problem in developing countries, exact data of low birth weight in Nepal is not available. Over 90% of the LBW babies are born in developing countries with the highest incidence in Asia (19.7%), [almost 3 times that of Europe (6.5%) or USA (7.0%)].⁶ There are various fetal and maternal conditions related to delivery of premature and LBW babies. These are

diseases of mother, placental problem like placenta previa and ante-partum haemorrhage, maternal infection, multiple pregnancies, uncontrolled diabetes, congenital malformations, cardiac disease, fetal hypoxia, fetal distress and severe intrauterine growth retardation.⁷ LBW is a great problem in a developing country like ours.

MATERIALS AND METHODS

This was a prospective, descriptive study. Study period was of six months duration. Based on the data 2008 from medical record section, the low birth weight (LBW) babies admitted to BPKIHS were 350.

All newborn babies weighing less than 2500 grams at birth and admitted to BPKIHS in paediatric wards, NICU, nursery and postnatal ward were enrolled in study after a verbal consent from the parent. Details of perinatal characteristics, epidemiological parameters, clinical parameters, and outcome recorded in the proforma. Data were entered and screened for error in MS Excel. The analysis was done using SPSS 14.0 version statistical software.

RESULTS

Total live inborn (deliveries at BPKIHS) from 01/06/2010 to 30/10/2010 were 2587, among them 374 were low birth weight babies, so prevalence of

LBW at this period were 14.45%. Some cases of LBW babies admitted in this hospital got referral from other health facilities and community level (outborn). The incidence of LBW babies in all cases (inborn and outborn) was 19.1%. Out of these LBW 58.9% were from primigravida mothers and 17.2% were from mothers below 20 years. Due to early discharge from postnatal ward among 374 LBW babies only 268 LBW were included in our study. Majority (82.5%) babies mother were not on follow up in this hospital, mothers of 40.6% babies, mother had history of leaking and 32.5% had history of leaking per vagina more than 12 hours duration. There were total 141 mothers given birth to total 268 LBW babies admitted in department of pediatrics. Among them 86 were outborn where as 182 were inborn LBW babies. Among total admission in department of paediatrics, 77 (20.6 %) were twins and 9 (2.4%) were triplets.

Among 268 LBW babies, 3 (1.1%), 69 (25.7%), and 196 (73.1%) were up to 999.0 grams (extremely low birth weight), 1000-1499(very low birth weight) and 1500-2499(low birth weight) babies respectively. The median weight of LBW babies was 1648.0 grams with standard deviation (± 344.0). The mean of birth weight of survivors and those who expired were 1648 grams and 1600 grams respectively. Mean duration of hospital stay was 7.4 (± 5.5) days ranging from 1 day to 35 days. Duration of hospital stay was negatively correlated with birth weight in our study (Pearson correlation coefficient-0.206, $p=0.001$). Among our study population, males babies were 152 (56.7%) and 116 (43.3%) were female babies.

In our study, more than four fifth (82.9%) were preterm babies whereas only 17.2% were term babies. 229 (85.4%) babies didn't receive any form of active resuscitation while the rest received some form of active resuscitation 39 (14.6%). Pregnancy induced hypertension was observed in 15 (5.6%), eclampsia in 12 (4.5%), oligohydramnios in 10 (3.7%), chronic illness in 5.6% and congenital malformations in 8 (3.0%).

Regarding mode of delivery, more than two third 71.7% newborns were delivered by normal vaginal route with episiotomy and remaining 28.3% were delivered by lower section caesarean section.

Among risk factors of low birth babies, preterm delivery was the commonest risk factor observed in 222 (82.9%) out of 268 newborns. Intrauterine growth retardation was the next important risk factor observed in 29.5% cases, previous abortion in 24 (9.0%), antepartum haemorrhage in 22 (8.2%).

Table 1: Treatment offered to LBW babies

Treatment	Number (%)
Antibiotics	203 (75.7)
Oxygen	168 (56.8)
Phototherapy	143 (53.4)
Calcium	86 (32.1)
Blood Transfusion	31 (11.6)
Double Volume Exchange Transfusion	29 (10.8)
Aminophyllin	22 (8.2)
Antenatal steroid	15 (5.6)
Indomethacin	7 (2.6)
Others	3 (1.1)

There were various modes of therapies during treatment at the hospital, more than three fourth of the LBW babies received antibiotics during hospital stay. Next to this, oxygen was the second common mode of therapy (56.6%). Phototherapy, calcium, blood transfusion (BT), double volume exchange transfusion (DVET), aminophyllin and indomethacin therapy were provided. Other modes of therapies were fresh frozen plasma (FFP) and steroid.

Table 2: Mode of oxygen therapy

Mode of oxygen therapy	Number (%)
Room air	108 (40.2)
Oxygen by hood	91 (34.0)
Continuous positive airway pressure	43 (12.6)
Mechanical ventilator	26 (9.7)

Table -2 depicts various forms of oxygen therapy which includes Oxygen by hood box, nasal prong, continuous positive airway pressure (CPAP), and mechanical ventilator. Oxygen by oxygen hood box was the most common means of oxygen therapy.

Table 3 shows the various complications seen amongst the LBW babies

Table 3: Complications encountered amongst the LBW babies

Complication	Number (%)
Clinical sepsis	173 (64.6)
Non physiological jaundice	166 (61.9)
Hypoglycaemia	41 (15.2)
Apnoea	39 (14.6)
Perinatal asphyxia	34 (12.7)
Hypocalcaemia	33 (12.3)
Culture proven sepsis	31 (11.6)
Hypoxic ischemic encephalopathy	24 (8.9)
Patent ductus arteriosus	13 (4.9)
Hyaline membrane disease	9 (3.3)
Meconium aspiration syndrome	8 (3.0)
Necrotizing enterocolitis	8 (3.0)
Polycythemia	7 (2.6)
Intraventricular bleeding	6 (2.3)
Meningitis	6 (2.3)
Bronchopulmonary dysplasia	3 (1.1)
Bilirubin encephalopathy	3 (1.1)

Table 4: Comparison of risk factors occurring in survivors and nonsurvivors

Characteristics	Outcome		P value
	Improved (219)	Expired (49)	
SGA n (%)	69 (31.5%)	1.0 (20.4%)	0.123
Birth weight (Mean±SD)	1679.5±330	1509.3±375	0.002*
Gestational age (Mean±SD)	34.31± 2.87	32.39± 3.32	<0.001*
Outborn n (%)	67 (30.6%)	19 (38.8%)	0.267
DVET n (%)	23 (10.5%)	6 (12.2%)	0.642
Unbooked n (%)	179 (81.7%)	44 (89.8%)	0.172
Apnoea n (%)	19 (8.7%)	20 (40.8%)	<0.001*
Hypoglycemia n (%)	25 (11.4%)	15 (30.6%)	<0.001*
Birth asphyxia n (%)	26 (11.9%)	7 (14.3%)	0.642
Culture positive n (%)	18 (8.2%)	10 (20.4%)	0.012
Mechanical ventilation n (%)	4 (1.8%)	19 (38.8%)	<0.001*
Multiple birth n (%)	66 (30.1%)	20 (40.8%)	0.148
Male sex n (%)	129 (56.2%)	29 (59.2%)	0.700

SGA: small for gestational age; DVET: double volume exchange transfusion; *:statistically significant

Table -4 shows comparison of significance of various risk factors among improved and expired newborns.

OUTCOME

Outcome of the low birth babies was excellent; 218 (82%) babies improved and were discharged from hospital after treatment, 25 (9.0%) babies died and the same number of babies left against medical advice (LAMA).

DISCUSSION

The prevalence of LBW is a good indicator of mother's health and maternal nutritional status. The incidence of LBW in Asia as a whole is 19.7%. That of Europe, USA and Korea is 6.5%, 7% and 6-8% respectively.⁵ The incidence of LBW in our hospital deliveries was (14.5%) Previous study done in Nepal Medical College and Medani Hospital, Sudan showed lesser incidence of LBW [(11.9%) and 12.6% respectively].^{6,11} A study done in rural area of Sarlahi district, Nepal recorded more incidence of LBW (43%) mainly due to lack of micronutrients.¹² In our study, incidence of LBW deliveries were comparably lower than study done in Sarlahi district was likely due to the lack of easily accessible health facilities and majorities of deliveries took place at home in Sarlahi.

The prospective analysis of maternal antenatal profile in this study noted the various risk factors responsible for low birth weight delivery. The most common factor was inadequate antenatal visit (unbooked 82.5%). Previous studies also noted the same fact.^{13,14,15} The second most common risk factor was premature rupture of membrane (40.6%) and third was multiple birth (32.1%). Similar pattern of risk factors were observed in a study conducted at BPKIHS during 2005-2008.¹³ Other risk factors noted were: age below 20 years (17.2%), pregnancy induced hypertension, pre-eclampsia and eclampsia (10.1%), history of previous abortion (9.0%), antepartum haemorrhage (8.2%), oligohydramnios (3.7%), urinary tract infection (2.6%) and poly-hydromnios (0.7%).

Previous study noted similar pattern of morbidities with a strong association between preterm labour and Antepartum Haemorrhage (APH).¹³ Other studies in Nepal, recorded APH in 5.8%⁵ and 9.7%¹³ mothers of low birth weight babies. Primigravida was important risk factor for low birth weight babies accounting for 59.0% in our study, which was in contrast to the previous studies.^{6,17}

Clinical sepsis, non physiological jaundice, hypoglycaemia, apnoea and perinatal asphyxia were five commonest complications observed in our study during hospital stay as noted in a previous study among very low birth weight (VLBW) infants, respiratory distress syndrome was noted in approximately 80% of infant 501-750 grams, in 65% of those 751-1000 grams and in 45% infant with 1,001-1250 grams, in 25% between 1,251 and 1,500 grams.^{13,18} In our study, respiratory distress syndrome was documented only in 3.3%. This contrasting result might be due to majority

of LBW babies were enrolled from paediatric and post natal wards. Sepsis was diagnosed on clinical assessment in 64.6% cases but only 11.6% cases had culture proven sepsis. The percentage of cases with culture proven sepsis among LBW in our study matches with the data from the similar studies done at developing countries like India and Kenya.^{16,19} The intraventricular haemorrhage (IVH) was diagnosed by cranial ultrasound, incidence of IVH in our study was 2.3%. Similar incidence reported in study done by Poudel *et al.*¹³ A study done in Turkey, incidence of necrotizing enterocolitis (NEC) was 26.3%, this result is markedly higher than our study (3.0%). A study done at BPKIHS in VLBW also showed higher incidence of NEC (8.6%).¹³ This lower incidence of NEC might be due to majority of study cases were in wards.

Overall survival of LBW in our study was excellent 82.0%. Nine percentage of babies died and same percentage of LBW babies left hospital against medical advice. This result contrasts with previous study in VLBW in NICU setting of same hospital.¹³ Similar pattern of

survival rate was reported in some other studies, where survival rates were from 78.3% to 90.3%.^{16,20} Contrasting result in this study as compared to previous study of same hospital likely due provision of new equipments like ventilator, oxygen saturation monitors. The median duration of hospital stay among survivors in our study was 7.0 days ranging from 1 day to 35 days. In a Thai study, it was 31.5 days.²¹ In one Japanese study, mean duration of hospital stay was 97 days.²² In resourceful countries, they keep LBW babies in hospital till babies achieved appropriate weight for discharge according to their guideline. Different studies show that higher the baby's weight and gestational weeks more the chance of survival as compared to the lower birth weight.²²⁻²⁴ This study also reported the significant difference in survival among LBW newborns according to birth weight. The duration of hospital stay was more for those lesser birth weight as compared to babies with more weight. The duration of hospital stay was negatively correlated with birth weight in our study (pearson correlation coefficient -0.206, p=0.001).

We applied Pearson Chi-square test to find out significance of different risk factors between survivors and expired LBW babies. All infants of extremely LBW groups were died at hospital during treatment. Survival rate of extremely LBW infants in previous study in this hospital was 34.8%.¹³ In one Jamaican study, and a Nigerian study, survival rates were 43.0%, and 10.3% respectively.^{25,26} Infants associated with apnoea, hypoglycaemia, and those who required mechanical ventilation in expired LBW were significantly high as compare to improved LBW in our study. In our study, place of delivery and male sex have no significant difference between survived and expired cases. Same result reported in a study done in very LBW babies at BPKIHS.²²

Conclusion: LBW deliveries are of major concern because of maximum perinatal morbidity and mortality

REFERENCES

- WHO, International statistical classification of Disease and related health problems tenth revision, World Health Organization, Geneva, 1992.
- Kramer MS Determinants of low birth weight: Methodological assessment and meta-analysis: Bulletin of the WHO, 1987, 65, 5, 663-737.
- WHO technical consultation, towards the development of a strategy for promoting optimal fetal growth, Report of a meeting, World Health Organisation, Geneva 2004.
- Mc Comick MC. Factors associated with smoking in low income pregnant women. *J Clin epidemiol* 1990; 43: 441-8.
- Pathmanathan. Investing in Maternal Health: learning from Malaysia and Sri Lanka, Health, Nutrition, and Population series, World Bank, Washington, D.C., 2003.
- Kayastha S, Tuladhar H: Study of Low Birth Weight babies in *Nepal Med Coll J* 2007; 266-9.
- VK Paul, Gupta OP, editors. Ghai Essential Pediatrics (6th edn). OP Ghai, Piyush Gupta, V.K. Paul 2004. P. 136-80.
- Cochran WD, Lee KG. Manual of Neonatal Care (5th edn). John P. Cloherty, Eric C. Eichenward, Ann R. Stark. 2003; 35-55.
- Barker, DJP(ed.), Fetal and infant origins of disease, *Brit Med J Books*, London, 1992.
- WHO, Coverage of Maternity Care: A listing of available information, WHO/RHT/MSM/96.28, Maternal and Newborn Health/Safe Motherhood, World Health Organization, Geneva, 1997.
- Elhassan EM, Abbaker AO, Haggaz AD, Abubaker et al. Anaemia and Low birth weight in Medani, Hospital Sudan. *Elhassan et al BMC Research notes* 2010, 3:181; <http://www.biomedcentral.com/1756-0500/3/181>
- Christian P, Khattri SK, Katz J, Pradhan EK et al. Effects of alternative maternal micronutrient supplements on low birth weight in rural Nepal: double blind randomized community trial. *Brit Med J* 2003; 326: 1-6.
- Poudel P, Budhathoki S, Shrivastava MK. Maternal risk factors and morbidity pattern of very low birth weight infants: A NICU based study at Eastern Nepal. *J Nepal Paediatr Soc* 2008; 29(2): 59-6.
- Mavalankar DV, Gray RH, Trivedi CR. Risk factors for term low birth weight in Ahmedabad, India. *Int J Epidemiol* 1992; 21(2): 263-72.
- Vega J, Saez G, Smith M, Agurto M, Morris NM. Risk factors for low birth weight and intra-uterine growth retardation in Santiago. *Chile Rev Med Chil* 1993; 121(10): 1210-9.
- Roy KK, Baruah J, Kumar S, Malhotra N, Deorari AK, Sharma JB. Maternal Antenatal profile and immediate neonatal outcome in VLBW and ELBW babies. *Indian J Pediatr* 2006; 73(8): 669-73.
- Moor KL. Before we are born: Basic embryology and birth defects. Toronto, Saunders co, 1983.
- Stoll BJ, Kliegman RM. The high risk infants. In: Nelson Textbook of Paediatrics. Behrman RE, Kliegman RM, Jensen HB (eds) (17th ED). Saunders 2004; 547-59.
- Simiyu DE. Morbidity and mortality of low birth weight infant in the new born unit of Kenyatta National Hospital, Nairobi. *East Afr Med J* 2004 Jul; 81(7): 367-74.
- Darlow BA, Cusack AE, Donoghue DA. Improved outcome for very low birth weight infants: evidence from New Zealand national population based data. *Arch Dis Child Fetal Neonatal Ed* 2003;88: F23-F28.
- Sritipsukho S, Suarod T, Sritipsukho P. Survival and outcome of very low birth weight infants born in a University Hospital with level II NICU. *J Med Assoc Thai* 2007; 90 (7): 1323-9.
- Kusuda S, Fujimura M, Sakuma I et al. Morbidity and mortality of infant with very low birth weight in Japan: center variation. *Pediatrics* 2006; 118(4): 1131-9.
- Poudel P, Budhathoki B. Perinatal characteristics and outcome of VLBW infants at NICU of developing country: An experience at eastern Nepal. *The Journal of Maternal-Fetal and Neonatal Medicine* 2010; 23(5): 441-7.
- Warner B, Musial MJ, Chenier T, Donovan E. The effect of birth Hospital type on the outcome of very low birth weight infants. *Pediatrics* 2004; 113: 35-41.
- Trotman H, Lord C. Outcome of extremely low birth weight infants at the University Hospital of the West Indies, Jamaica. *West Indian Med J* 2007; 56: 409-13.
- Okoji GO, Ornamabo RS. Survival in Very low birth weight infants at the University of Port-Harcourt Teaching Hospital, Nigeria. *West Afr J Med* 1992; 11; 1-6.