

## OUTCOME OF VERY LOW BIRTH WEIGHT INFANTS AT A DISTRICT HOSPITAL NICU ATTACHED TO MEDICAL COLLEGE IN SOUTHERN KARNATAKA

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**ABSTRACT: Need for the Study:** Mortality among Very low birth weight infant (VLBW < 1500g) is a major contributor to the Neonatal Mortality Rate (NMR) in both developing and developed countries. Clinical problems associated with VLBW include hypothermia, hypoglycaemia, perinatal asphyxia, hyperbilirubinemia, anaemia, sepsis and respiratory problems like RDS, apnoea of prematurity. The survival of these VLBW infants in a resource-limited setting in developing country like India is low. **OBJECTIVE:** To describe the mortality and morbidity pattern among VLBW babies. **METHODOLOGY:** This study was undertaken at District Hospital NICU, attached to Mandya Institute of Medical Sciences (MIMS). All VLBW babies admitted at MIMS over a span of 3 years from 1st January 2011 till 31st December 2013 formed the study population. Necessary permission was taken to access the medical records from NICU and Medical Record Section, MIMS. The relevant data was collected from the case records, analysed with Microsoft Excel software, and the results were interpreted using descriptive statistics. **RESULTS:** Of the 4, 653 new born admissions during the study period 492 (10%) were VLBW within which 332(67%) new-born survived to discharge. Among the 160 VLBW deaths, 77(48%) succumbed to death within 1 day of life and another 71(44%) between day 2 to day 7 of life. RDS accounted for 33% of all deaths while Sepsis was the second common cause accounting for 23% deaths. The most commonly encountered morbidities in study population were Sepsis (70%), Hyperbilirubinemia (62%), RDS (58%), ROP (32%) and Hypoglycaemia (30%). **CONCLUSION:** With an overall survival of 67% among non-ventilated VLBW babies, it is reassuring for a developing nation, where expensive modalities like mechanical ventilation and Surfactant may not be available for the needy round the clock.

**KEYWORDS:** Very low birth weight, Survivors, Mortality, Morbidity.

**INTRODUCTION:** Birth weight (BW) and gestational age (GA) are two of the most important factors that predict the short and long-term quality of life in neonates.<sup>1</sup> Mortality as a result of Very low birth weight infant (VLBW< 1500g) is the major contributor to the neonatal mortality rate in both developing and developed countries.<sup>2</sup> VLBW comprises 4-8% of live- births but about one third of death during the neonatal period occur in this group of new-borns.<sup>3</sup>

Extremely low birth weight infants (ELBW<1000g) are more susceptible to all of the possible complications of premature birth, both in the immediate neonatal period and after discharge from the nursery. Clinical problems associated with VLBW and ELBW include hypothermia, hypoglycaemia, perinatal asphyxia, hyperbilirubinemia, anaemia, infection, Necrotizing enterocolitis (NEC), Intraventricular haemorrhage (IVH) and respiratory problems like

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Hyaline membrane disease (HMD), apnoea of prematurity.<sup>2, 4</sup> This subgroup of neonatal intensive care unit (NICU) graduates requires extra care by the primary care provider and other health providers.

According to the World Health Organization, nearly 4 million neonatal deaths occur worldwide every year, most in developing countries.<sup>5</sup> The Millennium Development Goal 4 is to reduce child mortality by reducing under-5 mortality by two-thirds between 1990 and 2015.

Survival of VLBW infants has improved markedly over the past decade, largely owing to improved care, availability of antenatal steroids, provision of surfactant and establishment of appropriately equipped NICU, where resources permit.<sup>6-9</sup> Yet survival of these infants in a resource-limited setting in developing country like India is still low. With this background the present study was undertaken at the District hospital, Mandya, a tier two city with the following objectives- 1. To describe the mortality pattern among very low birth weight neonates. 2. To describe the spectrum of morbidity among very low birth weight neonates.

**METHODOLOGY:** This study was undertaken at the District Hospital NICU, attached to Mandya Institute of Medical Sciences (MIMS). Approximately 6,000 deliveries take place annually at MIMS. The NICU was established in 2009 December, with 17 beds and facilities to ventilate one neonate at a time.

All VLBW babies admitted at MIMS over a span of 3 years from 1st January 2011 till 31st December 2013 formed the study population. The VLBW neonates were categorized into two groups: BW <999g (Group A) and BW 1000g to 1499g (Group B). Babies who were referred for the need of mechanical ventilator support and those who were aided with ventilator support in our unit were not included in the study population. Necessary permission was taken to access the medical records from NICU and Medical Record Section, MIMS. All relevant pre and perinatal data, including course in the hospital stay till the time of discharge or death, was collected from the case record. Gestational age was determined by using last menstrual period (LMP), ultrasonography reported before 22 weeks GA and post natal assessment using expanded new Ballard score.<sup>10</sup> Standard criteria were used to define common morbidities (Iran). The data was analysed using Microsoft Excel software and results interpreted using descriptive statistics.

**RESULTS:** A total of 4653 neonates were admitted to the District Hospital NICU during the study period of 3 years, of which 3178 (68%) neonates were inborn and 1475 (32%) were out born admissions. Among the total NICU admissions 492(10.6%) were VLBW, with 80(16%) in group A and 412 (84%) in group B. Of the total VLBW admissions 259 (52%) were male and 276 (56%) were inborn. The study population had a median BW and GA of 1280 g (range 500 - 1499 g) and 30 weeks (range 23 - 40 weeks) respectively

Of the total 385 neonatal deaths in the unit during the study period, 160 (42%) deaths were accounted by VLBW group. A total of 332 (67%) babies survived to discharge in VLBW group, with 24 (7%) being in group A and 308 (93%) in group B. Among the 160 VLBW deaths, 77 (48%) babies succumbed to death within 1 day of life and 71 (44%) babies between day 2 to day 7 of life, and another 12 (8%) babies beyond 7 days of life (Table 1).

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Characteristics		VLBW n= 492	
		Survivors n= 332	Non survivors n= 160
Gestational age in weeks	<28	70 (21%)	97 (60%)
	29-32	157 (47%)	43 (27%)
	33-36	78 (24%)	16 (10%)
	> 37	27 (8%)	4 (3%)
Sex	Male	157 (47%)	102 (64%)
	Female	175 (53%)	58 (36%)
Place of birth	Inborn	183 (55%)	93 (58%)
	Out born	149 (45%)	67 (42%)
Mode of delivery	Vaginal	259 (78%)	145 (90%)
	Caesarean	73 (22%)	15 (10%)
Hospital stay	<1 day	0	77 (48%)
	2- 7	28 (8%)	71 (44%)
	> 8	304 (92%)	12 (8%)

Table 1: Demographic characteristics of the study subjects

Of the 160 VLBW deaths 56 (35%) were in group A and 104 (65%) in group B. The most common cause of death in group A was HMD 18 (32%) followed by Sepsis (23%) and in group B too the commonest cause of death was HMD 36 (35%) followed by sepsis 24 (23%) (Table 2).

Cause of mortality VLBW		Group A (n=56)	Group B (n= 104)
Prematurity related	Asphyxia	10 (18%)	19 (18%)
	HMD	18 (32%)	36 (35%)
	NEC	7 (13%)	12 (12%)
	IVH	4 (7%)	6 (5%)
Sepsis		13 (23%)	24 (23%)
Congenital anomaly		3 (5%)	5 (5%)
Others		1 (2%)	2 (2%)

Table 2: Cause of mortality among VLBW babies (n= 160)

When the morbidity spectrum was analyzed in the present study, the most common morbidity among survivors was Hyperbillirubinemia in 61%, followed by Sepsis in 48% babies. Among non-survivors the most frequent morbidity was Sepsis in 75% babies followed by Hyperbilirubinemia in 64% babies (Table- 3).

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Conditions	VLBW n=492		
	Survivors n= 332	Non survivors n= 160	Total *
RDS	112 (34%)	97 (60%)	285 (58%)
Pneumonia	51 (15%)	62 (38%)	113 (23%)
Pneumothorax	1(0.3%)	19 (12%)	20 (4%)
Pulmonary bleed	19 (6%)	33 (20%)	34 (7%)
CLD	78 (24%)	12 (8%)	90 (18%)
Sepsis	160 (48%)	120 (75%)	344 (70%)
NEC	30 (9%)	58 (36%)	88 (18%)
Hyperbilirubinemia	202 (61%)	103 (64%)	305 (62%)
Hypoglycaemia	62 (17%)	85 (53%)	147 (30%)
PDA	31 (10%)	38 (24%)	69 (14%)
IVH	4 (1%)	35 (22%)	39 (8%)
ROP	154 (46%)	3 (2%)	157 (32%)
ARF	54 (16%)	69 (43%)	123 (25%)

**Table 3: Morbidity pattern among survivors and non survivors of the study population**

\* Multiple conditions

**DISCUSSION:** Increasing numbers of very preterm and VLBW infants are surviving because of advances in both perinatal and neonatal care over the past two decades.<sup>11</sup> The present study compared survival to hospital discharge and short-term morbidity for all VLBW infants who were live born and admitted to NICU. The association between low birth weight and poor outcomes has been well established in literature. Fanaroff, et al. reporting NICHD network data showed that every 100g reduction in birth weight was associated with increasing mortality. The increase in survival rates by 100 g increments was marked between 600 and 1000 g compared with between 1000 and 1499 g, reflecting severe organ immaturity at the limits of viability.<sup>12</sup> In countries where almost all VLBW infants are offered mechanical ventilation the survival rates are 56 - 81% among those weighing <1000 g, and 94 - 97% in the 1000 - 1499g weight group, in comparison to our study which was 7% in <1000g and 93% in 1000- 1499g group.<sup>13, 14, 15</sup>

The lower survival rates in our hospital can be explained by the lack or limited availability of resources that have been shown to be associated with better survival. In our hospital the use of exogenous surfactant is restricted, and often delayed because of limited NICU beds and equipment. Most of the mothers present late in labour, resulting in inadequate time for antenatal steroids to be used or to have any effect.

During the study period, VLBW babies who accounted for 10% of the total NICU admissions, the same VLBW babies did contribute for 42% of total NICU deaths. Medlock et al reported that female sex frequently predicts survival. According to the results of our study, sex was not a predictor of mortality in infants with a BW <1500g.<sup>16</sup> Among the 160 VLBW deaths,

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77(48%) babies succumbed to death within 1 day of life and, 71(44%) babies between day 2 to day 7 of life and another 12(8%) babies beyond 7 days of life. In the present study the predominant causes of mortality in <1500g were HMD (34%), Sepsis (23%) and Asphyxia (18%). In the present study with a overall survival rate of 67% in VLBW babies, and 93% for 1000-1499g group compares well with the range of 55% to 68% reported for this birth weight group without the use of surfactant.<sup>17,18,19</sup> This result is reassuring for a developing nation, where expensive modalities like surfactant and mechanical ventilation may not be available for all preterm babies at any given time, and more than 50% babies can be salvaged without those modalities.

In the present study the most frequent morbidities reported in the VLBW babies were Sepsis (70%) followed by Hyperbilirubinemia (62%), HMD (58%) and ROP (32%). The same spectrum of morbidities with similar frequency was reported in other Indian studies as well. Of the 157 (32%) infants with ROP, 56 (36%) had stage 1 ROP and 101 (64%) had stage 2 ROP. Among 157 with some stage ROP, 19 infants (12%) progressed to treatment threshold ROP to undergo laser photo ablation. All treated infants showed a favourable outcome following treatment as defined by the standard classification and guidelines. Jakuskiene et al found the incidence of ROP requiring laser/cryocoagulation to be 9% for infants with a GA between 22 and 27 weeks and 2% for infants with a GA between 28 and 32 weeks<sup>20</sup>.

The incidence of CLD was 18% in the <1500g group, similar to results reported in other studies. Zhang et al reported the incidence of CLD to be 28.3% in infants with BW of  $\leq 1500$ g.<sup>21</sup>

Cole et al reported the NEC incidence in VLBW infants to be 10%.<sup>22</sup> Wilson et al reported the highest NEC incidence to be 42% in infants with a BW <1500g.<sup>23</sup> In the present study, NEC incidence was 18% in the <1500g group. Early minimal enteral nutrition with human milk seems to be a factor in this low incidence of NEC. As health workers working in limited resource areas we need to be aware of survival rates in our hospitals, our limitations, and areas those we can improve on.

**CONCLUSION:** With an overall survival of 67% among non-ventilated VLBW babies, it is reassuring for a developing nation, where expensive modalities like mechanical ventilation and Surfactant may not be available for the needy round the clock. Sepsis is an important preventable cause of morbidity and mortality in these VLBW babies.

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