



**“SHORT TERM OUTCOME OF EXTREMELY LOW BIRTH WEIGHT BABIES IN A TERTIARY CARE HOSPITAL, KOLKATA”**

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**ABSTRACT**

**Objective:** Within last few decades the discipline of neonatology has progressed significantly. However, research on morbidity and survival of ELBW infants were mostly done in the developed countries. Data have been sparse to show the “trends in mortality and morbidity rates among ELBW infant” in developing countries like India. This study have been conducted to determine different mortality and morbidity pattern in extremely low birth weight babies and to access different kind of supportive intervention required in these babies.

**Methods:** Study was conducted in the nursery of R. G. Kar Medical College, Kolkata from July 2019 to December 2020. The background characteristics of ELBW neonates were noted. All complications were monitored closely and managed accordingly. Relevant information thus obtained were recorded and analysed.

**Results:** 58.2% of the study subjects had birth weight above 900 grams. 59.1% of the ELBW died. Proportion of death was higher among <28 weeks of gestational age compared to  $\geq$ 28 weeks of gestational age (80.8% vs 53.7%). The distribution among the groups was found to be statistically significant ( $p < .05$ ). 70% of the babies had neonatal respiratory distress syndrome and all of them needed surfactant . In 31.8% of the study subjects apnoea was observed..66% of the study subjects had sepsis. Majority (64.5%) of them required moist oxygen.

**Conclusion:** The most effective care for ELBW infants is best ensured through the implementation of standardized protocols and collaborative support across various disciplines. However, the optimal way to care for these infants continues to be determined by ongoing research.

**Keywords:** ELBW, Babies and Outcome.

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## **INTRODUCTION:**

Low birth weight (LBW) is defined by the World Health Organization as “a birth weight of an infant of 2,499 g or less, regardless of gestational age”.<sup>1</sup> LBW babies are categorized into “very low birth weight (VLBW), which is between 1000-1499 g and extremely low birth weight (ELBW), which is less than 1,000 g”.<sup>2</sup>

Global prevalence of LBW neonates is 14.6% and in India 28% of live births are LBW.<sup>3</sup> About 4 million babies die each year worldwide in first month of life and India bears single largest share of 25-30% of neonatal deaths in World.<sup>4</sup>

Cause of prematurity can be due to spontaneous onset of premature labour or it may be induced by obstetrician to save the mother or baby against imminent danger.<sup>5</sup>

Although ELBW constitute a small percentage of overall births (1%), they are often critically ill and have high risk of death and long-term morbidity. They generally have prolonged hospital stays and require a large percentage of NICU (Neonatal intensive care unit) personnel time and effort as well as costs of care.<sup>6</sup> Various handicaps in them are NRDS (Neonatal Respiratory Distress syndrome, sepsis, hypoglycaemia, apnea, ROP (Retinopathy of prematurity) and Bronchopulmonary dysplasia (BPD).

However, ELBW survival has increased with the widespread use of exogenous surfactant agents, maternal steroids, and advancements in neonatal technologies.

Our study is on the morbidity and mortality pattern along with different supportive treatment required in the study subjects. Our objective was to determine different morbidity and mortality pattern in extremely low birth weight babies and to access different kind of supportive intervention required in these babies. Data regarding deaths in ELBW babies help to know disease patterns and its complications, to know the cause of death, to enact necessity actions to reduce the mortality rate and also to plan and implement programs.

## **MATERIALS & METHODS**

The study was conducted in Sick Newborn Care Unit (SNCU) and Neonatal Intensive Care Unit (NICU) of R. G. Kar Medical College, Kolkata from July 2019 to December 2020

All the ELBW babies were admitted irrespective of gestational age during the data collection period of this study. However, babies weighing <500 g, presence of lethal congenital anomalies and severe perinatal asphyxia were excluded from our studies.

Considering previous findings in similar studies based on the short-term outcome of extremely low birth weight babies and using the following statistical formula

$$N = [ Z (1- /2) 2 p(1-p)]/d^2; \text{ where-}$$

(N = sample size

Z (1- /2) = Is standard normal variant. At 5% type 1 error (p< 0.05), Z is 1.96.

P = Expected proportion in population based on previous studies, where it was 0.26%,

d= Absolute error of precision kept at 8.5);

$$N = [1.962 \times 0.26(1-0.26)]/0.0852 = 102$$

Considering 10% of N to be non-responsive, total estimated size was 102+10 = 112

Every ELBW neonate admitted during the data collection period was selected for this study, after the consideration of all the exclusion criteria as mentioned. Thereafter, the very purpose of this study and other ethical issue were explained to their parents in their own language and an informed consent was taken . Then babies were managed according to protocol. All the complication were monitored closely and managed accordingly. All the relevant information were recorded with the help of a pre-designed and pre-tested schedule. Various blood tests, imaging, anthropometric measurement, new Ballard scoring system were done.

Available appropriate statistical software has been used for extrapolation of all the data that have been meticulously assimilated after due consideration. Descriptive and inferential statistical method was used. P value of less than 0.05 was considered significant.

## **RESULTS AND ANALYSIS**

The study was conducted among 110 extremely low birth weight babies in SNCU and NICU of R G Kar Medical College & Hospital, Kolkata to assess the mortality and morbidity pattern as well as different kind of supportive interventions required for those babies.

Findings are presented in this section broadly in three sub-sections as stated below:

Section I: Background details of the study subjects

Section II: Outcome profile of the study subjects and gestational age, birth weight, sex as a predictor of outcome

Section III: Morbidity and mortality pattern

Section IV: Different kind of supportive intervention

### **Section I: Background characteristics of the study subjects**

Majority of the study subjects (75.5%) belonged to 28-36 weeks of gestational age followed by 23.6% in <28 weeks of age and 0.9% in  $\geq 37$  weeks of age. Mean gestational age is 29.1+(2.8) weeks 58.2% of the study subjects had birth weight above 900 gram followed by 23.6% in 801-900 gram, 13.6% in 700-800 gram and 4.5% had birth weight of below 700 grams having mean birth weight to be 897.8+-(95.1) grams 51.8% of the study subjects were males. Rest 48.2% were females.

### **Section II: Outcome of the study subjects**

59.1% of the study subjects had an outcome of death. 39.1% and 1.8% of them underwent discharge and LAMA respectively.

### **Factors affecting outcome (n=100)**

Death was higher among <28 weeks of gestational age compared to  $\geq 28$  weeks of gestational age (80.8% vs 53.7%). The distribution among the groups was found to be statistically significant ( $p < .05$ ). It also shows that proportion of death was higher among <28 weeks of gestational age compared to  $\geq 28$  weeks of gestational age (80.8% vs 53.7%). The distribution among the groups was found to be statistically significant ( $p < .05$ ). It also shows that proportion of death was higher among male babies (68.4%) compared to females (51.0%). But the distribution was not statistically significant ( $p < .05$ ).

### **Section III: Morbidity and mortality pattern**

Majority of ELBWs suffered from NRDS (70%), followed by jaundice (66.4%), sepsis (66.3%) and apnoeic attacks (31.8%). Considerable of them had BPD (25.5%), ROP (29.1%), NEC (24.5%). Metabolic complications like Hypoglycaemia (28.2%) & Hypothermia (14.5%) occurred in some. Very few developed meningitis(19.1%).

Majority of the study subjects died from Neonatal respiratory distress syndrome and PA (24.6% each) followed by EONS (18.5%) and Meningitis (17.0%).

### **Section IV: Different kind of supportive interventions required for the study population:**

### **The basis of different kinds of interventions needed(n=100)**

Majority (64.5%) of the study subjects required moist oxygen. It also shows shows that 64.5% of the study subjects required non-invasive treatment. In 35.5% cases it was not required. Invasive treatment was required for 47.2% cases while for 52.8% cases it was not needed. Surfactant was received by only 70.0% of the study subjects.

### **Duration of interventions(N=100)**

On 29.6% of the study subjects required moist oxygen up to second day followed by 22.5% up to 3rd day. 9.9% required up to 8th day also. It also shows that 26.8% of the study subjects required non-invasive treatment up to third day followed by 16.9% and 15.5% up to 5th day and 4th day respectively. 32.7% of the study subjects required invasive treatment up to second day followed by 25.0% and 11.5% up to 3rd day and 4th day respectively.

### **DISCUSSION**

Extremely low birth weight (ELBW; birth weight <1,000 g) infants are a special group of patients in the neonatal intensive care unit. They are so much physiologically immature that their survival is jeopardised at every steps of extrauterine life.

“NRDS is the most common cause of neonatal mortality in ELBW babies”.<sup>7</sup> Many requires respiratory support either in the form of invasive mechanical ventilation (IMV) or non-invasive ventilation (NIV) like CPAP or moist oxygen even surfactant too. In our institute we routinely give prophylactic surfactant therapy to <28 weeks gestation by INSURE technique

Sepsis is the second leading cause of mortality of ELBW.<sup>7</sup> Hypoglycemia occurs more frequently in SGA neonates.<sup>8</sup> If not detected in time. ELBW babies are also vulnerable to hypothermia due to less subcutaneous fat.<sup>9</sup> Incidence of apnea is inversely proportional to gestational age. In our institute we prophylactically give caffeine to all neonate with <32 weeks of gestation. ROP (Retinopathy of maturity) is a vaso-proliferative disorder of the retina among premature infants. In some of them, it may progresses to the stage of retinal detachment and loss of vision. Timely screening and treatment of ROP can prevent blindness and minimize visual handicaps.<sup>10</sup> In our institute we routinely screen for it.

Although the mortality rate has greatly decreased with time, the proportion of surviving infants with severe sequelae, such as cognitive delays, cerebral palsy, chronic lung disease and neurosensory deficits has not improved as significantly in India.

Age and gender distribution of study population:

During the study period 110 ELBW babies were enrolled for the study based on inclusion and exclusion criteria.

In our study, majority of the study subjects are between 28-36 weeks gestation with mean gestational age is  $29.1 \pm 2.2$  weeks, Mean birth weight  $897.8 (\pm 95.1)$  g with 51.8% are male and 48.2% are female.

Hui-Jia Lin et al had the mean gestational age (GA)  $28.1 \pm 2.2$  weeks, and the mean BW was  $868 \pm 97$  g with 57.8% males and 42.3% females<sup>11</sup>. Viena Tommiska et al had 529 ELBW with mean gestational ages were 26.0 weeks in stillborn and 26.4 weeks in live-born ELBW infants, and the mean birth weights were 601 g in still born and 750 g in live born. Total 49% were male in there study subjects.<sup>12</sup>

### **Outcome of the study population:**

Robert E. Piecuch et al studied outcome over 12 years period. In Pre surfactant era (1979–1985) survival was between 26-80% in different birth weight group. In surfactant era (1986–1988) survival increased significantly with 28-93% in these group.<sup>13</sup>

In our study 59.1% died, 39.1% survived till discharge and 1.8% left against medical advice. 19.2% survives below 28 weeks gestation, 46.3% survives above or at 28 weeks gestation.

Study by Rolf F. Maier et al showed mean length of hospital stay was 63.6 days<sup>14</sup>. In our study we also found similar mean days of hospital stay of is  $57(\pm 11.8)$  days.

### **Mortality and morbidity pattern of study population:**

Zhonghua Er Ke Za Zhi et al<sup>15</sup> had NRDS 75.5%, BPD 50.2%, ROP 31.6%, neonatal sepsis 30.3%, and NEC 12.2% while Salma Shaziya et al<sup>16</sup> had RDS 35%, Neonatal sepsis 38%, Jaundice 55%, Birth asphyxia 23%, Apnoea 15% and Hypoglycaemia 12%. Our ELBW babies too had similar comorbidities(NRDS-70%,BPD, Jandice 66.4%,) with little difference in BPD(25.5%) and sepsis (66%) occurrence

### **Supportive Intervention in study population:**

S.Abreu-Pereira et al observed about different ventilator strategy in their institute over a 10 years period. Non-invasive mechanical ventilation (NIMV) was performed exclusively in a minority (21.4%) of patients, followed by invasive mechanical ventilation (79.4%)<sup>17</sup>. Ten year trends in neonatal assisted ventilation of very low birth weight infants by Wade Rich et al observed that 74.5% requires invasive mechanical ventilation and 52% require non-invasive mechanical ventilation. From 1997 to 2002, non-invasive ventilatory support hours representing CPAP and NIMV, increased from 20 to 55% of all mechanical support.<sup>18</sup>

In our study 64.5% of the study subjects required moist oxygen. 26.8% of the study subjects required non-invasive treatment up to third day followed by 16.9% and 15.5% up to 5th day and 4th day respectively. Invasive treatment was required for 47.2% cases. Surfactant was received by 70.0% of the study subjects.

Though our study reiterates the high mortality & therapeutic dependence rate in ELBW neonates, at the same time improvement in ROP rate, detection & intervention, lesser reliance on invasive ventilation & improved asepsis all in a synergistic way contributes to the better short-term outcomes. Strengthening follow up multidisciplinary care will certainly add positive to this positive outlook.

## **CONCLUSION**

Care of extremely low birth weight neonates is multifaceted. Survival to discharge is only a part of the story. Our SNCU graduates are future citizens & so equally important is their wellbeing. At this margin of viability where the question of survival often contradicts wellbeing, where there is dilemma between resuscitation & DNR, even the definition of live birth is challenged constantly, it is very apparent to get demotivated. But at the same time as Pediatric & Neonatal health care worker, we along with parents & other stakeholders must cling to the advocacy of their wellbeing. Care of these tender newborns must be seen as a responsibility than a health burden, as shared responsibility with more and more family centred care, improved follow up and multidisciplinary management to ensure the health of future India.

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**Table 1: Factors affecting outcome(n=100)**

		Death (%)	Discharge (%)	Total (%)	P-value
Gestational age (in weeks)	<28	21(80.8)	5(19.2)	26(100.0)	0.014
	≥28	44(53.7)	38(46.3)	82(100.0)	
	Total	65(60.2)	43(39.8)	108(100.0)	
Birth weight (in grams)	< 800	17(94.4)	1(5.6)	18(100)	0.0005
	≥ 800	48(53.5)	42(46.7)	90(100)	
	Total	65(60.2)	43(39.8)	108(100)	
Sex	Male	26(51)	25(49)	51(100)	0.06
	Female	39(68.4)	18(31.6)	57(100)	
	Total	65(60.2)	43(39.8)	108(100)	

**Table 2: Distribution of study population on the basis of different kinds of interventions needed(n=100)**

		Frequency	Percentage (%)
Moist Oxygen	Required	71	64.5
	Not required	39	35.5
	Total	110	100.0
Non-invasive interventions	Required	71	64.5
	Not required	39	35.5
	Total	110	100

Invasive Interventions	Required	52	47.2
	Not Required	58	52.8
Surfactant Required	Required	77	70
	Not required	33	30
	Total	110	100

**Table 3: Duration of interventions(N=100)**

Days	Moist O2(%)	Non-invasive (%) Intervention	Invasive Intervention (%)
1	4.2	8.5	9.6
2	29.6	19.7	32.7
3	22.5	26.8	25
4	8.5	15.5	11.5
5	15.5	16.9	9.6
6	5.6	5.6	0
7	2.8	0	5.8
8	9.9	2.8	3.8
9	0	1.4	0
10	1.4	2.8	2
Total	100	100	100