



## STUDY ON MATERNAL RISK FACTORS, MORBIDITY PROFILE AND SHORT TERM OUTCOME OF VERY LOW BIRTH WEIGHT NEONATES

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### ABSTRACT

**Introduction:** VLBW babies constitute 4 – 7 % of all live births. The mortality in this subgroup is high and survival is directly associated with their birth weight and inversely associated with their gestation.

**Objective:** To study the maternal risk factors & short term outcomes of VLBW neonates. **Methodology:** This is a hospital based observation study conducted in level 3 NICU of King George Hospital. Maternal details like age, gravida, complications in pregnancy & baby details like sex, gestational age, birth weight are noted. Investigations like blood glucose, neurosonogram, sepsis screen, blood culture and sensitivity, hematocrit, x – ray & 2d ECHO are done as required. **Results:** 306 VLBW babies were included in this study. Maternal anemia, teenage pregnancies, multiple gestation & PIH were common maternal risk factors for VLBW. Neonatal jaundice, RDS & sepsis were common complications in VLBW babies. Antenatal steroid coverage is low. Antenatal steroids reduced the incidence of RDS. Mortality rate was 23.5%. RDS & sepsis were common contributing factors for mortality.

**KEYWORDS :** VLBW babies, RDS, sepsis

### INTRODUCTION

VLBW babies constitute approximately 4 – 7% of all live births but need a major share of effort, time and resources for their care. In India currently 8 million VLBW infants are born each year which constitutes 40% of global burden, the highest for any country. The mortality in this subgroup is high and survival is directly associated with their birth weight and inversely associated with their gestation. The outcome of these babies closely reflects the quality of neonatal intensive care.

Several maternal factors like maternal age, parity and obstetric complications like anemia, PIH etc. are associated with very low birth weight. Several interventions including improvement in quality of prenatal care, early identification and proper management of high-risk pregnancies and timely administration of antenatal steroids influence the outcome of very low birth weight babies.

Neurodevelopmental deficits including cerebral palsy, developmental delay, hearing & vision impairment and subnormal academic achievement are common in premature babies. So, these infants require periodic follow up for assessment of growth and development.

There is paucity of literature about the survival and morbidities of this very vulnerable group of preterm very low birth weight infants from Indian hospitals. Hence this study is taken up to identify the maternal risk factors for VLBW and to study the short-term complications.

### METHODS

The present study is a hospital based observational study conducted at tertiary care hospital with level 3 NICU. The study was conducted over a period of 1 year 9 months, from April 2020 to December 2021. All Very low birth weight babies (1000-1499grams) admitted to NICU (intramural and extramural), attached to teaching hospital, Andhra Pradesh.

### Exclusion Criteria

1. Cases with lethal congenital malformations.
2. Cases left against medical advice.
3. Cases that expire within 24 hours of admission.

An informed written consent was obtained from the parent/caregiver before enrolling the babies. Weight was measured on admission using electronic baby weighing scale. On admission, detailed maternal history was taken about pregnancy, delivery and immediate postnatal period by interviewing the parents. The gestational age at birth was assessed based on maternal history of last menstrual period, first trimester ultrasound scan if available and / or Modified New Ballard Score. Pre-designed proforma was used to collect details of maternal data, newborn details, complications during hospital stay. Standard criteria were used for definition of common morbidities.

Maternal details like age, gravida, any complications during pregnancy, mode of delivery were recorded. Baby details like sex, gestational age and birth weight were taken. All infants enrolled in the study were followed daily till discharge for any morbidity by clinical evaluation. Investigations like blood glucose, sepsis screen, hematocrit, blood culture, chest x-ray, NSG, 2D Echo and ABG were done whenever required.

Data entry was done in MS-EXCEL.2010. Statistical package for social sciences (SPSS) version 15 was used for data analysis. Descriptive data was represented in frequencies, percentages and Mean  $\pm$  Standard Deviation. Chi-square test was applied and p values were calculated to find statistical difference between categorical variables. Statistical analysis was carried out at 5% level of significance and p value <0.05 was considered significant.

### RESULTS

In the present study 306 VLBW babies who satisfied the inclusion criteria were included. Of them 146 were females,

160 were males. Male to female ratio was 1.1:1.282 VLBW babies were delivered spontaneously. 24 of the deliveries were induced due to maternal and 18 due to fetal causes.

114 babies weighed between 1000-1250gms & 192 weighed between 1251-1500gms, 174 babies were preterm SGA. 116 were preterm AGA & 16 were term SGA babies.

62.1% of mothers of VLBW babies were primiparous, 42.7% were teenage pregnancies.

Other common maternal risk factors associated with VLBW infants were multiple gestation (29.4%), pregnancy induced hypertension (15.03%), PPROM (10.45%), oligohydramnios (9.8%), abnormal presentation (8.49%) and bad obstetric history (7.84%). Other less common risk factors included hypothyroidism (3.92%), antepartum Hemorrhage (2.61%), Rh negative pregnancy (2.61%), HIV (2.61%), diabetes complicating pregnancy (1.3%), polyhydramnios (1.3%) and cervical incompetence (0.65%).

**Table 1: Maternal Factors Associated With VLBW**

RISK FACTOR	NUMBER	PERCENTAGE
AGE <20 YEARS	134	43.7
PRIMI GRAVIDA	190	62.1
ANEMIA	258	84.4
PIH	46	15.03
GDM	4	1.30
APH	8	2.61
OLIGOHYDRAMNIOS	30	9.8
POLYHYDRAMNIOS	4	1.30
HYPOTHYROIDISM	12	3.92
MOTHER HIV+	8	2.61
CERVICAL INCOMPETENCE	2	0.65
PPROM	32	10.45
ABNORMAL PRESENTATION	26	8.49
BAD OBSTETRICS HISTORY	24	7.84
MULTIPLE GESTATION	90	29.4

**TABLE:2 ANTENATAL STEROIDS:**

STEROID DOSE	TOTAL (n=290)	PERCENTAGE
NO DOSE	230	79.31
INCOMPLETE	22	7.5
COMPLETE	38	13.1

In the present study, out of 290 VLBW babies who were <37 weeks, mothers of 230 babies (79.31%) did not receive antenatal steroids, while 22 (7.5%) received incomplete course and 38 (13.1%) received full course of antenatal steroids.

**Table 3: Neonatal Complications In VLBW Babies**

COMPLICATIONS	TOTAL N=306	PERCENTAGE %
NEED FOR RESUSCITATION	42	13.72
RESPIRATORY DISTRESS SYNDROME	136	44.4
CONGENITAL PNEUMONIA	28	9.15
TTNB	68	22.22
JAUNDICE REQUIRING PHOTOTHERAPY	204	66.66
DVET	14	4.57
APNEA	100	32.67
SEPSIS		
CLINICAL SEPSIS	4	1.3
PROBABLE SEPSIS	96	31.3
PROVEN SEPSIS	20	6.5
FUNGAL SEPSIS	2	0.65
FEED INTOLERANCE	58	16.3
SHOCK	80	26.14
ACQUIRED PNEUMONIA	32	10.45
HYPOGLYCEMIA	20	6.53

POLYCYTHEMIA	6	1.96
ANEMIA	32	10.45
PDA	8	2.61
IVH	34	11.11
NEC	6	1.96
OTHERS		
ACYANOTIC CHD	2	0.65
AKI	2	0.65
BPD	4	1.30
TORCH	2	0.65
HYDROCEPHALUS	12	3.92
HYPERGLYCEMIA	12	3.9
PULMONARY HEMORRHAGE	2	0.65

In the present study RDS, Neonatal jaundice & sepsis were common neonatal complications accounting for 44.4%, 66.6% and 37.8% respectively.

Among sepsis cases, 20 were culture +ve, CONS & klebsiella were common organisms isolated. Among 136 RDS cases 80 received surfactant, 90 were kept on CPAP, 40 babies required mechanical ventilation. Among 204 cases of NNJ all required phototherapy and exchange transfusion was done for 14 babies.

**Table 4: Relation of antenatal steroids with neonatal complications.**

	Incidence	HYALINE MEMBRANE DISEASE		Total	p value
		Yes	No		
ANS	Yes	12 (31.6)	26 (68.4)	38	0.05
	No	122 (48.4)	130 (51.6)		
	Incidence	INTRAVENTRICULAR HEMORRHAGE		Total	p value
		Yes	No		
ANS	Yes	2 (5.3)	36 (94.7)	38	0.184
	No	32 (12.7)	220 (87.3)		
	Incidence	NECROTISING ENTEROCOLITIS		Total	p value
		Yes	No		
ANS	Yes	0 (6)	38 (100)	38	0.34
	No	6 (2.4)	246 (97.6)		

Antenatal steroid coverage significantly reduced the incidence of respiratory distress syndrome. However, the incidence of IVH and NEC were not significantly reduced.

**Table 5: Gender Distribution Of HMD Cases**

GENDER	HMD		P VALUE	RR (95% CI)
	YES	NO		
MALE	84 (52.5%)	76 (47.5%)	0.003	1.47(1.28-3.16)
FEMALE	52 (35.6%)	94 (64.4%)		

**Table 6: Gender distribution of sepsis cases**

GENDER	SEPSIS		P VALUE	RR (95% CI)
	YES	NO		
MALE	72 (45%)	88 (55%)	0.007	1.49(1.18-3.04)
FEMALE	44 (30.1%)	102 (69.9%)		

Gender distribution of RDS and sepsis was shown in the above tables. The present study shows that RDS and Sepsis were more common in males. This difference is statistically significant with P value <0.05.

**Mortality Of Vlbw Babies:**

In the present study, out of 306 VLBW babies included in the study, 72 expired and the overall mortality rate was 23.5%.

Mortality was higher in infants weighing <1250gms (31.6%) compared to mortality in infants weighing >1250gms (18.8%) and the difference was statistically significant.

Multiple factors contributed to mortality in each case in the study group.

RDS&Sepsis(both EOS&LOS) were common contributing factors for mortality.

### ROP in VLBW babies

In the present study, 234 VLBW survivors were screened for ROP as per NNF guidelines. The overall incidence of ROP in VLBW survivors was 42.7% (100 babies). Incidence of severe form of ROP requiring treatment was 19.6% (46 babies). 28 babies were given LASER photocoagulation and 18 babies received anti VEGF.

### DISCUSSION

The primary causes of VLBW are premature birth and intrauterine growth restriction(IUGR), usually due to problems with placenta, maternal health or to birth defects. Many VLBW babies with IUGR are preterm and thus are both physically small and physiologically immature.

### Maternal Age Versus Birth Weight

In the present study, 43.7% were <20 years. Similar age distribution among mothers was seen in Vidyasagar et al study. In the study done by Moorthi MMS et al the risk of VLBW was significantly higher in young mothers (<20 years). R K Bhimwal et al also reported that teen age pregnancy and maternal age >30 years had adverse effects on birth weight of babies.

### Maternal Anemia

In the present study, 84.4% of mothers of VLBW babies were anemic. Majority of them (65.3%) were moderately anemic. The prevalence of anemia in our study is much higher than the studies done by K K Roy et al(32.6%) and Vidyasagar et al(26.3%). Anemia in pregnancy is a common problem and 65-75% of the pregnant women in India are suffering from anemia.<sup>60</sup> Anemia predisposes to preterm deliveries and also adversely affects birth weight of the baby.

The factors leading to VLBW delivery in developing countries like India are modifiable and preventable. Parents and community at large must be educated and motivated to avoid early age of marriage and avoid teenage pregnancies. As majority of mothers are anemic, the nutritional status of expectant mothers is to be improved with special focus on iron and folic acid supplementation. The pregnant women should be counselled continuously by skilled health workers and nutritionists

### Maternal Risk Factors

Among the maternal risk factors preterm labor, pregnancy induced hypertension, PROM and multiple gestation have been recognized as common causes of spontaneous and iatrogenic early delivery.

The factors leading to VLBW delivery in developing countries like India are modifiable and preventable. Parents and community at large must be educated and motivated to avoid early age of marriage and avoid teenage pregnancies. As majority of mothers are anemic, the nutritional status of expectant mothers is to be improved with special focus on iron and folic acid supplementation. The pregnant women should be counselled continuously by skilled health workers and nutritionists

### Multiple Gestation

In the present study, multiple gestation was associated with 24.3% of VLBW babies. Similar results were seen in Vidyasagar V et al study (21.42%) and Mukherjee S et al (25.7%) study.

### Pregnancy Induced Hypertension

Hypertension during pregnancy is the major cause of chronic placental insufficiency leading to chronic fetal hypoxia, IUGR, prematurity and perinatal deaths. 15.03% had Pregnancy induced hypertension in the present study. This was similar to

studies done by Vasu Saini et al(20.49%), RK Bhimwal et al (23.68%), Vidyasagar V et al(29.3%), Nandini Naskar et al(13.44%), Kabilan S et al(17.3%) and Navaei et al (18%).

### Antenatal Steroids

In the present study, out of 290 VLBW babies which were <37 weeks, mothers of 230 (79.31%) babies did not receive steroids during antenatal period, while 22 (7.5%) received incomplete course and 38 (13.1%) received the full course of antenatal steroids.

The coverage of antenatal steroids to mothers of preterm VLBW babies was much lower in the present study compared to other studies done by Nandini Naskar et al(25.81%), Kabilan S et al(38.3%) and Bansal and Chawla

Mukherjee S et al reported very high coverage of 85.7%. Administration of antenatal steroids significantly reduced the incidence of RDS (p-value 0.046), NEC (p-value 0.015) and IVH (p-value 0.034) in study done by Nandini Naskar et al. However, the present study showed a significant reduction only in RDS.

In the present study antenatal steroids were given to 20.6% of mothers of preterm babies. Administration of antenatal steroid significantly reduced the incidence of HMD in the present study. However, antenatal steroid coverage was very low. Hence, there is a need to strengthen the existing policy under INAP to ensure administration of antenatal steroid to expectant mothers even before referring them to tertiary care centre.

### Neonatal Complications

In the present study, common complications among VLBW babies included neonatal hyperbilirubinemia, respiratory distress syndrome, sepsis.

### Neonatal Hyperbilirubinemia

Jaundice requiring phototherapy was seen in 66.66% of VLBW babies in the present study which is similar to Mukherjee S et al study and Fatemeh Nayeri et al study.

### Hyaline Membrane Disease

In the present study, incidence of HMD was 44.4%. Surfactant was given to 58.8% of HMD cases via INSURE technique. This could be attributed to poor antenatal steroid coverage which is only 20.6% in the present study. The incidence of HMD was low in studies done by Mukherjee S et al(22.8%) and Bansal and Chawla (20.5%). The antenatal steroid coverage was high in their studies (85.7% in Mukherjee S et al study and 60% in Bansal and Chawla study). This underscores the importance of good antenatal steroid coverage.

In the present study, HMD was more common in males (52.5%) than in females (35.6%). This is statistically significant. Male gender is at a disadvantage of delayed lung maturation.

Higher birth weight and gestational age and female sex were associated with lesser incidence of HMD.

The concept of accelerated lung maturation in response to "stress" was initially proposed in the 1980s and has been supported by some studies. In the present study, SGA infants were significantly at a lower risk to develop hyaline membrane disease [RR (95% CI) 0.69 (0.31-0.79)]. Similar results were seen in study done by Nandini Naskar et al. However, in the study done by Li.-Yi. Tsai et al and J Ho et al, they did not find any difference in the incidence of RDS between the SGA and AGA groups. In the present study, out of 136 babies with HMD, 90 (66.2%) babies were started on CPAP, surfactant was given to 80 (58.8%) babies and 40 (29.4%) babies needed mechanical ventilation. Administration of surfactant was based on severity of HMD and availability of surfactant.

## CONCLUSION

The present study assessed the maternal risk factors, morbidity profile of VLBW infants admitted to the study center. Study showed maternal factors like maternal age < 20 years, multiple gestation, PIH, PPROM contributed more for VLBW births. Neonatal hyperbilirubinemia, respiratory distress syndrome requiring CPAP & surfactant, late onset sepsis, apnea are common morbidities seen in VLBW neonates. Better survival & reduced complications are possible by adequate antenatal care, antenatal steroid use, presence of trained person at time of delivery for resuscitation & well equipped NICU with mechanical ventilator & surfactant therapy.

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