VOLUME - 10, ISSUE - 05, MAY- 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

**Original Research Paper** 

Pediatrics

# OUTCOME OF LOW BIRTH WEIGHT NEONATES WITH RELATION TO EARLY ANEMIA.

Dr. Anmol Kaur	Resident Doctor, Dept. Of Pediatrics, Sri Guru Ram Das Institute of Medical
Sidhu*	Sciences, Sri Amritsar. *Corresponding Author
Dr. Droot: Malhotna	M.D. Pediatrics, Professor, Sri Guru Ram Das Institute of Medical Sciences,

Dr. Preeti Mainotra Sri Amritsar.

# ABSTRACT

Background: Weight of newborn is a universal predictor of health during childhood. Haematological profile varies with period of gestation in low birth weight neonates i.e., <2500 grams. They have different haematological profile as compared to normal birth weight neonates. Aim of this study is to relate early morbidity and mortality of low birth weight neonates and their haemoglobin at days 1, 4 and 7.

Materials and methods: A prospective cross-sectional study was conducted from January 2019 to June 2020 on children weighing below 2500 grams admitted within 24 hours of birth in Department of Paediatrics, SGRDIMSR, Amritsar. A total of 110 neonates were enrolled in this study following the inclusion and exclusion criteria. Haemoglobin levels of these were measured on days 1, 4 and 7. The data obtained was compiled and analysed to reach valid conclusions in relation to outcome in form of morbidity and mortality of the subjects.

Results: Among 110 neonates majority belong to category of birth weight between 1500-2500 grams (70%). Lowest mean haemoglobin levels were seen in ELBW (<1000 grams) neonates. Fall in haemoglobin from day 1 to 7 in all the neonates was seen and was statistically significant. Anaemia was significantly related to PNA and mortality. Lowest mean haemoglobin values were seen in neonates with PNA as a morbidity on day 7 ( $13.04 \pm 2.32$ ). Neonates who died had even lower haemoglobin level on day 7 ( $12.17 \pm 2.03$ ).

Conclusion: It was concluded that ELBW neonates had higher risk of early anaemia as compared to LBW and VLBW neonates. Anaemia was also significantly present in neonates who died and those who had PNA. Thus early anaemia is associated with PNA, ELBW and Mortality.

# KEYWORDS : hemoglobin, extremely low birth weight, perinatal asphyxia

# INTRODUCTION

A newborn represents the culmination of developmental events from conception and implantation through organogenesis. Birth brings dramatic changes in circulation and oxygenation, which affects hematopoiesis, as the newborn makes the transition to a separate biological existence.<sup>1</sup> Weight of the child at birth is accepted as the single parameter that is directly related to the chances of the newborn to survive and experience healthy growth and development. This is because low birth weight (LBW) has been shown to be directly related to both immediate, long-term and very long-term development and well-being<sup>2</sup>. The World Health Organization defined low birth weight as a weight at birth of less than 2500 grams, irrespective of gestational period, and recommended an additional demarcation of 1500 grams to define very low birth weight. LBW infants are of two clinical types, one, those born before 37 weeks (preterm) and secondly, those babies who have intrauterine growth retardation i.e. small for gestational age (SGA).<sup>3</sup>

The significance and interpretation of low birth weight has recently come into prominence, because it indicates the chances of survival, growth, and long-term health, and of impaired cognitive development, diabetes and coronary heart diseases in the later part of their lives. The United Nations had set up the seven major goals for the last decade, viz., 'A world fit for children,' one of which was to reduce the proportion of low-birth-weight babies to one-third by 2010. The reduction of low-birth-weight also forms an important part of Millennium Development Goals for reducing child mortality.<sup>4</sup>

India, a developing country with high infant mortality rate (60 per thousand live births) is also characterized with substantial number of neonatal deaths. Low birth weight is probably one of the major causes of neonatal and infant deaths in the country.4

The concentration of hemoglobin fluctuates dramatically in the weeks and months after birth as a result of physiologic

changes and various factors must be considered when analyzing neonatal hematologic values. At birth the haemoglobin levels is 14.9 g/dl-23.7 g/dl in term and 19.1 g/dl-22.1 g/dl in preterm babies. It rapidly falls to 9.5-11 g/dl by 9-11 weeks of postnatal period in term babies and 6.5-9 g/dl by 4-8 weeks in preterm babies. Preterm babies require iron supplementation from as early as 2-3 weeks of post-natal age continued through their first year of life. Preterm babies have added problems like, poor general condition, reduced life span of RBC (35-40 days vs. 60-70 days of term babies), increased phlebotomy losses, accelerated growth rate, poor iron stores and inappropriate bone marrow response making them at the risk of developing anaemia and hence exposure to repeated blood transfusions.<sup>5</sup>

A variety of hematological problems have been identified in low birth weight neonates like anemia, polycythemia, leukopenia/leucocytosis, thrombocytopenia etc. A characteristic aspect of these unique problems is that, if the neonate survives, the hematological problem will remit and will not recur later in life, nor will it evolve into a chronic illness. This characteristic comes about because the common hematological problems of these patients are not genetic defects but are a result of environmental stresses such as infection, all immunization or a variety of maternal illnesses that are imposed on a developmentally immature hematopoietic system. Thus, it is important to know the factors that lead to these hematological disturbances in low birth weight neonates so that appropriate steps are taken in time.

# MATERIALS AND METHODS

A prospective cross-sectional study was conducted over a period of 18 months from  $1^{st}$  January 2019 to  $30^{th}$  June 2020 on children weighing below 2500 grams admitted within 24 hours of birth in Neonatal Intensive Care Unit of Department of Pediatrics, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. The subjects were assessed on the basis of their hemoglobin values on days 1, 4 and 7. The data thus obtained was compiled and analyzed to reach valid

### VOLUME - 10, ISSUE - 05, MAY- 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

conclusions and to know the morbidity and mortality of low birth weight neonates.

### INCLUSION CRITERIA

1. Neonates weighing below 2500 grams.

#### **EXCLUSION CRITERIA**

1. Any hematological abnormality in mother.

All neonates (inborn and outborn) weighing less than 2500 grams and admitted in NICU of department of pediatrics within 24 hours of birth were enrolled in the study.

## Following definitions were used for assessment of newborn:

- Low birth weight: <2500 grams irrespective of gestational age.</li>
- 2. Very low birth weight: Birth weight <1500 grams.
- 3. Extremely low birth weight: Birth weight < 1000 grams.
- 4. Preterm baby: Baby born before 34 completed weeks of gestation from history and examination.
- 5. Late preterm baby: Baby born before 37 weeks but after 34 completed weeks of gestation.
- 6. Term baby: Baby born >/= 37 weeks of gestation.
- 7. Sepsis: considered in cases with positive blood culture
- 8. PNA (perinatal asphyxia): considered in cases with history of delayed cry at birth or need for bag and mask ventilation or mechanical ventilation at birth.
- 9. Respiratory distress: defined as respiratory rate more than 60/min in a quiet baby associated with intercostal retractions with or without nasal flaring and / or expiratory grunt.

The data collected was analyzed statistically with SPSS Statistics-26 version to draw relevant conclusions. For nonparametric data, chi square test was applied. For parametric data student t-test was applied. Results for skewed data were compiled using median (IQR) and Kruskal wallis H test/Mann Whitney U test were applied to find the significance. The level of significance was determined as its 'P-value' with pvalue>0.05 as insignificant, <0.05 as significant and <0.001 as highly significant. The following observation was made.

#### RESULTS

A total of 110 neonates were enrolled in this study. 70 % of the neonates were LBW, 21.8 % VLBW and 8.2 % ELBW. During the stay 87.2 % neonates had morbidity and 12.8 % died. Out of the neonates who expired, majority were ELBW (n=7, 50%), followed by VLBW neonates (37.5%).



Figure 1: Showing Comparison of Haemoglobin on day 1,4 and 7 with Birth Weight

The above graph depicts the mean haemoglobin values of low birth weight neonates on days of life 1, 4 and 7. It was observed that ELBW neonates had lowest mean haemoglobin values on 1, 4 and 7 which were  $11.42\pm1.28$ ,  $13.33\pm2.65$ ,  $13.88\pm2.67$ respectively. Fall in haemoglobin from day 1 to day 7 was also seen in neonates of all the birth weight categories and the correlation was statistically significant (p value <0.05).



Figure 2: Showing Comparison of Haemoglobin on Day 1, 4 and 7 with Morbidity and Mortality

Neonates were assessed on days of life 1, 4 and 7 with respect to haemoglobin and its correlation with morbidity (RD, PNA and SEPSIS) and mortality. It was found that lowest mean haemoglobin levels were observed in neonates who expired with lowest being on day 7 (12.17 $\pm$ 2.03). In morbidity, it was found that lowest mean haemoglobin values were seen in neonates with PNA with minimum haemoglobin values seen on day 7 (13.04 $\pm$ 2.32). It was also seen that fall in haemoglobin from day 1 to day 7 was present in all the cases of morbidity and mortality and was statistically significant in RD, Sepsis and Mortality (p value <0.05) but insignificant in those with PNA (p value >0.05).

## DISCUSSION

Low birth weight neonates (< 2500 grams) constitute a major part of public health problems. Intrauterine growth retardation and prematurity are the subjects that contribute to LBW. Approximately 15% of all the newborns, that is, approximately 20 million neonates throughout the world are born low birth weight. India constitutes 40 % of this burden. The survival, growth patterns of low birth neonates and the spectrum of haematological profile varies from those of neonates born with appropriate weight. The haemoglobin abnormalities reflects the changes caused by low birth weight, morbidity and mortality.

Thus, it is vital to understand the abnormalities of haemoglobin in low birth neonates and its relation with morbidity and mortality, so that, early detection and treatment can be instituted leading to further reduction of morbidity and mortality.

The present observational study was conducted on 110 neonates weighing <2500 grams and admitted within 24 hours of age in Neonatal Intensive Care Unit of Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar over a period of 18 months (from January 2019 to June 2020), to study the morbidity and mortality in low birth neonates and its relation with haematological profile at 1, 4 and 7 days of life.

Avery et al.<sup>6</sup> defines anemia during the first week of life as any hemoglobin value <14 gm/dl. Hemoglobin ranges differ with respect to birth weight. Neonates weighing 1.2 to 2.5 kg have a normal hemoglobin range of 13.5-19.0 gm/dl in the first week of life. Thus, anemia in these neonates is defined as hemoglobin levels less than 13.5gm/dl. Neonates weighing <1.2kg have a normal hemoglobin range of 13.0-18.0 gm/dl. Anemia in these neonates is defined as hemoglobin levels <13 gm/dl. In our study, lowest mean hemoglobin values were observed in ELBW neonates on days 4 and 7 (12.93 $\pm$ 2.49 and 11.42 $\pm$ 1.28). Thus, it was inferred that lower the birth weight lower is the mean hemoglobin values and higher the risk for development of anemia. This could be attributed to premature birth that occurs before placental iron transport and fetal erythropoiesis are complete. It could also be due to diminished erythropoietin production and accelerated catabolism. Similar observations were made by Banerjee J et al. <sup>7</sup> who demonstrated that lower hemoglobin values were seen in neonates with birth weight <1000 grams as compared to those with weight 1000-1500 grams and 1500-2500 grams. We also observed that there was fall in hemoglobin from day 1 (14.07±3.13) to day 7 (11.42±1.28) which could be attributed to multiple sampling, sickness and infection of the neonate. Jopling J et al.<sup>8</sup> observed a linear decline in hemoglobin values in neonates with gestation 35-42 weeks, 29-34 weeks and <29 weeks respectively.

Neonates with PNA had lowest mean haemoglobin on day 7 with value of  $13.04\pm2.32$ . In a study by Brucknerova I et al<sup>9</sup>, it was observed that neonates with perinatal asphyxia had statistically significant decrease in mean haemoglobin values from day 1 to 5. This anaemia could be attributed to oxidative stress during prenatal and postnatal period, as well as by blood redistribution or by haemorrhage. Thus, it was concluded that lower haemoglobin levels are associated with increased risk of mortality as well as with perinatal asphyxia.

### CONCLUSION

We concluded in our study that lower the weight, higher is the risk for haemoglobin abnormality, morbidity and mortality. ELBW (<1000 grams) neonates had higher risk of anaemia. They also had significant mortality, contributing 50 % to the total mortality count. Early diagnosis and management with judicious sampling to reduce phlebotomy losses can play an important role in reducing the morbidity and mortality in these neonates.

#### REFERENCES

- Esan AJ. Hematological differences in newborn and aging: a review study. Hematol Transfus Int J. 2016;3(3):178-90.
- Agarwal K, Agarwal A, Agrawal VK, Agrawal P, Chaudhary V. Prevalence and determinants of "low birth weight" among institutional deliveries. Ann Nigerian Med. 2011;5(2):48.
- Bari MI, Ullah MA, Khatun M. Morbidity and mortality of low birth weight baby. TAJ: J Teachers Ass. 2008;21(1):35-9.
- Chellan R, Lopamudra P, Kulkarni P. Incidence of Low-Birth-Weight in India: Regional Variations and Socio-Economic Disparities. J Heal Develop. 2007;3(1):148-62.
- Kumar K, Nagar N, Sarnadgouda P. Anemia in New Born. J Infec Antibio. 2018;1(1):101.
- Weindling M. Avery's Diseases of the Newborn. InSeminars in Fetal and Neonatal Medicine 2013 Feb 1 (Vol. 18, No. 1, p. 65). Elsevier.
- Banerjee J, Asamoah FK, Singhvi D, Kwan AW, Morris JK, Aladangady N. Haemoglobin level at birth is associated with short term outcomes and mortality in preterm infants. BMC Medicine. 2015;13(1):16.
- Jopling J, Henry E, Wiedmeier SE, Christensen RD. Reference ranges for hematocrit and blood hemoglobin concentration during the neonatal period: data from a multihospital health care system. Pediatrics. 2009;123(2):333-7.
- Brucknerova I, Ujhazy E, Dubovicky M, Mach M. Early assessment of the severity of asphyxia in term newborns using parameters of blood count. Interdisciplinary Toxicology. 2008;1(3-4):211-3.