

ORIGINAL ARTICLE

BURDEN OF LOW BIRTH WEIGHT AND MALNUTRITION AMONG NEWBORN BABIES IN RAJASTHAN, INDIAAjay Sethi¹, Devang Gandhi¹, Jayesh J Varia², Vipul Bhageria², Vasav Darshan²**Author's Affiliations:** Assistant Professor, Resident, Dept. of Pediatrics, SMIMER, Surat, Gujarat**Correspondence:** Dr. Ajay Sethi E-mail: divyamsethi91@yahoo.co.in**ABSTRACT**

Introduction: The goal of reducing low birthweight incidence by at least one third between 2000 and 2010 is one of the major goals in 'A World Fit for Children', the Declaration and Plan of Action adopted by the United Nations General Assembly Special Session on Children in 2002. The present study was planned to show the measure the prevalence of Low birth weight in tertiary care hospital.

Methodology: The present study was conducted in the department of Paediatrics, S.M.S. Medical College, Jaipur in which clinical assessment & assessment of nutritional status was done among the neonates delivered at Mahila and Zenana Hospital, S.M.S. Medical College, Jaipur.

All neonates delivered at the hospital and fulfilling inclusion criteria during one year period were included in the study.

Results: Out of total 500 neonates, 313 (62.6%) neonates were male and 187 (48.4%) neonates were female. Maximum number (55%) of newborns were having MAC of 9 to 10 cm. Mean of birth weight of all newborns was 2.59 kg. Around 35% of infants were having birth weight of less than 2.5 kg which are considered Low Birth Weight babies. Maximum number of newborns i.e. 220 (44%) were having birth weight of 2.5 to 3.0 kg. 17.8% of newborns were having birth weight of 3.0 to 3.5 kg. According to MAC/HC ratio, 59% of newborns were well nourished (MAC/HC ratio >0.27) and 41% newborns were malnourished (MAC/HC ratio <0.27). According to Ponderal Index, 76% newborns were well nourished (PI>2.2) and 24% newborns were malnourished (PI<2.2).

Keywords: Low birth weight, Ponderal Index, MAC/HC Ratio, Malnutrition

INTRODUCTION

The growth of the fetus depends on both the seed and the soil. The soil, the mother, is again dependent on multiple factors such as environment, socio-economic status, cultural practices and pregravid status of mother herself. The seed, the fetus, has its own growth potential. The net result of these two factors is a wide distribution of birth weight at any given gestational age and a wide variation in the state of nutrition at birth.

The measurements of body proportionately used to identify at risk IUGR infants are Ponderal index and Mid arm/ head circumference ratio. But they have their own drawbacks¹

Low birthweight has been defined by the World Health Organization (WHO) as weight at birth of less than 2,500 grams (5.5 pounds). This is based on epidemiological observations that infants weighing less than 2,500 g are approximately 20 times more likely to die than heavier babies. More common in developing

than developed countries, a birthweight below 2,500 g contributes to a range of poor health outcomes.

A baby's weight at birth is a strong indicator of maternal and newborn health and nutrition. Being undernourished in the womb increases the risk of death in the early months and years of a child's life. Those who survive tend to have impaired immune function and increased risk of disease; they are likely to remain undernourished, with reduced muscle strength, cognitive abilities and IQ throughout their lives. As adults, they suffer a higher incidence of diabetes and heart disease.²

The goal of reducing low birthweight incidence by at least one third between 2000 and 2010 is one of the major goals in 'A World Fit for Children', the Declaration and Plan of Action adopted by the United Nations General Assembly Special Session on Children in 2002.³ One of the major challenges in measuring the incidence of low birthweight is the fact that more than half of infants in the developing world are not weighed.

The present study was planned to show the measure the prevalence of Low birth weight in tertiary care hospital.

METHODOLOGY

The present study was conducted in the department of Paediatrics, S.M.S. Medical College, Jaipur in which clinical assessment & assessment of nutritional status was done among the neonates delivered at Mahila and Zenana Hospital, S.M.S. Medical College, Jaipur.

All neonates delivered at the hospital and fulfilling inclusion criteria during one year period were included in the study.

Inclusion Criteria: Neonates fulfilling all below criteria were included in the study

1. Live born, singleton infants
2. Only infants whose hospital stay exceeded 24 hours of age.
3. Known gestational age (last menstrual period or Ballard score)
4. No major congenital malformation.
5. Parents willing to give informed written consent to participate in the study.

All circumferences were measured by standard technique using a metallic tape nearest to 0.1 cm. Length was measured using infantometer. Weight was measured to the nearest 0.05 kg using infant weighing scale. All measurements were recorded on Performa with other basic details of neonates.

Permission of Institutional Ethical Committer was obtained before study. All parents of eligible neonates were explained the nature of study and asked for written consent.

All data were entered in to Microsoft Excel and analysed.

RESULTS

There were total 500 neonates included in the study during the study period of one year. Out of total 500 neonates, 313 (62.6%) neonates were male and 187 (48.4%) neonates were female.

Majority of babies in study population were full-term, mean gestational age was 39 weeks. Table 1 shows that out of total 500 neonates, 95.4% were term (37 weeks or more) and 4.6% newborns were preterm (35 & 36 weeks). 76.6% newborns were AGA – Appropriate for Gestational Age and 23.4% were SGA – Small for Gestational Age.

Table 1: Basic information of newborns (N=500)

Variable	No. (%)
----------	---------

Gender	
Male	313 (62.6)
Female	187 (48.4)
Maturity	
Term	477 (95.4)
Preterm	23 (4.6)
According to Gestational Age	
AGA	383 (76.6)
SGA	117 (23.4)

Table 2: Anthropometric measurement of newborns (N=500)

Anthropometry	No. (%)
Mid-Arm circumference (in cm)	
<7	12 (2.4)
7-9	179 (35.8)
9-11	275 (55.0)
11-13	33 (6.6)
>13	1 (0.2)
Head Circumference (in cm)	
<30.0	14 (2.8)
30.0-32.5	136 (27.2)
32.5-35.0	322 (64.4)
>35.0	43 (8.6)
Length (in cm)	
<42.5	15 (3.0)
42.5-45.0	73 (14.6)
45.0-47.5	232 (46.4)
47.5-50.0	133 (26.6)
50.0-52.5	43 (8.6)
>52.5	4 (0.8)

Table 2 shows anthropometric measurement of newborns. In present study, all newborns were having measurement of Mid arm circumference (MAC), Head Circumference (HC) and Length. Out of total 500 newborns maximum number (55%) of newborns were having MAC of 9 to 10 cm. 35.8% of newborns were having MAC of 7 to 9 cm.

Present study shows that mean head circumference was 32.87 cm. Maximum number of newborns (64.4%) were having HC of 32.5 to 35 cm. Total 136 (27.2%) of newborns were having HC of 30 to 32.5 cm.

Mean length of newborns was 46.7 cm. Maximum number of newborns 232 (46.4%) were having length of 45 to 47.5 cm. Out of total 500 newborns, 3% had length <42.5cm, 14.6% newborns had length between 42.5 to 45 cm, 26.6 newborns had length between 47.5 to 50 cm and 8.6% had length between 50 to 52.5 cm.

Table 3: Distribution of newborns according to different Indices (N=500)

Indices	No. (%)
Birth Weight (in Kg)	

< 2.0	30 (6.0)
2.0-2.5	146 (29.2)
2.5-3.0	220 (44.0)
3.0-3.5	89 (17.8)
3.5-4.0	15 (3.0)
MAC/HC Ratio	
>0.27	295 (59.0)
<0.27	205 (41.0)
Ponderal Index	
>2.2	380 (76.0)
<2.2	120 (24.0)

Mean of birth weight of all newborns was 2.59 kg. Out of total 500 newborn babies, 30 (6%) were having birth weight less than 2 kg and 146 (29.2%) were having birth weight of 2 to 2.5 kg. Thus around 35% of infants were having birth weight of less than 2.5 kg which are considered Low Birth Weight babies. Maximum number of newborns i.e. 220 (44%) were having birth weight of 2.5 to 3.0 kg. 17.8% of newborns were having birth weight of 3.0 to 3.5 kg.

Table 3 shows that according to MAC/HC ratio, 59% of newborns were well nourished (MAC/HC ratio >0.27) and 41% newborns were malnourished (MAC/HC ratio <0.27).

According to Ponderal Index, 76% newborns were well nourished (PI>2.2) and 24% newborns were malnourished (PI<2.2).

DISCUSSION

In 2013, nearly 22 million newborns—an estimated 16 per cent of all babies born globally that year—had low birthweight. Among regions, South Asia has the highest incidence of low birthweight, with one in four newborns weighing less than 2,500 grams.²

Low birth weight leads to an impaired growth of the infant with its attendant risks of a higher mortality rate, increased morbidity, impaired mental development, and the risk of chronic adult disease.^{4,5,6}

In present study it was observed that 76.6% newborns were AGA – Appropriate for Gestational Age and 23.4% were SGA – Small for Gestational Age. In a study by Metcoff, proportion of AGA was 89% and SGA was 11% which are correspond tour study.⁷

In present study, Mean of birth weight of all newborns was 2.59 kg. Around 35% of newborns were Low birth weight. 44% were having birth weight of 2.5 to 3.0 kg. Prevalence of Low birth weight in our study is higher than national average which is 26%.⁸

The two other measurements of body proportionally used to identify at risk intrauterine retarded babies are ‘Ponderal Index’ and ‘MAC/HC ratio’. Ponderal index relies on the principle that length is spared at the expense of weight during period of acute malnutrition, weight and length velocities may be proportionately impaired. So, infants with chronic insult in utero may be misclassified by PI. Similarly, MAC/HC ratio, which is independent of birth weight, readily discriminated the late gestational growth retarded babies.⁹ It was shown that this ratio can be used as a reliable test to identify neonates whose growth is retarded, even when his weight does not fall below the 10th percentile but those babies whose head circumference is reduced because of proportionate growth retardation might not be identified. Thus, PI and MAC/HC ratio is less useful. Single and most important predictor of fetal growth is Birth weight.

REFERENCES

- Georgieff MK, Sasanov SR, Chockalinam UM, Percisa GR. A comparison of mid arm/head circumference ratio and ponderal index for evaluation of mentally retarded infants after abnormal interaerterine growth. *Acta Paediatr Scand* 1988; 77: 214-219.
- Undernourishment in the womb can lead to diminished potential and predispose infants to early death. Available at: <http://data.unicef.org/topic/nutrition/low-birth-weight/>. Last accessed on 17th February, 2016.
- Low birth weight- Country, Region and Global Estimates. Available at http://data.unicef.org/wp-content/uploads/2015/12/low_birthweight_from_EY_107.pdf. Last accessed on 17th February, 2016.
- Ashworth A. Effects of intrauterine growth retardation on mortality and morbidity in infants and young children. *Eur J Clin Nutr* 1998; 52(Suppl 1): S34-S42.
- Grantham-McGregor SM. Small for gestational age, term babies, in the first six years of life. *Eur J Clin utr* 1998; 52 (Suppl 1): S59-S64.
- Barker DJP. Mothers, babies and health in later life. Edinburgh: Churchill Livingstone; 1998.
- Metcoff J. Clinical assessment of nutritional status at birth. Fetal malnutrition and SGA are not synonymous. *Pediatr Clin/North Am* 1994; 41: 875-891.
- Park K. Park's Text book of preventive and social medicine. 18th Edition. Jabalpur: M/s Banarsidas Bhanot, 2005: 395-396.
- Kliegman RM. The fetus and the neonatal infant In: Textbook of Pediatrics Ed 15, Eds Nelson WE, Behrman RE, Kliegman RM, Arvin AM, WB Saunders Company 1996; pp 453-454.