A Prospective Study on Low Birth Weight Neonates- It’s Incidence and Risk Factors in a Tertiary Medical College

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Abstract- In a prospective hospital based study, during the period from 1st Jan 2017 - 30th June 2018, 3110 consecutively delivered live newborns were studied for the incidence of low birth weight neonates and to evaluate the associated risk factors. Eleven hundred newborns were classified as low birth weight babies. The incidence expressed per 1000 live births was 353.7 (35.37%). Of these, 850 (77.27%) were small for gestational age neonates and 250 (22.72%) were preterm neonates. Five hundred eighty small for gestational age neonates (68.23%) were weighing between 2001 to 2500 gms. Mothers belonging to the age group of 19-24 years delivered the maximum newborns of low birth weight babies (600/1100) and of (510/600) these 86.33% were small for gestational age neonates. There were 50 neonates with low birth weight born to mothers below the age of 18 years. Primiparous mothers were found to contribute higher number of low birthweight neonates (400/1100). Spacing as a factor did not show any major difference. Two hundred eighty low birth weight neonates were born to mothers with significant obstetrical problems such as pregnancy induced hypertension, bad obstetrical history and premature rupture of membranes. The incidence of 35.37% of low birth weight babies is high enough to ring alarmbells.

Keywords- Incidence, primiparous, Newborns, small for gestational age.

I. Introduction

Low birth weight at birth is an important underlying contributor for neonatal and infant mortality. It accounts for nearly half of all perinatal deaths. Identifying predictors of low birth weight is the first essential step in designing appropriate risk factors. Hence, this study aimed to identify risk factors for low birth weight in hospitals. Birth weight is a good reflector of the status of maternal health. It is also true that birth weight is the single most important factor that affects neonatal mortality and morbidity, infant and childhood morbidity. Low birth weight i.e. weight below 2500 gms may indicate that the baby did not remain in the uterus long enough or it did not develop well enough. Neonates with weight less than 10th percentile or more than 2 SD below the mean for the gestation age are classified as small for gestational age. This group of neonates with poor intra uterine growth remains the cause of concern in developing countries including India. The incidence of low birthweight (LBW) in India varies between 25-30% and of which 60-65% are because of intra uterine growth retardation (IUGR) [1]. Evidence from developing countries over time also demonstrates that the incidence of IUGR decreases as a country becomes more developed. Some of the adverse factors responsible are maternal malnutrition, anemia, inadequate prenatal care drug abuse, birth order, maternal medica

II. Materials And Methods

This prospective study was carried out on Department of Obstetrics & Gynaecology at Bankura Sammilani Medical College, west Bengal period from 1st Jan 2017 - 30th June 2018. This was a One half year hospital based prospective study. A total of 1100 newborns were for in this study.

Study design: Prospective observational study.
Study Location: This was a tertiary care teaching Hospital based study done in Department of Obstetrics & Gynaecology at Bankura Sammilani Medical College, west Bengal.
Study Duration- 1st Jan 2017 - 30th June 2018.
Sample Size- 1100 Newborns.

Sample size calculation- The sample size was calculated on the basis of a single proportion design. The target population was from a mixed population having a varied socio-economic background.

Subject & selection method- The study population was drawn from all patients who delivered live newborn during the study period.

Inclusion Criteria-
1. Pregnant women >14 years.
3. Pregnant women suffering from medical morbidities like anemia, PIH, GDM, BOH etc.
4. Newborns weighing between 2-2.5 kg.
5. SGA newborns.
6. Preterm babies born between 28-37 weeks.

Exclusion Criteria- 1. Unmarried pregnant women.
2. Extremely LBW.
3. Early preterm babies <28 weeks.
4. Intrauterine fetal demise cases.

Procedure & Methodology-
The population of the study included mothers attending regular antenatal clinics. The hospital being a tertiary referral government hospital included women from the very low income strata of the society of class 1-4 employees of the central government who were authorized free medical care. Newborn babies were weighted on a beam type weighing scale within one hour of birth to the closest of 20 gms. Gestational age was determined by the Dubovitch criteria[1]. All consecutively born low birth weight babies were included and evaluated. Low birth weight (LBW) is defined as a birth weight less than 2500g and LBW infants are at greater risk of death and disability [3]. Small for gestational age (SGA) newborns were defined as those with weight less than the 10th percentile [1]. Incidence of low birth weight babies was calculated by the following formula:

\[
a) \frac{\text{Live LBW babies born during the study period} \times 1000}{\text{Total live births during the study period}} \times 100 \quad \text{b) Live LBW babies born during the study period} \times \text{Total live births during the study period} \times \text{expressed as percentage}
\]

Detailed maternal data were recorded for all low birth weight neonates studied based upon direct questioning and review of the antenatal card. Maternal malnutrition for the study was defined as weight <45 kgs and height <145 cms. Maternal anemia was defined as Hb <11 g/dl [4]. Bad obstetrical history (BOH) was considered when there was previous history of one or more abortions, one or more stillbirths or one or more neonatal deaths. Low birth weight babies were further segregated into small for gestational age and preterm babies in relation to their maternal data.

III. Result

During the period of study (Jan 2017 to June 2018), 3110 consecutively delivered live newborn babies were studied. Out of these 1100 were classified as low birth weight babies. The incidence expressed, as per 1000 live births was 353.7. Of the total 1100 LBW babies, 850 (77.27%) were small for gestational age neonates and 250 (22.72%) were preterm neonates. There were 580 female low birth weight neonates out of the total 1100.
The classification and pattern of birth weight is reflected in Fig I.

Eight hundred fifty neonates were small for gestational age out of the total 3110 live births (27.33%). Of these majority (580/850 i.e. 68.23%) were weighing between 2001 to 2500gms. The correlation between maternal age, height, weight and parity and low birth weight neonates is highlighted in Table I. The maximum number of LBW babies (54.54%) were born to mothers in the age group of 19-24 years. Of these 60 per cent were SGA neonates. Significantly 105 LBW neonates were born to mothers below the age of 19 years. Table 2 highlights the correlation between maternal parity, spacing between pregnancy and family income. Primiparous mothers were found to contribute significantly higher number of LBW neonates (36.33%) and of these 85 per cent were SGA neonates. Spacing as a factor did not show major difference in the incidence of LBW neonates. Mothers belonging to the income group of Rs 1000 – Rs 3000 per month gave birth to higher number of LBW neonates (780/1100). Of these 79.48 per cent were SGA neonates.

TABLE I- Correlation between maternal anthropometry and low birth weight neonates (n=1100)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Small for Gestation</th>
<th>Preterm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age in years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;35</td>
<td>20</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>30-35</td>
<td>60</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>25-30</td>
<td>250</td>
<td>45</td>
<td>295</td>
</tr>
<tr>
<td>19-24</td>
<td>510</td>
<td>90</td>
<td>600</td>
</tr>
<tr>
<td>&lt;19</td>
<td>10</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>Maternal Heights in (cms)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;155</td>
<td>140</td>
<td>30</td>
<td>170</td>
</tr>
<tr>
<td>145-155</td>
<td>700</td>
<td>140</td>
<td>840</td>
</tr>
<tr>
<td>&lt;145</td>
<td>10</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Maternal weight (kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;45</td>
<td>190</td>
<td>40</td>
<td>230</td>
</tr>
<tr>
<td>45-55</td>
<td>600</td>
<td>150</td>
<td>750</td>
</tr>
<tr>
<td>&gt;55</td>
<td>60</td>
<td>60</td>
<td>120</td>
</tr>
</tbody>
</table>

Fig 2 reflects the correlation between maternal medical morbidity including anemia, medical illness and obstetrical problems and low birth weight babies. Nine hundred and eighty low birth weight babies were born to mothers whose hemoglobin levels were below 10 g/dl. Further of these 30 per cent (330) of low birth weight neonates were delivered by mothers with Hb per cent below 8 gm per cent. Medical illness including rheumatic heart disease [5], urinary tract infection and other episodic illness were observed in mothers with LBW babies in the present study. Obstetrical problems included premature rupture of membranes (PROM), pregnancy induced hypertension (PIH), bad obstetrical history (BOH) and ante-partum hemorrhage (APH). Fig 2.
A Prospective Study on Low Birth Weight Neonates- It’s Incidence and Risk Factors in a Tertiary ..

The details of correlation between obstetrical problems and low birthweight neonates highlighted in Fig 3. Out of total 1100 LBW neonate, 262 cases had significant antenatal obstetric problems in their mother. Bad obstetric history and PIH were two important factors.

**TABLE II**-Correlation between LBW and maternal parity, spacing and family income (n=1100)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Small for Gestation</th>
<th>Preterm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primipara</td>
<td>330</td>
<td>90</td>
<td>420</td>
</tr>
<tr>
<td>2nd Para</td>
<td>310</td>
<td>60</td>
<td>370</td>
</tr>
<tr>
<td>3rd Para</td>
<td>140</td>
<td>40</td>
<td>180</td>
</tr>
<tr>
<td>&gt;3</td>
<td>70</td>
<td>60</td>
<td>130</td>
</tr>
<tr>
<td><strong>Spacing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 years</td>
<td>510</td>
<td>120</td>
<td>630</td>
</tr>
<tr>
<td>&gt;2 years</td>
<td>340</td>
<td>130</td>
<td>470</td>
</tr>
</tbody>
</table>

n-262

BOH-bad obstetrics history
PIH-Pregnancy Induced hypertension
APH-Antepartum Hemorrhage
**A Prospective Study on Low Birth Weight Neonates- It’s Incidence and Risk Factors in a Tertiary...**

| Family income (Rs/mth) | 25 | 10 | 35 | 22 | 10 | 32 | 240 | 70 | 310 | 380 | 90 | 470 | 183 | 70 | 113 |
|-----------------------|----|----|----|----|----|----|------|----|----|------|----|----|------|----|----|     |

## IV. Discussion

Low birth weight is one of the leading causes of neonatal mortality and is influenced by various socioeconomic, maternal and environmental factors [6]. This study identified some socioeconomic, obstetric and environmental risk factors for low birth weight in the study area.

Pierre Budin introduced the most basic concepts in the care of low birth weight babies in 1895. He stated 'with weaklings we shall have to consider three points, one, their temperature and their chilling, two, their feeding and three, the diseases to which they are prone'. Of the low birth weight babies, small for gestational age neonates are the cause for concern, given their long-term consequences. It shall not be wrong to say that the vicious cycle of malnourished mother giving birth to a small for gestational age girl neonate who will in turn deliver a low birth weight child continues in our country. The incidence of low birth weight neonates in India varies between 25-30 per cent [I]. In the present study the incidence was 35.37 per cent. In an astudy by ICMR, wherein the criterion for low birthweight was taken to be <2000 gm, the incidence was reported to be 5.5 per cent [7]. The assumption was based on the assumption that the mean birth weight of the mature Indian baby is about 500 gms less than that of the American infant and hence the WHO definition of LBW babies wherein 2500 gms is the sakes of economics shall we lower our standards. Small for gestational age neonates contribute the maximum to the incidence of LBW babies in India vis a vis the developed countries. In the present study 77.27 per cent of the LBW neonates were SGA infants. In a national collaborative study, the authors have given similar observation [8]. Parity was significantly associated with birthweight in northwest Ethiopia and the Gambia and London [9, 10, 11]. Another hospital based study in London [12] showed association of parity with low birth weight. A cross-sectional study conducted in Central Africa revealed that adolescent women had significant risks of delivering a low birth weight baby [13]. This might be due to the effect of placental factors as gravidity/parity increases. A systematic review and meta-analysis revealed an association between nulliparity with low birth weight [14]. This shows the need of universal and quality prenatal care, nutritional counselling to all pregnant women. Additionally, early marriage and teenage pregnancy should be discouraged to prevent low birth weight in this group of women.

Hirve SS et al [2] in their prospective study have reported primipara contributing significantly to the incidence of LBW neonates. In the present study, 38.8 per cent of SGA neonates were born to primipara mothers as compared to 36.47 per cent to 2nd para and 316.47 per cent to 3rd para. Another Indian study [16], has observed that newborn of primiparae were 150 gms lighter than those of second para. Short spacing interval between pregnancies is a confounding factor to nutritional deficiency and inadequate physiological recovery [17]. In the present study 510/850 neonates with SGA were born to mothers with spacing interval less than 2 years. It has also been observed that outcome of previous pregnancy is an important confounding factor. If the previous gestation resulted in a preterm or SGA neonate still birth, the mother will be at an increased risk for both shorter pregnancy interval and a repeat preterm SGA neonate [17]. Maternal undernutrition does play an important role in outcome of pregnancy in terms of fetal growth. Adopting the definition criteria for maternal malnutrition to be weight <45 kg and or height <145 cms, 320/1100 of total LBW were born to malnourished mothers in the present study. In a recent study to evaluate the scoring system for predicting the risk of preterm birth, previous history of preterm delivery and low prepregnancy weight were the most predictive factors in multiparous and nulliparous mothers [18].

Anemia in mothers is a major determinant for increased morbidity both for the mother and the growing fetus. Anemia if severe could impair oxygen delivery to the fetus and thus interfere with normal intrauterine growth and pregnancy duration. Iron deficiency without anemia might affect key enzymes and thereby also lead to adverse outcome [17]. Two studies [3, 8] have noticed the relation between low birth weight and low maternal hemoglobin levels. In the present study, 990 (90%) neonates with SGA were born to mothers with anemia. Failure of the hemoglobin concentration to fall during pregnancy was associated with a five to seven fold increase in the incidence of low birth weight and preterm birth.

Closely related factor is income and the economic status of the family. Two studies analyzing the social factors related to low birth weight babies, has observed the direct relation between family income and birth weight [8, 14]. In the present study, 470 (55.29%) percent of low birth weight neonates were born to mothers in the family income bracket of less than Rs 2000 per month.

Maternal illness like rheumatic heart disease, chronic infections and other episodic illnesses such as respiratory tract infection, diarrheal disorder and shortfebrile episodes were the contributing factors in the present study for low birth weight babies. Among cardiac problems, rheumatic heart diseases is the...
A Prospective Study on Low Birth Weight Neonates- It’s Incidence and Risk Factors in a Tertiary ..

commonest cause complicating pregnancy and resulting in smaller babies in our country [19]. Obstetric problems complicating third trimester of pregnancy like PIH, BOH and PROM are important in contributing to the chances of prematurerdelivery and poor growth of the fetus. Several authorshave observed the increased incidence of low birthweight babies in these morbidity states [8,17].

The present study has strengthened the fact that asignificant percentage of neonates are born with thedisadvantage of low birth weight. The maternal factor were found to be working in unison and to reach anylogical conclusion regarding the causative or etiological effect of these maternal factors on low birthweight, they should be properly controlled to prevent confounding.

V. Conclusion

Adoption of "At risk approach' to include all those mothers with social, natural and medical adverse factors. The 'risk approach' isa managerial tool for improved MCH care. Apart fromprofessional health workers, involvement of community health workers and social women's organization is required to be incorporated in the health deliveriesystem [2]. Correction of three interrelated conditions, viz. maternal malnutrition, infections and unregulatedfertility through direct intervention programmes, including dietary improvements through the existingICDS scheme, identifying and controlling infectionsand early detection and treatment of medical disorders complicating pregnancies. Nutritional counselling during ANCvisits for pregnant mothers and health information about obstetric complications should beadvocated. Health professionals should be vigilant in early detection and management of complications during pregnancy. Additionally, efforts should be done to improve living standardand lifestyles of mothers. Community based studies are needed to better address householdenvironmental factors with observation.

Reference


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