

## ORIGINAL RESEARCH

### Correlation of Maternal Profile and Neonatal Outcome Among Low Birth Weight Babies

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#### ABSTRACT

**Introduction:** Observational study to find out maternal risk factors associated with low birth weight babies & their association with the morbidity and mortality.

**Materials& Methods:** The maternal demographic profile, previous obstetric history, risk factors, causes of preterm labor, low birth weight babies, and delivery outcome were recorded. Similarly, the immediate neonatal morbidity and mortality were recorded. Both data of maternal and neonatal profile were pooled and analyzed by using proper statistical method.

**Results:** All the babies who weighed 1500g at birth were born preterm. All the mothers who were less than 40 kg in weight had delivered VLBW (<1500gms). Majority of the mother (76.5%) belong to lower & upper lower socioeconomic status according to Modified Prasad classification. 44.5% of the mothers were illiterate & 43.5% had only primary education. The morbidities found among babies were sepsis (19%), followed by jaundice (14.5%), RDS (11%), birth asphyxia (9.5%). Most common maternal risk factors were Anemia (92.5%) & improper antenatal visit (71.5%). 17 newborn (8.5%) died during their stay in hospital (within 7 days). 70.5% babies were premature. Causes of mortalities in the study were probable septicemia (50%), respiratory distress syndrome (41.6%) & birth asphyxia (8.3%).

**Conclusions:** Present study reveals that increase in gestational age was directly proportional to birth weight. Lighter the babies more the chances are of premature birth which is statistically highly significant ( $p=0.00$ ). Out of 200 LBW babies 40% were premature babies. 28.5% of mothers were booked mothers. Statistically significant correlation was found on correlating maternal demographic factor with physical parameters of baby.

**Keyword:** LBW Babies, Maternal Risk Factors, Prematurity, Sepsis.

## INTRODUCTION

Newborns are unique in their physiology and the health problems that they experience. Neonatal period is characterized by transition to extrauterine life and exquisitely rapid growth and development. This is the phase in life with the greatest risk of mortality as well as the maximum potential for long term physical and neurocognitive development. Almost half of under five child deaths occur in neonatal period and out of these neonatal deaths three-fourths occur among low birth weight newborns.

Low birth weight is one of the major clinical problems in neonatology as it is associated with perinatal mortality, serious neonatal morbidity and in some cases childhood disability. The low birth weight babies need to spend more time in NICU till they start catching growth as a normal neonate and sufficient multi-organ maturation resulting in prolonged hospital stay for both mother and infant. Therefore, the consequence of low birth often continue beyond the neonatal period and can lead to significant direct and indirect costs that have to be borne by parents and society. Mother and child must be considered as one unit. The maternal factors such as height, nutrition, anaemia, hypertension, congenital or acquired cardiovascular diseases, diabetes, antepartum haemorrhages, uterine anomalies, incompetent cervix, premature rupture of membranes, etc play major role in the neonatal mortality and morbidity. Hence, a better understanding of maternal antenatal factors contributing to low birth weight and need for improvement of health of the mother and her care during pregnancy and at child birth have profound influence on neonatal outcome and to improving the neonatal survival.

## MATERIAL & METHODS

200 mothers along with low birth weight babies who were admitted to obstetric section of Government medical college and associated group of hospitals Barmer and District Hospital & R.D. Gardi Medical College, Ujjain were taken up for study. The study was conducted from September 2021 to August 2022 over a period of 12 months with prior approval of Ethics committee. All the information related to demography, maternal factors which could affect the growth of fetus were asked according to preformed performa, Questionnaire included mother's height, weight, age, education status, socio economic status, maternal risk factors associated with low birth weight babies and their association with morbidities & mortality.

The examination of mother was done in presence of a relative / attendant / nursing staff. It included height, weight, general examination and estimation of hemoglobin and examination of baby was done & warmth was maintained. It included weight, length, head circumference, gestational age assessment & complete neonatal examination. Data thus collected was pooled in master chart & subjected to statistical analysis.

## OBSERVATIONS

A total of 200 babies weighing below 2500 gm & their mother were included in the study. Majority of the LBW babies (74%) were above 1500gms, 26% were below 1500gm out of which only 6.5% were below 1000gms. 61 % of the babies were males against 39% were female. In the present study there were 10 pairs of twins. 89.5% of mothers were from surrounding rural areas which came for institutional delivery. 20.5% of mothers were in the teenage group. The majority (76.5%) of the mothers belonged to the lower & upper lower class of Prasad's Classification. 92.5% of mothers had anaemia with haemoglobin levels varying from 6 to 11 gm%.

The majority of mothers (70%) were not attending antenatal visits properly. Only 28.5% were booked to get their delivery done at hospital (Table 1). 40% of the LBW babies were preterm & 60% IUGR. There was total 81 preterm babies in the study out of which 52 (64%) babies were less than 1500gms at birth & rest 36% were more than 1500 gms showing a direct correlation of LBW with prematurity. All the babies who weighed 1500g at birth were born

preterm. Babies born after completing 37 wks were close to 2500gms (59.5%) while with decrease in gestational age there is definite decrease in birth weight (Table2). Almost all mothers received Tetanus toxoid vaccination. Only 6% of mothers had taken supplemental calcium tablets. 60% of mothers took Iron & folic acid tablets for around one month, but none of the mothers took full course of iron & folic acid tablet as prescribed for the pregnancy.(Table 3)

There was a decrease in birth weight of the baby with decrease in age of mother. 46.5% of LBW were born to mothers were less than 20 years & 21-25 yrs (44%). It is evident from the table that Taller is the mother better is the weight of the baby. 55.7% of LBW babies were born to the mother whose height was less than 150cm as well as they also delivered higher proportion of LBW with lower weight (18% i.e 500 to1000gm - 5.5% & 1001 to 1500gm – 12.5%). 3% of mothers were below 40 kg, 82% mothers were between 40 to 50 kg, 12% were between 50-55 kg & only 3% mother were above 55 kg of weight. All the mothers who were less than 40 kg in weight had delivered VLBW (<1500gms), thereafter with increasing weight of mother there was definite increase in birth weight of the baby. The correlation between the wt of baby & mother's age, height & weight was found to be highly statistically significant. (Table 4)

76.5% of mothers belong to lower & upper lower socioeconomic status according to Modified Prasad classification. 44.5% of the mothers were illiterate & 43.5% had only primary education, 10.5% received secondary education & only 1.5% mothers were graduates (Table 5). Various morbidities found in present study among babies were sepsis (19%), jaundice (14.5%), RDS (11%), birth asphyxia (9.5%). It is evident from the table that a statistically significant relationship was found between birth weight & sepsis, jaundice & RDS (0.045, 0.12 & 0.00 respectively) (Table 6)

**Table 1: Antenatal visits of mothers**

| Antenatal Visits | Number | Percent |
|------------------|--------|---------|
| Unbooked         | 57     | 28.5    |
| Registered       | 86     | 43.0    |
| Booked           | 57     | 28.5    |
| Total            | 200    | 100.0   |

**Table 2: Correlation between gestational age & weight of the baby**

| Gestational Age |   | Birth weight |           |           | Total |
|-----------------|---|--------------|-----------|-----------|-------|
|                 |   | 500-1000     | 1001-1500 | 1501-2499 |       |
| Preterm         | n | 13           | 39        | 29        | 81    |
|                 | % | 6.5%         | 19.5%     | 14.5%     | 40.5% |
| Term            | n | 0            | 0         | 119       | 119   |
|                 | % | .0%          | .0%       | 59.5%     | 59.5% |
| Total           | n | 13           | 39        | 148       | 200   |
|                 | % | 6.5%         | 19.5%     | 74.0%     | 100%  |

**Table 3: Distribution of mothers taking supplementation**

| Taken | Calcium |     | TT  |     | Iron & Folic acid |     |
|-------|---------|-----|-----|-----|-------------------|-----|
|       | n       | %   | n   | %   | n                 | %   |
| Yes   | 12      | 6   | 194 | 97  | 93                | 60  |
| No    | 188     | 94  | 6   | 3   | 107               | 40  |
| Total | 200     | 100 | 200 | 100 | 200               | 100 |

**Table 4: Correlation between weight of baby & maternal age, height & weight**

| Gestational Age    |         | Birth weight |           |           | Total | P value |
|--------------------|---------|--------------|-----------|-----------|-------|---------|
|                    |         | 500-1000     | 1001-1500 | 1501-2499 |       |         |
|                    |         | N            | N         | N         |       |         |
| <b>Age (Years)</b> | 17-20   | 10           | 20        | 63        | 93    | 0.01    |
|                    | %       | 5%           | 10%       | 31.5%     | 46.5% |         |
|                    | 21-25   | 3            | 14        | 71        | 78    |         |
|                    | %       | 1.5%         | 7%        | 35.5%     | 44%   |         |
|                    | 26-30   | 0            | 2         | 13        | 15    |         |
|                    | %       | 0%           | 1%        | 12.5%     | 7.5%  |         |
|                    | 31-33   | 0            | 3         | 1         | 4     |         |
| %                  | 0%      | 1.5%         | .5%       | 2%        |       |         |
| <b>Height (cm)</b> | 141-145 | 1            | 5         | 11        | 17    | 0.01    |
|                    | %       | .5%          | 2.5%      | 5.5%      | 8.5%  |         |
|                    | 146-150 | 10           | 20        | 64        | 94    |         |
|                    | %       | 5%           | 10.1%     | 32.2%     | 47.3% |         |
|                    | 151-155 | 2            | 10        | 49        | 61    |         |
|                    | %       | 1%           | 5%        | 24.6%     | 30.6% |         |
|                    | 156-160 | 0            | 4         | 19        | 23    |         |
|                    | %       | 0%           | 2%        | 9.5%      | 11.5% |         |
| <b>Weight (Kg)</b> | 35-40   | 1            | 5         | 0         | 6     | 0.00    |
|                    | %       | .5%          | 2.5%      | 0%        | 3%    |         |
|                    | 41-45   | 7            | 20        | 43        | 70    |         |
|                    | %       | 3.5%         | 10%       | 21.5%     | 35%   |         |
|                    | 46-50   | 5            | 10        | 79        | 94    |         |
|                    | %       | 2.5%         | 5%        | 39.5%     | 47%   |         |
|                    | 51-55   | 0            | 3         | 21        | 24    |         |
|                    | %       | 0%           | 1.5%      | 10.5%     | 12%   |         |
|                    | 56-76   | 0            | 1         | 5         | 6     |         |
| %                  | 0%      | .5%          | 2.5%      | 3%        |       |         |

**Table 5: Correlation of weight of baby with SES & education of mother**

| Gestational Age        |            | Birth weight |           |           | Total | P value |
|------------------------|------------|--------------|-----------|-----------|-------|---------|
|                        |            | 500-1000     | 1001-1500 | 1501-2499 |       |         |
|                        |            | N            | N         | N         |       |         |
| <b>Economic Status</b> | lower      | 2            | 5         | 28        | 35    | 0.57    |
|                        | %          | 1%           | 2.5%      | 14%       | 17.5% |         |
|                        | Up lower   | 8            | 23        | 87        | 118   |         |
|                        | %          | 4%           | 11.5%     | 43.5%     | 59%   |         |
|                        | Low middle | 3            | 11        | 32        | 46    |         |
|                        | %          | 1.5%         | 5.5%      | 16%       | 23%   |         |
|                        | Up middle  | 0            | 0         | 1         | 1     |         |
| %                      | 0%         | 0%           | 0.5%      | 0.5%      |       |         |
| <b>Education</b>       | illiterate | 7            | 17        | 65        | 89    |         |

|  |           |      |      |       |       |      |
|--|-----------|------|------|-------|-------|------|
|  | %         | 3.5% | 8.5% | 32.5% | 44.5% | 0.76 |
|  | primary   | 6    | 18   | 63    | 87    |      |
|  | %         | 3%   | 9%   | 31.5% | 43.5% |      |
|  | secondary | 0    | 3    | 18    | 21    |      |
|  | %         | 0%   | 1.5% | 9%    | 10.5% |      |
|  | graduate  | 0    | 1    | 2     | 3     |      |
|  | %         | 0%   | 0.5% | 1%    | 1.5%  |      |

**Table 6: Prevalence of common morbidities in LBW newborns**

| Gestational Age |     | Birth weight |           |           | P value |      |
|-----------------|-----|--------------|-----------|-----------|---------|------|
|                 |     | 500-1000     | 1001-1500 | 1501-2499 |         |      |
|                 |     | N            | N         | N         |         |      |
| Economic Status | Yes | N            | 2         | 5         | 28      | 0.57 |
|                 |     | %            | 1%        | 2.5%      | 14%     |      |
|                 | Yes | N            | 8         | 23        | 87      |      |
|                 |     | %            | 4%        | 11.5%     | 43.5%   |      |
|                 | Yes | N            | 3         | 11        | 32      |      |
|                 |     | %            | 1.5%      | 5.5%      | 16%     |      |
|                 | Yes | N            | 0         | 0         | 1       |      |
|                 |     | %            |           |           |         |      |

**Table 7: Maternal risk factors associated with poor neonatal outcome**

| Maternal Factors                     | n   | %    | Expire | %    |
|--------------------------------------|-----|------|--------|------|
| Anemia                               | 185 | 92.5 | 17     | 9.1  |
| Improper ANC (unbooked & registered) | 143 | 71.5 | 14     | 9.7  |
| PIH                                  | 19  | 9.5  | 2      | 10.5 |
| APH                                  | 18  | 9    | 5      | 27.7 |
| Fever                                | 15  | 7.5  | 4      | 26.6 |
| Polyhydramnios                       | 15  | 7.5  | 1      | 6.6  |
| PROM                                 | 13  | 6.5  | 2      | 15.3 |
| Oligohydramnios                      | 7   | 3.5  | 1      | 14.2 |
| Convulsion (epileptic)               | 3   | 1.5  | 1      | 33.3 |
| Rashes                               | 3   | 1.5  | 0      | 0    |
| Jaundice                             | 1   | 0.5  | 0      | 0    |
| RHD                                  | 1   | 0.5  | 0      | 0    |

**Table 8: Causes of mortalities**

| Cause of mortality               | n                                      | %     |
|----------------------------------|--|-------|
| Prematurity                      | 12(Sepsis-6, RDS-5 & Birth asphyxia-1) | 70.5% |
| Birth asphyxia                   | 1                                      | 5.8%  |
| Sepsis                           | 1                                      | 5.8%  |
| MAS                              | 1                                      | 5.8%  |
| Herliquen fetus (collodian baby) | 1                                      | 5.8%  |
| ABO Incompatibility              | 1                                      | 5.8%  |
| Total                            | 17                                     | 100   |

Common maternal risk factors associated with LBW babies & adverse outcome were Anemia (92.5%) & improper antenatal visit (71.5%), PIH (9.5%) & APH (9%), fever (7.5%), polyhydramnios (7.5%), PROM (6.5%), oligohydramnios (3.5%), convulsion (1.5%), rashes (1.5%), etc. These factors are associated with poor neonatal outcome. Maternal risk factors

associated with adverse neonatal were convulsion (neonatal mortality – 33%) antepartum haemorrhage (27.7%) & fever (26.6%) respectively. There is overlapping in the morbidities found in the mother with neonatal mortality (Table 7). Out of 200 babies under study 17 (8.5%) died during their stay in hospital (within 7 days). Out of which 70.5% babies were premature & the cause of mortality in decreasing trend was probable septicemia (50%), respiratory distress syndrome (41.6%) & birth asphyxia (8.3 %) respectively which is evident from the table. It is observed from the study that 70.5% mortality was among preterm LBW as compared to 29.5% among term LBW babies. (Table 8)

## DISCUSSION

In the present study out of 200 LBW babies 40% were preterm & 60% were IUGR. Out of total preterm babies, 52(64%) babies were less than 1500gms at birth which shows lighter is the baby more the chances are of being premature. All the babies who weighed below & less 1500g at birth were born preterm in our study. “VLBW infants weigh less than 1500g & are predominantly premature”.<sup>1</sup> It is observed that with decrease in gestational age there is definite decrease in birth weight. Similarly in other studies, period of gestation has emerged as important maternal factors significantly associated with birth weight of the baby.<sup>2</sup> In present study birth weight of the baby decreases with decrease in age of mother i.e. younger the mothers (below 20 yrs) lower is the weight of babies is observed in this study. Most studies have documented a tendency of increasing birth weight with maternal age.<sup>3</sup> Various studies, over the years have consistently associated low maternal age with LBW.<sup>4</sup> The prevalence of low birth weight is high for mothers aged 19 years or less.<sup>5</sup>

In present study 55.7% of LBW babies born to the mother whose height were lesser than 150cm. “Taller is the mother better is the weight of the baby.” Similar observations were made by various authors. Maternal height of 150 cm or less is one of the strongest determinants of LBW.<sup>6</sup> The infants of the shorter women were symmetrically smaller than the infants of the taller women. All the mothers who were less than 40 kg in weight had delivered VLBW (<1500gms), thereafter with increasing weight of mother there was definite increase in birth weight of the baby as was observed in present study. Low weight and height of mother were associated with increased risk of perinatal death & LBW.<sup>7</sup> Various studies observed significant positive correlations between maternal weight and birth weight & maternal height and birth weight was observed.<sup>8,9</sup> Contrary to our study Elhassan<sup>10</sup> observed that there was no significant association between maternal socio-demographic characteristics and anthropometrics measurement and LBW.

Finding are similar to many studies done in past. Anaemia during pregnancy was found to be the commonest association in LBW and was present in 92.5% of cases. Elhassan<sup>10</sup> observed that maternal anaemia was the main risk factor for LBW. In another similar study it was found that 65% of patient of preterm labour had anaemia.<sup>11</sup> Amongst various maternal risk factors anaemia during pregnancy (32.6%) is highest in VLBW and ELBW Babies.<sup>12</sup> Anaemic women were at nine times higher risk to deliver LBW babies as observed by Kejell et al 2007.<sup>13</sup> Strong association between anaemia & low birth weight is observed by various authors.<sup>9,11,14,15</sup>

Lack of antenatal care & visit was the one of the commonest causes of LBW babies. In present study, 71.5% were not attending antenatal visits properly, 28% of mothers have never attended the ANC visit. Women who did not attend antenatal care were at six times higher risk of LBW.<sup>16</sup>

Convulsion, APH & pyrexia was found in mothers with adverse neonatal outcome whose neonatal mortality was 33, 27.7% & 26.6% respectively. Kayastha et al<sup>17</sup> observed that among the risk factor for LBW babies, spontaneous preterm labour was 61 (35.5%), intra-uterine growth restriction was 51 (29.0%), APH 10 (5.8%), twin 9 (5.2%), PIH 12 (7.0%).

Preeclampsia was the most common (24.6%) risk factor of preterm labour.<sup>17</sup> Birth weight is crucial to the survival of newborn. Birth weights have strong associations with the infant mortality thus it can serve as a proxy for infant mortality itself.<sup>12</sup>

Commonest morbidity among babies in our study is sepsis (19%), followed by jaundice (14.5%), RDS (11%), birth asphyxia (9.5%). Out of total 17 mortalities 70.5% babies were premature & the common causes of mortality are probable septicemia (50%) In another similar study Neonatal hyperbilirubinaemia (78%) and hyaline membrane disease/respiratory distress syndrome (65%) were the most common causes of morbidity. The most common immediate cause of death was respiratory failure. HMD (63%), sepsis (32%), IVH/ICH (27%), pulmonary haemorrhage (18%) and NEC (9%) were the main contributors to mortality.<sup>(11)</sup> The main causes of mortality among LBW in order of prevalence were respiratory distress syndrome (RDS) (59%), asphyxia (20%), septicemia (12%) and congenital malformation (9%).

In the present study the common causes of neonatal morbidities & mortalities were sepsis, RDS, asphyxia, neonatal hyperbilirubinaemia. These are preventable causes which should be tackled properly. Small changes can make large differences like increasing the marriageable age, improving literacy, nutritional status of mother & ANC Visits & supplementation of iron & folic acid can improve neonatal outcome & there reduce neonatal mortality.

## CONCLUSION

Out of 200 LBW babies 40% were premature & 60% were male babies. Majority 89.5% mothers were from surrounding rural area. Only 28.5% of mothers attended Antenatal visits properly. The majority of mothers (70%) were not attending antenatal visits properly. Statistically significant correlation was found on correlating maternal demographic factor with physical parameter of baby. Correlating socioeconomic status & education with baby's weight, found to be statistically insignificant. 92.5% of mothers were anemic. Common risk factors in mothers for LBW babies are anemia & improper antenatal visits. As regards mortality among LBW it is higher in the premature LBW babies. The present study revealed adverse outcomes in the form of low birth weight babies, neonatal morbidities like probable sepsis, icterus, birth asphyxia, RDS in the face of maternal under nutrition, anemia, lack of ANC visits, PIH, young maternal age, etc. There is an urgent need to address the nutritional status of mothers with imparting knowledge to mothers regarding importance of better weight of baby at birth in terms of immediate survival and long morbidity.

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