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Original Research Article

Low Birth Weight Babies and their association with Maternal Risk Factors: A hospital-based study

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Abstract:

Objectives: Weight at birth is directly influenced by general level of health status of the mother. Maternal environment is most important determinant of birth weight and risk factors that prevent the normal circulation across the placenta cause poor nutrient and oxygen supply to the fetus, restricting the growth of fetus. The present study was to evaluate the prevalence of low birth weight babies and their association with maternal risk factors.

Methods: Socio-demographic profile of the mother and her family, obstetric history of the mother especially about previous births, abortions, pre-pregnancy weight, height, weight gain during pregnancy, antenatal services obtained by the mother including antenatal visits, TT prophylaxis, Iron and Folic acid prophylaxis and presence of any systemic illness like hypertension, cardiovascular disease, chronic renal disease were recorded by using performed questionnaire. Weight gain was calculated. All the babies were weighed within one hour after birth and birth weight was measured to the nearest 10 grams using a baby weighing scale.

Results: A total of 200 neonates were studied. The prevalence of low birth weight neonates was 28%. The mean birth weight of the population was 2.79kgs. 102 were male and 98 were female babies. Mothers from rural areas ($p=0.0199$), illiterate mothers ($p=0.0005$), pregnancy induced hypertension ($p=0.0002$), irregular antenatal checkups ($p=0.0032$), oligohydramnios ($p=0.0024$) and mothers who gained less than 6kgs during pregnancy ($p<0.0001$) are the major maternal risk factors associated with low-birth-weight babies.

Conclusions: Rural mother, illiteracy, maternal PIH, irregular antenatal checkup, oligohydramnios, and weight gain less than 6 kg during pregnancy are significantly associated with low-birth-weight neonate.

Keywords: Maternal Risk Factors, Low Birth Weight Babies, Antenatal Checkup, PIH.

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Introduction

Birth weight is a good indicator of reproductive and general health status of population. It is not only about the baby's health and nutritional status but also the physical and psychological growth and development of babies and their chances of survival [1].

Weight at birth is directly influenced by general level of health status of the mother. Maternal environment is most important determinant of birth weight and factors that prevent the normal circulation across the placenta cause poor nutrient and oxygen supply to the fetus, restricting the growth of fetus. The maternal risk factors are biologically and socially interrelated, most are however modifiable. The mortality of LBW can be reduced if the maternal risk factors are detected early and managed by simple techniques. Thus, it is necessary to identify the factors prevailing in a particular area responsible for LBW. It is not essential that all factors should be present in given area. The factors vary from one area to another, depending on geographic, socioeconomic and cultural factors [2].

LBW is estimated to be 16% worldwide, 19% in least developed & developing countries and 7% in developed countries [3]. Birth weight refers to a newborn's first weight, which is often obtained shortly after birth. The World Health Organisation (WHO) defines LBW as a weight at birth of less than 2500 grams or 5.5 pounds, regardless of gestational age [4]. India has a significant burden of childhood malnutrition and death [5,6]. There is significant variation in the incidence of LBW across regions. South Asia has the highest incidence with 21-28% of LBW [7]. In India disparity has ranged from a prevalence of 10% among high socioeconomic

status to 56% in poor slum areas. Prevalence of LBW in Orissa is 40%, being the highest in India [8].

Many studies and literature describe risk factors for low birth weight, providing insight into conditions that may increase the incidence of LBW. LBW is not only associated with baseline maternal characteristics during pre-pregnancy, but also potential risk factors during pregnancy, including maternal age, education level, lifestyle, health status, and disease, where maternal age, education level, and marital status are more closely associated with LBW [9,10].

Low birth weight is a complex syndrome that includes preterm neonates (born before 37 weeks of gestation), small for gestational age neonates at term and the overlap between these two situations preterm and small for gestational age neonates, who typically have the worst outcomes. These three groups have their own subgroups, with individual components linked to different causative factors and long-term effects, and distributions across populations that depend on the prevalence of the underlying causal factors [11]. Understanding and differentiating the various categories and their subgroups is an essential first step in preventing these conditions [11]. Socioeconomic conditions, poverty, education level, violence during pregnancy, and early marriages are also an essential contributing factor for low birth weight infants. Infectious agents have the potential to penetrate through the uterus and cause inflammations in uterus and placenta [12]. Objective of the present study was to evaluate the low birth weight babies and their association with maternal risk factors at tertiary care center.

Material & Methods

The present study was conducted in the Department of Paediatrics & Neonatology, Jan Nayak Karpuri Thakur, Medical College & Hospital, Madhepura, Bihar, India during a period from January 2025 to November 2025**.**

Study Population: All healthy term newborn babies delivered in JNKTMCH, hospital, Madhepura, Bihar during the study period.

Study Design: This is a hospital-based prospective observational study.

Sample size and sample technique: A total of 200 term newborns were enrolled according to inclusion criteria.

Data collection technique and tools: All the data about maternal exposure to different risk factors were recorded using a preformed questionnaire.

The information included a socio-demographic profile of the mother and her family, obstetric history of the mother especially about previous births, abortions, pre-pregnancy weight, height, weight gain during pregnancy, antenatal services obtained by the mother including antenatal visits, TT prophylaxis, Iron and Folic acid prophylaxis and presence of any systemic illness like hypertension, cardiovascular disease, chronic renal disease.

Adequate antenatal care was considered when the pregnant women were registered at any time, had at least 3 antenatal checkups, was adequately vaccinated against tetanus, had consumed at least 100 tablets of Iron and Folic acid, was not involved in hard work, and had adequate rest during pregnancy [minimum 2 hours sleep during the day and 8 hours sleep during the night]. Weight gain was calculated by subtracting the weight of the mother at 12 weeks or before from the weight of the mother at term considering negligible weight gain up to 12 weeks of gestation. All the babies were weighed within one hour after birth and birth weight was measured to the nearest 10 grams using a baby weighing scale.

Statistical Analysis: Data was analysed with the help of IBM SPSS version 26 software. All the data was tabulated and percentages were calculated. Chi-squared test was applied. P-value was taken less than or equal to 0.05 ($p \leq 0.05$) for significant differences.

Results

A total of 200 neonates were studied during the study period. The mean birth weight of the population was 2.79kgs. Out of 200 newborns, 98 were female and 102 were male babies. Out of 200 newborns, 58 newborns were of low birth weight i.e., the prevalence of low birth weight was 28%. The prevalence of low birth weight was more in female babies 30(30.61%) when compared to male babies 26(25.49%).

Table 1: Distribution of the study population by residence.

Residence	Total no. of babies	LBW babies	NBW babies	P-value
Rural	88	32(36.36%)	56(63.64%)	0.0003
Urban	112	24(21.43%)	88(78.57%)	<0.0001
P-value		0.0199	0.0199	

The prevalence of low birth weight was more in mothers from rural areas 32(36.36%) when compared to mothers from urban areas 24 (21.43%). Which was statistically significant differenced (p=0.0199).

Table 2: Distribution of the study population by maternal education.

Maternal education	Total no. of babies	LBW babies	NBW babies	P-value
Literate	124	24(19.35%)	100(80.64%)	<0.0001
Illiterate	76	32(42.11%)	44(57.91%)	0.0522
P-value		0.0005		

The prevalence of low birth weight was more in illiterate mothers (42.11%) when compared to literate mothers (19.35%). Which was statistically significant differenced (p=0.0005).

Table 3: Distribution of the study population by maternal PIH.

PIH	Total no. of babies	LBW babies	NBW babies	P-value
Yes	28	16(57.14%)	12(42.86%)	0.2896
No	172	40(23.26%)	132(76.74%)	<0.0001
p-value		0.0002		

Prevalence of low birth weight was more in mothers who had pregnancy induced hypertension (57.14%) when compared to mothers who had normal blood pressure. (23.26%). Which was statistically significant differenced (p=0.0002).

Table 4: Distribution of the study population by primi/non-primi.

Primi/Non Primi	Total no. of babies	LBW babies	NBW babies	P-value
Primi	112	26(23.21%)	86(78.57%)	<0.0001
Non Primi	88	30(34.09%)	58(65.91%)	<0.0001
p-value		0.0897		

The prevalence of low birth weight was more in multigravida mothers (34.09%) when compared to primi mothers (23.21%). Which was not statistically significant differenced (p=0.0897).

Table 5: Distribution of the study population by ANC`S.

ANC	Total no. of babies	LBW babies	NBW babies	P-value
Regular	162	38(23.46%)	124(76.54%)	<0.0001
Irregular	38	18(47.36%)	20(52.64%)	0.6475
p-value		0.0032		

The prevalence of low birth weight was more in mothers who had irregular antenatal checkups (47.36%) when compared to mothers who had regular antenatal check-ups (23.46%). Which was statistically significant differenced (p=0.0032).

Table 6: Distribution of the study population according to parity.

Parity	Total no. of babies	LBW babies	NBW babies	P-value
First	112	23(20.53%)	89(79.46%)	<0.0001
Second	70	24(34.29%)	46(65.71%)	0.0002
Third & More	18	9(50%)	9(50%)	01.0000
p-value		0.0002		

The prevalence of low birth weight was more in mothers who had parity first (20.53%) and second 34.29%).

Table 7: Distribution of the study population by oligohydramnios.

Oligohydramnios	Total no. of babies	LBW babies	NBW babies	P-value
Yes	24	13(54.17%)	11(45.83%)	0.5675
No	176	43(24.43%)	133(75.57%)	<0.0001
p-value		0.0024		

The prevalence of low birth weight was more in mothers who had oligohydramnios (54.17%) when compared to mothers who had adequate liquor (24.43%). Which was statistically significant differenced (p=0.0024).

The mode of delivery did not show any significant effect on birth weight in our study.

Table 8: Distribution of the study population by maternal weight gain.

Weight gain	Total no. of babies	LBW babies	NBW babies	P-value
<6Kgs	26	21(80.77%)	5(19.23%)	<0.0001
>6Kgs	170	35(20.59%)	135(79.41%)	<0.0001
p-value		<0.0001		

The prevalence of low birth weight was more in mothers who gained less than 6kgs during pregnancy (80.77%) when compared to mothers who gained more than 6 kgs (20.59%). Which was highly statistically significant differenced (p<0.0001).

Discussions

The present study examined maternal risk factors associated with low birth weight (LBW) in Madhepura district of Bihar. The mothers who were delivered LBW infants (<2500 gm) and of normal birth weight infants (≥2,500 g). The analysis revealed several maternal characteristics significantly linked with LBW [13].

In the present study, a total of 200 neonates were studied. The prevalence of low birth weight was 28%. The mean birth weight of the population was 2.79 kilograms. The prevalence of low birth weight was more in female babies 30(30.61%) when compared to male babies 26(25.49%).

In a prospective hospital-based study, Raman TR, Devgan A et al newborns were studied for the incidence of low birth weight neonates and to evaluate the associated risk factors. A significant number of 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 32.7% of low birth weight babies is high enough to ring alarm bells [14].

Mondal B. did a hospital-based study on Tangsa tribe from Arunachal Pradesh on Low birth weight to the sex of baby, maternal age, and parity. The occurrence of low birth weight was 28.48% and only 4.64% of newborns weighed 2000 g or less. The mean birth weight was found to be 2806.95±39.32 g. Female babies had a significantly higher incidence of low birth weight than male babies. Parity was found to be a significant influence on the incidence of low birth weight. An increase of low birth weight babies was noticed after the 4th parity and the best outcome was also observed at this parity. The higher incidence of low birth weight was found in the 5+ parity. Young mothers (< 20 years) had also a higher incidence of low birth weight and mother's age had no significant effect on the incidence of low birth weight [15].

De Bernabé JV et al did a review and concluded that low birth weight (LBW) is one of the main predictors of infant mortality. LBW is generally associated with situations in which uterine malnutrition is produced due to alterations in placental circulation. There are many known risk factors, the most important of which are socio-economic factors, medical risks before or during gestation, and maternal lifestyles [16]. Agarwal K et al concluded that the 40.0% of mothers delivered LBW babies. They indicate that gestational age less than 37 weeks (76.5%), maternal age less than 20 years (58.5%), irregular antenatal checkup (70.5%), mother's height less than 150 cm (68.5%), mother's weight less than 50 kg (76.1%), haemoglobin less than 10 gm/dl (60.5%), severe physical work (78%), and tobacco chewing (58.5%) are significant determinants of LBW. Prevalence of LBW can be reduced by increasing the gestational age, regular antenatal checkup, balanced diet during the antenatal period, adequate rest during the antenatal period, and avoiding tobacco chewing [17].

In the present study, the prevalence of low birth weight was more in mothers who had irregular antenatal checkups (47.36%) when compared to mothers who had regular antenatal check-ups (23.46%). Which was statistically significant differenced (p=0.0032).

The impact of maternal nutritional status on birth outcomes, particularly the association with LBW babies, was a crucial aspect of maternal and child health. This finding underscores the significance of adequate maternal nutrition for optimal fetal development. Our study provides significant evidence that inadequate nutritional status among cases was strongly associated with LBW babies. A study conducted in Nepal proposed a link between poor nutritional intake and LBW. Mothers who took food less than two times had a 2 times higher chance of delivering LBW babies [18]. In another study, the nutritional status of pregnant women revealed that mothers who had experienced malnutrition during their pregnancies were more likely to give birth to underweight children [19].

Lasker JN et al assessed risk factors for low birth weight deliveries. Results of the multivariate analysis indicate key variables that contribute to LBW: in particular, racial/ethnic background and specific medical problems during pregnancy, including preeclampsia, incompetent cervix, bleeding, low BMI, and lack of adequate weight gain. Results were incorporated into training in best practices for prenatal care in the city's prenatal clinics [20].

In the present study, the prevalence of low birth weight was statistically (p=0.0005) higher in

illiterate mothers (42.11%) when compared to literate mothers (19.35%).

The impact of maternal education on birth outcomes, particularly the association between illiteracy and the occurrence of LBW, was a critical aspect of maternal risk factors. One study shows a strong correlation between maternal illiteracy and the likelihood of having a LBW baby. An Indian study conducted that shows low birth outcomes were significantly correlated with mothers' education. Illiterate mothers frequently lack optimum antenatal and nutrition, which stunts fetal growth and increases the risk of LBW and preterm birth in babies. These findings provide a body of evidence supporting the impact of maternal illiteracy on LBW [21].

Bansal P et al did a study intending to find out the prevalence of low birth weight babies among institutional deliveries and its association with socio cultural and maternal risk factors. The low birth weight (LBW) is considered a sensitive index of a nation's health and development. Socio-cultural and maternal risk factors like rest received in the afternoon during pregnancy, dietary intake, and period of gestation were found to be significantly associated with low birth weight babies. The problem of low birth weight babies can be lessened down as most of these factors can be tackled easily by providing adequate and effective antenatal care services with its maximum utilization as well as home care by emphasizing upon the education of mothers and family members, hence decreasing infant and child mortality rates [22].

Mavalankar DV et al conducted a hospital-based case-control study that showed that low maternal weight. poor obstetric history, lack of antenatal care, clinical anemia, and hypertension were significant independent risk factors for both term and preterm LBW. The short interpregnancy interval was associated with an increased risk of preterm LBW birth while primiparous women had an increased risk of term LBW. This analysis suggested that a substantial proportion of term and preterm LBW births may be averted by improving maternal nutritional status, anemia, and antenatal care [23]. Wachamo TM et al did a case-control study and found that 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 management strategies. Maternal weight during pregnancy, paternal education, previous obstetric complication, and place of antenatal follow-up were associated with low birth weight. The risk factors identified in this study are preventable. Thus, nutritional counselling, health education on the improvement of lifestyle, and early recognition and treatment of complications were the recommended interventions [24]. A matched pair case-control study was done by Mumbare SS et al on maternal risk factors associated with term low birth weight neonates. Maternal malnutrition, inadequate antenatal care, and poor weight gain during pregnancy are significant predictors for the delivery of a low birth weight neonate [25].

Rafati et al studied maternal determinants of giving birth to low-birth-weight neonates which are universally used as an indicator of health status and is an important subject of national concern and a focus of health policy. Similar studies were done by Sharma M, Mishra S et al, Poudel P et al in whom LBW is associated with a higher risk for childhood mortality and morbidity. After these studies, it was concluded that the majority of factors that lead to the delivery of LBW neonates are preventable [26,3,27]. Singh G, Anjum F et al also studied the maternal factors which adversely affect the fetus in utero and their impact on the fetus. Maternal factors like age, parity, pre-pregnancy body mass index, haemoglobin levels, bad obstetric history (history of stillbirth/neonatal death in previous pregnancies, three or more spontaneous consecutive abortions), pre-eclampsia, fetal distress, mode of deliveries were studied. It was concluded that pre-pregnancy maternal body mass index, unbooked status, pre-eclampsia, and bad obstetric history are significant maternal factors resulting in low birth weight babies. Teen-age, illiteracy, poor antenatal care, maternal anemia, and pregnancy-induced medical ailments have a strong association with low birth weight. To overcome these problems, the mother and child health care services in the country should receive special attention. Darmstadt GL et al did work on evidence-based, cost-effective A combination of universal—i.e. for all settings—outreach and family-community care at 90% coverage averts 18–37% of neonatal deaths. Most of this benefit is derived from family community care, and a greater effect is seen in settings with very high neonatal mortality. Reductions in neonatal mortality that exceed 50% can be achieved with an integrated, high-coverage program of universal outreach and family community care, consisting of 12% and 26%, respectively, of total running costs, plus universal facility-based clinical services, which make up 62% of the total cost early success in averting neonatal deaths is possible in settings with high mortality and weak health systems through outreach and family-community care, including health education to improve home care practices, to create demand for skilled care, and to improve care-seeking. Simultaneous expansion of clinical care for babies and mothers is essential to achieve the reduction in neonatal deaths needed to meet the Millennium Development Goal for child survival [28,29].

Conclusions

The present study concluded that the rural residence of mother, illiteracy, maternal PIH, irregular antenatal checkup, oligohydramnios, and weight gain less than 6 kg during pregnancy are significantly associated with low-birth-weight neonate.

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