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A retrospective study assessing the effect of maternal factors on birth weight of Newborn in a tertiary care teaching hospital at Eastern India

Saroj Kumar Tripathy[1], Nurul Islam[2], Kripasindhu Chatterjee[3],* Atanu Bhadra[4], Arindam Dasgupta[5], Sukanta Sen[6]

[1]Assistant Professor, Department of Pediatrics, AIIMS, Deoghar, Jharkhand, India
[2]Assistant Professor, Department of Pediatrics, Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, West Bengal, India
[3]Professor and Head, Department of Pediatrics, Santiniketan Medical College, Bolpur, West Bengal, India
[4]Medical Superintendent and Pediatric Consultant, ESI Hospital, Asansol, West Bengal, India
[5]Assistant Professor, Department of Microbiology, Burdwan Medical College & Hospital, Purba Bardhaman, West Bengal, India
[6]Professor& Head, Department of Pharmacology, ICARE Institute of Medical Sciences and Research, Haldia, West Bengal, India

Abstract
Background: Although neonatology has advanced a lot in last few years, low birth weight babies still put a challenge in terms of mortality and morbidity. Maternal parameters during antenatal period are directly or indirectly linked to the birth weight of a newborn. We intended to study the effect of maternal factors on birth weight from eastern part of India. **Objective:** To assess the effect of maternal factors on birth weight. **Materials and Methods:** A retrospective cross-sectional study was conducted in Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, West Bengal, from 1st July 2019 to 30th June 2020. Data were collected from the mothers who visited the pediatrics OPD with their child during the study period. **Results:** Out of 225 mothers, 76 mothers had babies with low birthweight which accounted for 33.78% of total babies in our study. Seventeen (22.37%) no. of LBW babies were born to young mothers (<20yrs of age). Proportion of LBW babies born to young mothers was higher than those born to normal age mothers (20-34yrs) which was found to be significant. Lower SES of families had more chances of LBW babies as compared to middle SES groups. Anemia was found in 191(84.89%) mothers which was significantly associated with higher risks of LBW. Only 4.76% of mothers (BMI 18.5-24.9) with adequate wt. gain had delivered LBW babies as compared to 37.42% of mothers with poor wt. gain which was significant**.** Antenatal checkup, BMI of mother in pre pregnancy period and sex of the baby was not found to influence birth weight. **Conclusion:** Young maternal age, poor socioeconomic status, anemia and poor weight gain during pregnancy were important predictors of low birth weight.
Keywords: Low birth weight (LBW), anemia, socioeconomic status.

Introduction
Babies with birth weight less than 2500gm are known as low birth weight (LBW) babies[1]. LBW babies account for 15%-20% of all births worldwide (2). Causes of LBW include prematurity and less commonly intrauterine growth restriction (IUGR). LBW babies especially extremely low birth weight (ELBW) babies have the highest risk of mortality. Because of physiological immaturity, these babies are bound to suffer from both short term and long term complications. Complications of premature/LBW babies include respiratory distress syndrome, hypothermia, hypoglycemia, infection, necrotizing enterocolitis, neonatal hyperbilirubinemia, intraventricular hemorrhage, bronchopulmonary dysplasia, and retinopathy of prematurity. With the advances in the field of neonatology, the mortality of LBW babies has reduced significantly. Although we have been able to save many preemies, still we struggle to prevent long term morbidities[2].

*Correspondence
Dr. Kripasindhu Chatterjee
Professor and Head, Department of Pediatrics, Santiniketan Medical College, Bolpur, West Bengal, India.
E-mail: kschatterjee@gmail.com

LBW is a global health challenge. WHO has put forth a target for reducing LBW babies by 50% globally. Maternal, fetal, placental, social and genetic factors are known to cause low birth weight. Maternal factors like anemia, malnutrition, poor socioeconomic status, poor weight gain in pregnancy, improper antenatal checkup are known to affect the weight of the newborn[3-6]. In developing countries like India, there is regional imbalance in the health care indices. Although an aggressive approach by National Health Mission (NHM) has been able to increase the institutional delivery with an antenatal check up still we are miles away from the western counterpart. Needless to say that an affordable, quality and approachable health care is the need of the hour to address the issues during pregnancy. Although there are studies assessing the factors affecting LBW, no study till date has been conducted in this region of India to ascertain the factors related to LBW. Data regarding maternal factors related to birth weight are patchy and sparse in city/urban areas. Therefore, we intended to study the maternal determinants of birth weight.

Objective
The objective of this study was to assess the effect of maternal factors on birth weight.

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Tripathy *et al*   International Journal of Health and Clinical Research, 2022; 5(1):273-276
www.ijhcr.com
273

Inclusion criteria
Mothers who had live births within last one year and visited to pediatric OPD during the study period

Exclusion criteria
Mothers who had babies with genetic disorder, congenital anomalies and stillbirths were excluded from the study.

Materials and Methods
A retrospective cross sectional study was conducted at Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, West Bengal, India from 1st July 2019 to 30th June 2020. Although it was located in the city, the draining population of this hospital included the patients from adjoining rural areas and urban slums. Mothers who visited the pediatric OPD with their babies were enrolled in this study within the study period. To avoid recall bias, only mothers who had delivered baby in last 1 year were included in this study. Details of maternal factors, antenatal problems were recorded in a pre-designated case record form. Ethical clearance was taken from the institutional ethical committee. Appropriate consent was taken from the mother before inclusion in the study. Details of past records of mother during the antenatal period were verified.

Age of mother at conception, anthropometry of mother (weight, height, BMI) and weight gain during pregnancy were recorded. Socioeconomic status (SES) of family was decided based on education, occupation and income. SES of family was categorized into upper, upper middle, lower middle and lower class based on modified Kuppuswamy scale [7]. Anemia in pregnancy was defined as he ogle in < 11 gram/dl. Number of antenatal visits including antenatal USG was recorded. Data regarding maternal complications like diabetes, ante-partum hemorrhage, hypertension, anemia, prolonged labour, premature rupture of membrane and fatal distress if any were obtained. Type of delivery, birth weight of baby and sex of the baby was noted. Data collected were recorded in Microsoft excel. Data collected were analyzed by an appropriate statistical test. Comparison of two sets of data was done by chi square and Fischers' exact test. P value < 0.05 was considered significant.

Results
Two hundred and eighty four mothers were enrolled in this study. Fifty-nine participants who did not meet the inclusion criteria or had incorrect/incomplete details were excluded from the study. A total two hundred and twenty five (225) mothers were taken into account for analysis. Out of 225 mothers, 76 mothers had babies with low birth weight. LBW accounted for 33.78% of total babies in our study. Seventeen (22.37%) no. of LBW babies were born to young mothers (<20yrs of age) whereas only 11(07.38%) of normal birth weight babies were from young mothers. The Proportion of LBW babies born to young mothers was higher than those born to normal age mothers (20-34yrs) which was found to be significant (p value<0.05). Seventy four (35.92%) no. of Hindu mothers had LBW babies as compared to 2 (10.53%) no. of Muslim mothers which was significant. In our study all participants were either from lower or middle socioeconomic classes. Forty six (60.53%) no. of LBW babies belonged to lower SES groups (IV, V) whereas 30(39.47%) LBW babies belonged to Middle SES groups (III, IV). Lower SES of families had more chances of LBW babies as compared to middle SES groups. Anemia was found in 191 mothers who accounted for 84.89% of the total study population. Although anemia was present in both sub groups, it was significantly associated with higher risks of LBW. Adequate antenatal check-up (≥ 4) was done by 140 (62.22%) mothers. Adequate antenatal check-up and USG were not significantly associated with the increase risk of LBW babies. Only 15 (6.67%) mothers were underweight, and 18(8.00%) mothers were overweight. BMI did not have any impact on the incidence of LBW babies. Antenatal complications were observed in 49(21.78%) of mothers. Fetal distress and premature prolonged rupture of membranes were associated with a higher risk of LBW babies. Eighty (35.55%) no. of babies were delivered by NVD. There was no significant difference in the incidence of LBW between NVD and LSCS. Similarly, sex of the baby didn't have any effect on the birth weight of the baby. Weight gain during pregnancy in normal BMI mothers was found to have a positive impact on birth weight of the baby. Only 4.76% of mothers (BMI 18.5-24.9) with adequate wt. gain had delivered LBW babies as compared to 37.42% of mothers with poor weight gain which was statistically significant. Results of various parameters affecting the birth weight are summarized in Table 1 and Table 2.

Table 1: Maternal and fetal variables in relation to birth weight

Parameter		LBW n= 76(%)	Normal Birth weight n=149 (%)	P value
Age of Mother	< 20 yrs	17(22.37)	11(07.38)	0.0023#
	20-34 yrs	59(77.63)	138(92.62)	
	≥35 yrs	0	0	
Religion	Hindu	74(97.37)	132(88.59)	0.024#
	Muslim	2(02.63)	17(11.41)	
Socioeconomic Status of family	Lower(IV&V)	46(60.53)	62(41.61)	0.0077#
	Middle(II&III)	30(39.47)	87(58.39)	
	Upper(I)	0	0	
Anemia	Hb< 11gm/dl	73(96.05)	118(79.19)	0.0006#
	Hb>11gm/dl	3(03.95)	31(20.81)	
Antenatal Check up	< 4	35(46.05)	50(33.56)	0.0812
	≥4	41(53.95)	99(66.44)	
Antenatal USG	< 3	74(97.37)	143(95.97)	0.7201
	≥3	20(02.63)	6(04.03)	
BMI	< 18.5	5(06.59)	10(06.72)	0.998
	18.5- 24.9	65(85.52)	127(85.23)	
	> 25	6(07.89)	12(08.05)	
Antenatal complications	PPROM	7(09.21)	4(02.68)	0.023#
	HTN	5(06.57)	19(12.75)	
	APH	1(01.31)	1(0.67)	
	Fetal Distress	8(10.52)	4(02.68)	
Type of delivery	NVD	48(63.16)	97(65.10)	0.77
	LSCS	28(36.84)	52(34.90)	
Sex of baby	Male	40(52.63)	76(51.01)	0.888
	Female	36(47.37)	73(48.99)	

Tripathy *et al*   International Journal of Health and Clinical Research, 2022; 5(1):273-276
www.ijhcr.com
274

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significant, LBW: Low birth weight, BMI: Body mass index

Table 2: Weight gain during pregnancy and birth weight

BMI	Weight gain in Pregnancy (kg)	LBW N=76(%)	Normal Birth Weight N=149(%)	P value
<18.5 (Underweight)	<12.5	5(06.58)	9(06.05)	1
	≥12.5	0(0.00)	1(0.67)	
18.5-24.9 (Normal)	<11.5	64(84.21)	107(71.81)	0.0025
	≥11.5	1(01.32)	20(13.42)	
25-29.9 (Overweight)	<7	0(0.00)	0(0.00)	1
	≥7	6(07.89)	12(08.05)	

Discussion

The incidence of LBW babies was 33.78% in our study which is higher than the national average. As per NFHS 4 data, 18% of babies in our country are low birth weight[8]. Although incidence of LBW has decreased from 22% as per NFHS 3(2005-2006), still we are way behind in reducing the LBW burden. On the other hand, estimates of LBW were derived from 3/4th of the actual births that have been on record which implies that the real incidence could be possibly higher than the present one. Similar studies from different parts of India found the overall incidence of LBW to be 15-25% and more than 30% in the rural belt[9-11]. Incidence of LBW in our study was high because majority of the study population were from the adjoining rural areas.The age of the mother is an important factor affecting the birth weight. Teenage mothers have a high risk of producing LBW baby. Possible reasons for this could be linked to lack of education, experience and awareness regarding pregnancy. In our study young mothers (<20 yrs) had high risk of delivering LBW babies, and similar findings were also observed in other studies[12, 13]. We didn't have any mother more than 35 yrs of age. In our study, majority of study population were Hindus and rest were Muslims. Proportion of LBW was more commonly noted in Hindus which were statistically significant. Higher proportion of LBW babies were found in other studies however it was not found to be statistically significant[12, 13]. Lower incidence of LBW in Muslims in our study could have been attributed to less number of study subjects along with variable socioeconomic profiles. Socioeconomic status of family is an important predictor of birthweight because it directly or indirectly influences the other maternal parameters. All the study participants of our study were either from the lower or middle socioeconomic classes. LBW incidence was higher in mothers belonging to families of lower socioeconomic classes. Studies across different parts of India and the world depict the similar picture[14, 15]. Prevalence of anemia is very high in developing countries like India as suggested by many studies including ours. A very clear picture of anemia associated with LBW was observed in our study. A study by A Patel et al from rural Maharashtra found that anemia any time in pregnancy was significantly associated with low birth weight[16]. Antenatal checkup and antenatal USG did not have any impact on birth weight in our study. Low pre pregnancy BMI, a marker of malnutrition is known to cause poor growth of the fetus and LBW[17]. Only 21.77% of all mothers had antenatal complications in our study. Important complications like premature rupture of membrane and fetal distress were more commonly associated with low birth weight. Since these complications threaten the life of the fetus, emergency delivery was done for the survival of fetus. It might be the reason for prematurity and low birth weight in this situation. There was no significant difference in birth weight between normal vaginal delivery and LSCS. Female sex predilection for LBW was found in many studies where as it was not significant in other studies[15, 18, 19]. We did not find any significant difference in the percentage of LBW in either of the sex. Eighty five percentages of mothers in our study had normal pre pregnancy BMI. Incidence of LBW was higher in this subgroup of mothers who had poor weight gain during pregnancy. Poor weight gain in pregnancy has a direct relationship with the growth of the fetus. Therefore, it is essential to have a routine checkup at regular interval throughout the pregnancy.

Conclusion

Undoubtedly low birth weight is a global challenge, and preventing it is of utmost importance. Young maternal age, poor socioeconomic status, anemia and poor weight gain during pregnancy are important predictors of low birth weight. Nonetheless, the result of this study should prompt a rethink and review of the strategic changes needed to address the issues for the poor residing in the urban areas. A holistic approach including education, health promotion, prevention and timely care is required for a favorable result. More high-quality research is needed to ascertain the cause of low birth weight and measures for its prevention.

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Tripathy *et al*   International Journal of Health and Clinical Research*, *2022; 5(1):273-276
www.ijhcr.com
275

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