

## MATERNAL FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT (LBW) BABIES IN A GOVT. MEDICAL COLLEGE IN KOLKATA

Kuntal Gupta<sup>1</sup>, Dr. Maitreyee Banerjee (Mukherjee)<sup>\*2</sup>, Dr. Sanjoy Kr. Bhattacharyya<sup>3</sup> and Ms. Anindita De<sup>4</sup>

<sup>1</sup>Assistant Professor, Dept. of Physiology, Hooghly Mohsin College, Chinsurah, Hooghly.

<sup>2</sup>Assistant Professor, Dept. of Physiology, Krishnagar Govt. College, Krishnagar, Nadia.

<sup>3</sup>Assistant Professor, Dept. of Obstetrics and Gynaecology, R.G. Kar Medical College and Hospital.

<sup>4</sup>Ex- PG Student, Dept. of Physiology, Hooghly Mohsin College, Chinsurah, Hooghly.

**\*Corresponding Author:** Dr. Maitreyee Banerjee (Mukherjee)

Assistant Professor, Dept. of Physiology, Krishnagar Govt. College, Krishnagar, Nadia.

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### ABSTRACT

A live born infant having birth weight of less than 2.5 kg regardless of gestational age is defined as Low Birth Weight (LBW) baby. The birth weight of a baby may be influenced by several factors. The present study has been undertaken to assess the association between the birth weight of babies born in a government hospital in Kolkata and other maternal factors including the SES of her family. Women who delivered between the month of May and June 2018 and are willing to participate in the study were included as the subject. Anthropometric and socioeconomic data were recorded. Birth weight of the baby was obtained from the hospital data including the number of LBW babies. 46% of the babies were found to be suffering from LBW condition and is higher than the earlier studies. Maternal factors which are found to be significantly correlated to the birth were BMI, gestation period and SES of her family. The waist hip ratio of the mother was found to be correlated significantly with the number of babies she already has. Thus, it can be concluded from the present study that proper education and provision of essential nutrient are essential for giving birth of a healthy baby.

**KEYWORDS:** Low birth weight, socioeconomic status, BMI, waist hip ratio, Gestation period

### INTRODUCTION

The period of intrauterine growth and development is one of the most vulnerable periods in the human life cycle. The weight of the infant at birth is a powerful predictor of infant growth and survival. The weight of the newborn obtained after birth is taken as birth weight and it is measured preferably within the first hour of life (UNICEF 2004).<sup>[1]</sup> Birth weight is governed by two major processes: duration of gestation and intrauterine growth rate. LBW is thus caused by either a short gestation period or retarded intrauterine growth (or a combination of both). In the developing countries, the majority (93%) of LBW infants are born small at term (>37 week of gestation) because of intrauterine growth retardation (IUGR) and only 7 % born prematurely (because of lower gestational age). The average birth weight of a newborn infant in the developed countries is about 3.3 to 3.5 kg while in the developing countries it is only 2.5 to 3.1 Kg<sup>2</sup>. A live born infant having birth weight of less than 2.5 kg regardless of gestational age is defined as Low Birth Weight (LBW) baby. There are subcategories of LBW, which include very low birth weight (VLBW), and extremely low birth weight (ELBW) where the birth weights are <1500 and <1000 g respectively.<sup>[3]</sup> The LBW of a baby may be due to

mothers' health condition, illness and complication during pregnancy.<sup>[4,5]</sup> Joshi et al. in 2005<sup>[6]</sup> showed that maternal education, occupation, and per capita income of the family were significantly correlated with birth-weight of the new born in Allahabad. Several factors determining the occurrence of LBW babies have been indicated from different studies.<sup>[7,8,9]</sup> The determinants of LBW as per a study carried out in Karnataka were age of the mother, literacy rate, weight gain during pregnancy, day time rest during pregnancy, birth interval and hemoglobin level of the mother at the time of delivery. The average birth weight of babies is not only low in Kolkata than that of other regions<sup>[10,11,12,13,14]</sup> but the prevalence of LBW is also higher in Kolkata.<sup>[11]</sup> Bisai et al. (2006)<sup>[11]</sup> found that the mean birth weight of babies in a Kolkata hospital was 2.6 kg and the prevalence of LBW was 36.5 percent. It was also noted in this study that the occurrence of LBW was related to the first parity of birth and younger age of mother. It appears from the previous studies that the birth weight of babies is associated with several factors such as height, weight gain during pregnancy, SES of the family, mothers' age and parity of birth.

BMI of the mother is also associated with infant birth weight. The birth weight was increased with both growing maternal pre-pregnant BMI and maternal weight gain during the 30 weeks of pregnancy. Both pre-pregnancy BMI and gestational weight gain are associated with the offspring of pregnancy. Several studies have demonstrated a relation between high maternal BMI and large offspring and also a consistent association was seen between weight gain and birth weight. Low mother's BMI in early pregnancy increased the intrauterine growth retardation (IUGR) and preterm delivery. One study<sup>[15]</sup> in India concluded that BMI less than 18.5, short stature are significant predictors of low birth weight. Low BMI had 49% higher odds of having low birth rate. Low maternal BMI is a marker for Marginal tissue nutrient reserves and a predictor of protein energy malnutrition which may affect fetal growth. Nikita Y Bharpoda et al (2016)<sup>[16]</sup> in India studied that BMI is associated with birth weight. Low BMI causes low birth weight, this is due to under nourishment of genetic pre-deposition, underweight mothers are associated with increased risk of low birth weight.

Socio-economic status (SES) is one of the most important factors having profound effect on body size and weight of newborns. A strong association between IUGR and SES has been documented. Rebacca Garcia et al (2017)<sup>[17]</sup> concluded that in southern Asian continents like India, Pakistan, Bangladesh, people with poor nutrients in the villages tend to have low BMI so they give birth the babies with lower weight. Som et al (2004)<sup>[18]</sup> in Madhya Pradesh, India found that in Sagar town peoples' economic condition is generally far below the poverty line. Women abstain from hospital delivery and birth weight of these babies are very low as they used to unfed.

The waist-hip ratio or waist-to-hip ratio (WHR) is the ratio of the circumference of the waist to that of the hips. This is calculated as waist measurement divided by hip measurement. The common finding of an independent effect of pregnancy BMI on BW may be largely attributable to maternal WHR. Women with increased WHR are well fed state and other nutrition status are well enough so they increased BW and the number of babies is increased as the mother is nutritionally well. WHR is a reliable marker not only of a woman reproductive potential but also of the number of offspring she has birthed.

With all these so many interplaying maternal factors in the development of LBW in new born babies, the present study was undertaken in a Govt. Hospital in Kolkata with the following objectives

1. To evaluate the nutritional status of the subjects accordingly to their BMI.
2. To determine the socio-economic status of the subjects.
3. To estimate the prevalence of low birth weight babies.

4. To estimate the correlation between birth weight and other factors of the mother.

## MATERIALS AND METHODS

### Study Subjects

The present study was conducted during the months of May and June 2018 in the Dept. of Obstetrics and Gynaecology, R.G. Kar Medical College and Hospital. 115 Mothers of new born babies admitted in the maternity ward of the hospital were included as the subjects in the present study. The required permission from the Institutional Ethical Committee was obtained prior to the study. The purpose of the study was explained to the participants in their mother tongue with the assurance that the identity of the participants will not be disclosed. Only interested participants with no gynaecological complications and babies without any congenital abnormalities were included, while unwilling mothers and those with clinical complications and sick new born babies were excluded from the study.

They were invited to answer the question which deal with information such as age, educational status, monthly family income, height, weight, waist-hip ratio, mid arm circumference etc.

### Instruments

1. Anthropometric rod: For Height
2. Omron® HBF 375 Karada Scan Complete Digital Body Composition Monitor For weight, fat, subcutaneous fat, skeletal fat, visceral fat resting metabolic rate
3. **Measuring tape-** subject's waist-hip ratio, mid arm circumference was measured by using measuring tape.
4. **Socio-economic measurement:** Kuppuswami's scale- The socio-economic status of mothers was measured by Kuppuswami's socio-economic scale<sup>[19]</sup> (Ravi Kumar et al. 2013).
5. **General information questionnaire:** Other information of the subjects and her family like address, total no. of family member, monthly income, educational qualification was obtained using general questionnaire.
6. **Hospital records:** Other relevant information about the mother and her new born baby like haemoglobin, blood sugar, gender, gestation period, date of birth of the baby, age of mother, birth weight of the baby, number of pregnancies were obtained from hospital records.
7. Statistical Software used: Minitab® Statistical Software (v 14.0)

## RESULTS

A total 115 subjects were taken and result was made upon them by 3 main observing factors, anthropometric data, socio economic status, BMI, Gestation period, waist hip ratio and number of babies.

Table 1 shows the anthropometric and other Variables of the mother and baby as mean, standard error mean (SEM) and standard deviation (SD). The mean age, height, weight, MAC were found to be 21yrs, 158 Cm, 51.6 kg and 24.1 cm respectively. The mean birth weight of the babies was found to be 2.43 Kg, the mean gestation period were 37 weeks.

**Table 1: Descriptive Statistics of the Anthropometric and Other Variables.**

Variable	Mean	SEM	SD
Age (yr.)	21.919	0.748	4.548
H (cm)	158.61	8.22	50.02
W (kg)	51.68	1.71	10.43
MAC (cm)	24.122	0.543	3.303
BW of baby (Kg)	2.4348	0.0885	0.5383
Gestation period (days)	37.216	0.418	2.54

Table 2 describes the distribution of socio-economic classes. They are divided into lower middle class and upper lower class. The lower middle class 58.6% and the upper lower class are 43.2% among total 100% of the subject studied in the project.

**Table 2: Distributions of the Socioeconomic (SES) Classes.**

SES classes	N (%)
Lower Middle	65 (56.8)
Upper Lower	50 (43.2)
Total	115 (100)

Table 3 shows the distribution of new born babies according to their birth weight. Birth weight are categorized into very low birth weight, low birth weight, normal birth weight. Very low birth weight constitutes only 2.7% where low birth weight contains little higher

as 43.2% and the normal birth weight is 54.1% among the total 100% of the subject studied in the project. Hence in the present study the prevalence of LBW is 46%.

**Table 3: Distribution of the new born babies according to their birth weight.**

Categories of Birth Weight	N (%)
Very Low Birth Weight	3 (3)
Low Birth Weight	50 (43)
Normal Birth Weight	62 (54)
Total	115 (100)

In table 4 the distribution of subjects was made according to BMI categories. BMI are categorized into underweight normal over weight and obese class 1. About 21.6% subjects were found underweight, the percentage of normal subject are 40.5, 32.4% subject are found over weight and only 5.4% subject fall in obese class 1 category, out of total 100% of the subject.

**Table 4: Distribution of subjects according to BMI categories.**

BMI categories	N (%)
Underweight	25 (21.6)
Normal	47 (40.5)
Overweight	37 (32.4)
Obese (class I)	6 (5.4)
Total	115 (100)

Table 5 stated Pearson Correlation among various maternal factors like BMI gestation period and socioeconomic status with the birth weight of the baby. Level of significant was taken and denoted as P-value with the birth weight in co-relation with the above three factors. BMI of mother, gestation period and SES of the family were found to be significantly correlated with birth weight of the baby.

**Table 5: Pearson Correlation coefficients among various maternal factors and birth weight of baby.**

	BMI	Gestation Period	Socioeconomic status
Birth Weight	0.423	0.710	0.322
P-Value	<0.01	< 0.001	<0.05

Significant correlation was also found between the WHR of the mother and the no. of babies and is shown in table 6.

**Table 6: Pearson Correlation among mothers' waist hip ratio and number of babies.**

	Number of babies
Waist hip ratio	0.929
P-Value	< 0.001

## DISCUSSION

The prevalence of the LBW babies in the present study was found to be 46 percent in the observed population. Lower prevalence was observed earlier in Kolkata,<sup>[11]</sup> in Agra,<sup>[20]</sup> Nashik,<sup>[21]</sup> Assam,<sup>[10]</sup> Bhopal<sup>[22]</sup> and Manipur.<sup>[14]</sup>

Earlier studies found that gestation period, body mass index (BMI), socio economic status (SES) and waist hip ratio (WHR) have direct influence on birth weight of the baby. Dooley & Praise<sup>[23]</sup> reported a decreasing birth weight of infants born to woman who shifted from adequate employment to under employment during pregnancy. Catalano et al<sup>[24]</sup> found increased risk of very LBW infants among parents where father was unemployed. In the present study we found SES of the mother was found significantly correlated with birth weight of the baby.

As the nutritional status is influenced by SES, it is obvious that the SES will be a determinant of the birth weight of babies. In the present study the SES class of the mother was also found to be associated with the birth weight of the new born. This is evident from the fact that higher numbers of low birth weight babies were found in the lower socio-economic class than that in the upper class. Such association of SES class and the birth weight of the new born were also found at Nasik<sup>[12]</sup> and Orissa<sup>[25]</sup> where lower numbers of LBW babies were found in the upper SES classes. In the present study maternal BMI was found to be significantly correlated with the birth weight of newborn. Spada et al<sup>[26]</sup> found that Maternal height and BMI, although not age, significantly affected birth weight in a multicenter study. However, in a study at Bangladesh<sup>[27]</sup> maternal BMI during 6-14 weeks of pregnancy was not found to be related to incidence of LBW. Recently a study in Lahore, Pakistan concluded that direct relationship exists between maternal BMI and neonatal birth weight.<sup>[28]</sup> In the present study, the maternal WHR was found to be significantly correlated to the number of babies she already gave birth to, in other word, her reproductive success. Judith. E. Brown et al in 2000<sup>[29]</sup> showed that WHR is related to fetal growth and that the effect of WHR on fetal growth may be mediated by metabolic alterations associated with a preponderance of central body fat stores or to other factors closely aligned with WHR. M. Butovskaya et al (2017)<sup>[30]</sup> found that the number of children significantly and positively predicted women WHR across several non-industrial populations.

## CONCLUSION

In the present study, it may be concluded that with an increase of socio- economic status, BMI and gestation period the birth weight of the newborn may be improved. Another factor which came under light is that with increase in waist hip ratio (WHR) the number of Babies also increases. Lack of Maternal Education in rural areas tends to cause high chances of birth risks as they do not meet with proper balanced diet and due to fluctuation in

BMI there stays a high chance of unhealthy baby. Hence proper education and provision of essential nutrients are essential for giving birth of a healthy baby

## LIMITATIONS

The present study has several limitations, these are

1. The number of the subjects is low and must be increased in future to obtain reliable results.
2. Due to infrastructure and time limit no information about the dietary intake of the mothers could be obtained.
3. Data are obtained from the hospital records and any mistake in the record kept, is thus should be avoided.
4. Due to shortage of time, each mother was interviewed for a brief period of time and more time is needed to get more detailed information.

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## REFERENCES

1. UNICEF Low Birth Weight: *Country, Regional and Global Estimates*. New York: UNICEF, 2004.
2. Mahmood AR, Haque GMS, Parvin T, Karim SR, Osman K, Ferdousi SK. Birth weight status of the new born babies born at Dhaka Medical College Hospital. TAJ, 2004; 17(2): 95-98.
3. Janaswamy VS, Kodandapani Y, Lathasree P. Mortality and morbidity profile of low birth weight babies at a tertiary care hospital. IOSR J Dent and Med Sci, 2016; 15(3): 1-7.
4. Kabir Z. Low birth weight and mortality: A future marriage of convenience. Ind Pediatr, 2002; 39: 1063-1064.
5. Rafati S, Borna H, Akhavirad M, Fallah N. Maternal determinants of giving birth to low birth weight neonates. Arch Iranian Med, 2005; 8(4): 277-281.
6. Joshi HS, Subba SH, Dabral SB, Dwivedi S, Kumar D, Singh S. Risk factor associated with low birth weight in newborns. Ind J Comm Med, 2005; 30(4): 10-12.
7. Rajashree K, Prashanth HL, Revathy R. Study on the factors associated with low birth weight among newborns delivered in a tertiary-care hospital, Shimoga, Karnataka. Int J Med Sci and Public Health, 2015; 4(9): 1287-1290.
8. Hosain M, Chatterjee N, Begum A, Saha SC. Factors associated with low birth weight in rural Bangladesh. J Trop Pediatr, 2005; 52(2): 87-91.
9. Dalal A, Chauhan S, Bala DV. Epidemiological determinants of low birth weight in Ahmedabad

- city: A facility-based case control study. *Int J Med Sciand Pub Health*, 2014; 3(4): 430-432.
10. Sengupta S, Barua M. Maternal bio-social factors affecting birth weight in Ahoms of Assam. *J Hum Ecol*, 2002; 13(4): 333-334.
  11. Bisai S, Sen A, Mahalanabis D, Datta N, Bose K. The effect of maternal age and parity on birth weight among Bengalese of Kolkata, India. *Hum Ecol*, 2006; 14: 139-143.
  12. Ashtekar SV, Kulkarni MB, Sadavarte VS, Ashtekar RS. Analysis of birth weights of a rural hospital. *Ind J Comm Med*, 2010; 35(2): 252-255.
  13. Joharpurkar M, Sharma R. Effect of maternal hemoglobin and weight gain on birth weight of new born. *Int J Biosci, Agri and Tech*, 2015; 6: 303-306.
  14. Ngaithianven E, Pathak RK. Maternal age, parity and birth weight in Manipur. *Hum Biol Rev*, 2015; 4(4): 347-354.
  15. Kader M, Perera NK. Socio-economic and nutritional determinants of low birth weight in India. *N Am J Med Sci*, 2014; 6(7): 302-8.
  16. Bharpoda NY, Leuva BR, Patel U, Patel SG, Srikrant, Kothari A. Study of the effect of maternal BMI on perinatal outcome. *Int Arch Int Med*, 2016; 3(2): 74-78.
  17. Garcia R, Ali N, Guppy A, Griffiths M, Randhawa G. Differences in the pregnancy gestation period and mean birth weights in infants born to Indian, Pakistani, Bangladeshi and white British mothers in Luton, UK: a retrospective analysis of routinely collected data. *BMJ Open*, 2017; 7(8): 017139.
  18. Som S Jr, Pal M, Adak DK, Gharami AK, Bharati S, Bharati P. Effect of socio-economic and biological variables on birth weight in Madhya Pradesh. *Malays J Nutr*, 2004; 10(2): 159-71.
  19. Ravi Kumar BP, Dudala SR, Rao AR. Kuppuswamy's socio-economic status scale – a revision of economic parameter for 2012. *Int J Res and Dev Health*, 2013; 1(1): 2-4.
  20. Kaushal SK, Misra SK, Gupta SC, Singh R. A hospital study of maternal factors and birth weight in a border district of Uttar Pradesh: A hospital based study. *Indian J Comm Health*, 2012; 24(2): 86-90.
  21. Mumbare SS, Maindarker G, Darade R, Yenge S, Tolani MK, Patole K. Maternal risk factors associated with term low birth weight neonates: A matched pair case control study. *Ind Pediatr*, 2012; 49: 25-28.
  22. Joshi SM, Likhar SK, Athavale AV, Shukla US. Factors affecting birth weight: A study in a secondary level hospital in gas affected area of Bhopal. *Natl J Community Med*, 2013; 4(4): 570-573.
  23. Dooley D, Prause J. Birth Weight and Mothers' Adverse Employment Change. *Journal of Health and Social Behavior*, 2005; 46(2): 141-155.
  24. Catalano R, Hansen HT, Hartig T. The ecological effect of unemployment on the incidence of very low birthweight in Norway and Sweden. *J Health Soc Behav*, 1999; 40(4): 422-8.
  25. Suryawanshi JV, Kaveri SB. Low birth weight – a hospital-based case control study. *J Biomed and Pharma Res*, 2015; 4(1): 46-52.
  26. Spada E, Chiossi G, Coscia A, Monari F, Facchinetti F. Effect of maternal age, height, BMI and ethnicity on birth weight: an Italian multicenter study. *J Perinat Med*, 2018; 46(9): 1016-1021.
  27. Bhowmik B, Siddique T, Majumder A, Mdala I, Hossain IA, Hassan Z, Jahan I, Moreira NCDV, Alim A, Basit A, Hitman GA, Khan AKA, Hussain A. Maternal BMI and nutritional status in early pregnancy and its impact on neonatal outcomes at birth in Bangladesh. *BMC Pregnancy Childbirth*, 2019; 19(1): 413.
  28. Gul R, Iqbal S, Anwar Z, Ahdi SG, Ali SH, Pirzada S. Pre-pregnancy maternal BMI as predictor of neonatal birth weight. *PLoS One*. 2020; 15(10): 0240748.
  29. Brown JE, Potter JD, Jacobs DR Jr, Kopher RA, Rourke MJ, Barosso GM, Hannan PJ, Schmid LA. Maternal waist-to-hip ratio as a predictor of newborn size: Results of the Diana Project. *Epidemiology*, 1996; 7(1): 62-6.
  30. Butovskaya M, Sorokowska A, Karwowski M, Sabiniewicz A, Fedenok J, Dronova D, Negashewa M, Selivanova E, Sorokowski P. Waist-to-hip ratio, body-mass index, age and number of children in seven traditional societies. *Sci Rep*, 2017; 7(1): 1622.