

Determinants of Birth Weight of Newborn In A Tertiary Hospital In Assam.

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Abstract: Introduction: The birth weight of an infant is a reliable index of intrauterine growth and also a sensitive predictor of newborn's chances of survival, growth and long term physical and psychosocial development. Also it is a valuable indicator of maternal health, nutrition and quality of life. LBW is closely associated with fetal and perinatal mortality and morbidity. The various risk factors related with term low birth weight neonates have been a subject of various studies in India. The present study was undertaken to understand the various maternal determinants which influence the birth weight of newborn in this part of country. **Materials and Methods:** A hospital based cross sectional study was done over a period of one year. 400 term neonates were selected randomly, out of them 165 were LBW and 235 were NBW. Various maternal characteristics including parity, inter pregnancy interval, PIH and GDM were noted. Data was analysed using Graph pad InStat software. P value < 0.05 was considered to be significant. **Results:** Out of total 400 term neonates studied, 165 were LBW and remaining 235 were NBW. Maternal factors found significantly associated with term low birth weight babies was inter pregnancy interval and PIH. **Conclusion:** Almost all the identified factors in our study are modifiable and thus preventable. Integrated approach incorporating medical, social, economical and educational measures to improve the overall health status of the women are needed to reduce the problem of LBW in India

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I. Introduction

*Children's health is tomorrow's wealth or healthy child is the wealth of our nation" is one of the WHO slogans. We will get a healthy child when the mother is healthy; health of the child is closely related to mother's health.*¹

LBW is the major risk factor for infant morbidity and mortality, (36% of all mortality in children <5 yrs of age), constituting about 4 million deaths per year.² Hence low birth weight is considered as a sensitive index of nation's health and development. "Low birth weight is a prospective marker of future growth and development..... and a retrospective marker of mothers nutritional and health status".³ A healthy mother delivers a healthy baby, and a malnourished mother contributes to LBW baby. Reducing the incidence of low birth weight is one of the most serious challenges in maternal and child health in developing countries.

Low birth weight (LBW) has been defined by World Health Organization (WHO) as weight at birth of less than 2.5kg irrespective of the gestational age.⁴ World health organisation estimates that globally, out of 139 million live births, more than 20 million low birth weight babies are born each year, consisting 15.5% of all live births, nearly 95.6% of them in developing countries. The level of low birthweight in developing countries (16.5 percent) is more than double the level in developed regions (7 percent).⁵ One of the highest occurrence of LBW is in India. South Asia has the highest prevalence of LBW. In fact the latest projections indicate that more than half of world's LBW babies are born in South Asia.⁶ Infants who weigh less than 2.5kg at birth represent about 28% of all live births in India and more than half of these are born at term. Various maternal factors leading to LBW among newborns in developing countries include low socio economic status, under nutrition, anaemia, chronic illness and inadequate prenatal care.⁷ Other factors such as teenage pregnancies,⁸ short inter-pregnancy interval,⁹ previous IUGR births¹⁰⁻¹¹ and multiparity¹² are also encountered more frequently. Similarly hypoxemic conditions due to respiratory and cardiac diseases are also associated with LBW.¹²⁻¹⁴ Reducing the incidence of low birth weight is one of the most serious challenges in maternal and child health in developing countries. Therefore, studies on antenatal characteristics of pregnant woman affecting birth weight of newborn is highly demanding to solve the current issue among institutional deliveries so that suitable recommendations can be made to prevent LBW.

OBJECTIVES: The present study has been undertaken with the following aim and objective

- To study various determinants of birth weight of newborn.

II. Materials And Methods

A hospital based cross sectional study was undertaken over a period of one year in Neonatal Intensive Care Unit (NICU), Gauhati Medical College and Hospital (GMCH) , Guwahati. Sample size was calculated using the formula $4pq/L^2$ (where P = prevalence of the disease, Q =100-p, L = allowable error). Considering p = 28% in India 18% allowable error, sample size comes out as 318. Minimum sample size was 318. We have taken 400 as the sample size. Babies delivered in our hospital during the study period, inborn babies and their mothers, singleton live births with birth weight < 2.5 kg and gestational age between 37 (completed)-41 weeks (Exact date of amenorrhoea was known, to calculate the gestational age) were included in the study. Multiple gestation or still born babies and babies with major congenital anomalies were excluded. Ethical clearance was obtained and informed written consent was obtained from all the parents of the babies in the study. The data was collected in the predesigned pro forma and the statistical analysis was done using Graph pad Instat software, version 3.10.

III. Results

Study population: Table 1: Distribution of study population

POPULATION	NUMBER
Low birth weight	165
Normal birth weight	235
Total	400

	MEAN BIRTH WEIGHT
LBW	1.80 kg
NBW	2.84 kg

Table 1 shows the distribution of our study population. Out of total 400 study population, we had 165 term LBW babies and 235 NBW babies. The mean birth weight of LBW babies was 1.80 kg and of NBW babies was 2.84 kg.

Maternal parity: Table 2: Distribution of low birth weight and normal birth weight on the basis of parity of the mother

Characteristics	Mothers of low birth weight infants (LBW)	% LBW	Mothers of normal birth weight infants (NBW)	% NBW	Total mothers
Primi	93	42.7	125	57.3	218
Multi	63	38	103	62	166
Grand Multi	9	56.2	7	43.8	16

From the above table 2 showing relation of parity of mothers and birth weight, we can see that primi mothers have more chances of delivered LBW babies than the multi gravida mothers. In grand multipara again the chance of LBW babies increases. Out of total 400 mothers we had 218 mothers with first pregnancy and 42.7% of them delivered LBW babies, 38% of 166 multi gravida mothers produced LBW babies and 56.2% of all grand multipara mothers delivered LBW babies.

Table 3: Association between parity of the mother and of low birth weight

Characteristics	Mothers of low birth weight infants (LBW)	Mothers of normal birth weight infants (NBW)	Chi square	P value
Primi	93	125	2.410	0.29*
Multi	63	103		
Grand Multi	9	7		

Applying the statistical test on the above data we found that maternal parity was not significantly associated with LBW newborns.

Inter pregnancy interval: Table 4: Distribution of low birth weight and normal birth weight on the basis of inter pregnancy interval

Characteristics	Mothers of low birth weight infants (LBW)	% LBW	Mothers of normal birth weight infants (NBW)	% NBW	Total mothers
< 18 months	54	47.8	59	52.2	113
≥18 months	18	26.1	51	73.9	69
Primi	93	42.7	125	57.3	218

Relationship between the effect of inter-pregnancy interval upon birth weight of newborn in the table 4, we observed that out of 182 multi gravida mothers, 113 of them had inter-pregnancy as < 18 months and remaining 69 had ≥ 18 months. 54(47.8%) mothers with <18 months of inter-pregnancy interval produced LBW babies and remaining 59(52.2%) delivered NBW babies. 18(26.1 %) mothers with pregnancy interval of ≥18 months gave birth to LBW babies and 51(73.9%) gave birth to NBW babies.

Table 5: Association between the inter-pregnancy and of low birth weight

Characteristics	Mothers of low birth weight infants (LBW)	Mothers of normal birth weight infants (NBW)	Chi square	P value
< 18 months	54	59	8.718	0.01
≥18 months	18	51		
Primi	93	125		

On performing the statistical test on the above data table19, we found a significant association between inter-pregnancy interval and birth weight of newborns. The p value was found to be 0.01.

PIH: Table 6: Distribution of low birth weight and normal birth weight on the basis of PIH in the mothers.

Characteristics	Mothers of low birth weight infants (LBW)	% LBW	Mothers of normal birth weight infants (NBW)	% NBW	Total mothers
PIH present	67	54.5	56	45.5	123
PIH absent	98	35.4	179	64.6	277

From the above table 6 showing the impact of Pregnancy induced hypertension (PIH) on birth weight on newborn, we could observe that we had 123 mothers with PIH in our study, out of them 54.5% produced LBW babies. 98 mothers out of 277 who did not suffer from PIH had LBW babies. The proportion of LBW babies in them was 35.5%.

Table 7: Association between the maternal PIH and of low birth weight

Characteristics	Mothers of low birth weight infants (LBW)	Mothers of normal birth weight infants (NBW)	Chi square	P value
PIH present	67	56	12.812	0.003*
PIH absent	98	179		

Performing a statistical test on the above data on the presence of PIH or its absence on mothers in relation to birth weight of babies we found that the p value (0.003) was significant. Therefore PIH and low birth weight are significantly associated in our survey.

GDM. Table 8: Difference between the characteristics of mothers of low birth weight and normal birth weight on the basis of Gestational Diabetes Mellitus (GDM)

Characteristics	Mothers of low birth weight infants (LBW)	% LBW	Mothers of normal birth weight infants (NBW)	% NBW	Total mothers
GDM present	11	37.9	18	62.1	29
GDM absent	154	41.5	217	58.5	371

In our study to find out the impact of Gestational Diabetes Mellitus (GDM) on the birth weight of newborn, that out of total 400 mothers, 29 of them had GDM and rest 371 did not. This data showed that out of 37.9% of LBW were born to mothers with disease GDM and the rest were normal weight. The proportion of LBW in mothers without the said disease was 41.5%.

Table 9: Association between the maternal GDM and low birth weight

Characteristics	Mothers of low birth weight infants (LBW)	Mothers of normal birth weight infants (NBW)	Chi square	P value
Present	11	18	0.142	0.7062*
Absent	154	217		

On performing the statistical test on the above data tablexxx we found that presence or absence of disease GDM didn't have effect on birth weight of newborn. The risk factor and the outcome was not associated. The p value was found to be 0.7062.

IV. Discussions

Table 2 and 3 describes the relation between parity and birth weight in our study. Our observation with parity of mothers as a factor for birth weight newborn implies that primi mothers had high chances of delivering LBW babies in comparison to multi gravida mothers. In grand multipara again the risk of LBW babies increases. We found that 42.7% of all primi mothers, 38% of multi gravida mothers and 56.2% of grand multi gravida mothers produced LBW babies. This pattern of parity effect where proportion of LBW in primi mothers is high and a gradual decrease from 2 to 4 gravida and a increase from 4th pregnancy onwards has been shown in reports by Gawande et al.(1994)¹⁵, Anand and Garg (2000)¹⁶, Joshi and Pai(2000)¹⁷, Kiranbala et al.(2012)¹⁸, and Samerjeet Kaur et al.(2014)¹⁹. However, all the authors mentioned found a significant association between parity of mothers and birth weight. Similar to our finding, parity was not associated with birth weight was found in some reports such as Acharya et al.(2004)²⁰, Mumbare et al.(2012)²¹, Kotabal Rajashree et al.(2015)¹ and Ravikumar et al.(2016)²².

We found a significant association between inter-pregnancy interval and birth weight of newborn. From the table 4 we could observe that mothers with <18 months of inter-pregnancy interval gave birth to 47.8 % of LBW babies whereas 26.1 % mothers with pregnancy interval of ≥18 months delivered LBW babies. This could be explained by the fact that a short interval between the previous and the present pregnancy is not sufficient for the women to regain her nutritional status before the conception and keep for the upcoming pregnancy. Proportion of LBW decreases with increase in birth interval.

Similar association was observed in the study done by Gawande et al.(1994)¹⁵. They observed that the proportion of LBW was 44.7% when the inter-pregnancy interval was <18 months. The proportion of LBW decreased with increase in inter-pregnancy interval, 33.2% for 18-35 months and 30 % for 36-59 months. They found the association as significant. Similar findings were observed by M Borah et al.(2014)²³ in a rural block of assam. They found that out of all mothers with < 18 months inter-pregnancy interval , 44.5% of them delivered LBW babies. And the proportion of LBW with inter-pregnancy interval a18-36 months and >36 months was 18.9% and 17.1% respectively. On statistical analysis they found a significant association between inter-pregnancy interval and birth weight of newborn.

Other literatures where a definite association between inter-pregnancy interval and birth weight has been observed are Gawande et al.(1994)¹⁵, Thomre et al.(2007)²⁴, Aivalli et al.(2015)²⁵.

In our study PIH had a significant effect on birth weight of newborn. From the table 6 showing the impact of Pregnancy induced hypertension (PIH) on birth weight on newborn, we could observe that we had 103 mothers with PIH in our study, out of them 55.3 % produced LBW babies. 108 mothers out of 297 who did not suffer from PIH had LBW babies. The proportion of LBW babies in them was 36.4 %. So increase in blood pressure decreases the birth weight. We found a significant association between PIH and birth weight of newborn. Manna et al.(2013)²⁶ found that 24.4 % of mothers with PIH delivered LBW. We had a higher proportion of LBW than their study. It may be explained by the fact that their study was conducted in a rural area whereas ours is conducted in a tertiary care centre. Here most of the high risk cases are referred from peripheries.

We found that pregnancy induced hypertension is associated with LBW. This is similar to other studies done by Fedrick and Aldestein(1978)²⁷, Chandra S Metgud et al(2012)²⁸, Ravi Kumar Bhaskar et al.(2015)²⁹ and Prudivi and Bhosgi(2015)³⁰.

Our study could not find any association between maternal diabetes and low birth weight. We had 29 mothers with GDM. Proportion of LBW born to them was 37.9% whereas proportion of LBW born to mothers without GDM was 41.5 %. There was no association between maternal diabetes and birth weight of newborn.

This can be explained by the fact that we had a less number of patients with GDM in our study.

Similar to our study no association between maternal diabetes and birth weight was found in other literatures by Taj Muhammad et al.(2010)³¹ and Prudhivi and Bhosgi (2015)³⁰.

V. Conclusion

The identified determinants in the study are preventable and hence modifiable. Comprehensive approaches which institute a combination of interventions to improve the overall health of the women are needed. Such approaches are most likely to be effective in reducing the problem of LBW in India. Focus should be on:

- ✓ Care of the girl child beginning right from the birth
- ✓ Improving the utilisation of ANC services
- ✓ Activities to increase the awareness regarding birth spacing and avoiding close birth spacing.
- ✓ Health education to the mothers regarding nutrition
- ✓ Identifying high risk pregnancies and early management of anaemia and PIH.

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References

- [1]. Kotabal R, Hebbali LP, Ratnagar R. Study on the factors associated with low birth weight among newborns delivered in a tertiary-care hospital, Shimoga, Karnataka. *International Journal of medical science and public health* 2015; 4 (9):1287-129
- [2]. Singh G, Chouhan R, Sidhu K. Maternal Factors for Low Birth Weight Babies. *Med J Armed Forces India* 2009; 65(1): 10-12
- [3]. Park K. Park's textbook of preventive and social medicine. Banarsidas Bhanot Publisher, Jabalpur, India, 19th edition, 2007
- [4]. Roy S, Motghare DD, Ferreira AM, Vaz FS, Kulkarni, MS. Maternal determinants of low birth weight at a tertiary care. *J FamWelf* 2009; 55:79-83.
- [5]. World Health Organization, *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision*, World Health Organization, Geneva, Switzerland, 1992.
- [6]. Park, K. Park's Textbook of Preventive and Social Medicine, Banarsidas Bhanot Publishers, Jabalpur, India, 20th edition, 2009.
- [7]. Allen MC. Developmental outcome and follow up of small for gestational infants. *Semin Perinatol* 1984; 8: 123-156.
- [8]. Villar J, Khoury MJ, Finucane FF, Delgado HL. Differences in the epidemiology of prematurity and intrauterine growth retardation. *Early Hum Dev* 1986; 14: 307-320.
- [9]. Khan DBA, Bari V, Chisty IA. Ultrasound in Diagnosis & Management of intra uterine Growth Retardation. *J Coll Physicians Surg Pak* 2004; 14: 601-604.
- [10]. Jamal M, Khan N. Maternal factors associated with low birth weight. *J Coll Physicians Surg Pak* 2003; 13: 25-28.
- [11]. Malik S, Ghidiyal RG, Udani R, Waingankar P. Maternal biosocial factors affecting low birth weight. *Indian J Pediatr* 1997; 64: 373-377.
- [12]. Stoll BJ, Adams-Chapman I. The high-risk infant. In: Behrman RE, Kleigman RM, Jensen HB. *Nelson Textbook of Pediatrics* 18th ed. Philadelphia: WB Saunders; 2007; 698-710.
- [13]. Xiong X, Mayes D, Demianczuk N, Olson DM, Davidge ST, Newburn -CC. Impact of pregnancy-induced hypertension on fetal growth. *Am J ObstetGynaecol* 1999; 180: 207-213.
- [14]. Brodsky D, Christou H. Current Concepts in Intrauterine Growth Restriction. *J intensive Care Med* 2004; 19: 307-319
- [15]. Gawande UH, Pimpalogaonkar MS, Betharia Sh. Biochemical determinants of birth weight in rural and urban Nagpur. *Indian J Community Med* 1994; 25(2): 64-67.
- [16]. Anand K, Garg BS. A study of factors affecting low birth weight. *Indian J Community Med* 2000; 25(2): 57-62.
- [17]. Joshi SM, Pai NP. Effect of maternal biosocial determinants on the birth weight in slum area of greater Mumbai. *Indian Journal of Community Med* 2000; 25(3): 121-123.
- [18]. Bala K, Kumar D, Mengi V. Association of maternal bio-social determinants with birth weight in urban slums of Jammu district; *JK Science* 2012; 14(1): 30-33.
- [19]. Kaur S, Upadhyay AK, Srivastava DK, Srivastava R, Pandey ON. Maternal correlates of birth weight of newborn: A hospital based study. *Ind J of Comm Health* 2014; 26(2):187-191.
- [20]. Acharya D, Nagraj K, Nair NS, Bhat HV. Maternal determinants of intrauterine growth retardation: A case control study in Udipi District, Karnataka; *Indian J community Med* 2004; 29(4): 181-183.
- [21]. Mumbare SS, Maindarkar G, Darade R, Yengl S, Tolani MK, and Patole K. Maternal risk factors associated with term low birth weight neonates: a matched-pair case control study. *Indian Pediatrics* 2012; 49(1): 25-28.
- [22]. Ravikumar K, Rajeshkannan B. A descriptive study of maternal risk factors in term Babies with IUGR, *IOSR Journal of Dental and Medical Sciences* 2016; 15 (12): 48-51.
- [23]. Borah M, Baruah R, Agarwalla R. Maternal and socio demographic determinants of low birth weight: A community based cross sectional study in a rural block of Assam. *Indian J Prev Soc Med* 2014; 45, No.1-2: 7-10.
- [24]. Thomre PS, Borle AL, Naik JD, Rajderkar SS. Maternal risk factors determining birth weight of newborns- A tertiary care hospital based study; *International Journal of Recent Trends in Science and Technology*, 2012; 5(1): 3-8.
- [25]. Aivalli PK, Swamy MK, Narasannavar AB, Angolkar M, Shrestha A, Banjade B. Bio social determinants of birth weight in a rural PHC of North Karnataka: A cross sectional study. *International Journal of Medical Science and Public Health* 2015; 4(5): 630-633.
- [26]. Manna N, Sarkar S, Baur B, Basu G, Bandyopadhyay L. Socio-biological determinants of low birth weight: A community based study from rural field practise area of Medical College, Kolkata, West Bengal, India. *IOSR Journal of Dental and Medical Sciences* 2013; 4(4): 33-39.
- [27]. Fedric J, Adelstein P. Factors associated with low birth weight infants at term. *British Journal of Obstetrics and Gynaecology* 1978; 85(1): 1-7.
- [28]. Metgud CS, Naik, VA. Mallapur, MD. Factors affecting birth weight of a newborn-A community based in rural Karnataka, India. *PLoS ONE* 2012; 7 (7): e40040.
- [29]. Bhaskar RK, Deo KK, Neupane U, Bhaskar SC, Yadav BK, Pokharel HP, Pokharel PK. A case control study on risk factors associated with low birth weight babies in Eastern Nepal. *International journal of paediatrics*, 2015.
- [30]. Prudhivi S, Bhosgi R. Maternal factors influencing low birth weight babies. *Int J Contemp Pediatr* 2015; 2(4): 287-296.
- [31]. Muhammad T, Khattak AA, Rehman S, Khan MA, Khan A, Khan MA. Maternal factors associated with intrauterine growth restriction. *J Ayub Med Coll Abbottabad* 2010; 22(4): 64-69.

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