



Relationship between low birth weight of babies and antenatal care of mothers: A cross sectional study at a tertiary care hospital of Kishanganj, Bihar

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ABSTRACT

Background

Low birth weight (LBW) is important risk factor for childhood morbidity and mortality thus an important public health concern.

Aim

To identify the maternal determinants associated with LBW of babies

Setting

M.G.M Medical college & L.S.K Hospital Kishanganj, Bihar.

Design

Hospital based cross sectional study

Study period

January 2014 to March 2014

Methodology

Institution based descriptive cross sectional study from February 2014 to April 2014. All postnatal women (190) with singleton apparently healthy babies during the study period were selected for study. Birth weight of babies was recorded, mothers were interviewed and antenatal cards were reviewed.

Result

34% of newborns were found to be low birth weight in our study. Statistically significant association was found between Low birth weight of babies and mother's age, religion, literacy of mother, consumption of IFA tablets and regular ANC checkup during pregnancy.

Conclusion

The study suggests various maternal factors influence the birth weight of newborn babies and by improving antenatal care services both in coverage and quality we can reduce infant mortality in country.

Keywords: Low Birth Weight, Antenatal Checkup, IFA Tablets, Birth Interval

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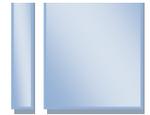
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INTRODUCTION

Low birth weight (LBW) is a reliable and sensitive indicator for predicting the immediate and long term outcome of a newborn. It is a crucial determinant of infants health at birth, child's survival and freedom from sickness and also mother's antenatal health and well-being.¹ Low birth weight is defined by WHO as weight less than 2,500 grams at birth. This is based on epidemiological observation that infants weighing less than 2500 gms are approximately 20 times more likely to die than heavier babies due to wide range of poor health outcomes.² This standard and uniform criterion to demarcate normal and low birth weight babies facilitates international comparisons and monitoring of global trend.

LBW is a strong determinant of infant morbidity and mortality in India and as a multifactoral inter-relationship exists between the environment where pregnant women lives and the the fetal growth, it is also a major indicator of socio-economic development.³

Global estimates by UNICEF show that incidence of low birth weight newborns in 2013 was nearly 22 million i.e. almost 16% of all babies born globally are low birth weight. There is only marginal reduction in proportion of LBW babies in past 15 years. As per averages by UNICEF 2009-13, worldwide magnitude shows phenomenal regional variation with incidence of LBW ranging from only 6 % in East Asia/Pacific region to 28% in South Asian region. Difference in developed and developing countries is striking, 95% of low birth weight babies are born in developing countries and nearly 40% of all LBW babies in developing world are born in India.⁴ In India, the prevalence of LBW infants is about 28%⁵ as compared to 4.5 % in developed countries.⁴

Wide inter-state and inter district variations in incidence of low birth weight was documented in an ICMR multicenter study with magnitude ranging from 25.9% to 56.9%⁵ and in Bihar it is 27.2%.⁶ It has been revealed that half of all perinatal and one third of all infant deaths occur due to low birth weight⁷ and LBW babies have three times more risk of developing neurodevelopmental and congenital anomalies.⁸

Various maternal factors such as maternal weight and height, education, parity of the mother, gestational age, caloric intake, quality of antenatal care and sex of the delivered child were identified as prominent determinants of LBW.⁹ In India, female babies grow up in neglect and discrimination and are deprived from good nutrition, good hygiene and care and also basic education. They grow up to be short, anemic, underweight mothers and perpetrate cycle of low birth weight in next generation. It appears that adverse environmental factors may become genetic and constitutional when they operate over several generations and this is difficult to reverse the cycle until women is empowered in our society.

In spite of our primary health care system and preventive and promotive strategies adopted, health services have remained inaccessible to many. So there is need of further research to find effective strategies for prevention of low birth weight babies considering its association with immense human wastage and suffering as well as very high cost of specialized and interventional care.

This study was undertaken in a tertiary care hospital to highlight the magnitude of Low birth weight and factors contributing to it.

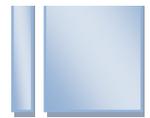
OBJECTIVES

- 1) To determine the percentage of low birth weight babies.
- 2) To find out the relationship between socio-demographic profile and antenatal care of mother with low birth weight of baby.

MATERIALS AND METHODS

A cross-sectional, hospital based epidemiological study was conducted in Gynaecology and Obstetrics department of M.G.M Medical college and L.S.K Hospital, Kishanganj, Bihar from 1st June 2014 to 31st August 2014 after clearance from Institutional Ethics committee and Head of Department of Obstetrics and Gynaecology department. All pregnant women who delivered in the hospital during the study tenure were included in the study initially.

210 pregnant women delivered in the hospital during study period. After taking proper consent from



mother, data was collected on pre-designed, pre-tested proforma by interview and review of records.

Exclusion Criteria: Pregnant with multiple pregnancy, whose last menstrual period was not exactly known, having history of some complications like ante-partum hemorrhage, previous caesarean delivery, neonates having congenital malformations etc were excluded from study.

190 cases were taken as study subjects who fulfilled our inclusion criteria. All mothers were interviewed within 24 to 48 hours after delivery and findings were recorded. Mother's height was measured up to the accuracy of 0.5 cm by height measuring stand and weight was recorded on spring balance weighing machine up to the accuracy of 0.5 kg. Standardization was done to minimize error. Antenatal checkup was graded regular if minimum three checkups were done with one checkup in each trimester 2, TT doses or booster was given and had taken 100 IFA tablets.

Birth weight less than 2500 g was used to label a child as LBW. The babies were weighed on beam type weighing machine within 24 to 48 hours of birth.

Data was collected, compiled, tabulated and then analyzed using the Statistical Package for Social Sciences (SPSS) Version 20.0 and are expressed as percentage. Chi-square test was applied for test of significance. P value less than 0.05 were considered as statistically significant.

Inclusion criteria: Singleton pregnant lady willing to participate in the study.

RESULTS

210 live births were recorded in the facility during the study and out of that 190 mothers/babies were studied. Of the total newborns, 64 babies (33.68%) were found to be low birth weight. 74 % of low birth weight babies were female though no significant association was found. 54.6% of mothers in age group of 20-30 yrs had LBW babies. 81.2 % of LBW babies happen to be of Muslim mothers. Significant association was seen between residence of mothers and low birth weight of babies as 76.6% of LBW babies were from rural population. Proportion of low birth weight babies was significantly high among illiterate mothers (85.9%) and low income groups (53.1%) (Table 1).

It summarizes low birth weight according to various maternal variables wherein highly significant association was found between LBW and maternal age <20 yrs and >30 yr with $p < 0.000$. Maternal literacy and family income were also significantly associated. Majority of mothers in this study were Muslims (63.4%) and significant association ($p < 0.0003$) was found between religion and LBW. Residence of mother also showed significant association with rural population showing more LBW babies (76.6%). The occupation of mother and type of family were not significantly associated with LBW.

Table 1 Distribution of Low Birth Weight according to Socio-Demographic Profile

Determinants of LBW	Low birth weight (LBW)				Statistical significance
	Present n=64		Absent n=190		
	No.	%	No.	%	
Maternal age					
<20 yrs	5	7.9	7	5.57	$\chi^2=48.07$ $p < 0.000$
20-30 yrs	35	54.6	117	92.85	
>30 yrs	24	37.5	2	1.58	
Residence					
Urban	15	23.4	48	38.1	$\chi^2=4.114$



Rural	49	76.6	78	61.9	P<0.043
Religion					
Hindu	12	18.75	57	45.23	$\chi^2=12.88$
Muslim	52	81.25	69	54.76	p<0.00033
Type of family					
Joint	47	73.4	77	61	$\chi^2=2.84$
Nuclear	17	26.6	49	39	p>0.092
Mother's literacy					
Illiterate	55	85.9	86	67.7	$\chi^2=7.31$
Literate	9	14.1	41	32.3	p<0.006
Mother's occupation					
Homemaker	57	89	123	97.6	
Agricultural worker	4	6.25	0	0	$\chi^2=5.579$
Daily wage labour	2	3.12	3	2.4	p>1.33
Service	1	1.6	0	0	
Per capita income (Rs)					
<2000	34	53.1	100	79.4	$\chi^2=14.06$
>2000	30	46.9	26	20.6	p<0.000177

Percentage of LBW in women with height <150 cms was 42.2% and weight <50 kgs was almost 33% and both were found to be statistically significant determinant of low birth weight in newborns. LBW babies among mothers with Hb % < 10 was 76.5% (Table 2). It summarizes low birth weight according

to maternal anthropometry and Hb%, wherein we found both height<150 cms and weight <50 kgs at first Antenatal visit are significantly associated .Anemia (Hb % < 10 gm%) was also highly significant determinant of LBW.

Table 2 Distribution of Low Birth Weight according to Maternal Anthropometry and Hb%

Determinants of LBW	Low birth weight (LBW)				Statistical significance
	Present (n=64)		Absent (n=126)		
	(no.)	%	(no.)	%	
Height of mother					
<150 cms	27	42.2	25	19.84	$\chi^2=10.662$
≥150 cms	37	57.8	101	80.16	p<0.001
Weight of mother					
<50 kgs	21	32.8	15	11.9	
≥50 kgs	43	67.2	111	88.1	$\chi^2=12.08$
					p<0.00051



Hb (gm%)					
<10	49	76.5	36	28.57	$\chi^2=39.54$ $p<0.00$
≥10	15	23.43	90	71.45	

The proportion of LBW babies was significantly high among mothers with period of gestation <37 weeks (57.8%), in women who had weight gain of less than 6 kgs during pregnancy (46%) and mothers with less than two years of birth interval. Percentage of low birth weight babies in birth order one was 27%, birth order two was 34% and birth order three or more than three was 39%, increase in risk of LBW with

increase in parity was significantly associated. (Table 3). It depicts LBW according to few maternal parameters wherein, parity ($p<0.00056$), birth interval less than 2yrs in between pregnancies ($p<0.00006$), period of gestation less than 37 weeks (0.000033) and weight gain during pregnancy less than 6 kgs were found to be highly significant determinants of LBW.

Table 3 Distribution of Low Birth Weight according to Maternal Variables

Determinants of LBW	Low birth weight (LBW)				Statistical significance
	Present (n=64)		Absent (n=126)		
	(no.)	%	(no.)	%	
Parity					
1	17	26.5	9	7.2	$\chi^2=13.645$ $p<0.0011$ sig
2	20	31.3	53	42.1	
≥3	27	42.2	64	50.7	
Birth interval					
<2 yrs	22	34.3	82	65.1	$\chi^2=16.15$ $p<0.0001$ sig
≥2 yrs	42	65.7	44	34.9	
Period of gestation					
<37 weeks	37	57.8	34	27	$\chi^2=17.23$ $p<0.00003$ sig
≥37 weeks	27	42.2	92	73	
Weight gain during preg					
<6 kgs	46	72	53	42.1	$\chi^2=15.115$ $p<0.0001$ sig
≥6 kgs	18	28	73	57.9	

85.93% of low birth weight babies were born to mothers who had less than 3 ante natal checkup, when compared with 14 % among mothers who had regular ante natal checkups the difference was statistically significant. Similar significant association found among mothers who consumed less than 100

IFA tablets. (Table 4). It summarizes the effect of antenatal checkups and consumption of IFA tablets on birth weight of new born. Birth weight of babies was influenced significantly with antenatal visits by mother ($p<0.00$). statistical significance was observed between LBW and IFA tablet consumption too.

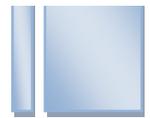


Table 4 Distribution of Low Birth Weight according to Antenatal Care

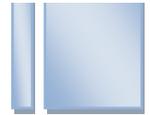
Determinants of LBW	Low birth weight				Statistical significance
	Present (n=64)		Absent (n=126)		
	No.	%	No.	%	
Antenatal checkup					
<3	55	85.93	51	40.48	$\chi^2=35.563$ p<0
≥3	9	14.06	75	59.52	
IFA Tablets consumption					
<100 tb	55	85.9	84	66.7	$\chi^2=8.026$ p<0.0041
≥100 tb	9	14.1	42	33.3	

The proportion of LBW babies in women who took rest and sleep for <10 hrs was almost 69%, who did not take extra meal during pregnancy was 81.3% and who chewed tobacco was 58% thus showing significant association. 18.6 % of mothers who had some obstetric complication during present pregnancy delivered LBW baby. (Table 5). It depicts LBW with various maternal determinants, tobacco

chewing during pregnancy (p<0.0001) and having any obstetric complication in present pregnancy were found to be significantly associated with LBW. Gender of baby seems to have no effect in determining birth weight whereas good rest and having proper diet were significant determinants of birth weight.

Table 5 Distribution of Low Birth Weight according to Maternal Habits and History

Determinants of LBW	Low birth weight				Statistical significance
	Present (n=64)		Absent (n=126)		
	No.	%	No.	%	
Rest and sleep					
<10	52	81.3	82	65	$\chi^2=5.34$ p<0.02
>10	12	18.7	44	35	
Extra meal					
Yes	10	15.6	51	40.4	$\chi^2=12.03$ p<0.0005
No	54	84.4	75	59.5	
Tobacco chewing during pregnancy					
Yes	37	57.81	36	28.57	$\chi^2=15.34$ p<0.0001
No	27	42.19	90	71.43	
Obstetric complication					
Yes	12	18.68	8	6.35	$\chi^2=6.93$ p<0.008
No	52	81.22	118	93.65	
Baby sex					
Male	22	34.37	52	41.3	$\chi^2=0.849$ p>0.356
Female	42	65.63	74	58.7	



DISCUSSIONS

The incidence of LBW in present study was (33.68%) while it was 21.5% as per NFHS-3 data.¹⁰ Higher incidence could be due to this being a hospital based study where high risk cases come for delivery and also geographic and socioeconomic differences with different communities. Similar results were seen in UNICEF-ICMR report which had shown 39.3% incidence of LBW in three slums in Madras, Delhi, Calcutta, and rural areas near Chandigarh, Varanasi, and Hyderabad.¹¹ In present study, maximum percentage of LBW babies was observed in two extreme of ages, i.e. age below 20 yrs (42.0%) and in mothers above 30 years of age (37.5%), thus establishing low birth weight to be significantly associated with maternal age and probability of LBW increases in the two extremes of age. Findings of present study were comparable with the findings of Raman *et al.*¹² and Negi *et al.*¹³

Proportion of Low birth weight babies was more in rural mothers (76.6%) than mothers residing in urban areas. This is not only because of their economic conditions but also due to their poor access to medical and educational facilities.

The proportion of LBW was 86% among the mothers who had less than three ante natal checkups when compared with 14% among the mother who had regular ANC checkups. Joshi *et al.*¹⁴ and Idris *et al.*¹⁵ also published similar findings in their study where the incidence of LBW was 57% and 61.76% in mothers who did not receive any ante natal care. Thus, statistically significant association exists between irregular antenatal checkup and LBW and it emphasizes on the need to improve coverage and quality of ante-natal care. Non-compliance to drugs (IFA) and medical advice could also be a reason for strong association.

75% of the women undertaken in this study were illiterate and 89 % of them had LBW babies. Sharma MK *et al.*¹⁶, Rizvi *et al.*¹⁷, Roudhari *et al.*¹⁸ and Mavalankar *et al.*¹⁹ showed significant association between maternal education and LBW. The high prevalence of low birth weight in relation to illiteracy may be linked to lower awareness levels regarding newborn care and the available antenatal care

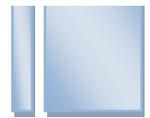
services and their utilization. High proportion of low birth weight was found in low income groups (53%). The proportion of LBW babies decreased with increase in the per-capita income of the family. There was statistically significant association between and LBW and family income. Other studies also support similar results.^{16, 18, 19}

Though proportion of LBW was high among mothers who are laborers by occupation but it was not statistically significant. Not taking proper diet and rest during pregnancy is significantly associated with having a low birth weight baby. Pregnancy precipitates deficiencies in women with average to poor nutritional status and may also lead to early onset of labor causing prematurity & fetal growth retardation.

This study highlights that there is significant association between period of gestation (≤ 37 weeks) and LBW. Studies carried out in Lucknow¹⁵ and Karnataka²⁰ have also found significant inverse association of low birth weight with gestational age. Improvement in other maternal factors like literacy, birth-spacing and reduced smoking level might improve the period of gestation and consequently improve the birth weight of the baby. Significant association was seen between maternal weight gain during pregnancy and LBW in this study, similar to other studies.²⁰

The present study revealed that anemia is a risk factor for LBW which is comparable to the findings of study by Joshi *et al.*¹⁴ Mavalankar *et al.*¹⁹ and Sharma *et al.*¹⁶ It is recommended that all efforts should be made to increase the Hb% level by regular supplementation of iron and also by dietary modification.

This study also revealed that low maternal weight (≤ 50 kgs) and height (≤ 150 cms) are related to LBW. Similar results have been observed by Chhabra *et al.*²¹, Kramer⁹ in their study, hence nutritional status of a girl child should be improved throughout her life cycle as it will significantly reduce the problem of LBW.



Present study shows that the proportion LBW was higher among the mother with birth interval of less than 2 years (34%), similar to studies conducted in Mumbai²² and Allahabad²⁴. A woman should recover from the effect of last pregnancy and period of breastfeeding, before conceiving again, as her nutritional status deteriorates with subsequent pregnancies and affects the health of the baby. Parity and LBW are also co-related, as the parity increases especially so does the incidence of LBW. Studies done in Dehradun¹³ and Tamil Nadu²³ also found significant association between low birth weight and parity. Hence, it is recommended to adopt birth spacing methods to widen the inter-pregnancy interval at least up to 2 years.

The present study shows that the proportion of LBW babies among mothers who chew tobacco was 58% similar to the Study done by Mehta *et al.*²⁴ which revealed that LBW proportion was 64.2% among tobacco chewing mothers, thus confirming that use of tobacco in any form during pregnancy is significantly associated with LBW.

Mothers with obstetric complications delivered more number of LBW babies and this is in accordance with other studies^{15,23,25} and emphasizes the importance of good antenatal care.

In conclusion, findings indicate that gestational age, maternal age, regular antenatal checkup, mother's height, mother's weight, anemia, physical work, tobacco chewing, is significant determinants of LBW. This is consistent with national and international findings indicating that maternal variables and risk behaviors during pregnancy play important roles on LBW.

CONCLUSION AND RECOMMENDATIONS

Multiple maternal factors influence birth weight of newborns among which maternal age, regular antenatal checkup, parity, birth interval, anemia, bad obstetric history, hard physical work, tobacco chewing during pregnancy were significant determinants of LBW. Every pregnant woman irrespective of her economic and risk status deserves quality health care during pregnancy, delivery and postpartum period.⁸ This study shows there is large

scope for improving the antenatal care, both in coverage and quality of services provided. Utmost importance should be given to strengthening of the existing maternal services especially at the grass root level of community or at the doorstep of beneficiaries. There is a need to promote right age at marriage (minimum 18 years), discourage teenage pregnancy and increase inter pregnancy interval through creating awareness and use of different contraceptive methods of spacing.

LIMITATIONS OF THE STUDY

- 1) The study was done in a short period of time adequate sample size could not be ascertained.
- 2) Recall bias - attempt was made to minimize it by cross checking with antenatal card but few respondents could not provide any medical document.
- 3) Per capita income was taken as socio-economic marker which gives less accurate picture.
- 4) Only some selected components of maternal health were studied.

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