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Original Research Article

Maternal factors associated with low birth weight babies

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ABSTRACT

Background: To identify and evaluate various maternal factors associated with low birth weight babies delivered at term and to find out prevalence of LBW babies delivered at term at Dhiraj hospital.

Methods: A single arm cross-sectional observational study was conducted in obstetrics & gynaecology department of Dhiraj Hospital, from June 2021 to December 2021. A total 250 patients fulfilling inclusion and exclusion criteria were enrolled. Data was collected from the labour room register statistics as reference for comparison. Maternal factors like-maternal age, parity, anemia, booking status, pregnancy induced hypertension, ante-natal iron and protein supplements, tobacco addiction, placenta previa, gender of newborn etc were studied. Data were analyzed with the help of chi-square test and were also presented by visual diagrams.

Results: From the study, the prevalence of LBW at term in Dhiraj hospital was around 22.36%. Out of 250 in sample group, 63.6% mothers were anemic. Almost over 50% mothers with LBW had not taken regular iron supplements. Around 67% mothers not adequately visited (4 antenatal visits) hospital during antenatal period. Primipara mothers (58%) associated more with LBW babies than Multipara (42%). Pregnancy induced hypertension and placenta previa significantly affects birth weight. Around 30% LBW show maternal history of tobacco addiction.

Conclusions: Although the prevalence of LBW in India has declined over the past decade, it remains still high. Anemia is the most important modifiable factors contributing birth weight. Iron and Protein supplementation need to be attention to prevent LBW. A comprehensive global strategy is required to reduce LBW which must include multiple elements: improving maternal status, treating PIH (or other associated condition), and providing adequate maternal care.

Keywords: Anemia, Birth weight, Antenatal visits, PIH

INTRODUCTION

Birth weight is the weight of a fetus or newborn just after birth. WHO defines birth weight for live births as the weight that should be measured within the first hour of life before significant weight loss occur.¹ Low birth weight (LBW) is defined as the birth weight less than 2500 gm irrespective of gestational age. LBW is further categorized into very low birth weight (VLBW, <1500 g) and extremely low birth weight (ELBW, <1000 g).¹ The prevalence of LBW varied widely across regions from 7.2% in developed regions to 17.3% in Asia.² Overall, it

is estimated that 15% to 20% of all births worldwide are low birth weight.³ Globally over 20 million babies born with low birth weight every year.² In the India, the prevalence of LBW decreased from 20% to 16% in the last decade. A major reason of this improvement could be due to improvement of maternal services and health programs.¹⁶

LBW is a valuable health indicator of maternal nutrition, maternal health, as well as a key indicator of delivery of healthcare policies. It is often considered as an indicator of the health status of a given society.¹⁶ Weight of the

baby depends on gestational age and rate of fetal growth in uterus. Babies with low birth weight may be appropriate for gestational age but delivered preterm. While small for gestational age babies may be born preterm or term.

Small for gestational age (SGA) refers to newborn whose weight less than 10th percentile for gestational age. LBW babies are at a higher risk of death and illness shortly after birth and non-communicable diseases in later life. The Infant mortality rate is 20 times higher for LBW babies.⁴ There is significant positive correlation between maternal nutritional status and length of pregnancy and the birth weight of the baby.⁴ In 2012, the world health assembly resolution 65.6 endorsed a comprehensive implementation plan on maternal, infant and young child nutrition, with six global nutrition target for 2025. The third target of this: a 30% reduction in low birth weight by 2025.¹⁷ Being a multi-factorial problem, integrated and holistic approach shall be followed to reduce prevalence of low birth weight as well as morbidity and mortality associated with LBW. An improvement with increment in the birth weight is expected to reduce the occurrence of LBW babies.

This study may help to identify the risk factors and by improving and correcting the risk factors, there could be decrease in perinatal mortality and morbidity. This study would help to identify maternal risk factors contributing to low birth weight in neonates delivered at term and to evaluate whether the noted factors are rectifiable or not. Thus, from this study we can formulate strategies and policies to decrease the incidence of LBW and complications associated with LBW.

Aims and objectives

Aim and objectives of current study were to identify and evaluate various maternal factors associated with LBW in

babies delivered at term and to find out prevalence of LBW babies delivered at term at Dhiraj hospital.

METHODS

Study design, location, duration and sample size

A single arm cross sectional observational study was conducted at the obstetrics and gynecology department at SBKS MIRC, Dhiraj hospital, Vadodara. The study duration was 9 months from June 2021 to December 2021. Labor room records, antenatal records and other information of women delivered at Dhiraj Hospital were screened. Patients fulfilling inclusion criteria were included in the study. A total of 250 patients were selected in the study. An Informed consent was taken from all selected patients. All the maternal factors associated with LBW were assessed. Data was collected from labor room as total number of deliveries as reference for comparison.

Inclusion and exclusion criteria

Mothers with singleton pregnancy who have delivered LBW babies at term gestation (gestational age 37 weeks to 40 weeks) were included in the study. Babies with LBW delivered before 37 weeks of gestation, Babies with LBW born with any congenital anomalies, multifetal gestation, mothers with renal/heart disease or other endocrine disorders, mothers not willing for study were excluded from the study.

RESULTS

Total no of babies born at term with low birth weight 405. Total no of babies born at term with adequate birth weight 1811.

Table 1: Effect of maternal age on birth weight of newborn.

Groups	Age group of patients (years)		Total	Chi-Square value	P value
	<21	>21			
Sample group	12	238	250	0.3486	0.566483
Reference group	73	1738	1811		

Table 2: Maternal parity status and birth weight of newborn.

Groups	Parity status		Total	Chi-Square value	P value
	Primi	Multi			
Sample group	145	105	250	0.1758	0.675008
Reference group	1025	786	1811		
Parity status and LBW	Primi	Para 1-3	Para >3	-	-
Sample group	145	65	40		

Table 3: Effect of antenatal visits on birth weight of newborn.

Groups	Frequent antenatal visit (>4 visits)	Infrequent antenatal visit (≤ 4 visits)	Total	Chi-Square value	P value
Sample group	80	170	250	46.7908	0.00001
Reference group	997	814	1811		

The difference in the teenage group is statistically not significant. Majority of our patients were in 21-30 years age group. Sample and reference groups are showing statistically insignificant difference between primi and

multiparous women. On analysis, 58% were primipara and 42% were multipara in study. Here frequent visits to be considered as more than 4 antenatal visits with first preferably in the first trimester.

Table 4: Gender of baby association with birth weight of newborn.

Groups	Gender of babies			Chi-Square value	P value
	Male	Female	Total		
Sample group	101	149	250	16.2964	0.000054
Reference group	978	833	1811		

Table 5: Maternal anemia and low birth weight of newborn.

Groups	Status		Total	Chi-Square value	P value
	Anemic (Hb<11gm%)	Non-anemic (Hb \geq 11gm%)			
Sample group	159	91	250	110.0931	0.00001
Reference group	544	1267	1811		
Anemia and LBW	Mild	Moderate	Severe	Total	
Sample group	136	17	06	159	-

Table 6: hypertension as a contributing factor for birth weight of newborn.

Groups	Hypertension	Normotensive	Total	Chi-Square value	P value
Sample group	30	220	250	12.4954	0.000408
Reference group	109	1702	1811		

Table 7: Placenta previa as a contributing factor for birth weight.

Groups	Placenta Previa		Total
	Present	Absent	
Sample group	5	245	250
Reference group	18	1793	1811

Table 8: Supplementation status as a contributing factor for birth weight of newborn.

Parameters		N	%
Iron supplementation	Regular	123	49
	Irregular	127	51
Protein supplementation	Regular	80	32
	Irregular	170	68

Proportion of LBW was seen higher in patients with Infrequent antenatal visits. About 67% patients from sample group with LBW baby had infrequent antenatal visit. In our study, female babies were more commonly associated with LBW (59.6%). Sample and reference groups are showing statistically significant difference between male and female babies.

Anemia has accounted to cause statistically significant difference on the occurrence of LBW. In sample group, 63.6% patients were anemic. Out of these, majority of patients 85% were having mild anemia, 11% were having moderate anemia and 4% patients were having severe anemia. Hypertension significantly associated with low birth weight. PIH will lead to uteroplacental

insufficiency. Severe PIH and eclampsia leads to premature deliveries. In our study group, 30 patients were hypertensive. Majority of patients have pre-eclampsia. Placenta previa significantly affects birth weight. Placenta previa is the major cause of maternal morbidity as well as premature birth and perinatal mortality. Almost over half of mothers in the sample group had not taken regular iron supplementation and 68% of mothers with LBW had not taken regular protein supplementation. In our study, around 30% babies with LBW show maternal history of tobacco addiction. Tobacco addiction is significantly associated with LBW.

Table 9: Maternal tobacco addiction and low birth weight of newborn.

Tobacco addiction	No addiction
74	176

DISCUSSION

This study was planned to understand the association of different maternal factors with term low birth weight babies born at Dhiraj hospital, Baroda. Around 250 post-natal mothers who delivered LBW babies at term gestation were studied. Many maternal factors like age of the mother, parity status, anemia, booking status, pregnancy induced hypertension (PIH), antenatal protein supplements, antenatal iron supplements, tobacco addiction etc. were studied. From my study, the prevalence of Low Birth Weight in Dhiraj Hospital was around 22.36% at term. In the study, 4.8% mothers were under 21 years. The difference is statistically not significant in the reference and sample group (table 1). Finding of our study is similar to the study conducted by Jones r et al, which indicate that rate of Small for gestational age babies born to adolescent mothers or mothers who were still growing did not differ from that of adult women.⁶ In sample group with LBW babies, 58% were primipara and 42% were multipara patients (Table 2). Maternal parity is a well-known predictor of birth weight and low birth weight are commonly seen among babies born to primipara women. Similar findings were also reported in the study conducted by P.S Shah in Mount Sinai Hospital, Toronto, Canada. The higher incidence of preeclampsia and other factors at young age may reduce fetal growth and duration of pregnancy.⁷

Over half of the women in reference group (55%) have received frequent antenatal care (Table 3). Here frequent visits mean that more than 4 visits with first preferably in the first trimester. There is significant association between low birth weight and infrequent antenatal visits. About 67% mothers with LBW babies had infrequent visits. Finding of our study is similar to the population-based study from 18 DHSs conducted by saverio bellizzi et al and published by WHO showed that absence of antenatal consultation increased the risk of LBW.⁸ Antenatal visits help in early diagnosis of maternal risk factors like iron deficiency, hypertension, threatened

preterm delivery, heart disease, IUGR etc. The benefit of frequent visit is the identification of high risk mother and preventive measure can be taken. When we look at the gender of babies, around 60% were female and rest 40% were male in the sample group (Table 4). Sample and reference groups show statistically significant difference between male and female babies. Female babies were significantly associated with low birth weight. Our findings were also in accordance with the study conducted by Halileh et al showed 120 females had LBW while 76 male had LBW.⁹ Anemia is when there is decreased oxygen carrying capacity of blood (Table 5). Here in study we focus on hemoglobin level of patients admitted at the time of delivery and its association with birth weight. Anemia will lead to placental angiogenesis, decreased oxygen availability to fetus and intrauterine growth retardation and subsequently low birth weight. It is defined as hemoglobin level less than 11 g/dl. It is further divided into three levels of severity: mild anemia (9 to 10.9 g/dl), moderate anemia (Hb levels 7 to 8.9 g/dl) and severe anemia (Hb levels less than 7 g/dl). In sample group, 54.4% mothers were having mild anemia, 6.8% mothers were having moderate anemia and 2.4% mothers were having severe anemia. Anemia still remains a high-risk factor for low birth weight. Deshmukh et al. found that anemia associated significantly with LBW.¹⁰

Gestational hypertension and preeclampsia significantly affect the birth weight (Table 6). It leads to IUGR and low birth weight. Severe preeclampsia and eclampsia may be delivered prematurely. Around 14 to 19% of term births in women with preeclampsia being low birth weight.⁵ However, In study it was observed that 30 babies with low birth weight delivered at term were associated with maternal hypertension. According to the study conducted by Getaneh et al the pooled prevalence of LBW among women with PIH was more than two times higher than the pooled estimate of LBW among all reproductive aged women.¹¹ Placenta previa is significantly associated with low birth weight. Placenta previa leads to maternal hemorrhage, preterm deliveries and fetal growth restriction (Table 7). In meta-analysis study of over 1593226 singleton pregnancies and 10575 confirmed cases of placenta previa, the placenta previa increases the relative risk of IUGR/SGA by an average of 19% documented by Balayla. Repeated episodes of bleeding from placenta previa may impact fetal oxygenation and growth.¹² Maternal nutrition is directly related to birth outcome. Iron supplementation as well as protein supplementation plays a significant role in the growth of the fetus. In our sample group, 51% had irregular iron supplementation (Table 8). In a study conducted by Mary et al the infants born to the women with iron supplementation group were significantly heavier and less likely to have low birth weight compared to placebo group. The LBW rate for iron supplementation group was as low as 4.3% compared to 16.7% of the placebo group.¹³ Another study shows that when mothers were provided balanced protein supplementation, there is 31% reduction in the risk of delivering SGA infant.¹⁴ The

consumption of foods that are important sources of protein and energy such as dairy products, fish, meat, green vegetables and soyabean is also low in rural India.¹⁶ Small dietary improvement even in the last trimester can lead to a significant improvement in the birth weight.⁴ Cigarette smoking and consumption of tobacco leads to nicotinic effect of vasoconstriction, utero-placental insufficiency and Intra-uterine growth retardation that leads to low birth weight. In a study conducted by Ting et al smoking group revealed higher incidence of LBW than non-smoker group and this association showed a dose related trend (Table 9). Also compared with non-smoker group, all infants of the maternal smoking group had lower birth weight ranging from -70.47 to -398.34 gm.¹⁵

Limitations

Limitation of current study was that the study was a hospital-based study and not a population based so women who have not delivered in our hospital have been missed.

CONCLUSION

Maternal anemia is the most important modifiable factor contributing low birth weight of newborn. Early detection from second trimester and aggressive treatment to improve Hb level improve the birth weight significantly. Pre-natal prophylactic iron supplements and anemia correction improve birth weight and health care costs. Iron and protein supplementation need to be attention to prevent low birth weight. Maternal malnutrition during pregnancy is mainly due to inadequate balanced protein and energy intake. Balanced energy protein supplementation can be appropriately recommended as an intervention to prevent low birth weight. Frequent antenatal visits influence dietary pattern and treatment from any illness that may have negative effects on the health of the fetus. Policies should made for accessible, affordable and quality antenatal care. Low birth weight rate is higher in female babies. Parity has not affected birth weight significantly but high risk of Hypertensive disorder of pregnancy in primigravida women make them more prone to LBW. Hypertension have strong association with LBW but is not modifiable, always. Although the prevalence of maternal smoking was relatively low in our study, the maternal smoking group, irrespective of the period of smoking (during preconception or during the stages of pregnancy), revealed a higher incidence of LBW than the nonsmoking group. Tobacco and nicotine cessation may benefit and prevent growth retardation. Smoking cessation interventions during pregnancy is an important public health strategy. To reduce the incidence of low birth weight, a comprehensive global strategy is required which must include multiple elements: improving maternal nutrition status, treating pregnancy associated condition such as pre-eclampsia, providing adequate

maternal care, affordable and accessible health care services and social support.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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