Original Research Article

Decoding the maternal factors for low birth weight babies and unveiling its impact on the newborn

Yugma Kamlesh Rana*, Lalit D. Kapadia, Arti J. Patel, Bijal Bhati

Department of Obstetrics and Gynecology, Dr MK Shah Medical College and Research Centre, Ahmedabad, Gujarat, India

*Correspondence:
Dr. Yugma Kamlesh Rana,
E-mail: yugmarana@gmail.com

ABSTRACT

Background: Low birth weight is a substantial global health issue with significant consequences to the newborn, family and society. It affects nearly 25 million births worldwide.
Methods: This was a prospective study. Total 100 patients included in this study. This study conducted for 6 months. at tertiary health care center.
Results: Maternal variables like anemia, hypertension, lack of proper antenatal care and lower socioeconomic status significantly influenced low birth weight in newborns. Clinical intervention such as iron supplementation and proper maternal nutrition, timely management of hypertensive disorders of pregnancy and creating public awareness regarding the importance of antenatal care have shown to impact neonatal outcomes positively.
Conclusions: Low birth weight is one of the leading causes of perinatal morbidity and mortality and hence it should be managed in a tertiary health care center with trained obstetricians and with facility of neonatal intensive care unit (NICU).

Keywords: Addiction, Anemia, Antenatal visits, Hypertensive disorders, Low birth weight, Maternal risk factors, Neonatal outcomes, Socioeconomic conditions

INTRODUCTION

World Health Organization (WHO) defines birth weight for live births as the weight that should be measured within the first hour of life before significant weight loss occurs.[1] Low birth weight (LBW) is defined as the birth weight less than 2500 gm. It continues to be a major public health issue globally with several short and long term adverse outcomes and this needs effective public health measures.[1]

WHO estimated that about 25 million low birth weight babies are born each year constituting 15% to 20% of all births worldwide. Nearly 95% of them are in developing countries.[7]

The prevalence of low birth weight in developing countries (16.5%) is twice that in developed regions (7%).[2] Most of the time, the cause of LBW is premature birth, intrauterine growth restriction, or the combination of both.[3] Low birth weight (LBW) is the dominating risk factor for infant morbidity and mortality.

Neonatal complications like birth asphyxia, hypothermia, meconium aspiration, respiratory distress syndrome, prematurity, septicemia, IUGR are associated with LBW.[5] Long term sequelae of LBW in terms of higher burden of non-communicable diseases has also been reported.[6]

This study aimed to study the maternal factors influencing low birth weight, to find out the prevalence of low birth

weight. Also, to analyze the neonatal outcomes of low birth weight and correlate it with maternal etiological factors in order to contribute to evidence-based practices for its anticipation and management.

METHODS

Study design and place

This is a retrospective cross sectional study of 100 low birth weight occurring over 6 months of the year 2023 in a tertiary health care center in western India. All the patients fulfilling the inclusion criteria were included in the study. This study conducted at Dr. MK Shah Medical College and Research Centre, Ahmedabad, Gujarat.

Study period

This study conducted from 1st March, 2023 to 31st August, 2023.

Inclusion criteria

All the live singleton babies delivered in the institute with birth weight <2500 gms who have taken treatment at the same institute were included in the study.

Exclusion criteria

Still births, multifetal gestation, babies with congenital malformations and babies who have not taken neonatal care at the same institute were excluded from the study.

Various demographic risk factors (age, parity, socioeconomical status, booking status, ANC visits and BMI), medical risk factors (HTN, anemia, addiction) and obstetrical risk factors (previous history low birth, multiple gestation, infection, PROM etc.) of past and present pregnancy were noted. Diagnostic modalities such as history, clinical examination and ultrasonography (along with Doppler studies for diagnosing IUGR) are used in the study.

Statistical analysis

The data analysis was performed in Microsoft Excel.

RESULTS

The study describes the incidence, risk factors and consequences associated with low birth weight babies based on data available. The study revealed a low birth weight incidence of 16.33% among total births.

Maternal age distribution revealed that the majority (55%) were between 21-35 years age group in both the normal and low birth weight groups, that being the child bearing age group. 38% unbooked patients had LBW and 41% had less than 4 antenatal visits, enhancing the importance of regular antenatal checkup for the betterment of the mother and the fetus. Primigravida patients showed highest incidence of LBW (49%) which is due to higher incidence of PIH in primigravida. Regarding BMI, patients with BMI <18.5 had higher chances of delivering a LBW baby (26%) reinforcing the belief of small mother-small baby.

Table 1: Number of patients (according to LBW/ VLBW/ ELBW).

Characteristics	No. of patients (n=100)
LBW	67
VLBW	22
ELBW	11

Table 2: Maternal demographic variables leading to low birth weight.

Maternal variables		NBW (n=512)		LBW (n=100) (%)	Afaya et al[4]	Singh et al[5]
		No.	Percentage			
Maternal age (years)	<20	113	22	37	8.3	
	21-35	348	68	55	58.2	
	>35	51	10	8	33.5	
Parity	Primigravida	210	41	49	27.8	
	2ND - 4TH gravida	240	47	44	48.9	
	Grandmultipara >/=5	62	12	7	25.2	
Booking status	Booked	400	78	62		87.5
	Unbooked	112	22	38		12.5
ANC visits	<4	169	33	41	8.7	
	>/= 4	343	67	59	91.3	
BMI (kg/m²)	<18.5	77	15	26		35
	19-29.9	271	53	57		60
	>30	164	32	17		5
Low socioeconomic status		118	23	54		

Table 3: Associated maternal risk factors leading to low birth weight.

Maternal risk factors (medical/obstetric)	NBW (n=512)		LBW (n=100)	Afaya et al[4]	Singh et al	Jemal et al
	No.	%				
Anemia	82	16	38		12.5	
H/o habit (smoking/chewing tobacco)	67	13	34			41
Short inter pregnancy interval (<24months)	87	17	26			27
Hypertensive disorders	62	12	25	34.8		
Febrile illness	36	7	23			
Bad obstetric history	56	11	22		17.5	
Hypothyroidism	41	8	17			
Rh negative	46	9	11			
Prom	41	8	7	12.9		
Antepartum hemorrhage	15	3	5	17.8		

Table 4: Mode of delivery and gestational age at delivery.

Mode of delivery and gestational age at delivery	(n=100)	Afaya et al[4]	<37 weeks (n=31)	37-42 weeks (n=67)	>42 weeks (n=2)
Vaginal Delivery	62	54.8	20	40	2
LSCS	38	45.2	11	27	0
Afaya et al			29.5	64.7	5.8

Table 5: Fetal and neonatal outcome in preterm birth.

Fetal and neonatal outcome		NBW (n=512)		LBW (n=100)	Afaya et al[4]
		No.	%		
APGAR score	>7	374	73	57	55.6
	<7	138	27	43	44.4
Resuscitation required	Yes	77	15	23	21.6
	No	435	85	77	78.4
NICU Admission (N=92)	1-3 days	67	13	19	
	3-7 days	41	8	38	
	7-10 days	15	3	17	
	10-21 days	5	1	11	
	>21 days	0	0	7	
Fetal Complications (indication for NICU admission)	Prematurity	62	12	38	
	RDS	82	16	22	
	Septicemia	36	7	26	
	Asphyxia	21	4	18	
	IUGR	92	18	24	
	Hypothermia	41	8	9	
Neonatal Mortality				5	

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.

Hypertensive disorders have a strong association with LBW. Pre-eclampsia, by reducing plasma volume reduces the supply of nutrient to the fetus thus affecting fetal growth leading to LBW.[5]

High risk of hypertensive disorder of pregnancy in primigravida women make them more prone to LBW.

High incidence of low birth weight in lower socioeconomic group, mainly consisting of the labour class suggests the lack of proper maternal antenatal care and poor maternal nutritive status in the antenatal period as a significant factor. 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 febrile illness that may have negative effects on the health of the fetus. Unbooked status contributes inadequate care during pregnancy, thus compromising both baby and the mother.[5]

The maternal history of addiction, irrespective of the period of addiction (during preconception or during the stages of pregnancy), and type of habit (tobacco chewing or smoking) revealed a higher incidence of LBW. Tobacco and nicotine cessation may benefit and prevent growth retardation.

Creating awareness through national health programs in the population regarding adequate inter-pregnancy interval will also contribute towards reducing the incidence of LBW.

Among 100 LBW babies, 31% were born preterm and 67% were born at term. Only 2 post term babies were LBW. Majority of the babies (62%) were delivered by vaginal delivery and most of the LSCS were for obstetric indication. Thus, indicating that LBW had no role to play in the mode of delivery.

There was an increased need for NICU admission and need for resuscitation in LBW babies as compared to NBW babies. This increases the morbidity of LBW babies. However; there were no reported cases of neonatal mortality.

DISCUSSION

In the study population of 100 LBW babies, maternal age distribution revealed that the majority (55%) were between 21-35 years age group in both the normal and low birth weight groups, that being the child bearing age group. The majority, 58.2% of the mothers were aged 21-30 years in a study by Afaya et al.[4] 37% of the LBW babies belonged to mothers <20 years age which suggests that lack of proper maternal growth and nutrition leads to LBW which is common in extremely young females. In a study by Louis B. et al on association of LBW in teenage patients they found a LBW prevalence rate of 25.5%, which is much higher than the prevalence rate 16% worldwide.[9]

Regarding BMI, patients with BMI <18.5 had higher chances of delivering a LBW baby (26%) reinforcing the belief of small mother-small baby.

The 38% unbooked patients had LBW and 41% had less than 4 antenatal visits, enhancing the importance of regular antenatal checkup for the betterment of the mother and the fetus. In a study by Kathrani SR et al 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.[1]

Primigravida patients showed highest incidence of LBW (49%) which is due to higher incidence of PIH in primigravida. 58% were primipara and 42% were multipara in study by Kathrani et al.[1]

Among the identified risk factors of LBW, anemia and hypertensive disorders were the most prevalent medical disorders, affecting 38% and 25% of cases respectively. Whereas anemia contributed to 12.5% in Singh et al and hypertensive disorders contributed to 34.8% in Afaya et al.[4,5] Maternal blood pressure has been assessed during pregnancy, when higher pressures were associated with lower birth weight.[8]

Short inter-pregnancy interval (<24 months) contributed by affecting 26% cases. The least inter-pregnancy interval was found to be in 3 patients which was 1 year. This signifies that despite of various family planning methods offered by the Government of India there is still a large lack of awareness regarding family planning amongst the general population.

Bad obstetric history, consisting patients with history of multiple spontaneous abortions caused 22% cases of LBW. In a similar study by Singh et al unbooked status (12.5% vs 2%, p<0.01) and bad obstetric history (17.5% vs 4%, p<0.01) had a highly significant association with LBW.[5]

Maternal history of habit in the antenatal period affected 34% of the cases. It included tobacco chewing and tobacco smoking, both active and passive. The study by Hulse BK suggests that maternal cocaine use causes higher incidence of low birth weight, and that the effect is greater with heavier use.[10]

Low socioeconomic status was also found to be a significant contributing factor, affecting 54% of the study population. In a study by Deriba BS, patients from rural population had a 63.7% incidence of LBW.[3]

History of acute febrile illness to the mother in the antenatal period affected 17% cases which mainly included cases of viral infections like dengue, swine flu, COVID 19, upper respiratory tract infection, some cases of urinary tract infection and malaria.

Among 100 LBW babies, 31% were born preterm (<37 weeks) and 67% were born at term (37-42 weeks). Only 2 post term babies (>42weeks) were LBW. Majority of the babies (62%) were delivered by vaginal delivery and most of the LSCS were for obstetric indication. Thus, indicating that LBW had no role to play in the mode of delivery.

In neonatal outcome, NICU admission ranged from short stay of 1-3 days (19%) to a more extended duration, with 11% requiring care for 10-21 days and 7% babies had >21 days of NICU stay. Whereas NICU admission required in NBW babies were much shorter with no babies requiring extended stay of 21 days and only 1% requiring 10-21 days NICU stay. This suggests a higher incidence of neonatal morbidity in LBW babies. No cases of still births were

reported but there were 5 cases of neonatal mortality. 100% cases of neonatal mortality belonged to ELBW babies (<1000 g). Fetal complications like prematurity (38%), RDS (22%), septicemia (26%), asphyxia (18%) and IUGR (24%) were more common in LBW group as compared to NBW group. 43% cases had a low 1 min APGAR score (<7) and 23% cases required resuscitation after birth. In a study by Gebregzabiherher et al 75.7% of the study population had had poor APGAR Score.[2]

This study has few limitations. The study was conducted at a tertiary healthcare center, potentially introducing selection bias as patients with more complex cases or higher-risk factors may be overrepresented. The reliance on retrospective data collection from medical records poses inherent limitations, including the potential for incomplete or inconsistent information. Furthermore, the study duration of six months may not capture the full spectrum of seasonal variations. Lastly, the absence of a control group hinders the establishment of causal relationships, limiting the ability to draw definitive conclusions about the effectiveness of interventions in preventing low birth weight.

CONCLUSION

Proactive identification of risk factors and timely interventions are crucial for reducing low birth weight babies and related mortalities. Regular antenatal care (ANC) visits play a pivotal role in early detection of risk factors (such as anemia, poor nutritional status, hypertension, maternal addiction to tobacco and nicotine), facilitating preventive measures. 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 will lead to reduction in the incidence of low birth weight. This study might contribute by providing pertinent information for policy makers and health system planers for possible modifications of strategies to reduce LBW.

REFERENCES

1. Kathrani SR, Patel RD, Jamkhandi SB, Chandnani KA. Maternal factors associated with low birth weight babies. Int J Reprod Contracept Obstet Gynecol. 2023;12(1):133-8.
2. Gebregzabiherher Y, Haftu A, Weldemariam S, Gebrehiwet H. The prevalence and risk factors for low birth weight among term newborns in Adwa General Hospital, Northern Ethiopia. Obstet Gynecol Int. 2017;2017:2149156.
3. Deriba BS, Jemal K. Determinants of low birth weight among women who gave birth at public health facilities in North Shewa Zone: unmatched case-control study. Inquiry. 2021;58:469580211047199.
4. Afaya A, Afaya RA, Azongo TB, Yakong VN, Konlan KD, Agbinku E R, et al. Maternal risk factors and neonatal outcomes associated with low birth weight in a secondary referral hospital in Ghana. Heliyon. 2021;7(5):e06962.
5. Singh G, Chouhan R, Sidhu K. Maternal factors for low birth weight babies. Med J Armed Forces India. 2009;65(1):10-2.
6. Kapoor SK, Kumar G, Pandav CS, Anand K. Incidence of low birth weight in Rural Ballabgarh, Haryana. Ind Pediatrics. 2001;38:271-75.
7. Anand K, Garg BS. A study of factors affecting LBW. Ind J Comm Medi. 2000;25(2):4-6.
8. Walker BR, McConnachie A, Noon JP, Webb DJ, Watt GCM. Contribution of parental blood pressures to association between low birth weight and adult high blood pressure: cross sectional study. BMJ. 1998;316(7134):834-37.
9. Louis B, Steven B, Margret N, Ronald N, Emmanuel L, Tadeo N, et al. Prevalence and factors associated with low birth weight among teenage mothers in new Mulago hospital: a cross sectional study. J Health Sci (El Monte). 2016;4:192.
10. Hulse G, English D, Milne E, Holman C, Bower C. Maternal cocaine use and low birth weight newborns: a meta-analysis. Addiction. 1997;92(11):1561-70.

Cite this article as: Rana YK, Kapadia LD, Patel AJ, Bhati B. Decoding the maternal factors for low birth weight babies and unveiling its impact on the newborn. Int J Reprod Contracept Obstet Gynecol 2024;13:2060-4.