



MATERNAL AND SOCIOECONOMIC FACTORS RESPONSIBLE FOR LOW BIRTH WEIGHT (1.5KG - 2.5 KG) IN RURAL TERTIARY CARE CENTRE

Paediatrics

Sayori N. Murarka Junior Resident, Department of Pediatrics, Swami Ramanand Teerth Rural Medical College, Ambajogai, Beed, Maharashtra India- 431517

Sunil S. Holikar* Associate Professor, Department of Pediatrics, Swami Ramanand Teerth Rural Medical College, Ambajogai, Beed, Maharashtra India- 431517 *Corresponding Author

Sambhaji C. Chate Professor and HOD, Department of Pediatrics, Swami Ramanand Teerth Rural Medical College, Ambajogai, Beed, Maharashtra India- 431517

ABSTRACT

Background: Low birth weight (LBW) contributes a major share in perinatal and neonatal mortality. Major challenge in field of public health is to identify the factors influencing LBW and to institute remedial measures. Therefore, to reduce the LBW deliveries, present study was undertaken to determine the maternal causes of LBW among mothers who delivered at Tertiary Care Hospital.

Methods: A cross sectional study was carried out among 300 mothers (150 with LBW babies and 150 with birth weight >2.5kg) over a period of 6 months from January 2019 to June 2019. Data was collected on structured, pre-designed questionnaire. All babies were weighed on electronic weighing scale within 24 hours of delivery. Data on clinical and biochemistry parameters were retrieved from medical records and compared on the basis of percentages and significance was assessed using chi squared test ($p < 0.0001$).

Results: The prevalence of LBW was significantly associated with: 1) Maternal age, 66.66% of mothers with LBW babies were < 19 years. 2) Weight before pregnancy, 60% of mothers with LBW babies weighed <40kg before pregnancy. 3) Birth-conception interval, 58.82% of mothers with LBW babies had interval <23 months. 4) Place of residence, 80% of mothers with LBW babies lived in urban areas.

Conclusion: The study highlights the importance of avoiding child marriages and having adequate birth spacing of minimum 2 years and need to increase efforts to improve maternal nutrition. Further studies to investigate the significance of stress, pollution and other factors associated with urban life impacting birth weight are needed.

KEYWORDS

Low birth weight, Perinatal, Neonatal, Questionnaire, Maternal age, Birth-conception interval

INTRODUCTION

The World Health Organization has defined low birth weight at birth as <2.5 kilograms (WHO, 1992). This practical cut off for international comparison is based on epidemiological observations that infants weighing <2.5 kilograms are approximately 25 to 30 times more likely to die than infants with birth weight exceeding this cut off, and it increases sharply as birth weight decreases [1]. The prevalence of LBW in any population reflects its socio-economic development and it is a good proxy to gauge the developmental status of the country. The global prevalence of LBW is 15.5% which amount to about 20 million LBW born each year, 95.5% of them in developing countries [2]. However, the level of LBW in developing countries is 16.5% (occurs primarily because of poor maternal health and nutrition) which is more than double the level in developed regions that is 7% [3]. India is one of the countries with the highest incidence of LBW, which has nearly 7.5 million LBW babies annually [4]. According to UNICEF estimate, almost every third newborn (30%) in India is LBW [5].

The LBW lower than that expected from the genetic potential might be caused by fetal maternal or placental factors or a combination of risk factors are resulting in an impaired placental transport of nutrients or reduced growth potential of the foetus [6]. LBW infants are forty times more likely to die within their first four weeks of life than normal birth weight infants. Also three times more likely than normal birth weight infants to have neurodevelopmental complications and congenital abnormalities. LBW infants are at risk of developing complications that impose risks for permanent sequelae. The risk increases both by lower gestational age and weight [6].

Moreover, the causes of LBW are multi-factorial and birth weight is determined by the interaction of both socio-demographic and biological factors [7]. LBW is a reliable indicator in monitoring and evaluating the success of maternal and child health programmes. It will be helpful to improve health policies and programmes to address this important health problem [8]. The present study was undertaken to examine the relation between maternal factors leading to low birth weight babies.

MATERIALS AND METHODS

A cross sectional study was carried out in the Department of Paediatrics at S.R.T.R Medical College, Ambajogai over a period of 6

months from January 2019 to June 2019. We extracted and analysed a total data sample of 300 mothers and their babies, with a 1:1 ratio of cases and controls. Cases were LBW infants; while controls were normal birth weight infants in this study. All mothers and their babies who had delivered and or were referred to the healthcare centres between January 2019 and June 2019 and who gave consent were eligible for inclusion. (150 with LBW babies with weight between 1.8kg to 2.49kg not requiring NICU admission and 150 with BW >2.5kg). Multiple pregnancies and still births were excluded. A predesigned and pretested structured questionnaire related to socio-demographic variables and the maternal risks factors of LBW among post-natal mothers were used for collecting information. All babies were weighed on an electronic weighing scale within 24 hours of delivery. Data on clinical and biochemistry parameters were retrieved from medical records. The data collected was compiled, tabulated and subjected to statistical analysis.

Ethical approval and informed consent: A cross sectional study was approved by the Institutional ethics committee of S.R.T.R Medical College, Ambajogai, Maharashtra, India (Ref. No. S.R.T.R./Pharma/IEC/27) and written informed consent was taken from all the patients.

Statistical Analysis

The data was analysed by Chi-square test and fisher-extract test and calculated by SPSS 19 version software and p-value of <0.001 was considered statistically significant.

RESULTS

The study enrolled 300 mothers/newborn pairs who delivered in Rural Tertiary Care Centre. Majority of mothers (81.66%) were Hindu and most of the mothers were literate (93.33%). 80 (26.66%) mothers belonged to nuclear family and 220 (73.33%) mothers belonged to joint family. These socio-demographic variables were not associated with low birth weight of newborn as shown in table 1. Most of the deliveries in cases were (66.66%) done by lower segment caesarean section (LSCS) while in controls, normal vaginal delivery (NVD) was found in majority of patients (60%). Most of the pregnancies (45%) were gravida 1 followed by G2 (26.66%), G3 (20%) and G4 (10%). The type of delivery and gravida of pregnancy were significantly associated with the low birth weight of babies, (Table 1).

The prevalence of LBW was strongly associated with: 1) Maternal age- 66.66% of the mothers with LBW babies were < 19 years. 2) Weight before pregnancy- 60% of mothers with LBW babies weighed <40kg before pregnancy. 3) Birth-conception interval- 58.82% of mothers with LBW babies had interval <23 months. 4) Place of residence- 80% of mothers with LBW babies lived in urban areas, (Table 2 and Figure 1).

DISCUSSION

LBW is a global challenging public health problem. Its high priority stems from the fact that it is the major predictor of infant morbidity and mortality [9]. In the present study, maximum number of mothers in both the case and control groups (86.6% and 87.09% respectively) belonged to the Hindu religion and the association of religion and LBW was not found to be significant. These findings are correlated with the previous studies [7, 10- 12]. Some researchers from their studies have established the fact that religion has some significance on various cultural practices, which in turn may affect the birth weight [13]. The percentage of LBW babies was higher among literate mothers (93.32%) than illiterate mothers (6.6%). There was no significant association found between mother's education and birth weight of babies. Similarly, prior studies [7, 14-16] revealed no significant effect of maternal education on birth weight of newborn while some studies showed that a low level of maternal education was a predictor of LBW [17-19]. This may be justified by increasing information of educated mothers about health services. Also, low birth weight proportion was 76.66% among joint families, 23.33% among nuclear families. No significant association could be revealed between type of family and birth weight of baby. This was in accordance with the study done by Bansal et al [7]. Yadav et al [10] and Deshpande et al [20]. Thus the present study did not find any significant association between low birth weight and sociodemographic factors including religion, educational status and family type. Several studies have shown that sociodemographic factors can influence low birth weight either directly or indirectly [21].

In the current study, cesarean section was a risk factor for LBW which is similar to a study conducted in Malaysia [22]. The mode of delivery and gravida was found to be significantly associated with low birth weight which is comparable with the earlier studies [23, 24]. It was observed that babies born via cesarean section as well as instrumental deliveries were less likely to be of LBW when compared to those born via spontaneous vaginal delivery. It could be due to the natural procedure in the case of spontaneous vaginal delivery i.e. series of physical compressions due to the labor process and the procedure could have been resulting in significant weight loss to the baby during delivery. Those babies born via cesarean section and other instrumental procedures are prevented from potential compressions at birth and hence attributable weight loss during delivery, yet the association with mode of delivery needs further investigations [25].

Early age of marriage and early confinement is an established custom in India. Teenage girls are physically and psychologically immature for reproduction, hence pregnancy in very young women is generally considered to be a very high risk event [12]. In the present study, the proportion of LBW babies was more in <19 and > 30 years (66.66%) as compared to 20-29 years age group of mothers (33.33%). Thus a significant association was found between mother's age and birth weight of babies. Similarly, Yadav et al [10] also found that LBW babies mostly (31%) from mothers of <19 and ≥ 30 years age group while minimum (17%) LBW babies delivered from mothers of 20 – 29 years age group. A study conducted by Malik et al [26] in Mumbai observed that a strong correlation between mothers age and birth weight of the baby. NDHS (2011) found LBW higher (13.4%) among younger mothers (<20 years) than among mothers of age 20-34 years (12.1%) and 12.3% among mothers of age 35-49 years [27]. A possible explanation for higher risk of LBW among younger mothers is that they are still developing and their need for minerals and vitamins is greater than among older mothers. Another reason may be the limited knowledge of these younger mothers about healthy lifestyles and preparation during the antenatal period. The risk of LBW among older mothers may be related to many risk factors such as cardiovascular disease, hypertension, diabetes and other diseases that frequently affect older mothers [16].

The risk having LBW was more for women weighing <40 kg compared to mothers with ≥40 kg body weight; however, the association was significant. This is in line with the study conducted in

India, Pakistan and China [28-30]. This could be due the fact that maternal weight less than 40 kg might be related with poor maternal malnutrition during infancy and child hood periods that persist to affect the new offspring. Previously, a systematic review including 42 studies found that both in developed countries and LMICs children born to underweight mothers were at higher risk of having LBW compared with those born to women with normal weight [31].

In addition, the incidence of LBW was high (58.82%) in mothers having birth conception interval ≤23 months and was found to be significantly associated with LBW. A study conducted by Nagargoji et al [32] at Nagpur has also observed that birth interval <24 months (OR=1.81) was significantly associated with LBW. Azimul et al [33] at Bangladesh observed that there was a significant relationship between birth weight and interval between pregnancies. Previous studies found that short interpregnancy intervals were a strong risk factor for LBW [20, 23, 24, 34, 35,]. One explanation is that longer birth intervals allow mothers to recover physically and psychologically, and may also improve nutritional status—all of which have a positive effect on fetal growth [36]. Also, we observed that urban residents had a higher likelihood of delivering an LBW baby. This finding is inconsistent with previous studies where rural residence was found to be a significant risk factor [37, 38]. Further exploration is needed to determine what factors influence LBW in the urban areas of India.

However, the present study revealed that maternal age (years) <19 years, maternal weight <40 kg, birth-conception interval <23 months and place of residence- urban were the risk factors strongly associated with the low birth weight of a newborn. The comprehensive approaches which institute a combination of interventions to improve the overall health of the women are needed. Such approaches are likely to be most effective in reducing the LBW problem in India.

There are some limitations of study which includes- the study was cross sectional study in which recall bias is a problem, nutritional status and eating habits of the study participants were not assessed which might affect birth weight.

CONCLUSION

The present study highlights the importance of avoiding child marriages and having adequate birth spacing of minimum 2 years and the need to increase efforts to improve maternal nutrition. Further studies to investigate the significance of stress, pollution and other factors associated with urban life impacting birth weight are needed. Mass awareness should be created by utilizing mass and print media regarding early signs of maternal complications, maternal nutrition, and essential family planning practices to promote primary prevention of LBW. It is recommended to improve maternal health through strengthening the existing maternal services such as maternal nutrition, and education, at the basic level of community.

Acknowledgment

The authors would like to thank the Department of Pediatrics, Swami Ramanand Teerth Rural Medical College, Ambajogai, Beed, Maharashtra, India, for providing facility and granting permission to carry out the work.

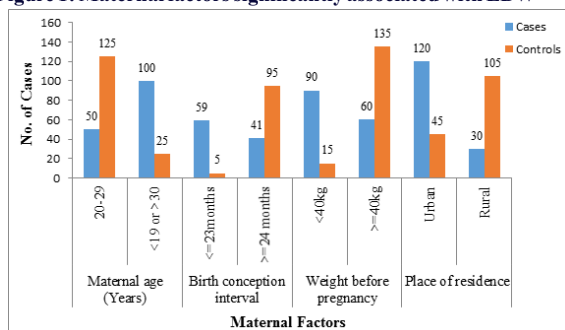
Conflict of Interest: None

Table 1: Socio-demographic characteristics

Characteristics	Cases	Controls	Total	P value
Religion	Hindu 130 (86.66%)	115 (87.09%)	245 (81.66%)	0.0179
	Muslim 20 (13.33%)	35 (12.90%)	55 (18.33%)	
Level of education	None 10 (6.66%)	10 (6.66%)	20 (6.66%)	0.9806
	Primary 49 (32.66%)	45 (30%)	280 (93.33%)	
	Secondary 48 (32%)	50 (33.33%)		
	Above secondary 43 (28.66%)	45 (30%)		
Family type	Nuclear 35 (23.33%)	45 (30%)	80 (26.66%)	0.1409
	Joint 115 (76.66%)	105 (70%)	220 (73.33%)	
Delivery type	NVD 50 (33.33%)	90 (60%)	140 (46.66%)	<0.0001
	LSCS 100 (66.66%)	60 (40%)	160 (53.33%)	
Gravida	G1 90 (60%)	45 (30%)	135 (45%)	<0.0001
	G2 40 (26.66%)	40 (26.66%)	80 (26.66%)	
	G3 15 (10%)	45 (30%)	60 (20%)	
	G4 05 (3.33%)	25 (16.66%)	30 (10%)	

Table 2: Maternal factors significantly associated with LBW of babies

Maternal Factors		Cases	Controls	p-value	X ² -test
Maternal age (years)	20-29	50 (33.33%)	125 (83.33%)	<0.0001	81.3
	<19 or >30	100 (66.66%)	25 (16.66%)		
Weight before pregnancy	<40kg	90 (60%)	15 (10%)	<0.0001	78.01
	≥40kg	60 (40%)	135 (90%)		
Birth conception interval	≤23months	88 (58.82%)	05 (3.33%)	<0.0001	73.49
	≥24 months	62 (41.33%)	95 (63.33%)		
Place of residence	Urban	120 (80%)	45 (30%)	<0.0001	69
	Rural	30 (20%)	105 (70%)		

Figure 1: Maternal factors significantly associated with LBW

REFERENCES

- Chang, S., O'Brien, K.O., Nathanson, M.S., Mancini, J. and Witter, F.R. 2003. Hemoglobin concentrations influence birth outcomes in pregnant African-American adolescents. *Journal of Nutrition*; 133:2348-55.
- United Nations Children's Fund and WHO, Low Birth Weight: Country, regional and global estimates, INICEF, New York, 2004.
- Stoll BJ, Kliegman RM. 17th ed. Philadelphia: Saunders; 2004. Overview of mortality and morbidity. *Nelson Textbook of Pediatrics*; pp. 519-23.
- Low birth weight in newborn/ symptoms and causes/ Boston children's Hospital.
- UNICEF (2004) Low Birth Weight: Country, Regional and Global Estimates. New York, USA, p. 1-9.
- Singh G, Chouhan R, Sidhu K. Maternal Factors for Low Birth Weight Babies. *Med J Armed Forces India*. 2009;65(1):10-12.
- Bansal P, Garg S, Upadhyay HP. Prevalence of low birth weight babies and its association with socio-cultural and maternal risk factors among the institutional deliveries in Bharatpur, Nepal. *Asian Journal of Medical Sciences* 2019;10(1):77-85.
- Esamai F, Nangami M, Tabu J, Mwangi A, Ayuku D, Were E. A system approach to improving maternal and child health care delivery in Kenya: innovations at the community and primary care facilities (a protocol). *Reprod Health*. 2017;14(1):105.
- Kim D, Saad A. The social determinants of infant mortality and birth outcomes in western developed nations: across country systematic review. *Int J Environ Res Public Health*. 2013;10(6):2296-335.
- Yadav DK, Chaudhary U and Shrestha N. Risk factors associated with low birth weight. *Journal of Nepal Health Research Council* 2011;9(19):159-164.
- Khatun S, Rahman M. socio-economic determinants of LBW in Bangladesh. A multi-variate approach. *Bangladesh Med Res Counc Bull* 2009;34:81-6.
- Shahnawaz et al. Association between maternal socio-demographic factors and low birth weight newborn in a rural area of Bihar, India. *South East Asia Journal of Public Health* 2014;4(1):30-34.
- Van Den Oord EJCG, Rowe DC. A step in another direction looking for maternal genetic and environmental effects on racial differences in birth-weight. *Demography* 2001;38(4): 573-6.
- Vahdaninia M, Tavafian S, Montazeri A. Correlates of low birth weight in term pregnancies: a retrospective study from Iran. *BMC Pregnancy and Childbirth*, 2008, 8:1-5.
- Farajzadegan Z et al. Could zinc supplementation in pregnancy improve infancy outcomes? *Shiraz E-Medical Journal*, 2007; 8 (2):80-86.
- Nazari M, Zainiyah SY, Lye MS, Zaliyah MS, Heidarzadeh M. Comparison of maternal characteristics in low birth weight and normal birth weight infants. *EMHJ* 2013;19(9): 775-781.
- Roudbari M, Yaghmaei M, Soheili M. Prevalence and risk factors of low-birth-weight infants in Zahedan, Islamic Republic of Iran. *Eastern Mediterranean Health Journal*, 2007, 13:838-845.
- Borna S et al. A comparative study of Zinc deficiency prevalence in pregnant and non pregnant women. *Tehran University Medical Journal*, 2009, 67:360-367.
- Schulpis KH et al. The effect of nutritional habits on maternal/neonatal zinc and magnesium levels in Greeks and Albanians. *European E-Journal of Clinical Nutrition and Metabolism*, 2009, 4(4):e176-e180.
- Deshpande JD, Phalke DB, Bangal VB, Peeyuusha D, Bhatt S. Maternal risk factors for low birth weight neonates: A hospital based case-control study in rural area of Western Maharashtra, India. *Natl J Community Med*. 2011;2:394-8.
- Roudbari M, Yaghmaei M and Soheili M. Prevalence and risk factors of low-birth-weight infants in zahedan, islamic republic of iran," *Eastern Mediterranean Health Journal* 2007;13(4):838-845.
- Sutan R, Mohtar M, Mahat AN, Tamil AM. Determinant of low birth weight infants: A matched case control study. *Open J Prev Med*. 2014;4:91-99.
- Bendhari ML, Haralkar SJ. Study of maternal risk factors for low birth weight neonates: A case-control study. *Int J Med Sci Public Health*. 2015;4:987-90.
- Dimple VK, Doibale MK, Nair A, Rajput PS. Assessment of maternal risk factors associated with low birth weight neonates at a tertiary hospital, Nanded, Maharashtra. *Niger Med J*. 2016;57(1):37-43.
- Hailu LD and Kebede DL. Determinants of Low Birth Weight among Deliveries at a Referral Hospital in Northern Ethiopia. *BioMed Research International* 2018;Article ID 8169615:1-8.
- Malik S, Ghidiyal RG, Udani R, Waingankar P. Maternal biosocial factors affecting low birth weight. *Indian Journal Paediatrics*. 1997;64(3):373-7.

- Population Division. Nepal Demographic and Health Survey. Ministry of Health and Population, Government of Nepal. 2011, 2012; 148-149.
- Mumbare SS, Mairdakar G, Darade R, Yenge S, Tolani MK. Maternal risk factors associated with term low birth weight neonates. *Indian Pediatrics J*. 2012;49:27.
- Edris M, Erakli G. The prevalence of LBW and factors associated with LBW in Gondar, North west Ethiopia. *Ethiop J Health Dev*. 1996;10:149-52.
- He Z, Bishwajit G, Yaya S, et al. Prevalence of low birth weight and its association with maternal body weight status in selected countries in Africa: a cross sectional study. *BMJ Open* 2018;8:e020410.
- Dharmalingam A, Navaneetham K, Krishnakumar CS. Nutritional status of mothers and low birth weight in India. *Matern Child Health J* 2010;14:290-8.
- Nagargoje MM, Chaudhary SS, Deshmukh JS, Gupta SC, Misra SK. A case control study of risk factors for low birth weight in nagpur city of maharashtra. *Indian J Community Health [Internet]*. 2011; [cited 2020Jan.11];23(1):1-7.
- Azimul SK, Matin A, Shabnam JH, Shamianaz S, Bannerje M. Maternal factors affecting low birth weight in urban area of Bangladesh. *J Dhaka Med Coll* 2009; 18(1) : 64-69.
- Gupta DR, Swasey K, Burrowes V, et al. Factors associated with low birth weight in Afghanistan: a cross-sectional analysis of the demographic and health survey 2015. *BMJ Open* 2019;9:e025715.
- Merklinger-Gruchala A, Jasienska G, Kapiszewska M. Short interpregnancy interval and low birth weight: A role of parity. *Am J Hum Biol* 2015;27:660-6.
- Shah PS, Knowledge Synthesis Group on Determinants of LBW/PT births. Parity and low birth weight and preterm birth: a systematic review and meta-analyses. *Acta Obstet Gynecol Scand* 2010;89:862-75.
- Rezende Chrisman J, Mattos IE, Koifman RJ, et al. Prevalence of very low birthweight, malformation, and low Apgar score among newborns in Brazil according to maternal urban or rural residence at birth. *J Obstet Gynaecol Res* 2016;42:496-504.
- Kayode GA, Amoakoh-Coleman M, Agyepong IA, et al. Contextual risk factors for low birth weight: a multilevel analysis. *PLoS One* 2014;9:e109333.