e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(9); 53-59

Original Research Article

A Study on Maternal Risk Factors Associated with Term Low Birth Weight Infants

K. Margaret Punitha[1], Poornima Shankar[2], Vikram R[3]

[1]Senior Assistant Professor, Dept. of SPM, Sri Lalithambigai Medical College and Hospital, Dr MGR Educational and Research Institute, Chennai.
[2]Assistant Professor, Department of Obstetrics and Gynaecology, Faculty of Medicine – Sri Lalithambigai Medical College and Hospital, Dr MGR Educational and Research Institute, Chennai
[3]Associate Professor, Department of Paediatrics, Madha Medical College and Research Institute.

Received: 25-07-2022 / Revised: 25-08-2022 / Accepted: 08-09-2022
Corresponding author: Dr. Poornima Shankar
Conflict of interest: Nil

Abstract

Background: Low birth weight (LBW) deliveries contribute to high neonatal mortality rates (NMR) in developing countries. Several maternal risk factors are associated with LBW newborns. Appropriate interventions will help to reduce the incidence of LBW deliveries in these countries and improve neonatal survival outcomes. This study aims to identify maternal risk factors associated with LBW in India

Materials and Methods: A cross-sectional study of 506 consecutive live newborns delivered between January 1st and June 31st 2022 was conducted in Kannigaa puram, MADURAVOYAL ,Chennai. Maternal data included last menstrual period, history of illnesses such as hypertensive disorders and anaemia during pregnancy, delivery date and time. The weights of the newborns were measured at birth. Data were analyzed with the Statistical Package for Social Sciences (SPSS) version 18.0. The relative risk of having a LBW newborn with maternal factors was calculated.

Results: There were a total of 72 LBW newborns, giving an incidence rate of 14.2%. Eighteen (25%) of the mothers with LBW deliveries had malaria in pregnancy while 4 (5.6%) tested positive for human immuno-deficiency virus (HIV). The relative risk of having a LBW newborn was high in maternal HIV (RR=3.25, C.I=1.51-6.97), hypertension in pregnancy (RR=3.07, C.I=1.52-6.22), ante partum hemorrhage (APH) (RR=7.20, C.I=5.79-8.95), as well as primiparity (RR=1.35, C.I=0.88-2.08).

Conclusion: Birth weight in infants depends on several causes, not a single cause. Drug Abuse, the interval between pregnancies, and the history of bleeding are among the most preventable factors associated with LBW.

Keywords: Low Birth weight, Maternal ,Pregnancy

Introduction

Birth weight is one of the most important factors in the development, survival, and future of the baby; it is one of the main determinants of future physical and brain

development of the child and also a valid sign of intrauterine growth [1, 2]. Low birth weight (LBW) is defined by the World Health Organization (WHO) as any weight less than 2,500 g regardless of the age of the baby [3]. Every year around 20 million newborns (17% of live births) weigh less than 2,500 g and more than 90% of them are born in developing countries [2, 4, 5]. According to WHO in 2015, the prevalence of LBW around the globe was 15%. It was 13% in developing countries, 9% in the US, 6% in East Asia and the Pacific, 13% in Sub-Saharan Africa, and 28% in South Asia [6]. LBW is closely related to infant mortality in the first days of life and even after infancy. It has been seen that the survival rate and survival chance of children who weigh less than 2,500 g after birth are much lower than other children [4,7]. Generally, in these newborns the risk of neonatal mortality is 25-30 times more likely than those weighing more than 2,500 g, the lower the birth weight at birth, the greater the risk of neonatal mortality [5, 8]. It has been shown that LBW children who are alive with therapeutic interventions are two to three times more likely to suffer from short-term and long-term disabilities than other children [5, 9]. Many maternal and fetal factors are significantly associated with LBW [10-12]. Based on the results obtained from various studies, these factors include the mother's age, occupation, weight, number of pregnancies, history of smoking, length of pregnancy, previous births, reproductive multiplication, inappropriate nutritional status, socioeconomic inequalities, lack of attention to proper diet and consumption of supplements during pregnancy, birth season, number of pregnancy cares and anemia, and birth defects, along with pre-pregnancy conditions and the socioeconomic status of the family related to LBW [5, 11]. LBW birth outcomes are high, especially in developing countries and the third world. Those who survive with LBW have cognitive and neurologic disorders as well as increased risk of hypertension, pulmonary disease, blood cholesterol, kidney damage, acute watery diarrhea, and immune system disorders [4]. Moreover, LBW is one of the determinants of neurological disorders and evolution, including backwardness and mental disability in learning, and may cause disorders relating to chronic diseases in adulthood [13]. Since LBW causes the risk of mortality, disability, and many diseases in childhood and even in adulthood while causing immense economic costs to the healthcare system and communities, it is very important to identify the factors affecting underweight during birth and hospital release [14, 15].

Materials and Methods

A cross-sectional study of 506 consecutive live newborns delivered between January 1st and June 31st 2022 was conducted in Kannigaa puram, MADURAVOYAL, Chennai. Maternal data included last menstrual period, history of illnesses such as hypertensive disorders and anaemia during pregnancy, delivery date and time. The weights of the newborns were measured at birth. Data were analyzed with the Statistical Package for Social Sciences (SPSS) version 18.0. The relative risk of having a LBW newborn with maternal factors was calculated. All new-born babies who met the study criteria were recruited by consecutively within the first 24 hours of delivery. Maternal data included last menstrual period, history of illnesses such as hypertension and anemia during pregnancy, delivery date and time. The educational attainment and occupation of the parents were also obtained as well as weights of the newborns.

Statistical analysis

Data were recorded and analysed using the Statistical Package for Social Sciences (SPSS) version 18.0. Continuous variables were reported as means + standard

deviation while categorical variables were reported as the number or percentage of subjects with a particular characteristic. The relative risk (RR) of having a LBW newborn with the different maternal factors was calculated. Results were presented in tables.

Results

A total of 506 live births occurred at the three centres during the study period, of which a total of 72 were LBW newborns, giving an incidence rate of 14.2%. The LBW neonates comprised 31 males and 41 females, giving a Male: Female ratio of 1: 1.3. Their weights ranged from 650 g to 2450 g with a mean of 2044.4 ± 427 g. Thirty-one (43.1%) of them were pre term, while the rest (56.9%) were term. The gestational ages of the neonates ranged from 24 to 41weeks with a mean gestational age of 36.43 ± 3.75 weeks (Table 1).

Table 1: Classification of the LBW babies by gestational age.

	N	Percentage	Mean GA
Pre term (< 37 weeks)	31	43.1	33.06 ± 3.21
Term (≥ 37 weeks)	41	56.9	38.98 ± 1.31
Total	72	100	36.43 ± 3.75

The demographic characteristics of the mothers are shown in Table 2.

Table 2: Mothers' socio-demographic characteristics.

Age (years)	≤ 20	21 – 25	26 – 30	31 – 35	≥ 36
Frequency (%)	1(1.4)	23 (31.9)	36 (50.0)	10(13.9)	2(2.8)
Parity	1	2	3	4	> 4
Frequency (%)	32(44.4)	24 (33.3)	10 (13.9)	6 (8.3)	0
Socioeconomic Class	Class 1	Class 2	Class 3	Class 4	Class 5
Frequency (%)	5 (6.9)	15 (20.8)	42 (58.3)	10 (13.9)	0
Mother's Occupation	Senior public servant	Intermediate grade public servant	Junior public servant	Petty trading	Unemployed
Frequency (%)	5 (6.9)	10 (13.9)	45 (62.5)	2 (2.8)	10 (13.9)

The mothers were aged between 20 to 42 years with a mean age of 27.47 ± 4.25 years. All the mothers received antenatal care. None of the mothers of the LBW newborns ha diabetes and severe anaemia (Hb <7 g/dl). Eighteen (25%) of the mothers in the LBW category had malaria in pregnancy while 4 (5.6%) tested positive to HIV. Other associated maternal risk factors for LBW are shown in Table 3.

Table 3: Maternal risk factors for development of LBW compared with other babies.

Maternal condition	**Proportion in LBW**	**Proportion in other babies**	**RR**	**95% CI**	
	N = 72	N = 434		Lower	Upper
Primiparity	44.40%	35.90%	1.35	0.88	2.08
Malaria	25.00%	38.00%	0.59	0.36	0.97
HIV	5.60%	1.20%	3.25	1.51	6.97

Hypertension	6.90%	1.60%	3.07	1.52	6.22
APH	2.80%	0%	7.2	5.79.	8.95
Use of herbal products in pregnancy	8.30%	9.70%	0.87	0.4	1.89
Use of alcohol in pregnancy	6.90%	15.90%	0.44	0.18	1.05

The relative risk (at 95 confidence interval) of having a LBW neonate was high in maternal HIV (RR=3.25, C.I=1.51-6.97), hypertension in pregnancy (RR=3.07, C.I=1.52-6.22), ante partum hemorrhage (APH) (RR=7.20, C.I=5.79-8.95), as well as primiparity (RR=1.35, C.I=0.88-2.08)

Table 3: Maternal risk factors for development of LBW compared with other babies.

Maternal condition	Proportio n in LBW	Proportio n in other babies	RR	95% CI	
	N = 72	N = 434		Lower	Upper
Primiparity	44.40%	35.90%	1.35	0.88	2.08
Malaria	25.00%	38.00%	0.59	0.36	0.97
HIV	5.60%	1.20%	3.25	1.51	6.97
Hypertension	6.90%	1.60%	3.07	1.52	6.22
APH	2.80%	0%	7.2	5.79.	8.95
Use of herbal products in pregnancy	8.30%	9.70%	0.87	0.4	1.89
Use of alcohol in pregnancy	6.90%	15.90%	0.44	0.18	1.05

Discussion

The incidence of LBW in this study was 14.2% with a female preponderance. This figure is similar to the incidence of 14.6% obtained in a study in Ethiopia [16], and comparable to the average estimate of 16.5% LBW rate for many sub-Saharan African countries [16]. However, it is lower than the incidence rate reported in an Indian study (24.5%) [17]. The difference may be explained by geographical and racial variations [18]. The incidence of LBW in developing countries ranges from 5 to 33% with an average of 16.5% which was more than double the rate of 7% in developed regions [19]. Interestingly, the incidence obtained in this study is consistent with the overall incidence of 12% in Nigeria [20]. In addition, the female preponderance is tandem with the pattern observed in other studies [21,22,23]. This gender predominance is attributable to the greater lean body mass and less body fat seen in male newborns than in females, possibly due to the effects of fetal testosterone production [24]. Approximately 60% of the LBWs in the present study were term neonates; a finding which agrees with the reports that IUGR is common among LBW deliveries in developing countries [25,21,26,27]. Other authors also corroborated this observation in a multi-regional study of the aetiology of LBW in developed and developing settings [28]. The risk of having a LBW baby was found to be relatively higher among mothers that had HIV, hypertension in pregnancy and ante partum haemorrhage (APH) as well as primiparous mothers. This is consistent

with the findings from studies in other African countries [28-30]. The mechanism of LBW in HIV infected mothers seems unclear. However, it has been suggested that immune complex formation in HIV infection could impair placenta transfer of substances in mother-foetal pair, which may lead to IUGR [31]. Hypertension in pregnancy may be associated with IUGR as a result of vasospasm which leads to a decrease in utero-placental perfusion. Preterm delivery can result from an attempt to save the life of the mother with severe pregnancy- induced hypertension [32]. Malaria infection in pregnancy, which has been documented as a cause of LBW delivery [33], did not show a high risk for LBW in our study. This finding may be a reflection of the intermittent preventive therapy in malaria during the antenatal period which all the mothers in our study received. One meta-analysis of 36 studies on the effect of alcohol in pregnancy reported that heavy alcohol consumption is associated with an increase in the risk of LBW while light alcohol consumption may not affect the birth weight of the baby [34]. In the current study, the mothers that consumed alcohol during pregnancy were all occasional drinkers-defined as consuming less than two bottles per week [35]. This may explain why the risk for LBW- following alcohol consumption- was low in our study. The proportion of LBW newborns may reflect the health status of the communities into which they are born; making maternal malnutrition an important risk factor for LBW especially in a developing country like the area of the current study. This is because birth weight is conditioned by the health and nutritional status of the mother as suggested by Barker [36]. Human foetuses while adapting to maternal undernutrition, permanently change their physiology and metabolism, and these changes may be the origin of a number of diseases in later life, including coronary heart disease, diabetes, and hypertension [36]. This has been corroborated by researchers in other parts of the world who have demonstrated an inverse relationship between birth weight and disease in adult life [37.39]. However, the current study did not assess maternal nutritional status; making it a limitation of the study. [40]

Conclusions

Birth weight in infants depends on several causes, not a single cause. Drug Abuse, the interval between pregnancies, and the history of bleeding are among the most preventable factors associated with LBW. In addition, other risk factors during pregnancy should be identified and nullified to reduce the number of LBW babies.

References

1. Alexander G, Wingate M, Mor J, Boulet S. Birth outcomes of Asian-Indian-Americans. Int J Gynaecol Obstet 2007; 97:215- 20.
2. Moradi G, Khazaei Z, Esmailnasab N, Roshani D, Zokaii M, Ghaderi E, Nouri B. The relationship between maternal dis- eases during pregnancy and low birth weight: a nested case-control study in rural areas of Kurdistan Province (west of Iran). Int J Pediatr 2017; 5:5501-14.
3. Zhang Y, Lin L, Cao Y, Chen B, Zheng L, Ge R-S. Phthalate lev- els and low birth weight: a nested case-control study of Chinese newborns. J Pediatr 2009; 155:500-4.
4. Demelash H, Motbainor A, Nigatu D, Gashaw K, Melese A. Risk factors for low birth weight in Bale zone hospitals, South- East Ethiopia: a case-control study. BMC Pregnancy Childbirth 2015; 15:264.
5. Moraes ABd, Zanini RR, Riboldi J, Giugliani ERJ. Risk fac- tors for low birth weight in Rio Grande do Sul State, Bra- zil: classical and multilevel analysis. Cad Saude Publica 2012; 28:2293-305.

6. Organization WHO. Global nutrition targets 2025: wasting pol- icy brief. 2014:123-18. e3
7. Rahmani K, Zokaei M, Bidarpoor F, Babahajiani S, Nessaei P, Moradi G. Children mortality rate trend in kurdistan prov- ince during 2007 to 2011. Iran J Epidemiology 2014; 10:65-72.
8. Namvaran Germi K, Moradi A, Farzad V, Zahrakar K. Identify- ing the dimensions of marital adjustment in Iranian couples: a qualitative study. J Health Care 2017; 19:182-94.
9. Xia W, Zhou Y, Zheng T, Zhang B, Bassig BA, Li Y, Wise J, Zhou A, Wan Y, Wang Y, Xiong Ch, Zhao J, Li Z, Yao Y, Hu J, Pan X, Xu Sh. Maternal urinary manganese and risk of low birth weight: a case-control study. BMC Public Health 2016; 16:142.
10. Teklehaimanot N, Hailu T, Assefa H. Prevalence and factors as- sociated with low birth weight in Axum and Laelay Maichew districts, North Ethiopia: a comparative cross-sectional study. Int J Nutr Food Sci 2014; 3:560-6.
11. Khazaei S, Mansori K, Khazaei Z, Sani M, Ayubi E. Infant and young child feeding status in Iran compared the different Unit- ed Nation Regions. Int J Pediatr 2016; 4:3639-41.
12. Goodarzi E, Ghaderi E, Khazaei S, Alikhani A, Ghavi S, Man- sori K, Ayubi E, Gholamaliee B,Beiranvand R, Dehghani SL, Ghotbi N, Nili S. The prevalence of transient and permanent congenital hypothyroidism in infants of Kurdistan Province, Iran (2006-2014). Int J Pediatr 2017; 5:4309-18.
13. Derakhshi B, Esmailnasab N, Ghaderi E, Hemmatpour S. Risk factor of preterm labor in the west of iran: a case-control study. IJPH 2014; 43:499.
14. Khanal V, Sauer K, Karkee R, Zhao Y. Factors associated with small size at birth in Nepal: further analysis of Nepal Demo- graphic and Health Survey 2011. BMC Pregnancy Childbirth 2014; 14:32.
15. Lim JW, Chung S-H, Kang DR, Kim C-R. Risk factors for cause-specific mortality of very-low-birth-weight infants in the Korean neonatal network. J Korean Med Sci 2015;30: S35-S44.
16. The 2005 Ethiopian Demographic and Health Survey (EDHS) Report: Addis Ababa, Ethiopia: Ethiopian Central Statistical Agency; 2006: 128– 129.
17. Ashtekar SV, Kulkarni MB, Sadavarte VS, Ashtekar RS. Analysis of birth weights of a rural hospital. Indian J Community Med 2010;35: 252-255.
18. Use of a simple anthropometric measurement to predict birth weight. WHO Collaborative Study of Birth Weight Surrogates. Bull World Health Organ 1993; 71:157163.
19. Low birth weight: country regional and global estimates. UNICEF, New York.
20. UNICEF. State of the world's children 2012: Children in an urban world
21. Mumbare SS, Maindarkar G, Darade R, Yenge S, Tolani MK, et al. Maternal risk factors associated with term low birth weight neonates: a matched-pair case control study. Indian Pediatr 2012;49: 25-28.
22. Tema T. Prevalence and determinants of low birth weight in Jimma Zone, Southwest Ethiopia. East Afr Med J 2006;83: 366-371.
23. Zeleke BM, Zelalem M, Mohammed N. Incidence and correlates of low birth weight at a referral hospital in Northwest Ethiopia. Pan Afr Med J.2012;12: 4.
24. Milner RDG, Gluckman PD. Regulation of intra-uterine growth. Pediatrics and perinatology: The scientific basis. (2nd edn), Arnold Publishers Ltd, London. 1996.
25. Demographic and health surveys Nigeria. Mavalankar DV1, Gray RH, Trivedi CR. Risk factors for preterm and term low birthweight in

Ahmedabad, India. Int J Epidemiol. 1992;21: 263-272.
26. Horta BL, Victora CG, Menezes AM, Halpern R, Barros FC. Low birthweight, preterm births and intrauterine growth retardation in relation to maternal smoking. Paediatr Perinat Epidemiol.1997; 11: 140-151.
27. Soheila K, Bahare G, Fariba M. Investigation of low-birth-weight incidence and its risk factors in Ilam-Iran. Pediatr on call J. 2007;4: 1-5.
28. Villar J, Belizán JM. The relative contribution of prematurity and fetal growth retardation to low birth weight in developing and developed societies. Am J Obstet Gynecol.1982;143: 793-798.
29. Siza JE. Risk factors associated with low birth weight of neonates among pregnant women attending a referral hospital in northern Tanzania. Tanzan J Health Res. 2008; 10: 1-8.
30. Jammeh A, Sundby J, Vangen S Maternal and obstetric risk factors for low birth weight and preterm birth in rural Gambia: a hospital-based study of 1579 deliveries. Open J Obstet Gynecol. 2011; 1: 94–103.
31. Scott S, Cumberland P, Shulman CE, Cousens S, Cohen BJ, et al. Neonatal measles immunity in rural Kenya: the influence of HIV and placental malaria infections on placental transfer of antibodies and levels of antibody in maternal and cord serum samples. J Infect Dis. 2005;191: 1854-1860.
32. Landy H. The impact of maternal illness on the neonate. Neonatology: Pathophysiology and management of the newborn. (5th edn), Lippincott Williams and Wilkin, Philadelphia, USA. 1999.
33. Guyatt HL, Snow RW. Impact of malaria during pregnancy on low birth weight in sub-Saharan Africa. Clin Microbiol Rev. 2004;17: 760-769.
34. Patra J, Bakker R, Irving H, et al. Dose–response relationship between alcohol consumption before and during pregnancy and the risks of low birth weight, preterm birth and small for gestational age (SGA)—a systematic review and meta-analyses. Br J Obstet Gynaecol 12: 1411-1421
35. Gallo M, Sarkar M, Au W, Pietrzak K, Comas B, et al. Pregnancy outcome following gestational exposure to echinacea: a prospective controlled study. Arch Intern Med. 2000;160: 3141-3143.
36. Barker DJ. Maternal nutrition, fetal nutrition, and disease in later life. Nutrition. 1997;13: 807-813.
37. Phenekos C. Influence of fetal body weight on metabolic complications in adult life: review of the evidence. J Pediatr Endocrinol Metab. 2001;14 Suppl 5: 1361-1363.
38. Godfrey KM, Barker DJ. Fetal programming and adult health. Public Health Nutr. 2001;4: 611-624.
39. Hoy WE, Rees M, Kile E, Mathews JD, Wang Z. A new dimension to the Barker hypothesis: low birthweight and susceptibility to renal disease. Kidney Int. 1999; 56: 1072-1077.
40. Salih, A. A., Saeedi, S. M., & Ghali, K. H. Impact of Fibrosis Related to TGF-B1and TNFR-1 Growth Factors in Renal Failure Patients. Journal of Medical Research and Health Sciences, 2022;5(7): 2105–2111.