Risk factors associated with low birth weight at the Northern Regional Hospital in Belize. July-December, 2021

Ana Ivis Estrada Rosales[1], Mildrey González Rivera[1]

Abstract

Low birth weight is a significant challenge for public health. It represents one of the most important aspects that can affect a newborn to experience satisfactory growth and development. **Objective:** to describe the risk factors for low birth weight in pregnant women treated at the Northern Regional Hospital, Orange Walk, Belize, in a period of six months. **Method:** A descriptive, retrospective study was carried out, with an epidemiological approach, of 27 mothers having newborns weighing <2500 g, between July and December, 2021. **Results:** 65% of the newborns with LBW occurred in the second semester of the year, being August, September and December the most affected months. Dystocic births (C-sections) had the highest incidence and most of the patients came from rural areas. Urinary tract infection had the highest incidence in almost all age groups, followed by anemia and hypertension as the three more prevalent comorbidities. Low maternal weight gain can be also considered as predictor for LBW. **Conclusions:** Improvement of preconceptional and prenatal care is essential to prevent LBW neonates and to decrease the high morbidity and mortality associated to this condition.

Keywords

Low birth weight; risk factors; maternal conditions

■ INTRODUCTION

The World Health Organization (WHO) defines "low birth weight" (LBW) as a birth weight less than 2500 g. This remains as a significant public health problem throughout the world and it is associated with multiple short and long term consequences. Overall, it is estimated that between 15% and 20% of children born worldwide have LBW, which represents more than 20 million newborns each year. The goal for 2025 is to reduce by 30% the number of children with a birth weight less than 2500 g, which would increase the annual number of children with LBW from 20 million to about 14 million. (1)

The Pan American Health Organization (PAHO) and the WHO reported in 2017 a prevalence of LBW for Central America of 10.28%. Belize exhibits low indicators compared to other countries in the region. These results have been

partially achieved thanks to the work strategies of the Ministry of Health and Wellness, in practice at the Northern Regional Hospital (NRH), Orange Walk District. This institution ended 2021 with a total of 1,014 live births, 50 of them with LBW, representing 4.9% of all live birth. (2,3) 64% of these LBW, occurred in the second half of the year, and this is the reason why we decided to carry out this research specifically in the period July - December 2021.

The causes of LBW are multifactorial involving genetic, placental, fetal and maternal. Maternal risk factors, especially anemia, is the most important determinant of LBW in developing countries. Other factors like maternal age, the number of antenatal visits and parity have both independent and cumulative effect in LBW. (4,5)

UNICEF further reported, that most of LBW infants are born in informal delivery settings, where they are not weighed, thus making it difficult to get a true estimate of

1.Registered Nurse. Northern Regional Hospital. Orange Walk. Belize.
Cuban Medical Brigade in Belize

the magnitude of the problem. Low birth weight has a significant impact on neonatal and infant mortality in children under one year old, particularly in the neonatal period. However, the negative consequences of LBW are not limited to the perinatal period, but also in what these children could express in the future. Multiple problems, both in childhood and adolescence, can be related to LBW. (6)

The purpose of this investigation was to identify and describe the risk factors for LBW, taking into account the association between them in pregnant women treated at the NRH.

■ METHOD

A descriptive, retrospective study with an epidemiological approach was carried out of 27 mothers whose delivery was attended at the NRH, having newborns weighing <2500g, between July and December, 2021. Variables analyzed were maternal age, parity, previous associated and pregnancy-related diseases, gestational age at the time of delivery and nutritional status.

Inclusion criteria
• Live births.
• Birth weight <2500 g.
• Mothers residing in the Orange Walk and Corozal districts.
Exclusion criteria
• Mothers who did not consent to be included in the investigation.

Data was obtained from the Clinical Charts, BHIS and from the Department of Statistics of the NRH. Descriptive stats were obtained from the variables and presented in tables and figures for the analysis. Confidentiality was preserved for all data obtained in this study and data was exclusively used for scientific purposes.

Table #1 shows the number of deliveries distributed by month. In August, September and December the highest incidence was reported, with 18.5% for each month. Three out of 27 mothers, representing 11,1%, had very low

Table 1. Total live births with LBW,
VLBW and ELBW by months

Months of the year	Live newborns. LBW	Live newborns. VLBW, ELBW	Total	%
July	4		4	14.8
August	5		5	18.5
September	5		5	18.5
Octuber	2	2	4	14.8
November	3	1	4	14.8
December	5		5	14.8
Total	24	3	27	100

LBW: Low birth weight
VLBW: Very low birth weight
ELBW: Extremely low birth weight

(VLBW) or extremely low birth weight (ELBW) babies, which are the most vulnerable ones for complications and death. A newborn is VLBW when the weight at birth is less than 1500 g, and an ELBW baby is one born very prematurely weighing between 401 and 1000 g. (7)

VLBW and ELBW are associated to major short and long term complications. Despite mortality has decreased in most of the high-income countries, the frequency of bronchopulmonary dysplasia, neurological impairment and malnutrition is still significant. (7) Unfortunately, developing countries still report a high mortality in these group of patients. In those settings, prevention is a must.

Graphic 1. Type of deliveries according to regions
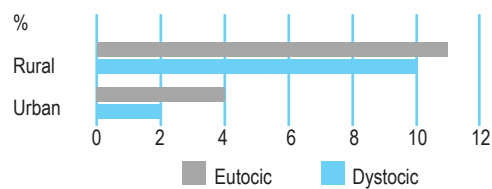
Source: NRH Department of Statistics

The type of delivery according to the provenance of the mothers is illustrated in graph 1. As it is shown, 21 (10 eutocic and 11 dystocic) deliveries corresponded to mothers coming from rural areas. Most of the dystocic deliveries were C-sections.

The predominance of women coming from rural areas can be related to the geographical characteristics of the district, where majority of the population is distributed in villages. However, difficult access to health care and low educational level can be factor affecting the quality of prenatal care (8). Nieuwenhuijsen MJ et al (9) observed statistically significant associations among presence of public bus line, land use Shannon's Evenness Index, and traffic density and birth weight in Europe.

Table 2. Age groups related to parity,
delivery preterm and term

Age group	Nulliparous		Multiparous		Total	%
	Preterm	Term	Preterm	Term		
15-19	2	3			5	18.5
20-24	1	2	1	3	7	25.9
25-29		1	1	2	4	14.9
30-34	1	1	2	1	5	18.5
35-39				3	3	11.1
40+			1	2	3	11.1
Total	4	7	5	11	27	100

Source: NRH Department of Statistics

Most of the mothers were between 20 and 24 years old, representing 25.9%, as it is shown in Table 2. Additionally, 16 mothers (22.2%) were multiparous. It is notorious that in 18 cases, LBW babies were the product of term pregnancies, which is evidence of intrauterine grow

retardation (IUGR). It is well known that those newborns have the highest morbidity and mortality, and demand special care.

IUGR fetuses experiencing growth restriction inside the uterus fails to achieve their full growth potential for a given gestational age and are at increased risk of perinatal mortality and morbidity. About 10% of all live born babies and at least 30% of the neonates having LBW suffer from IUGR. The perinatal mortality in IUGR neonates is 4 to 10 times higher than that of normal grown babies. (10)

The incidence of IUGR in developing countries is 6 times higher as compared to developed countries. In developing countries, the incidence of IUGR was reported to be 11% of the total number of neonates in 2008, but in 2017, it was up to 30% that constituted 50 to 60% of LBW. (11,12)

The relationship between multiparity, maternal age and LBW is evidenced in the present study. Some authors suggest that women older than 35 and under 20 are likely to have children weighing less than 2500 g (13-15). In our opinion, the predominance of women aging 20 to 24 years old in this sample is an expression of the overall frequency of pregnancies at these age, and cannot be exclusively connected to LBW. Many authors highlight maternal age (adolescents and elders) as an important risk factor, since this can affect the weight of the newborn, as reported by Montero Mesa M et al and Zerquera Rodriguez JR et al (14,15). In this regard, Cabezas Cruz E et al (16) reports that maternal age has not been identified as a significant risk factor for LBW.

Manandhar T et al (17) reported in a series of 60 cases in Nepal, that IUGR was common in multigavida, women coming from rural area, lower socioeconomic status and manual workers. Our results coincide with most of the ones reported. Social determinants are very important risk factors for LBW and especially for IUGR.

Pregnancy is a physiological state that demands numerous requirements from the maternal organism. Women should be in a good physical condition at the beginning of the pregnancy to ensure the best outcome. This implies actions from health personnel, especially with regard to the control of preconception reproductive risk, to prevent women from becoming pregnant with a poor nutritional status that negatively affects her and the future baby. (18,19)

When evaluating the conditions related and associated to pregnancy, according to age groups, it is important to highlight that the age group with the highest morbidity was 20-24 with a total of 12. Sometimes, pregnant women presented more than one health problem. Urinary tract infection (UTI) had the highest incidence in almost all age groups, affecting 14 pregnant women, followed by anemia with a total of 10. These two conditions, along with hypertension (HTN) were the three more prevalent

Table 3. Conditions associated to pregnancy according to age groups

Pregnancy conditions	Age group						Total	%
	15-19	20-24	25-29	30-34	35-40	40+		
UTI	2	3	4	2	2	1	14	51.9
Anemia	2	4		1	2	1	10	37.0
HTN		3		2	1	2	8	29.6
DM			1	1	1		3	11.1
Vaginosis	1	1		1			3	11.1
Mult. Preg.				2			2	11.1
Others	1	1		1		1	4	14.8
Total	6	12	5	10	6	5		

Source: NRH Department of Statistics
UTI: Urinary tract infection; HTN: Hypertension; DM: Diabetes Mellitus

comorbidities. In the case of hypertensive patients, two of them suffered preeclampsia and one eclampsia. While in other conditions like Diabetes Mellitus and vaginal infections exhibited low incidence in this study group, they are still of great concern.

Urinary tract infection (UTI) is related to LBW and its maternal-fetal repercussions are usually serious. Some authors have reported association of UTI and preeclampsia, preterm birth and LBW. (20-22) UTI may present as asymptomatic bacteriuria, acute cystitis or pyelonephritis. Escherichia coli is the most common pathogen associated with both symptomatic and asymptomatic bacteriuria. If asymptomatic bacteriuria is untreated, up to 30% of mothers develop acute pyelonephritis, with an increased risk of multiple maternal and neonatal complications, such as preeclampsia, preterm birth, intrauterine growth restriction and low birth weight. (20)

Lee AC et al (21) conducted an investigation in Sylhet, Bangladesh, reporting that one in 11 women had a UTI in pregnancy, and approximately half of cases were asymptomatic. Authors emphasized that there is a need for low-cost and accurate methods for UTI screening in pregnancy and efforts to address increasing rates of antibiotic resistance in low and middle income countries.

Many authors agree in pointing out the close relationship between anemia and LBW. Therefore, it is of great importance that all non-pregnant women between 15-49 years old consume nutritional supplements containing iron, folic acid. This strategy should attenuate the risk anemia. (15,23) Adequate follow up and prenatal control is essential to prevent and control anemia. Management include prenatal supplements, periodic blood tests and iron therapy in case of diagnosed anemia. (4,23)

Hypertension has been a relevant risk factor since it produces placental vascular alterations with decreased utero-placental irrigation, causing early aging of the placenta. Sometimes it is associated with toxemia that can lead to serious consequences such as eclampsia and

placental abruption, which forces the termination of pregnancy. The scenario can be a preterm delivery, with imminent risk of death, or as a result of malnutrition of the fetus, to obtain a full term newborn weighing less than 2500 g. (8,11)

Getaneh T et al (24) developed an study in Ethiopia finding that the pooled prevalence of LBW among women who had pregnancy induced hypertension was more than two times higher than the pooled estimate of low birth weight among all reproductive aged women. The odds of low birth weight also increased nearly four times among women with pregnancy induced hypertension than normotensive

Table 4. Maternal weight gain during pregnancy related to obstetric conditions and LBW

Weight gain in pregnancy	UTI	Anemia	DM	HTN	Vaginosis	Multiple prenancy	PROM	Total	%
Insufficient	6	7	1	4	2	2	1	15	55.6
Adecuate	8	3	2	4	1	0	1	12	44.4

Source: NRH Department of Statistics
PROM: Premature rupture of membranes

women.
In this study, it was found that despite having started with an adequate body mass index, weight gain during pregnancy was insufficient in 15 patients, representing 55.6%. The association of 2 or more conditions, including UTI, anemia and HTN also had a negative impact, leading to low maternal weight at term of pregnancy.

Fang L et al (5) concluded that the more the frequency of prenatal visits, the lower the risk of low birth weight infants. Hence health education and prenatal care for pregnant women with low educational level, multiple childbirths and advanced age should be strengthen, so as to promote the health of mothers and infants. Similarly, Baye Mulu et al (8) found as predictors of LBW: maternal height <155 cm, complications during pregnancy, gestational hypertension, and incomplete antenatal visit, and low maternal education. Concordant results were reported by Asmare G et al. (13)

■ CONCLUSIONS

Many maternal conditions, prior to and during pregnancy, including UTI, anemia and hypertension were highly associated to LBW. Majority of pregnant women came from rural areas and were multiparous. Low maternal weight gain can be also considered as predictor for LBW. Improvement of preconceptional and prenatal care is essential to prevent LBW neonates and to decrease the high morbidity and mortality associated to this condition.

Factores de riesgo asociados al bajo peso al nacer en el Hospital Regional del Norte. Julio-Diciembre, 2021

Resumen
El bajo peso al nacer constituye un desafío para la salud pública mundial. Representa uno de los aspectos más importantes que pueden afectar a un recién nacido para experimentar un crecimiento y desarrollo satisfactorio. Objetivo: describir los factores de riesgo de bajo peso al nacer en gestantes atendidas en el Hospital Regional del Norte, Orange Walk, Belice, en un periodo de seis meses. Método: Se realizó un estudio descriptivo, retrospectivo, con enfoque epidemiológico, de 27 madres de recién nacidos con peso <2500g, entre julio y diciembre de 2021. Resultados: El 65 % de los recién nacidos con BPN se presentaron en el segundo semestre del año, siendo agosto, septiembre y diciembre los meses más afectados. Los partos distócicos (cesáreas) tuvieron la mayor incidencia y la mayoría de los pacientes procedían de zonas rurales. La infección del tracto urinario fue la de mayor incidencia en casi todos los grupos de edad, seguida de la anemia y la hipertensión arterial como las tres comorbilidades más prevalentes. La ganancia insuficiente de peso materno también se puede considerar como predictor de BPN. Conclusiones: La mejora de la atención preconcepcional y prenatal es fundamental para prevenir los recién nacidos con bajo peso al nacer y disminuir la alta morbimortalidad asociada a esta condición.

Palabras clave
Bajo peso al nacer; factores de riesgo; morbilidad materna

■ REFERENCES

1. Chacón Lozada E, Chacón Veranes M, del Toro Felipe S, Felipe Fuentes IC, Acosta Perdomo YD. Low birth weight, a challenge in primary care health. Observatorio Ciencias Sociales Iberoamérica [Internet]. 2021 [cited Nov 10, 2022]; 2(14): 26-41. Available at: https://www.eumed.net/es/revistas/ocsi/ocsi-septiembre21/bajo-peso-nacer

2. Health in the Americas 2017 [Internet]. Washington: Pan American Health Organization; 2017 [cited Oct 18 2022]. Available from: https://www.paho.org/salud-en-las-americas-2017/index-2017.html

3. Obstetric Care Protocols. Guide for Doctors and Nurses. Ministry of Health and Wellness of Belize. Jun-2020. Available from: https://www.health.gov.bz

4. Javed H, Mehmood B, Javed RA. Frequency of low birth weight in term pregnancy and its association with maternal risk factors. Rawal Med J [Internet]. 2018 [cited Nov 10 2022];43(1):102-105. Available at: https://www.rmj.org.pk/fulltext/27-1495136561.pdf

5. Fang L, Mei-ling T, Shuo W, Zi-jia S, Hui-qing Y, Li W. A study on the relationship between the number of prenatal visits and low birth weight infants. Chinese J Dis Control Prev [Internet]. 2021 [cited Nov 10 2022];25(10): 220-1225. doi: 10.16462/j.cnki.zhjbkz.2021.10.019

6. Tshotetsi L, Dzikiti L, Hajison P, Feresu S. Maternal factors contributing to low birth weight deliveries in Tshwane District, South Africa. PLoS One[Internet]. 2019 [cited Nov 10 2022];14(3):e0213058. doi: 10.1371/journal.pone.0213058.

7. Lui K, Lee SK, Kusuda S, Adams M, Vento M, Reichman B, et al. Trends in outcomes for neonates born very preterm and very low birth weight in 11 high-income countries. J Pediatr [Internet]. 2019 [cited Nov 10 2022];215:32-40.e14. doi: 10.1016/j.jpeds.2019.08.020

8. Baye Mulu G, Gebremichael B, Wondwossen Desta K, Adimasu Kebede M, Asmare Aynalem Y, Bimirew Getahun M. Determinants of low birth weight among newborns delivered in public hospitals in Addis Ababa, Ethiopia: case-control study. Pediatric Health Med Ther [Internet]. 2020 [cited Nov 10 2022];11:119-126. doi: 10.2147/PHMT.S246008.

9. Nieuwenhuijsen MJ, Agier L, Basagaña X, Urquiza J, Tamayo-Uria I, Giorgis-Allemand L, et al. Influence of the Urban Exposome on Birth Weight. Environ Health Perspect [Internet]. 2019 [cited Nov 10 2022];127(4):47007. doi: 10.1289/EHP3971

10. Abbas G, Shah S, Hanif M, Shah A, Rehman AU, Tahir S, et al. The frequency of pulmonary hypertension in newborn with intrauterine growth restriction. Sci Rep [Internet]. 2020 [cited Nov 10 2022];10(1):8064. doi: 10.1038/s41598-020-65065-2.

11. Badshah S, Mason L, McKelvie K, Payne R, Lisboa PJ. Risk factors for low birthweight in the public-hospitals at Peshawar, NWFP-Pakistan. BMC Public Health [Internet]. 2008 [cited Nov 10 2022];8:197. doi: 10.1186/1471-2458-8-197.

12. El-Wahed MA, El-Farghali OG, ElAbd SA, El-Desouky ED, Hassan SM. Metabolic derangements in IUGR neonates detected at birth using UPLC-MS. Egyptian J Med Human Gen [Internet]. 2017 [cited Nov 10 2022];18(3):281-287. Available at: https://doi.org/10.1016/j.ejmhg.2016.12.002

13. Asmare G, Berhan N, Berhanu M, Alebel A. Determinants of low birth weight among neonates born in Amhara Regional State Referral Hospitals of Ethiopia: unmatched case control study. BMC Res Notes [Internet]. 2018 [cited Nov 10 2022];11(1):447. doi: 10.1186/s13104-018-3568-2.

14. Zerquera Rodriguez JR, Cabada Martinez Y, Zerquera Rodriguez D, Delgado Acosta HM. Factores de riesgo relacionados con bajo peso al nacer en el municipio Cienfuegos. MediSur [Internet]. 2015 [cited Nov 10 2022];13(3): 366-374. Available from: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1727-897X2015000300006

15. Montero Mesa M, Dihigo MT, Núñez Valdés L, Salabert Tortoló I, Vega Rodríguez L. Factores de riesgo asociados al bajo peso al nacer en la provincia Matanzas. 2013. Rev Med Electron [Internet]. 2014 [cited Nov 10 2022];36(4). Available from: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1684-18242014000400005

16. Cabezas Cruz E. Mortalidad materna y perinatal en adolescentes. Rev Cubana Obstet Ginecol [Internet]. 2002 [cited Nov 10 2022];28(1): 5-10. Available from: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0138-600X2002000100001

17. Manandhar T, Prashad B, Nath Pal M. Risk Factors for Intrauterine Growth Restriction and its neonatal outcome. Gynecol Obstet [Internet]. 2018 [cited Nov 10 2022];8(2): [about 9p.] doi: 10.4172/2161-0932.1000464

18. Jacob CM, Killeen SL, McAuliffe FM, Stephenson J, Hod M, Diaz Yamal I, et al. Prevention of noncommunicable diseases by interventions in the preconception period: A FIGO position paper for action by healthcare practitioners. Int J Gynaecol Obstet [Internet]. 2020 [cited Nov 10 2022];151(Suppl 1):6-15. doi: 10.1002/ijgo.13331

19. Stephenson J, Schoenaker DA, Hinton W, Poston L, Barker M, Alwan NA, et al. A wake-up call for preconception health: a clinical review. Br J Gen Pract [Internet]. 2021 [cited Nov 10 2022];71(706):233-236. doi: 10.3399/bjgp21X715733

20. Kalinderi K, Delkos D, Kalinderis M, Athanasiadis A, Kalogiannidis I. Urinary tract infection during pregnancy: current concepts on a common multifaceted problem. J Obstet Gynaecol [Internet]. 2018 [cited Nov 10 2022];38(4):448-453. doi: 10.1080/01443615.2017.1370579.

21. Lee AC, Mullany LC, Koffi AK, Rafiqullah I, Khanam R, Folger LV, et al. Urinary tract infections in pregnancy in a rural population of Bangladesh: population-based prevalence, risk factors, etiology, and antibiotic resistance. BMC Pregnancy Childbirth [Internet]. 2019 [cited Nov 10 2022];20(1):1. doi: 10.1186/s12884-019-2665-0.

22. Dautt-Leyva JG, Canizalez-Román A, Acosta Alfaro LF, Gonzalez-Ibarra F, Murillo-Llanes J. Maternal and perinatal complications in pregnant women with urinary tract infection caused by Escherichia coli. J Obstet Gynaecol Res [Internet]. 2018 [cited Nov 10 2022];44(8):1384-1390. doi: 10.1111/jog.13687

23. Figueiredo ACMG, Gomes-Filho IS, Silva RB, Pereira PPS, Mata FAFD, Lyrio AO, et al. Maternal Anemia and Low Birth Weight: A Systematic Review and Meta-Analysis. Nutrients [Internet]. 2018 [cited Nov 10 2022];10(5):601. doi: 10.3390/nu10050601

24. Getaneh T, Negesse A, Dessie G, Desta M. The impact of pregnancy induced hypertension on low birth weight in Ethiopia: systematic review and meta-analysis. Ital J Pediatr [Internet]. 2020 [cited Nov 10 2022];46(1):174. doi: 10.1186/s13052-020-00926-0