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Related factor with the low weight born in a high-complexity hospital

Factores relacionados con el bajo peso al nacer en un hospital de alta complejidad

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Conflict of interest: nothing

Abstract

Background: between the risk factors associated with LBW, adverse social conditions such as unemployment, lack of food security, extreme poverty and barriers to access to health services are reported, and the most frequent causes of low birth weight are preterm births and fetal growth restriction.

Objective: To identify the frequency and determinants of low birth weight in a high complexity hospital in Cali Colombia.

Methods: Observational analytical study of cases and controls, retrospective. The information of 906 single births and term, that occurred between October and December 2017 was analyzed; We identified 53 cases of low birth weight and compared them with 853 births with normal weight.

Results: The exposure variables that showed association with LBW were the OR gestation time 10.2 (CI 95%: 4.7-21.9, p: 0.000); primigestation OR 0.9 (CI 95%: 1.1-3.5; p: 0.022).

Conclusion: LBW can be explained by biological variables with a sociodemographic background, specifically primigestation as a risk of LBW in our population.

Resumen

Antecedentes: Entre los factores de riesgo asociados al BPN, se reportan las condiciones sociales adversas como el desempleo, la falta de seguridad alimentaria, la extrema pobreza y las barreras de acceso a los servicios de salud y las causas más frecuentes del bajo peso al nacer son los nacimientos pre-término y la restricción en el crecimiento fetal.

Objetivo: identificar la frecuencia y determinantes del bajo peso al nacer en un hospital de alta complejidad en Cali-Colombia.

Métodos: Estudio observacional analítico de casos y controles, retrospectivo. Se analizó la información de 906 nacimientos de embarazos únicos y a término, sucedidos entre octubre y diciembre de 2017; se identificaron 53 casos de bajo peso al nacer y se compararon con 853 nacimientos con peso normal.

Resultados: En los determinantes de BPN las variables de exposición que mostraron asociación fueron el tiempo de gestación OR de 10.2 (IC: 95% 4.7-21.9; p 0.000); ser primigestantes OR de 1.9 (IC 95%: 1.1-3.5; p 0.022).

Conclusión: el BPN puede ser explicado por variables biológicas con trasfondo sociodemográfico, concretamente la primigestación como riesgo de BPN en nuestra población.

Contribución clave del estudio

Objective	TTo identify the frequency and determinants of low birth weight in a high-complexity hospital in Cali, Colombia
Study design	Cases and controls
Source of information	Clinical records of newborns with low birth weight and registry of live newborns
Population/sample	Information from 906 singleton and full-term births was analyzed; 53 cases of low birth weight were identified and compared with 853 normal weight births
Statistical analysis	A bivariate and multivariate analysis was performed, estimation of odds ratio (OR) and a multivariate analysis through logistic regression.
Main findings	The exposure variables that showed association with low birth weight (LBW) were gestation time OR of 10.2 (95% CI: 4.7-21.9; p= 0.000) and being a first-time pregnancy OR of 1.9 (95% CI: 1.1-3.5; p= 0.022).

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Introduction

Low birth weight (LBW) remains a public health problem throughout the world. Globally, about 20 million births (18%) were reported with weights less than 2,500g, of which 96% were in developing countries. The worldwide incidence of LBW varied between 8%-20%, depending on the level of development of the countries (1) with about 85% of all neonatal deaths being associated with LBW (2,3). The most affected region is South Asia (22-25%), and the least affected region is the Western Pacific (5-6%) (4,5). Approximately 40% of all LBW births in the world are registered in India. Since in many developing countries, babies are not weighed at birth, there is an estimated global underreporting of LBW of 58% (6).

Regarding low birth weight in the Americas, the countries that report the highest incidences are Honduras (15.0%), Dominican Republic (14.0%), Guatemala (12.4%), Ecuador (12.1%), El Salvador (9.4%), Colombia with (9.0)%, Panama (7.8%), Peru (7.5%), Argentina (7.2%), Costa Rica (6.8%), Chile (6.2%), Paraguay (6.2%), Mexico (5.7%) and Cuba (5.3%). In South America, the incidence ranges between 6.2% and 12.0% and in North America, the incidence is less than 8.3% (7,8).

In Colombia, during 2016, 48,340 births were reported, of which 292 (0.6%) died due to some complication related to the LBW (9). Between the years of 2004-2015, LBW has exhibited an irregular behaviour and in some municipalities, it has decreased slightly (5).

The proportion of children with LBW in the Valle del Cauca department of Colombia was 6.5% (10), while the reported incidence in Cali was 9%, with Commune 14 having the highest prevalence of LBW (8.1%). During 2016, the Hospital Universitario del Valle (HUV) registered 90 cases of LBW, which represented 23.4% of all births (11).

Several risk factors associated with low birth weight have been identified. Those related to the mother include periodontitis, depression, alcohol consumption and smoking, preterm birth, birth interval, multiple births, primiparity, prenatal care, parents' socioeconomic level, maternal age, maternal occupation, maternal educational level and maternal marital status (12).

The INS has identified 5 types of risk associated with low birth weight: sociodemographic (maternal age, low socioeconomic status), medical history (hypertension, previous births, kidney, cardiorespiratory and autoimmune diseases, maternal malnutrition, primigravida), risks during pregnancy (gestational hypertension, anemia, vaginal bleeding, gestational diabetes, urinary tract infection, gestational syphilis, TORCH), inadequate prenatal care (late check-ups, few check-ups, lack of micronutrient supplementation) and environmental risks (excessive work, stress, anxiety, depression, consumption of tobacco, alcohol, coffee and drugs) (10).

Other factors linked to LBW are adverse social conditions including unemployment, lack of food security, extreme poverty and barriers to accessing health services. Anemia in the early stages of pregnancy is the main biological determinant for LBW, which in turn explains why lack of prenatal care is one of the main risk factors related to deficiencies in health care (13). With regard to the main barriers to health services in Colombia which are related to LBW, these are geographical, economic, related to the complexities of the national health system (14,15), and also include inaccessibility, limitations in transportation, health, social, cultural, regulatory, administrative and political barriers (16-22).

Given that many of the determinants associated with LBW are structural, each region or administrative unit needs to identify and evaluate the specific regional social, cultural, political and economic determinants that are associated with LBW, in order to improve the processes of quality and safety of care of health to the vulnerable population, for LBW, ADD and perinatal mortality, which are the main public health events that are indicators of social development of the regions (23). This research aimed to determine the frequency and determinants of LBW in a high-complexity hospital in Cali, Colombia, using data from 2017.

Methods

A descriptive observational study with an analytical scope (cases and controls) was carried out. All the records of births in the HUV were analyzed, in single-term newborns of both sexes in a high-complexity hospital in Cali, Colombia. The WHO parameters were used to classify LBW (24).

53 cases of LBW and 853 normal-weight neonates were identified in the HUV newborn registries for the last quarter of 2017. A case of LBW was defined as "any patient who was born in the HUV within the study period, weighing between 1,800 and 2,499g". A control was defined as "any patient who was born in the HUV in the same period with a weight greater than 2,500g". Records of patients with extreme low weight were excluded, as they were generally related to unfavorable clinical conditions of the mother or the pregnancy, including pre-eclampsia, severe urinary tract infection and/or congenital malformations, amongst others.

Study site

The HUV is a public institution of high complexity and is a reference centre for the population of southwestern Colombia. It has 548 enabled beds, 397 in hospitalization rooms and 151 for emergencies and each year more than 4,000 children are born in the institution (25). The HUV is the hospital with the highest number of births in southwestern Colombia. The care provided is mostly for patients who have the subsidized health insurance regime and the patients treated are mostly from neighborhoods of Cali and vulnerable areas of the Department of Valle. The majority of people who are treated in the HUV are from low socioeconomic classes, usually 1, 2, and 3 (of 6 possible classes) (26).

Population studied

The study subjects were selected from the birth records of the Epidemiology and Statistics Department of the HUV. The clinical and demographic information, considered to be the main exposures, was obtained from the clinical records of the mothers and included aspects related to demographic variables, care,

prenatal compliance, weeks of pregnancy and the sentimental status of the mother during pregnancy. The information related to the identity of the study subjects was masked with codes to ensure confidentiality.

Data management and statistical analysis

All birth records from the HUV were included. The characteristics of the study population were summarized using descriptive statistics. The distribution of numerical variables was evaluated with the Kolmogorov-Smirnov test. When the variables assumed a parametric distribution, the mean was used as a measure of central tendency and the standard deviation as dispersion. In other cases, the median and interquartile ranges were used. Categorical variables are presented as proportions in frequency tables.

To identify the determinants of LBW, bivariate analyzes were performed using the OR as a measure of association with their respective 95% confidence intervals. To evaluate the dependence of each of the categorical exposures on LBW, a Chi-squared test or Fisher's exact test was applied, as appropriate, assuming p values less than or equal to 0.05 for each of the variables evaluated as significant.

Numerical variables with parametric distribution were compared through their means using the Student's t-test. To determine the weight of each exposure variable in LBW, a multivariate analysis was performed using logistic regression. The model was built with the variables that had a significance of less than or equal to 0.20. Through the Backward strategy and the ratio of similarities statistical test, the most parsimonious model was identified.

Ethical considerations

This research was approved as being a piece of risk-free research by the Ethics Committee of the HUV according to the session notification dated June 4, 2018, and by the Ethics Committee of the Universidad Libre Cali, according to minutes No.2 of April 30. 2018. The researchers declare that they have no conflicts of interest.

Results

During the period October 1st to December 31st, 2017, 1,131 live births were registered in the HUV. 179 (11%) records for preterm pregnancy (less than or equal to 36.6 weeks of gestation) and 46 (3.0%) records for extreme low birth weight were excluded. Information from 906 records of patients who met the selection criteria was analyzed, of which 53 (6.0%) were classified as cases of LBW with 853 children with weights considered normal being classified as controls (Figure 1).

The median birth weight was 3,181.9 g (IR +/- 4,32.7) in the study population and in the 853 controls, it was 3,233.5 g (IR +/- 390.8). In the LBW group, the median birth weight was 2,351.6 g (IR +/- 96.7). The predominant sex in the LBW cases was female, at 53% (28/53), in contrast to the control group in which it was male, at 61% (411/953). Regarding ethnicity, the most frequent ethnicity in both groups was "mestizo" (64%), followed by Afro-Colombians (19; 36%). Regarding insurance, 91% of the cases belonged to the subsidized regime in the LBW cases and 90% in the controls (Table 1).

Regarding the factors related to LBW in the bivariate analysis, which showed an association with LBW, these included the mother's gestation time (OR: 10.21; 95% CI: 4.75-1.90; p= 0.000) and type of delivery (OR: 1.90; 95% CI: 1.05 - 3.43 p= 0.032), with first-time pregnancy being at the limit of significance (OR: 1.71; 95% CI: 0.98-2.99 p= 0.056) (Table 1).

Logistic regression was performed on the statistically significant variables which showed that the variables that explain LBW in this study were gestation time and first-time births (Table 2). The variable "type of delivery", that had a significant association in the bivariate analysis, had a diluted association in the multivariate analysis, showing itself as confounding. After adjusting for first-time pregnancy, newborns with gestations between 37-38 weeks presented a positive association with an OR of 10.2 (95% CI: 4.7-21.9). Similarly, newborns with LBW from first-time deliveries presented an adjusted OR of 1.9 (95% CI: 1.1-3.5) compared with newborns of mothers with a history of previous deliveries.

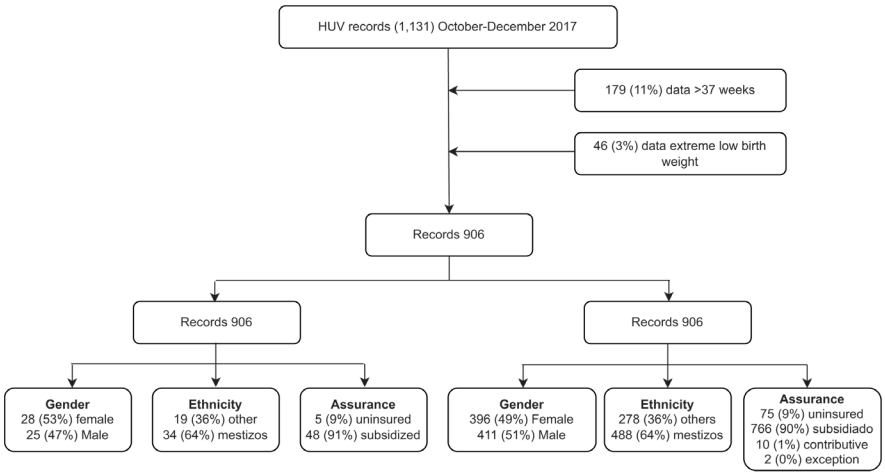

Figure 1. Description of the records and steps for the neonates included in the study. Source: Hospital HUV Epidemiology

Table 1. Measures of association between exposure and outcome characteristics

Característic	Description	n	LBW (n=53)	Controls (n=853)	OR	IC (95%)	p
Sex	Female	424	28	396	1.29	0.74-2.25	0.364
	Male	482	25	457			
Gestation time (week)	37-38	348	45	303	10.21	4.75-21.9	0.000
	39-41	558	8	550			
Primigestation	Primigestante	382	29	353	1.71	0.98-2.99	0.056
	More than one pregnancy	524	24	500			
Type of delivery	Cesarean	200	18	182	1.90	1.05-3.43	0.032
	Vaginal Delivery	706	35	671			
Ethnicity	Mestizo	588	34	554	0.96	0.54-1.72	0.906
	Other	318	19	299			
Young age group	Adolescent	176	13	163	1.37	0.72-2.63	0.333
	No Adolescent	730	40	690			
Older age group	40 or more	26	2	24	1.36	0.31-5.90	0.685
	Minor 40	880	51	829			
Mother's education	elementary or less	106	8	98	1.37	0.63-2.99	0.428
	More that elementary	800	45	755			
Relationship status	With partner	672	39	633	0.96	0.52-1.82	0.920
	Without partner	234	14	220			
Assurance	Subsidized Regime	814	48	766	1.09	0.42-2.81	0.858
	No Subsidized Regime	92	5	87			
Social status	low	509	27	482	0.79	0.46-1.40	0.428
	Other	397	26	371			

*The most statistically relevant variables were gestation time, primigestation and type of delivery.

The association between LBW and cesarean deliveries presented adjusted OR 1.69 (95% CI: 0.92-3.13), however, their confidence intervals include the null value, so the association was not significant.

In general terms, the adjusted ORs provided by logistic regression show that the exposure variables with raw ORs that were significant maintained the direction and strength of the association, indicating that they behave as true determinants that explain low birth weight in this population. Those variables with significance greater than 0.05 were excluded in the multivariate analysis which suggests that these did not behave as confounding factors (Table 2).

Discussion

This study evaluated the determinants of LBW in patients born at the HUV, evaluating clinical and demographic information available in the medical records of 906 patients who met the selection criteria. The findings of this study demonstrate that in the HUV, LBW is associated with the length of gestation and the history of previous pregnancies, regardless of the mother's age.

Regarding the gestation time, it was found that LBW was more frequent in mothers who had gestations between 37-38 weeks compared to mothers with gestations between 29-41 weeks. These findings agree with those reported in Venezuelans where a positive association was found between gestational age of 37-38 weeks and LBW (27). Additionally, in 2013, 502 births were evaluated in a high-complexity private hospital in Cali, Colombia, where a significant dependence was found between LBW and gestational age (p: 0001) (28). This association between LBW and gestational age is explained by fetal maturity, which depends on gestation time and therefore it is expected that the longer the gestation period, the greater the weight in the newborns. Generally, gestations between 37-38 weeks lead to newborns with weights greater than 2,500g, demonstrating that there are other factors that interact with gestational age, including the social status of the mother (29).

In this research, this association can be explained by the type of population that accesses the HUV, with patients normally living in low socioeconomic strata, coming from deprived areas of Cali and rural areas of the areas of influence. Although other studies have shown significance with other variables related to gestational immaturity, including access to health services, low adherence

Table 2. Multivariate analysis

Característic	Description	n	LBW (n=53)	Controls (n=853)	OR	IC 95%	p	OR Adjusted	IC 95%	p
Gestation time (weeks)	37-38	348	45	303	10.2	4.7-21.9	0.000	10.2	4.7-21.9	0.000
	39-41	558	8	550						
Primigestation	Primigestants	382	29	353	1.7	1.0-3.0	0.056	1.9	1.1-3.52	0.022
	More than one pregnancy	524	24	500						
Type of delivery	Cesarean	200	18	182	1.9	1.0-3.4	0.032	1.7	0.9-3.1	0.092
	Vaginal delivery	706	35	671						

to prenatal care and food safety (30), this information was not available in the medical records used for this study.

Regarding maternal age, this research did not show an association between LBW and extreme age of the pregnant woman. The association was also not statistically significant in the multivariate analysis, which would indicate that in this study the age of the pregnant woman is affected by other variables. Associations have been found between LBW and extreme ages (31), where a greater association was reported between adolescents and those over 35 years of age at the time of delivery, the authors arguing that in the youngest mothers this was due to immaturity and in those older than 35 years this was due to ageing. This was not found during our study, perhaps due to the characteristics of the pregnant women treated at the HUV, where the poor clinical and sociodemographic conditions are more important for the first pregnancy, probably due to the care provided during pregnancy and adherence to prenatal care as a protective factor in future pregnancies, regardless of the age at which gestation occurs.

Regarding the type of delivery, our findings agree with two studies (12,32). Cesarean delivery showed a significant association before the multivariate analysis, confirming a high risk of LBW in Cesarean delivery. Cesarean delivery was also performed in the presence of clinical, psychological, or social conditions that were not favorable for a vaginal delivery and so we consider Cesarean delivery is a possible response to the gestation process, rather than a risk factor for LBW.

Regarding the limitations of the study, the short period of analysis (which included only three months) could be regarded a limitation: the HUV statistical records do not, however, report seasonality in births or in LBW in previous years and so this limitation can be discarded. Only three months of 2017 were included in the study because the HUV was undergoing administrative restructuring allowing it to expand its coverage and installed capacity to provide a better service to the entire city, which has been reflected in the better quality of services it has provided since mid-2017.

Conclusions

The results of this study showed that LBW can be explained by biological variables including sociodemographic background: specifically, first-time pregnancy and gestation time represented risks for LBW in our population.

This suggests the need to reinforce sexual, nutritional and reproductive education programs at the public health level, in order to prepare women to become pregnant only in favorable biological and psychological conditions.

We have considered the possibility of carrying out prospective studies delving into sociodemographic variables and the perception of support for pregnant women by health promoters and health providers, in addition to replicating this study in hospitals that treat patients with private health insurance and which cater to patients with more favorable sociodemographic situations. This would allow us to compare our findings with the findings from these other hospitals and to improve the quality of life of the poorer population by focusing efforts on installing improvements from the point of view of public health.

Bias control

The case-control study is notably vulnerable to selection bias. It is recommended to work with new cases (incidents) to prevent exposure or related variables from conditioning their inclusion in the study. We minimized bias by working exclusively with incident patients in LBW newborns. Additionally, controls were recruited from the same area of the hospital and had a sociodemographic profile similar to the LBW group.

We consider two more biases: measurement bias, given the difficulty in obtaining accurate measurements of past exposure in case-control studies, it is useful to extract clinical data from control consultations, using the booklet that pregnant women take to prenatal control as a log, thus mitigating the risk of bias. Finally, interviewer bias was also considered. This form of bias is introduced because the health professional can induce positive responses about exposure in cases. It is important to remember, however, that cases of LBW are incidental and unpredictable and that newborns with extreme LBW were excluded from the study. As such, the risk of LBW being attributed by the interviewer is reduced due to the impossibility of predicting the outcome in most patients.

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