

LOW BIRTHWEIGHT AND SOCIOECONOMIC FACTORS IN MEXICO

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ABSTRACT

Low birthweight (LBW) represents an important problem in public health in developing countries because it is associated to neonatal mortality, malnutrition and disability in childhood. The objective was to describe maternal and socioeconomic factors related to LBW in Mexico City. Case-control study nested in a cohort of women and their live newborn children in three public obstetric hospitals in Mexico City. LBW was defined as a neonate with less than 2500 gr. For each case 4 children without LBW were chosen. An interview format was used to collect socio-demographic and reproductive factors before and after delivery. Socioeconomic position was categorized as: high, medium and low.

158 low birthweight cases were identified within the cohort. Maternal predominant age was 20-30 years and most of them were married housewives. There were no significant differences between cases and controls. Women that were in the lower socioeconomic position had probability of higher risk for LBW OR 2.19 [1.18, 4.07] compared to those in medium and high position. It was found that not receiving calcium supplementation during pregnancy was a risk factor for low weight (marginally significant). Women whose weight before pregnancy was <48 kg had more probabilities of having a newborn with low weight compared with those with >48 kg, OR 1.61 [1.09, 3.84]. Women with history of low birthweight in previous pregnancies had a higher risk of LBW, OR 2.55 [1.44, 4.50]. Finally, the three regression models showed that low socio-economic position category had a higher risk of having a newborn with LBW, this risk persisted in the three models, OR 2.57 [1.19, 5.58]; OR 2.45 [1.13-5.36] and OR 2.68 [1.19, 6.03] respectively. Also, history of lack of calcium supplementation during pregnancy was statistically significant when all variables were included in model 3, OR 2.30 [1.14, 4.63].

We conclude that socioeconomic position and health are related in ways and directions within the structure of society. Low socioeconomic position, previous LBW and not receiving calcium doubled the risk of low birthweight. Further research is required to identify specific socioeconomic factors affecting reproductive health.

Keywords: low birthweight, socio-economic position.

BACKGROUND

In all countries worldwide one of the challenges regarding maternal and childhood health is to diminish perinatal and infant mortality rates through the improvement in health conditions of woman and newborn. The probabilities of the newborn of surviving and enjoying a good health start before birth and continue in the post-partum, therefore investing in maternal health and care during delivery and puerperium is one of the interventions that leads to larger benefits.

Infections (33%) are one of the main causes of neonatal mortality, and they are present in a higher proportion in newborns with preterm (PT) or low birthweight (LBW).¹

In the United States PT and LBW are two of the main causes of neonatal mortality^{2, 3} and they both represent the third cause of infant mortality.⁴

For decades LBW has been considered an important infant health problem in different populations. In the world every year there is an average figure of 17% of LBW.⁵

Incidence of LBW varies among countries and ranges from 4 to 6% in countries like Sweden, France, United States and Canada (UNICEF 2003). In Latin America LBW rate varies according to geographical region, and according to the Pan American Health Organization in South America and Mexico this rate is 8.27% from total live neonates, with variations between 6% (Peru) and 10% (Bolivia and Venezuela). In Central America the rate is 11.2% with extremes values from 15% (Nicaragua) and 6% in Belize and El Salvador.⁶ In Mexico the incidence goes from 8.2 to 12% depending on the geographical zone.^{7, 8}

As we can see those children are born in developing countries where the differences in socio-economic conditions put in risk woman's health during pregnancy, as well as having negative effects in the development and growth of the newborn.

Besides the impact on infantile mortality, LBW has been associated with higher probability of infections, malnutrition and handicapping conditions during childhood like cerebral palsy, mental deficiency and problems related to behaviour and learning during childhood, among others.^{9, 10, 11}

Children that survive LBW suffer from a larger proportion of diseases, retardation in the cognitive development and have higher probabilities of under nourishment. There are evidences indicating that low birthweight or its determinant factors post a predisposition to suffer higher rates of diabetes, cardiac diseases and other chronic health problems in the future.^{12, 13, 14}

Associations between poverty, inequity and social exclusion with child health have been documented in all countries, independently from methods and health care services provision and culture.¹⁵ The biological processes that affect the fetus *in utero* are related to mother's physiology (stock before pregnancy, nutrition, exercise, infections, tobacco, alcohol and other drug consumption).¹⁶ During the fetal phase growth depends on the nutritional condition of the mother, therefore pregnant women should not only increase their weight but also consume essential nutritious elements. However, for many women in the developing world there are economic, social and cultural factors that make difficult to satisfy their needs for food, health and care that are closely interrelated.¹⁷ The relationship between socio-economic conditions and their effects on health have been a reason of interest and concern for centuries. In the later years there has been a bigger development in studies that seek to identify the most relevant social factors that allow characterizing and decreasing the distance in the different health conditions of populations.¹⁸

In the study of the social determinants of health it has been described that there might exist a causal direction with two ways: health can determine socio-economic position and socio-economic position can also affect health. Health could be an important determinant of the opportunities in life. This has been called "selection by health" and it would imply that health "selects" people in different social strata.^{19, 20, 21}

Among the socio-economic factors that have been traditionally described there is income, education, occupation, household leadership and gender differences in relationship to roles within the family.^{22, 23}

In Mexico there are differences in socio-economic conditions resulting from the geographic region and the political organization that have implications in health indicators, like mortality, morbidity and reproductive behaviour.

In the worldwide context many factors are known to be related to low birthweight, the main ones are tobacco consumption, mother's weight before pregnancy, and history of having newborns with LBW among others.

However, the studies that try to find more evidence of the weight that socioeconomic aspects might have on pregnancy results and the newborn conditions are still controversial.^{24, 25}

It has been argued that the lack of consistency on findings might be because the mechanisms have been poorly clarified; especially in aspects related to mother nutritional condition, even though it is known that mother low weight before pregnancy and the little weight gain during pregnancy represent a bigger risk for preterm and LBW.²⁶ Other studies

have questioned if maternal occupation is one of the factors that may be more related to the presence of low weight, or if it is the educational level what determines it, or is it the group of socioeconomic factors what finally put women in more or less disadvantage during pregnancy.

The difficulty to identify the specific role of socioeconomic factors associated to low birthweight has been a limitation to use preventive actions in exposed populations. Studies using interventions aiming to reduce the number of cases with low birthweight have had limited success in the conditions of the newborn, although some showed benefits on pregnant women, in particular, when considering the psychological variables.²⁷ Even more, the results of nutritional interventions are not very clear, even though it has been reported that women with an adequate nutritional status and body mass index have better results in their pregnancy.²⁸

In accordance to the conceptual background which emphasises that individual's life course can be affected by economic and social factors that influence his/her health, and that they are dynamic and complex because there is an intergenerational transmission process and they depend on the historical context of each population or country, the analysis of maternal and socio-economic factors related to birthweight in the urban population of Mexico was considered relevant. Bearing this in mind, the aim of this study was to assess the relationship between maternal socio-demographic factors and the weight of newborn in three hospitals from different geographic zones in Mexico City. It is necessary to point out that our perspective took into account variables that the literature has described as determinants of low birthweight and some of the nutritional interventions that health services deliver as part of their preventive programmes.

METHODS

A case-control study was carried out in three hospitals with gynaecological and obstetrics services in Mexico City: two from the Mexican Institute of Social Security and one from the Ministry of Health during 1997.

One hundred and fifty-four newborns with low birthweight and 474 controls were recruited from three hospitals. Women were interviewed when they arrived at the hospital for delivery in order to verify if they met our inclusion criteria. Women that had history of previous chronic conditions or those with actual twin or multiple pregnancies were not included. LBW was defined as the newborn weighing <2500 grams. Once a case was identified controls were chosen from the next newborns with normal gestational age, normal weight for gestational age and with the same date of birth.

Informed permission was asked and trained interviewers applied a questionnaire to women after delivery and during the stay at the hospital aiming to get information about socio-economic factors (age, education, civil status, occupation, income and owning certain goods), reproductive factors (parity, history of preterm delivery and low birthweight), nutritional factors (pre-gestational weight) and prenatal care (prenatal care, calcium and iron intake). Clinical records were also reviewed to verify the information of the newborn.

In order to create the index of socio-economic position two variables were taken into account: ownership of certain goods and occupation (as a proxy of income). First, a variable for ownership of goods was defined and it was created with three categories depending on the answer to whether they owned their house or flat and if they had a car. Second, occupation variable from both pregnant woman and husband or partner was also categorised depending on whether one, both or none of them were employed. Finally, with these two variables the socio-economic position index was constructed with three categories: High = woman and partner had a job + goods; Medium = they have a job or goods; Low = when the woman and/or her partner did not have a job nor goods.

To compare socio-demographic and reproductive variables between cases and controls t and χ^2 tests were carried out. The assessments of confounders were done comparing the crude odds ratio (OR) versus the adjusted one and confounders were defined as those in which the relationship between crude OR versus adjusted OR was $\geq 10\%$. After evaluating the confounders one by one those with biological and social plausibility were chosen to be included in the final model as well as those that were statistically significant ($P < 0.05$).

In model 1 socio-demographic variables and accessibility to public services were included; in model 2 the variables related to prenatal care, risks factors and woman health conditions were added; finally, model 3 included also the reproductive variables.

The analyses were performed using the STATA version 7 software.²⁹

RESULTS

Sociodemographic characteristics of LBW group versus the normal weight group are shown in Table 1. There were no significant differences between cases and controls. It can be seen a larger proportion of married women in both groups. Ninety percent of women in both groups had access to public services (electricity, water and sewage system). The effect of maternal education had the expected direction although

it was not statistically significant. Women that were in the lower socio-economic position had probability of higher risk for low birthweight OR 2.19 [1.18, 4.07] compared to those in medium and high position. This relationship had statistical significance.

Table 2 describes variables related to tobacco consumption and prenatal care, and there were no significant differences between groups in relationship to tobacco consumption, however it was found that not receiving calcium supplementation during pregnancy was a risk factor for low weight (marginally significant).

Another variable related to the presence of low birthweight was pre-gestational weight. Our results showed that women whose weight before pregnancy was <48 kg had more probabilities of having a newborn with low weight compared with those with >48 kg, OR 1.61 [1.09, 3.84]. In table 3 it can also be seen that those women with history of low birthweight in previous pregnancies had a higher risk of LBW, OR 2.55 [1.44, 4.50].

Finally, the three regression models can be seen in table 4 showing that women in the low socio-economic position category had a higher risk of having a newborn with LBW, this risk persisted in the three models, OR 2.57 [1.19, 5.58]; OR 2.45 [1.13-5.36] and OR 2.68 [1.19, 6.03] respectively. Also, history of lack of calcium supplementation during pregnancy was statistically significant when all variables were included in model 3, OR 2.30 [1.14, 4.63].

DISCUSSION

LBW is one of the health public problems that is linked to lack of equity in populations and its solution remains as a challenge for everybody. Despite efforts to decrease the proportion of newborns with LBW, success has been quite limited and the problem persists with different variations in both, developing and developed countries.³⁰

In the last years studies have focused on trying to explain how social factors influence low or high incidence of this problem. It has been observed that among populations with more inequity there is a proportional relationship with newborns with LBW.³¹

This inequity is caused by social conditions of populations and also because of gender differences. Although these differences are not explicit and conclusive, they can be clearly observed in some social indicators like access to health care services, occupation, income, education, social exclusion and isolation.

Within the studies about social factors the relationship between LBW and socioeconomic position has been addressed, however findings are not conclusive and

there are both, those who show a positive association,³² and those who did not find any relationship.^{33,34}

Probably the existing disagreement between the effect of socioeconomic factors and LBW is due to the fact that the studies have used different socioeconomic indicators and in an isolated way. On the other hand, there are limitations to get information that reflects accurately the social and economic characteristics, and the interaction between them; this leads to the need to generate proxy variables. In the literature, education has been used as a proxy variable of social class,³⁵ and other authors include occupation as a proxy of income.²³

In this study we had some limitations related to the availability of information about income, therefore we assumed that occupation variable (of pregnant woman and/or her partner) could reflect closely the access to a regular income source. Another indirect information, and which is relatively easy to get through interviews and that allows us to approach the socioeconomic condition, is ownership of goods, assuming that the fact of having an income source allows purchasing those goods.

Our results showed that women who were in a disadvantaged socioeconomic position had a higher risk of having newborns with low birthweight than those in a better socioeconomic position. This finding is similar to some studies in which a positive relationship between socioeconomic condition and effects on health has been described.^{36,37,38}

In relationship with education, even though some authors use it as a proxy of social status, in our studied population the results were not so clear because in those pregnant women who referred low education we observed a smaller number of newborns with LBW, in comparison to women with higher education. We can assume that women who are in the higher stratum are the ones that leave their home in order to work and that they are probably more exposed to other factors that might have a more direct relationship with outcomes in the newborn. We concluded that the role of education is not quite clear in this population and that there are probably other factors that might be interacting with the health of pregnant women and that they were not identified in this study. It has been described that family circumstances and biological processes are affected by a wider social context: cultural and historic issues (education opportunities, parent's divorce, unemployment, poverty risk, risks factors for smoking and obesity, etc.)

On the other hand, findings related to interventions can not be projected to other populations because of their heterogeneity, this makes necessary to design studies that take into account the geographic, racial, cultural, social and economic context of each country and specific group. In the case of Mexico we think that this

study provides information that represents a closer approach to know the role of socioeconomic position in LBW. This is a starting point in the search of better indicators that allow to evaluate this in populations with other social conditions, like sub-urban, rural, indigenous, etc.

Another aspect to consider within the context of each different country is the information availability. In Mexico we do not have an even information system about the socioeconomic characteristics of the population, i.e. there is not a homogenous way to get the data or among and within the studied groups. Information is very important to know the conditions of different populations and in order to offer programmes that help to solve inequity aspects. We consider that building a socioeconomic index that reflects the real situation in which pregnant women are living is a challenge, and it requires including another variables and to refine the proxy ones.

CONCLUSIONS

We think that there are two critical points where it is required to work in order to decrease and solve the problem of LBW: interventions that prevent it and those aimed to treat it once it happened. The objective of these interventions in a perspective focused on country development and growth would be “to break or interrupt the poverty cycle”. Therefore it would be achieved the reduction of preventable mortality, because an early death is a basic neglect of the most fundamental freedom of human beings.³⁹

Finally, we consider that the main challenge of equity is to achieve the development within the more vulnerable populations, like in this case: pregnant women and children. Consequently investing in childhood and in reproductive age are very important by themselves because they are preparing the context and environment for a more productive and healthy life, with the full development and use of mental and physical human potential.⁴⁰

Table 1. Odds ratio by sociodemographic characteristics

Variables	Birthweight		OR	95% IC
	<2500grs (n=158)	≥ 2500grs (n=474)		
Socioeconomic position				
Good	81	267	1.0	
Regular	57	177	1.06	[0.71,1.56]
Bad	20	30	2.19*	[1.18,4.07]
Maternal age				
<19	22	83	0.77	[0.46,1.29]
20-30	110	321	1.0	
>20	26	70	1.08	[0.65,1.80]
Marital Status				
Married	138	429	1.0	
Unmarried	20	45	1.38	[0.78,2.42]
Occupation				
Housewives	101	305	1.0	
Employed	57	169	1.02	[0.69,1.49]
Maternal education(years)				
>12	13	50	1.0	
10-12	56	143	1.50	[0.76,2.98]
7-9	52	165	1.21	[0.61,2.40]
<7	37	116	1.22	[0.60,2.50]
Accessibility to public services				
No	12	51	0.68	[0.35,1.31]
Yes	146	423	1.0	
Medical care unit				
North	59	177	1.0	
Northwest	37	111	0.79	[0.65,1.50]
South	62	186	0.98	[0.47,1.33]

* p<0.05

Table 2 .Odds ratio for Low Birthweight by Smoking and Medical care characteristics

Variables	Birthweight		OR	95% IC
	<2500grs (n=158)) [≥] 2500grs (n=474)		
Smoking before pregnancy				
No	126	384	1.0	
Yes	32	90	1.09	[0.70,1.71]
Smoking during pregnancy				
No	149	451	1.0	
Yes	9	23	1.19	[0.53,2.66]
Hypertension during Pregnancy				
No	131	416	1.0	
Yes	27	58	1.53	[0.93,2.53]
Urinary Infection during pregnancy				
No	100	318	1.0	
Yes	58	156	1.22	[0.83,1.77]
Calcium supplementation				
Yes	146	409	1.0	
No	12	65	1.86	[0.97,3.56]
Iron Supplementation				
Yes	64	216	1.0	
No	94	258	1.20	[0.83,1.74]
Prenatal Care				
Yes	150	454	1.0	
No	8	20	1.07	[0.45,2.52]

Table 3 Odds ratio for Low Birthweight by Reproductive Characteristics

Variables	Birthweight		OR	95% IC
	<2500grs (n=158)	≥2500grs (n=474)		
Parity				
Multiparous	92	284	1.0	
Primiparous	66	190	1.04	[0.73,1.51]
Maternal Weight				
<48kgs	54	107	1.61*	[1.09,3.84]
49-54	37	120	0.99	[0.58,1.67]
55-60	37	119	1.0	
>60	30	128	0.75	[0.43,1.29]
Previous^a Pretermbirth				
No	58	213	1.0	
Yes	34	71	1.75*	[1.06,2.90]
Previous Low Birth Weight^a				
No	66	246	1.0	
Yes	26	38	2.55*	[1.44,4.50]
Previous abortion^a				
No	67	222	1.0	
Yes	25	62	1.33	[0.77,2.28]

*p <0.05

^a Only applicable for women with more than one pregnancy

Table 4. Factors related to Low birthweight among women of the Mexico City.

Variables	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Socioeconomic position						
Regular	1.14	[0.75,1.74]	1.16	[0.76,1.77]	1.12	[0.72,1.74]
Bad	2.57	[1.19,5.58]*	2.45	[1.13,5.36]*	2.68	[1.19,6.03]*
Maternal Age (years)						
<19	0.74	[0.43,1.25]	0.74	[0.43,1.26]	0.57	[0.32,1.03]
>30	1.17	[0.70,1.98]	1.09	[0.64,1.84]	1.34	[0.76,2.38]
Marital Status						
Unmarried	0.99	[0.49,2.01]	1.08	[0.52,2.28]	0.96	[0.44,2.08]
Occupation						
Out of home	0.97	[0.65,1.45]	1.00	[0.67,1.50]	0.97	[0.64,1.48]
Accessibility to public services						
No	0.68	[0.34,1.33]	0.58	[0.29,1.17]	0.56	[0.27,1.14]
Scholarity (years)						
< 7	1.21	[0.58,2.56]	1.11	[0.52,2.40]	1.05	[0.47,2.34]
7-9	1.29	[0.63,2.62]	1.23	[0.59,2.55]	1.39	[0.66,2.94]
10-12	1.56	[0.78,3.13]	1.61	[0.79,3.27]	1.82	[0.87,3.77]
Smoking before pregnancy						
Yes			0.99	[0.57,1.72]	1.07	[0.60,1.90]
Smoking after pregnancy						
Yes			1.09	[0.43,2.78]	1.14	[0.43,2.99]
Hypertension						
Yes			1.61	[0.95,2.73]	1.55	[0.90,2.68]
Urinary Infection						
Yes			1.23	[0.83,1.83]	1.14	[0.76,1.71]
Calcium intake						
No			1.98	[1.01,3.87]**	2.30	[1.14,4.63]*
Iron Intake						
No			1.23	[0.84,1.80]	1.32	[0.89,1.96]
Prenatal care						

No	1.15	[0.47,2.87]	1.27	[0.52,3.19]
Parity				
Primiparous			1.73	[1.05,2.83]*
Pre-gestational Weight(kgs)				
<48			2.33	[1.33,4.08]***
49-54			1.28	[0.71,2.31]
>60			1.32	[0.74,2.36]
Previous Preterm birth^a				
Yes			2.95	[1.04,8.38]**
Previous Low Birth Weight^a				
Yes			2.61	[1.36,5.04]***
Previous abortion^a				
Yes			0.52	[0.17,1.63]

* p =0.01 **p<0.05 ***p <0.005

^a Only applicable for women with more than one pregnancy

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