

The Pregnancy-Specific Stress How Factor Risk for Preterm Birth

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Abstract

Preterm birth (PB) has a multifactorial etiology and psychosocial stress can be a risk factor. Objective. Quantify the association of the specific stress of pregnancy with PB. Material and methods. A case-control study was conducted in 254 preterm mother-child dyads and 254 term dyads, between 2010 and 2011, at the Civil Hospital of Guadalajara. The dependent variable was PB (24-36 weeks of gestation) and the independent stress specific to pregnancy. Gestational age was confirmed with the Capurro and Ballard methods. The specific stress of pregnancy was sought by direct interview. We inquired about psychosocial, obstetric and illicit drugs. The association was evaluated with logistic regression. Results. The age of the mothers was 25 ± 6 years. The frequency of psychosocial factors and drug use was similar. In the bivariate analysis were more frequent in PB, antecedent of PB (OR: 1.98, CI95%: 1.17-3.36), diseases in pregnancy (OR: 1.49, CI95%: 1.03-2.17), multiple pregnancy (OR: 14.72, CI95%: 4.28-60.63), being born by caesarean section (OR: 4.93, CI95%: 3.26-7.48), worrying about work and family care (OR 1.60, CI95% 1.01-2.55) and paying for clothes, food and medical expenses of the baby (OR 1.55, CI95% 1.00-2.39). A multivariate model identified as covariates associated with PB to worry a lot about the care of the new baby (OR 2.58, CI95% 1.21-5.47) and to be born by caesarean section (OR 5.59, CI95% 2.63-11.90). Discussion and conclusion. Of the variables related to specific stress of pregnancy, only worry much about the care of the baby was associated with PB, as well as being born by cesarean section.

Keywords: preterm birth, pregnancy, psychosocial stress

Keywords: Pregnancy; Preterm Birth; Psychosocial Stress

PB : Preterm Birth

PROM : Premature rupture of amniotic membranes

Abbreviations

CI : Confidence Interval

LMP : Last Menstrual Period

HCGJIM : Hospital Civil De Guadalajara “Dr. Juan I Menchaca”

NB : Newborn

OR : Odds Ratio

Introduction

Preterm birth (PB) is the product born before 37 weeks of gestation or 259 days from the first day of the last menstrual period (LMP) the PB rate in the US is 12.5%, affects 500,000 births per year and is related to 75-80% of perinatal deaths. In Mexico, the PB rate is 8% to 12% [1]. The PB has a multifactorial etiology and

among the risk factors involved in its etiology, psychosocial stress during pregnancy has been identified as a variable of interest [2,3]. It has been mentioned that maternal stress contributes to preterm birth by the dysfunction of neuroendocrine, immune, inflammatory and vascular processes that are modifiable by stress and that participate in the physiology of labor and can trigger its onset before the end. However, much of the research [4-5] has studied the non-specific stress of pregnancy such as emotions during pregnancy especially anxiety, and stressful prenatal conditions such as serious life events, for example the death of a family member and catastrophic events in the community, among others [4]. A more recent approach to measuring prenatal stress focuses on the specific stress of pregnancy that arises from specific pregnancy issues and includes its symptoms, parental concern, interpersonal relationships, bodily changes, work-related anxiety and childbirth and concerns about the baby's health, and it has been shown to be a better predictor for PB than anxiety, perceived stress, and serious life events. Because the specific stress of pregnancy can be modified by the influence of local variables, the objective of this study was to investigate whether it is associated more frequently with PB in a public hospital in western Mexico [5].

Material and Method

A case-control study was conducted in the population constituted by all births from May 2010 to June 2011, at the Hospital Civil de Guadalajara "Dr. Juan I Menchaca" (HCGJIM) which provides health services to urban population, open, with limited economic resources, low educational level and no social security [6]. The sample was constituted with all the mother-child dyads from 24 to 36 weeks of gestation collected consecutively and a control group from 37 to 41 weeks of gestation selected in a simple random manner. To collect information related to the specific stress of pregnancy one of the researchers (ACBS) was trained and standardized by a certified psychologist to interview mothers about the variables related to the specific stress of pregnancy as suggested by Lobel, et al. and to evaluate the gestational age of Newborns (NB) with the assessments of Capurro and Ballard modified, the researcher was trained and standardized with a certified neonatologist; All the standardizations were carried out until almost perfect concordance between two observers [5,7-8]. The data were collected prospectively by direct interview with the mothers of the cases and the controls in the first 24 hours after the birth of the newborns. The pregnancy-specific psychosocial stress measurement instrument [5] included the following questions: 1) for the effects on your health such as blood pressure or diabetes in your pregnancy and / or some other illness, 2) for feeling tired and with little energy during your pregnancy, 3) for the payment of medical expenses during pregnancy, 4) for the changes in the weight and shape of your body, 5) for the possibility of having a baby with health problems, 6) for the physical symptoms of the pregnancy

such as vomiting, leg swelling or colic, 7) for the quality of the medical service during pregnancy, 8) for your work and the care of your family during pregnancy, 9) for the possibility of having a preterm birth, 10) for changes in relationships with people after having a baby, 11) for paying for clothes, food and medical expenses for the baby, 12) about the care you will have with the new baby, 13) about pain during labor of childbirth, 14) about caring two diaries, nannies and another help to monitor the baby after birth.

Each question was asked, how you have felt tired, sad or worried in your pregnancy before having your baby; and to which the interviewees responded as: no, a little or something or a lot. The mother was also asked about her marital status, occupation, unsafe housing, schooling, socioeconomic status, drug use during pregnancy, maltreatment during pregnancy, date of onset of LMP, history of PB, prenatal care and diseases during the pregnancy. On the same day of the interview, information related to premature rupture of amniotic membranes (PROM), mode of birth and laboratory results relevant to the investigation was obtained from the clinical file. The gestational age was calculated with the days elapsed from the first day of the LMP obtained by direct interview. Also, all the NB were evaluated for gestational age by physical examination as follows: with the modified Capurro assessment, when the neonates had >29 gestation weeks; and with the valuation of Ballard, when the NB were \leq 29 gestation weeks. When there was a difference of more than two weeks between the gestational age calculated by LMP and that measured by Capurro or Ballard, and when the mother did not remember the LMP, the gestational age obtained by Capurro or Ballard was taken as definitive. Prenatal care was evaluated by the number of consultations in relation to the moment of pregnancy, expressed in weeks of pregnancy. The socioeconomic status was evaluated using the Álvarez et al. scale, which takes into account schooling, housing characteristics and work activity of the head of the family and the mother [9-10]. The information was captured in a spreadsheet with the Excel 2007 program. A pilot test was carried out to collect and capture information before the final one, to detect and correct errors.

The quantitative variables were calculated mean and standard deviation and compared with Student's t test for two independent samples; the qualitative ones were compared with proportions and compared with the χ^2 or Fisher's exact test as necessary. The association between stress with PB and the confounding effect was measured with Odds Ratio (OR) by logistic regression with the forced introduction method. The good fit of the model was verified with the Hosmer and Lemeshow test. In all calculations, the confidence interval was 95% (95% CI). The analyzes were carried out with the statistical program for social sciences (SPSS Statistics for Macintosh, Version 22.0, Armonk, NY: IBM Corp.) This research was approved by the Research and Ethics Committees of the Hospital headquarters registration 991/10), the mothers signed a written informed consent to participate in the study.

Results

During the study period, enough information was collected for the research in 254 preterm mother-child dyads and in 254 mother-child dyads for the term, no mother-child dyad was eliminated. The gestational age of PB was 34.7 ± 2.2 and of the NB term 38.9 ± 1.4 weeks. Mean age of the mothers (25 ± 6 vs 24 ± 6 years, $p = 0.183$), maternal education (8 ± 2 vs 8 ± 2 years of study, $p = 0.409$), the monthly economic income of the family ($3,653 \pm 1619$ vs $3,624 \pm 1,746$ Mexican pesos, $p = 0.902$), the age of the parents (27 ± 7 vs 27 ± 7 years, $p = 0.487$) and the parents' schooling (8 ± 3 vs 8 ± 3 years of study, $p = 0.837$) were similar. Also, the frequency of attending school, perceived rejection by family and friends, drug use during pregnancy and being single, were distributed in a similar way in the two study groups (Table 1).

Variables	Preterm births		Term births		OR (CI 95%)	P
	n/N	%	n/N	%		
Single ¹	38/254	15	46/254	18	0.80(0.48-1.31)	0.339
He left school ²	16/254	6	10/254	4	1.64(0.69-3.97)	0.227
Worked in pregnancy ²	30/254	12	28/254	11	1.08(0.60-1.93)	0.78
Rejection by the couple ²	26/254	10	36/254	14	0.69(0.39-1.22)	0.175
Rejection in the family ²	19/254	7.5	17/254	6.7	1.13(0.54-2.34)	0.729
Rejection by friends ²	35/254	14	31/254	12	1.15(0.66-1.99)	0.597
Smoked 1 st trimester ²	15/254	6	13/254	5	1.16(0.51-2.66)	0.697
Smoked 2 nd trimester ²	4/254	2	8/254	3	0.49(0.12-1.83)	0.242
Smoked 3 rd trimester ²	4/254	2	3/254	1	1.34(0.25-7.60)	0.5
Alcohol 1 ^{er} trimester ²	7/254	3	11/254	4	0.63(0.22-1.78)	0.337
Alcohol 2 ^o trimester ²	5/254	2	4/254	2	1.26(0.29-5.63)	0.5
Alcohol 3 ^{er} trimester ²	1/254	0.4	3/254	1	0.33(0.01-3.57)	0.311
Illicit drugs 1 st trimester ^{* 2}	1/254 **	0.4	1/254 ***	0.4	1.00(0.00-36.73)	0.75

¹ Single, separated and divorced vs. married and in free union; ² yes vs. do not
 NB: Newborn. OR: Odds Ratio. CI: Confidence Interval. P: p-value when comparing proportions with chi-square or Fisher's exact test.
^{*} Illicit drugs were consumed only during the first trimester of pregnancy.
^{**} Tonsil. ^{***} Marijuana.

Table 1: Psychosocial Variables and Drug Use During Pregnancy in The Study Groups.

The most frequent obstetric factors in preterm mother-child dyads were: previous spontaneous PB (50/254, 20% vs 28/254, 11%, $p = 0.006$), diseases during pregnancy (168/254, 66% vs 144 / 254, 57%, $p = 0.028$), multiple pregnancy (38/254, 15% vs 3/254, 1%, $p = <0.001$), PROM ≥ 24 h (31/254, 12% vs 5/254, 5%, $p = <0.001$) and being born by caesarean section (139/254, 58% vs 50/254, 20%, $p = <0.001$). Similarly, in the bivariate analysis, the aforementioned variables were associated with a higher frequency of PB (Table 2).

Variables	Preterm births		Term births		OR (CI 95%)	P
	n/N	%	n/N	%		
Antecedent of PB spontaneous ¹	50/254	20	28/254	11	1.98(1.17-3.36)	0.006
Pregnancy no planned ¹	124/254	49	112/254	44	1.21(0.84-1.74)	0.285
Diseases in the pregnancy ¹	168/254	66	144/254	57	1.49(1.03-2.17)	0.028
Multiple pregnancy ¹	38/254	15	3/254	1	14.72(4.28-60.63)	< 0.001
Prenatal care	183/254	72	193/254	76	1.23 (0.81-1.86)	0.311
PROM ≥ 24 hours ¹	31/254	12	5/254	5	6.92 (2.51-20.64)	< 0.001
Cesarean ¹	139/254	58	50/254	20	4.93 (3.26-7.48)	< 0.001

¹Yes vs. do not.
 NB: Newborn. OR: Odds Ratio. CI: Confidence Interval. P: p value when comparing the proportions with square chi or Fisher's exact test. PROM: premature rupture of amniotic membranes.

Table 2: Obstetric factors in the study groups.

The most frequent responses related to pregnancy-specific stress in the mothers of PB were to worry about the work and care of the family during pregnancy (72/216, 35% vs 46/183, 25%, $p = 0.035$) and worry about paying for clothes, food and medical expenses for the baby (90/191, 47% vs 68/186, 37%, $p = 0.037$). Also, in the bivariate analysis, these two variables were associated with a higher frequency of PB (Table 3).

Variables	Preterm births		Term births		OR CI (95%)	P
	n/N	%	n/N	%		
For the effects on your health such as blood pressure or diabetes in your pregnancy						
No	157/254	62	168/254	66		
Something ¹	51/208	25	52/220	24	1.05 (0.66-1.67)	0.83
A lot ²	46/203	23	34/202	17	1.37 (0.82-2.29)	0.207
For feeling tired and with little energy during your pregnancy						
No	74/254	29	92/254	36		
Something ¹	117/191	61	101/193	52	1.44 (0.94-2.21)	0.077
A lot ²	63/137	46	61/153	40	1.28 (0.78-2.10)	0.293
For the payment of medical expenses during pregnancy						
No	126/254	49	120/254	47		
Something ¹	69/195	35	68/188	36	0.97 (0.62-1.50)	0.872
A lot ²	59/185	32	66/186	35	0.85 (0.54-1.34)	0.462
By changes in the weight and shape of your body						
No	158/254	62	174/254	68		
Something ¹	62/220	28	47/221	21	1.45 (0.92-2.30)	0.092
A lot ²	34/192	18	33/207	16	1.13 (0.65-1.98)	0.637
Because of the possibility of having a baby with health problems						
No	50/254	20	46/254	18		
Something ¹	76/126	60	89/135	66	0.79 (0.46-1.34)	0.347
A lot ²	128/178	72	119/165	72	0.99 (0.60-1.63)	0.965
Having vomiting, swollen legs or cramping during pregnancy						
No	125/254	49	118/254	46		
Something ¹	78/203	38	78/196	40	0.94 (0.62-1.44)	0.778

A lot ²	51/176	29	58/176	33	0.83 (0.51-1.34)	0.419
For the quality of the medical service during pregnancy						
No	156/254	61	160/254	63		
Something ¹	58/214	27	55/215	26	1.08 (0.69-1.70)	0.72
A lot ²	40/196	20	39/199	20	1.05 (0.62-1.77)	0.84
For your work and the care of your family during pregnancy						
No	134/254	53	137/254	54		
Something ¹	72/206	35	46/183	25	1.60 (1.01-2.55)	0.035
A lot ²	48/182	26	71/208	34	0.69 (0.44-1.09)	0.096
Because of the possibility of having a preterm birth						
No	68/254	27	81/254	32		
Something ¹	60/128	47	69/150	46	1.04 (0.63-1.71)	0.884
A lot ²	126/194	65	104/185	56	1.44 (0.93-2.23)	0.081
Because of changes in relationships with people after having a baby						
No	197/254	77	194/254	76		
Something ¹	36/233	15	43/237	18	0.81 (0.49-1.36)	0.399
A lot ²	21/218	10	17/211	8	1.20 (0.58-2.46)	0.597
By paying for baby's clothes, food and medical expenses						
No	101/254	40	118/254	46		
Something ¹	90/191	47	68/186	37	1.55 (1.00-2.39)	0.037
A lot ²	63/164	38	68/186	37	1.08 (0.69-1.71)	0.72
About the care you will have with the new baby						
No	90/254	35	105/254	41		
Something ¹	58/148	39	64/169	38	1.06 (0.65-1.71)	0.809
A lot ²	106/196	54	85/190	45	1.45 (0.96-2.22)	0.066
About pain during labor						
No	89/254	35	68/254	27		
Something ¹	75/164	46	65/150	43	0.89 (0.55-1.45)	0.628

A lot ²	90/179	50	104/189	55	1.02 (0.64-1.64)	0.922
About daily care, babysitters and other help to monitor the baby after birth						
No	157/254	62	165/254	65		
Something ¹	45/202	22	50/215	23	0.95 (0.58-1.53)	0.811
A lot ²	52/209	25	39/204	19	1.40 (0.85-2.30)	0.157
* The variables were interrogated as: you have felt tired, sad or worried in this moment of your pregnancy? And they were answered as not, something or much.						
¹ Worry something vs. not worry, after having excluded who responded worry a lot.						
² Worry a lot vs. not worry, after having excluded who responded worry about something.						
OR: odds ratio. CI: confidence interval. . P: p value when comparing the proportions with chi square or Fisher's exact test.						

Table 3: Variables related to specific stress of pregnancy in the study groups

To assess the strength of association between the variables related to pregnancy-specific stress with PB, taking into account the effect of intervention of covariates that the bivariate analysis and the theoretical context suggested to be related to PB, a multivariate model with logistic regression was constructed. The model identified as variables associated with PB, the variable being very concerned about the care it would have with the new baby (OR 2.58, CI95% 1.21-5.47) and being born by caesarean section (OR 5.59, CI95% 2.63-11.90). On the other hand, worrying about paying for the clothes, food and medical expenses of the baby, the history of PB, multiple pregnancy and diseases during pregnancy lost the statistical significance they had shown in the bivariate analysis (Table 4).

Covariables	OR *	(CI95%)*	OR**	(CI95%)**	P **
Worry about your job and your family's care during pregnancy	1.6	1.01-2.55	1.1	0.49-2.42	0.817
Worrying about paying for the clothes, food and medical expenses of the baby, of course, and a little	1.55	1.00-2.39	1.05	0.54-2.06	0.88
Worry a lot about the care you will have with the new baby as not and much	1.45	0.96-2.22	2.58	1.21-5.47	0.014
Worry about feeling tired and with little energy during your pregnancy as not and a little	1.44	0.94-2.21	1.17	0.62-2.22	0.621
Antecedent of spontaneous PB	1.98	1.17-3.36	2.04	0.88-4.71	0.095
Diseases in the pregnancy	1.49	1.03-2.17	1.36	0.74-2.50	0.323
Multiple pregnancy	14.72	4.28-60.63	2.9	0.71-11.83	0.137
Caesarean section	4.93	3.26-7.48	5.59	2.63-11.90	< 0.001
* OR crude of each variable, with preterm birth as outcome.					
** OR adjusted with logistic regression by the method of forced introduction with preterm birth as the outcome of each covariate.					
CI: Confidence Interval. P: p value obtained by logistic regression.					
Setting the model with the Hosmer and Lemeshow test ($\chi^2 = 3.6$, $p = 0.887$)					
PB: preterm birth					

Table 4: Multivariate model with preterm birth as variable outcome.

Discussion

This study shows that of the variables related to the specific stress of pregnancy, being very concerned about the care they will have with the new premature baby was associated with a higher frequency of PB, in addition to the covariate birth by caesarean section [3]. In relation to the above, using the same questionnaire, Lobel et al. [5] in the USA measured the specific stress between 10 and 25 weeks and 25 weeks of pregnancy in 279 women, and showed that the specific stress of pregnancy is a better predictor of outcomes at birth, than the state of anxiety, perceived stress and that the serious life events.

Also, Cole-Lewis et al. in the US, [11] measured the specific stress of pregnancy in the second and third trimesters of pregnancy in 920 young black and Latina women, found that the specific stress of pregnancy in the third trimester was associated with preterm birth, which did not occur with the specific stress of pregnancy in the second trimester. In the two previous studies, [5,12]. the models constructed allowed us to associate the block of the total of the questions related to specific stress of pregnancy with PB, however, in the present investigation it was specifically identified to worry a lot about the care that you will have with the new baby as variable associated with PB. The fact that a mother is concerned about the care she will have with her premature baby can be explained from the perspective of a primary assessment of the threat that the pregnant woman has for not knowing the care of the premature baby, and of a secondary evaluation of not having enough elements to respond before that threat. It is also worth mentioning that although in the multivariate model the association with PB of the economic expenses of the baby's clothes, food and medical expenses disappeared, about 40% of the pregnant women said they worried about the economic expenses, and the average of the economic income monthly was \$ 3,350 Mexican pesos, equivalent to 250 US dollars taking into account the exchange rate parity at the time of data collection, which gives an idea of the level of poverty of the mothers studied. In relation to the above, it is also worth mentioning that the aforementioned monthly economic income was close to that declared in Mexico in the 2010 census, by 40% of the 42 million employed persons. Among the limitations of this research are the fact that having interviewed the mothers only once, it would have been desirable to have done it periodically during the pregnancy, also, the design of cases and controls does not allow to prove causality; In favor, the researcher who collected the information was carefully trained so that, when questioning the mothers, information on events occurred before birth was obtained as far as possible and standardized with a certified psychologist until considerable agreement was obtained [12]. Worry about the care that you would have with the new baby was associated with PB, and behaved as a variable independent of the effect of the other covariates that were studied in this investigation.

Conclusion

The present study allows us to conclude that of the variables related to pregnancy specific stress, a multivariate model showed that mothers of PB worry about not knowing what care they should have for their new baby, which can be used to implement programs of information to mothers during prenatal care.

Declaration of conflicts of interest: The authors declare that for this investigation no material or financial support was received that generates conflicts of interest.

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