REVISTA CHILENA DE PEDIATRÍA
Sociedad Chilena de Pediatría
www.scielo.cl

Rev Chil Pediatr. 2017;88(3):360-366
DOI: 10.4067/S0370-41062017000300008

ORIGINAL ARTICLE

Maternal postnatal depression and its impact on child neurodevelopment: a cohort study

Depresión materna postnatal y su repercusión en el neurodesarrollo infantil: estudio de cohorte

Gabriel González[a], Mario Moraes[b], Claudio Sosa[c], Eleuterio Umpierrez[d], María Duarte[e], José Cal[e], Andrea Ghione[b]

[a]Neuropediatrics Chair, Pereira Rossell Hospital Center, Medicine School, Montevideo
[b]Department of Neonatology, Pereira Rossell Hospital Center, Medicine School, Montevideo
[c]Gynecological clinic "C", Pereira Rossell Hospital Center, Medicine School, Montevideo
[d]Pando Technological Pole, Chemistry School, University of the Republic
[e]Student, Medicine School, Montevideo, Uruguay

Received: 28-6-2016; Accepted: 7-11-2016

Abstract

Introduction: Post partum depresion (DPP) is the most frequent psquiatric disorder in pregnant woman and it may affect the neurodevelopment of their offspring. Our goal was to analyze the association between maternal depressive symptoms at 6 months after birth and child's neurodevelopmental disorders at 18 months-old, in a homogeneous population characterized by low socioeconomic and cultural level. **Patients and Methods:** A prospective cohort study was conducted. There were included 127 healthy postpartum women and their infants. A structured interview was performed, which included patronymic data and family perception before discharge. Binomial monitoring took place at 6 months postpartum, when was applied the Beck test for depression and anxiety to mothers; children´s neurodevelopment at 18 month-old was evaluated by Lezine Revised Brunet-test. **Results:** The sample consisted of 125 women and their children. The mean age was 24.5 year old (SD 6.02); 30.6 % had completed less than 6 years of formal education. The incidence of moderate to severe postpartum depression at 6 months after birth was 20%. The overall development score mean was 73.52 (SD 8.06) in the depression population and 76.97 (SD 8.07) in the population without depression (p = 0.04). The development coefficient was 69.08 (SD: 10.35) in the depression population and 74.11 (SD 0.67) in the population without depression (p = 0.01). **Conclusions:** The incidence of moderate to severe DPP was 20%. Persistent DPP in a vulnerable socio-economic context has impact on child development.

Keywords:
Postpartum depression;
Social vulnerability;
Developmental;
Childhood.

Correspondence:
Gabriel González
viciogon@hotmail.com

Introduction

Postpartum depression (PPD) is the most common maternal psychiatric disorder that can determine negative effects on the mother-child bond and on child development, with a prevalence of 15-20%. It is estimated that 2020 will be the second most common public health problem[1-5].

Between 30 and 50% of women with PPD persist with major depression beyond the year of delivery, coinciding with the critical period of greatest vulnerability of the child's neurodevelopment[6]. Research on PPDs suggests a negative impact on child development especially if it is severe, protracted and affects vulnerable populations[7-13]. The most affected areas are social skills and language.

Hammen postulates that depression generates interpersonal stress, ie interpersonal conflicts and low level of social support, which maintain and increase depression, affecting the future well-being of the child[14,15].

Although it is suggested that the correction of adverse environmental factors may mitigate the negative effects, long-term follow-up studies show that neurobehavioral involvement persists in adolescence and adulthood[2,7-9,16-20].

The present study analyzes the effects of depressive symptoms on child development in a homogeneous population characterized by a low socioeconomic and educational level with the objective of analyzing the relationship between maternal depressive symptoms at 6 months postpartum and neurodevelopmental disorders at the 18 months.

Patients and Method

Design

A prospective cohort study at the Pereira Rossell Hospital Center, Montevideo, Uruguay, from November 2010 to May 2012. The sample size calculated for an alpha error of 5% and a beta error of 10% was 132 fresh Born (102 unexposed and 30 exposed) who would be followed up at 18 months. Exclusion criteria were newborns with major congenital malformations, asphytic, with Apgar less than 7 to the first and fifth minutes of life, congenital infection, meningitis or with levels of bilirubin with indication of phototherapy. Children of mothers with psychiatric conditions, HIV positive, multiple pregnancies and those who did not accept informed consent were excluded.

Method

After informed consent was obtained, a structured interview was given to the puerperal women. The interview was the first data collection instrument that was performed during hospitalization and included patronymic data, marital status, educational level, family income, characteristics of the family nucleus, occupation of the mother and the head of the family.

The instrument used to identify alcohol and cocaine use during pregnancy was the meconium sample of the newborn whose analysis was performed based on the methodology previously published by the authors[21].

At 6 months after childbirth, the child was monitored; the questionnaire was questioned about the persistence of exclusive or complementary breastfeeding, and the evaluation of the level of depression and maternal anxiety using the Beck scale as the assessment tool. This scale has similar reliability to the

Edinburgh and was applied by psychologists with clinical assessment of maternal health, taking as cut limit a value equal to or greater than 21 points[22].

The detected cases of depression or maternal anxiety were referred to mental health centers for assistance.

At 18 months of age, the developmental evaluation was performed using a revised Brunet-Lézine test as the evaluation instrument. There is no gold standard to evaluate development, Bayley test and Batelle have not been validated in Uruguay.

Brunet-Lézine scale is a French adaptation of the Gesell scales, validated in a sample of 1,032 children, with high test-retest reliability and internal reliability[23].

If the women did not attend the evaluation, they were located and offered to transfer them for evaluation (20% of the sample).

Statistical analysis

Initially, univariate analyzes were performed for all dependent and independent variables. Because the Beck scale did not have a normal distribution pattern, quartile distributions were evaluated. The fourth quartile coincided with the established cut of 21 points to define depression and moderate to severe anxiety. Subsequently, bivariate analyzes were performed between the independent and dependent variables. Demographic characteristics as well as determining factors were compared between both groups. For the Brunet Lezine test we proceeded to categorize the population in global coefficient deficit if it was below the 50th percentile of the sample in order to perform bivariate analysis and logistic regression to adjust for the different variables.

This work complied with the requirements on informed consent and was approved by the ethics committee of the Faculty of Medicine of the University of the Republic of Uruguay.

Results

The final sample consisted of 127 women with their children. Of the births in the study period, two families did not agree to participate, one woman was not included due to HIV infection, eight infants younger than 35 weeks were excluded, a twin child was excluded. 127 children were evaluated for development. A depression and anxiety evaluation was performed on 125 mothers, two women did not answer the Beck test questions (table 1).

The socio-demographic characteristics of the population are presented in table I. No demographic, socioeconomic and educational differences were observed among women with a scale of less than 21 and those with a score of 21 or higher in the Beck assessment at 6 months (table 1). Moderate to severe PPD was found in 25 women at 6 months (20%) and anxiety symptoms in 18 women (14.4%). There was no difference in overall development coefficient in reference to breastfeeding feeding for more than 6 months (76.80, ED 8.56, 95% CI: 75.13-78.48) and lactation less than 6 months (75 , 44, DE 7.52, 95% CI: 72.29-78.58), p = 0.72.

The relationship between PPD and child development is presented in table 2. In this regard, it is emphasized that the mean coefficient of language development in the population with PPD was 69.08 and 74.11 without PPD (p = 0.01). The mean of social development was 72.08 in the population with PPD and 76.53 without PPD (p = 0.04). The mean overall development in the population with PPD was 73.52 and 76.97 without PPD (p = 0.02).

Table 1. Socio-demographic characteristics of women and newborns

Variable		Population total n = 127*	Mean (SD) Beck Depression > = 21 n = 25	Mean (SD) Beck Depression < 21 n = 100	p
Maternal age mean (SD)		24.5 (6.02)	24.4 (5.7)	24.8 (5.7)	0.18
Race – n (%)	White	88 (70.4)	16 (64)	72 (72)	0.25
	Mixed	27 (21.6)	5 (20)	22 (22)	
	Black	10 (8.0)	4 (16)	6 (6)	
Civil Status – n (%)	Married	10 (8)	2 (8)	8 (8)	0.23
	Concubine	78 (62.4)	16 (62)	62 (64)	
	Divorced	1 (0.80)	1 (4)	0 (0)	
	Single	36 (28.8)	6 (24)	30 (30)	
Does not live with his partner – n (%)		27(21.6)	5 (27.8)	22 (20.6)	0.82
Education – n (%)	< = 6 years	38 (30.0)	9 (36)	29 (29)	0.50
	7-12 years	79 (63.2)	16 (64)	63 (63)	
	>12 years	8 (6.4)	0 (0)	8 (8)	
Caesarean section – n (%)		40 (32)	9 (36)	31 (31)	0.63
Male sex – n (%)		62 (49.6)	11 (44)	51 (51)	0.53
Newborn's Weight (grams)	Mean (SD)	3.289 (489)	3.262 (446)	3.295 (501)	0.76
Cranial circumference (cm)	Mean (SD)	33.9 (1.56)	34.3 (1.9)	33.7 (1.5)	0.11
Breastfeeding (Yes) – n (%)		101 (79.5)	21 (84)	80 (80)	0.49

*Loss of 2 data, two women did not respond to Beck test.

Table 2. Beck scale and child's development relationship (Brunet Lézine)

Variable	Beck > = 21 Mean (SD)	Beck < 21 Mean (SD)	p
Psychomotor development Coefficient	78.68 (10.93) IC 95% 74.16-83.19	80.04 (9.56) IC 95% 78.14-81.93	0.53
Language development Coefficient	69.08 (10.35) IC 95% 64.80-73.35	74.11 (DE 0.67) IC 95% 71.99-76.22	0.01
Social development Coefficient	72.08 (10.85) IC 95% 68.31-77.28	76.53 (9.32) IC 95% 74.67-78.38	0.04
Global development Coefficient	73.52 (8.06) IC 95% (70.19-76.84)	76.97 (8.07) IC 95% (75.36-78.57)	0.02

Table 3. Multivariate analysis of environmental factors and their relationship with Neurodevelopment assessed by Brunet Lézine test at 18 months

Variable	Odds Ratio for the Result: Global Development Coefficient Deficit *	Standar derivation	IC 95%	p
Depression	3,14	1,71	1,07-9,17	0,03
Caffeine > 300 mg/day	1,31	0,57	0,53-2,54	0,53
Mother educational level**	1,00	0,34	0,94-1,07	0,84
Alcohol + in meconium***	1,21	0,44	0,99-100	0,63
BMI****	0,96	0,04	0,89-1,04	0,2
Family income	0,90	0,63	0,22-3,56	0,88
Family dysfunction	0,96	0,69	0,16-2,35	0,23
Cocaine + in meconium	0,34	0,26	0,07-1,41	0,17

*Global Development Deficit defined as a global Brunet-Lézine coefficient lower than 50th percentile. **More or less than 6 years of study. ***FAEEs: meconium fatty acids ethyl esters > 0.1 nmol/g. ****BMI: Mother body mass index.

Statistical analysis with logistic regression of multiple environmental variables and the coefficient of development by Brunet-Lézine is expressed in table 3. It highlights the effects of PPD expressed in Odds Ratio for outcome: Overall Development Coefficient Deficit was 3.14 (95% CI: 1.07-9.17), p = 0.03.

Discussion

The observed incidence of PPD of 20% is in the upper limits of international figures, explained by the high socioeconomic vulnerability of the population where the reported prevalence is higher[2]. In Chile, the DPP observed in the last years was 14% of the mothers attended in the first level of care[24].

Due to the controversies in the various studies on PPD and its effects on child neurodevelopment explained by the most involved confounding variables, a prospective study was designed that included a homogeneous and uniform sample of mothers with persistent symptoms after 6 months, Of social vulnerability, without comorbid pathology, with healthy children, where the variable with the greatest difference was PPD.

The relationship between breastfeeding and neurodevelopment is controversial because of the many confounding variables. In the study population, there were no significant differences between the persistence of breastfeeding at 6 months and development at 18 months, the positive association is especially described at high socioeconomic levels.

Although we observed lower development ratios in all the analyzed population, the difference was statistically significant in global, social and language development without compromising motor and coordination areas in children of mothers with PPD. Language was the most clinically compromised area, located in a delay zone, with more than 2 SD below the mean, which in the Brunet-Lézine scale ranks at 100 for all areas.

The results obtained are similar to those reported by other authors in similar contexts, showing that persistent PPD in a vulnerable population is a factor that

Has a negative influence on early childhood development, especially in social and language areas[2,7,10,18-20,28-32].

When performing multivariate analysis, considering the different variables with statistically significant results in the univariate analysis; PPD remains a significant predictor of child development outcomes at 18 months, with particular social areas being compromised, an element that is a clear indicator of future risk of behavioral and emotional disturbances[10,18].

These are in line with those reported by Podestá et al. In Chile, who found that once corrected for other variables that affect child development, PPD manifests itself as a very important risk factor[33].

There are reports of discordant results that refute the negative effects of PPD on child development, but unlike the present study; Were performed in non-deficit socioeconomic settings and PPD measured before 6 months[17,34]. On the contrary, more recent publications show a clear association between PPD and adverse neuropsychological development, with a greater impact but not exclusive to the vulnerable population[5-7,12,13,30]. Although the long-term commitment on the socio-cognitive development of the child or its potential reversibility is not fully clarified, it is suggested that contextual factors may attenuate or deepen these alterations[16,33,34]. Jensen in nearly 7,000 mother/child binomials with evaluation at 8 years shows a clear negative impact of pre and postpartum depression on

child cognitive development, increased by contextual risks[30].

The key question of what does a depressed mother have for her children to have an abnormal development?; They are the biological mechanisms of inheritance and neuroregulation, the interpersonal processes, the contextual factors or the sum of them[34]. To discern whether the negative repercussion on the neurodevelopment of the maternal depression and the unfavorable environmental contextual risks are additive or independent is not simple, Postulates that there is interrelation of contextual risks, depression and interpersonal stress[30]. The time of evolution and intensity of maternal depression associated with unfavorable environmental factors would have a greater impact on the socio-emotional imbalance of the child[35]. The adverse intrauterine environment could alter the Hypothalamic-Hypophyseal-Adrenal axis mediating the stress response, determining greater exposure to intrauterine cortisol and an inadequate response to environmental stress after birth, altering children's behavior[36]. The chronic depression maintained before and postnatal, that affects this population, has greater negative consequences. Unsafe attachment, neglect, and inappropriate parenting styles have been associated with[37-39] elevated cortisol reactivity.

In order to recognize prepartum postpartum depression early and avoid its deleterious effects with its timely treatment, a simple screening tool can be implemented, which can be performed in a few minutes[40].

Conclusions

A moderate to severe incidence of PPD of 20% was observed. Persistent PPD in a context of socio-economic vulnerability has a clear impact on child development at 18 months. The main areas affected are language development and social skills.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Financial Disclosure

The research was supported by the National Agency for Research and Innovation (ANII) Health Sectorial Fund, Interdisciplinary Space-UDELAR, Uruguay.

Conflicts of Interest

Authors state that any conflict of interest exists regards the present study.

References

1. Tronick E, Reck C. Infants of Depressed Mothers. Harv Rev Psychiatry 2009;17:147-56.
2. Parsons C, Young K, Rochat T, Kringelbach M, Stein A. Postnatal depression and its effects on child development: a review of evidence from low-and middle-income countries. Br Med Bull 2012;101:57-79.
3. Patel M, Bailey R, Jabeen S, Ali S, Barker N, Osiezagha K. Postpartum Depression: A Review. J Health Care Poor Underserved 2012;23:534-42.
4. Wisner KL, Chambers C, Sit DKY. Postpartum depression: a major public health problem. JAMA 2006; 296:2616-8.
5. Shrivastava S, Shrivastava P, Ramasamy J. Antenatal and Postnatal Depression: A Public Health perspective. J Neurosci Pract rural. 2015;6(1):116-9.
6. Vliegen N, Casalin S, Luyten P. The course of postpartum depression: a review of longitudinal studies. Harv Rev Psychiatry 2014;22(1):1-22.
7. Ali N, Mahmud S, Khan A, Ali B. Impact of postpartum anxiety and Depression on child's mental development from two peri-urban communities of Karachi, Pakistan: a quasi-experimental study. BMC Psychiatry 2013;13:274.
8. Morgan V, Croft M, Valuri G, et al. Intellectual disability and other neuropsychiatric outcomes in high-risk children of mothers with schizophrenia, bipolar disorder and unipolar major depression. Br J Psychiatry 2012;200(4):282-9.
9. Korhonen M, Luoma I, Salmelin R, Tamminen T. A longitudinal study of maternal prenatal, postnatal and concurrent depressive symptoms and adolescent well-being. J Affect Disord 2012;136(3):680-92.
10. McLearn KT, Minkovitz CS, Strobino DM, et al. The timing of maternal depressive symptoms and mothers' parenting practices with young children: implications for pediatric practice. Pediatrics 2006;118:e174-e182.
11. Sohr-Preston SL, Scaramella LV. Implications of Timing of Maternal Depressive Symptoms for Early Cognitive and Language Development. Clin Child Fam Psychol Rev 2006;9(1):65-83.
12. Stringaris A, Lewis G, Maughan B. Developmental pathways from childhood conduct problems to early adult depression: Findings from the ALSPAC

cohort. Br J Psychiatry 2014; 205:17-23.
13. Koutra K, Vassilaki M, Georgiou V, et al. Antenatal maternal mental health as determinant of postpartum depression in a population based mother-child cohort (Rhea Study) in Crete, Greece. Soc. Psychiatry Psychiatr Epidemiol. 2014;49:711-21.
14. Hammen C. Generation of stress in the course of unipolar depression. J Abnorm Psychol 1991;100(4):555-61.
15. Keim S, Daniels J, Dole N, Herring A, Siega-Riz A, Scheidt P. A prospective study of maternal anxiety, perceived stress, and depressive symptoms in relation to infant cognitive development. Early Hum Dev. 2011;87(5):373-80.
16. Stein L, Malmberg K, Sylva J, Barnes P, Leach S and the FCCC team. The influence of maternal depression, caregiving, and socioeconomic status in the post-natal year on children's language development. Child Care Health Dev. 2008;34(5):603-12.
17. Piteo A, Yelland L, Makrides M. Does maternal depression predict developmental outcome in 18-month-oldinfants? Early Hum Dev. 2012;88(8):651-5.
18. Kingston D, Tough S, Whitfield H. Prenatal and postpartum maternal psychological distress and infant development: a systematic review. Child Psychiatry Hum Dev. 2012;43:683-714.
19. Cornish AM, McMahon CA, Ungerer JA, Bernett B, Kowalnko N, Tennant C. Postnatal depression and infant cognitive and motor development in the second postnatal year: the impact of depression chronicity and infant gender. Infant Behav Dev 2005;28:407-17.
20. Sutter-Dalley AL, Murray L, Dequae-Merchadou L, Glatigny-Dalley E, Bourgeois ML, Verdoux H. A prospective longitudinal study of the impact of early postnatal vs. chronic maternal depressive symptoms on child development. Eur Psychiatry 2011;26:484-9.
21. Moraes M, González G, Sosa C, et al. Consumo de alcohol y cocaína en el embarazo. An Fa Med. 2014;1(2):43-50.
22. Lam N, Contreras H, Moria E, et al. Comparación de dos cuestionarios auto aplicables para la detección de síntomas depresivos en gestantes. An Fac Med. 2009; 70(1):28-32.
23. Sun H, Como PG, Downey LC, Murphy D, Ariagno RL, Rodríguez W. Infant formula and neurocognitive outcomes: impact of study end-point selection. J Perinatol. 2015; 35(10):867-74.
24. Schonhaut Berman L, Podestá López L. The role of the paediatrician in post-partum depression. Rev Chil Pediatr. 2016; 87(1):1-3.
25. Dias C, Figueiredo B. Breastfeeding and depression: a systematic review of the literature. J Affect Disord 2015;171: 142-54.
26. Bogen D, Hanusa B, Moses-Kolko E, Wisner KL. Are maternal depression or symptom severity associated with breastfeeding intention or outcomes? J Clin Psychiatry 2010; 71(8):1069-78.
27. Rochat T, Houle B, Stein A, et al. Exclusive Breastfeeding and Cognition, Executive Function, and Behavioural Disorders in Primary School-Aged Children in Rural South Africa: A Cohort Analysis. PLoS Med. 2016;13(6):1-30 e1002044. doi: 10.1371/journal.pmed.1002044.
28. Patel V, DeSouza N, Rodríguez M. Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India. Arch Dis Child 2003;88:34-7.
29. Hadley C, Tegegn A, Tessema F, et al. Parental symptoms of common mental disorders and children's social, motor, and language development in sub-Saharan Africa. Ann Hum Biol 2008;35:259-75.
30. Jensen SK, Dumontheil I, Barker ED. Developmental inter-relations between early maternal depression, contextual risks, and interpersonal stress, and their effect on later child cognitive functioning. Depress Anxiety. 2014;31(7):599-607.
31. Quevedo LA, Silva RA, Godoy R, et al. The impact of maternal postpartum depression on the language development of children at 12 months. Child Care Health Dev. 2012;38:420-4.
32. Westerlund M, Lagerberg D. Expressive vocabulary in 18 month old children in relation to demographic factors, mother and child characteristics, communication style and shared reading. Child Care Health Dev. 2008;34:257-66.
33. Podestá L, Alarcón A, Muñoz S, Legüe M, Bustos L, Barría M. Alteración del desarrollo psicomotor en hijos de mujeres con depresión posparto de la ciudad de Valdivia-Chile. Rev Med Chile 2013;141:464-70.
34. Karam F, Sheehy O, Huneau MC, et al. Impact of maternal prenatal and parental postnatal stress on 1-year-old child development: results from the OTIS antidepressants in pregnancy study. Arch Womens Ment Health. 2016;19(5):835-43.
35. Barker E. The duration and timing of maternal depression as a moderator of the relationship between dependent interpersonal stress, contextual risk and early child dysregulation. Psychol Med. 2013;43(8):1587-96.
36. O'Connor TG, Bergman K, Sarkar P, Glover V. Prenatal cortisol exposure predicts infant cortisol response to acute stress. Dev Psychobiol. 2013;55(2):145-55.
37. Bernard K, Dozier M. Examining infants' cortisol responses to laboratory tasks among children varying in attachment disorganization: stress reactivity or return to baseline? Dev Psychol. 2010;46(6):1771-8.
38. Luecken L, Lin B, Shayna S, et al. Prenatal Stress, Partner Support, and Infant Cortisol Reactivity in Low-Income Mexican American Families. Psychoneuroendocrinology 2014;38(12):1-20.
39. Meaney M. Epigenetics and the biological definition of gene x environment interactions. Child Dev. 2010;81(1):41-79.
40. Figueroa-Leigh F, Rojas P, Castañón C. Screening for postpartum depression in a private health care network in Chile. Fam Pract. 2015;32(4):431-5.