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ORIGINAL ARTICLE

Low quality of mother-child interaction in infants at psychosocial risk is associated with risk of developmental delay

Baja calidad de interacción madre-hijo/a en lactantes en riesgo psicosocial se asocia con riesgo de retraso del desarrollo

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Abstract

Early childhood is a fundamental period in children´s development and depends largely on their interactions with their main caregivers. **Objectives**: To evaluate the association between risk of psychomotor developmental delay (PDD) with mother-child interaction quality, postpartum depressive symptoms, and other factors related to care and environment in healthy infants at psychosocial risk. **Patients and Method:** Analytical cross-sectional study in 181 mothers at psychosocial risk and their children aged under one year seen in Primary Health Care. The presence of risk of PDD was determined using the Ages & Stages Questionnaire and its association with interaction quality (CARE Index), postpartum depressive symptoms (Edinburgh Postpartum Depression Scale), and other factors related to environment and care (questionnaire applied to the mother) was studied through bivariate and multivariate analyses, adjusting for confusing variables. **Results:** 20% of infants were at risk of PDD. There was an increased risk of presenting risk of PDD after adjusting for predefined control variables with: low-quality mother-child interaction (OR = 2.46, p = 0.03), exclusive breastfeeding (EBF) <6 months (OR = 2.58, p = 0.01), and partner does not help with childcare (OR = 2.97, p = 0.03). No significant association was observed with postpartum depressive symptoms. **Conclusions**: In healthy infants at psychosocial risk, low-quality mother-child interaction, EBF <6 months, and the non-involvement of the father in the childcare are associated with a higher risk of PDD.

Keywords:
Psychomotor development;
mother-child interaction;
postpartum depression;
risk factors;
breastfeeding;
psychosocial factors

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Introduction

Child development is a maturation process that depends on the child's interaction with others[1]. The prenatal period to 4-5 years is key to physical, cognitive, and social-emotional development, as it provides the foundation for lifelong development[2].

The psychomotor developmental delay (PDD) prevalence in children under 3 years of age in developed countries is between 12-16%[3,4]. In Chile, according to the latest Quality of Life and Health Survey 2016-17[5] the prevalence is 9.9% in children under 5 years of age, showing a significant decrease in recent years.

It is very important to detect early PDD since children who do not receive early intervention are more likely to fail in the school system, to have behavioral problems, low self-esteem, and mental and social health problems such as delinquency, unemployment, and poverty[6], with a social and economic impact on the entire society[7]. At the same time, early detection and intervention have shown effectiveness in improving different outcomes such as school performance, quality of jobs, criminal behavior, and school dropout, among others, in addition to a proven reduction in associated costs[8].

Different risk factors have been described to present PDD[9], some of them depend on the characteristics of the child such as male sex, premature birth, low birth weight, and presence of chronic diseases. Other factors depend on the characteristics of their main caregivers such as poor quality of interaction with the child, relationship difficulties between parents, mental health problems, low educational level, and adolescent parents. Finally, there are context-dependent risk factors such as poverty, poor parenting support, low quality of out-of-home care, and environments that do not stimulate child development. A Chilean study of preschoolers identified that in families where there is greater poverty, no preschool education and/or illiterate mothers, there is a higher risk of PDD[10]. Another study in Chilean preschoolers shows higher PDD in children treated in the public health system compared to the private system[2]. A cohort study conducted in the United States[11] showed that one of the most relevant predictors for an adequate psychomotor development (PMD) was the mother-child interaction quality, that is, the more sensitive, responsive, attentive, and cognitively stimulating was the mother during interactions, the better the results obtained in the children's PMD evaluations. Moreover, a low-quality interaction has been suggested as the possible mechanism by which the characteristics of the primary caregivers and the context ultimately impact on the child's development[12].

An example of this is postpartum depression (PPD), considered one of the most influential factors in the mother-child interaction quality and child development[13]. This affects the interaction quality and possibly impacts on the PMD through this mechanism. The PPD is a prevalent pathology, reported between 20 and 37%[14,15] in the Chilean population, reaching up to 50% in low socioeconomic level sectors[16], thus it is relevant for the PDD evaluation.

Considering this background, knowing the factors associated with infantile PDD is crucial for the early identification of children at risk and to intervene on those modifiable factors that allow avoiding the impact of PDD in the long term.

Objectives

To evaluate the association between PDD risk and a) mother-child interaction quality, b) postpartum depressive symptoms, and c) other factors related to care and context, in healthy infants at psychosocial risk treated in the Primary Health Care (PHC) in Santiago, Chile.

It is expected that both the low quality of interaction and the presence of postpartum depressive symptoms will be significantly associated with PDD risk, as well as identifying other risk factors related to the care and context of the child.

Patients and Method

Study design

Analytical cross-sectional study.

The data used for this study were obtained from the baseline sample of a randomized clinical study (FONIS SA12|2089), whose objective was to evaluate the effectiveness of a group intervention[17] to increase maternal sensitivity. This study is in the results analysis phase.

Reference population

181 mothers at psychosocial risk and their children under one year of age, treated at the Juan Pablo II and El Roble Family Health Centers (CESFAM) in the commune of La Pintana, Santiago, Chile, between 2013 and 2015. Considering a population prevalence of 17% PDD risk, a figure reported in the Ages & Stages Questionnaire (ASQ) validity study in Chile at 8 months of age[18], this sample allows us to study the PDD risk prevalence and its associations, with 5.41% of accuracy and 95% confidence level.

The inclusion criteria were mothers at psychosocial risk with children between 2 and 12 months of age. The psychosocial risk definition is the one used in PHC in Chile, defined as the presence of one or more psychosocial risk factors detected in the first prenatal control through the *Evaluación Psicosocial*

Abreviada scale (Abbreviated Psychosocial Evaluation, EPsA)[19], the risk factors considered are first control after 20 weeks, < 6 years of schooling, age < 18 years, substances consumption during pregnancy (tobacco, alcohol, or drugs), victim of domestic violence, conflicts with maternity, insufficient social or family support, and depressive symptoms. The exclusion criteria were mothers with severe mental health pathology (schizophrenia, mental retardation, and mood disorder with active suicidal ideation), children with serious pathologies (genetic diseases, severe heart disease, and extreme prematurity), and/or severe psychosocial problems (institutionalization of other children history, complaints of sexual and/or child abuse).

Procedure

Mothers who met the inclusion criteria were contacted by telephone in order to invite them to participate. Recruitment was carried out in succession in order to fulfill the number of participants. The selection interview was conducted at the respective CESFAM by professional CESFAM workers, who collaborated with the study. All mothers who attended the selection interview agreed to participate and signed the informed consent, then completed the assessment instruments.

Instruments

Ages & Stages Questionnaire (ASQ Second Edition, translated into Spanish)[20] was used for the PMD risk assessment. If one or more areas evaluated are < 2SD, the screening is positive and is considered a PDD risk. In Chile, this scale is validated with good psychometric properties[18].

For the evaluation of the mother-child interaction quality, CARE-Index was used which consists of the observation and microanalysis of a 3-minute videotape of free play between mother and child. It delivers a maternal sensitivity score on a 0-14 scale (the higher the score, the better the sensitivity). Scores from 0 to 6 are considered of low-quality interaction. The videos were evaluated by three coders who were trained by the author of the instrument and obtained the reliability test. The intraclass correlation between coders was > 0.9, p < 0.001. The coding was done independently and was blind to the rest of the measurements.

For the evaluation of postnatal depressive symptoms, the Edinburgh Postnatal Depression Scale[22] was used, which consist of 10 questions with a maximum score of 30 points. It is validated in Chile[16]with good psychometric properties. The cut-off point of ≥ 10 points was used to consider the presence of postpartum depressive symptoms.

For the evaluation of other PDD risk factors, participants completed a sociodemographic data and care questionnaire, incorporating characteristics of the child, caregivers, and context that might be associated with the presence of PDD (Table 1).

Ethical Considerations

The study was approved and met the requirements of the Ethics Committees of the Pontifical Catholic University of Chile and the South East Metropolitan Health Service.

Statistical analysis

The sample description was made by mean, standard deviation, and proportions. Chi-square, odds ratio (OR), and T-test were used for bivariate analyses of independent samples, with a significant $p<0.05$ value. A multivariate logistic regression analysis was performed with those variables of significant association to measure the effect magnitude, adjusting for the following control variables known as PDD risk factors: male sex, adolescent mother (<18 years at the onset of pregnancy), incomplete maternal schooling (<12 years of study), prematurity (gestational age ≤ 37 weeks), hospitalization of the newborn (NB) ≥ 4 days, and age of the child ≤ 6 months. Statistical analysis was performed with SPSS software version 17.

Results

The mean age of the mothers was 25.3 years, (ranging from 14 to 46 years, SD = 7.07), the mean age of the children was 7.39 months (ranging from 2 to 12 months, SD = 2.12). Table 1 shows the socio-demographic and care characteristics of the sample.

20.1% (n=36) of the children were at risk of PDD, 57.3% (n= 102) of the mother-child dyads had low quality of interaction, and 46.7% of the mothers (n = 84) had postpartum depressive symptoms.

25.7% of the dyads with low-quality interaction to be at risk of PDD compared to 13.4% of those with adequate interaction quality (Figure 1). This difference is statistically significant ($\chi^2 = 4.07$, $p = 0.04$, OR = 2.25, 95% CI [1.01-5.02].

25% of children of mothers with depressive symptoms were at risk of PDD compared with 15.8% of the children of mothers without depressive symptoms. This difference is not statistically significant ($\chi^2 = 2.35$ $p = 0.12$, OR = 2.25, 95% CI [0.84-3.72].

As Table 1 shows, out of the studied variables using the socio-demographic and care questionnaire, in the bivariate analysis the following variables were significantly associated with PDD risk: exclusive breastfeeding (EBF) < 6 months or age at entry to the study, father does not help with child care, and age of the child ≤ 6 months.

Table 1. Sociodemographic characteristics of the sample and its association with risk of developmental delay in bivariate analysis

Characteristic	Total (n = 181)	Association with RDD		
	n (%)	p	OR	CI 95%
From de child				
Age ≤ 6m	66 (36.5)	0.02	2.28	1.08-4.7
Male gender	92 (50.8)	0.79 NS	1.1	0.5-2.2
Only child	77 (42.7)	0.56 NS	1.2	0.5-2.5
Gestational Age ≤37 weeks	34 (18.6)	0.34 NS	1.5	0.6-3.7
Small for gestational Age	13 (7.1)	0.63 NS	0.68	0.14-3.2
Newborn hospitalization ≥4 days	42 (23.2)	0.11 NS	1.8	0.8-4.1
Postnatal Hospitalization	35 (19.3)	0.98 NS	0.9	0.39-2.49
EBF < 6 months	59 (32.6)	0.015	2.48	1.17-5.25
Never received breastfeeding	23 (12.7)	0.06 NS	1.15	0.95-1.3
From the caregivers				
Teenager pregnancy	34 (18.8)	0.2 NS	0.49	0.16-1.5
Pregnancy non planned	128 (70.7)	0.15 NS	1.6	0.7-3.2
Father doesn't live at home	81 (44.8)	0.27 NS	1.2	0.32-1.28
Father does not help with child care	130 (71.8)	0.03	2.94	1.07-8.05
Incomplete school education (mother)	102 (56.4)	0.38 NS	0.72	0.34-1.5
Previous depression (mother)	82 (45.3)	0.57 NS	1.23	0.5-2.5
From the context				
Overcrowding	60 (33.1)	0.73 NS	0.87	0.39-1.9
Violence within the home	11 (6.1)	0.16 NS	2.4	0.67-8.8
Drugs or alcohol abuse within the home	22 (12.2)	0.14 NS	2.04	0.7-5.4
Nobody helps with child care	45 (24.9)	0.09 NS	1.9	0.89-4.3
Assistance to child care center	11 (6.1)	0.08 NS	0.9	0.88-0.96

EBF (exclusive breastfeeding); RDD (risk od developmental delay); OR (Odds ratio); CI 95% (Confidence interval 95%); NS (not significant, p > 0.05)

When multivariate analysis was performed using logistic regression, adjusting for possible predefined confounding variables (male sex, adolescent mother, incomplete maternal schooling, prematurity, NB hospitalization, and age ≤ 6 months) it was observed that a low quality of mother-child interaction, EBF < 6 months, and father not helping with child care increased the PDD risk (Table 2).

Table 2. Multivariate analysis of the factors associated with the risk of developmental delay in infants at psychosocial risk

Risk factor's	aOR	CI 95%	p
Low-quality of mother-child interaction	2.46	1.06-5.71	0.03
EBF < 6 months or age at entry to the study	2.58	1.17-5.66	0.01
Father does not help with child care	2.97	1.06-8.29	0.03

EBF (exclusive breastfeeding); aOR (Adjusted odds ratio); IC 95% (Confidence interval 95%). CI and p-value obtained with logistic regression models, adjusting for: male sex, teenager mother, incomplete maternal education, prematurity, newborn hospitalization and age ≤ 6 months.

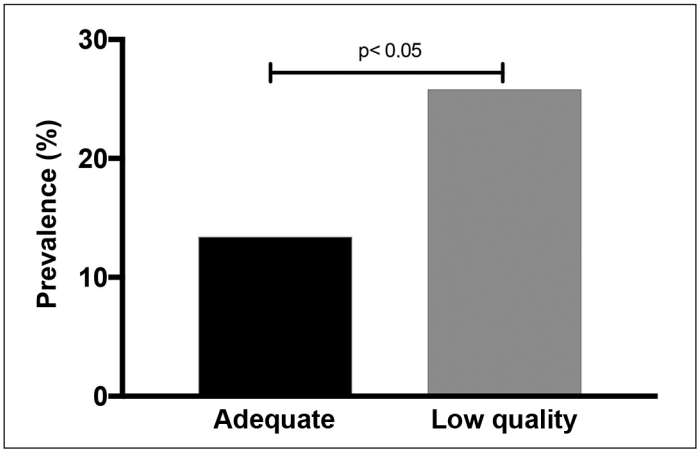

Figure 1. Prevalence of risk of development delay according to the quality of mother-child interaction (n = 181).

Discussion

This study shows a positive association between low-quality of mother-child interaction with the presence of PDD risk in healthy infants at psychosocial risk. The low quality of mother-child interaction increases by 2.4 times the chances of presenting PDD risk by adjusting for variables known by their association with PDD. No significant association was observed between postpartum depressive symptoms and PDD risk. Other detected risk factors in this study were EBF < 6 months or age at entry the study, and lack of involvement of the father in the child care.

It is confirmed in Chilean mother-child dyads that the presence of low-quality interaction between mother and child in the first year of life is associated with a greater presence of problems in infant development. This association is consistent with the international literature where insensitive parenting in the first year of life is associated with worse cognitive and social outcomes until at least 48 months of age[23,24]. On the other hand, the quality of interaction presents high stability from the first year of life[12,25], influencing from such an early age on developmental outcomes to future.

The importance of the father in child development is increasingly studied[26], single-parent families are recognized as a risk factor for PDD[11]. In our study, the presence of the father at home was not the variable associated with PDD, but the father involvement with child care. This could be similar to studies that evaluate the good quality of father-child interaction[23] as very relevant to developmental outcomes.

The absence of association between postpartum depressive symptoms and PDD in our sample may be given mainly by two reasons: 1) lack of sufficient **n** to find the difference, and 2) being a cross-sectional study and in young infants. The presence of depressive symptoms in the mother does not yet visibly affect the child's PMD, but their effect could be found later in children, as observed in the cohort studied by Lung et al.[27], which did not show association between maternal mental health and PDD at 18 months of age, but did at 36 months.

It is important to consider that the factors of care and context are interrelated[11], a mother who has a supportive partner in child care has less stress and less likelihood of depressive symptoms. In this way, the mother is more likely to have good quality interactions with her child that are stimulating for his or her development.

In relation to the evaluated care factors, the association found between PDD risk and EBF < 6 months is very interesting, which is also supported by the literature. There are studies that demonstrate a linear "dose-response" type association between the EBF duration and motor and cognitive development, where this relationship is independent of the characteristics of children and their parents[28,29].

Limitations

For this study, the ASQ scale was used in its second edition in Spanish, which is not the same adapted and validated version of this questionnaire in Chile[20], since, at the time of study recruitment, the results of the validation were not yet available. There is no direct interaction assessment of the father or another caregiver relevant to the child, which would be ideal, as its developmental relevance is studied and it can act as a buffer in the event of inadequate interaction with the mother[23]. There are limitations due to it is a cross-sectional study; we only observe the association between the variables, we do not know how the quality of the interaction and depressive symptoms observed influence the PMD of these children in the future, although the literature guarantees their stability over time. Also, we do not know if the low quality of the observed interaction is partly given by the presence of PDD. In the literature, it is proposed that this influence is reciprocal since the interaction is more challenging with a child who does not present the expected development[25]. The results come from a sample of low socioeconomic level and at psychosocial risk, so they are not generalizable to the entire population.

The results of this study are relevant to the public policies of our country. Since it is a sample coming from a context of psychosocial risk, it is necessary to know which are the factors associated with PDD, especially those that are modifiable through appropriate interventions, such as those found in this study: promoting the quality of mother-infant interaction, encouraging the involvement of the father in the child care, and promoting when possible the EBF for 6 months. On the other hand, it is necessary to incorporate within the care provided to children detected with PDD the evaluation of quality of mother-child interaction and offer interventions that promote maternal sensitivity to achieve improvement in developmental outcomes. There are several studies showing that interventions can be effective in increasing maternal sensitivity[30].

Studies are required to show that interventions focused on increasing maternal sensitivity directed at children with PDD show better results in their long-term development.

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.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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