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Research Article

Biological Factors Associated with Lag and Risk of Neuromotor Delay in Tijuana, Mexico

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Abstract

Background: In Mexico, a prevalence of 14-20% risk of neurodevelopmental disorders has been reported.

Objective: To identify the biological factors associated with the lag and risk of delayed child development in Tijuana, Mexico.

Design and Setting: Analytic cross-sectional study.

Methods: For the evaluation of psychomotor development, the Child Development Assessment (EDI) test was used. With the result of the test, an association was made with biological risk factors. In the bivariate analysis, odds ratio and Chi-square were used, with a 95% confidence interval; a $p<0.05$ was considered significant.

Results: In the evaluation with the EDI test, 68% was normal, 17% lagged and 15% risk of delay. It was found that there is a statistically significant association between lag and risk of delay with maternal comorbidities (p=0.001).

Conclusion: 32% of children have an evaluation of abnormal development, higher than reported in other studies in the country.

Keywords: Child development; Development evaluation; Neurodevelopmental disorders

Introduction

The term psychomotor development is attributed to the German neuropsychiatrist Carl Wernicke, who used it to describe the evolutionary phenomenon of continuous and progressive acquisition of skills throughout childhood [1]. Psychomotor development is a process that results from the maturation of the nervous system, neuromuscular function and sensory organs. It is considered a normal development to acquire skills according to age in the gross motor, fine motor, sensory, language and socialization areas [2]. The period from birth to 5 years of age is critical for development. Early childhood is the most effective time to ensure that children develop their full potential. Developmental disorders in children range from subtle learning disabilities to severe cognitive and motor disabilities [3].

Newborns at risk are a population of children with certain perinatal characteristics, including prematurity, low birth weight, infections, asphyxiation, among others [4]. Hypertension during pregnancy is an entity that causes placental dysfunction, with insufficient blood supply to the fetus and low oxygenation to the nervous system, this condition generates disorders in childhood neurodevelopment [5]. The interruption of the maturational processes that occur in the intrauterine environment due to premature delivery negatively affects the neurological development [6]. Perinatal asphyxia is one of the most important causes of mortality and neurological sequelae in the newborn [7].

The impact caused by low birth weight has neurological repercussions that potentially influence psychomotor development [8]. On the other hand, children of teenage mothers are at greater risk of presenting alterations or delays in some areas of development [9]. The Child Development Evaluation (EDI) test is a screening test, designed and validated in Mexico, it is used for the timely detection of developmental problems and it is applied from 1 to 59 months of age. The results are based on a traffic light: green or normal development, yellow or lag in development and red or risk of delay [10].

In the world, an estimate indicates that more than 200 million children under 5 years failed to reach their potential in cognitive and socio-emotional development [11]. In Mexico, a prevalence of 14-20% in risk of neurodevelopmental alteration has been reported [12]. The objective of the research was to identify the biological factors associated with the lag and risk of developmental delay in children under 5 years of the family medicine unit #27 in Tijuana, Mexico.

Materials and Methods

Study design and population

An analytical cross-sectional study was conducted in Tijuana, Baja California, Mexico, from February 2018 to February 2019. The research was carried out in the family medicine unit #27 (FMU 27) of the Instituto Mexicano del Seguro Social (IMSS); a primary care unit. Patients under 5 years of age with at least one evaluation of child development with normal outcome, lag or risk of delay were included. Patients with a history of neurodevelopmental disorders or neurological diseases with treatment were excluded and patients with incomplete information were eliminated.

Variables

The collection of variables was obtained from the unique

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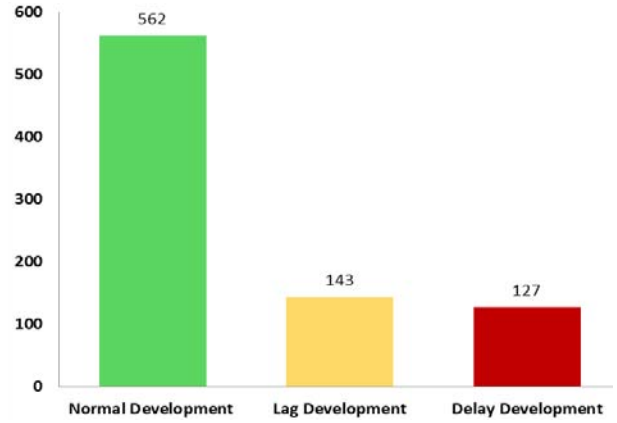

Figure 1: EDI test distribution.

Table 1: Association between developmental lag and biological risk factors.

Biological factor	Total, %	X^2	Odds Ratio	CI 95%
Comorbidities during pregnancy	n=66, 46.2%	p= 0.000	2.442	1.686-3.536
Delayed breathing or circular umbilical cord during labor	n=14, 9.8%	p= 0.018	2.157	1.123-4.145
Hospitalization of the child in intensive care unit	n=18, 12.6%	p= 0.008	2.163	1.208-3.874

Table 2: Association between risk of developmental delay and biological risk factors.

Biological factor	Total, %	X^2	Odds Ratio	CI 95%
Assistance to <2 prenatal consultations	n=41, 32.30%	p=0.016	1.651	1.093-2.492
Comorbidities during pregnancy	n=73, 57.50%	p= 0.000	4.189	2.832-6.197
Delayed breathing or circular umbilical cord during labor	n=15, 11.80%	p= 0.001	2.817	1.424-3.513
Hospitalization of the child in intensive care unit	n=16, 12.60%	p= 0.013	2.114	1.155-3.871

application format of the EDI test. The variables studied were the following: attendance at 2 or less prenatal consultations, comorbidities during pregnancy, pregnancy less than 34 weeks, weight of the child at birth, delay in breathing or circular cord during delivery, hospitalization of the child in the unit of neonatal intensive care or hospitalization before the first month of life with a duration of more than four days and a mother under 16 at the time of delivery. The evaluation of child development was carried out using the EDI test, a screening tool designed for the early detection of neurodevelopmental problems in children under 5 years of age, which was validated in Mexico in 2013.

Statistic analysis

For qualitative variables frequencies and percentages were used; for quantitative variables, mean and standard deviation. The results were analyzed with odds ratio to establish the association between the variables. Statistical significance was determined with Chi square for qualitative variables; with a 95% confidence interval. A $p < 0.05$ was considered significant. For data analysis, the IBM SPSS program, version 20, was used.

Ethics

The study was approved by the local health ethics and research committee number 204; with registration number R-2019-204-016. The research was conducted under the general health law on health research, the Helsinki declaration and bioethical principles.

Results

A total of 832 patients were obtained from the census of the digital EDI test of the family medicine unit #27. 46% were female (n= 386) and 54% male (n= 446). The mean age was 15.5 ± 14.8 months. The evaluation of psychomotor development through the EDI test showed 562 children with normal development (271 women and 291 men), 143 with lag in development (76 women and 67 men) and 127 with risk of developmental delay (39 women and 88 men) (Figure 1).

Of the 143 patients with an EDI test in yellow (Table 1), the lag in child development was associated with comorbidities during pregnancy (n=66, p=0.001), delayed breathing or circular cord during delivery (n=14, p=0.018) and hospitalization of the child in the neonatal intensive care unit (n=18, p=0.008). Of the 127 patients with an EDI test in red (Table 2), the risk of delayed childhood development was associated with attending 2 or less prenatal consultations (n=41, p=0.016), comorbidities during pregnancy (n=73, p=0.001), delayed breathing or circular cord during labor (n=15, p=0.010) and hospitalization of the child in the neonatal intensive care unit (n=16, p=0.013).

Discussion

In this study, 33% of children who were evaluated with the EDI test have an abnormal evaluation, above that reported in other studies. In gender, there was no significant difference between men and women according to the result of the EDI evaluation or the association with biological risk factors as seen in various studies. The age group was not associated with developmental disorders, contrary to what was found in one of the studies conducted by Rizzoli-Córdoba [10].

Moreno-Mora [2] found that of the children with abnormal evaluation, 23% presented a maternal comorbidity during pregnancy mainly arterial hypertension and 42% presented neonatal and umbilical cord circle, which agrees with our study on the biological risk factors with greater association. In another study conducted by the same author [5], in a different population he found low birth weight (<2,500kg) as associated factor. In this study, no statistical significance was found with this biological factor.

Ozkan [3] reports that when comparing gestational age <37 weeks between a group with normal evaluation and with abnormal evaluation there were no statistically significant differences. Gestational age <34 weeks had no association with lag or risk of developmental delay in our study. Alamo [9] in a study on the development of the child in teenage mothers observed that 40% of children have developmental disorders and 60% have a normal level of development, a finding that was not associated in our study.

Conclusion

The objectives set out in this study were met; the lag frequency and risk of developmental delay were achieved, as well as the factors involved. Therefore, strategies to prevent and detect comorbidities during pregnancy to reduce psychomotor development disorders should be created.

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