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Article

Early stimulation, cognitive and neuromotor delay in preterm infants.

Estimulación temprana, retraso cognitivo y neuromotor en recién nacidos prematuros

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Abstract

The identification of the level of maturation of a child within its psychomotor neurodevelopment is of importance to demonstrate the existence or not of a deficit, in addition to its relationship with the application of early stimulation within the first year of life GENERAL OBJECTIVE: To determine the relationship between psychomotor development assessed with the Denver II test and prematurity of newborns in the Neonatology Department of the IESS Riobamba Hospital, in the year 2019 - 2020. Data were collected from 50 children who met the inclusion criteria, the data obtained were tabulated in SPSS software version 22, and then analyzed and interpreted using statistical tables. RESULTS: The results obtained showed a statistically significant relationship between receiving early stimulation with the social-personal area with p= 0.031-OR= 8, IC=95% (0.94-68.4); as in the gross motor area with p= 0.006-

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OR= 7.969 IC=95% (1.57-40.5) which decreases the possibility of developing a global delay in neuropsychomotor development.

Keywords: Prematurity, Developmental Delay, Denver Test II, Early Stimulation.

Resumen

La identificación del nivel de maduración de un niño dentro de su neurodesarrollo psicomotor es de importancia para demostrar la existencia o no de un déficit, además de su relación con la aplicación de estimulación temprana dentro del primer año de vida OBJETIVO GENERAL: Determinar la relación entre el desarrollo psicomotor valorado con el test de Denver II y la prematurez de los recién nacidos en el Departamento de Neonatología del Hospital del IESS Riobamba, en el año 2019 – 2020. Se recolectó datos de 50 niño/as que cumplieron con los criterios de inclusión, los datos obtenidos fueron tabulados en el software SPSS versión 22, y luego analizados e interpretados mediante tablas estadísticas. RESULTADOS: Los resultados obtenidos presentó una relación estadísticamente significativa entre recibir estimulación temprana con el área social-personal con p= 0,031-OR= 8, IC=95% (0.94-68.4); como en el área motora gruesa con p= 0,006-OR= 7.969 IC=95% (1.57-40.5) lo que disminuye la posibilidad de desarrollar un retraso global del desarrollo neuro psicomotor.

Palabras clave: Prematurez, Retraso Del Desarrollo, Test Denver II, Estimulación Temprana.

Introduction

The development of the child, specifically from conception, is one of the most important aspects to consider in the medical evaluation, since it is during this stage where growth is more rapid and therefore there are several causes that compromise and threaten this growth; prematurity is considered the first cause of neonatal mortality, in addition to justifying 50% of infant disability. Premature newborns are vulnerable to several complications during the hospital stay and throughout their lives, among them we have that 10% of neonates develop neurological, motor and sensory deficiencies and more than

50% develop cognitive, behavioral and learning disorders (Casado, 2019, p. 555).

According to WHO: "Developmental delay refers to children who experience significant variation in the achievement of expected milestones for their actual or adjusted age" (World Health Organization, UNICEF, 2013). A child's normal development can be affected by birth complications, malnutrition, chronic health problems, lack of stimulation, and family and environmental factors that are very common in our society.

Neurodevelopment begins and has the most important and critical periods from intrauterine life until the first year of life. This development is a process based on the interaction of the newborn and the surrounding environment resulting in the maturation of the nervous system developing brain functions and the formation of personality. It has non-consecutive stages that can overlap and can also be affected by external or internal agents within these stages are: neurulation, neuronal proliferation, migration, organization - lamination of the brain, and myelination. Although neuronal reproduction after 25 weeks of gestation the brain triples its weight and associated with the increase in volume is related to the generation of new synaptic connections between neurons and arborization, continuing with neurological development until the school stage (Medina et al., 2015).

In the international health community, the use of screening tests is recommended for developmental surveillance, especially those with greater sensitivity to detect abnormalities and recognize normality in various areas and ages of development. Screening tests seek to differentiate between normal and impaired subjects. Some of them base their evaluation strategies on the ability of children to solve the greatest number of behaviors close to their age, from a basal age in which they can solve everything that is explored to older ages in which the child shows no ability to solve more behaviors (Casado, Gutiérrez , & Ruiz, 2018).

For this research we used the Denver test II (DDST-II), where cultural and social characteristics and psychometric estimations are increased in order to reduce the variability of functional sequences that are manifested in children because they present different rhythms according to their cultural and generational traits or patterns of upbringing. Being an evolutionary test allowed us to measure the acquired skills of the child according to his chronological age, as

well as to see a suspension in the development or even worse a delay. The items are presented in an ascending sequence according to the value of the 90th percentile obtained from the population, i.e., in the case of Denver II "is based on the estimate of the age at which most of the population (90%) is able to perform each of the milestones or items that comprise it" (Rivera et al., 2013, p. 460).

It was evaluated according to the Personal-Social group of items, which refers to the child's behavior in relation to other people, socialization with the surrounding environment and the relationship with him/herself. The Fine-Adaptive Motor contains an eye-hand evaluation, that is, it is related to those abilities of coordination, concentration and manual dexterity of the child, such as manual dexterity. The Language group encompasses listening and communication skills through speech or gestures. In the Large Motor group are the skills, movements, coordination and control of body segments such as legs, arms, trunk, among others (Pereira, Lanzarote, Barbancho, Padilla, 2020).

Basically the standards indicate when 25%, 50%, 75%, and 90% of children pass each task. This assessment of the child's development is based on the child's performance and on reports provided by the child's parents showing the relationship of the four areas of functioning.

The way in which this test was used was to draw a line (age line) on the test sheet that joins the child's age in both scales and all the tasks that were crossed by the age line or that are slightly behind it if they have not been evaluated before were evaluated, then proceeded to evaluate the selected tasks, and depending on the result, any of the keys was placed over the 50% mark of the reference population.

These keys were marked as follows; P (passed) if the child performed the task, F (failed) if the child did not perform a task that is done by 90% of the reference population. NO (new opportunity) if the child did not perform the test, but still has time to develop it (the age line is behind 90% of the reference population), R (refused), the child for some situation did not collaborate for the evaluation, and automatically becomes a NO.

The test was considered as ANORMAL when there were one or more sectors with two or more failures and DOUBTFUL when there were more sectors with only one failure". It should be emphasized that those children who did not perform or complete a task and their age is between the 75th and 90th percentile, were considered at risk

and it was suggested that interventions be implemented with activities that favor their development and that are in accordance with their age (Pérez, Molina, & Colcha, 2019, p. 23).

To have this estimation between age and sequence of development in the child depends entirely on the population with which we are working. Thus, determining the age at which most of the population (75-90% percentile) is able to solve each item and establish a timeline, allowing to differentiate between normal and altered development.

One of the qualities of the Denver II is that it explores 3 items prior to their age and does not allow compensating the results with achievements of later ages. Therefore, the order of presentation of the items according to their progress in age is of greater importance than reaching any item older than its age, since it shows that the sequence in the development according to the characteristics of each population. It is worth mentioning that the reliability of the test is 90% and between evaluators of 80 - 95%, it is easy to apply and is not costly, its sensitivity is 56 to 83% and a specificity between 43 to 80%.

According to Pérez Cruz, Molina Vega, & Colcha Gonzales (2019), mention that the early approach to most child development problems can significantly improve their prognosis, so the Denver Test II allows the child who presents some type of pathology during development to be treated early and increase their chances of achieving a better quality of life, therefore early detection of developmental disorders is a health priority.

According to Freddy Fernando in the journal Uisrael in 2021, the DDST II provides a sensitivity of 80 to 97% and a specificity of 80 to 96% in studies of more than 1000 children population with a positive predictive value of 80% and provide a reliability when the test is applied repeatedly. In addition to being the most widely used test in Latin America with greater ease of application due to its affordability (Jumbo, Salazar , Acosta, Torres, 2021, p, 2632).

The main purpose of this research is to provide a benefit in the development of the first years of life in premature patients. It has been observed that the IESS Riobamba Hospital does not have a regime of periodic evaluations, so it is important to know the characteristics of how the premature child has been evolving and how it has affected the impact of having attended or not to early stimulation centers, Therefore, the developmental screening

"Denver Test II" was used to determine how beneficial it was to apply early stimulation in children born prematurely and if they were able to meet the expectations in their development in the personal-social area, language area, fine and gross motor area until their first year of life.

Materials and methods

This work was carried out through a documentary and cross-sectional research conducted at the General Hospital IESS Riobamba, preterm newborns born in the year 2019-2020 were selected. The data collection was through medical records and the Denver II test was used to evaluate the premature newborns who attended the outpatient clinic for their controls up to the first corrected year, a population of 50 children was obtained, among them: 4 very premature preterm, 6 moderate preterm, and 40 late preterm. The aim was to find a greater neurological development in children who received early stimulation during their first year of life, to be implemented as hospital policy.

A database was used in the statistical software SPSS version 22 in which a univariate descriptive analysis was performed in order to obtain measures of central tendency and percentages, and a bivariate analysis to carry out the hypothesis test which refers to frequency distributions, so the Chi-square statistic was used to determine the existence or not of independence between variables and to express a possibility of occurrence in this research, the Odds Ratio (OR) was used.

The inclusion criteria for this study were:

- Children aged 0-1 year who attended the 1-year follow-up regardless of sex.
- Evaluation of the Denver Test II in the medical control at one year.
- Birth weight.
- Gestational age at one year corrected; between extreme preterm (less than 27 weeks, 6 days), very preterm (from 28 weeks to 31 weeks, 6 days), moderate preterm (from 32 weeks to 33 weeks, 6 days), late preterm (from 34 weeks to 36 weeks, 6 days) weeks.
- History of respiratory distress.

- Post-birth pathology affecting development such as neonatal sepsis.
- Newborns with hyperbilirubinemia requiring hospitalization.
- Whether or not they received early stimulation.
- The exclusion criteria in this study were:
- Children over 1 year old.
- Lack of information in the medical records.

Results

Table 1. *Frequency and Percentage Equivalent to Univariates:*

Variant	Frequency	Relative Frequency (%)
Sex (male)	27	54,0
Gender (female)	23	46,0
Very premature preterm (gestational age)	4	8,0
Moderate prematurity (gestational age)	6	12,0
Late preterm (gestational age)	40	80,0
Global Delay (Yes)	25	50,0

Source: Authors

In the univariate analysis of Table 1, with a total population of 50 patients, 54.0% were male, while 46.0% were female. This is in line with the research of (Pacha, 2018), where the prevalence of male preterm infants born at the Provincial General Hospital of Latacunga was evidenced. After the analysis of gestational age, it was found that 80 % were late preterm, which, according to the Pediatrics Treaty, coincides that late preterm newborns, represent 84% of the total preterm births Ortiz (2011). According to Soto, Gonzalez, & Garcia (2020), in children under 5 years of age, the tests performed include at least two areas of development to consider that there is a

global delay: fine and gross motor skills, language and personal-social. Of the 50 preterm infants, 17 (34%) received early stimulation.

Table 2. *Summary of bivariate analysis*

Variant	Percentage	p-value*	Odds ratio**	95% CI
Early Stimulation passes test Personal - Social Area	91,7	0,031	8	0.94-68.4
Early Stimulation passes Gross Motor Area test	89,5	0,006	7.969	1.57-40.5
Early Stimulation does not present global developmental delay.	88.3	0,000	2.3	1.4-3.8

Source: Authors

Note: *The contrast is significant if p< 0.05.

** Express a possibility of occurrence

In the bivariate analysis of Table 2, it was found that 91.7% of patients who received early stimulation passed the Denver II test in the personal-social area (p=0.031), OR=8 CI95% (0.94-68.4). According to Toasa (2015), many of the items at the social level refer to the autonomy of the subject, in her research she exposes on the importance of early stimulation in the psychomotor development of children from 0 to 5 years old in the city of Puyo, where no patient is at a "high" level, due to items that are not achieved, or because they do not attend stimulation sessions so the development of these can stay at the same level or at the same time go down. Early stimulation and the gross motor area are related since 89.5% of preterm infants who received early stimulation passed this test item (p=0.006), OR= 7.969 IC95% (1.57-40.5) , according to Toasa (2015), showed that the data obtained from the evaluations performed on an experimental group of children between 0 to 5 years old, the motor development of the child is important for the mobility of the child, so early stimulation works with a series of exercises that provide stimuli for the development of both gross motor skills, as well as fine motor skills. At the same time, an association was found between those preterm infants who received early stimulation and

those who did not present a global developmental delay (p=0.000), OR= 2.3 CI95% (1.4-3.8).

In the present study it was determined that there is no relationship between global delay with gestational age (p=0.356), however, according to the meta-analysis of Allotey et al., (2017) on cognitive, motor and behavioral performance in preterm infants; concludes that, any prematurity of any degree, affects cognitive performance.

There is no relationship between global delay with birth weight (p = 0.528), according to Streimish, Ehrenkranz, Allred, O'Shea, & Kuban (2012), present in their article on Birth weight and fetal weight growth restriction: impact on neurodevelopment; that girls with low birth weight for gestational age presented a low psychomotor development index (>70 assessed on the Bayley scale).

Discussion

Applying the Denver Test II allows the specific identification of the area of development in which the children present a partial delay or if they have a global delay in psychomotor development. Therefore, it is concluded that of the preterm newborns in the period 2019-2020, 50% of the children at one year of life presented a global delay; while within the partial delays, 38% failed in the gross motor area, 42% failed in the language area, 26% failed in the fine motor area and 24% failed in the personal-social area.

The research did not find a direct relationship between global delay with the gestational age of preterm infants (p=0.356).

The early stimulation applied to premature newborns presented a statistically significant relationship when performing the test showing better indicators in the social-personal area with a value of p= 0.031, OR= 8 IC95% (0.94-68.4); as well as better indicators in the gross motor area with a value of p= (0.006) and an OR= 7.969 IC95% (1.57-40.5).

Global developmental delay was lower in preterm infants who received early developmental stimulation (p=0.000), OR= 2.3 CI95% (1.4-3.8).

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