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Association of risk factors with the development of gross motor skills

Asociación de factores de riesgo con el desarrollo de habilidades motoras gruesas

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ABSTRACT

Introduction: Proper development of gross motor skills in early childhood is considered as an important factor for the child's development.

Objectives: To determine the risk factors that influence the development of gross motor skills in children from 1 to 5 years of age from Neiva, Huila, Colombia.

Methods: This was a descriptive, observational, cross-sectional study. The sample was composed of 240 children. The Abbreviated Development Scale (ADS) -3 was used for the assessment of gross motor skills. Furthermore, a questionnaire was designed to assess perinatal (prenatal and postnatal) risks, which was completed by mothers of children who participated in the study.

Results: Around 15% of the assessed children in our study presented any risk (10.8%) or suspicion of developmental problems (3.8%) in gross motor skills. This was related to different factors including month of the first pregnancy visit, gestation time, important health conditions of the children and constant falls.

Conclusion: The need for both clinical follow-up and implementation of effective health programs for children with delay in motor development should be very relevant.

Keywords: child development, child, motor skills, risk factors, prenatal care

RESUMEN

Introducción: El desarrollo adecuado de las habilidades motoras gruesas en la primera infancia se considera un factor importante para el desarrollo de niños.

Objetivo: Determinar los factores de riesgo que influyen en el desarrollo de las habilidades motoras gruesas de niños de 1 a 5 años de edad en la ciudad de Neiva, Huila, Colombia.

Métodos: Estudio descriptivo, observacional y transversal. La muestra estuvo compuesta por 240 niños. La Escala de Desarrollo Abreviado-3 se utilizó para evaluar las habilidades motoras gruesas. Además, se diseñó un cuestionario para evaluar los riesgos perinatales (prenatales y postnatales), que fue completado por las madres de los niños que participaron en el estudio.

Resultados: Alrededor del 15% de los niños evaluados en nuestro estudio presentaron algún riesgo (10.8%) o sospecha de problemas de desarrollo (3.8%) en las habilidades motoras gruesas. Esto se relacionó con diferentes factores, como mes de embarazo cuando fue realizada la primera consulta médica, tiempo de gestación, condiciones de salud importantes de los niños y caídas frecuentes.

Conclusión: La necesidad tanto del seguimiento clínico como de la implementación de programas de salud efectivos para niños con retraso en el desarrollo motor debe ser muy relevante.

Palabras clave: desarrollo infantil, niño, habilidades motoras, factores de riesgo, atención prenatal

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INTRODUCTION

Early childhood is defined as the period from gestation to age of 6 years. Such period is essential for the development of physical abilities, language, fine-motor, motor skills and cognitive, psychological and social functions, which are strengthened according to the child stimulation and experience living (1,2).

Gross motor corresponds to a key component for the child's development. It is acquired in a cephalocaudal direction, which allows the achievement of changes in the body, balance control, posture and coordinated movements. The gross motor is also associated with greater neurological maturity (3).

The delay of motor development is a condition of late onset, or related to absence of development of some or all of the motor skills (3). The occurrence of this disorder is due to several factors including environmental, biological, prenatal and perinatal risks to which the mother is exposed during pregnancy (4), as well as psychosocial factors such as low educational level, unwanted pregnancies, low birth weight, early pregnancies (5,6) and low socioeconomic level (7). Some studies have also shown that child maltreatment is related to a delay in development of gross motor skills (8).

The knowledge of the risks and the early detection of delay in the development of gross motor skills should be achieved from early childhood, since during this life period almost 85% of neuronal connections are established. These connections are, in turn, fundamental for the development of people (9).

According to the findings of a research conducted by Quino and Barreto (2015), there is association between gross motor skills and acute malnutrition (10), which indicates that a child with malnutrition should not develop the gross motor skills for age. This may also influence on the acquisition of abilities in other areas such as fine-adaptive motor skills, personal-social and language, compromising the cognitive development of children who are affected (11).

In this stage of early childhood development, parents, educational agents, caregivers and healthcare professionals play an important role in the detection of risks to the occurrence of motor development problems. In this connection, a previous assessment of the health status of children for their access in educational institutions, as well as the implementation of Child Development Centers (CDC) and nurseries, among others, can serve as indicators on development levels of children according to their chronological age (12).

In addition to this strategy, the early detection of related causes to these disorders may be achieved together with the implementation of health programs for promotion and prevention. At present, there are few published data on this subject matter in Colombia. Thus, the objective of this study was to determine the risk factors that influence the development of gross motor skills in children from 1 to 5 years of age from Neiva, Huila, Colombia.

MATERIALS AND METHODS

This was a descriptive, observational, cross-sectional study. A correlational non-experimental design was adopted. The sample was composed of 240 children enrolled in the Panorama and Woods of San Luis CDC, from Neiva, Huila, Colombia. Children aged between 1 and 5 years of both sexes were included in the study. All participants had written informed consent signed by their legal guardian. Children with underlying pathologies and those that did not complete all the evaluation tests were excluded of the study.

The Abbreviated Development Scale (ADS) -3 was used for the assessment of gross motor skills (2). The studied children were assessed by a physiotherapist in CDC. The duration of each assessment was an average of 30 minutes. Furthermore, a questionnaire was designed to assess perinatal (prenatal and postnatal) risks in accordance with the postulate of the Cuestionario Materno de Riesgo Perinatal (CMRP) (13). It was completed by mothers of children who participated in the study.

The assessed items were scored (for each area of development and age range) as "1" satisfactory or "0" not satisfactory. Based on the total score obtained by each child, the following classification was used (2):

A) Expected development for age: level of development expected for his age in each area of development.
B) Risk of development problems: level of development under expected for his age in any area of development.
C) Suspicion of developmental problems: high probability of experiencing a developmental delay in some area.

The data analysis was carried out using a computerized statistical program (SPSS version 24.0; SPSS Inc, Chicago, IL). Values of measures of central tendency, means, maximum values, minimums and standard deviation were obtained. The Kolmogorov-Smirnov test and the Pearson correlation coefficient (r) were used, respectively, to compare the normality of distributions and to verify the relationship between the variables. A level of statistical significance of $p < 0.05$ was adopted.

Table 1: *Correlation of prenatal factors and gross motor*

Variables	MFPV	SA	CMP	CPS	SP	CAP	DP	SSP	GM
MFPV	1	0,899	0,000	0,000	0,000	0,000	0,908	0,780	0,944
SA	0,899	1	0,127	0,127	0,223	0,005	0,020	0,049	0,656
CMP	0,000	0,127	1	0,010	0,066	0,126	0,835	0,234	0,593
CPS	0,000	0,127	0,010	1	0,000	0,000	0,684	0,736	0,304
SP	0,000	0,223	0,066	0,000	1	0,000	0,950	0,200	0,820
CAP	0,000	0,005	0,126	0,000	0,000	1	0,240	0,680	0,081
DP	0,908	0,020	0,835	0,684	0,950	0,240	1	0,000	0,807
SSP	0,780	0,049	0,234	0,736	0,200	0,680	0,000	1	0,569

MFPV= Month of the first pregnancy visit; **SA=** Signs of abortion; **CMP=** Consumption of medications during pregnancy; **CPS=** Consumption of psychoactive substances; **SP=** smoking during pregnancy; **CAP=** consumption of alcohol in pregnancy; **DP=** diseases during pregnancy; **SSP=** stress situations in pregnancy; **GM=** gross motor

Table 2: *Correlation of perinatal factors and gross motor*

Variables	GT	TD	ID	MD	BW	CCB	GM
GT	1	0,010	0,354	0,078	0,000	0,205	0,795
TD	0,010	1	0,003	0,739	0,136	0,887	0,334
ID	0,354	0,003	1	0,542	0,971	0,830	0,381
MD	0,078	0,739	0,542	1	0,000	0,704	0,382
BW	0,000	0,136	0,971	0,000	1	0,056	0,341
CCB	0,205	0,887	0,830	0,704	0,056	1	0,049

GT= Gestation time; **TD**= Type of delivery; **ID**= Induced delivery; **MD**= Multiple delivery; **BW**= Birth weight; **CCB**= Complications in childbirth; **GM**= Gross motor

Table 3: *Correlation of postnatal factors and gross motor*

Variables	SCAD	CF	CHOSP	IHC	GM
SCAD	1	0,669	0,018	0,258	0,552
CF	0,669	1	0,302	1	0,659
CHOSP	0,018	0,302	1	0,275	0,675
IHC	0,258	1,000	0,275	1	1

SCAD= Special care after delivery; **CF**= Constant falls; **CHOSP**= Child hospitalizations; **IHC**= Important health conditions; **GM**= Gross motor

The study was conducted in accordance with the standards of the Declaration of Helsinki of the World Medical Association (14), and the Resolution #008430 of 1993.

RESULTS

The age of the children who participated in the present study ranged from 12 months to 63 months, with a mean of 42±12.8 months. With respect to the socioeconomic status of the parents and children, we found families with status I to III (with a mean of 1.36±0.53). A total of 119 girls and 121 boys participated in the study.

Regarding the gross motor variable, we found that 85.4% of the children achieved the expected level of development for their age, 10.8% were at risk of developmental problems and 3.8% presented suspicion of developmental problems in gross motor skills.

Table 1 shows a very strong positive correlation between GM (gross Motor) – MFPV (month of the first pregnancy visit) (r= 0.944). A considerable positive correlation was observed between GM-SP (smoking during pregnancy) (r= 0.820) and GM–DP (diseases during pregnancy) (r= 0.807). An average positive correlation was found between GM –SA (signs of abortion) (r= 0.656), GM–CMP (consumption of medications during pregnancy) (r= 0.593) and GM–CPS (consumption of psychoactive substances) (r= 0.569). No relationship between GM and CAP (consumption of alcohol in pregnancy) was evidenced.

Table 2 shows a considerable positive correlation between GM-GT (gestation time) (r = 0.795).

Table 3 shows a perfect positive correlation between GM–IHC (important health conditions) (r = 1.00) and CF (constant falls) –IHC (r= 1.00). Also an average positive correlation was found between GM-SCAD (special care after delivery) (r = 0.552), GM-CF (r= 0.659) and GM-CHOSP (child hospitalizations) (r= 0.675). No relationship between GM-CAP was evidenced.

DISCUSSION

The present study examined the association of risk factors with the development of gross motor skills in children from 1 to 5 years of age from Neiva, Huila, Colombia. The results showed that mothers are exposed to factors during pregnancy period (in the prenatal and perinatal stages), which should have a negative influence on the development of gross motor skills in early childhood of their children.

Around 15% of the assessed children in our study presented any risk (10.8%) or suspicion of developmental problems (3.8%) in gross motor skills, a result similar to that found by Vélez, Toledo and González (2007) (16). These authors found a prevalence of developmental delay (gross motor deficits) of 6.6% in preschool children from Bogotá, Colombia.

Other authors such as Palma (2016) (17) and Herrera (2016) (18) found significant percentages of children of CDC with greater risk to problems in gross motor skills. Moreover, Carmona and Correa (2014) (19) conducted a study with a sample of 46 children aged 2.5 to 4 years who were assessed through eight questionnaires on living conditions. In this occasion, anthropometric indicators were also calculated using Epinut 6.0. The Abbreviated Development Scale was used to assess the living conditions of family members, nutritional status and infant development of preschool children from Urabá, Colombia.The findings of these authors revealed a frequency of maturational and pathological delays in the gross motor area of 17% and 6% respectively, which also corroborates our finding.

This finding in our study is worrying in view of the fact that the gross motor area is of great importance for the child's development. It is linked to fine-adaptive motor skills acquisition, social staff (2), cognitive processes, learning disorders (16), as well as a high risk of suffering from obesity (20).

Furthermore, in the present research, we found a strong relationship between gross motor skills and prenatal history of the mothers (during the month of the first pregnancy visit), which suggests that prenatal care visits performed (initially) after the recommended period should predispose to risk of delay in the development of gross motor skills in children. The same applies to cases of absence of prenatal care.

A study conducted by Miranda and Castillo (2016) (21) determinate the need factors associated with the use of prenatal care by pregnant women from Sincelejo, Colombia. These authors found that 2.3% of the patients did not attend routine prenatal care and 24.4% did not attend the routine as recommended. However, 84.9% of the patients attended the prenatal care visits during the first trimester, since they considered this measure as a protective factor for mother and child during the pregnancy period. This demonstrates the need for implementation of more effective prenatal programs.

In our research, we found a relationship between delay in the gross motor area and mothers who smoked during pregnancy, which corroborates the results of Lester et al. (2002) (22). This indicates that smoking contributes to a wide range of developmental and psychomotor disorders.

Despite the limitations of the study design and for data collection, our research may be considered relevant for the population of children with delay in gross motor skills, given that it had a representative sample. Moreover, no recent study has used the version 3 of ADS. There are only studies that used the version 1 of ADS, described by Nelson Ortiz (23).

In short, based on our findings, the need for both clinical follow-up and implementation of effective health programs for children with delay in motor development should be very relevant. We hope that the expansion of treatment services for children with this disorder shall be adequately provided.

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