GROSS MOTOR ACTIVITY AND ETIOLOGIC FACTORS ASSOCIATED WITH THE CEREBRAL PALSY

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ABSTRACT

Introduction: The cerebral palsy presents different degrees and consequences, and its causes not very known. Thus, this article objectified to identify the etiology factors and evaluate the gross motor function of students with cerebral palsy of the municipal public of Florianópolis (Santa Catarina, Brazil) system education.

Materials and Methods: This study was classified as descriptive, diagnostic and transversal. Twenty-two subjects with cerebral palsy that obeyed the inclusion approaches were selected. The instruments used were antecedent form and the Gross Motor Function Measure-88. Statistical analysis was based on the descriptive and inferencial statistics.

Results: The average age was eight years, with 63.3% of the female gender and 36.7% male. The prevalent palsy was quadriplegia (35.7%). The preponderant etiologic factor was perinatal asphyxia (42.8%). The larger percents of gross motor function occurred in the measures A, B, E and D of the ataxic cases, and the less percents in the measures C, D and E of the choreoathetosis cases.

Discussion: Multiple etiologic factors on prenatal, perinatal and postnatal periods were identified. Lowest scores in the Gross Motor Function occurred in the quadriplegia and choreoathetosis cases, in which the girls had a total score greater than the boys in the average value, however, this difference was not significant.

KEYWORDS

Motor Activity; Cerebral Palsy/Etiology; Motor Skills Disorders.

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RESUMO

Introdução: A paralisia cerebral apresenta diferentes graus e consequências, e suas causas ainda são pouco conhecidas. Assim, este artigo buscou identificar os fatores etiológicos e avaliar a função motora grossa de alunos com paralisia cerebral matriculados na rede pública municipal de ensino de Florianópolis, Santa Catarina. Materiais e Métodos: O estudo foi classificado como descritivo, diagnóstico e transversal. Seleccionaram-se 22 indivíduos com paralisia cerebral que atenderam aos critérios de inclusão. Foram aplicados o formulário de antecedentes e o Gross Motor Function Measure-88. Os dados foram analisados por meio de estatística descritiva e inferencial. Resultados: A idade média dos investigados foi oito anos, sendo 63% do sexo feminino e 37% do masculino. A paralisia predominantemente foi a quadriparesia (35,7%). Os fatores etiológicos prevalecentes foram a asfixia perinatal (42,8%). As maiores porcentagens de função motora grossa ocorreram nas dimensões A, B, E e D dos casos de ataxia, e as menores nas dimensões C, D e E dos casos de coreoatetose. Discussão: Identificaram-se fatores etiológicos pré-natais, perinatais e pós-natais. Os menores escores na função motora grossa ocorreram nos casos de quadriplegia e coreoatetose, sendo que as meninas tiveram escore total em valor médio maior que os meninos, entretanto, esta diferença não foi estatisticamente significante.

PALAVRAS-CHAVE

Atividade Motora; Paralisia Cerebral/Etiologia; Transtornos das Habilidades Motoras.

INTRODUCTION

The cerebral palsy is one of the causes with greater association with the mental and motor disability; however, the specialized literature cites that its etiologic factors are not sufficiently known. It is defined as the form of a non-evolutive chronicencephalopathy lesion initiated in the first infancy, which interferes in the neuromotor maturation of the child, and promotes disorders of the tonus, movement, posture and sensorial integration, associated or not with the cognitive involvement1,2. The movement disorders associated with the cerebral palsy are caused by the muscular adaptive modifications that compromise the acquisition process of abilities. In cases of higher gravity, osseous deformities can occur, and the abilities acquisition can be sustained in the initial stages of the motor development3,4. The risk factors associated with the cerebral palsy are connected to causes pre, peri or post-natal, with multifactorial etiology, and it can present genetic origin, anatomo-functional, infectious, physiopathological and environmental, besides non-specific alterations1,5,6.

In countries with developed health systems, an increase in the cases of cerebral palsy have been observed in the last two decades, with prevalence indices of moderate to severe cases that varies between 1.5 and 2.5 by 1,000 births. These data have been attributed to the improvement of the perinatal medical care, contributing to the survival’s increase of premature and low weight kids in the birth every time more extreme7,8.
The consequences associated with cerebral palsy affect, in different degrees, the motor and cognitive competencies necessary to the teaching-learning process and create difficulties to the subjects included in the regular education system. These difficulties are associated, specially, with the basic motor abilities, as walking, running, jumping, equilibrating, among others, and with the essential cognitive competencies, like the memory and attention, among others.\textsuperscript{2,7,9,10}

Considering the exposed, this research had as an objective, to identify the etiological factors and to assess the gross motor function of students with cerebral palsy enrolled in the municipal regular teaching of Florianópolis, Santa Catarina.

\section*{MATERIALS AND METHODS}

\subsection*{Sample}

This study was characterized as descriptive, diagnostic and transversal\textsuperscript{11}, developed in the municipal public net of teaching of the Florianópolis city. It was previously approved by the Ethics Committee in Researches involving human beings of Universidade do Estado de Santa Catarina (UDESC), under protocol 021/2004. The experimental procedures were performed inside the ethical principles seen in the resolution n. 196, of October 10, 1996, of the National Health Council\textsuperscript{12,13}.

After the approval of municipal public organs, the data collection started in 2005. The tabulation, analysis and data discussion were developed in the following year. The preparation of the articles was done in 2007 and 2008.

The individuals’ identification was done by a census of all the students from an investigated municipal regular net of teaching, registered with cerebral palsy, completing a total of 32 subjects. The selection of the subjects was done by the following inclusion criteria:

\begin{itemize}
  \item clinical diagnosis of cerebral palsy;
  \item ages comprising 4 and 15 years old;
  \item authorization and consent to the study’s participation;
  \item confirmed frequency in the classes.
\end{itemize}

From the censitary survey and the inclusion criteria application, 22 subjects were identified. The sample analysis showed that the inclusion criteria less attended was the confirmed frequency to the classes.

\subsection*{Instruments and data collection}

For the pre, peri and post-natal etiological factors identification of the history of cerebral palsy, an antecedent form, with questions for the kids’ parents or responsible, was used. The antecedent form included questions about:

\begin{itemize}
  \item identification data;
  \item gestational antecedents;
  \item perinatal history;
  \item neonatal period;
  \item rehabilitation;
  \item orthosis use.
\end{itemize}

In order to evaluate the ample motricity, the Gross Motor Function Measure 88 (GMFM-88)\textsuperscript{14,15,16,17,18} was used. The GMFM-88 was developed to produce an ample or gross motor function index, especially with cerebral palsy or cerebral damages kids, and it was characterized by the standard observation\textsuperscript{17}, with 88 items, divided in the following dimensions: a) lay down and roll (A dimension); b) sit (B dimension); c) creep and kneel (C dimension); d) standing (D dimension) and e) walking, running and jumping tests with and without orthosis (E dimension).

\subsection*{Procedures of data collection}

After the approval of the Ethics Committee, the study was analyzed and received the authorization from Secretaria Municipal de Educação de Florianópolis and schools which presented students with cerebral palsy enrolled.

With the institutional permissions (information term to the institution), the contact with parents proceeded, requesting the Informed Consent Form to the participation of the kid in the study. Only after the father or responsible’s consent, the antecedent form application and GMFM-88 started.

The motor evaluation was carried out in the habitual shift of the student, in the school’s domains, in an isolated room, with at least two researchers and one institutional responsible present. This procedure aimed at minimizing the risks and discomforts of a data collection involving kids and adolescents.

\subsection*{Data treatment}

Data were analyzed from a data bank created in the software Epi Info 2000, version 3.2.2, and stored in the spreadsheet of Microsoft Excel 2003 software. The descriptive analyses of the results were done by the statistic of the simple, percentage, standard deviation, maximum and minimum values of the frequency calculus. The inferential analyses of the results were realized by the Student’s t test. The significance level considered was $p \leq 0.05$, in a 95% confidence interval\textsuperscript{11}.

The GMFM-88 items were evaluated in a four-point scale of the Likert type. The total punctuations for the items in each dimension were applied and, consequently, converted to percentage. The percentage punctuation of
each dimension was weighted equally to determine the total percentage punctuation\textsuperscript{17,18}.

**RESULTS**

The mean age of male individuals was 8.7 years old and of the female sex was 7.5 years old. Most of the investigated were female (63.4%).

Table 1 shows the occurrence of the cerebral palsy type by sex. It was verified that quadriparesia presented the highest occurrence among female and male subjects. No cases of quadriplegia and choreoathetosis among the female sex were identified, nor hemiparesia and quadriplegia with ataxia athetoid between the male sex subjects.

Table 2 shows the results of the ample motricity evaluation. The highest percentages of the gross motor function occurred in ataxia cases in the A, B, C and D dimensions in diparesia cases in the A and D dimensions, besides hemiparesia cases in the E dimension. It is also verified that the smallest percentages of gross motor function happened in choreoathetosis cases in the C, D and E dimensions, in quadriplegia cases in the D and E dimensions, and in quadriparesia cases with athetoid in the D and E dimensions.

From the total score of ample motricity related to sex, a superior profile for the female sex was verified, although the difference was not statistically significant according to the t test (p=0.29).

Concerning the pre-natal aspects, it has been evidenced that most of the gestations were not planned (90.9%). In most of the cases there was an adequate pre-natal follow-up (68.2%), i.e., the realization of six or more appointments; but the use of tobacco was done during the gestation by 27.3% of the pregnant women. The mother’s ages which predominated in the birth period were of 20 to 29 years old (38.1%), with one case above 40 years old (7.1%) and five with ages below 20 years old (23.8%).

**Table 1** - Classification of cerebral palsy related to sex

<table>
<thead>
<tr>
<th>Palsy type</th>
<th>Female</th>
<th></th>
<th>Male</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Quadriparesia</td>
<td>5</td>
<td>35.7</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Diparesia</td>
<td>4</td>
<td>28.6</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Hemiparesia</td>
<td>2</td>
<td>14.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ataxia</td>
<td>2</td>
<td>14.3</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Choreoathetosis</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Quadriparesia with athetoid</td>
<td>1</td>
<td>7.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
<td>8</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 2** - Evaluation of the ample motricity in relation to the cerebral palsy classification

<table>
<thead>
<tr>
<th>Type of cerebral palsy</th>
<th>Dimensions*</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean/sd</td>
<td>Min/Max</td>
<td>Mean/sd</td>
<td>Min/Max</td>
<td>Mean/sd</td>
<td>Min/Max</td>
</tr>
<tr>
<td>Quadriparesia</td>
<td>(n=8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>59.0/96.0</td>
<td>16.6/100</td>
<td>0/45.2</td>
<td>0/84.6</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>88.0/12.3</td>
<td>50.8/19.1</td>
<td>9.5/14.1</td>
<td>44.8/43.8</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>(n=2)</td>
<td>7.8/100</td>
<td>1.6/70.0</td>
<td>0/7.0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>53.9/65.1</td>
<td>35.8/42.3</td>
<td>3.5/4.9</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>Diparesia</td>
<td>(n=5)</td>
<td>59.0/100</td>
<td>23.0/100</td>
<td>0/97.6</td>
<td>0/89.7</td>
<td>0/82.0</td>
</tr>
<tr>
<td></td>
<td>100/18.0</td>
<td>93.0/32.2</td>
<td>73.8/42.6</td>
<td>71.8/63.4</td>
<td>56.9/38.3</td>
<td></td>
</tr>
<tr>
<td>Hemiparesia</td>
<td>(n=2)</td>
<td>72.5/98.0</td>
<td>88.0/98.3</td>
<td>40.4/92.8</td>
<td>77.0/84.7</td>
<td>44.0/88.9</td>
</tr>
<tr>
<td></td>
<td>85.2/18.0</td>
<td>93.1/7.3</td>
<td>66.6/37.0</td>
<td>83.4/9.0</td>
<td>66.4/31.7</td>
<td></td>
</tr>
<tr>
<td>Ataxia</td>
<td>(n=3)</td>
<td>100/100</td>
<td>100/100</td>
<td>92.8/100</td>
<td>38.4/100</td>
<td>75.0/79.1</td>
</tr>
<tr>
<td></td>
<td>100/0</td>
<td>100/0</td>
<td>100/4.1</td>
<td>89.7/33.0</td>
<td>76.4/2.0</td>
<td></td>
</tr>
<tr>
<td>Choreoathetosis</td>
<td>(n=1)</td>
<td>15.7/15.7</td>
<td>8.3/8.3</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>15.7/0</td>
<td>8.3/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>Quadriparesia with athetoid</td>
<td>(n=1)</td>
<td>84.3/84.3</td>
<td>41.6/14.6</td>
<td>2.3/2.3</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>84.3/84.3</td>
<td>41.6/0</td>
<td>2.3/2.3</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
</tbody>
</table>

\* Values in % of ample motor function.
Min: minimum; Max: maximum; sd: standard deviation.
Concerning the perinatal aspects, most of the subjects were born by normal delivery (68.2%), followed by cesarean delivery (22.7%) and normal delivery assisted by forceps (9.1%). Half of the subjects were born premature, i.e., with gestational age below 37 weeks (50%). Still, it was noticed that 18.2% of the subjects had extreme prematurity, i.e., gestational age below or equal to 32 weeks. The body mass at birth characterized subjects with low weight, between 1,500 and 2,500g (52.4%), and very low weight, i.e., below 1,500g (23.8%). The perinatal asphyxia was the neonatal intercurrence with higher percentage of cases (42.8%). Among the subjects who suffered perinatal asphyxia, more than half needed neonatal reanimation (55.5%). Yet, even among the subjects who did not suffer any neonatal intercurrence, it was also verified that there was a neonatal reanimation in 45.5% of the cases. The Apgar index data of the first and fifth minutes demonstrated that in 84.7% of the researchers a neurologic risk was detected.

In relation to the post-natal aspects, 46.7% of the cases had cerebral palsy diagnosis concluded during the first year of life, while 40% of the cases were concluded in the second year. The mean age of the rehabilitation beginning presented a great amplitude (dp=21.8 months), with a median of eight months, and a modal value fixed in six months. The total time mean of physiotherapeutic intervention situated in 75 months, with great standard deviation (86.6 months). The orthosis use, current or in the past, was noted by 71.6% of the subjects, specially the orthosis of ankle-foot and cubitus-palmar type, indicated for minimizing the tonic changes.

DISCUSSION

The results obtained about the general age of the subjects combine studies as to the age (second infancy) and diverge as to the sex, cerebral palsy type and age. According to the realized researches about the matter, prevalence of cerebral palsy of the spastic type occurs, and then the dyskinetic and ataxic also occurs. It must be noticed that the gained data in this study ratify the specialized literature and realized studies as to the low prevalence of the ataxic palsy.

The score of the motor functions found for the different types of palsy confirm the study, which suggests that individuals with ataxia and hemiparesia diagnosis present superior standards, while in quadriplegia and choreoathetosis subjects demonstrate inferior standards. These scores are in conformity, yet, with the gross motor function division in three levels (light, moderate and severe), which present hemiplegia with light to moderate levels, and portraits of quadriplegia considered severe and that need the aid for locomotion.

The maternal age predominant combines studies that showed mean age of the mothers during the delivery of the researched of 26 to 29 years old. The gestational age of the investigated in the birth also confirms the prematurity results in the birth of several studies. The low weight at birth results ratify studies in which the individuals with cerebral palsy were born with weight below the recommended.

According to a research about this matter, asphyxia does not represent the main cause of cerebral palsy, varying from 6 to 10% of the occurrences, discording from the obtained results in this article. This phenomena can be explained by the occurrence of neonatal encephalopathy, which is a pathology commonly accompanied by the Apgar scale punctuation, whose result is similar to asphyxia. Nevertheless, neonatal encephalopathy happens because of placental infections and metabolic and genetic infirmities. In conformity to other research about cerebral palsy, the low Apgar indices (lower than three to five minutes) are related to the subjects with future diagnosis of cerebral palsy. In a study that compared diplegia to quadriplegia, the Apgar index values more inferior were related to the kids with quadriplegia.

The results about the time elapsed until the cerebral palsy diagnosis confirm the study, which shows that this period is about 18 months, but it can reach until 456 months. The kid’s diagnosis with cerebral palsy must be based on observation, so that it can be noted the abnormal motor movements persistency that, in many times, are not seem in the age of one and two years old.

The high values raised about the rehabilitation time suggest the need of changes in the kids with cerebral palsy attending, since studies have showed that the rehabilitation offers significant improvements to the motor and ambulatory abilities, besides contributing significantly for the gross motor function.

As a limiting factor, a little number of subjects, which is typical of studies with special populations, does not allow generalizable conclusions, suggesting that, in this study, there are pre, peri and post-natal etiological factors associated with cerebral palsy. The main pre-natal factors include non-planned gestations, rejection to the child, adequate pre-natal follow-up, maternal age and use of tobacco. The perinatal mains factors comprise the births in the normal and cesarean delivery, the prematurity and extreme prematurity, the low and very low body mass in the birth, the perinatal asphyxia, the neonatal reanimation and the low Apgar indices. On the other hand, the main post-natal factors indicate the high percentage of diagnosis in the first and second years of life and the small percentage of late diagnosis.

The ataxia, diparesia and hemiparesia are the aggressions that present higher commitment of the gross
motor function in several dimensions and that happen bigger and more crescent involvement in the cases of quadripareisia, quadriplegia and in the case of isolated choreoathetosis and associated with quadripareisia. Although there is a predominance of female subjects with cerebral palsy diagnosis of the quadriparetic kind, no statistically significant differences were found.

REFERENCES

1. Pascual JM, Koenigsberger MR. Parálisis cerebral: Factores de riesgo. [Statistically significant differences were found.]

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