



CLINICAL MANIFESTATIONS AND INTERRELATIONS OF MULTIDISCIPLINARY REFERRAL WITH NEONATAL HYPOXIC-ISCHEMIC ENCEPHALOPATHY

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ARTICLE INFO

Article History:

Received 8th October, 2017

Received in revised form 10th

November, 2017

Accepted 06th December, 2017

Published online 28th January, 2018

Key words:

Hypoxic-Ischemic Encephalopathy; Speech Therapy; Physiotherapy; Neurology; Child.

ABSTRACT

Objective: To investigate clinical characteristics, complications, and neonatal conditions of Neonatal Hypoxic-Ischemic Encephalopathy patients and their relation with necessity of a multidisciplinary approach.

Methods: Cross-sectional study using data collected from medical records of Neonatal Hypoxic-Ischemic Encephalopathy children, aged from 0 to 24 months, seen in the last five years in a hospital in southern Brazil. Analysis of birth data, clinical interurrences, and neonatal conditions of these patients were done while attempting to relate them to the need for multidisciplinary follow-up.

Results: Of 208 medical records collected, 111(53.36%) were of boys. Of all patients, 76(47.79%) had vaginal birth, mean gestational age was 34.86 weeks (SD±4.30), mean birth weight was 2,392.31g (SD±973.618), mean Apgar score in the first and fifth minutes was 5.25 and 7.18, respectively and 116(60.19%) were preterm. Regarding multidisciplinary referral, seven (8.17%) were referred to Speech Therapy and 86(41.34%), to Physiotherapy, with significant association of these referrals with the variables pre-term birth, sepsis, and ventilator support ($p \leq 0.05$). The convulsion event variable was related only to Speech Therapy referral ($p=0.005$) and respiratory distress, only to Physiotherapy referral ($p=0.008$). The Oral Motor Sensory System variable was also analyzed and a relationship with respiratory distress, sepsis, and ventilator support was observed ($p < 0.05$). **Conclusion:** These patients have traits that lead to rehabilitation due to specific characteristics of their neurological condition, requiring multidisciplinary referrals, including Physiotherapy and Speech Therapy interventions. Specific clinical variables of Speech Therapy were significantly related to the clinical manifestations most commonly altered in the sample. Further research is suggested in this area.

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INTRODUCTION

Neonatal Hypoxic-Ischemic Encephalopathy (NHIE) is the most prevalent neurological affliction in the neonatal period. It is a severe interurrence that leads to the death of 10% to 60% of affected children, while at least 25% of survivors have long-term neurological sequelae. About 35% of the cases are a consequence of perinatal asphyxia and the affliction is inversely related to gestational age and weight at birth.[1-6]

It is characterized by a significant decrease in oxygen supply to the brain tissue, with changes in the cellular metabolism.[7,8]

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Since the NHIE diagnosis is clinical, it is important to define the newborn's initial neurological setting and evolution after the hypoxic-ischemic event so a prognostic can be established. The most common clinical manifestations of NHIE classify the patient according to the level of conscience, muscle tonus, primitive reflexes, convulsive events, and altered autonomic functions, among others.[2,9,10].

There are several measures to minimize the clinical complications of this affliction and provide support to the children aiming at ideal development conditions, with an emphasis on brain plasticity.[3,10-12] The early intervention is multidisciplinary since the alterations compromise motor, cognitive, and social aspects alone or concomitantly at different levels.[2,13] Regarding the speech therapy and physiotherapy practices in these cases, the alterations in oral

motor function (suction, deglutition, and speech), difficulties in learning and language, poor facial expression, hearing loss, respiratory distress, and physical and motor difficulties that limit movement and body expression – thus impairing these patients’ functional ability – stand out.[11,14-16]

Studies have related NHIE to health outcomes in a quest for immediate neuroprotection therapies,[1,6] however, the literature is still lacking. In this context, the present study aimed to investigate birth data, clinical interurrences, and neonatal conditions of patients with NHIE while attempting to relate them to the need for multidisciplinary follow-up.

METHODS

The present research is a cross-sectional retrospective study with a convenience sample and data collected from medical records of children seen between 2009 and 2014 in the upper-cortex-function outpatient clinic of a children’s hospital in the city of Porto Alegre, RS, Brazil. The study was approved by the institution’s Ethics Committee in Research under protocol 311.810.

The sample comprised the medical records of 208 children diagnosed with NHIE who were or had been in regular outpatient clinic follow-up for the first two years of life according to the classification of each case. The newborns (NB) were referred to this outpatient clinic through a request of the pediatric neurologist at the time of discharge from the neonatal intensive care unit, where they were admitted due to clinical interurrences and neonatal conditions related to hypoxia and/or cerebral ischemia.

Data were collected by two examiners trained for this task who had hands-on and theoretical experience in the field. All findings were transcribed into a previously established file with data characterizing the sample and clinical information

professionals involved, of the patients, and of their family members were preserved.

The data were tabbed and analyzed using descriptive statistics and the chi-squared and Mann-Whitney tests to verify statistical significance, while normality was verified by the Kolmogorov-Smirnov test. The maximum significance level assumed was 5% ($p \leq 0.05$) and the software used for the statistical analysis was SPSS version 13.0.

RESULTS

Of the 208 medical records included in this study, 111 (53.36%) were of male patients. 76 (47.79%) had normal childbirth with mean gestational age of 34.86 (± 4.30) weeks, mean weight of 2,392.31 (± 973.618) grams, and mean Apgar in the first minute of 5.25 and of 7.18 in the fifth minute. Pre-term births were found for 116 cases (60.19%).

The researchers attempted to relate the clinical interurrences and neonatal conditions to the sex of the patients, although no statistically significant relations were found between these variables.

Table 1 shows the results of the association between the set of clinical interurrence variables and neonatal conditions with the birth data using Mann-Whitney test. A relation was found between low weight and low gestational age with clinical interurrences and pre-term neonatal conditions, sepsis, respiratory distress, and use of mechanical ventilation (MV). It was also observed that the newborns’ Apgar score was low in the first minute and tended to normality in the fifth minute.

Of all patients included in the study, 154 (74.04%) were referred by the neonatal and neurology teams during the follow-up of other specialties, specifically to speech therapy and physiotherapy – the services available to the hospital staff – for a multidisciplinary intervention.

Table 1 Relation between clinical interurrences and neonatal conditions and birth data

Clinical interurrences/ Neonatal conditions	Birth data							
	Weight		Gestational age		Apgar 1 ^{**}		Apgar 5 ^{**}	
	Median (quartiles)	p value	Median (quartiles)	p value	Median (quartiles)	p value	Median (quartiles)	p value
Pre-term birth	1,715 (1,195.00-2,562.50)	<0.001*	33 (30.00-35.00)	<0.001*	5 (3.00-7.00)	0.054	8 (6.00-8.50)	0.176
Sepsis	1,485 (1,088.75-2,400.00)	<0.001*	32 (30.00-36.00)	<0.001*	5 (3.00-7.00)	0.508	7 (6.00-8.00)	0.275
Respiratory distress	1,990 (1,215.00-2,905.00)	<0.001*	34 (31.00-38.00)	0.001*	6 (3.00-7.00)	0.691	8 (6.00-9.00)	0.924
Mechanical ventilation use	1,590 (1,105.00-2,460.00)	<0.001*	32 (29.75-37.00)	<0.001*	5 (3.00-7.00)	0.005*	7 (6.00-8.00)	0.007*
Convulsive events	2,550 (1,400.00-3,225.00)	0.834	36 (31.00-38.25)	0.431	5 (2.00-8.00)	0.275	8 (6.00-9.00)	0.822

*The maximum significance level assumed was 5% ($p \leq 0.05$).

**Apgar 1^{*}: Apgar in the first minute; Apgar 5^{*}: Apgar in the fifth minute. Mann-Whitney statistical test

researched. The information was split into birth data (weight, gestational age, Apgar in the first and fifth minutes, type of childbirth, and sex), clinical interurrences, neonatal conditions, and referral to other professionals (speech therapist and physiotherapist).

Regarding speech therapy, data were collected on specific suspected alterations, comprising issues in the oral motor sensory function (OMSF) (orofacial motor skills and dysphagia) and in hearing. The privacy and anonymity of the

Of those, 17 (8.17%) were referred to speech therapy, 86 (41.34%) were referred to physiotherapy, and 51 (24.52%) were referred to both specialties.

As shown in Table 2, the statistically significant association between clinical interurrences and neonatal conditions with the referral to speech therapy and physiotherapy stand out. Pre-term patients, those with sepsis, and those who used MV were often referred to these specialties. Of note, the relation of convulsive events and respiratory distress with referral to speech therapy, as well as the later with referral to

physiotherapy. The referrals to these services are significantly related to the sample's birth data, weight, and gestational age, as seen in Table 3. These analyses were carried out using the chi-squared test.

Table 2 Relation between clinical interurrences and neonatal conditions and the referrals to speech therapy and physiotherapy.

Clinical interurrences/Neonatal conditions	Area of referral			
	Speech therapy referral		Physiotherapy referral	
	N	p value	N	p value
Pre-term birth	47	0.014*	88	0.007*
Sepsis	26	0.050*	49	0.002*
Respiratory distress	48	0.003*	85	0.008*
Mechanical ventilation use	33	0.048*	68	<0.001*
Convulsive events	39	0.005*	64	0.186

*The maximum significance level assumed was 5% (p≤0.05).
Chi-squared statistical test

As for the comparison of the speech therapy variables, statistical significance was found in the comparisons related to the OMSF. The chi-squared test shows the statistical significance when cross-referencing respiratory distress, sepsis, and MV use. MV use was statistically significantly related to suspected hearing disorder, as seen in Table 4.

Table 3 Relation between birth data and referrals to speech therapy and physiotherapy.

Birth data	Area of referral			
	Speech therapy referral		Physiotherapy referral	
	Median (quartiles)	p value	Median (quartiles)	p value
Weight	2,235(1,155.00-2,802.50)	0.007*	2,370(1,345.00-3,000.00)	0.020*
Gestational age	34.00 (31.00-38.00)	0.033*	35.00 (31.20-38.00)	0.032*
Apgar1'	6.00 (4.00-7.00)	0.409	5.00 (3.00-8.00)	0.607
Apgar5'	7.00 (6.00-9.00)	0.755	8.00 (6.00-9.00)	0.368

*The maximum significance level assumed was 5% (p≤0.05).
Chi-squared statistical test

Table 4 Relation between clinical interurrences and neonatal conditions and suspected alterations in OMSF and hearing.

Clinical interurrences/Neonatal conditions	Suspected alterations			
	OMSF**		Hearing	
	N	p value	N	p value
Pre-term birth	56	0.976	12	0.816
Sepsis	35	0.046*	8	0.635
Respiratory distress	64	0.005*	15	0.517
Mechanical ventilation use	45	0.033*	5	0.074
Convulsive events	42	1.000	14	0.129

*The maximum significance level assumed was 5% (p≤0.05).
**OMSS: Oral motor sensory function.
Chi-squared statistical test

DISCUSSION

The present study aimed to investigate birth data, clinical interurrences, and neonatal conditions of patients with NHIE while attempting to relate them to the need for multidisciplinary follow-up, particularly speech therapy. Hence, the aim is to contribute relevant data to the field's literature.

The relation between clinical interurrence of sepsis and low weight and pre-term gestational age in the sample studied suggests a statistically significant occurrence. Sepsis causes damage and imbalances in the organism [17] and is often associated with inflammatory events in the neonatal period and with an immature immune system in pre-term children.[18] Pre-term birth is also characteristic of the sample studied. Previous researches outlined the existence of a window of vulnerability when NHIE is related to this condition.[17,18]

Moreover, the present study highlights the frequency of respiratory distress and consequent need for MV. Although MV is considered a risk factor for the development of respiratory alterations, it must be pointed out that, among the newborns in the present sample, it is an essential tool to manage pre-term newborns with respiratory distress [19] since it improves the clinical prognostic and protection of these individuals.

More comorbidities are associated with unfavorable outcomes to neurodevelopment as a response to this setting.[3,16] That implies the creation of more specific rehabilitation programs, particularly multidisciplinary assessment and intervention, for a better prognostic.[10,12,15] The large number of referrals in this sample, in particular to physiotherapy and speech therapy, is attributed to the frequency of adverse motor and respiratory clinical conditions in these individuals.[4,20] In this sense, these referrals aim to reduce the individuals' complications and the hospitalization period since these areas are responsible for preventing, promoting, and rehabilitating these disorders in neonatal care.

Furthermore, a significant relation was found between referrals to speech therapy and physiotherapy and respiratory distress. Among the roles of physiotherapy, respiratory therapy is often

requested by the staff in neonatal intensive care units since it optimizes the respiratory function and decreases respiratory load, thus enhancing ventilation.[6,21] In addition, changes in OMSF are often associated with respiratory alterations, which grants the use of speech therapy.

The relation between referrals to speech therapy and convulsive events is justified by the frequent association in the literature[1,4,22-25] of this affliction with language alterations, neurofunctional deficits, and memory, behavior, and cognition impairment.[11,13,26]

Also regarding speech therapy, the motivation for such referral included in particular suspected changes in oral motor sensory structures and functions. Changes in this system comprise difficulties in suction, deglutition, and respiration.[4,9,15] Sepsis, respiratory distress, and MV use have a statistically significant association with changes in OMSF and are often present in patients with these speech therapy difficulties. VM

use due to respiratory distress causes sensory deprivation, leading to altered development of oral structures and functions,[27] which may also be affected by sepsis in the perinatal period.

Although not statistically significant, a trend was found between MV use and the referral to hearing assessment. This referral must be related to the known fact that MV use is considered an indicator of risk for hearing deficiency.[28]

Although countless studies have been carried out aiming to characterize NHIE and to understand the clinical interurrences caused by this setting, little is mentioned about the referral to rehabilitation treatment. When each area better understands the relation between NHIE and its manifestations, its physiopathology may be better understood, thus speeding up and improving referrals, as well as entailing better possibilities for the treatment and rehabilitation prognostic.

CONCLUSION

Patients with NHIE have alterations that lead them to rehabilitation treatment due to specific characteristics of their neurological setting. This study reached its proposed goals by identifying the prevalence of pre-term births, respiratory distress, sepsis, and MV use among these patients. Clinical aspects and the need for referral to physiotherapy and speech therapy were associated. Specific variables of speech therapy clinical practice were significantly related to the most commonly altered clinical manifestations in the sample.

The data identified highlight the importance of early multidisciplinary action since these interventions complement the treatment, thus improving the prognostic. Further studies are suggested aiming to establish programs for the diagnostic and rehabilitation in this population.

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How to cite this article:

Luíza Silva Vernier *et al* (2018) 'Clinical Manifestations and Interrelations of Multidisciplinary Referral with Neonatal Hypoxic-Ischemic Encephalopathy', *International Journal of Current Advanced Research*, 07(1), pp. 8959-8963.
DOI: <http://dx.doi.org/10.24327/ijcar.2018.8963.1464>
