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Evaluation of Psychomotor Development in Children Treated with Therapeutic Hypothermia

Ocena rozwoju psychomotorycznego dzieci leczonych hipotermią terapeutyczną

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Abstract

Introduction. Perinatal asphyxia is a common neonatal problem. It remains a leading cause of neonatal morbidity and mortality and plays a major role in motor and intellectual developmental deficits in children. Complications of cerebral hypoxia in asphyxiated newborns can be treated with therapeutic hypothermia. The treatment involves moderate cooling of the newborn to minimize the consequences of hypoxia.
Aim. To evaluate psychomotor development and detect impairments and deficits in motor functions, perception, speech, manual functions and social contacts in children treated with therapeutic hypothermia.
Material and Methods. The study was carried out on a group of 27 children treated with therapeutic hypothermia. The data involved an analysis of medical records and the results of psychomotor development evaluation using the Munich Functional Development Diagnostics scale.
Results. We found no significant delay in the developmental age of the children for walking. The mean developmental age for this area was 30.56 months (SD=8.42 months), for fine motor skills, speaking, independence and social skills were similar. The mean developmental age for understanding speech was 28.76 months (SD=7.92 months). The mean developmental age for cognitive skills was 27.73 months (Me=28 months). The speech development was slightly delayed for their age ($\bar{x}$=3.2 months, SD=1.09 months).
Conclusions. Children aged up to 1 year showed normal psychomotor development. Small deficits in cognitive processes and social skills were identified in children in the second and third years of life. The greatest developmental delays were identified in children in the fourth, fifth and sixth years of life. **(JNNN 2024;13(1):9–16)**
Key Words: hypoxia, newborn, perinatal asphyxia, therapeutic hypothermia

Streszczenie

Wstęp. Zamartwica okołoporodowa jest częstym problemem noworodkowym. Pozostaje główną przyczyną zachorowalności i śmiertelności noworodków oraz odgrywa istotną rolę w rozwoju motorycznym i intelektualnym dzieci. Powikłania niedotlenienia mózgu u uduszonych noworodków można leczyć za pomocą hipotermii terapeutycznej. Leczenie polega na umiarkowanym schłodzeniu noworodka w celu zminimalizowania skutków niedotlenienia.
Cel. Ocena rozwoju psychoruchowego oraz wykrycie zaburzeń i deficytów w zakresie funkcji motorycznych, percepcji, mowy, funkcji manualnych i kontaktów społecznych u dzieci leczonych hipotermią terapeutyczną.
Materiał i metody. Badaniem objęto grupę 27 dzieci leczonych hipotermią terapeutyczną. Badanie obejmowało analizę dokumentacji medycznej oraz wyników oceny rozwoju psychoruchowego z wykorzystaniem Monachijskiej Skali Diagnostyki Rozwoju Funkcjonalnego.
Wyniki. Nie stwierdzono znacznego opóźnienia w wieku rozwojowym dzieci w zakresie chodzenia. Średni wiek rozwojowy dla tego obszaru wynosił 30,56 miesiąca (SD=8,42 miesiąca), dla umiejętności motorycznych, mówienia, niezależności i umiejętności społecznych był podobny. Średni wiek rozwojowy dla rozumienia mowy wynosił 28,76

miesięcy (SD=7,92 miesięcy), dla umiejętności poznawczych wynosił 27,73 miesięcy (Me=28 miesięcy). Rozwój mowy był nieznacznie opóźniony w stosunku do ich wieku ($\bar{x}$=3,2 miesiąca, SD=1,09 miesiąca).
Wnioski. Dzieci w wieku do 1 roku życia wykazywały prawidłowy rozwój psychoruchowy. Niewielkie deficyty w zakresie procesów poznawczych i umiejętności społecznych stwierdzono u dzieci w drugim i trzecim roku życia. Największe opóźnienia rozwojowe stwierdzono u dzieci w czwartym, piątym i szóstym roku życia. **(PNN 2024;13(1):9–16)**
Słowa kluczowe: niedotlenienie, noworodek, zamartwica okołoporodowa, hipotermia terapeutyczna

Introduction

Perinatal asphyxia (PA) is one of the leading causes of perinatal mortality and is a common cause of severe central nervous system damage in newborns [1,2]. It is a condition caused by an inadequate supply of oxygen to the brain of the fetus and neonate in the period immediately before, during or after the birth process [3,4]. PA can cause hypoxic-ischemic encephalopathy (HIE), which is estimated to occur in 2–6/1,000 live births [1,5]. HIE can lead to various neurological disorders, including cerebral palsy, epilepsy, cognitive and social development deficits, speech impairments, and — in severe cases — brain death [1,3,5]. Complications of cerebral hypoxia in asphyxiated newborns can be treated with therapeutic hypothermia (TH). Hypothermia has a neuroprotective effect on ischemic brain tissue [6–8]. TH involves cooling the head or the whole body of the newborn to approximately 34°C. Two cooling methods are available [7,9]:

— selective head cooling (SHC) to a target temperature of 34.5°C±0.5°C using a special cooling cap (Cool-Cap device),
— whole-body cooling to 33–34°C using the Tecotherm Neo cooling system.

To achieve beneficial results, the procedure should be initiated within 6 hours from the detection of cerebral hypoxia. TH should be continued for 72 hours. Patients are rewarmed gradually, no faster than 0.5°C per hour. Both the methods have been proven effective. As the procedure is associated with only mild and transient adverse effects, it is considered to be safe and is recommended globally as a treatment option for newborns and children with cerebral hypoxia. In 2015, TH was included as a treatment option in European guidelines for the resuscitation of newborns. In the UK, the procedure is recommended for the treatment of newborns with HIE (guidelines by NICE and the British Association of Perinatal Medicine) [9,10]. Evaluation of psychomotor development in children treated with TH enables the detection of neurological disorders and deficits and provision of therapy interventions aimed at correcting developmental deficits. One diagnostic tool that allows for early detection of developmental delays is the Munich Functional Developmental Diagnostics (MFDD) scale [11–14]. MFDD is used to evaluate psychomotor development in children from one month of age. It is based on the observation, evaluation and interpretation of the child's behavior. It enables the detection of impairments, delays and deficits in perception, speech development, manual functions and social contacts [15,16]. There are only few clinical reports on psychomotor development evaluation in children treated with selective head cooling in online scientific databases (Web of Science, PubMed, Medline, Scopus).

The aim of the study was to evaluate psychomotor development and detect impairments and deficits in motor skills, perception, speech, manual functions and social contacts in children treated with TH using the Munich Functional Developmental Diagnostics scale.

Material and Methods

Study Design and Baseline Characteristics of the Patients

A total of 51 patients were invited to participate in the study involving psychomotor development evaluation. Six of the children who qualified for TH died and one child remained hospitalized in the department due to poor prognosis. Of those patients, only 27 took part in the study. The parents (legal representatives) of the children were provided with information about the study and gave consent for their participation.

Based on an analysis of medical records, a group of 27 children treated with TH at the Department of Anesthesiology and Intensive Care of Newborns and Children of the Provincial Specialist Hospital was selected. A decision on whether a given newborn qualified for TH was made in three stages based on the following criteria:

Stage 1: Newborns born more than or equal to 35 weeks' gestation with an episode of perinatal cerebral hypoxia that could lead to perinatal HIE with at least one of the following:

— apgar score ≤5 at 10 minutes after birth,
— ongoing need for resuscitation, including mask or endotracheal ventilation with positive pressure ventilation and chest compression at 10 minutes after birth,
— cord or arterial blood pH<7.0 or base excess of –12 mmol/L or less,

— if cord pH is not available, arterial pH<7.0 or base excess less than –12 mmol/L within 60 min of birth base excess (BE)<16 mmol/L in umbilical cord or arterial blood sample within 60 minutes of birth.

Stage 2: The presence of moderate/severe HIE; defined as seizures or presence of altered state of consciousness (lethargy, stupor, coma) and with at least one of the following:

— hypotonia, flaccid,
— decreased activity, no activity,
— abnormal arms reflexes, legs extended including oculomotor or pupillary abnormalities,
— absent or weak suck, incomplete or absent Moro,
— bradycardia, variable heart rate,
— periodic breathing, apnoea,
— clinical seizures.

Stage 3: Seizures on aEEG.

Performing an aEEG can help make a decision on whether to perform TH, with aEEG being used as criteria 3 for hypothermic therapy. The aEEG should ideally be commenced before the administration of anticonvulsant therapy.

Exclusion criteria:

— oxygen requirement >80%,
— major congenital abnormalities,
— uncontrolled severe clinical coagulopathy (low platelet count or clinical evidence of abnormal clotting and/or clotting studies which has not responded to appropriate therapy,
— significant chromosomal anomaly such as trisomy 13,18,
— baby unlikely to survive.

Follow-up Examination using the Munich Functional Developmental Diagnostics (MFDD)

To evaluate psychomotor development and detect impairments and deficits in motor functions, perception, speech, manual functions and social contacts in the children studied, MFDD tests were used according to the age of the children (1st, 2nd, 3rd, 4th, 5th and 6th year of life).

MFDD is used to evaluate psychomotor development in children from one month of age. It is based on the observation, evaluation and interpretation of the child's behavior. It enables the detection of impairments, delays and deficits in perception, speech development, manual functions and social contacts. Early detection of developmental problems makes it possible to provide children with early motor, psychological and pedagogical rehabilitation to correct or compensate for developmental problems.

The development evaluation sheet for children aged between 1 month and 1 year is designed to evaluate the following 8 psychomotor functions: crawling, sitting up, walking, grasping, perception, speaking, understanding speech (from the age of 10 months) and social skills.

The development evaluation sheet for children in the second and third years of life is designed to evaluate the following 7 developmental functions: gross motor skills, fine motor skills, cognitive processes, speaking, understanding speech, social skills and independence.

The development evaluation sheet for children in the third and fourth years of life includes 13 tasks, including 4 verbal tasks, 8 functional skill tasks and a questionnaire for parents. It is designed to evaluate the following functions: fine motor skills, visual motor skills, speech, general knowledge, understanding numbers and independence.

The development evaluation sheet for children aged over 4 includes 15 tasks to be performed by the child, including 6 verbal tasks and 9 functional skill tasks, and a questionnaire for parents. It is designed to evaluate 6 developmental functions: fine motor skills, visual intelligence, speech and general knowledge, understanding numbers, independence and logical thinking.

The results were analyzed statistically. Quantitative variables were reported using means, standard deviations, medians and interquartile ranges, whereas qualitative variables were described using numbers and percentages. Data were assessed for normality using the Shapiro–Wilk test and visual inspection of distributions. As the distribution of the variables was not normal, non-parametric statistical methods were used.

Ethical Consideration

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of Wroclaw Medical University (protocol code KB 229/2017 and 14 April 2017).

Statistical Analysis

Quantitative variables are presented using mean, standard deviation, the median and the quartile range, and qualitative using the cardinality and percent. The normality of the data was tested using the Shapiro–Wilk test and visual assessment decomposition. Due to the lack of normality, non-parametric statistics were used in the analysis. Analysis of the difference in the level of the quantitative variable pH value of umbilical cord blood, deficiency BE rules in the first hour of life between the categories of the qualitative variable — pathological

changes in the USG recording of the brain, the impact of resuscitation, resuscitation on development psychomotor skills in children was performed using a non-parametric test Mann–Whitney. Analysis of the relationship between quantitative variables and Apgar scores in the 1st, 3rd, 5th, 10th minute of life, mean core temperature on psychomotor development was performed the Pearman correlation coefficient. Analysis of the relationship between the route of delivery and umbilical cord blood pH values, deficiency the principles of BE and pathological changes in the USG recording of the brain was performed with the help of Fisher's test. The significance level was $p<0.05$. The analysis was performed in the R for windows software (version 3.6.1).

Results

The study was carried out on a group of 27 children treated with TH. The results of umbilical cord blood pH measurement in the first hour of life in the studied group of newborns were X″=7.06, minimum value 6.76, Me=7.05. For BE values: X″=–14.95 mmHg, the lowest drop was –29 mmHg. After 6 hours, the average SaO2 value was 94.16%, Me=96%, SD=5.36%, Min=77.7%. After 6 hours, the average pH value was 7.29, Me=7.30, SD=0.12, Min=6.78. In subsequent time intervals the results improved significantly. At 72 hours, the average value of SaO2=95.71%, Me=96%, SD=1.85%, Min=91.8%. The average pH value was 7.37, Me=7.38, SD=0.07, Min=7.23. Eleven (59.26%) of the children were female and 16 (40.74%) were male. The gestational age of the newborns ranged from 36 to 41 weeks, whereas their birth weight ranged from 2.200 g to 3.990 g. An analysis of medical records showed that 12 of the children (approximately 44.44%) were born by caesarean section and 15 (55.56%) by vaginal delivery. As for the presence of coexisting defects, 24 (88.90%) of the children had no defects, whereas 3 (11.1%) had such conditions as persistent fetal circulation, tricuspid insufficiency and ventricular septal defect. The average time from birth to the initiation of TH was 4.75 h. The longest duration of hospital stay was 29 days.

The development of the children was evaluated using MFDD tests according to the age of the children. A total of 5 infants were examined using the MFDD. The mean age of the group of children aged up to 1 year (N=5) was 4.4 months. The youngest child was 2 months old and the oldest was 9 months old. The psychomotor development of children aged up to 1 year in terms of crawling ($\bar{x}$=4.3 months, vs. (sitting up, grasping, perception and social skills did not deviate significantly from the norm. The speech development of the children was slightly delayed for their age ($\bar{x}$=3.2 months, SD=1.09 months). The mean developmental age of the children for walking was 3.6 months (SD=2.07 months) (Table 1).

Table 1. Baseline characteristics of children areas of development in the first years of life (in months)

Variable	$\bar{x}$	Me	SD	Min	Max	Q_1	Q_3
Crawling	4.3	3	3.5	1	10	2	4
Sitting up	4.6	3	4.08	1.5	11.5	2	5
Walking	3.6	3	2.07	2	7	2	4
Grasping	4.4	3	2.82	2	9	3	5.5
Perception	4.8	4	7.52	2.5	9	2.5	6
Speaking	3.2	4	1.09	2	4	2	4
Social skills	4.5	3	2.82	2	9	3	5.5

$\bar{x}$ — mean; Me — median; SD — standard deviation; Min — minimum value; Max — maximum value; Q_1 — lower quartile; Q_3 — upper quartile

An analysis of the psychomotor development evaluation results in children in the second and third years of life (N=15) showed that the mean age of the children was 31.7 months and their median age was 33 months. The youngest child was 16 months old and the oldest was 42 months old (SD=8.1 months).

We found no significant delay in the developmental age of the children for walking. The mean developmental age for this area was 30.56 months (SD=8.42 months). The mean developmental ages for fine motor skills, speaking, independence and social skills were similar. The mean developmental age for understanding speech was 28.76 months (SD=7.92 months). The mean developmental age for cognitive skills was 27.73 months (Me=28 months) (Table 2).

The study included 7 children in the fourth, fifth and sixth years of life (N=7). The mean age of the children was 63.57 months (SD=13.22 months). The youngest child was 42 months old and the oldest was 78 months old on the day of the evaluation.

Table 2. Results of psychomotor development evaluation in children in the second and third years of life

Variable	$\bar{x}$	Me	SD	Min	Max	Q_1	Q_3
Gross motor skills	30.56	33	8.42	16.5	45	23	35
Fine motor skills	29.2	32	8.75	11.5	41	25	34.5
Cognitive skills	27.73	28	7.34	12	39	24.5	30
Speaking	29.23	32	9.26	10.5	43	24.5	36
Understanding speech	28.76	32	7.92	13.5	42	24.5	32
Social skills	29.1	30	8.15	12.5	42	24	36
Independence	29.66	33	8.86	11	43	25	36

$\bar{x}$ — mean; Me — median; SD — standard deviation; Min — minimum value; Max — maximum value; Q_1 — lower quartile; Q_3 — upper quartile

Table 3 shows the results of psychomotor development evaluation in a group of children at a mean age of 63.5 months. The best results were obtained for speech and general knowledge, with the mean developmental age of the children being 63.5 months (Me=75 months; SD=34.67). The results for fine motor skills and visual intelligence were somewhat similar (Me=60 months; SD=35.78). The results for understanding numbers and independence were even poorer, with the median developmental age of 30 months. This group of children showed the greatest developmental delay in independence, with the mean developmental age of 46 months.

Table 3. Results of psychomotor development evaluation in children in the fourth, fifth and sixth years of life

Variable	$\bar{x}$	Me	SD	Min	Max	Q_1	Q_3
Fine motor skills	51.71	60	35.78	5	98	22	77.5
Visual intelligence	52.57	60	37.41	24	98	28	65
Speech and general knowledge	63.57	75	34.67	21	98	31.5	94
Understanding numbers	47.28	30	41.88	4	98	12	87.5
Independence	46	30	42.97	5	98	8	86.5
Logical thinking	49.66	45	42.38	5	98	12.75	88.5

$\bar{x}$ — mean; Me — median; SD — standard deviation; Min — minimum value; Max — maximum value; Q_1 — lower quartile; Q_3 — upper quartile

Table 4. Analysis of cord blood pH and BE results in the first hour of life

USG results	N	$\bar{x}$	Me	SD	Min	Max	Q_1	Q_3	p
pH blood cord									
Yes	13	7.07	6.97	0.30	6.76	7.96	6.94	7.16	0.40883
No	14	7.06	7.08	0.13	6.80	7.25	6.99	7.25	
BE base deficiency									
Yes	13	–14.0	–12.9	–4.73	–22.1	–5.4	–17.00	–10.90	0.35631
No	14	–15.85	–16.3	–5.72	–29.00	–5.5	–18.72	–12.67	

N — number of observations; $\bar{x}$ — mean; Me — median; SD — standard deviation; Min — minimum value; Max — maximum value; Q_1 — lower quartile; Q_3 — upper quartile

Table 5. Results of analysis of the effect of resuscitation in the study group on psychomotor development at 1 year of age

Resuscitation N=5	Developmental area [months]	$\bar{x}$	Me	SD	Min	Max	Q_1	Q_3	p
No (N=4)	Crawling	4	2.5	4.08	1	10	1.75	4.75	0.80000
Yes (N=1)		4	4.0	–	4	4	4.00	4.00	
No (N=4)	Sitting	4.5	2.5	4.70	1.5	11.5	1.87	5.12	0.80000
Yes (N=1)		5.0	5.0	–	5.0	5.0	5.00	5.00	
No (N=4)	Walking	3.5	2.5	2.38	2	7	2	4	0.71680
Yes (N=1)		4.0	4.0	–	4	4	4	4	
No (N=4)	Grasping	4.75	3.5	3.59	2.0	10.0	2.75	5.5	0.80000
Yes (N=1)		4.50	4.5	–	4.5	4.5	4.50	4.5	
No (N=4)	Perception	4.5	3.25	3.08	2.5	9	2.5	5.25	0.71680
Yes (N=1)		6.0	6.00	–	6.0	6	6.0	6.00	
No (N=4)	Speaking	3	3	1.15	2	4	2	4	0.68309
Yes (N=1)		3	4	–	4	4	4	4	
No (N=4)	Social development	5.12	3.75	3.32	3	10	3	5.87	0.71680
Yes (N=1)		8.00	8.00	–	3	8	8	8.00	

N — number of observations; $\bar{x}$ — mean; Me — median; SD — standard deviation; Min — minimum value; Max — maximum value; Q_1 — lower quartile; Q_3 — upper quartile

In the study group of children (N=27), 14 had no pathological changes in the trans-temporal ultrasound image during hospitalization in the unit. Analysis of the characteristics in the group of children who did not have lesions in the trans-temporal ultrasound recording showed that the mean results of cord blood pH in the first hour of life were 7.06, the median equal to 7.08, and the minimum value was 6.80. In the group in which pathological lesions were found in the children's brains (N=13), the results of the mean measurement were 7.06, the median equal to 6.97, and the min=6.76. The analysis conducted with the Mann–Whitney U test did not show statistical significance ($p>0.05$). This means that low pH and BE values in the first hour of life had no effect on pathological changes in brain tissue (Table 4).

Of the total number of children studied at 1 year of age (N=5), only 20% (1 child) had been CPR performed at birth. The results of the analysis of psychomotor development of the child in whom resuscitation was performed (Table 5) showed that his development was not delayed compared to children who were not resuscitated

(N=4). The correlation of the studied characteristics in children at 1 year of age was assessed using the Mann–Whitney's test. The results of the test (p>0.05) showed no statistical significance. This means that the differences found in psychomotor development in children at 1 year of age are not due to the influence of resuscitation activities in the first hour of life.

Discussion

Results from the most recent clinical studies confirm the effectiveness of TH in reducing mortality and disability in newborns and infants born with moderate or severe HIE [17–19]. Hypothermia prolongs the duration of "autoresuscitative" gasps that support cardiac function during asphyxia, thereby further increasing the chance of survival [20]. According to a report published in the 13th issue of the New England Journal of Medicine, newborns with PA who receive hypothermic therapy within 6 hours after birth have an increased chance of survival and are less likely to have brain injury [19]. Findings from a multi-center randomized trial, which was published in 2013 showed that TH initiated as soon as possible within 6 hours from the onset of the symptoms of cerebral hypoxia is associated with reduced mortality and reduced extent of brain injury [12]. A similar randomized trial was carried out in 2010 in China on a group of 100 infants with HIE treated with selective head cooling and a control group of 94 infants with HIE. The time from birth to the initiation of cooling did not exceed 6 hours [21]. In 2013, Thoresen et al. published the results of a clinical study on a group of newborns who received TH within three hours after birth and a group of newborns who received TH>180 minutes after birth. In our study group, there was no difference in the time to the initiation of cooling between the children who survived and those who did not. The time to TH was approximately 5 hours. However, the study found that those children who received TH within 3 hours after birth had better psychomotor outcomes. The findings clearly show that the sooner cooling is initiated, the better the neurological prognosis of children [22]. Our analysis of psychomotor development problems in the children included in the present study showed that the greatest developmental deficits were experienced by children in the fourth, fifth and sixth years of life. This group of children had the greatest developmental delays in independence, understanding numbers and logical thinking. Children in the second and third years of life had delays in cognitive processes, social skills and understanding speech. In the youngest group of children, a speech delay of 1 month was identified. The development of gross and fine motor skills using MFDD, was also analyzed in a study by Małek et al. [23], in a group of 22 children. Malek found that motor development delays decreased faster in children who had a higher gestational age at birth and shown that early diagnostics and rehabilitation are extremely important in the early detection of developmental impairments and deficits.

The use of TH remains a determinant factor for neonatal survival [24,25]. For hospitals that perform TH, it is necessary to establish and maintain infrastructure and training programs in a highly organized and reproducible manner in order to ensure patient safety. Moreover, such hospitals should be able to provide comprehensive care, including MRI, neurologic consultation and short and long-term follow-up [24,26]. To conclude, it should be stressed that in patients with HIE, the timing and magnitude of brain injury vary greatly. Thus, according to researchers, one should not expect any single intervention to offer uniformly favorable outcomes. The heterogeneity of neuropathological changes after perinatal HIE, combined with regional heterogeneity in treatment effects, will result in differences in outcomes among the survivors of HIE. This highlights the need for long-term follow-up of all infants with HIE receiving any treatment [26–29].

One shortcoming of the study was that it was carried out in only one center. A multicenter study would allow the inclusion of a larger number of patients. The long-term follow-up was extremely difficult to conduct and had certain limitations. Some participants were excluded from the study at its different stages, which had an impact on the final number of patients in particular groups.

Conducted research on the assessment of psychomotor development in children using tests of the Munich Functional Developmental Diagnostics enabled early detection disorders and deficits in movement, perception, speech, manual functions and social. In the early-diagnosed group developmental disorders have been proposed rehabilitation interventions movement, psychology, speech therapy and pedagogy. The actions taken made it possible alignment and compensation of detected development disorders.

This study is not without limitations. The sample size is small was carried out in only one center. A multicenter study would allow the inclusion of a larger number of patients. The long-term follow-up was extremely difficult to conduct and had certain limitations. Some participants were excluded from the study at its different stages, which had an impact on the final number of patients in particular groups. The limitation of the study is a weak access to a uniform medical care and support scheme for children with developmental problems and their families. Parents experience deficits in emotional, instrumental and spiritual support and equal access to care and specialists. Children and their

parents have limited access to early, comprehensive, coordinated, multi-specialist medical and rehabilitation care.

Conclusions

We found that the psychomotor development of children aged up to 1 year was normal. Small developmental deficits in cognitive processes and social skills were identified in children in the second and third years of life. The largest developmental deficits were identified in the oldest group of children (fourth, fifth and sixth years of life). This group of children had the greatest developmental delays in independence, understanding numbers and logical thinking. MFDD is a scale that provides a simple way of correctly identifying delays in one or more areas of psychomotor development.

Implication for Nursing Practice

Early detection of psychomotor development problems and early therapy intervention help correct developmental deficits and improve quality of life in children treated with TH. The lack of standards for comprehensive psychomotor development evaluation in children treated with TH prevents early detection of possible impairments in perception, speech development, social skills and motor functions. The range of guaranteed medical services covered by public health insurance is not sufficient to finance sup-port for the psychosocial development of children, including extended diagnostic evaluation of psychomotor development, in order to reduce their social exclusion.

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