PARTICIPATION OF CHILDREN WITH NEURODEVELOPMENTAL RISK FACTORS IN THE EARLY REHABILITATION PROGRAM IN RELATION TO THE LEVEL OF PARENTAL EDUCATION

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SUMMARY – Many factors that have an adverse effect on fetal growth and development can manifest later in the child's development. Because of the biological basis, children born under the influence of these factors belong to the group of neurorisk children. They need special attention and prompt participation in the early rehabilitation program to encourage the use of brain plasticity. In addition to the biological influences, socioeconomic status affects a wide array of medical, cognitive and socio-emotional consequences in children, which begin before birth and continue into adulthood. This retrospective study included 50 children aged one to three years, hospitalized at Department of Pediatric Rehabilitation, University Department of Rheumatology, Physical Medicine and Rehabilitation, Sestre milosrdnice University Hospital Center in Zagreb. The aim was to determine the frequency of inclusion of children with neurodevelopmental risks in the early rehabilitation program according to the level of parental education. The results showed the highest percentage of parents of neurorisk children to have high school education, while the smallest number of parents had elementary school education. These data pointed to the lack of public awareness of the importance of the early period of life. However, they also indicated the lack of parental knowledge of their rights and opportunities for involvement of their neurorisk children in the early rehabilitation programs.

Key words: *Brain – growth and development; Developmental disabilities; Child; Infant; Rehabilitation; Parents*

Introduction

The terms neurological risk and neurorisk children first appeared in medical literature in the 1960s in Great Britain. The initial objective was early identification of newborns that were most likely to demonstrate developmental impairment later in life according to certain criteria[1]. Various risk factors that can affect the pregnancy, labor and early childhood may have an adverse effect on the child's neurodevelopment. The most common causes of neurodevelopmental disorders include premature birth, low birth weight and perinatal brain damage[2]. Premature infants are at a greater risk of short- and long-term physiological complications related to the immature enzymatic, metabolic, immune, respiratory, hematology and nephrology mechanisms, which make them predisposed to motor and intellectual disability[3]. The perinatal brain damage can be caused by traumatic, hypoxic, infectious and genetic factors[4]. In consequence to these biological grounds, children with perinatal damage to the central nervous system

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and premature birth belong to the group of neurorisk children that require special medical attention and early participation in the rehabilitation program in order to stimulate the unique neurobiological process of the perinatal brain plasticity that exists in early childhood[2]. Numerous studies show that 10%-15% of live born babies belong to the group of neurorisk children. The majority of these children (80%) show normal development, whereas the others (20%) exhibit short- or long-term disabilities manifested in the early childhood[6]. It has been shown that socioeconomic factors influence the progress and developmental outcome of premature infants[7]. Some research suggests that birth weight is more influenced by environmental factors (62%) than genetic elements (38%)[8].

Socioeconomic status is described by several parameters such as housing characteristics, parental occupation, parental employment status, parental education, marital status, number of children in the family, and social security benefit payment eligibility[8]. Research shows that children from low-income families demonstrate reduced socio-emotional development and poorer school achievements. The potential reason for that observation has been found in strict and inadequate parenting accompanied by elevated stress level in disadvantaged families[9]. In addition, it has been shown that in high-risk social environment, children with low birth weight more often demonstrate unwanted social behavior and weakened health[10,11]. The research undertaken in Great Britain indicates that families with poorer socioeconomic status have reduced access to health care[12]. American studies show that children born with low birth weight, whose mothers are poorly educated, belong to a high-risk group for participation in an early intervention program[13,14]. Adverse perinatal factors can cause serious intellectual disabilities, whereas sociodemographic attributes can be the reason for moderate learning difficulties leading to undesirable educational consequences[15]. In conclusion, socioeconomic status affects a broad spectrum of health, cognitive and socio-emotional results in children, which starts long before birth and continues into adulthood[16].

The main clients in the early intervention program are parents. They spend most of the time with their children and know their needs better than anybody else. The parental care for children is not comparable with anything else. They are usually the only constant component in the child's life[17]. The family is a dynamic and reciprocal system that has a strong influence on the child's development[18].

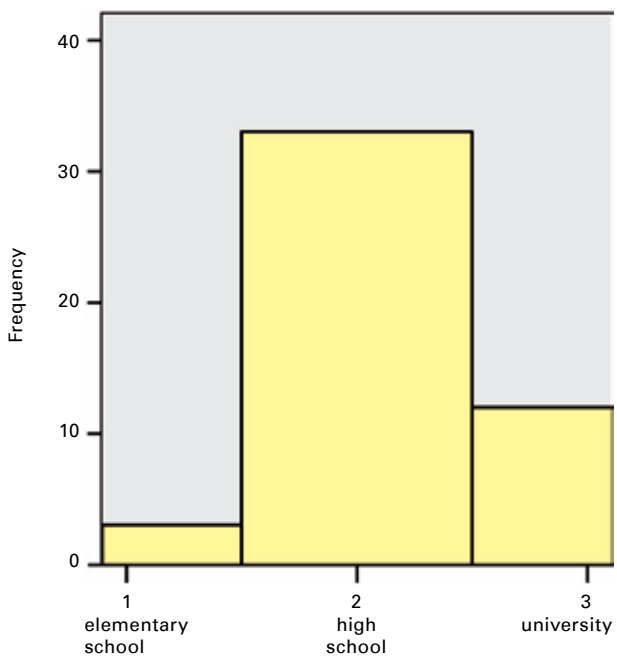

Fig. 1. Paternal level of education.

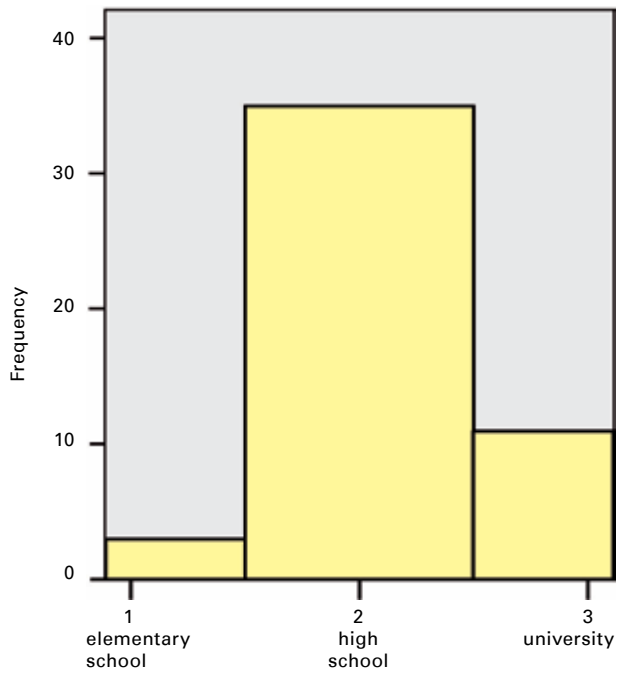

Fig. 2. Maternal level of education.

Table 1. Risk factor indicators

Brain ultrasound	Frequency	%	Birth	Frequency	%	Term	Frequency	%
Normal	5	10						
Irregular	31	62	Normal	33	66	Full term	37	74
Total	36	72	Abnormal	17	34	Early or after term	13	26
Unknown result	14	28						
Total	50	100		50	100		50	100

The aim of this study was to determine the frequency of participation of children with neurodevelopmental risks in the early rehabilitation program in relation to the level of parental education.

Methods

We conducted retrospective analysis of 50 children aged one to three years, hospitalized at Department of Pediatric Rehabilitation, University Department of Rheumatology, Physical Medicine and Rehabilitation, Sestre milosrdnice University Hospital Center in Zagreb, Croatia, between April and September 2010. The children included in the study were born with risk factors, manifested as moderate motor difficulties. There were 22 female and 28 male children. All study children were assessed by a physiatrist, psychologist and rehabilitator. Neuro-pediatric assessment involved brain ultrasound. The level of parental education was also recorded. Results are presented using descriptive statistical parameters, frequencies and numbers.

Results and Discussion

All study children had some risk factors (Tables 1 and 2). Ultrasound examination of the brain revealed some degree of impairment caused by asphyxia or birth trauma (periventricular (PVI) and intraventricular (IVH) hemorrhage) in 62% of study children. Complications during delivery such as breech birth and cesarean section were recorded in 34% of the children. The majority of pregnancies reached full term, while only 26% of the children were born before or after term. The median birth weight was 3275.4 g. According to average values, developmental indicators showed delay in developing certain motor skills such as verticalization of the body and independent walking. The mean developmental quotient value was 99.04, which is interpreted as normal.

Parental education showed the majority of parents (66% of fathers and 70% of mothers) to have high school education. University degree was recorded in 23% of parents, and only a small portion of the parents had elementary school.

Our results showed the majority of parents of neurorisk children participating in the early rehabilitation treatment to have high school education. This is consistent with the last population census in Croatia in 2011, which revealed 40% of the population to have elementary school or no education, 47% high school education, and 11.9% university degree. It is important to emphasize that the lowest number of our study participants belonged to the group with low level of education. It has been reported in the literature that

Table 2. Developmental indicators and birth weight

Variable	n	Min	Max	Mean	Standard deviation
Developmental quotient	50	66	138	99.04	14.838
First step (months)	48	11	23	14.65	2.445
First word (months)	49	10	18	12.39	1.858
Birth weight (grams)	50	930	4630	3275.40	685.739

in the group of parents who regularly present with higher risk factors, stimulation of the child's development is often inadequate due to poor socioeconomic status. Nowadays when multi-media and the internet are available as a source of information, parents who cannot afford this type of technology are disadvantaged. The unique biology that children are born with is not the only factor that determines the outcome of their development. Upbringing and interaction with the environment play an important role. An adequate and timely advice to the parents together with an appropriate stimulation of neurorisk children will prevent developmental problems that can endanger the child's progress[18].

In conclusion, it is important for the children born with risk factors, who come from socioeconomically disadvantaged families, to start an early intervention program as early as possible and for the parents to be appropriately advised and supported in their role to assist their children's development. In order to achieve this, it is important to inform the public about the significance of children's stimulation early in life and about the existence of the early intervention programs. This can be achieved not only through the media, but also through the network of experts from different professions, who can inform the parents about their rights and options. This approach would ensure higher participation of parents, especially from disadvantaged socioeconomic groups, who are the most vulnerable group with their neurorisk children.

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Sažetak

UKLJUČENOST DJECE S ČIMBENICIMA NEURORIZIČNOSTI U PROGRAM RANE REHABILITACIJE S OBZIROM NA RAZINU OBRAZOVANJA RODITELJA

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Mnogi čimbenici mogu imati nepovoljan utjecaj na rast i razvoj ploda, što se može očitovati u kasnijem razvoju djeteta. Zbog biološke podloge djeca rođena pod utjecajem nekih od ovih čimbenika pripadaju skupini neurorizične djece te im treba posvetiti osobitu pažnju i pravodobno ih uključiti u program rane rehabilitacije kako bi se potaknula mogućnost korištenja plastičnosti mozga. Uz biološki utjecaj socioekonomski status također utječe na široku lepezu zdravstvenih, kognitivnih i socioemocionalnih ishoda u djece, što počinje prije rođenja djeteta, a nastavlja se i u odrasloj dobi. Provedena je retrospektivna analiza na 50 djece u dobi od 1 do 3 godine hospitalizirane na Odsjeku za dječju fizikalnu medicinu i rehabilitaciju Klinike za reumatologiju, fizikalnu medicinu i rehabilitaciju Kliničkog bolničkog centra Sestre milosrdnice u Zagrebu. Cilj je bio utvrditi učestalost uključenosti djece s neurorazvojnim rizikom u rani rehabilitacijski program s obzirom na razinu obrazovanja roditelja. Prema dobivenim rezultatima najveći postotak roditelja djece s neurorizikom imao je srednju stručnu spremu, dok je najmanji broj roditelja bio niže stručne spreme. Taj podatak ukazuje na nedovoljnu obaviještenost roditelja i javnosti o važnosti ranog razdoblja djetetova života, ali i o pravima i mogućnostima uključivanja neurorizične djece u programe rane rehabilitacije.

Ključne riječi: *Mozak – rast i razvoj; Razvojni poremećaji; Dijete; Dojenče; Rehabilitacija; Roditelji*