Quality of life studies in chronic childhood neurological diseases:

Epilepsy, cerebral palsy and meningomyelocele

Doctoral (PhD) thesis

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1 Introduction

In 2012, I had the opportunity to start a quality of life study. Data collection was extensive. We contacted approximately 800 families to make our data statistically valuable and meaningful

In many ways our work is the first research of that issue in Hungary. No such complex survey has been conducted so far in pediatric neurological diseases. In addition to rigorous quality of life studies, we also studied the effect of disease characteristics and sociodemographic indicators on quality of life.

2 Objectives, hypotheses

The main goal of my research was to assess the disease-related quality of life of children and adolescents with various chronic neurological diseases. I wanted to answer whether the quality of life of chronically ill children differs from that of their healthy peers and if yes to what extent.

1. We hypothesized that a similar result to European standards would be obtained when assessing the quality of life of the Hungarian general population of children and adolescents as a control group.
2. In the study of quality of life in children and adolescents with *epilepsy*, our null hypothesis was that well-treated, i.e. pharmacologically well-adjusted, epilepsy without significant comorbidities did not significantly reduce the quality of life of the patient (s) compared to the general population of the same age.
3. We hypothesized that in *epilepsy*, physique is affected not only by antiepileptic drugs but also by sociodemographic background and certain epileptic syndromes.
4. In the case of patients with *cerebral palsy*, the null hypothesis was that the quality of life of children with mobility impairments is affected by both the chronic disease itself and the social situation of the child in the family. We hypothesized that the self-awareness of children / adolescents with reduced mobility did not differ statistically significantly from that of the general population of the same age but not suffering from chronic diseases.
5. We aimed to determine the epidemiology of cerebral palsy (CP) in Borsod-Abaúj-Zemplén County.
6. We wanted to examine the assessment of complex medical / rehabilitation care for children with cerebral palsy up to the age of 18, and the determination of individual / family and state / social security costs.
7. In the study of patients with meningomyelocele, our null hypothesis was that their quality of life may differ from that of the general population of the same age, but it is very similar to that of cerebral palsy patients who also have mobility impairments.
8. We asked parents raising chronic neurological patients for their opinion on their child's quality of life, which we wanted to compare with parents raising a healthy child. We were curious to see if there was a significant difference of opinion between children / parents about different life situations.

3 Persons involved in the study and commonly used methods

Quality of life studies

Health status refers to the health of an individual at a given time. Health status can be altered by a variety of impairments, sensory and functional abnormalities, social opportunities that may be affected by illnesses, injuries, treatments, or health policy measurements.[1]

The term “Health Related Quality of Life” (HRQoL) describes the health side of quality of life and generally reflects the impact of the disease and its treatment on disability and self-sufficiency.[2]

HRQoL questionnaires developed by the KIDSCREEN Group examine the quality of life of children and adolescents.[3-4]

Healthy and sick individuals in the studies

The children belonging to the general population (primary schools, vocational secondary schools, grammar schools in Pécs, Baranya and Borsod-Abaúj-Zemplén counties) and their parents were contacted after having received a prior permission of the school principals.

Children with cerebral palsy, meningomyelocele, and epilepsy were selected from several sources:

• From the patient material of the Pediatric Neurology, Child Rehabilitation and Nephrology-Special Urodynamics Clinics of the Borsod-Abaúj-Zemplén County Hospital.

• Children attending special schools in Borsod-Abaúj-Zemplén County (e.g. Éltes Mátyás Primary and Vocational School, residential institution for children with special educational needs in Sály).

• Patients treated in the Department of Neurology and Clinic of the Department of Pediatrics of the University of Pécs (PTE).

• From special schools for children with special educational needs (e.g. Éltes Mátyás Unified Special Education Institution, Pécs).

• I visited the MMC camp in Gánt twice, which was organized by the Department of Surgery of the Department of Pediatrics of the University of Pécs.

• Some patients with disabilities from the Budapest School of Physical Education, Gymnasium and College also took part in the survey.

A total of 256 children and their families with CP, 86 MMC and 144 epileptics, as well as 314 families with control children, i.e. children without a chronic illness, were contacted in person or by mail. The return rate of the issued questionnaires was 75.4%.

4 Examination of quality of life in children and adolescents with epilepsy

In the study of quality of life in children and adolescents with epilepsy, our null hypothesis was that well-treated epilepsy without comorbidities did not reduce quality of life at a statistically significant extent compared to the general population.

Patients and Methods

Data were collected between November 2012 and February 2015. The study examined the health-related quality of life of children and adolescents aged 8–18 years with epilepsy.

One epileptic child with severe musculoskeletal or cognitive deficits was not included in this study. All patients received antiepileptic therapy, but none of them were on a ketogenic diet or underwent epilepsy surgery.

Epileptic seizures and types of epilepsy were classified according to ILEA criteria. [5-6] The duration of epilepsy is given in years. According to the frequency of seizures, four categories were distinguished: uncommon (zero or one / year), rare (every 1 or 2 months), more common (every ≥3 weeks), and most common (daily seizures). We talked about monotherapy when administering one antiepileptic drug to patients and polytherapy when administering two or more.

Statistical analysis was performed with licensed IBM SPSS 24 software.

Results

144 children with epilepsy aged 8–18 years and their parents from the two county pediatric centers were included in the study.

The studied data from the general population were compared to European values reported by KIDSCREEN 52. The parental values of the average population did not differ statistically significantly from the KIDSCREEN 52 values, i.e. both populations can be used as the healthy controls. *(Table 1)*

Not only all children with epilepsy but also their parents rated their quality of life statistically significantly lower than the general population [p (Ch, P) = 0.002 and 0.009].

Self-assessed HRQoL scores were statistically significantly lower in children with epilepsy in five in ten dimensions, i.e., physical and psychological well-being, self-esteem, financial resources, and social acceptance / school environment ($p \leq 0.05$). Children with epilepsy rated their financial resources significantly worse than their peers in the general population ($p = 0.000$). (Table 1.)

Table 1.Mean T-values and their standard deviations of children with general population and children with epilepsy and the relevant effect sizes (KIDSCREEN to GP and GP to E). (Fejes M.Mathews J Neurol 2019; 54(2):17.)

Questions	Item	GP Children			E Children			
		T	±SD	ES-1	T	±SD	ES-2	p
	52	51.68	8.6	0.17	50	9.2	**0.19***	0.00
Sum	5	52.9	14.4	0.29	49.5	13.6	**0.24***	0.001
Physical Well-being	6	53.6	13.8	0.36	51.5	15.4	**0.15***	0.00
Psychological Well-being	7	55.3	10.6	0.53	53.3	13.2	0.17	0.10
Moods & Emotions	5	46.2	4.2	0.38	45.2	4.6	**0.23***	0.006
Self-Perception	5	52.2	17	0.22	52.5	16.4	-0.02	0.26
Autonomy	6	53.4	12.6	0.34	53	12.8	0.03	0.49
Parent Relation & Home Life	3	52.9	21.6	0.28	49.2	22.4	**0.17****	0.00
Financial Resources	6	53.8	16.8	0.38	53.2	18.2	0.03	0.08
Social Support & Peers	6	55	15.8	0.5	55.2	16	**-0.01***	0.014
School Environment	3	61	9.6	**1.1***	46.6	13	**1.31****	0.002

Abbreviations: SD: Standard deviation, T: mean T-value *: p< 0.05, **p<0.001, Sum: summary of the ten KIDSCREEN dimensions. ES-1: Cohen effect sizes between KIDSCREEN and GP, EF-2: Cohen effect sizes between GP and E children.

The opinions given by them (i.e., judged by the child) and those given by their parents were similar. Self-esteem and social acceptance were rated worse by children than by parents. The school environment appears to have had a greater impact on children's quality of life than their parents perceived. ($p \leq 0.01$)

Adolescents aged 13–18 rated their quality of life as poorer than their peers aged 8–12 in four out of ten dimensions, namely physical well-being, self-esteem, family, and school environment ($p < 0.05$).

Other variables

Age showed a weak positive correlation with the duration of epilepsy (r: 0.212; p = 0.017). The duration of epilepsy had no statistically significant effect on quality of life. There was a moderately weak association between seizure frequency and duration of epilepsy (r: 0.352; p = 0.000). The frequency of seizures negatively affected four areas of HRQoL (physical and psychological well-being, friends and social acceptance).

Physical well-being was significantly affected by a number of areas, primarily psychological well-being (r: 0.670; $p \leq 0.001$).

Social acceptance was negatively affected by more frequent seizures and positively by physical well-being and friends (r: -0.19 to 0.294; $p \leq 0.05$). The dimensions of mood and emotion, self-

esteem, autonomy, and financial resources did not show a statistically significant correlation with the other variables and categories of HRQoL

Mean scores showed a decreasing trend with increasing seizure frequency. Values in the ranges of physical and mental well-being decreased exponentially with increasing seizure frequency to a statistically significant extent.

The mean duration of treatment in children receiving polytherapy was statistically significantly longer than in children receiving monotherapy ($p = 0.001$).

The total scores given by children with epilepsy and their parents were statistically significantly higher with high efficacy rates (0.83), where children had to take only one type of medication.

Socio-demographic Background

Parents of epileptic patients were less educated than parents of the average population (RR: 2.64). One-fifth of parents raising children with epilepsy were inactive (RR: 1.31). Children with epilepsy were more likely to live in a single-parent family (RR: 2.61). Three times as many children with epilepsy attended special school as their chronic disease-free peers. Children with epilepsy had a larger family and more siblings (RR: 4.6). Siblings of patients with epilepsy were also more likely to be chronically ill, primarily with epilepsy.

Discussion

There are a number of reports in the medical literature assessing the quality of life associated with disease in children with epilepsy (HRQoL), but mostly based on parental responses. The study we conducted is one of the few studies that together examines and compares the children's own opinions about the quality of life with epilepsy and those of their parents.

When assessing the quality of life of the Hungarian general population of children and adolescents included as a control group, we obtained a result similar to European standards. Our study shows that children with epilepsy and their parents are lagging behind in several dimensions of the quality of life associated with the disease. There is therefore much to be done to optimize treatment on the one hand and to improve the social acceptance of epilepsy as a chronic neurological disease.

5. Childhood epilepsy and nutrition

The aim of our study was to assess the nutritional status of children and adolescents with epilepsy, to investigate the effect of antiepileptic treatment and sociodemographic factors. We designed a prospective, clinical, non-interventional case-control study.

We enrolled 139 children aged 8-18 years with epilepsy cared for at the Department of Pediatrics of the University of Pécs and the Department of Pediatric Neurology of the Borsod-Abaúj-Zemplén County Central Hospital in Miskolc. 232 children (8-18 years old) belonged to the general population (GP).

Methods

Hungarian standards were used to assess the nutritional status of the examined patients.[7]

BMI categories were compared not only with Hungarian but also with international standards (extended international (IOTF) body mass index definitions for leanness, overweight and obesity, and WHO limits). [8-9] Statistical analysis was performed using IBM SPSS 24 software. Risk ratios (RRs) were calculated relative to BMI data from the average population for each BMI category and for each variable in epileptic patients. Cohen-d was used to measure the effect sizes (ES).

Results

139 families with epileptic children were recruited. Their mean age was 15 years and 7 months, 80 boys (55.6 %) and 64 girls (44.4 %).

According to the ILAE epilepsy classification: 34 (24.46%) had idiopathic localization-related epilepsy (ILRE), 64 (46.04%) idiopathic generalized epilepsy (IGE), 4 (2.87%) symptomatic generalized epilepsy (SGE) and 33 (23.74%) symptomatic focal epilepsy (SPE). 4 (2.87%) had non classifiable E. Mean duration of their epilepsy was 4.3 years (SD 2.92 years). 96 (66.7%) patients were on monotherapy, and 39 (27.1 %) on polytherapy. 4 patients were on drug withdrawal.

232 families formed the general population. The children's mean age was 12 years 11 months (SD 7 months) 114 (49.14 %) boys and 118 (50.86 %) girls.

Physical parameters

The height distribution curve corresponded to the normal distribution, both in the case of children with epilepsy and the GP.The median values of body weight distribution were closer to the slim values in both groups, but the proportion of thin children was higher in the GP's group.

Table 2. Nutritional status of children with epilepsy (E) and from the general population (GP) according to the three classification systems (Hungarian,WHO and IOTF) using by BMI values.There is no significant difference between the three classification systems (p:0.26-0.50)
(Fejes M et al: Factors affecting the Body Composition in Childhood Epilepsy. J Pediat Infants 2021; 4(2) 32-39.)

Classification	**Value**	**Epilepsy**				**General Population**					
Hungarian	Percentil	N	%	Mean	SD	N	%	Mean	SD	p	RR
Verythin	<P3	5	3.47	14.24	1.84	24.00	10.13	15.01	2.18	**0.006**	0.34
Thin	<P10 and ≥P3	12	8.33	16.12	2.43	26.00	11.81	16.04	2.14	**0.001**	0.71
Normal	≥P10 and<P90	102	70.83	19.23	8.34	146.00	60.76	18.72	5.21	**<0.001**	1.17
Overweight	≥P90 and ≤P97	10	6.94	25.84	3.89	18.00	7.59	23.28	4.11	0.48	0.91
Obese	>97	10	6.94	30.57	4.42	18.00	7.59	26.35	5.59	**0.018**	0.91
WHO	Standard deviation										
Very thin	<- 2 SD	5	3.47	14.37	1.53	17.00	7.17	15.30	2.07	**0.002**	0.48
Thin	<-1SD and ≥- 2 SD	12	8.33	16.07	2.74	31.00	13.80	15.85	1.93	**0.004**	0.64
Normal	≥-1and ≤1SD	101	70.14	19.17	8.13	146.00	60.60	18.67	5.20	**<0.001**	1.14
Overweight	>1SD and ≤2 SD	9	6.25	25.97	4.03	19.00	8.02	23.24	3.92	0.38	0.78
Obese	>2SD	11	7.64	30.11	6.31	18.00	7.59	26.35	5.59	0.076	1.01
IOTF	BMIat18years										
Very thin	<17	4	2.78	13.64	0.81	17.00	7.17	15.03	1.22	**0.001**	0.39
Thin	<18.5 and ≥17	14	8.33	16.35	2.37	32.00	13.50	15.96	2.12	**0.002**	0.72
Normal	18.5 and<25	99	68.75	19.14	8.12	144.00	60.76	18.68	5.10	**<0.001**	1.13
Overweight	25 and<30	11	7.64	25.50	4.58	20.00	8.44	23.17	3.80	0.67	0.91
Obese	≥30	11	7.64	26.31	6.31	18.00	7.59	26.35	5.59	0.76	1.01

Abbreviations: BMI: Body Mass Index, E: epilepsy, GP: general population, RR: risk rate, P: percentile, SD: standard deviation, WHO: World Health Organisation, IOTF: International Obesity Task Force.

The nutritional status (BMI values) of children from epilepsy and the general population were examined according to all three classification systems (Hungarian, WHO and IOTF). (Table 2.) A statistically significant difference can be measured in the thin groups, as the proportion of thin and lean children was higher in the general population group. Normal physique was more common in children with epilepsy, but the proportion of overweight, obese patients was not higher than in the general population. The IOTF system indicates a higher proportion of predominance than the other two scales. No statistically significant difference was found among the three classification systems (p = 0.26-0.50).

Special features of epilepsy

Epilepsy syndromes: more children with idiopathic localization related epilepsies (ILRE) were overweight (RR: 1.52) and less children with idiopathic generalized epilepsy syndromes (IGE) were thin or very thin. (RR: 0.31- 0.66) while patients with symptomatic focal epilepsy (SFE) were mainly thin and normal (12% and 62 %). But it must be mentioned that the number of SGE patients was very low.*(Table 3)*

No statistical difference was found considering duration time of epilepsy and seizure frequency on the basis of the age and gender.

BMI values of patients were not significantly influenced by the duration of epilepsy using linear regression analysis (E: β1:0.08; R2:0.02; r: 0.13).

Medium weak correlation was established between seizure frequency and duration time of epilepsy (r: 0.352, p=0.000) and no correlation was found between seizure frequency and BMI (β1:0.01; R2:0.003; r: 0.16).

Children on monotherapy were found to be mostly very thin (RR: 1.15). Valproate and carbamazepine were the most frequently used drugs in case of monotherapy. Nor valproate, nor carbamazepine had caused notable weight gain (Table 4). Those on polytherapy were frequently overweight (RR: 1.33). In the well-controlled epilepsy group, children were mainly normal-built. (RR:1.17) *(Table 3.)*

Socialdemographic data

The children of parents with secondary levels of education turned out to be more obese and thinner than off springs of the highly educated parents.

Children of non-working parents were thinner, than offsprings of the active workers.

The children with epilepsies in single parent families were more overweight, than in the “double” parent families. (RR:2.24)

Those children who attended special schools with high level qualification were either thinner or overweight, than the normal schoolgoers (RR:1.65). Families with an only child showed the highest rate of overweight and obesity. On the contrary, in families with at least 3 children more siblings were thin. Among the siblings there were only 11 children with epilepsy, some of them were thin or obese. *(Table 3.)*

Health Related Quality of Life of children with epilepsy compared to the general (control) population

The scores of physical quality of life with children with epilepsy showed lower values than GP in normal body shape.

Table 3: Risk rate of variables and sociodemographic characteristics of epilepsy relative to the general population based on CI_E and CI_{GP}.

	Total number	Very thin	Thin	Normal	Overweight	Obese
Epilepsy syndromes						
ILRE	34	0.00	0.48	1.17	**1.52**	**1.14**
IGE	63	**0.31**	**0.66**	1.18	1.04	**1.04**
SGE	3	0.00	0.00	1.64	0.00	**0.00**
SFE	30	0.61	1.03	1.04	0.40	**0.81**
Antiepileptic drug therapy						
Monotherapy	96	1.15	0.00	1.09	0.56	**0.97**
Polytherapy	40	0.75	1.06	0.94	**1.33**	**0.67**
Valproate	60	0.50	0.83	1.06	**1.28**	**0.84**
Valproatemonotherapy	46	0.43	0.72	1.11	1.10	**1.10**
Carbamazepine	25	0.1	0.66	1.09	**1.53**	**0.51**
Carbamazepinemono.	19	0.5	0.42	**1.27**	0.06	**0.64**
Controlled E	130	0.23	0.72	1.17	0.92	**1.03**
Parents' Education						
≤8 classes	18	0.33	0.67	**1.60**	0.67	**0.44**
Medium	85	0.28	**1.25**	1.07	0.88	1.21
High graduated	32	0.47	0.40	**1.29**	0.00	**0.00**
Parents' Occupation						
Active	95	0.20	0.58	**1.23**	0.64	**0.96**
Inactive	36	0.75	**2.50**	0.92	0.67	**0.67**
Family Relationship						
Living Together	107	0.24	0.66	1.16	0.80	**1.06**
Single parent	25	1.12	1.12	1.06	**2.24**	**0.28**
Type of School of the children						
Normal	106	0.27	0.66	1.19	0.73	**0.94**
Special	26	0.66	**1.65**	0.92	**1.65**	**0.33**
Siblings						
None	33	0.00	0.00	1.01	**1.39**	1.67
1sibling	58	0.29	0.58	1.35	0.50	**0.39**
≥2 siblings	53	0.61	1.12	0.98	0.86	**1.15**

Abbreviations: E: epilepsy; GP: general population; y: Year; BMI: body mass index; ILRE: Idiopathic localization-related epilepsy; IGE: Idiopathic generalized epilepsy; SFE:Symptomatic focal epilepsy;CI: cumulative incidence;RR: risk ratio.

Discussion

The main aim of our study was to assess and compare the nutritional status of epileptic and healthy children and to investigate the association between epileptic disease and nutritional status. To the best of our knowledge, no similar studies have been published on children and adolescents with epilepsy so far.

In our study, we found that children with epilepsy were more normal-built than obese. Our data show that the body composition of children with epilepsy depends at least as much on environmental factors as on the type of epilepsy. Patients with epilepsy receiving polytherapy are more prone to obesity, therefore efforts should be made to prescribe as few but effective antiepileptic drugs as possible. We found that children's quality of life related to health was also affected by their body composition. In epilepsy, physique is affected not only by antiepileptic drugs but also by sociodemographic background.

6 Epidemiology of Cerebral Palsy

Our primary goal was to locate cerebral palsy in 6-18 year olds living in Borsod-Abaúj-Zemplén County, i.e. to determine the prevalence of CP.

The age limit was 6-18 years, because on the one hand the diagnosis of CP can be made with complete certainty at the age of 5-6 years, and on the other hand we only wanted to examine the pediatric population. We originally planned a complex study of the entire CP child population, but more than half of the parents disagreed with participating in personal communication.

From the data characteristic of the disease, we collected the risk factors included in the history, the presence of co-morbidities (epilepsy, intellectual deficience, incontinence, vision and hearing problems, contractures). The severity of the patient's movement injury was determined using the GMFCS (Gross Motor Function Classification System).[10] The type of CP was established according to the instructions on the SCPE (Surveillance of Cerebral Palsy in Europe) website. The frequency of CP was calculated on the basis of data from Borsod-Abaúj-Zemplén county. [11-14]Among the comorbidities, in the case where we did not have enough data of our own, we relied on the data in the literature (eye diseases, hearing impairment, contractures). [15]

Results

Epidemiological data on cerebral palsy

In the total CP population of Borsod – Abaúj – Zemplén County, born between 1994 and 2006 we found 226 patients aged 6-18 years. The prevalence of CP in Borsod-Abaúj-Zemplén County is 2.1 ‰, the annual incidence is 1.7: 10,000 live births.

Among the comorbidities, intellectual disorders were found to be the most common (46%). Epilepsy occurred in 22 % of CP patients and incontinence in 27%.

Among the risk factors for CP, preterm birth, low birth weight, and perinatal asphyxia were the most common. A patient may have had several risk factors. One-third of patients (37.61%) failed to present a risk factor. (Table 4.)

Table 4. The frequency of perinatal risk factors of cerebral palsy in Borsod County.

Risk factors	N°	%
Prematurity	70.00	30.97
LBW	67.00	29.64
HIE	44.00	19.47
HIC	16.00	7.07
Hydrocephalus	14.00	6.19
Severe infection	10.00	4.42
Developmental disorder*	6.00	2.65
Metabolic disease**	2.00	0.88
Twins	7.00	3.09
Unknown	85.00	37.61

Abbreviations: LBW: Low Birth Weight; HIE: Hypoxic Ischaemic Encephalopathy; HIC: Intraventricular Haemorrhage. * Developmental disorders: esophageal atresia + ventricular septum deficit, complex heart failure, craniosynostosis, cerebral heterotopia, sacral lipoma (non-MMC), corpus callosum hypoplasia; ** metabolic disease: lysine-hydroxylysin metabolism disorder, primary carnitine deficiency.

Discussion

Studying the entire CP population, we found that nearly one-third of the patients were preterm infants. Low birth weight and maternal asphyxia were also high rates.

The prevalence in Borsod-Abaúj-Zemplén County was 2.1 ‰, which is close to the lower value of the international data. [16-18] A study of patients at Semmelweis University showed a similar rate of unilateral CP (20% vs. 19%), but a higher rate of bilateral spastic paresis was found at the university (68% vs. 60%). The clinical severity showed a similar appearance, the proportion of severely disabled people (GFMCS III-V.) Was 42.5% in our material and 43% in the Barta survey.[19] The incidence of comorbidities is similar to that reported in the literature (epilepsy 22%, incontinence 27%, mental involvement 46%).

There was not enough data on contractures, hearing damage, and eye diseases, so I used the literature frequency.

Among the risk factors for CP, the most significant indicator is the proportion of children born with a low birth weight to the total number of live births in addition to preterm birth. In this

indicator, there has been a slight upward trend in Hungary since 2005, currently around 8.5% of the total newborn population, while preterm birth is around 9%, both values are 10-20% higher than the EU average.[14]

The strength of the study is that recent data from the screening of patients with CP — frequency, prevalence of risk factors — are suitable for national and international comparisons, as they may serve as a measure of perinatal care.

We believe that epidemiological research should be extended to the entire country and a national CP registry should be established.

7 Costs of caring for cerebral palsy patients aged 0-18 years

CP is one of the neurological diseases that requires the most care and complex treatment. Long-term treatment of patients in special institutions, schools, rehabilitation wards is provided in a residential care form or in their homes, among their family, but by being transported daily to these intstitutes. It is difficult for a physician to handle the costs, as their preferred task is to deal with healing, but CP is a disease that requires multilateral treatment, and it is advisable to assess the financial costs of raising a child at home and as a result what costs the health care should bear.

We aimed to assess the cost of complex medical / rehabilitation care for children with CP up to the age of 18, as well as the individual / family and state / social security costs.

Methods for calculating health and non - health care

First, the 0 – 18-year direct and non-direct medical cost and lost family income was calculated for one patient, after which all costs for 0-18-year-old patients and the one-year costs of the CP population were found.

Impacts on the national economy

I calculated the care costs covering one-year, and the costs covering 0-18-year of CP patients in Hungary, as well as the eliminated tax revenue. Based on these, I determined the annual share of curative-preventive direct health care and social benefits.

Results

The summarized results are shown in the table.*(Table 5.)*

Table 5. Charge summary of Cerebral palsy between 0-18 years (1 €/child)

		Home care		Institutional care	
Charge	**Median**	**Min.**	**Max.**	**Min.**	**Max.**
Hospital + other health care	118774.65	74672.22	86835.02	150697.05	162859.84
Aid equipment	31445.52	23477.1	39413.93	23477.1	39413.93
Drugs	83419.94	21978.2	144861.68	21978.2	144861.68
Hearing aids	378.62	115.86	641.38	115.86	641.38
Eyeglasses	377.33	206.38	548.28	206.38	550.34
CCC+CCA+SFA	15650.81	27297.93	35305.32	0	0
Travel charge	938.48	0	3753.93	0	0
Total cost (€)	251 724	***147748***	***311359***	***196475***	***348327***
Productivity lost	108896				

Abbrevations: Min.:minimal, Max.:maximal, CCC: child care cost, CCA: child care assistance, SFA: special family allowance

Proportion of CP in the national budget

What is the impact at the national budget level? The GDP was € 98,717million; from this, the full Health and Social Budget of Hungary was € 5861 million or 0.525 ‰; 0.88 % (€ 52.13 million) of this budget was spent on CP families in 2012. The sum of treatment and prevention was € 2,844 million; 1.83 % of this sum was the direct medical cost of CP (Table 4-5). The lifetime costs will be 2-4 times that of the 0-18-year sum.(Table)

Discussion

The costs of CP patients care in Hungary have not yet been assessed. The survey required accurate epidemiological data, which we collected from many sources for two years. Our study determined the frequency, types, severity and proportion of the most important comorbidities in Hungary. Based on these data, CP costs up to the age of 18 were calculated on the basis of minimum and maximum values, based on home and institutional care. By knowing the cost of CP we will have a better understanding of a more appropriate usage. The large amount of money raises the importance of primary prevention.

The price and economic effects of CP are rarely studied. Values from Europe, the Far East, Australia and New Zealand are mainly known.[20-26]

The strength of our study is that the CP cost analysis model is reproducible. Price changes, subsidies, delivery times are subject to change. The proportion of the effects on the national economy can be traced within the closed health and social coffers. Similar data are only available for Australia and New Zealand.[24,26]

CP is a relatively rare condition, but its costs consume a significant portion of health care. Families raising a child with CP have fewer choices than those raising a healthy child.

It would be useful to set up a domestic CP register for future research.

8 Examination of quality of life in children and adolescents with cerebral palsy

The symptoms of cerebral palsy are recognizable even for an average person. Increased attention, and possible discrimination, makes it difficult for children and adolescents with cerebral palsy to integrate into society and it also impairs self-esteem. The aim of the study was to assess the quality of life of children with cerebral palsy, taking into account disease characteristics.

Patients included in the study and general population, methods

We involved families raising cerebral palsy children in the research. Families included in the general population (GP) formed the control group. There were no twins in either the patient group or the general population.

During the survey, most children were able to complete the questionnaires on their own. Patients with CP who have learning difficulties (mild intellectual disability, dyslexia, etc.) could also participate in the research, but it was an essential condition for the child to understand the questions and be able to answer them.

Data collection took place from November 2012 to February 2016. Socio-demographic data were also collected during the research. The type of CP was determined according to the scheme recommended by the SCPE (Surveillance of Cerebral Palsy in Europe).[27]
Not only the motor condition of the children but also all other comorbidities were assessed. If the child not only had a motor disability but also other related disorders (e.g., active epilepsy or intellectual disability IQ 50-70), moderate CP (CP plus another disease) or severe CP (CP plus two or more other diseases) grouped.
Statistical analysis was performed by using SSPS-19 statistical software.

Results

99 KIDSCREEN-52 questionnaires were completed by a family raising a child with CP (child and parent). A completed questionnaire of 237 parents and 236 children from the general control population was processed.
Spastic bilateral cerebral palsy was seen in nearly half of the diseased children (51 / 51.5%), and spastic unilateral cerebral paresis was observed in a smaller proportion (26 / 26.3%). Moderate to mild intellectual impairment (IQ = 50-70) occurred in 55.6% of patients. At the time of completing the questionnaire, 16 patients had active epilepsy. There were no frequent seizures on antiepileptic therapy. More than two comorbidities occurred in 39.4 percent of children with CP. 47.5% of patients (47 people) were able to walk without aids (GMFCS 1-2). In five cases, no personal examination was possible and the level of the disability was not clear from the database.

The mean of the answers of all children with CP and their parents to all questions did not differ statistically significantly (paired t-test value 0.939; p = 0.35). However, the evaluation of both CP children and their parents differed from that of children and their parents from the general population. The mean HRQoL responses to all questions in the ten KIDSCREEN dimensions for both parents and children were statistically significantly lower than the mean for parents and children with GP (4.07 vs 3.8 for parents; p = 0.000; for children). 3.95 vs 3.10; p = 0.000).

Examining the ten KIDSCREEN dimensions separately, the categories “physical well-being”, “mood / emotions”, “financial situation”, “social support / friends” and “social acceptance / bullying” were judged significantly worse by children with CP and their parents than children and their parents in the average population. *(Table 6.)*

Table 6.Mean T-values and their standard deviations (SD) in the general population (GP) and cerebral palsy (CP) group based on responses from children and parents, supplemented by inter-group Cohen effect size (ES) calculations
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	Children					Parents				
	GP		CP			GP		CP		
Questions	**T**	**±SD**	**T**	**±SD**	**ES-1**	**T**	**±SD**	**T**	**±SD**	**ES-2**
Sum	51.8	8.6	50.65	10	**0.08****	54.10	8.60	51.27	10.4	**0.03****
Physical Well-being	52.9	14.4	35.7	27.6	**1.32****	52.30	12.20	40.77	16.2	**0.78****
Psychological Well-being	53.6	13.8	52.51	16	0.08	59.00	11.20	52.7	14.2	0.06
Moods & Emotions	55.3	10.6	53.38	13.2	**0.15***	53.20	8.60	51.48	11.8	**0.27****
Self-Perception	46.2	4.2	44.18	4.8	0.16	52.60	11.20	54.08	14.2	-0.52
Autonomy	52.2	17	51.54	17.8	0.05	50.60	15.20	50.2	17.8	0.12
Parent Relation & Home Life	53.4	12.6	54.75	12.6	-0.10	53.60	12.40	55.21	11.6	-0.13
Financial Resources	52.9	21.6	42.75	27.2	**0.78****	54.00	20.40	46.77	26.6	**0.32****
Social Support & Peers	53.8	16.8	48	19.8	**0.44****	5.90	15.00	48.86	20	**0.29****
School Environment	55	15.8	58.9	13.6	-0.8	54.0	13.0	55.15	14.4	-0.01
Physical Well-being	61	9.6	51.7	14.6	**0.6*[1]**	53.0	9.0	51.34	12	**0.67***

Abbreviations: SD: standard deviation, GP: general population, CP: cerebral palsy, T: mean T-value, *: p <0.05, ** p <0.001, Total: Joint assessment of scores for the ten KIDSCREEN 52 dimensions, ES-1: Cohen effect rate between GP and CP children, ES-2: Cohen effect measure between GP and CP parents.

There is a positive moderate to strong relationship between the assessment of children and their parents for both CP families and families from the general population for all KIDSCREEN dimensions. (Table 20)

In terms of age, we did not find a statistically significant difference in the quality of life of children and adolescents with CP.

Girls with CP rated their own overall quality of life as worse than boys (p = 0.020).

Parents of CP girls rated their financial situation as worse than parents of boys. The mean of the financial dimension was 2.6 for girl parents and 3.4 for boys (p = 0.008).

The severity of CP not only significantly reduces physical well-being, but also impairs financial status, social and friendly environment, and social acceptance. According to the types of movement injury, the group with bilateral spastic CP rated physical well-being as the worst (ES compared to unilateral and other CP: 0.5; -1.7). Although patients with unilateral spastic CP gave lower values in the other quality of life dimensions, no statistically significant difference was found between the three groups.

The more severe the movement injury was based on GMFCS, the lower level of physical well-being was measured (p: 0.029; ES: medium, 0.5).More than half of the CP patients had mild to moderate intellectual impairment, which negatively affects the dimensions of social support and friendships in the opinion of both children and their parents (p = 0.019 - 0.007; ES: medium 0.61 - 0.51). The parents of these children also rated the risk of stigma higher.

Regarding epilepsy, parents and children rated the school environment (p = 0.012; ES: 0.55) and social acceptance (p = 0.048-0.003, ES: 0.63-0.99) as statistically significantly lower than the general population. Incontinence first affects social living conditions. In cases where the disease was associated with incontinence, children with CP and their parents rated their financial situation, children's independence, friendships, and school environment as statistically significantly worse than the general population (p = 0.001 - 0.023, ES : 0.71 - 0.95), (p = 0.022, ES: 0.71 - 0.95).

Examining parents' educational attainment, parents of CP patients were more than four times more likely to be under-educated (22% vs. 5%) than parents in the general population. CP children whose parents had a lower level of education rated physical well-being as the worst. Nearly half of the parents with CP were inactive (RR: 2.85). The psychological well-being of their children lagged behind that of the children of active workers. Children with CP often grow up in a single-parent family (RR: 1.89). The values of the total score and the dimensions of physical and mental well-being and mood were lower than those of the two-parent family. Many children with CP attend special schools or institutions (RR: 9.46). Compared to a normal school, the assessment of friendship and social acceptance is significantly worse among those attending a special school and growing up in an institutional setting. Large families are more common in the CP population (RR: 2.5). Patients with CP had more sick siblings than the general population and their siblings were more likely to have intellectual impairment. (RR: 5.77). The proportion of people living in rural areas was lower among patients with CP (RR: 0.77)

Discussion

Chronic disability statistically significantly impairs the health-related quality of life of children and adolescents with CP. Age, severity of motor injury, and comorbidities have a negative impact on the assessment of several HRQoL dimensions. There are also statistically significant differences between the sexes, with girls with CP judging their psychosocial quality of life to be lower than boys. All patients with CP have higher T-values in the parental and school environment than in the general population. From this, it can be concluded that children and adolescents with disabilities are more attached to their parents and teachers than members of the general population. The severity of CP greatly affects the quality of life and sociodemographic status of children and their parents.

Our research contributes to an even more accurate understanding of the psychosocial care needs of parents and their children with CP. Based on the results, it can be concluded that not only CP patients but also their family members need psychosocial care. Based on all this, it can be concluded that family-centered care would help these families and improve integration processes.
The results of the study confirmed that children with CP have reliable knowledge of their condition and their quality of life reflects their sociodemographic background.

9 Examination of the quality of life of children and adolescents born with meningomyelocele

In the study of the quality of life of our patients born with meningomyelocele (MMC), we hypothesized that their quality of life may differ from that of the general population of the same age, but it is very similar to that of cerebral palsy patients with reduced mobility. For the study of the MMC patient population, data were collected between 2012 and 2016 for four years. Statistical analysis was performed using SSPS-19 statistical software.

Results

We received child-parent or child-parent questionnaires from a total of 86 patients. The patients came from 16 counties and Budapest, so we could not perform a regional comparison.
Meningomyelocele was mostly located in the lumbar-lumbosacral region. The most common comorbidities were incontinence (63.95%) and hydrocephalus internus (40.70%). 35 patients underwent ventriculoperitoneal shunt surgery. Spinal stabilization was performed 3 times. Paraparesis was variable, with half of the patients traveling without assistance or with little assistance.
There was no statistically significant difference between the opinions of children with MMC and their parents in the factors that the parent knows / can know well, i.e. in the physical and mental state and environment. However, in areas where the parent is not present (e.g., school, friends, social acceptance), we measured a statistically significant difference between the opinions of children and their parents with moderately strong correlation. Social acceptance was perceived by children with MMC to be much more positive than that of their parents. *(Table 7)*
No statistically significant gender difference was found between patients with MMC in any of the dimensions of KIDSCREEN 52.
When comparing the opinions of children and adolescents, we found a number of statistically significant differences. Younger children indicated a higher / better quality of life than adolescents in almost all dimensions. A statistically significant deviation from the ten was measured in six dimensions with medium and high exposure values.

Table 7. MMC population Parent and child mean T-values, variance and parent-child correlation, significance, effect value.
N: evaluable questionnaire number, r: correlation, p: significance level, ES: effect level

MMC	***Children***		***Parents***		***Parents/Children***		
Questions	Mean	SD	Mean	SD	r	p	ES
Sum	46.86	8.84	46.61	8.14	0.523	0.479	0.01
Physical Well-being	38.13	11.81	39.92	9.34	0.277	0.293	-0.04
Psychological Well-being	44.98	15.07	47.42	9.64	0.119	0.624	-0.05
Moods & Emotions	48.17	9.43	47.67	9.07	0.201	0.628	0.01
Self-Perception	49.39	10.00	47.31	9.29	0.329	.000**	0.05
Autonomy	47.52	8.94	49.22	9.08	0.407	0.113	-0.04
Parent Relation & Home Life	49.65	10.48	49.28	9.52	0.543	0.17	0.01
Financial Resources	43.97	10.19	44.77	10.59	0.469	0.984	-0.02
Social Support & Peers	45.56	11.19	44.15	11.33	0.546	.002*	0.03
School Environment	47.77	8.35	47.16	9.70	0.542	.000**	0.01
Physical Well-being	47.68	14.58	45.12	18.96	0.76	.000**	0.03

Discussion

In a study of meningomyelitis patients, we found that nearly 50 % of patients

are able to walk without help or with a little help, the other group of patients occasionally or constantly use a wheelchair or other walking aids. The incontinence rate is very high. 30% of the patients underwent ventriculoperitoneal shunt surgery for hydrocephalus.

Their quality of life differed significantly from that of children in the general population. The greatest difference was found in physical well-being with a high degree of effect. Our adolescent patients generally rated their quality of life lower than younger children. The opinions of parents and children showed a moderately strong correlation.

The strength of our study was that, due to prenatal screening, we were now able to collect data from 86 rare diseases and assess their quality of life. All patients had personal encounters. As the patients came from several -16 counties, the research did not show local but general characteristics.

Meningomyelocele, like cerebral palsy, significantly affects quality of life. Disability makes it difficult to integrate socially and, in some cases, to work. Personal conversations have revealed that some patients with meningomyelocele live in a house without an elevator, making it difficult to get to school. This is why many of them went to boarding schools. The quality of life can be improved by expanding the barrier-free environment. For the returned parental questionnaires, several mothers described their own experiences and difficulties. Incontinence was identified as one of the biggest concerns. The development of the bladder-umbilical fistula has greatly

improved the quality of life of children, as it has made self-catheterization easier. In my opinion, the disease, the patient, and their environment do not only need healing. Appropriate material conditions, a social, accepting environment and the financial resources needed for the training make it easier for the patients to live independently.

10 Comparative analysis of chronic neurological patients and the general population

Quality of life studies in patients with epilepsy, cerebral palsy, and meningomyelitis have been described in details in previous chapters. At this stage, we compare the quality of life of children with three chronic neurological diseases with data from the general population and with each other. The methods have been described in details in the previous chapters.

Results

What the three chronic neurological diseases have in common is that the overall quality of life, physical well-being, materiality, and social acceptance were judged to be lower by both parents and children relative to the general population. In the school environment, children with epilepsy felt worse, while in the ranges of psychological life, mood, and friendly environment, groups with mobility impairments (CP, MMC) indicated a lower quality of life.

The quality of life of epileptic patients at two main points, physical well-being, i.e., independent movement and autonomy, was significantly higher in children and parents than in children with MMC.

In addition to physical well-being, children with cerebral palsy also rated their financial means, school environment, and friendships worse than their peers of similar age. Of the two groups with disabilities, children with MMC rated their own movement and school environment more positive.

Discussion

To our knowledge, our study was the first to examine the quality of life of children and adolescents with cerebral palsy, meningomyelocele, and epilepsy simultaneously using the same methods and to compare the results with the three patient groups and the general control population. What is also new is that we took into account not only the opinions formed by the children, but also the opinions of their parents.

The results of our study provided information on the self-assessed quality of life of children and adolescents. Their HRQoL levels were lower than those of healthy controls in most quality of life dimensions. This means that disability is not only a medical but also a sociological problem,

meaning it cannot be reduced by improving medical care alone. Children and adolescents with disabilities need special help to maintain their self-esteem, and this help is a moral duty of every society. Negative cultural attitudes and stigma should be decreased. Interventions at different levels can be applied, e.g. improvement of the social network, psychological assistance, environmental, cultural and social policy measurements. These are the interventions that help sick people adapt to their situation and integrate into society.

11 Summary of new results

11.1 Examination of the quality of life of the general population

Compared to European data, we found that our own general population of children and adolescents was suitable as a control group in our studies. The use of t-value, risk ratio calculations and the application of Cohen's d are novel in our research.

11.2 Quality of life in children with epilepsy

The number of patients / families involved in the quality of life study in children with epilepsy was significant (144 families). Quality of life was generally judged to be lower by both parents and children than in the general population. The parents' opinions were more negative than their children's. We found that older age and antiepileptic polytherapy have a negative impact on six dimensions of quality of life. The frequency of seizures significantly reduces physical and mental well-being. The duration of epilepsy did not affect the results. We found that well-adjusted epilepsy means a better quality of life. Considering the family situation, we have shown that there are more disadvantaged children with epilepsy than in the general population. Their parents are more often less educated, inactive, and single than in the general population. They attend special schools more often and have more siblings.

Although our null hypothesis, well-treated epilepsy without significant comorbidities does not reduce quality of life to a statistically significant extent, has not been substantiated, our results still suggest that striving for monotherapy, achieving seizure relief, and educating the child / family / educator with epilepsy can improve a child's quality of life.

A similar study has not been performed in children with epilepsy in Hungary.

11.3 Relationships between epilepsy and nutrition

We performed a complex analytical study that considered sociodemographic variables in addition to the characteristics of epilepsy. The significant patient population and general population

allowed us to classify patients according to five main weight categories. Using three main BMI classifications (Hungarian, WHO, IOTF), we found that the majority of children with epilepsy are of normal physique. There was no statistically significant difference between the three grades within the categories. We found that idiopathic localization-dependent epilepsy predisposes to obesity. We have shown that the majority of epileptic patients receiving polytherapy are normal in shape but more prone to overweight than the general population. Valproate and carbamazepine were not significantly overweight in monotherapy. The child of a single parent is more often overweight. Only children are more likely to be obese. In special classes, the chances of being overweight and slim are higher.

When examining the quality of life according to the nutritional status, most of the differences were observed in the normal physique, i.e. the physique also affects the children of the general population in their assessment of their quality of life. We found that the nutritional status of children with epilepsy is influenced by several factors: the disease itself, medication, and the environment. Abnormal physique can lead to further deterioration in quality of life.

Encouraging children with epilepsy to get active / involved in school sports as much as possible, increasing their self-confidence, accepting the advice of a dietitcian, and preferably ordering an anticonvulsant, can significantly improve their quality of life.

Analysis of a larger patient population from a variety of epilepsy syndromes may provide newer results that can be used in practice.

11.4 Quality of life in children with cerebral palsy

We found that children and their parents with cerebral palsy rated health-related quality of life worse than their peers. Our results show that female gender, poorer motor function, and comorbidities (epilepsy, incontinence, and intellectual impairment) have a negative impact on quality of life. Parental opinions were suitable as proxy reports because of the measured strength of the correlation. It is noteworthy that among the subtypes of cerebral palsy, children with unilateral spastic CP have the lowest quality of life. Respondents probably rated this in this way because of the functional difference between the two sides of the body. Intellectual deficits occurred in more than half of the patient population. Among siblings of CP patients, mental illness is 5.7 times more common. We found the family environment of children with CP to be much more disadvantaged than that of healthy children. Based on the results of the research, we found that the parent's lower educational attainment and labor market inactivity, as well as the single-parent family, were statistically significantly higher in children with CP, and these factors had a negative impact on quality of life.

We found that the quality of life of children with disabilities is affected by both the disease and the sociodemographic environment. Their self-awareness does not differ statistically significantly from that of the general population of a similar age.

Psychological and social assistance, organized activities that provide pleasure help in social integration and improve the quality of life.

A similar study has not been performed in Hungary for cerebral palsy. In the international literature, either the characteristics of the disease or the sociodemographic background were taken into account.

11.5 Epidemiological research on cerebral palsy

In Borsod-Abaúj-Zemplén county, I collected patients with cerebral palsy aged 6-18 years using several sources. I chose this age group because at the age of 6, almost all symptoms of CP are recognizable. The prevalence of cerebral palsy in the studied age group was 2.1 ‰, which corresponds to the frequency in the literature. From the risk factors I found low birth weight to be the highest.

11.6 Economic / social effects of cerebral palsy and costs of care

The economic / social impact of disability was calculated by assessing the family and state costs of cerebral palsy patients up to 18 years of age. Based on a principle comparable to a shopping cart, we expected expected medical and non-medical costs. We found that the cost of complex medical / rehabilitation care for a child with CP up to the age of 18 costs HUF 73 million. The lost family income was calculated at HUF 27.36 million. During the study period, 0.525‰ of GDP, 0.88% of the total health and social budget, and 1.83% of direct medical costs were spent on caring for children with CP and their families. Caring for a child with a disability therefore places a significant financial burden on both the family and society. Children with CP raised in the family have a higher quality of life, but home care is also more affordable. Costs can be reduced by improving primary prevention (more frequent monitoring of pregnant women, even better quality perinatal care).

Later, with insurance number-based cost research, it is also possible to estimate the real costs and compare them with the theoretical calculation. A similar cost-oriented study is rare in the international literature.

11.7 Quality of life study in patients with meningomyelocele

We found that meningomyelocele, like the other two major neurological diseases, significantly affects quality of life. Social acceptance was perceived by children born with meningomyelocele to be much more positive than that of their parents. We found that in the case of meningomyelocele, our null hypothesis was confirmed, i.e., their quality of life is similar to that of

those with CP, but with a more positive assessment. In our opinion, this is due to the fact that the mental development of children born with meningomyelocele is less retarded and the movement of the upper limbs is also retained.

A quality of life study has not yet been performed in patients with meningomyelitis in Hungary.

11.8 A comparative study of the opinions of parents raising patients with chronic neurological diseases

The quality of life of children with epilepsy, cerebral palsy and meningomyelocele has not been compared so far. The benefit of the studies was the large patient population and the general population. The views of both parents and children were taken into account in the quality of life study. We found that in the examined general population and chronic neurological patient groups (CP, MMC, E) we did not find any statistically significant difference between the opinions of children and parents in the dimensions of quality of life known to the parent (physical and mental condition of the child). In contrast, we measured a statistically significant difference in areas where the parent was not present (e.g. school, friends, social acceptance) with moderately strong correlation. Younger children generally indicated a higher quality of life than older ones.

What was found common in all three disease groups was that overall quality of life, physical well-being, materiality, and social acceptance were judged to be lower in both parents and children compared to the general population.

In the school environment, children with epilepsy felt worse, while the domains of psychical life, mood, and friendly environment showed a lower quality of life in the disabled groups (CP, MMC). The quality of life of epileptic patients was significantly higher in two main points, physical well-being, ie independent movement and autonomy, also in the opinion of children and parents than in children with meningomyelocele. In addition to the above two areas, cerebral palsy children also rated financial, school, and friendly relationships as worse than epileptic patients of a similar age. Of the two groups with disabilities, children with meningomelocele rated their own movement and school environment more positively.

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13 Publications related to this thesis

Publications:

1. **Fejes** M, Varga B, Molnar D, Hollody K (2021) Factors affecting the Body Composition in Childhood Epilepsy. J Pediat Infants 2021;4(2) 32-39. [IP:1,7]

2. **Fejes** M, Varga B, Hollody K. A betegség és a szociodemográfiai háttér hatása a cerebralis bénulásban szenvedő gyermekek életminőségére. Orvosi Hetilap 2021;162(7) pp 269-279 (2021) [IP: 0,56]

3. **Fejes** M, Varga B, Hollódy K. A cerebralis paresis epidemiológiája, költségei és közgazdasági hatásai Magyarországon. Ideggyógyászati Szemle / Clinical Neuroscience 2019;72 3-4 pp 115-122 [IP:0,256]

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1. **Fejes** M, Varga B, Kovács A, Hollódy K. (2088) Quality of life of children with epilepsy in Hungary : clinical non-interventional case-series study with parental and general population controls. Qual Life Res 2016;25 (1) 149-149. (0962-9343 1573-2649): Abstract

Presentations and posters related to this thesis:

1. **Fejes** M, Varga B, Hollody K. Quality of Life of Children with Cerebral Plasy in Hungary (poster presentation) ICCN 2019-International Conference of Clinical Neonatology, Venice 2019. jun. 09-11.

2. **Fejes** M, Varga B, Hollody K. Epilepsziás gyermekek életminősége a tápláltsági állapot függvényében Magyarországon. MGYNT 2019.április 4-6 Miskolc,Lillafüred. előadás

3. **Fejes** M, Varga B, Hollody K. Are there any significant differences in the quality of life among children with epilepsy, cerebral palsy, meningomyelokele and control in Hungary from the point of view of nutritional aspect. 1st Congress of Joint European Neonatal Societies (jENS) 16-20 Sep 2015, Budapest

4. **Fejes** M, Varga B,Kovács A, Hollódy K.(2088) Quality of life of children with epilepsy in Hungary : clinical non-interventional case-series study with parental and general population controls.23rd Annual Conference of the International Society for Quality of Life Research. Konferencia helye, ideje: Copenhagen, Dánia 2016.10.19. - 2016.10.22.

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9. **Fejes** M, Kovács A, Varga B, Hollódy K. Quality of Life in Children with Epilepsy, Cerebral Palsy and Meningomyelocele in Hungary from the view of the Children and their Parents. CIP 2015 4th Global Congress for Consensus in Pediatrics & Child Health, Budapest , Hungary, March 19-22. 2015. június 19.

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