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Children with Cerebral Palsy and Epilepsy

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1. Introduction

The mental health reform in Bosnia and Herzegovina came into reality after the war (1992-1995) and the Dayton agreement in 1996. An important part has been the creation of a network of community mental health centers (CMHCs) all over the two entities of Bosnia and Herzegovina. They are all organized as part of the primary health care system. There was a lack of clear legislative and policy framework, job descriptions and funding as well as management. The personnel had just started to work and had many ideas how to improve the service. The users were basically satisfied but not quite aware of what service they could expect. Co-operation with other service units was poor (Lagerkvist, Maglajlić, Puratić, Suši & Jacobsson, 2003).

Families who have children with disabilities and live in poverty are truly in a double-bind. The same poverty-related factors that place their children at higher risk for disabilities also serve as barriers to assess services for their children and themselves. Early childhood practitioners can play a critical role in supporting families by providing services to overcome these obstacles and by working in partnership with specialized early intervention programs to assure that families and children receive needed services (Peterson, Mayer, Summers & Luze, 2010).

Poverty-stricken families, as well as regression in the structure and services caused by war in Bosnia and Herzegovina, and education system which anticipates "special schools" for children with intellectual disabilities, contributed to isolation of children with disabilities into anonymity of their homes, and especially anonymity of the rural areas. Those children are in the families which often lack financial resources for transportation to special schools or rehabilitation institutions.

Before the 1992, medical rehabilitation in Bosnia and Herzegovina had been provided at the level of institutions, usually after the hospital or ambulant treatments. As a concept of rehabilitation, community-based rehabilitation (CBR) was included in the strategic plan of reform of health care in Bosnia and Herzegovina. CBR is strategy for rehabilitation, equal possibilities and social integration of all persons with disabilities.

Priority problems for the families of children and adolescents with intellectual disabilities in Bosnia and Herzegovina are:

- lack of Register for developmental and intellectual disabilities,
- lack of continuous preventive measures for disability manifestation,

- lack of continuous education for the professionals in multiprofessional team for work with families of children with intellectual and development disabilities,
- lack of continuous education of teachers in general schools for work with children in program of educational inclusion,
- lack of adequate and continuous multidisciplinary community support for all education levels for children and adolescents with intellectual disabilities,
- lack of adequate programs for profession selection and employment, as well as accompanying legislation, and,
- high cost of habilitation-education programs for children and adolescents with intellectual disabilities and their insufficient financing.

The aims of the study "The influence of prenatal etiological factors on learning disabilities of children and adolescents with cerebral palsy" were:

- to identify the prenatal etiological factors of cerebral palsy in children and adolescents aged from 6 to 20 years in the Canton of Sarajevo, Bosnia and Herzegovina;
- to determine the learning disabilities among children with the cerebral palsy, and
- to determine relationship between prenatal etiological factors of cerebral palsy and learning disabilities of children and adolescents with cerebral palsy.

Importance of this study is reflected in the fact that this is the first time in Bosnia and Herzegovina that the influence of the prenatal etiological factors on learning difficulties of the children and adolescents with the cerebral palsy has been determined with use of a scientific method.

Knowing the cause of the condition is fundamental to understanding its prevention, its potential complications, and prospective treatment strategies. Thus, there is a great need for better communication and cooperation between all professional dedicated to the care of individuals with intellectual and developmental disabilities (Percy, 2007).

1.1 The influence of prenatal etiological factors on learning disabilities of children and adolescents with cerebral palsy

The study of the influence of prenatal etiological factors on learning disabilities of children and adolescents with cerebral palsy in the Canton of Sarajevo was conducted as a cohort, retrospective study. The research was conducted in homes of 67 (83,75%) participants, and in Center for education and re/habilitation of children with intellectual disabilities, cerebral palsy and autism, "Vladimir Nazor", for 13 (16,25%) participants. It was necessary to make home visits, especially because of the children who were staying at home, without an institution based re/habilitation or any other form of education.

Participants were members of the Association of persons with cerebral palsy in the Canton of Sarajevo. The Association includes 315 members. Of that number, 123 (39,05%) are children and adolescents, age 4 up to 20 years, and 192 (60,95%) are adults. There are only three Associations of persons with cerebral palsy In Federation of Bosnia and Herzegovina, (towns: Sarajevo, Goražde and Zenica). Cerebral Palsy Association of Federation of Bosnia and Herzegovina is established at 17. October of 2011. That day was announced for Day of persons with cerebral palsy of Federation of Bosnia and Herzegovina.

The sample was consisted of 80 participants, children and adolescents with cerebral palsy in the Canton of Sarajevo, age from 6 up to 20 years; 25 children (age 6-11), and 75 adolescents

(age 12-20). Mean age was 13,94 years, 47 male (58,75%) and 33 (41,25%) female. The sample was divided in two subgroups, first includes 30 participants whose mothers had problems during the pregnancy, and second includes 50 participants whose mothers didn't have problems during the pregnancy.

The research data were collected using a Questionnaire for the parents of children and adolescents with cerebral palsy, which was developed by the investigator, based on professional and scientific literature, and personal experience. The Questionnaire consists of 69 questions. The first 8 questions are general sociodemographic characteristics of the family. Questions 9-19 are about pregnancy control and problems during pregnancy; 20-23 questions are directed at determining if there were still-born children. Fourth group of questions (25-35) are about delivery. 36-42 questions are directed at determining type of cerebral palsy, motor development and physical and surgical therapy. 43-56 questions are about intellectual and sensor disabilities; 57-67 questions are directed at determining education and academic success. The last two questions are about family's membership in Association of person with cerebral palsy in the Canton of Sarajevo.

Diagnosis of cerebral palsy has been made before this Study by pediatric neurologist at the Pediatric Clinic in Sarajevo, for each child. Specialist of physical medicine and rehabilitation, the author of the Questionnaire, examined all children (neurological status and observation at home or Center "Vladimir Nazor") depending on the history and clinical findings. After that, almost all children had individual home physical therapy: individual program of exercises and manual massage, with occupational therapy. Cognitive development was assessed by a cognitive test of psychologist.

The study was approved by director of the Center "Vladimir Nazor", and president of the Association of persons with cerebral palsy in the Canton of Sarajevo. Before starting the data collection, the research aim and Questionnaire were explained to parents and they agree to participate by signing consent.

Of total sample, 67 (83,75%) mothers were interweaved, 5 (6,25%) fathers, one (1,25%) aunt, and, in 7 cases (8,75%) both parents participated. Of 80 families, 64 (80%) were complete, and 16 (20%) were one parent families: 15 mothers and one father.

2. Epilepsy in cerebral palsy

Epilepsy is one of the most common neurological disorders in childhood. The risk of epilepsy is highest in patients with an associated brain abnormality, such as intellectual disability and cerebral palsy (symptomatic epilepsy). The average annual rate of new cases per year (incidence) of epilepsy is approximately 5-7 cases per 10000 children from birth to age 15 year. Prevalence studies in childhood epilepsy have been carried out in different geographical areas, age groups, and ethnic groups, with different design and methods. Despite these differences, it is possible to rate the prevalence of epilepsy in children as 4-5/1000. According to several population-based studies, this prevalence tends to increase from 2-3/1000 at age 7 to 4-6/1000 at age 11-15. A wide variety of seizure disorders are included under the term epilepsy. Approximately two thirds of cases were considered idiopathic. Children with additional health problems were more likely to continue to have seizures in early adult life than those with epilepsy alone (Beghi M, Cornaggia, Frigeni & Beghi E, 2006).

If the seizures are responsive to medication – as they are in approximately 60% of cases – the individual may never have another seizure. He or she will have to take medication regularly, but epilepsy will note prevent a full productive life. If the seizures are only partly responsive to medications - as they are in approximately 20% of cases – the individual will continue to have some attacks. If the attacks occur in public, he or she may experience negative consequences. Moreover, if an individual has even one seizure per year, he or she may never be able to legally drive again. Partially resistant seizures, therefore, have a clear, negative effect on life. Still, many people with partially resistant seizures also live productive, successful lives. If seizures are fully drug resistant – as they are in approximately 20% of cases – the individual will continue to experience seizures, which may be frequent, despite use of the best medications available. Drug-resistant seizures are called intractable seizures or refractory seizures. Intractable epilepsy is clearly a disability, sometimes called the "invisible disability" (Burnham, 2007.)

Younger age at onset is strongly associated with symptomatic causes and epileptic encephalopathy, both associated with intellectual disability (Berg, Langfitt, Testa, Levy, DiMario, Westerveld & Kulas, 2007).

Epilepsy, and particularly intractable epilepsy, is often associated with cognitive impairment. As noted, severe impairments are seen in children with West and Lennox-Gastaut syndromes; however, cognitive impairment may be associated with many forms of intractable seizures. In children, this often becomes evident during the school years. Children with intractable seizures have lower IQ scores, often in the "low-normal" range of 80-85. Studies have also found a significant correlation between low IQ scores and the longer duration of the child's seizure disorder (Burnham, 2007).

Epilepsy is common and the frequency increases as IQ decreases. Seizures are more frequent and status epilepticus occurs more often. When epilepsy and learning disabilities coexist, there is a much higher chance of challenging behavior, psychiatric disorders and cerebral palsy (Courtman and Mumby, 2008).

One cause of learning problems is frequent absence seizures. These mild, non-convulsive attacks consist only of brief lapses of consciousness. Some children have hundreds per day, however, and clusters of dozen may occur within a few minutes. During these periods, children cannot follow what is going on around them. Children with absence epilepsy, therefore, may give the appearance of being "slow learners" when their intelligence may very well be normal or even higher (Burnham, 2007).

Severe seizures, such as tonic-clonic attacks, cause a major perturbation in the brain. The after effects of such seizures last for hours. Children who have had one or more seizures during the night may show excessive fatigue during the following day and may appear to have forgotten things learned the day before (Burnham, 2007).

Some children, particularly those with complex partial seizures, have isolated epileptic spikes in their EEG between seizures. These are called interictal spikes. Interictal spikes produce no outward manifestation, but they slow the children's ability to process and retrieve information, causing transient cognitive impairments (Burnham, 2007).

Children with an epileptic focus in particular parts of the brain may show selective deficits related to that area. Children with a focus in the left hemisphere (dominant for language),

for example, often have trouble with finding and remembering words. Children with a focus in the right hemisphere may have problems with visual memory (Burnham, 2007).

In addition to the cognitive impairments associated with the sedative (sleep-inducing) side effects of anti-epileptic drugs (AED). These side effects are most serious at the start of the therapy. They improve as tolerance develops, but they do not entirely disappear. They are worst with the older drugs, such as Phenobarbital, but they may be seen with almost any of the AEDs. They are more of a problem in children taking multiple drugs (Burnham, 2007).

Depending on the study, up to 75% of young patients do not take their AEDs as prescribed, and are at increased risk of the adverse effects of seizures, including physical injury, learning disabilities, psychosocial problems, poor self-esteem, damage to future life prospects, and death (Wilmont-Lee, 2008).

Cerebral palsy (CP) occurs at present in about 2,2 per 1000 live born children in Sweden. Epilepsy occurs in 15% to more than 60% of children with CP, depending on the type of CP and the origin of the series, compared with 0,5% in the general population. Epileptic seizures associated with brain damage are generally difficult to control. About half the individuals with epilepsy and a neurodeficit can be successfully treated with AEDs in the long term. A good outcome (seizure free ≥ 1 year) has been reported in 38% to 67% of children with CP and epilepsy. Even if the prognosis in this group is relatively poor, as far as complete remission is concerned, it is noteworthy that in our study 38% (21 of 55) had been seizure-free for one year or more. Nine of these children were without AEDs and were still seizure-free after epilepsy surgery and has remained so for 5 years 6 months. Children with CP due to CNS malformation, CNS infection, and gray matter damage had significantly less chance of a good seizure outcome than those with CP due to white matter damage or with unknown etiology. For all groups the chance of becoming seizure-free increased over time. Further studies are required to describe the long-term follow-up in children with CP and epilepsy (Carlsson, Hagberg & Olsson, 2003).

Prevalence of epilepsy in persons with CP varies with the type of motor impairment. It is most common among persons with hemi-and quadriplegic CP. Children with quadriplegic CP tend to have an earlier onset with other types of CP. Epilepsy is present in 79,5% children with severe disability. Of children with quadriplegic CP and severe intellectual disability, 94% have epilepsy. All types of epilepsy occur; but generalized and partial epilepsy are the predominant types. Children with quadriplegic CP are more likely to have generalized epilepsy, and more than half of them require two or more anti-epileptic drugs. In children with hemiplegic CP the predominant type is localization related epilepsy (83%). The frequency of seizures often decreases after age 16 (Odding, Roebroeck & Stam, 2006).

The proportion of patients with spastic quadriplegic CP and epilepsy ranges from 38 to 56,5%. Children with CP and epilepsy also had higher rates of other comorbidities including gross motor dysfunction and intellectual disability. Epilepsy frequently begins in the first year of life in patients with spastic quadriplegic CP (Venkateswaran & Shevell, 2008).

Epilepsy is a common disorder among children with CP. Of all children (n= 127) included in the Dutch population based study, 18,9 had active epilepsy at the time of examination, and a further 21,3% had a history of epilepsy. Of the children with quadriplegic CP 44,8% never had epilepsy, compared with 66,7% of the children with spastic diplegia, triplegia and

hemiplegia, and 37,5% of the children with ataxia and dyskinesia (Wichers, Odding, Stam & Nieuwenhuizen, 2005).

CP type	With epilepsy		Without epilepsy		Total
	Male	Female	Male	Female	
Spastic Quadriplegic CP	8	5	9	10	32
Spastic Quadriplegic CP mixta	3	0	0	0	3
Triplegia	1	0	2	2	5
Spastic diplegia	3	2	6	5	16
Spastic Hemiplegic CP (right)	4	1	2	3	10
Spastic Hemiplegic CP (left)	2	3	3	1	9
Dyscinetic CP	0	0	2	0	2
Ataxia	0	1	2	0	3
	21	12	26	21	
Total	33 (41,25%)		47 (58,75%)		80

Table 1. Frequency of epilepsy in 80 children with CP by gender

Of 33 children with cerebral palsy and epilepsy, 21 (63,6%) are male, and 12 (36,4%) are female.

Of 47 children with cerebral palsy, and without epilepsy, 26 (55,32%) are male and 21 (46,68%) are female.

As children grow, the comorbidities of epilepsy grow with them. The focus of trouble simply shifts from the school to the workplace. Cognitive deficits, once acquired, are likely to remain. The after effects of seizures still occur in adults, as do the sedative effects of AEDs (Burnham, 2007).

2.1 Cerebral palsy

Cerebral palsy (CP) is an umbrella term that defines a group of non-progressive, but often changing, syndromes of motor impairment secondary to lesions or anomalies of the brain arising in the early stages of its development. The characteristic clinical feature that is common to all CP syndromes is the presence of pyramidal or extrapyramidal signs. CP is neither a specific disease nor a pathological or etiological entity, and importantly the term CP does not- and should not-necessarily imply or identify a specific cause (Gupta & Appleton, 2001).

The most recent consensus definition recognizes that: "Cerebral palsy describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, and behavior, by epilepsy, and by secondary musculoskeletal problems (Venkateswaran and Shevell, 2008).

CP is traditionally classified according to the type of motor symptoms (spastic, dyscinetic, or ataxic) and the location of impairment (hemiplegic, diplegia, or quadriplegic). The spastic subtype accounts for 66%-82% of CP cases, which makes it the most common type (Bottcher, 2010).

A child is often first suspected of having CP in the first year of life when his or her motor milestones are delayed. For example, the child might be late in sitting, crawling, and walking. Parents may also notice that their baby has an atypical way of moving, such as commando crawling (crawling by pulling the body forward with the arms and dragging the legs behind) or that their child always stands or walks on his or her toes. The child may also appear to have "advanced" development, for example, being left-handed or "wanting to stand all the time". Clear evidence of handedness before 2 years of age is unusual and actually suggests impairment in the limb that is not used, whereas a child who seems "too strong" is probably showing evidence of increased stiffness in their muscles due to spasticity (Fehlings, Hunt & Rosenbaum, 2007).

The transitions from childhood to adolescence and from adolescence to adulthood are difficult for all families, but this stage of development can become particularly challenging when a child has a disability. The first challenge begins with learning to cope independently from one's parents. Other important issues include development of friendships, career planning, emotional and sexual relationships, and marriage. It is known that individuals with disabilities such as CP have more difficulty finding satisfying relationships and making career plans. Only 51% of youth with disabilities have plans for postsecondary education, compared with 74% of same-age peers (Fehlings, Hunt & Rosenbaum, 2007).

2.1.1 Prevalence and causes

Despite the huge progress of medicine in general and neonatology (or better: perinatology) in particular, the prevalence of cerebral palsy hasn't dropped in the recent decades and remains stable around 2 per 1000 live births (De Cock, 2009).

In 1998, fourteen centers in eight European countries started a network called Surveillance of Cerebral Palsy in Europe (SCPE). After reached consensus about the criteria to classify CP, they presented the prevalence rates in six countries, and more detailed prevalence estimated of 13 areas. The prevalence of CP rises in time from well below 2,0 per 1000 live births in the 1970s to well above 2,0 in the 1990s, boys form a small majority (58%). It seems fair to assume that these European data are not very different from findings in other parts of the world. For example the prevalence of CP in China is reported to be 1,6 per 1000 children under age 7. In Mississippi (USA) 2,12 per 1000 inhabitants were diagnosed with CP with a higher prevalence for males, and a, non-significant, higher prevalence in black people. The prevalence of CP in Australia is 2,0 to 2,5 per 1000 live births (Odding, Roebroeck & Stam, 2006).

In the last 15 years, intensive medical care performed in Neonatal Intensive Care Units (NICU) has allowed an increase in the survival of very low birth-weight (VLBW) and extremely premature newborns. New risk factors have appeared among infants who previously would have died, and the incidence of neurodevelopmental impairments in survivors of NICU is higher than in normal birth-weight newborns. In particular, due to the high risk of interventricular haemorrhage and periventricular leukomalacia, an

increasing prevalence of cerebral palsy has occurred in premature, low birth-weight newborns and children born with asphyxia (Romeo D, Cioni, Scoto, Mazzone, Palermo & Romeo M, 2008).

According to the time of influence, causes of cerebral palsy can be divided to prenatal (from conception until beginning of the delivery), perinatal (beginning of the delivery until age of 28 days) and postnatal (from 29th day of age until two years of age). The majority of international studies indicates that the prevalence of the cerebral palsy is about 2-2,5 cases per 1000 born, although there are some reports about lower and higher prevalence rates (Nordmark, Hagglund & Lagergren, 2001).

Majority of previous research in the world was focused on the prevalence, determination of the motor abilities, and perinatal etiological factors of the cerebral palsy. Evidences indicated that 70-80 % of cerebral palsy is caused by the prenatal factors and that the birth asphyxia has a relatively minor role with the less than 10 % (Jacobsson & Hagberg, 2004).

Prenatal factors
Hereditary factors
Congenital anomalies of the CNS: hidrocephalus, microcephalus, cranistenosis, vascular malformations
Hormonal disorders
AIDS embriopathy
TORCHS infections
Psychological trauma
Intoxication of the mother
X-ray and other forms of radiation
Uncontrolled use of medications
Abortion attempt and previous bad abortion
Bleeding
Use of contraceptives
Fetal alcohol syndrom
Smoking
Insufficient nutrition
Cardiovascular disorders (severe hearth decompensations, shock) and severe anemia
Multifetal pregnancies
Mother age
Other factors

Table 2. Prenatal etiological factors of cerebral palsy

In our study, of the 35 participants with prenatal factors, 30 were participants whose mothers had problems during the pregnancy, 3 children had congenital anomalies, and 2 children had hereditary factors.

CP etiology	With epilepsy	Without epilepsy	Total
Prenatal	15	20	35 (43,75%)
Perinatal	14	23	37 (46,25%)
Postnatal	2	3	5 (6,25%)
Unknown factors	2	1	3 (3,75%)
Total	33 (41,25%)	47 (58,75%)	80 (100%)

X2=1.018 p=0.7969

Table 3. Frequency of epilepsy in 80 children with CP by CP etiology

Children with prenatal etiology for CP have 1,2 times greater chance of developing epilepsy.

In our study with prenatal etiological factors were 35 (43,75%) participants: 15 with epilepsy and 20 without; with perinatal 37 (46,25%) participants: 14 with epilepsy and 23 without epilepsy; with postnatal 5 (6,25%) participants: 2 with epilepsy and 3 without epilepsy, and with unknown etiological factors 3 (3,75%) participants: 2 with epilepsy and 1 without epilepsy.

Time of birth before introduction of modern neonatal intensive care in Bosnia and Herzegovina and war time (1992-1995) produced more representation of perinatal etiological factors.

Cerebral palsy	Etiological factors				Total
	Prenatal	Perinatal	Postnatal	Unknown	
Bilateral spastic CP					
Spastic Quadriplegic CP	5	7	1		13
Spastic Quadriplegic CP mixta	2	1			3
Triparesis	1				1
Paraparesis	3	2		1	6
Unilateral spastic CP					
Spastic Hemiplegic CP (right)	3	2			5
Spastic Hemiplegic CP (left)	1	2	1	1	5
Total	15	14	2	2	33

X2=9,697 p=0.8384

Table 4. Structure of children with cerebral palsy and epilepsy according to the etiological factors

All children, in group with epilepsy have spastic cerebral palsy: 23 bilateral and 10 unilateral spastic CP.

It is often assumed that children who develop CP have had a difficult birth. As more studies are done, however, it is becoming evident that only a small percentage of children with CP have difficulties related to their delivery. Birth asphyxia is a condition in which the newborn

is felt to have a low oxygen level during delivery (sometimes resulting in delayed crying and poor respiratory effort at birth), and it is associated with the subsequent development of CP. One study of children with CP found that 78% did not have birth asphyxia, all had prenatal risk factors as well, which might have been the reason they had difficulty during the delivery. In fact, due to this type of research, the term birth asphyxia has been replaced with the term neonatal encephalopaty because this latter term does not imply a causal relationship (Fehlings, Hunt & Rosenbaum, 2007).

Birth weight less than 2500 g			Up to 3500 g		Over 3500 g		Unknown	Total
< 1500	1501-2000	2001-2500	2501-3000	3001-3500	3501-4000	>4001		
7	13	15	9	17	12	5	2	80
35 (43,75%)			26 (32,5%)		17 (21,25%)		2 (2,5%)	80 (100%)

Table 5. Structure of the sample according to the birth weight

Birth weight less than 2500 g had 35 children (43,75%), 2501-3500 g 26 children (32,5%), more than 3501 g 17 children (21,25%) and for 2 children (2,5%) birth weight was unknown.

Very-low-birth weight (VLBW) children are at risk of developing psychiatric symptoms and disorders, especially symptoms of attention deficit/hyperactivity disorder, anxiety and reduced social skills, and also possibly depression and thought problems. Cognitive and learning disadvantages are documented, as well as increased prevalence of neurodevelopmental disabilities, such as cerebral palsy, and minor motor and visuomotor problems (Indredavik, Vik, Heyerdahl, Romundstad & Brubakk, 2005).

2.2 Physical disability

With the rising incidence of CP in time, the distribution over the subtypes changed: fewer cases with diplegia and more with hemiplegic. The motor impairments of CP, in especially the spastic types, lead to other impairments of the musculoskeletal system; for example; among children and adolescents with quadriplegic CP, 75% have hip luxations, 73% contractures, and 72% scoliosis (Odding, Roebroeck & Stam, 2006).

Orthopedic (bone) complications are frequently seen in CP. They can require surgical intervention by an orthopedic surgeon. The extra stiffness in the muscle decreases the muscle growth. This can lead to joint contractures that can affect an individual's gait (walking pattern). The surgeon can do an operation that lengthens the tendon of the muscle to help to increase flexibility. For instance, with a heel cord lengthening, a child can go from always standing on his or her toes to being able to bring the heel down to the floor. A significant complication of the extra stiffness can be subluxation (a partial sliding out). The surgeon can lengthen the muscles around the hip and do a procedure to reshape the pelvis and try to prevent a complete dislocation of the hip. Children with CP are also at risk for osteopenia (low bone density) if they are nonambulatory. This in turn increases the risk of fractures of "thin" bones (Fehlings, Hunt & Rosenbaum, 2007).

In our study 16 (20%) children had operations of the tendons of the muscles (foot, knee and hip).

Children with CP have increased energy consumption by walking compared with appropriately developing peers. Within the spectrum of the condition, increasing energy consumption is associated with an increase in the severity of functional involvement. Functional and community ambulation issues associated with the increased energy consumption of walking may have a direct effect on participation and social integration of the child at home, at school, and in the community setting (Kerr, Parkes, Stevenson, Cosgrove & McDowell, 2008).

Gait abnormalities increase submaximal walking energy expenditure almost 3-fold compared with healthy children. Children with diplegia have a higher fat percentage and are hypoactive compared with healthy children. Wheelchair-dependent adolescent with CP are hypoactive, which is not the case for ambulatory adolescents with CP. Physical, but not mental, fatigue is more common in adults with CP, than in the general population. The strongest predictors for fatigue are bodily pain, deterioration of functional skills, limitations in emotional and physical role function and life satisfaction (Odding, Roebroeck & Stam, 2006).

In the Study "Cerebral palsy in Norway: Prevalence, subtypes and severity", a total of 374 children with CP were identified with a prevalence of 2,1 per 1000 live births .

Cerebral palsy	Walking ability				Total
	Walks without restrictions	Holding a hand	Walker	Wheelchair	
Bilateral spastic CP					
Spastic Quadriplegic CP	2	/	1	10	13
Spastic Quadriplegic CP mixta	/	/	/	3	3
Triplegia	/	/	/	1	1
Paraplegia	3	1	1	1	6
Unilateral spastic CP					
Spastic Hemiplegic CP (right)	5	/	/	/	5
Spastic Hemiplegic CP (left)	4	/	/	/1	5
Total	14	1	2	16	33

Table 6. Structure of the sample of children with CP and epilepsy according to walking ability

Of 33 children with cerebral palsy and epilepsy, 14 (42,4%) were able to walk independently, 1 (3%) child needs to hold a mother's or friend's hand, 2 (6%) children walks with assistive device (walker), and 16 (48,5%) children were unable to walk, in need of wheelchair.

Of total sample of 80 participants, 34 (42,5%) were in need of wheelchair, and 46 (57,5%) were not.

Of total sample of 80 children, 42 (52,5%) were able to walk independently.

In the group of 30 participants, with illnesses during pregnancy, 13 (43,3%) were in need of wheelchair, and 17 (56,7%) were not. In the group of 50 participants, without illnesses during pregnancy, 21 (42%) were in need of wheelchair, and 29 (58%) were not.

Of 30 participants with illnesses during pregnancy, 17 (56,7%) were able to walk independently, and 13 (43,3%) were not. Of 50 participants without illnesses during pregnancy, 25 (50%), were able to walk independently, and 25 (50%) were not.

2.3 Learning disabilities

The term *mental retardation* has been used in the United States and some other countries recently but is being used with decreasing frequency worldwide. In 2006, the American Association on Mental Retardation (AAMR) voted to change its name to the American Association on Intellectual and Developmental Disabilities (AAID). This name change became official January 1, 2007. The meanings of terms are the blend of their literal, definitional, and social meanings. The literal meaning of *intellectual disability* (ID) – a person's skill or power to know and understand, as the thing that deprives him or her of performing or accomplishing specific things – is tempered by widely accepted definitions of *intellectual disability* and similar terms and by specific social contexts within which the term is used. Similarly the literal meaning of *developmental disability* – something in the way a person grows and changes over time that deprives him or her of developing the abilities to perform or accomplish specific things – takes on specific meaning by those who use it in the jurisdictions where they live and work (Brown, 2007).

A child is described as having a *learning disability* or *mental retardation* (preferred by the World Health Organization) if there is firstly an overall intelligence significantly lower than the general population i.e. IQ less than 70. Secondly, the cognitive impairment must have occurred during the developmental period (less than 18 years), and is accompanied by declining social functioning (Courtman & Mumby, 2008).

A register of all persons with ID in a certain area, with detailed information from many different perspectives, would help in estimating the need for services. There are, however, obstacles in keeping such a register. In many countries, including Finland, a conscious and determined mainstreaming policy is underway, and maintaining a register of people with ID is viewed as a step backward. These registers may also be regarded as unethical and feared as a potential means of discrimination. Moreover, our experience has shown that keeping such a register up to date is demanding and the reliability is difficult to guarantee in normal clinical practice (Westerinen, Kaski, Virta, Almquist & Iivanainen, 2007).

About 40% of children with hemiplegic CP have normal cognitive abilities, while children and adolescents with tetraplegic CP are generally severely intellectually impaired (Odding, Roebroeck & Stam, 2006).

CP associated with epilepsy is far more frequently accompanied by intellectual disability than CP without epilepsy. Similarly, the combination of CP and intellectual disability is reported to be associated with a high risk of developing epilepsy (Carlsson, Hagberg & Olsson, 2003).

Intellectual disability	With epilepsy	Without epilepsy	Total
Normal range	4	11	15 (18,75%)
Borderline	1	4	5 (6,25%)
Mild ID*	7	17	24 (30%)
Moderate ID	9	7	16 (20%)
Severe ID	12	8	20 (25%)
Total	33	47	80 (100%)

*ID = Intellectual disability
Intellectual disability was defined as IQ below 70.
Normal range > 91; Border line IQ = 71-90; Mild ID IQ = 51-70; Moderate ID IQ = 35-50;
Severe ID IQ = 21-34
X2=8,081 p=0.0887

Table 7. Frequency of epilepsy in 80 children with CP by intellectual disability

Of 60 children with cerebral palsy and intellectual disability, 28 (46,7%) have epilepsy. Of 20 children with cerebral palsy and normal intellectual status, 5 (25%) children have epilepsy.

Among all children (n= 127) included in the Dutch population based study, only the hemiplegic subtype showed a majority with normal mental capacity; severe learning difficulties were most common in children with quadriplegic CP (Wichers, Odding, Stam & Nieuwenhuizen, 2005).

Cerebral palsy	Intellectual disability					Total
	Normal range	Borderline	Mild ID	Moderate ID	Severe ID	
Bilateral spastic cerebral palsy						
Spastic Quadriplegic CP	/	/	3	2	8	13
Spastic Quadriplegic CP mixta	/	/	/	/	3	3
Triplegia	/	1	/	/	/	1
Paraplegia	1	/	1	3	1	6
Unilateral spastic cerebral palsy						
Spastic Hemiplegic CP (right)	2	/	1	2	/	5
Spastic Hemiplegic CP (left)	1	/	2	2	/	5
Total	4	1	7	9	12	33

Table 8. Structure of children with cerebral palsy and epilepsy according to the intellectual disability

There is a significant difference between the groups: X2=53,130 p=0.0001

Of 33 children with cerebral palsy and epilepsy, 4 (12,1%) have normal mental capacity, 1 (3%) border, 7 (21,2%) have mild intellectual disability, 9 (27,3%) have moderate intellectual disability, and 12 (36,4%) have severe intellectual disability.

Department of Education (USA) report notes that 4,7% of public school age children are diagnosed as learning disabled. Many feel that the figure represents, at best, half of the children who should be so identified. Public Law 94-142, the Education for All Handicapped Children Act, established a definition for learning disabilities. Since that time, several professional and governmental groups have proposed modifications of this initial definition. In practical terms, the major defining characteristic of a child or adolescent with learning disabilities has become the discrepancy between his or her current academic achievement and the child's intellectual ability as measured by standardized tests (Silver, 1989).

In Sweden, practically all children with motor disabilities are brought up by their parents or sometimes foster parents. Furthermore, almost all children with CP and with normal cognitive development are integrated in mainstream school education: special schools for the group being exceptions. Children with learning disabilities are referred to special schools, but parents have the option to choose integration in a mainstream school for their child. That is not unusual in the lower school grades. Children with severe learning disability with IQs at the upper and attend special schools for those with learning disability and children with profound learning disability have some degree of educational activity on a daily basis, i.e. in communication and music therapy. Forty-three of the 105 children with CP and average IQ attended a mainstream school although they used mobility devices or wheeled mobility and 12 of the 26 children with mild learning disability attended a mainstream school with extra support. Only five children with severe learning disability had no form of educational activity (Beckung & Hagberg, 2002).

Education	With epilepsy	Without epilepsy	Total
Home	18	16	34 (42,5%)
School with special program	9	18	27 (33,75%)
Mainstream school	6	13	19 (23,75%)
Total	33	47	80 (100%)

Table 9. Frequency of epilepsy in 80 children with CP by education

There is a significant difference between the groups: X2=3,349 p=0.0187

More children with CP and epilepsy stay at home without any institutional re/habilitation, and more children without epilepsy attend schools with special programs and mainstream schools.

In our Study, of 80 children and adolescents with cerebral palsy, 34 (42,5%) stay at home without any service of education: 15 female and 19 male; 18 with CP and epilepsy, and 16 with CP and without epilepsy.

Of 80 children and adolescents with CP, 27 (33,75%) children attend schools with specially adapted programs.

Of whole sample of children and adolescents with CP, 19 (23,75%) children attend mainstream schools: 9 female, and 10 male; 6 with cerebral palsy and epilepsy, and 13 with CP and without epilepsy.

Education	Intellectual disability					Total
	Normal range	Border line	Mild ID	Moderate ID	Severe ID	
Home	/	/	1	5	12	18
Elementary school with specially adapted programs	/	/	5	1	/	6
Vocational programs in special elementary school	/	/	/	3	/	3
Mainstream elementary school	3	1	/	/	/	4
Mainstream secondary school	1	/	1	/	/	
Total	4	1	7	9	12	33

Table 10. Structure of the sample of children with CP and epilepsy according to the type of education

Nonverbal learning disabilities refer to developmental disorders of motor function (developmental coordination disorder), visuo-spatial processing, mathematics (dyscalculia), memory, prefrontal executive function, and social-emotional cognition and behavior (Ramanujapuram, 2007).

In a study of 149 children with hemiplegic, one third of children met the criteria for having a specific learning disability in reading, spelling, or math, and nearly half of the children with learning disabilities had problems in two or three areas despite an average verbal IQ. Learning disabilities have been shown to predict lower participation in children with CP (Bottcher, 2010).

Learning mathematics involves not one but a cluster of academic activities, each of which places different cognitive and social demands on the student. It is not enough to give students a test of arithmetic computation and feel satisfied that their mastery of mathematical learning is understood. Assessment of calculation is ordinarily carried out with pencil-and-paper tests, but for learning children with written language disability (e.g. reading or handwriting) assessment should also include oral presentations and responses of problems based on pictures or objects. Care must be taken to determine whether students understand the purpose or meaning of the calculation they are performing (Silver, 1989).

Children born prematurely, particularly those with birth weights below 1500 g, considered as a group, do less wll at school than their fully-developed contemporaries. This applies specially to the ability to solve mathematical problems, but it is also affects behaviour in the form of hyperactivity and ampared fine motor ability. Particularly exposed are those

children who have been so ill during their neonatal period that they had to be treated in respirators, or who suffered cerebral haemorrhage (Janson S, 2001).

2.4 Communication problems

Many people with CP are able to speak fluently and clearly. Some have difficulty with articulation, which can make speech difficult for a listener to understand. Others may be unable to speak because of motor problems and require alternate strategies, such as picture or symbol displays to communicate. This is more likely to be the case for people with extrapyramidal CP. Some people with CP have language learning disabilities (Fehlings, Hunt & Rosenbaum, 2007).

Communication disorders are developmental speech and language disorders which include expressive language disorders, mixed receptive-expressive language disorders, phonological disorder, stuttering and other unspecified communication disorders. Prevalence rates for communication disorders range from 1-13% children (Ramanujapuram, 2007).

Many children with more severe spastic CP experience communication problems due to disturbed neuromuscular control of speech mechanism, i. e, dysarthria, that diminish the ability of the child to speak intelligible. However, substantial dysarthria are most often seen in children with severe CP and intellectual disability, while most children with mild or moderate CP and average cognitive level of functioning have normal or near-normal expressive language and articulation skills (Bottcher, 2010).

In our Study, of all sample, 31 (38,75%) children with CP used nonverbal and sign communication, and 49 (61,25%) children used verbal communication (i.e. speech).

Illnesses during pregnancy	Speech impairment		
	Yes	No	Total
With illnesses during pregnancy	22 (73,3%)	8 (26,7%9	30 (100%)
Without illnesses during pregnancy	34 (68%)	16 (32%)	50 (100%)
Total	56 (70%)	24 (30%)	80 (100%)

X2=0,063 p=>0,05 RR=1,07

Table 11. Structure of children with CP and speech impairment according to the illnesses during pregnancy

Of 80 participants, 56 (70%) children have speech impairment.

In subgroup with illnesses during pregnancy, of 30 participants, 22 have speech impairment. In subgroup without illnesses during pregnancy, of 50 participants, 34 have speech impairment.

Of 60 participants with CP and intellectual disability, 50 children have speech impairment. Of 20 participants with CP and normal IQ, 6 children have speech impairment.

Epilepsy	Speech impairment		
	Yes	No	Total
With epilepsy	27	6	33
Without epilepsy	29	18	47
Total	56 (70%)	24 (30%)	80 (100%)

X2=7,186 p=0.0001
RR=2,89 CI=0,9978-8,3877

Table 12. Structure of children with CP and speech impairment according to the epilepsy

Children with epilepsy have 2,89 greater chance of having speech impairment.

Of 33 children with CP and epilepsy, 27 have speech impairment.

Of 47 children with CP and without epilepsy, 29 have speech impairment.

2.5 Visual impairments

The objective of the study "Prevalence and selected characteristics of childhood vision impairment was to examine the descriptive epidemiology of vision impairment among 6-10 years old children in metropolitan Atlanta, Georgia, USA. Children with vision impairment (n=310; 42% black, 56% white; 57% male, 43% female), defined as a best corrected visual acuity in the better eye of 20/70 or worse, were identified through the Metropolitan Atlanta Developmental Disabilities Surveillance Program (MADDSP). The MADDSP conducts active population-based surveillance of five developmental disabilities: vision impairment, intellectual disability, cerebral palsy, hearing impairment, and autism among 3-10 year old children in the five-county metropolitan Atlanta area. The severity of the child's vision impairment was categorized according to World Health Organization guidelines (20/70 through 20/400), blindness (worse than 20/400), or unknown. The overall vision impairment prevalence rate was 10,7 per 10000 children. Prevalence did not differ significantly by either sex or race. 59% had low vision; 64% of the children had one or more coexisting developmental disability. The most common combination was intellectual disability, CP, and epilepsy, which was found in 85 (27%) of the children with vision impairment in the study (Mervis, Boyle & Yeargin-Allsopp, 2002).

Over the last decade the term cerebral visual impairment (CVI) has come to indicate the clinical picture of the child who present with visual impairment due to cerebral pathology, generally in the retrogeniculate visual pathway. Perinatal hypoxia is probably the most frequent cause of CVI and leads to severe neurological sequel that worsen the clinical picture. The visual deficit in CVI involves three different aspects: the perceptual (the sheer visual impairment with subnormal visual acuity and visual field defects), the neuropsychological (attention, recognition, and spatial orientation), and the oculomotor aspects. The latter are so severe that not only does it bring about strabismus and nystagmus but other oculomotor mechanism, such as saccadic movements, pursuit, and vergence, are affected (Salati, Borgatti, Giammari & Jacobson, 2002).

Visual perception is the complex processes that enable us to perceive a wide array of visual qualities such as movement, depth, spatial relations, facial expressions, and, eventually, the identity of objects. The normal functioning of the visual system is thought to hinge on both

the integrity of the areas subserving visual-perceptual processes and early visual experience. Several studies have associated visuoperceptual impairment with reduction in the white matter in the parietal and occipital lobes in groups of children with spastic CP. The visuoperceptual impairments of children with spastic CP appear to be unrelated to general intelligence, nonverbal intelligence, or the presence of epilepsy (Bottcher, 2010).

Depending of the study, the prevalence of visuomotor and perceptual problems among children with spastic CP varies from 39% to 100% (Stiers & Vanderkelen, 2002)

In the Canadian Study "Comorbidities and clinical determinants of outcome in children with spastic quadriplegic (SQ) cerebral palsy", were included 92 patients (55 males and 37 females). This study demonstrated that the comorbidities of visual impairment, hearing loss, epilepsy, and the need for assisted feeding occur in a high proportion of children with SQ CP ranging from 33% (assisted feeding) to 80% (visual difficulty). Whether the child was born preterm or at term did not appear to significantly affect any of these eventual outcomes. It is demonstrated that visual impairment is the most common comorbidity in group of children with SQ. Studies have demonstrated that visual abnormalities vary from 10 to 39%. Periventricular leukomalacia (PVL) appears in prior studies to have correlation with observed visual impairment depending on the extent of white matter injury (Venkateswaran & Shevell, 2008).

In a representative series of 176 children with cerebral palsy, aged 5 to 8 years, associations were studied between additional neurodisabilities, activity limitation, and participation restrictions in the domains of mobility, education and social relations as proposed in the International Classification of Functioning Disability and Health (ICF). Visual impairment occurred in 20%, and infantile hydrocephalus in 9% of the children (Beckung & Hagberg, 2002).

Problems during pregnancy	Visual impairment		
	Yes	No	Total
With problems during pregnancy	18 (60%)	12 (40%)	30 (100%)
Without problems during pregnancy	22 (44%)	28 (56%)	50 (100%)
Total	40 (50%)	40 (50%)	80 (100 %)

X2=1,333 p>0,05

Table 13. Structure of children with visual impairment according to the subgroup

Of total sample (80 participants), 40 (50%) have visual impairmants.

Of 30 participants whose mothers had problems during pregnancy, 18 (60%) have visual impairments.

Of 50 participants whose mothers didn't have problems during pregnancy, 22 (44%) have visual impairments.

It is well known that impaired vision early in life from strabismus or ocular disorders can lead to permanent amblyopia because of reorganization of central visual pathways, and early hearing impairment can lead to impaired central auditory perception (Johnston, 2009).

In our research, of total sample, 40 (50%) participants have strabismus.

Of 30 participants whose mothers had problems in pregnancy, 17 (56,7%) have strabismus.

Of 50 participants whose mothers didn't have problems in pregnancy, 23 (46%) have strabismus.

Children whose mothers had illness during pregnancy have 1,2 times greater chance of strabismus.

Epilepsy	Visual impairment		
	Yes	No	Total
With epilepsy	15	18	33
Without epilepsy	25	22	47
Total	40	40	80

Table 14. Structure of children with CP and visual impairment according to the epilepsy

Of whole sample, 4 children (5%) were blind in both eyes, 2 children with epilepsy, and 2 without. One girl without epilepsy, had myopia gravis (- 10) and nystagmus.

2.6 Hearing impairment

Hearing loss is known to be prominent in patients with kernicterus, congenital infections, very low birthweight (VLBW) or severe hypoxic ishemic injury. Hearing impairment in groups of patients with CP ranged from 4 to 15% (Venkateswaran and Shevell, 2008).

In the Study of neuroimpairments, activity limitations, and participation restrictions in children with cerebral palsy, in Sweden, of 176 children with CP, severe hearing impairment have 2 children (Beckung & Hagberg, 2002).

In the study of the health status of 408 school-aged children with cerebral palsy, range 5 to 13 years, hearing ability among the children was very good; overall 97% could hear perfectly, while 2% (n=8) were deaf. There was suggestive evidence that a higher percentage of children with hearing difficulties was found in the Gross Motor Function Classification System (GMFCS) level V, but the numbers were small. In the whole sample, only 12 children (3% of the total) had a hearing ranking other than 1 (best); however, in GMFCS level V, 9 of 84 children (almost 11%) were classified by their parents as fitting into a hearing ranking other than 1 (Kennes, Rosenbaum, Hanna, Walter, Russell, Raina, Bartlett & Galuppi, 2002).

In our study, of total sample of 80 children and adolescents with CP, hearing impairment have 3 children (3,75%). All three children had intellectual disability, and two of them had epilepsy.

2.7 Behavioral and emotional problems

Professionals and parents need to be aware that children with cerebral palsy are at higher risk of psychological problems than their non-disabled peers and this may be attributable to problems in adjustment to their adverse circumstances as well as having an organic basis. Attention should be paid to the effective management of pain, particularly in children

unable to self-report for whom a reliable instrument for assessing pain now exists. The difficulties most commonly reported here were peer problems; as these may have implications for later psychological adjustment, follow up work into adolescence and beyond will be important. It may be that for many children with cerebral palsy and their families, chronic psychological problems will have a greater impact than the physical impairments and this possibility also needs to be investigated in longitudinal studies (Parkes, White-Koning, Dickinson, Thyen, Arnaud, Beckung & all, 2008).

Emotional and psychosocial problems are disproportionately high in people with epilepsy, particularly in people with intractable epilepsy. In one large study, approximately 50% of the children with intractable epilepsy were identified as having serious psychosocial problems. In another study, clear-cut psychiatric disorders were identified in 33% of children with epilepsy, as compared with 7% in the general population and 2% in children with other chronic illnesses. Some of the most problems include anxiety, depression, irritability, aggression, and irrational periods of rage. In children at risk for suicide, there is a fifteen-fold overrepresentation of children with epilepsy (Burnham, 2007).

Difficulties in psychosocial adjustment appear to be the major manifestation of learning disabilities. Children with learning disabilities experience less acceptance, lower popularity, more peer rejection, and increased neglect by peers than do normally achieving children or low-achieving peers. In addition to low self-esteem, social skills deficits and general psychosocial adjustment difficulties, many children with learning disabilities experience more serious psychopathology or seek psychiatric help. It has been estimated that 30-70% of children with learning disabilities will experience ongoing comorbid symptoms of attention-deficit/hyperactivity disorder (Ramanujapuram, 2007).

Children with epilepsy are at increased risk for depression and anxiety, and the effect of these conditions on their performance in the classroom can be significant. This is especially true for children who recently experienced their first seizure or may have been recently diagnosed with epilepsy. The condition of epilepsy carries with it a high degree of stigma and it can be confusing and scary for children, resulting in feelings of learned helplessness and loss of control. Adjustment disorders with behavioral or emotional features are not uncommon after the diagnosis and should always be considered as a potential etiology of learning problems (Titus & Thio, 2009).

3. Conclusion

There are large number of health and educational institutions in the Canton of Sarajevo which are working on re/habilitation and education of children and adolescents with intellectual and developmental disab**ilities,** but there isn't a unique database about the people with disabilities, as well as with the cerebral palsy. Lack of unique database indicates poor network among these institutions and Associations in the Canton of Sarajevo.

It is necessary to initiate a Project to open the Registers of neurology developmental disorders in Bosnia and Herzegovina as necessary factor for contemporary exchange of data and link toward European Register, as well as in order to improve organization of health care for children and adults with disability.

Children with prenatal etiology for CP have 1,2 times greater chance of developing epilepsy.

In our study with prenatal etiological factors were 35 (43,75%) participants: 15 with epilepsy and 20 without; with perinatal 37 (46,25%) participants: 14 with epilepsy and 23 without epilepsy; with postnatal 5 (6,25%) participants: 2 with epilepsy and 3 without epilepsy, and with unknown etiological factors 3 (3,75%) participants: 2 with epilepsy and 1 without epilepsy.

It is necessary to initiate more projects of Family Counseling, for education of young couples about etiological factors of learning disabilities, especially prenatal.

More children with CP and epilepsy stay at home without any institutional re/habilitation, and more children without epilepsy attend schools with special programs and mainstream schools.

In our Study, of 80 children and adolescents with cerebral palsy, 34 (42,5%) stay at home without any service of education: 15 female and 19 male; 18 with CP and epilepsy, and 16 with CP and without epilepsy.

Children with epilepsy have 2,89 greater chance of having speech impairment; X2=7,186 p=0.0001

RR=2,89 CI=0,9978-8,3877

Of 33 children with CP and epilepsy, 27 have speech impairment.

Of 47 children with CP and without epilepsy, 29 have speech impairment.

It is also necessary to conduct continuous education of the teaching staff at schools with general curriculum and parents of the children without intellectual disability, as well as health professionals.

In recent years, the probability of long-term survival has increased even among children with a severe level of disability. This means that appropriate services will need to be provided for children with CP through adolescence and into adulthood (Beckung & Hagberg, 2002).

Identification and heightened awareness of comorbidities of CP may assist physicians in guiding caregivers, delivering appropriate counseling, and helping families access suitable resources for their child. Such efforts will lessen the burdens of disability, minimizing secondary complications, and hopefully improve overall quality of life for both the child and family (Venkateswaran & Shevell, 2008).

It is necessary to implement contemporary principles in the management of the cerebral palsy in order to make improvements at all levels of health care, and not only the cure seeking treatment.

Preventions should be primary, secondary, and tertiary, with the guidelines given in this study.

Finally, it is important that all children with a diagnosis of CP should be followed up, and when no obvious cause has been identified or there is any evidence of regression, children should be referred to a pediatric neurologist (Gupta & Appleton).

4. Summary

The aims of the study "The influence of prenatal etiological factors on learning disabilities of children and adolescents with cerebral palsy" were:

- to identify the prenatal etiological factors of cerebral palsy in children and adolescents aged from 6 to 20 years in the Canton of Sarajevo, Bosnia and Herzegovina;
- to determine the learning disabilities among children with the cerebral palsy, and
- to determine relationship between prenatal etiological factors of cerebral palsy and learning disabilities of children and adolescents with cerebral palsy.

Importance of this study is reflected in the fact that this is the first time in Bosnia and Herzegovina that the influence of the prenatal etiological factors on learning difficulties of the children and adolescents with the cerebral palsy has been determined with use of a scientific method.

The study of the influence of prenatal etiological factors on learning disabilities of children and adolescents with cerebral palsy in the Canton of Sarajevo was conducted as a cohort, retrospective study. The sample was consisted of 80 participants, children and adolescents with cerebral palsy in the Canton of Sarajevo, age from 6 up to 20 years; mean age was 13,94 years, 47 male (58,75%) and 33 (41,25%) female. The sample was divided in two subgroups, first includes 30 participants whose mothers had problems during the pregnancy, and second includes 50 participants whose mothers didn't have problems during the pregnancy. The research data were collected using a structural interview for the parents of children and adolescents with cerebral palsy, which was developed by the investigator, based on professional and scientific literature, and personal experience. The Interview consists of 69 questions.

Of 33 children with cerebral palsy and epilepsy, 21 (63,6%) are male, and 12 (36,4%) are female. Of 47 children with cerebral palsy, and without epilepsy, 26 (55,32%) are male and 21 (46,68%) are female.

According to the time of influence, causes of cerebral palsy can be divided to prenatal (from conception until beginning of the delivery), perinatal (beginning of the delivery until age of 28 days) and postnatal (from 29th day of age until two years of age). In our study with prenatal etiological factors were 35 (43,75%) participants: 15 with epilepsy and 20 without; with perinatal 37 (46,25%) participants: 14 with epilepsy and 23 without epilepsy; with postnatal 5 (6,25%) participants: 2 with epilepsy and 3 without epilepsy, and with unknown etiological factors 3 (3,75%) participants: 2 with epilepsy and 1 without epilepsy. Of 33 children with cerebral palsy and epilepsy, 14 (42,4%) were able to walk independently, 1 (3%) child needs to hold a mother's or friend's hand, 2 (6%) children walks with assistive device (walker), and 16 (48,5%) children were unable to walk, in need of wheelchair. Of total sample of 80 participants, 34 (42,5%) were in need of wheelchair, and 46 (57,5%) were not. Of total sample of 80 children, 42 (52,5%) were able to walk independently.

Of 33 children with cerebral palsy and epilepsy, 4 (12,1%) have normal mental capacity, 1 (3%) border, 7 (21,2%) have mild intellectual disability, 9 (27,3%) have moderate intellectual disability, and 12 (36,4%) have severe intellectual disability. In our Study, of 80 children and adolescents with cerebral palsy, 34 (42,5%) stay at home without any service of education: 15 female and 19 male; 18 with CP and epilepsy, and 16 with CP and without epilepsy.

Of 80 participants, 56 (70%) children have speech impairment. In subgroup with illnesses during pregnancy, of 30 participants, 22 have speech impairment. In subgroup without illnesses during pregnancy, of 50 participants, 34 have speech impairment.

Of total sample (80 participants), 40 (50%) have visual impairmants. Of 30 participants whose mothers had problems during pregnancy, 18 (60%) have visual impairments. Of 50 participants whose mothers didn't have problems during pregnancy, 22 (44%) have visual impairments.

In our study, of total sample of 80 children and adolescents with CP, hearing impairment have 3 children (3,75%). All three children had intellectual disability, and two of them had epilepsy.

There are large number of health and educational institutions in the Canton of Sarajevo which are working on re/habilitation and education of children and adolescents with intellectual and developmental disab**ilities,** but there isn't a unique database about the people with disabilities, as well as with the cerebral palsy. Lack of unique database indicates poor network among these institutions and Associations in the Canton of Sarajevo.

Finally, it is important that all children with a diagnosis of CP should be followed up, and when no obvious cause has been identified or there is any evidence of regression, children should be referred to a pediatric neurologist (Gupta & Appleton).

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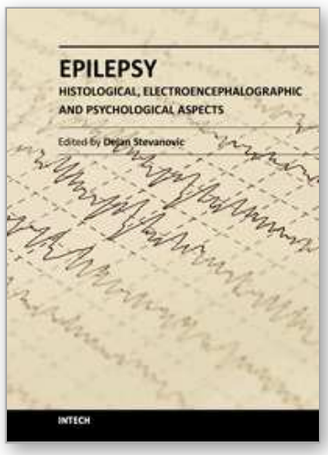

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With the vision of including authors from different parts of the world, different educational backgrounds, and offering open-access to their published work, InTech proudly presents the latest edited book in epilepsy research, Epilepsy: Histological, electroencephalographic, and psychological aspects. Here are twelve interesting and inspiring chapters dealing with basic molecular and cellular mechanisms underlying epileptic seizures, electroencephalographic findings, and neuropsychological, psychological, and psychiatric aspects of epileptic seizures, but non-epileptic as well.

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