

## FREQUENCY OF ASSOCIATED DIFFICULTIES OF PERSONS WITH CEREBRAL PARALYSIS

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### ABSTRACT

*Cerebral palsy is a group of permanent disorders of movement and posture that cause limitations in the activities and are the result of non-progressive disorders of the immature brain or the developing brain. Motor disorders are often associated with disorders of the senses, perception, cognition, communication, behavior, epilepsy, hearing, visual impairment and secondary musculoskeletal problems. The aim of this study is to examine the prevalence of associated difficulties of persons with cerebral palsy in the four cantons of the Federation of Bosnia and Herzegovina (FBiH) and to determine whether there is a statistically significant difference in the representation of associated difficulties between the cantons. The study was conducted on a sample of 120 respondents, persons with cerebral palsy from four FBiH cantons. The total sample of respondents was divided into 4 sub-samples of respondents. The results of the study showed that of the associated difficulties in persons with cerebral palsy, speech difficulties in 56.60%, intellectual disabilities 34.90%, visual impairment in 32.50%, epilepsy 20.90%, behavioral disorders 7.60% and autism in 2.40%. No statistically significant difference was found between cantons in the representation of associated difficulties for persons with cerebral palsy.*

**Key words:** cerebral palsy–associated difficulties–hearing impairment–visual impairment–speech difficulties–intellectual disabilities.

### 1 INTRODUCTION

Cerebral palsy is a group of permanent disorders of movement and posture that cause limitations in conducting activities and are the result of non-progressive disorders of the immature brain or the developing brain (Švraka et al, 2018). Motor disorders are often associated with disorders of the senses, perception, cognition, communication, behavior, epilepsy, hearing, visual impairment and secondary musculoskeletal problems (Mejaski-Bošnjak and Đaković, 2013).

Children with cerebral palsy most often show slower motor development during the first year of life, which is later reflected in delayed development of speech. Brain damage can lead to impaired auditory memory, auditory processing and cognition, and thus to altered voice quality, delayed speech development, and abnormal speech production. Motor development is associated with speech development, so the first step often accompanies the first word (Downey, 2003).

In children with cerebral palsy, common neurodevelopmental and sensory problems are often present, and it is necessary to register the presence or absence of these disorders, as it is known that their presence can limit an individual in daily activities (Demeši et al., 215).

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The presence of various visual impairments is very common in persons with cerebral palsy. Oculomotor and refractive errors are the most common vision problems in children with cerebral palsy. Strabismus and nystagmus are the most common oculomotor problems (Alimovic, 2012). The occurrence and severity of visual impairments varies with the type of cerebral palsy (Vucinic et al., 2012).

Hearing loss in children with cerebral palsy is usually sensorineural with a predisposition to be bilateral. The severity of hearing loss is correlated with the degree of motor and neurological disability (Weir et al, 2018). Children with cerebral palsy often have epilepsy. The relation between these two conditions is usually a brain lesion occurred in period of development. It starts early, in over 50% of cases, by the first year of life (Zelnik et al, 2010).

A significant number of children and adolescents with cerebral palsy are also persons with intellectual disabilities and other multiple impairments, making the process of habilitation, education and socialization more difficult and complex (Švraka, 2007).

The associated difficulties in persons with cerebral palsy further complicate and slow down their educational rehabilitation processes, especially if they are not detected and diagnosed in a timely manner to take adequate rehabilitation measures and to mitigate their effects. The consequences of associated difficulties are in many cases „perceived“ as the consequences of cerebral palsy.

**The aim** of this study is to examine the prevalence of associated difficulties of persons with cerebral palsy in the four cantons of the Federation of Bosnia and Herzegovina (FBiH) and to determine whether there is a statistically significant difference in the prevalence of associated difficulties among the cantons.

## 2 METHOD

### 2.1. Sample

The study was conducted on a sample of 120 respondents, persons with cerebral palsy from four cantons of FBiH, within the project of the Cerebral Palsy Associations „*Functional capacity of persons with disabilities, the main factor for improving the quality of life of the whole family*“. The total sample of respondents was divided into 4 sub-samples of respondents:

1. The first sub-sample of respondents
2. The second sub-sample of respondents
3. The third sub-sample of respondents
4. The fourth sub-sample of respondents

### 2.2. Study instrument

The study is retrospective and analytical-descriptive. The study used the „Questionnaire to Examine Associated Disabilities of Cerebral Palsy, Hearing Impairment and Other Associated Difficulties“. The measuring instrument consisted of 11 questions of nominal, ordinal and interval

type. One of the questions of the measuring instrument is „*Do you (your child) have any associated difficulties besides cerebral palsy?*“. The variables used within the question are: *hearing impairment, visual impairment, speech difficulties, intellectual difficulties, epilepsy, behavioral disorders, autism, some other difficulties and no associated difficulties*.

### 2.3. Statistical data processing

Based on the data obtained from the study, a database was formed. After checking the integrity of the data, a statistical analysis was performed in the software IBM SPSS Statistics v.20.0 for Windows. The data are presented in tabular form using classical descriptive statistics methods. The parametric statistics, analysis of variance (ANOVA) at the level of statistical significance of 0.05 was used to examine the statistical significance of differences between the sub-samples of the respondents.

## 3 RESULTS AND DISCUSSION

An insight into the frequency and percentage distribution (Table 1) shows that 64 or 53.33% of respondents are male and 56 or 46.67% female.

Based on the results of the ANOVA test, it can be concluded that, at the set level of statistical significance of 0.05, **there is a statistically significant difference in the gender of the Tuzla Canton respondents** ( $p=0.0331$ ). For **Canton Sarajevo** ( $p=0.8629$ ), **Zenica-Doboj Canton** ( $p=0.7696$ ) and **Bosnia-Podrinje Canton** ( $p=0.9404$ ), **no statistically significant difference was observed in the gender of the respondents**.

The largest number of respondents was at age up to 15 years, 37 or 30.83% (22 or 18.33% male and 15 or 12.5% female). The second most frequent are respondents at age group 26-35 years, 28 or 23.33% (17 or 14.17% male and 11 or 9.16% female). The respondents in the age group from 16-25 years are in third place by frequency, 26 or 21.67% (11 or 9.17% male and 15 or 12.5% female). The respondents from 36 to 45 years of age are represented by 16 or 13.33%, (7 or 5.83% male and 9 or 7.5% female), and the respondents aged 46 to 55 with 8 or 6.67% of respondents (4 or 3.33 both sexes). Quite a small number of respondents at age group 56-65 years, 4 or 3.34% (2 or 1.67 male and 2 or 1.67 female). There are the least number of respondents over 65 years of age, 0.83% or 1 male respondent at age of 68 years.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05, **there is no statistically significant difference in age at all age groups between the sub-samples of the respondents**.

Table 2 shows the **distribution of frequencies and percentages of associated difficulties in the total sample**. Based on the distribution of frequencies and percentages of associated difficulties for persons with cerebral palsy, it can be concluded that seven associated difficulties are present: speech and intellectual disabilities, visual impairment, hearing, epilepsy, behavioral disorders and autism.

Table 1. Relationship between gender and age

Age	Canton Sarajevo		Zenica-Doboj Canton		Bosnia-Podrinje Canton		Canton Tuzla (Sapna)		Total			ANOVA (p)
	Pol	Ž (%)	Pol	Ž (%)	Pol	Ž (%)	Pol	Ž (%)	M (%)	Ž (%)	(%)	
0-15	3 (2.5)	1 (0.83)	15 (12.5)	8 (6.67)	1 (0.83)	3 (2.5)	3 (2.5)	3 (2.5)	22 (18.33)	15 (12.5)	37 (30.83)	0.6181
16-25	3 (2.5)	4 (3.33)	5 (4.17)	5 (4.17)	1 (0.83)	3 (2.5)	2 (1.67)	3 (2.5)	11 (9.17)	15 (12.5)	26 (21.67)	0.8350
26-35	8 (6.67)	4 (3.33)	2 (1.67)	4 (3.33)	4 (3.33)	2 (1.67)	3 (2.5)	1 (0.83)	17 (14.17)	11 (9.16)	28 (23.33)	0.3766
36-45	3 (2.5)	8 (6.67)	2 (1.67)	-	1 (0.83)	1 (0.83)	1 (0.83)	-	7 (5.83)	9 (7.5)	16 (13.33)	0.8505
46-55	2 (1.67)	2 (1.67)	-	-	1 (0.83)	2 (1.67)	1 (0.83)	-	4 (3.33)	4 (3.34)	8 (6.67)	0.8855
56-65	-	2 (1.67)	-	-	1 (0.83)	-	1 (0.83)	-	2 (1.67)	2 (1.67)	4 (3.34)	0.9091
> 65	-	-	-	-	-	-	1 (0.83)	-	1 (0.83)	-	1 (0.83)	0.9335
Total	19 (15.84)	21 (17.5)	24 (20.01)	17 (14.17)	9 (7.48)	11 (9.17)	12 (10)	7 (5.83)	64 (53.33)	56 (46.67)	120 (100)	
ANOVA (p)	0.8629		0.7696		0.9404		0.0331					

Table 2. Frequency of associated difficulties

No.	Variables	Canton Sarajevo		Zenica-Doboj Canton		Bosnia-Podrinje Canton		Canton Tuzla (Sapna)		Total		ANOVA (p)
		%	%	%	%	%	%	%	%			
1.	Speech difficulties	24	20.00	27	22.50	10	8.30	7	5.80	68	56.60	0.6356
2.	Intellectual difficulties	12	10.00	15	12.40	8	6.70	7	5.80	42	34.90	0.8395
3.	Visual impairment	10	8.30	14	11.70	8	6.70	7	5.80	39	32.50	0.8565
4.	Epilepsy	5	4.20	8	6.70	7	5.80	5	4.20	25	20.90	0.9069
5.	Hearing impairment	4	3.30	5	4.20	2	1.70	2	1.70	13	10.90	0.9107
6.	Behavioral disorder	2	1.70	3	2.50	2	1.70	2	1.70	9	7.60	0.9259
7.	Autism	1	0.80	1	0.80	0	0.00	1	0.80	3	2.40	0.9321
8.	There are no associated difficulties	7	5.80	6	5.00	4	3.30	3	2.50	20	16.60	0.9019
9.	Some other difficulty	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	

Of the associated difficulties in persons with cerebral palsy *the most common are speech difficulties*. Out of a total of 120 respondents, *56.60% of persons with cerebral palsy (68 respondents) have speech difficulties*. Speech difficulties are most prevalent in persons with cerebral palsy from the Zenica-Doboj Canton, 22.50% of respondents. In Sarajevo Canton, speech difficulties in persons with cerebral palsy are represented by 20.00%. In Bosnia-Podrinje Canton, 8.30% of persons with cerebral palsy have speech difficulties, and in Tuzla Canton, 5.80% of persons with cerebral palsy have speech difficulties.

Based on the results of the ANOVA test, it can be concluded that, at the set level of statistical significance of 0.05, *no statistically significant difference was found between the cantons for the speech difficulty variable* (ANOVA  $p=0.6356 >0.05$ ).

*Of baseline, 34.90% of persons with cerebral palsy have intellectual disabilities* (42 respondents). Analyzed by cantons, intellectual disabilities are most prevalent in

persons with cerebral palsy from Zenica-Doboj Canton 12, 40% of respondents. In Sarajevo Canton, 10.00% of persons with cerebral palsy have intellectual disabilities. In Bosnia-Podrinje Canton, persons with cerebral palsy have intellectual disabilities in 6.70%, while in Tuzla Canton they are present in 5.80%.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between cantons for the variable of intellectual disability* (ANOVA  $p=0.8395 >0.05$ ).

*In total sample 32.50% of persons with cerebral palsy have visual impairment* (39 respondents). The highest percentage of visual impairment is found in persons with cerebral palsy in the Zenica-Doboj Canton, 11.70%. In Sarajevo Canton, 8.30% of persons with cerebral palsy have visual impairment, while in Bosnia-Podrinje Canton this percentage is slightly lower 6.70%. The percentage of visual impairment in persons with cerebral palsy in Tuzla

Canton is 5.80%.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between the cantons for the variable visual impairment* (ANOVA  $p=0.8565 >0.05$ ).

*In total, 20.90% of persons with cerebral palsy have epilepsy* (25 respondents). Analyzed by cantons, epilepsy is the most prevalent among persons with cerebral palsy from Zenica-Doboj Canton, 6.70% of respondents. In Bosnia-Podrinje Canton, 5.80% of persons with cerebral palsy have epilepsy. The same percentage of epilepsy in persons with cerebral palsy is in the Sarajevo Canton and Tuzla Canton, 4.20% each.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between the cantons for the variable epilepsy* (ANOVA  $p=0.9069 >0.05$ ).

*Hearing impairment is reported in 10.90% of persons with cerebral palsy* (13 respondents). The highest percentage of hearing impairment in persons with cerebral palsy is in the Zenica-Doboj Canton, 4.20%. In the Sarajevo Canton, 3.30% of persons with cerebral palsy have hearing impairment, while in Tuzla and Bosnia-Podrinje Cantons, 1.70% of persons with cerebral palsy have hearing impairment respectively.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between cantons for the variable hearing impairment* (ANOVA  $p=0.9107 >0.05$ ).

*Behavioral disorders are reported in 7.60% of persons with cerebral palsy* (9 respondents). Frequencies and percentages of behavioral disorders in persons with cerebral palsy are approximately the same in all cantons. Behavioral disorders are most prevalent in Zenica-Doboj Canton 2.5%. Behavior disorders in Sarajevo Canton, Bosnia-Podrinje Canton and Tuzla Canton are present in 1.70% in each.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between cantons for the variable behavioral disorder* (ANOVA  $p=0.9259 >0.05$ ).

*From baseline, 2.40% of persons with cerebral palsy have autism as an associated disorder* (3 respondents). Autism in the Sarajevo Canton, Zenica-Doboj Canton and Tuzla Canton is present in 0.8% each, while in the Bosnia-Podrinje Canton, autism was not reported as an associated problem in the tested sample.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between the cantons for the variable autism* (ANOVA  $p=0.9321 >0.05$ ).

Out of a total of 120 respondents, **16.60% stated that they had no associated difficulties** (20 respondents). The

highest percentage of persons with cerebral palsy without associated disabilities is 5.80% in Sarajevo Canton, then 5.00% in Zenica-Doboj Canton, 3.30% in Bosnia-Podrinje region and 2.5% in Tuzla Canton.

Based on the results of the ANOVA test, it can be concluded that at the set level of statistical significance of 0.05 *no statistically significant difference was found between the cantons for the variable - without associated difficulties* (ANOVA  $p=0.9019 >0.05$ ).

Respondents did not indicate *any other difficulty*, if any, that was not covered by the variables offered.

Table 3 shows the *distribution of frequencies and percentages of associated difficulties by cantons*.

*The most common associated difficulties of persons with cerebral palsy in the Sarajevo Canton are:* speech difficulties (60%), followed by intellectual disabilities (30%), visual impairment (25.00%), epilepsy (12.50%), hearing impairment (10.00%), behavioral disorders (5.00%) and autism (2.50%). Only 17.50% of persons with cerebral palsy in the Sarajevo Canton have no associated difficulties.

*In the Zenica-Doboj Canton, the most common associated difficulties for persons with cerebral palsy are:* speech difficulties (65.85%), followed by, intellectual disabilities (36.59%), visual impairment (34.15%), epilepsy (19.51%), hearing impairment (12.20%), behavioral disorders (7.32%) and autism (2.44%). Only 14.63% of persons with cerebral palsy in the Zenica-Doboj Canton have no associated difficulties.

*The most common associated difficulties of persons with cerebral palsy in the area of Bosnia-Podrinje Canton are:* speech difficulties (50.00%), then, intellectual disabilities (40.00%), visual impairment (40.00%), epilepsy (35.00%), hearing impairment (16.67%) and behavioral disturbance (10%). Only 14.63% of persons with cerebral palsy in the Bosnia-Podrinje Canton have no associated difficulties.

*In the Sapna area, the most common associated difficulties for persons with cerebral palsy are:* speech difficulties, intellectual disabilities and visual impairment, which are represented by a percentage of 36.84% each, followed by epilepsy (26.32%), hearing impairment (10.53%), behavioral disorders (10.53%) and autism (5.26%). Only 15.79% of persons with cerebral palsy in the Sapna region have no associated difficulties.

Looking at Table 4, it can be concluded that 34 or 28.33% of respondents have one associated difficulty (17 or 14.16% of male and female respondents respectively). The same number and percentage of respondents have two associated difficulties, 34 or 28.33% (18 or 15% of male and 16 or 13.33% of female respondents). The second most prevalent are respondents with three associated difficulties, 17 or 14.17% (11 or 9.17% male and 6 or 5.00% female). Respondents with four associated disabilities ranked third in terms of representation, 12 or 10% of them (7 or 5.83% of male and 5 or 4.17% of female respondents). With five associated difficulties, 2 or 1.67% of the respondents are both male. The seven associated difficulties had one female respondent, accounting for 0.83%. There are no associated difficulties in

**Table 3. Frequency of associated difficulties by cantons**

No	Variable	Canton Sarajevo		Zenica-Doboj Canton		Bosnia-Podrinje Canton		Canton Tuzla (Sapna)	
			%		%		%		%
1.	Speech difficulties	24	60.00	27	65.85	10	50.00	7	36.84
2.	Intellectual difficulties	12	30.00	15	36.59	8	40.00	7	36.84
3.	Visual impairment	10	25.00	14	34.15	8	40.00	7	36.84
4.	Epilepsy	5	12.50	8	19.51	7	35.00	5	26.32
5.	Hearing impairment	4	10.00	5	12.20	2	16.67	2	10.53
6.	Behavioral disorder	2	5.00	3	7.32	2	10.00	2	10.53
7.	Autism	1	2.50	1	2.44	0	0.00	1	5.26
8.	Some other difficulty	0	0.00	0	0.00	0	0.00	0	0.00
9.	There are no associated difficulties	7	17.50	6	14.63	4	20.00	3	15.79

**Table 4. Frequency of the number of associated difficulties**

No.	Variables	Canton Sarajevo		Zenica-Doboj Canton		Bosnia-Podrinje Canton		Canton Tuzla (Sapna)		Total		
		M	F	M	F	M	F	M	F	M	F	(%)
1	One associated difficulty	3	8	7	3	4	4	3	2	17	17	34
										(14.16)	(14.16)	(28.33)
2	Two associated difficulties	8	4	6	8	2	2	2	2	18	16	34
										(15.00)	(13.33)	(28.33)
3	Three associated difficulties	3	2	5	2	-	1	3	1	11	6	17
										(9.17)	(5.00)	(14.17)
4	Four associated difficulties	3	1	2	1	-	2	2	1	7	5	12
										(5.83)	(4.17)	(10.00)
5	Five associated difficulties	-	-	1	-	1	-	-	-	2	-	2
										(1.67)		(1.67)
6	Seven associated difficulties	-	1	-	-	-	-	-	-	-	1	1
											(0.83)	(0.83)
7	Without associated difficulties	2	5	3	3	2	2	2	1	9	11	20
										(7.5)	(9.17)	(16.67)
Total		19	21	24	17	9	11	12	7	64	56	
		40		41		20		19		120		

20 or 16.67% of respondents (9 or 7.5% of male and 11 or 9.17% of female respondents).

**3.1. Similar studies**

In children with cerebral palsy, various sensory and perception disorders are common, especially in the area of vision and hearing, so that one quarter to one half of children with cerebral palsy have some visual impairment, impaired ocular muscle function and visual motor disorders, and each fourth child has hearing impairment, while both auditory and visual perception are often impaired (Golubović et al, 2005).

According to study carried out at five special institutions in Sarajevo Canton, on a sample of 58 children (pupils) with cerebral palsy, musculoskeletal disorders or other motor disorders found that 74.13% of the respondents had some of the associated difficulties. In total, 27.59% of the respondents have more than one associated difficulty. The results of the study showed that of the associated difficulties, the most common were: intellectual disabilities 43.10%, visual impairment 29.31%, speech difficulties 10.34%, hearing impairment 8.62%, epilepsy 8.62%, behavioral disorders 1.73% and autism 1.73% (Salkic, 2015).

Children with cerebral palsy as associated disorders have autism 79.6%, intellectual disabilities 56.9% and epilepsy 55.1% (Arora et al., 2018).

Speech and voice disorders are very common in the clinical picture of childhood cerebral palsy. The most common speech disorders are dysarthria, dyslalia, underdeveloped speech, rhinolalia, aphonia, and motor aphasia (Mikov et al., 2015).

Studies examining speech-language impairment show that speech-language impairment is an associated deficit in 28-43% of cases of children with cerebral palsy (Demeši et al, 2015).

Depending on the form of cerebral palsy, speech is most preserved in spastic and the most severe impairments are in mixed form of cerebral palsy (Savic and Djuric, 2005).

Every fourth child with cerebral palsy has hearing impairment and often impaired auditory and visual perception (Golubović, 2005).

The incidence of epilepsy in children with cerebral palsy is 20 - 90% (Zelnik, 2010). Beckung (2002) states that 35% of children with cerebral palsy have epilepsy, and Švraka (2005) has found epilepsy in 36.17% of cases.

In a study examining the impact of prenatal etiological factors on learning difficulties in children and adolescents with pediatric cerebral palsy in Sarajevo Canton, Švraka (2004) states that of 80 children, 3 children (3.75%) have hearing impairment. All three children have intellectual disabilities and two have epilepsy.

#### 4 CONCLUSION

1. Speech disorders are the most common among the associated difficulties for persons with cerebral palsy. 56.60% of persons with cerebral palsy have speech difficulties. No statistically significant difference was found between cantons in the incidence of speech impairment in persons with cerebral palsy.
2. In our sample, 34.90% of persons with cerebral palsy have intellectual disabilities
3. Visual impairment is present in 32.50% of persons with cerebral palsy
4. From baseline, 20.90% of persons with cerebral palsy have epilepsy
5. From baseline, 10.90% of persons with cerebral palsy have hearing impairment
6. From baseline, 7.60% of persons with cerebral palsy have a behavioral disorder
7. From total, 2.40% of persons with cerebral palsy have an associated problem in form of autism
8. There are no associated problems in 16.60% of persons with cerebral palsy

**Majority of persons with cerebral palsy (83.33%) have some associated difficulty.** The highest percentage is with one or two associated difficulties, 28.33%. Three associated difficulties had 14.17%, and four 10% of persons with cerebral palsy. A smaller percentage are persons with five associated disabilities, 1.67%, and the lowest with seven associated disabilities 0.83%.

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