MEDICO - GEOGRAPHICAL ANALYSIS OF DYSLEXIA AMONG CHILDREN IN BULGARIA

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ABSTRACT

Dyslexia is a communicative disorder in which there is an inability to perceive and process the written form of speech through various sensory modalities. It is associated with difficulties in the process of processing information, which has an impact on the literacy process and is characterized by differences and inconsistencies between tasks and their implementation. The aim of the present work is to make a medico-geographic analysis of children with dyslexia in Bulgaria for the period 2010-2022. The medico-geographical research is significant in this case and connected with the school's geographical education. In addition to disorders in reading, writing, and mathematical abilities, students may have difficulties determining the geographical position of objects and locating them on the map, reading tables, and diagrams, describing phenomena and objects, etc., due to disorders in spatial orientation. Children with dyslexia are a category that requires a variety of knowledge from the geography teacher, including in the fields of medicine and communication disorders. In the present work, the number of children with dyslexia and their territorial distribution will be analyzed in the country and by districts. Specialists who work with children are few and it is necessary to be proposed a model in which children with dyslexia are covered by enough specialists..

Keywords: Bulgaria, medico-geographical analysis, dyslexia, geography

INTRODUCTION

Medico-geographic studies and analyzes in the field of child development are of particular importance. In Bulgaria, such analyzes are performed only by doctors or specialists in health care and work with children. Geography remains out of the process, and medical geography can be of significant help in solving complex health problems across the country. The need for specialists in places could be analyzed and qualitative planning could be made for the needs of the population and the future development of the territory through medical-geographic research and geographic information systems.
Geographers are interested in questions, pointed at theoretical issues and spatial models of medical geography [7], the vital need for geographical research in the development of some diseases in Bulgaria [1], [2], the specific language impairments, the problem with dyslexia, the necessity of oncogeography.
Dyslexia is within the scope of geography's scientific interest because children are society's most valuable priority. They must be well cared for and institutions and specialists must provide quality care for them. The problem arises when a particular

disorder is detected in children and there is no specialist to help. Moreover, with the advancement of the child's age and with the introduction of the study discipline "Geography and Economics" after the age of 10-11, some difficulties are observed, related to orientation in the surrounding area, reading and analyzing geographical maps, map schemes, tables, diagrams.

Dyslexia is a complex problem and requires cooperation at different levels and of various specialists. Written speech, as a complex analytical-synthetic activity, develops based on oral speech and is a continuation of it [10]. Unlike oral language, reading and writing could only be acquired through special training, and literacy for Bulgarian children is after the sixth year. It is estimated that between 5-10% of children have disorders in the field of reading, writing, and/or mathematical operations and are dyslexic [3].

The term dyslexia was used for the first time in 1887 by the German doctor Berlin to denote isolated disorders in reading, in children with preserved intellectual functioning [3]. In 1968, the World Federation of Neurology gave one of the first definitions of Dyslexia, according to which it is a disorder manifested by difficulties in learning and reading, despite adequate conventional instruction, sufficient intelligence, and socio-cultural opportunities. Similar are the definitions of the International Statistical Classification of Diseases and Health Problems [ICD-10], of the World Health Organization [21] and the diagnostic criteria for the reading disorders of DSM-IV [11]. They describe learning difficulties as specific disorders in the development of school skills (F81). According to the specific content, the various disorders are divided into - a specific reading disorder (F81.0), which is designated as developmental dyslexia, a specific spelling disorder (F81.1), and a specific disorder of arithmetic abilities (F81.2) - dyscalculia [21].

THEORY AND METHODOLOGY

Dyslexia is perceived as a specific disorder of the ability to learn, a consequence of "a different type of information processing, which limits the development of literacy and leads to a discrepancy between expected and actual achievements in school" [16], [8]. In the clinical picture of the disorder, it manifests as a specific difficulty in spelling analysis, reading, and writing, and it is not necessary to observe disorders in all areas. Mathematical, musical, motor, and organizational skills could sometimes be affected. Spatial orientation in some individuals is impaired, which leads to additional problems in learning geography.

There are various theories that attempt to explain the etiology of the disorder. The first is the genetic theory, according to which there is a genetic predisposition to dyslexia, which varies between 32% and 62% [17], [15]. According to genetic studies, it is suggested that there are defects in chromosomes 1, 6, 15, and 18 [20].

Another theory is the phonological one, which is perceived as leading in the development of dyslexia. Developmental Dyslexia is commonly described as a language-based disorder in which phonological processing is often compromised [13].

Opposite to these theories of the etiology of dyslexia are the temporal, cerebellar (cerebellar and cerebellar-vestibular), and magnocellular theories.

According to the temporal deficit theory, the leading factor in dyslexia is the auditory deficit, and phonological problems are a result of the auditory deficit. It is thought that it is developed as a result of a disturbance in the processing of auditory information in the temporal zone [19].

The cerebellar theory was proposed by Nicolson and Fawcett [14] and is thought it is a result of delayed or dysfunctional articulation. Moreover, the difficulties that are often observed in mastering the corresponding grapheme-phoneme can be explained by the weak capabilities of the automatic control of articulation.
Cerebellar-vestibular theory, in turn, is based on the fact that the cerebellum integrates and regulates sensory impulses from receptors in the eye, ear, and proprioceptors, which can lead to poor visual-motor coordination [12].
Magnocellular theory brings together the theories, which were mentioned. According to it, deficits in dyslexia are due to a general difficulty in processing time. These general difficulties in the time required to process sensory information are related to the magnocellular system in the brain, whose pathways affect all sensory modalities [18].
Despite the existence of various opposing theories that explain dyslexia, all consider it as a multifactorial syndrome, an interaction between exogenous factors and the structural and functional characteristics of the central nervous system.
The purpose of this report is to analyze the medical-geographical situation in the frequency and prevalence of dyslexia in children in Bulgaria at the district level and to pay attention to the problem and specialists who take care of the children.
The object of the present study is children from 2nd to 12th grade who do not attend a special education school in Bulgaria. The data for this scientific article was provided by the Ministry of Education and Science in accordance with the Law on access to public information. Both individuals with dyslexia and professionals who care for children were examined. Dyslexia is diagnosed after the literacy process is complete, and the usual developmental errors are not allowed. We should note that, unlike other communication disorders, these children are covered by the education system, and the data cover the real number of children. Some of the children visit private therapeutic centers, where speech therapy, psychological and other services, including kinesitherapy, occupational therapy or ergo-therapy, and psychomotorics are included.
Methods which are used are the descriptive, statistical, method of analysis, and synthesis, historical and cartographic methods. First-grade children are not considered because the literacy process is not over, and the mistakes that could be made are part of the development.

RESULTS AND DISCUSSION

According to data from the last population census of Bulgaria, in 2021, the population in the age category 0-19 years is 1,312,173 people out of 6,838,937 people, or about 19.2% of the country's population. Education in geography at school starts in the 5th grade (children are around 10-11 years old). There are 349,723 children in this age category - 10-14 years, and 319,108 in the 15-19 age category. Children who are registered with learning difficulties and dyslexia in the country are 9,695 people, and these data include children aged 8-19. The relative share is not high, but the problems with the inability to cover all children with difficulties are visible.
The data of the National Statistical Institute [22], and the Ministry of Education and Science in Bulgaria [23], for children with dyslexia for the period 2010-2023 fluctuate widely (Table No. 1). The largest increase in registered cases was observed in the regions of Blagoevgrad, Varna, Vidin, Vratsa, Gabrovo, Dobrich, Kardjali, Kyustendil, Pazardzhik, Pernik, Plovdiv, Silistra, Sliven, Smolyan, Sofia - city, Sofia-region, Stara Zagora, Targovishte, Haskovo, Shumen and Yambol. In some of the districts, the increase

in the number of children is not high, but in other places, more than a 2-3 times increase in the number of students with dyslexia is registered (Figure No. 1).
In the regions of Burgas, Veliko Tarnovo, Lovech, Montana, Pleven, Razgrad, and Ruse, a decrease in cases of dyslexia is noted. Some of the districts, although registering a decrease, it is with too few cases. This raises doubts about whether the parents recognize and seek help and a solution to the problem, or whether some of the families of these children migrate to larger cities in connection with the availability of better quality specialists. Another problem is the increasing illiteracy among students, without paying attention to possible difficulties, especially in small settlements far from urban centers. The periphery of the country is in deep crisis and the young people who live there do not have many opportunities. Specialists are missing or access to them is difficult. A significant problem that follows many others is the lack of information on issues related to dyslexia in children. With a shortage of healthcare professionals, there is often a shortage of teachers as well. If there are not good educators to notice a possible problem, even at a later age, the disorder deepens.

Figure 1. Mapscheme of the increase and reduction in cases of dyslexia by districts in Bulgaria, 2022
Source: National statistical institute; Ministry of education and science

Bulgaria has a well-developed system of speech therapy clinics. Initially, speech therapy assistance was provided within the "Speech Therapy Schools" or in an office in the "Special Schools" in the so-called "closed institutions". At the beginning of the democratic changes in the 1990s, speech therapy began to be deinstitutionalized and the "State Speech Therapy Centers" were set up, where children not only with communication disorders were admitted.
As reported by Mitova [4], [5], [6], the change in the attitude towards children with disabilities is slow and difficult, and only through the "National Program for the Development of School Education and Preschool Education and Preparation 2006 -2015" children with disorders have access to various specialists, not just speech therapy.

It can be seen from the data (Table No. 1) that the number of specialists in the country and by region has increased during the period. The number of speech therapists has increased about 4 times compared to 2010, psychologists - about 5 times, and special education teachers - about 2 times. This shows a good trend in the development of personnel and is part of the improvement of the population care and health care system. In reality, in the country there is no unified system for the quality of specialists and whether they improve their qualifications because they also work with other communication disorders.

In Bulgaria, one speech therapist works with 9 children, one psychologist - with 6.8 children, and one special education teacher - with 5 children (on average, for 2022-2023). In 2022-2023, with the highest number of children and students with dyslexia is the city of Sofia. It is understandable and expected. The institutions are located there, and access to speech therapists, psychologists, and special education teachers is faster and easier. The fewest children are registered in the Kyustendil district. The reasons are many and varied, but some of the main ones are the aging population, the low birth rate, and the emigration of young people from the region (Figure No. 2).

There are about 8 children per speech therapist in the city of Sofia, 6,5 children per psychologist, and 5.4 children per special education teacher. There are good conditions for working with children with dyslexia in the city of Sofia, with indicators lower than the average for the country. In the Sofia region, there are about 10.5 children per speech therapist, but the city of Sofia is the educational center and many of the children in the region visit specialists in the city.

The Smolyan region is an example of a territory with a lack of specialists. There are 28.5 children per 1 speech therapist, 17 children per 1 psychologist, and 8 children per 1 special education teacher. Gabrovo and Vratsa districts also have deteriorated indicators. Is it possible for a speech therapist to work well and qualitatively with almost 30 children with dyslexia?

Specialists work with over 30 children with various disorders - motor, sensory, language and learning, and emotional-behavioral within 20 hours a week. It is necessary to create groups of children so every child could be covered. This reduces the quality of therapy.

Table 1. Reference for the number of children and students with dyslexia, studying in schools, kindergartens and centers for special educational support by districts in Bulgaria

№	District	2010/2011				2016/2017				2022/2023			
		Number of children and students with dyslexia	Number of specialists			Number of children and students with dyslexia	Number of specialists			Number of children and students with dyslexia	Number of specialists		
			Speech therapists	Psychologists	Special education teachers		Speech therapists	Psychologists	Special education teachers		Speech therapists	Psychologists	Special education teachers
	1	2	3	4	5	26	27	28	29	50	51	52	53
1	Blagoevgrad	184	28	10	36	346	39	20	52	495	55	50	63
2	Burgas	267	12	10	49	382	32	35	73	234	52	71	84
3	Varna	301	4	24	34	662	41	44	56	486	100	101	116
4	Veliko Tarnovo	243	14	9	31	365	17	24	42	231	35	53	51
5	Vidin	95	9	5	23	198	9	10	28	223	12	15	30
6	Vratsa	90	5	5	31	344	19	13	52	416	35	40	90
7	Gabrovo	61	6	6	10	120	11	12	16	143	12	18	28
8	Dobrich	178	8	6	14	257	14	10	20	247	28	29	42
9	Kardzhali	110	4	4	16	171	6	10	24	147	11	27	30
10	Kyustendil	63	7	3	20	176	9	6	26	77	12	15	26
11	Lovech	112	8	4	11	171	11	8	26	107	15	20	27
12	Montana	185	6	4	21	199	12	14	34	130	14	18	33
13	Pazardzhik	174	6	11	43	322	15	23	56	244	36	59	74
14	Pernik	155	2	3	20	234	8	9	32	185	18	23	49
15	Pleven	327	8	13	30	279	18	32	55	239	44	67	83
16	Plovdiv	335	20	15	58	383	29	36	65	351	66	116	122
17	Razgrad	207	0	9	29	189	7	10	34	122	14	22	34
18	Ruse	287	8	10	43	319	11	16	51	271	17	34	57
19	Silistra	149	3	3	21	224	10	9	34	219	20	25	51
20	Sliven	62	5	8	26	207	12	20	34	196	23	33	60
21	Smolyan	231	6	7	36	445	18	16	56	655	23	39	80
22	Sofia city	786	30	65	154	1591	133	138	165	2154	260	330	396
23	Sofia-district	73	7	3	0	183	11	11	8	283	27	33	37
24	Stara Zagora	215	10	11	53	542	15	22	50	620	48	68	118
25	Targovishte	285	4	4	28	404	8	14	42	406	21	25	56
26	Haskovo	273	2	7	42	375	27	13	47	406	29	40	53
27	Shemen	67	5	5	24	206	24	15	36	288	34	35	46
28	Yambol	111	5	6	22	116	13	12	23	120	19	27	32
	Total:	5626	232	270	925	9410	579	602	1237	9695	1080	1433	1968

Source: National statistical institute; Ministry of education and science

Figure 2. Mapscheme of the number of children with dyslexia by districts in Bulgaria, 2022
Source: National statistical institute; Ministry of education and science

CONCLUSION

Dyslexia accompanies people throughout their lives. The problems with difficulties with dyslexia among children and young people in Bulgaria are serious, but the population does not pay attention, is not familiar with and is not interested in the raised issue. A large number of these children are thought to have no interest in learning and education, but in fact, they have a communication disorder. Some children with dyslexia also have attention deficit hyperactivity disorder.

One of the goals of the article - to give more publicity to the problem - has been fulfilled. Parents and specialists in childcare facilities and schools must monitor and recognize the problem in time. That way, the individual work with the child will start as early as possible. There are tests for detecting early markers of dyslexia - a picture test for phonological awareness for children 4-7 years old [9] in Bulgaria. The problem is how many dyslexic children can be tested with it because specialists familiar with the test are not many.

REFERENCES

[1] Бояджиев, В. (2009) Медицинската география в Италия. Сб. Доклади, Симпозиум „Природа-здраве“, Българско дружество по медицинска география, Издателство на Съюза на учените в България, С.

Boyadzhiev, V. (2009) Meditsinskata geografiya v Italiya. Sb. Dokladi, Simpozium „Priroda-zdrave“, Bŭlgarsko druzhestvo po meditsinska geografiya, Izdatelstvo na Sŭyuza na uchenite v Bŭlgariya, S.

[2] Бояджиев, В. (2011) Географска характеристика на туберкулозното заболяване сред донаборниците и срочнослужащите в армията в годините преди Балканската война. Сб.

Доклади VIII национален конгрес по медицинска география с международно участие, Българско дружество по медицинска география, С.

Boyadzhiev, V. (2011) Geografska kharakteristika na tuberkuloznoto zabolyavane sred donabornitsite i srochnosluzhashtite v armiyata v godinite predi Balkanskata voĭna. Sb. Dokladi VIII natsionalen kongres po meditsinska geografiya s mezhdunarodno uchastie, Bŭlgarsko druzhestvo po meditsinska geografiya, S.

[3] Колев.Д. (2021) Диагностична стойност на Z-score swLORETA qEEG и използване на неврофийдбек терапия при пациенти с дислексия., Сборник от логопедична конференция с международно участие на тема "Предизвикателства пред общественото здраве", Благоевград, стр.37-43, ISBN 978-954–00-0304-7

Kolev, D., (2021) „Diagnostichna stoĭnost na Z-score swLORETA qEEG i izpolzvane na nevrofiĭdbek terapiya pri patsienti s disleksiya" ,sbornik ot logopedichnata konferentsiya s mejdunarodno uchastie na tema "Predizvikatelstva pred ob]estvenoto zdrave", B., p 37-43 ISBN 978-954–00-0304-7

[4] Митова Ек. (2014) Влияние на пренебрегването върху развитието на детето. Педиатрия, 6, ISSN 1311-0756, 12-14

Mitova Ek. (2014) Vliyanie na prenebregvaneto vŭrkhu razvitieto na deteto. Pediatriya, 6, ISSN 1311-0756, 12-14

[5] Митова Ек. (2016) Ролята на екипа в преодоляване на медико-социални проблеми на лицата с умствена изостаналост живеещи в ЦНСТ. Асклепий, 1, ISSN: 1310-0637

Mitova Ek. (2016) Rolyata na ekipa v preodolyavane na mediko-sotsialni problemi na litsata s umstvena izostanalost zhiveeshti v TSNST", Asklepiĭ, 1, ISSN: 1310-0637

[6] Митова Ек. (2016) Политики и практики за работа с деца от домовете за медикосоциални грижи по пътя на деинституционализацията. „Асклепий", ISSN: 1310-0637

Mitova Ek. (2016) Politiki i praktiki za rabota s detsa ot domovete za medikosotsialni grizhi po pŭtya na deinstitutsionalizatsiyata. „Asklepiĭ", ISSN: 1310-0637

[7] Патарчанов, Пл. (2011) За приложението на някои пространствени модели в медико-географските изследвания. Сб. Доклади VIII национален конгрес по медицинска география с международно участие, Българско дружество по медицинска география, С.; Patarchanov, Pl. (2011) On the application of some spatial models in medical geographic research. Sat Papers VIII National Congress of Medical Geography with International Participation, Bulgarian Society of Medical Geography, S.

[8] Тодорова, Ек., Парталозова, В. (2016) Влияние на фактора „пол" при оценка на уменията за четене и писане при деца с Дислексия. Интердисциплинарни логопедични практики, НБУ, София, 34-41 ISBN 978-954-535-863-0

Todorova, Ek., Partalozova, V. (2016) Vliyanie na faktora „pol" pri otsenka na umeniyata za chetene i pisane pri detsa s Disleksiya. Interdistsiplinarni logopedichni praktiki, NBU, Sofiya, 34-41 ISBN 978-954-535-863-0

[9] Щерева, Ек. (2012) Фонологичното осъзнаване на децата (превенция на дислексия) Глосса Терапи, София, ISBN 978-954-92903-1-8

Shtereva, Ek. (2012) Fonologichnoto osŭznavane na detsata (preventsiya na disleksiya) Glossaterapi, Sofiya, ISBN 978-954-92903-1-8

[10] Щерева, Ек. (2018) Четенето и свързаните фактори. София, ISBN 978-954-92903-5-6

Shtereva, Ek. (2018) Cheteneto i svŭrzanite faktori. Sofiya, ISBN 978-954-92903-5-6

[11] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. DSM-IV. 4th ed. Washington, DC: American Psychiatric Association, 1994.

[12] Lane, K. A. (1988). Reversal errors: Theories and therapy procedures. Santa Ana, CA: Vision Extension.

[13] Mihaylova, M. S., Bocheva, N. B., Stefanova, M. D., Genova, B. Z., Totev, T. T., Racheva, K. I., Shtereva, K. A., & Staykova, S. N. (2022). Visual noise effect on reading in three developmental disorders: ASD, ADHD, and DD. Autism & Developmental Language Impairments, 7. ttps://doi.org/10.1177/23969415221106119

[14] Nicolson, R. I., & Fawcett, A. J. (1990). Automaticity: a new framework for dyslexia research? Cognition, 35(2), 159-182

[15] Pennington, B.F., Lefly, D.L. (2001). Early reading development in children at family risk for dyslexia. Child Development 72:3, 816-83

[16] Reid, G. (1994) Specific learning difficulties (Dyslexia) – a hand book for study and practice. ISBN-13: 978-0901580603

[17] Scarborough HS. (1990) Very early language deficits in dyslexic children. Child Dev 61: 1728–1743

[18] Stein, J., & Walsh, V. (1997). To see but not to read: The magnocellular theory of dyslexia. Trends in Neuroscience, 20, 147–152

[19] Tallal, P., Miller, S., & Fitch, R. H. (1993). Neurobiological basis of speech: a case for the preeminence of temporal processing. Ann.N.Y.Acad.Sci., 682, 27-47.

[20] Walker, J. E., & Norman, C. A. (2006). The neurophysiology of dyslexia: A selective review with implications for neurofeedback remediation and results of treatment in twelve consecutive patients. In Journal of Neurotherapy, 10(1), 45-55

[21] World Health Organization. (1992). The ICD-10 classification of mental and behavioral disorders:Clinical descriptions and diagnostic guidelines. Geneva, Switzerland

[22] National Statistical Institute. www.nsi.bg (28.01.2023; 11:36)

[23] Ministry of education and science. www.mon.bg (27.01.2023; 10:40).