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Epilepsy Prevalence in the 0-17 Age Group in Trabzon, Turkey

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Abstract

Objective: Epilepsy is a most common serious neurological disorder and is one of the world's most prevalent non-communicable diseases. The aim of this study was to determine the prevalence and risk factors of epilepsy in 0–17 year old children in Trabzon, Turkey.

Methods: A cross-sectional epidemiological investigation was performed in two phases, a screening phase and a confirmation of the diagnosis phase. The gold standard was a clinical investigation and neurological examination. The diagnosis of epilepsy followed clinical guidelines proposed by the International League against Epilepsy (ILAE). The chi-square test was used in analysis of the results and *P*-value <0.05 was calculated.

Findings: The prevalence per 1000 participants of epilepsy was 8.6 (5.9–11.4; 95%CI). We detected 37 cases (18 males and 19 females) of epilepsy. The male/female ratio was 0.95. This study showed an increased risk for epilepsy with low socioeconomic level, a history of postpartum seizure, meningitis, head trauma, febrile convulsion and family history of epilepsy. More than one seizure type was present in 15 (40.5%) of epileptic children. Generalized tonic-clonic seizures were determined in 24 patients (64.9%) and absence type in 9 (24.3%). It was found that 25.0% of children with epilepsy had never visited the school at the time the study was performed due to the disease and attendant seizures.

Conclusion: The prevalence of epilepsy in Trabzon is low compared to other parts of Turkey and other developing countries.

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Key Words: Epilepsy; Prevalence; Risk Factor; Neurological Disorder

Introduction

Global epilepsy prevalence is between 0.4% and 1.7%[1,2]. Epilepsy incidence in developing countries is 190/100.000, with a prevalence of 15 per 1000, much higher figures than those for developed countries[3-9]. Epilepsy prevalence has been put at between 0.8% and 1.7% in the limited number of studies performed in Turkey[3,9-11].

The lives of epilepsy patients in Turkey may be negatively affected by various societal preconceptions, and patients may face many difficulties in social and economic terms. The fact the disease is more seen in the children of families with low socioeconomic levels, uncertainty as to when an epileptic child's seizures will take place and how

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severe they will be, a lack of sufficient knowledge regarding steps to be taken during and after an epileptic episode, the fact that prolonged seizures and drugs used cause brain damage and memory problems and that these in turn lead to learning difficulties and attention impairment are regarded as medico-social problems attendant upon epilepsy. As a result, the search for solutions outside modern medicine, such as visiting religious figures and the tombs of holy individuals out of a belief that the patient is infested by evil spirits and djinn/genies, can also be seen in Turkey[12].

This study was intended to determine epilepsy prevalence in the 0-17 age group in the Turkish province of Trabzon, as well as various characteristic features.

Subjects and Methods

This cross-sectional field study was carried out among children in the 0-17 age group in Trabzon city and its surrounding districts in February-March 2007. The province of Trabzon lies in the northeast of Turkey in the middle of the Eastern Black Sea Mountains, with the Black Sea to its north. Together with the central district, the province of Trabzon consists of a total of 18 districts. According to population census figures for 2000, the province has a total population of 975,137, of which 81.1% of women and 95.9% of men are literate.

On the basis of census figures for 2000, the total 0-17 age group population in the province of Trabzon is 334,243. According to an unpublished postgraduate medical thesis from the region, epilepsy prevalence in the 0-6 age group is 1.7%[11]. The sample size was calculated based on a 1.7% prevalence (P) of epilepsy with a 0.4% uncertainty level (d), using the formula $n = Z^2_{1-\alpha/2} P(1-P)/d^2$ (Z=1.960, with 95%CI) [13]. We estimated that this would necessitate 4012 subjects. However, that was increased to about 4500 subjects with the addition of a further 10% because of possible reductions in the number of subjects available, due to absence from home or a failure to give informed consent to participation. Subjects were chosen at random from health districts using primary health center household registration records. Of these, 4288 subjects participated in the study (a participation rate of 95.3%). Data were collected at face-to-face interviews with mothers of children in the 0-17 age group.

Examination of Cases and Definition of Epilepsy: Mothers administered the questionnaire were asked the following about the children included in the sampling: “Have there ever been any times, even brief ones, when he/she has experienced loss of consciousness, or experienced a seizure in such a way as to be unaware of his/her surroundings, or when he/she suffered fainting, rolling of the eyes, foaming at the mouth after having fainted, being unable to speak, being unable to hear what others say, loss of awareness, urinary incontinence, and his/her eyes being fixated on a single point or loss of consciousness?” Those answering “yes” were invited to attend the health clinic where they were registered for examination within that same week.

At the health clinic, patients were administered a general examination by a single physician who had received training in pediatric neurology and epilepsy before the study. Suspected cases were invited to attend the Karadeniz Technical University Faculty of Medicine Pediatric Neurology Department. Clinical evaluation was performed by a single pediatric neurologist. As defined by the International League against Epilepsy (ILAE 2001), epilepsy is a condition characterized by two or more unprovoked seizures without an acute underlying cause[14,15]. Subjects previously diagnosed with epilepsy and suspected cases at scanning whose anamnesis characteristics met the ILAE criteria and with findings suggestive of epilepsy at physical and neurological examination. A single episode, neonatal convulsions, reflex and anoxic attacks and acute symptomatic seizures were excluded as not meeting the definition of epilepsy.

The study was conducted in accordance with the basic ethical principles of medical research and approved by the Karadeniz Technical University Regional Ethical Board (Reg. no. 2007/10: 04).

Statistical evaluations were performed using the SPSS (Ver. 13.0). Quantitative data were analyzed using the chi-square test. Additionally, epilepsy prevalence values by age and mother's educational status were analyzed using the chi-square test for trend. The results of continuous are cited as mean ±standard deviation, and quantitative data as number and percentage. The results of the chi-square test for trend and odds ratio (OR) were shown. P <0.05 was considered significant.

Findings

This research was conducted on 4288 children, 2104 females (49.1%) and 2184 males (50.9%), between the ages of 0 and 17. Ninety-six (2.2%) children were suspected of having epilepsy and invited for primary health care; 94 children attended, and diagnosis of epilepsy was confirmed in 37 subjects following advanced examination at the primary health care unit and university hospital. Thirty-six of these children had previously been diagnosed, while 1 was diagnosed as a result of this scanning. Epilepsy prevalence in this study was 8.6 per 1000 (n=37, 95%CI: 5.9-11.4). The boy:girl ratio was 0.91. Crude and age–adjusted epilepsy prevalence's are shown in Table 1.

Epilepsy prevalence was higher in the 10-14 age group (1.53%) compared to the other age groups, and the difference was statistically significant (P=0.01). In terms of epilepsy risk, there was a rise in the 5-9 and 10-14 age groups compared to the 0-4 age group, though this was not statistically significant (chi-square for trend P=0.3; OR:1.48 and OR:3.05, respectively). One of our interesting results is that as mothers' educational levels rise there is a statistically significant decrease in epilepsy risk and frequency (chi-square test P=0.108; chi-square for trend P=0.02). In terms of families' monthly incomes, epilepsy prevalence in economically worse-off families (2.05%) was significantly higher compared to that in slightly better-off families (0.01%) (P=0.001) (Table 2). More than one seizure type was present in 15 (40.5%) of epileptic children.

Generalized tonic-clonic seizures were determined in 24 patients (64.9%) and absence type in 9 (24.3%). Age at onset of first seizure was 3.9±4.2 years. Average length of exposure to seizures was 6.3±4.0 years (Table 3).

We determined that 13.5% of cases experienced postpartum eclampsia, with febrile convulsion in 10.8%, head trauma in 8.1%, a history of meningitis in 5.4%, and someone with epilepsy in the family history in 27.0% (Table 4; P<0.0005, P=0.02, P=0.01, P<0.0005 and P<0.0005, respectively). We also established that 7 (25.0%) of the 28 children who were at school age with epilepsy had never been to school at the time the study was performed due to the disease and attendant seizures.

Discussion

The World Health Organization (WHO) regards epilepsy prevalence as an indicator of countries' development[16,17]. Epilepsy prevalence in the region in a scan of the disease in adults aged 15 and over has been reported as 5/1000[18]. Epilepsy

Table 1: Participants' crude and age–adjusted epilepsy prevalences (Trabzon, 2007)

Age groups (years)	Prevalence of epilepsy*	Segi (world) standard*	Scandinavian (European) standard*	WHO world standard*
0-4	5.1	0.61	0.41	0.45
5-9	7.5	0.75	0.53	0.65
10-14	15.3	1.38	1.07	1.32
15-17	3.3	0.18	0.14	0.17
Total	8.6	3.14	2.26	2.69

*Per 1000

Table 2: Epilepsy prevalence by various socio-demographic characteristics (Trabzon, 2007)

Characteristics		Prevalence of epilepsy			95% CI		*P* value	Odds Ratio
		n	n	*per 1000*	Lower	Upper		
Age Group (years)	0-4	1181	6	*5.1*	1.0	9.2	0.01	1
	5-9	1198	9	*7.5*	2.6	12.4		1.48
	10-14	1304	20	*15.3*	8.6	22.0		3.05
	15-17	605	2	*3.3*	0.0	7.9		0.65
Gender	Female	2104	19	*9.0*	5.0	13.0	0.9	
	Male	2184	18	*8.2*	4.4	12.0		
Mother's Education Level	Illiterate	227	5	*22.0*	2.9	41.1	0.1	1.00
	Primary school (5 years)	2235	22	*9.8*	5.7	13.9		0.44
	Middle school (8 years)	482	3	*6.2*	0.0	13.2		0.28
	High school (11 years)	996	6	*6.0*	1.2	10.8		0.27
	University (13-17 years)	346	1	*2.9*	0.0	8.6		0.13
Father's Education Level	Illiterate	37	0	*0.0*	0.0	0.0	0.4	
	Primary school (5 years)	1297	15	*11.6*	5.8	17.4		
	Middle school (8 years)	661	4	*6.1*	0.2	12.0		
	High school (11 years)	1422	14	*9.8*	4.7	14.9		
	University (13-17 years)	836	4	*4.8*	0.1	9.5		
Family Income	Minimum wage and below	635	13	*20.5*	9.5	31.5	0.001	
	Above minimum wage	3606	24	*0.1*	0.0	0.4		
Mother Working and Bringing in a Wage	Not working (Housewife)	3741	33	*8.8*	5.8	11.8	1	
	Working	547	4	*7.3*	0.2	14.4		
Degree of Relation between Parents	1st Degree Relatives	363	4	*11.0*	0.3	21.7	0.8	
	2nd Degree relatives	163	1	*6.1*	0.0	18.1		
	Not Related by Blood	3754	32	*8.5*	5.6	11.4		

prevalence values for various countries at different levels of development and the age range of the study groups concerned are given in Table 5. This study determined an epilepsy prevalence of 0.86%. This level resembles that in developed countries.

The first 10 years of life has been reported as the period with the highest incidence. Individuals suffering epileptic attacks in childhood and adolescence may therefore typically be exposed to severe educational complications, as well as medical ones[19]. Age at onset of epilepsy is important in terms of prognosis of the disease. Age at onset of epilepsy in our study was quite low, at 3.9±4.2 years. Epileptic children having a history of febrile convulsion may play a role in this.

Table 3: Epileptic children's epilepsy type, age at onset and time spent as epileptic patient

Parameter	Definition	n	%
Seizure Type	Tonic clonic	24	64.9
	Myoclonic	10	27.0
	Absence	9	24.3
	Atonic	7	18.9
	Complex Partial	5	13.5
	Simple Partial	4	10.8
	Tonic	4	10.8
Onset of first seizure	<1 year	11	29.7
	1-4 years	17	45.9
	5-9 years	5	13.5
	≥ 10 years	4	10.8
Duration of epilepsy	1-4 years	20	54.1
	5-9 years	9	24.3
	≥10 years	8	21.6

* Calculated according to number of epileptic individuals (n=37)

Table 4: Distribution of various risk factors in normal and epileptic individuals

Risk Factors		Epilepsy (n=37) n (%)	Normal (n=4251) n (%)	*P* value
During Mother's Pregnancy	Drug Use	3 (8.1)	728 (17.1)	0.2
	Disease	2 (5.4)	235 (5.5)	1
	Hemorrhage	3 (8.1)	95 (2.2)	0.06
Before and after Birth	Jaundice	12 (32.4)	933 (21.9)	0.1
	Incubator	3 (8.1)	276 (6.5)	0.7
	Bruising	4 (10.8)	227 (5.3)	0.3
	No crying	4 (10.8)	199 (4.7)	0.2
	Cord entanglement	1 (2.7)	99 (2.3)	1
	Health Personnel Unassisted Birth	1 (2.7)	55 (1.3)	0.3
	Neonatal convulsion	5 (13.5)	36 (0.8)	<0.0005
Past History	Febrile Convulsion	4 (10.8)	120 (2.8)	0.02
	Heat Trauma	3 (8.1)	68 (1.6)	0.01
	Meningitis	2 (5.4)	14 (0.3)	<0.0005
Family History	Epilepsy	10 (27.0)	307 (7.2)	<0.0005
	Febrile Convulsion	6 (16.2)	598 (14.1)	0.7
	MMR	1 (2.7)	158 (3.7)	1

Epilepsy has been reported in some studies as slightly more common in males than in females. For example, Wong determined a M/F ratio of 1.22:1, while Karabiber et al determined a ratio of 1.42:1 in a study of children aged 1-12 in Malatya, Turkey[20,10]. In contrast, Sidenvall et al reported a M/F ratio of 0.91, similar to that in our study [21]. These results show that there is no significant difference between the sexes in terms of epilepsy.

Epilepsy is more common in families and countries with inadequate social and economic means[22]. Many studies have reported that epilepsy is affected by such social and economic factors as a low level of education, unemployment and low income[23,24]. In this study, epilepsy frequency was very high in those with monthly income below the minimum wage.

Is there a possible correlation between mother and father's level of education and epilepsy incidence? In this study, while there was no correlation between father's education level and incidence of epilepsy, incidence and risk of epilepsy declined as mothers' level of education rose. This finding is significant in showing the relation between such a serious disease and mother's level of formal education.

Table 5: Epilepsy prevalences in different countries

Study	Country	Age Group	Year	Prevalence or incidence* per 1000
Kurtz et al [25]	England	0-23	1998	8.4*
Eriksson et al [26]	Finland	0-15	1992	3.9
Karabiber et al [10]	Malatya (Turkey)	7-12	2001	8.0
Singh et al [27]	India	6-15	1997	4.2
Endziniene et al [28]	Lithuania	0-15	1995	4.3
Beilmann et al [29]	Estonia	5-9	1999	4.3
Waaler et al [30]	Norway	6-12	2000	5.1
Aziz et al [31]	Pakistan	0-10	1997	9.98
Aziz et al [31]	Turkey	0-10	1997	7.0
Wong V [20]	Hong Kong	<19	2004	4.3
Sidenvall et al [21]	Switzerland	0-16	1996	4.2
Serdaroğlu et al [9]	Turkey	0-16	2004	8.0
Banerjee et al [6]	India	≤19	2003-4	7.0
Prischich F et al [7]	Cameroon	10-19	2004	26.1
Present study	Trabzon / Turkey	0-17	2007	8.6

Birth trauma, head trauma, infection, central nervous system (CNS) infection and febrile convulsions head the list of the preventable causes of epilepsy and increase the incidence of epilepsy in developing countries[5,33-35]. Olaffson et al. determined a history of head trauma in 4% of epileptic patients and Çalışır et al in 7.6%[36,37]. Yücesoy et al observed epileptic attacks in 12.5% of people with head trauma[38]. There was a history of head trauma in 8.11% of our cases, and this was statistically significant. All four studies corroborate the etiological role of head trauma.

Some studies have reported that 1% of epilepsy cases are correlated with CNS infections[39]. Daoud et al determined a 1.3-time greater risk of epilepsy in children undergoing CNS infection, though this was not statistically significant[40]. In our study, 5.41% of cases had a history of meningitis, and this was statistically significant.

The presence of epilepsy in family history has been reported to increase the risk of epilepsy. In our study, epilepsy incidences between the children of blood-related or unrelated parents were similar. Hussein et al reported that family history was positive and statistically significant in 21.8% of cases[35]. Epilepsy was present in relatives of 27.03% of our cases, this also being statistically significant.

Conclusion

The prevalence of epilepsy in Trabzon is low compared to other parts of Turkey and other developing countries. It is important for pre-natal monitoring to be performed in a regular and accurate manner, for birth to take place under appropriate conditions with the help of health personnel and for the baby to be regularly monitored after birth if the child is to be protected from factors that can impair brain development during or after birth. In the event that society's economic difficulties are overcome, the risk of developing epilepsy declines. Educational seminars for parents within the scope of protective health services, the first step against such important and preventable epilepsy risk factors as febrile convulsion, head trauma and CNS infections will reduce the incidence of the disease. Greater care must be taken with regard to the development of epilepsy in children with a family history of the disease, and preventive measures must be taken against other known risk factors by informing families within the scope of first stage health services. Parents of epileptic children must be taught how to deal with seizures, to protect their children against health risks that may give rise to the disease, to enhance their children's cognitive and intellectual capacities and to promote the quality of life of their children.

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Conflict of Interest: None

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