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Original Article

Prevalence of Febrile Seizures in School-Aged Children: A Community Based Survey in İzmir, Turkey

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ABSTRACT

Aim: Febrile seizures (FS) are the most common seizures seen in childhood. Although they are usually benign and self-limiting, parents feel great fear and concern about them. The prevalence of FS varies in different parts of the world. These differences are thought to be due to genetic, geographic and environmental factors. However, there has been no recent study about the prevalence of FS among Turkish children. This study was designed to find out the prevalence, clinical and some epidemiological features of FS among Turkish school children.

Materials and Methods: A school based, cross-sectional study was conducted in first and second grade children. A stratified cluster sampling technique was used to define the study population, which represents the schools located in the metropolitan area of İzmir. Data were collected through a standard questionnaire from the parents who agreed to be involved in the study. The survey had questions about some demographic features of the children and FS episodes.

Results: Three thousand eighty hundred six children and parent pairs agreed to participate in the survey. The FS prevalence determined was 4.8% (boys, 5.2%; girls, 4.3%, p>0.05). It was found that 28.5% of the children experienced their first FS between the ages of 18 months and three years old and most of them had an upper respiratory tract infection. The most common practice by parents during the seizure was admission to the nearest emergency room. The recurrence rate for FS was 33.0%.

Conclusions: The FS prevalence determined in our study is lower than previous studies in Turkey. It was thought that the advancing healthcare systems in our country might have decreased the FS prevalence within the last eight years in Izmir.

Keywords: Children, febrile seizure, fever, prevalence, seizure

Introduction

Febrile seizures (FS) are the most common seizures that occur with a temperature of 38 ºC or higher in the absence of a history of prior a FS. It is seen with afebrile illness not caused by a central nervous system infection or any metabolic imbalance. FS are usually seen between the ages of 6 and 60 months (1-3). According to the literature, there are no cognitive adverse effects of having FS. These patients do not have any increased risk of abnormalities of attitude, attention or school performance compared with age-matched controls (2). Although FS are usually benign and self-limiting, parents feel great fear and concern about them. Also, the risk of epilepsy after FS increased between 3% to 7% compared with nearly 0.5% of the general population which makes FS a significant health problem (4,5).

Methodological differences might be a factor, but the prevalence of FS varies in different parts of the world (2). Higher prevalences are found in Japan and Guam (8% and 14%, respectively), whereas, the prevalence in Europe and

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United States is reported between 2% and 6.9% (6-9). The prevalence of FS in Turkey was found to be between 3.5% and 12.8% in previous studies (10-15). These differences are thought to be due to genetic, geographic and environmental factors. Also, due to socio-economic and environmental factors of population change through time, the prevalence of FS might have changed. However, there has been no recent study about the prevalence of FS among Turkish children.

The objective of this study is to find out the prevalence, clinical and some epidemiological features of the FS among Turkish children aged from 6 to 7 in the center of İzmir city.

Materials and Methods

A cross-sectional study was conducted in first and second grade primary school children in the metropolitan area of İzmir. Information on the study population was obtained from the Bureau of Statistics of the Provincial Education Administration of İzmir (16). The primary school grade 1 and 2 population consisted of 65.866 children in 2015 in İzmir. Taking into consideration the prevalence rate detected by Aydin et al. (15) in 2008 of 9.7%, with ±1 standard deviation (SD) with a 99% confidence interval, we planned to assess 5.340 students for this study. Nine districts in İzmir city center were the clusters for our study, and a cluster-sampling method was used. Randomly chosen schools from the sample frame were represented proportionally to their size. Taking into account those questionnaires that would not be replied and returned, instead of 5.340, we distributed 5.501 questionnaires. Together with the questionnaire, a consent/approval form was sent to the families of the sample population.

After Dokuz Eylül University Ethics Committee (approval number: 2015/28-15) was received, written permission was obtained from the Provincial Education Administration and Governor of İzmir City and then the study was performed.

We planned to collect data for our study via the questionnaire to be answered by the parents of first and second grade students in the 2015-2016 educational year. The survey, which had 30 questions, was prepared according to the guidelines for epidemiologic studies on epilepsy, which were proposed by the Commission on Epidemiology and Prognosis, International League Against Epilepsy in 1993, and also according to the current literature about epilepsy. To minimize any memory difficulties, we added an option as "I do not remember" to the survey and these data were accepted as missing data. Teachers sent questionnaires to the parents, who were asked to return them within five days via the children. The response rate was 69.2%, and 3.806 questionnaires were returned out of 5.501 sent.

The survey had questions about some demographic features of the children and FS episodes. The main independent variables of the study were age and gender of children, the FS history of children, the reason for fever, type of treatment conducted by the parents during the FS, admission to a medical unit, the medicine recommended and also a story of FS and epilepsy throughout the family.

FS were defined as seizures that occur in children aged between six months and six years, accompanied by a fever (at least 38 °C before the onset of the seizure) without signs of an intracranial infection (3). Cases with intracranial infections such as encephalitis or meningitis, or intoxication as a reason for the fever, and those who had a history of an afebrile seizure were excluded from the study.

Data were analyzed using SPSS version 21.0 for Windows software (SPSS Inc., Chicago, IL). Results were reported as mean ± SD values or n (%) where appropriate. The statistical significance level was set at a p value <0.05. The normality of data distribution was checked using the Kolmogorov–Smirnov test in the whole group and the subgroups. Statistical analysis was done by using t-test for measurable variables and $\chi 2$ test for countable variables.

Results

Of the sent 5.501 questionnaires, parents of 3.806 voluntarily completed and returned the survey (69.2%). Out of 3.806 cases, 30 were excluded from the study due to the diagnosis of intoxication, encephalitis, meningitis and history of afebrile seizure. Finally, 3.776 cases were assessed, 49.3% of them were boys. The median age of the children at the time of the survey was 7.0 years (range 5.0 to 8.5). Of the 3.776 investigated children, 181 (4.8%, 95% confidence interval 4.1% to 5.5%) were reported to have experienced at least one FS. Among them, 98 were boys and 83 were girls. Some demographic characteristics are shown in Table I. We found a slightly higher prevalence of FS in boys compared to girls (5.2% and 4.3%, respectively), but this was not significantly significant (p=0.183). The FS prevalence in six-

Table I. Some demographic characteristics of study population

Demographic characteristics	n (%)
Age, months	
Mean ± SD	6.5 (±0.61)
Median	7
Gender	
Males	1.862 (49.3)
Females	1.914 (50.7)
Febrile seizure history	
Overall	181 (4.8)
Males	98 (5.2)
Females	83 (4.3)

SD: Standard deviation

Table II. Febrile seizure characteristics		
	n	**%**
Febrile seizure age		
6-11 months	21	11.7
12-17 months	37	20.7
18-35 months	51	28.5
3-4 years	40	22.3
>4 years	30	16.8
Fever		
38-39 ºC	103	57.0
>39 ºC	78	43.0
Time between fever and seizure		
≤30 minutes	43	35.6
31-60 minutes	33	27.2
1-23 hours	37	30.6
≥24 hours	8	6.6
Reason for the fever		
Acute tonsillopharyngitis	140	80.5
Otitis media	16	9.2
Acute gastroenteritis	16	9.2
Unknown	2	1.1
Number of febrile seizure episodes		
1 episode	120	67.0
2 episodes	39	21.8
≥3 episodes	22	11.2
Recommended medicine type		
Medicine to be used on the fever	73	71.6
Antiepileptic drugs for long term treatment	15	14.7
Medicine to be used at the time of seizure	14	13.7

There are 2 missing data from the febrile seizure age data, 60 missing data from the time between fever and seizure data, 7 missing data from the reason for the fever data and 9 missing data from the recommended medicine Type

year-old students was lower than in seven years old students (4.1% and 5.3%, respectively), but this difference was not statistically significant (p=0.105).

Our results showed that 28.5% of the children experienced their first FS between the ages of 18 months and three years old. Among children who had a FS history, 62.8% of them had a seizure within the first hour of the fever. Most of the parents report that their children had an upper respiratory tract infection as the reason for the fever, and 12.4% of them had a vaccination history at two weeks before the seizure. 94.4% of the parents (171/181) brought their child to the hospital, and medicine was recommended for 54.0% of those (Table II). Sixty-one (33%) children were reported to have experienced two or more FS episodes. 37.3% of the patients with recurrent FS had their first episode before 18 months of age. The first episode age did not significantly affect the recurrence risk for FS (p=0.327). 59.3% of the repeated cases were males, and there was no significant difference between males and females in recurrence risk (p=0.284).

The most common practices by parents during the seizure were admission to the nearest emergency room and giving a shower to the child in order to decrease the fever. (Table III). Only 4.4% of them turned the child's head to the right or left side to open the airway. One parent attempted to perform cardiopulmonary resuscitation. There was no significant difference in attitudes between parents with single FS and multiple FS (p>0.05).

Seizure history among family members of FS subjects is shown in Table IV. Among the 181 FS subjects, 29.0% of them gave a history of FS for their parents. Approximately 20% of them had a history of convulsive disorders within their immediate family and relatives.

Discussion

FS is the most common type of childhood seizure disorders. Most cases of FS are benign and self-limiting, and in general, treatment is not recommended (2). Our study was a school-based, cross-sectional prevalence survey of a history of FS in children between the ages of 6 and 7 in İzmir.

Table III. Attitudes of the parents during the febrile seizure (n=181)							
	Total		**Single FS**		**Multiple FS**		**p value**
	n	**%**	**n**	**%**	**n**	**%**	
Admission to the nearest emergency department	114	63.0	78	65.0	36	61.0	0.722
Giving a shower to the child to decrease the fever	53	29.3	31	25.8	22	37.3	0.160
Using wet clothes to decrease the degree of fever	15	8.3	8	6.7	7	11.9	0.381
Giving the medicine advised before	13	7.2	6	5.0	7	11.9	0.097
Call to the emergency service (112)	9	5.0	6	5.0	3	5.1	0.981
Positioning the patient (Turning the child's head to the right or left side)	8	4.4	4	3.3	4	6.8	0.507

Some parents carried out more than one action. FS: Febrile seizure

The prevalence of FS in our study was found to be 4.8%. Our result is similar to the literature from Western countries (2,6-9) while our prevalence rate is lower than Asian and African countries (17-20). The cause for higher prevalence rates in Asian and African countries is not known. It is hypothesized that it may be due to a different genetic predisposition as well as the influence of environmental factors (21). FS prevalence rates in our country were reported as 4.5% and 3.5% in two previous studies which are similar to our result (11,14). On the other hand, the prevalence rate in primary school children in Diyarbakır was found to be 8.9% (12). We found a lower prevalence rate compared to the study by Aydin et al. (15) in which the prevalence was 9.7% in İzmir. Moreover, in another study, researchers reported the FS prevalence as 12.8% in İzmir (22). These differences might be due to methodological variations between studies. Also, the reduction in the prevalence of FS within the similar population, like our study and the study by Aydin et al. (15), may be partly as a result of the improved education of parents' behaviors towards a child with fever. Unfortunately, we did not have any information about parents' fever attitudes in our study.

There were some studies that found that males have a slightly higher frequency of FS (male to female ratio, 1.1:1 to 2:1) (2,20). Like these studies, there were more boys than girls with FS, 1.2:1 in our study (17,20,23-25). There is no explanation for this male predominance, but some researchers considered that boys have a predisposition to the febrile illnesses that may cause FS (2,9,17,19). On the other hand, this prevalence rate difference between boys and girls was not statistically significant in our study like most other studies (2,17).

In our study, we found that FS was mostly seen at the ages between 18 months and 3 years, similar to the contemporary literature (17,19,20,26). We also found that most of the FS cases had a fever of 39 °C or more and seizure occurred within the first hour of the fever. These findings are similar to the previous studies (2,7,9,18-20). In our study, the most common reason of the fever among the FS cases was upper respiratory tract infections. Studies from the Western world, Japan, and our neighbors found similar results (5-8,18,27,28). On the other hand, bacterial meningitis and severe falciparum malaria were the most common infections found in FS cases in Africa (17). FS may recur in approximately 30% of the cases with a first episode, and we found a similar FS recurrence rate to the contemporary literature (2,18,20).

Table IV. Family seizure histories of febrile seizure subjects

		n	Percentages
Febrile seizure history of parents	+	52	29.0%
	-	127	71.0%
Febrile seizure history of siblings	+	24	13.4%
	-	155	86.6%
Afebrile seizure history of parents	+	5	2.8%
	-	174	97.2%
Afebrile seizure history of siblings	+	3	1.7%
	-	176	98.3%
Febrile and/or afebrile seizure history of other family members	+	28	15.7%
	-	150	84.3%

Among the 181 cases with febrile seizure histories, there are 2 missing data in the variables that were questioned for febrile seizure history of parents and siblings, and 3 missing data in the other family members

A significantly increased risk for FS was found for children of whom there was a history of FS in the parents or/and siblings (2,9). According to the literature, 25% to 40% of the cases had a positive family history for FS (2,29). 29% of the parents and 13.4% of the siblings had a history of FS in our study. A family history of FS is considerably higher among FS cases in our study, and this is concordant with the literature.

Although FS is one of the benign diseases seen in childhood, parents can perceive FS as a traumatic and highly dangerous event. It is essential to reduce parental concerns to improve their responses to FS at home. Parental attitudes toward FS are important for children's first aid during the seizure. Sixty-three percent of parents brought their child directly to the hospital in our study. In a similar study in Japan, 91% of parents brought their child directly to the hospital by ambulance after an emergency call (30). Also, in Korea it is found that during a FS, 86.5% of the parents rushed the child to an emergency department (31). These results show us that although parental FS knowledge has significantly improved, most parents still panic and rush their child to doctors without giving first aid to the child. Only 4.4% of them turned the child's head to the right or left side to open the airway. In our study, this result did not change between parents who have children with a single FS and parents who have children with recurrent FS. According to our results, although most parents had thought that they had an appropriate approach during the seizure of their children, most of them had false or insufficient information about seizure management at home. These results might be due to an inappropriate education of parents or a variation in the quality of information given by health care professionals in İzmir.

Study Limitations

We have several limitations. Firstly, our study was carried out as a school-based survey. Data was collected by questionnaire. There was no clinical evaluation. Therefore, febrile reactions might have been perceived as a FS by parents. Secondly, because we used a questionnaire method, recall bias might have interfered with the results. On the other hand, a population-based questionnaire method remains the most practical method for assessing these parameters in large groups. Moreover, to reduce recall bias, we did this study on 6-7 years old children. Thirdly, although schooling

until the 8th grade is obligatory in Turkey, some low-income families do not send their children to school. They choose to send them to work, and this might affect the results. Along with that, use of a school-based questionnaire method enabled us to find cases who could not access health care facilities because of social, cultural or financial problems. So, due to this, we thought that our study design enabled us to find more realistic results on the prevalence of FS.

Conclusion

In conclusion, the FS prevalence determined in our study is lower than the study within a similar population done by Aydin et al. (15) in 2008. Our study supports findings that the prevalence of FS in our country is similar to developed countries but lower than the developing Asian communities. It was thought that increasing the awareness of febrile illness of parents and the advancing healthcare systems in our country may have decreased the FS prevalence within the last 8 years in İzmir. Our school-based population study enabled us to know the prevalence rate of FS, but repeated studies are needed to follow-up the effect of changing socio-economic factors on FS prevalence.

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Ethics

Ethics Committee Approval: The study was approved by the Dokuz Eylül University Local Ethics Committee (approval number: 2015/28-15).

Informed Consent: Written and verbal consent was obtained from the patients who participated in this study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: M.A., T.İ., A.E., A.A., Design: M.A., D.L., A.A., Data Collection or Processing: M.A., D.L., T.İ., Analysis or Interpretation: T.İ., D.L., A.E., A.A., Literature Search: M.A., T.İ., Writing: M.A., T.İ.

Conflict of Interest: No conflict of interest was declared by the authors.

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Febrile Seizure Prevelance Survey

No:
Person filling out the survey: Mother Father
1. Birth date of your child:
2. Sex: Boy Girl

3. Does your child have a disease that requires constant medication?
a. Yes: .....
b. No

4. Did your child have a febrile seizure?
a.Yes
b. No
c. I don't remember
5. If your answer is yes, please continue the survey, otherwise the survey ends here

6. How old was your child when he/she had a febrile seizure?
a. 6-11 months
b. 12-17 months
c. 18-35 months
d. 3-4 years
e. >4 years

7. What was the temperature of your child during the febrile seizure?
..... ºC

8. What was the time between fever and febrile seizure of your child?
a. ≤ 30 minutes
b. 31-60 minutes
c. 1-23 hours
d. ≥24 hours

9. Had your child been vaccinated within the previous 2 weeks before the febrile seizure?
a. Yes
b. No
c. I don't remember

10. What did you do first when your child had a seizure?
a. Admission to the nearest emergency department
b. Giving a shower to the child to decrease the fever
c. Using wet clothes to decrease the degree of fever
d. Giving the medicine advised before
e. Call to the emergency service (112)
f. Positioning the patient (Turning the child's head to the right or left side)

11. What was the reason of your child's fever?
a. Acute tonsillopharyngitis
b. Otitis media
c. Acute gastroenteritis
d. Urinary tract infection
e. Vaccination
f. Other:.....
g. I don't remember

12. Was there any medicine recommended to be used for your child?
a. Medicine to be used on the fever
b. Antiepileptic drugs for long term treatment
c. Medicine to be used at the time of seizure
d. No
e. I don't remember

13. How many times did your child have a febrile seizure?
a. One
b. More than one: .....(please write)

14. Has your child previously had a seizure (without fever)?
a. Yes
b. No
c. I don't remember

15. Did you or your partner have a febrile seizure during your own childhood?
a. Yes
b. No
c. I don't remember

16. Do you or your partner have an epilepsy diagnosis?
a. Yes
b. No
c. I don't remember

17. If you have any other children, have they had any febrile seizures?
a. Yes
b. No
c. I don't remember

18. If you have any other children, have they been diagnosed with epilepsy?
a. Yes
b. No
c. I don't remember

19. In yours or wife/husband's family, is there anyone who has been diagnosed with febrile seizure or epilepsy?
a. Yes
b. No
c. I don't remember