Sociodemographic risk factors for febrile seizures: A school-based study from Izmir, Turkey

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ABSTRACT

Purpose: Despite the fact that socioeconomic and environmental factors of a population are changing over time, there are few studies focusing on the effects of sociodemographic factors on the prevalence of febrile seizures (FS). This study was designed to find out the prevalence of FS and to investigate the effect of socio-cultural and economic factors on this prevalence among the Turkish school children.

Methods: A school-based, cross-sectional study was conducted in first and second-class children. Data were collected through a questionnaire from the parents who agreed to be involved in the study. The survey had questions about some socioeconomic and demographic features of the children and febrile seizure episodes.

Results: 3806 children and parent pairs accepted to participate in the survey. Febrile seizure prevalence was 4.8%. It was found that the prevalence of FS was significantly associated with the chronic illnesses of a child that requires continuous medication, developmental delay of a child, NICU history, gestational hypertension history of a mother, and lower educational level of a mother. Recurrence of FS was observed in 32.9% of children. Children whose first FS was seen below the 39 °C had 1.9 times more recurrence risk.

Conclusion: FS prevalence rate has declined from 9.7% to 4.3% in our study population within ten years. It was thought that advancing healthcare systems in our country might be decreased the prevalence. Our study enabled us to find out sociodemographic risk factors of FS, but further studies are needed in order to confirm the effect of sociodemographic factors on FS prevalence.

1. Introduction

Febrile seizures (FS), which are accompanied by a fever greater than 38 °C with no other seizure-provoking causes, are the most common type of seizure in childhood. FS are seen in children younger than 5 years of age and are classified as either simple or complex [1–3]. Simple FS are generalized (i.e., without a focal component) tonic–clonic seizures, which last for a maximum of 15 min. On the other hand, complex FS are prolonged (> 15 min), focal, or occur more than once in 24 h [2]. Although FS are usually benign and self-limiting, they are a cause of great concern to parents. No definite long-term adverse effects of simple FS have been reported. However, although some conflicting results have been reported, mesial temporal sclerosis and temporal lobe epilepsy were shown to be associated with complex FS in childhood [4–6]. In addition, the risk of one's developing epilepsy after complex FS is about 3–7% compared with an estimated risk of ~1.5% in the general population, which makes such seizures a significant health problem [7–9].

The reported prevalence rates of FS vary in different parts of the world, although methodological differences may be an underlying factor in these regional variations [2]. The prevalence of FS is known to be associated with genetic, environmental, and sociodemographic factors [2,7,8]. Although socioeconomic and environmental factors change over time, few recent studies have examined the effects of sociodemographic factors on the prevalence of FS. It is important to identify additional potential risk factors for the prevention, improved prognosis, and management of FS. However, no recent studies have addressed the sociodemographic risk factors associated with FS among Turkish children.

This study was performed to determine the prevalence and risk factors of FS among children 6–7 years old in elementary schools in the center of Izmir City, Turkey. In addition, this study investigated the effects of changes in sociocultural and economic factors in our country over the last 10 years on the frequency of FS based on the risk factors

defined by Aydın et al. [10].

2. Methods

This descriptive cross-sectional study was performed in first and second grade elementary school children in the metropolitan area of Izmir, Turkey. The information on the study population was obtained from the Bureau of Statistics of the Provincial Education Administration of Izmir. The sample consisted of 65,866 elementary school students (grades 1 and 2 students) from 296 public elementary schools [11]. A cluster sampling method was used, with the nine districts of Izmir City Center as the clusters. Twenty-two elementary schools chosen randomly from the sample were represented in proportion to their size. Taking into consideration the 9.7% prevalence rate detected by Aydın et al. [10] in 2008 with ± 1 standard deviation and 99% confidence interval, we planned to include 5340 students in the study. Taking into account the proportion of questionnaires expected to have missing responses and those that would not be returned, we distributed a total of 5501 questionnaires. After receiving Dokuz Eylül University Ethics Committee Approval for the study, written permission was obtained from the Provincial Education Administration and Governor of Izmir City prior to commencement of the study. Together with the questionnaire, a consent/approval form was sent to the families of the children in the study population.

We planned to collect data for our study via the questionnaire, which was distributed to the parents of grades 1 and 2 students in the school year 2015–2016. The survey, which consisted of 30 questions, was prepared according to the Guidelines for Epidemiologic Studies on Epilepsy proposed by the Commission on Epidemiology and Prognosis, International League Against Epilepsy in 1993 [1], and also according to the current literature about epilepsy. To minimize recall difficulties, we planned to conduct the surveys among the parents of grade 1 and 2 students aged 6 and 7, and added the option "I don't remember" to the survey, with these responses accepted as missing data. Teachers sent questionnaires to the parents, who were asked to return them within 5 days via the children. The response rate was 69.2%; 3806 of 5501 questionnaires sent were returned.

The questionnaire had two parts. The first part consisted of questions about families' socioeconomic and demographic features. The second part dealt with the history of any seizure episode(s). The highest body temperature measured during the seizure was determined from the family (via the questionnaire) and noted as peak fever. The main independent variables of the study were age, gender, and perinatal history of the child, educational status and occupation of parents, family income, and seizure history among family members. Family economic status was categorized as "lower income than expenses," "income equal to expenses," or "higher income than expenses." We planned to categorize the parental occupations as "blue collar" and "white collar" similar to the recent literature. However, as the incomes of these two groups are similar in our country, this variable was divided into occupations providing "regular" or "irregular" income. Parents' educational status was divided into four subgroups: "illiterate," "elementary school graduate," "high school graduate," and "university graduate." After preparation, the questionnaire was first piloted with a small group to determine whether the questions could be understood. The questions that could not be understood or answered by the survey population were rephrased.

Febrile seizures were defined as seizures occurring in infants and children between 6 months and 6 years old, accompanied by a fever of at least 38 °C before seizure onset [2]. FS were described to the parents as unconsciousness, fainting, unconscious movements or spasms of the extremities seen in children with fever higher than 38 °C. Children diagnosed with meningitis, encephalitis, or drug intoxication, children with gross structural abnormalities of the brain, and children with a history of afebrile seizures were excluded from the study. As it would be difficult to differentiate FS from fever-provoked seizures by a

questionnaire, patients whose first episode of FS occurred at later than 72 months of age were excluded from the study. Recurrent FS was defined as the occurrence of more than one seizure during different febrile illnesses. We did not differentiate between FS types in the questionnaire, so the findings reflect the results of all FS types.

Data were analyzed using SPSS version 21.0 for Windows software (SPSS, Inc., Chicago, IL). The results are reported as means ± SD or n (%) where appropriate. In all analyses, $p < 0.05$ was taken to indicate statistical significance. The normality of the data distribution was checked using the Kolmogorov–Smirnov test for the whole group and for each subgroup. Statistical analyses were performed using the t-test for continuous variables and the χ^2 test for categorical variables. Logistic regression was performed to explain the variables affecting FS. Sociodemographic variables found to be significant on univariate analysis ($p \leq 0.25$) were included in the logistic regression models.

3. Results

Of the 5501 questionnaires initially sent out, parents of 3806 children completed the survey (69.2%). Of these 3806 cases, 30 were excluded from the study due to a diagnosis of intoxication, encephalitis, meningitis, or history of afebrile seizures. Finally, 3776 cases were included in the analysis. Of these, 49.3% were male, and the mean age of participants was 6.5 years (median age = 7 years). Of the 3776 children included in the investigation, 181 were reported to have experienced at least one FS (4.8%). Although FS prevalence was higher in boys (5.3%, n = 98) than in girls (4.3%, n = 83), the difference was not statistically significant (p = 0.105). There was no significant difference between age-specific prevalence rates of FS [4.1% (6 years) and 5.3% (7 years), p = 0.103]. A total of 76 children (41.9%) had a family history of FS, including 52 (28.7%) in their parents and 24 (13.2%) in their siblings.

Some sociodemographic variables of the study population are shown in Table 1. According to univariate analyses, the prevalence of FS was significantly associated with consanguineous marriage (OR: 1.54, 95% CI: 1.004–2.371, p = 0.046), developmental delay of the child (OR: 2.05, 95%CI: 1.277–3.302, p = 0.002), chronic illnesses requiring continuous medication (OR: 2.58, 95% CI: 1.596–4.167, p < 0.001), history of neonatal intensive care unit (NICU) admission (OR: 1.96, 95% CI: 1.252–3.065, p = 0.003), and maternal history of gestational hypertension (OR: 2.14, 95% CI: 1.326–3.443, p = 0.001). In addition, the prevalence of FS increased with decreasing parental education level (p < 0.001). There was no significant relationship between health insurance status and the prevalence of FS (p = 0.455).

Some characteristics of the seizures are shown in Table 2. Most occurred before 18 months of age and were associated with body temperature above 39 °C A total of 59 (32.9%) children had a history of recurrent FS. Among these, 39 children had two episodes, and 20 children had three or more episodes of FS (Table 2). Recurrence after the first FS was reported within the first 3 months in 20 (33.9%) children, after 3–6 months in 21 (35.6%) children, after 6–12 months in 10 (16.9%) children, after 12–24 months in five (8.5%) children, and after more than 24 months in three (5.1%) children. Among children with recurrent FS, 15.8% had developmental delay (p = 0.323), and 37.3% had their first FS episode before 18 months of age (p = 0.327).

The relationships between positive history of FS and study variables were analyzed by logistic regression. We eliminated similar variables from the analysis to obtain more reliable results. For example, because NICU history, intrauterine fetal growth retardation, type of delivery, and gestational age were related, NICU history was chosen for the analysis. Thus, gender, consanguinity, chronic illnesses requiring continuous medication, developmental delay, NICU history, maternal education level, paternal occupation, and history of gestational hypertension were included in the model. Chronic illness requiring continuous medication, developmental delay, NICU history, history of maternal gestational hypertension, and lower maternal education level (elementary school) were found to be significantly associated with the