Evaluation of Patients Complaining of Staring Spells: Single Center Experience

Göz Dalması Şikayetiyle Başvuran Hastaların Değerlendirilmesi: Tek Merkez Deneyimi

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ABSTRACT

Objective: This study aimed to analyze the demographic characteristics, spell semiology, and electroencephalographic characteristics of children with a complaint of staring spells and determine the factors that differentiate epileptic and non-epileptic etiology.

Material and Methods: Fifty-six patients were included retrospectively between October 1, 2022, and December 1, 2023. The patients' age, gender, co-morbidities, and other characteristics of the staring spells (duration, frequency, automatism, and presence of post-attack symptoms), access time to the pediatric neurologist, referring unit and access time to the final diagnosis were also recorded. Electroencephalography (EEG) was performed on all patients.

Results: Fifty-six patients were divided into two according to epileptic and non-epileptic etiology. Thirty-three patients (59%) were diagnosed with non-epileptic staring spells, 15 (26.7%) were diagnosed with generalized epilepsy, and 8 (14.3%) were diagnosed with focal epilepsy. The non-epileptic group had a longer spell time and spell frequency, the presence of verbal stimulation response, and no post-attack symptoms ($p<0.001$). The access time to the pediatric neurologist was detected as 5.5 days, and the access time to the final diagnosis was 6.6 days. EEG was diagnostic in 100% of the epileptic group. Most of the patients were referred by pediatricians and family physicians ($p<0.001$).

Conclusion: Identifying the cause of staring spells is crucial for further follow-up. In this study, we emphasized that history and routine EEG are important to determine the etiology. It has been observed that access time to pediatric neurologists and final diagnosis are shorter in our country compared to the literature. It can be concluded that pediatricians and family physicians have a high awareness of staring spells.

Key Words: Childhood, Epilepsy, Staring spells, Epileptic seizure

ÖZ

Amaç: Bu çalışmanın amacı, göz dalması atakları şikayeti olan çocukların demografik özelliklerini, atak semiyolojisini ve elektroensefalografik özelliklerini analiz ederek epileptik ve epileptik olmayan etiyolojiyi ayıran faktörleri belirlemektir.

Gereç ve Yöntemler: 1 Ekim 2022-1 Aralık 2023 arasında göz dalması şikayetiyle başvuran 56 hasta, retrospektif olarak incelendi. Hastaların yaşı, cinsiyeti, komorbiditeleri, dalmanın diğer özellikleri (süre, sıklık, otomatizma ve atak sonrası

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Conflict of Interest / *Çıkar Çatışması*: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethics Committee Approval / *Etik Kurul Onayı*: This study was conducted in accordance with the Helsinki Declaration Principles. The study was provided by the Ankara Etlik City Hospital Ethics Committee (AEŞH-EK1-2023-646).

Contribution of the Authors / Yazarların katkısı*: *ÖZBUDAK P: Constructing the hypothesis or idea of research and/or article, Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in necessary literature review for the study, Taking responsibility in the writing of the whole or important parts of the study. ***KARGIN MENDERES D:*** Planning methodology to reach the conclusions, Taking responsibility in necessary literature review for the study, Taking responsibility in the writing of the whole or important parts of the study. ***ÜSTÜN C:*** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments, Taking responsibility in the writing of the whole or important parts of the study, Reviewing the article before submission scientifically besides spelling and grammar. ***ÖNCEL EP:*** Planning methodology to reach the conclusions, Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments, Taking responsibility in logical interpretation and conclusion of the results, Reviewing the article before submission scientifically besides spelling and grammar. ***YÜKSEL D:*** Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in logical interpretation and conclusion of the results, Reviewing the article before submission scientifically besides spelling and grammar.

How to cite / *Atıf yazım şekli* : Özbudak P, Kargın Menderes D, Üstün C, Öncel EP and Yüksel D. Evaluation of Patients Complaining of Staring Spells: Single Center Experience. Turkish J Pediatr Dis 2024;18:289-294.

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Received / Geliş tarihi : 03.02.2024
Accepted / Kabul tarihi : 17.04.2024
Online published : 23.05.2024
Elektronik yayın tarihi
DOI:10.12956/tchd.1431243

semptom varlığı), çocuk nöroloji hekimine ulaşma süreleri ve kim tarafından refere edildikleri sorgulandı. Tüm hastalara elektroensefalografi (EEG) uygulandı.

Bulgular: Ellialtı hasta epileptik ve epileptik olmayan etiyolojiye göre ikiye ayrıldı. Otuz-üç hastaya (%59) epileptik olmayan göz dalması, 15 hastaya (%26.7) jeneralize epilepsi, 8 hastaya (%14.3) ise fokal epilepsi tanısı konuldu. Epileptik olmayan gruptaki hastaların dalma süresinin ve atak sıklığının daha fazla olduğu, verbal uyarı yanıtının görüldüğü, atak sonrası semptomunun olmadığı saptandı (p<0.001). Dalma şikâyetiyle başvuran hastaların çocuk nöroloji hekimine ulaşma süresi 5.5 gün, hastaların sonuçlandırılma süresi 6.6 gün olarak hesaplandı. EEG epileptik grubun tamamında tanısaldı. Hastaların çoğu pediatrist ve aile hekimleri tarafından yönlendirilmişti (p<0.001).

Sonuç: Göz dalması şikayetinin nedenini belirlemek daha sonraki takip için çok önemlidir. Bu çalışmada etyolojinin belirlenmesinde öykü ve rutin EEG'nin önemi vurgulanmıştır. Ülkemizde pediatrik nörologlara erişim ve kesin tanı süresinin literatüre göre daha kısa olduğu görülmüştür. Ayrıca çocuk doktorları ve aile hekimlerinin göz dalması atakları konusunda farkındalıklarının yüksek olduğu söylenebilir.

Anahtar Sözcükler: Çocuk, Epilepsi, Epileptik nöbetler, Göz dalması

INTRODUCTION

Staring spells frequently prompt referrals to pediatric neurology clinics, aiming to distinguish between epileptic seizures and non-epileptic paroxysmal events.

Staring spells typically manifest as inattention, unresponsiveness, and daydreaming. Similar symptoms can also manifest in individuals diagnosed with attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) (1,2). Staring spells might serve as the main symptom in individuals experiencing absence seizures, which comprise 10-17% of childhood-onset epilepsy (3).

Determining a diagnosis for a child experiencing staring spells can pose challenges since clinicians seldom witness these events directly. Instead, they rely on descriptions provided by the parent or the child regarding the occurrence (4). Identifying the underlying cause of these spells is vital for devising appropriate follow-up steps and implementing an effective treatment strategy.

Video-electroencephalography monitoring (VEEG) is the gold standard method for distinguishing between epileptic and non-epileptic causes of staring spells, as it provides the concurrent evaluation of both the clinical events and cerebral electrical activity (5). However, it is important to identify distinguishing factors between epileptic and non-epileptic staring spells due to the difficulty of accessing video EEG, the prolonged duration of recordings, and the higher cost involved.

This study aimed to review patients referred to a pediatric neurology outpatient clinic for staring spells and to identify the distinguishing features that would aid in the differentiation of non-epileptic from epileptic spells in clinics without video EEG monitoring units.

MATERIALS and METHODS

We included 73 patients who were diagnosed with staring spells in a tertiary-level pediatric neurology clinic between October 2022 and December 2023. The study focused on patients under 18 years old whose staring spells were captured during routine EEG monitoring. Patients with epilepsy diagnosis before the onset of staring spells, with incomplete data, and patients who did not take EEG results were excluded.

Various patient details were collected from 56 patients who met the inclusion criteria, including demographic data, clinical presentation, and staring spell features. The analysis of the staring spells involved evaluating their characteristics, such as duration, frequency, progression over time, response to stimuli, presence of automatisms, post-spell behaviors like crying or irritability, and postictal confusion. The 2017 International League Against Epilepsy (ILAE) guidelines were used to determine seizure types if applicable.

The patients were also examined for family history of epilepsy, psychiatric disorders, and staring spells, as well as relevant comorbidities like autism, attention deficit hyperactivity disorder (ADHD), developmental delays, and metabolic or organ dysfunction. The final diagnosis was established based on the clinical features observed and EEG changes during monitoring. A flowchart illustrating the study's methodology and patient selection process is provided in Figure 1. In addition, they were queried about who had referred the patients, reaching time to the pediatric neurology outpatient clinic, and the duration of reaching of final diagnosis.

Since the study was designed retrospectively, patient consent was not obtained, but ethical approval for the study was provided by the Ankara Etlik City Hospital Ethics Committee (AEŞH-EK1-2023-646). The study was conducted following the Declaration of Helsinki's ethical principles.

Statistical Analysis

All statistical analyzes were conducted using IBM Statistical Package for the Social Sciences, version 28.0 (SPSS Inc., Armonk, NY, IBM Corp., USA). P values less than 0.050 were considered statistically significant. Descriptive statistics included mean and standard deviation for continuous variables and frequency and percentages for categorical variables. The data were analyzed for both epileptic and non-epileptic groups using Mann-Whitney U tests for continuous variables and chi-square or Fisher exact tests for categorical variables.

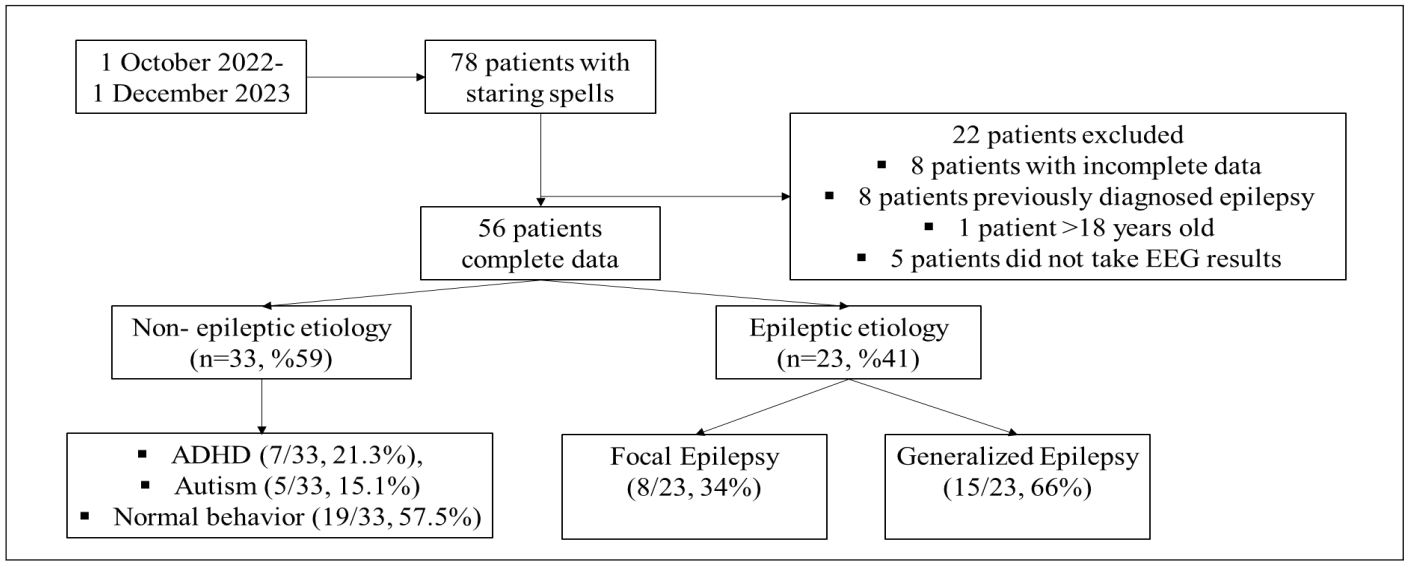

Figure 1: Shows the flowchart of study. **ADHD:** Attention deficit and hyperactivity disorder, **EEG:** Electroencephalography

RESULTS

In total, 56 patients were included in the study. The onset age of symptoms ranged from 24 to 142 months (82.10±24.9 months), with 53.7% of the patients (n=30) being male. Based on the etiology the patients were divided into two groups: epileptic (n=23, 41%) and non-epileptic (n=33, 59%) spell group. In all cohorts the most common comorbidity was detected as ADHD (n=7, 12.5%) and secondly ASD (n=6, 10.7%).

The average duration of spells was 95.2 seconds, with an average frequency of 8.4 per week. The presence of spells from onset was detected to be 14.25 ±7.83 weeks. Table I provides a summary of the entire cohort and the classification of patients based on their etiology as either epileptic or non-epileptic.

Table I: provides a summary of the entire cohort and the classification of patients based on their etiology as either epileptic or non-epileptic.

	All Cohort(n=56)	Epileptic (n= 23)	Non Epileptic (n= 33)	p
Demographic Datas				
Age (m)*	82.10±24.90 (24-142)	88.56±17.31 (65-132)	79.48±28.81 (24-142)	0.208‡
Gender (female)†	26 (46.5)	10 (43)	16 (48)	0.923§
Comorbidity†				
ADHD	7 (12.5)	-	7 (21.2)	
ASD	6 (10.7)	1 (3)	5 (15.1)	0.015§
ID	2 (3.5)	-	2 (6)	
Familial Epilepsy History†	4 (7.1)	2 (8)	2 (6)	0.547§
Familial Psychiatric Disorder History†	6 (10.7)	3 (13)	3 (9)	0.479§
Familial Staring Spell History†	3 (5.3)	1 (4)	2 (6)	0.635§
Staring Spells				
Duration (s)*	95.26±110 (10-600)	35.2±34.88 (10-120)	136.6±124.96(20-600)	<0.001‡
Frequency at onset (w)*	8.4±6.73 (1-30)	4.39±3.55 (1-15)	11.24±7.03 (2-30)	<0.001‡
Presence duration of staring spells (w)*	14.25±7.83 (3-35)	14.52±8.6 (3-35)	14.06±7.38 (4-34)	0.973‡
Increase in frequency†	17 (30.3)	16 (69.5)	1 (3)	<0.001§
Decrease in frequency†	17 (30.3)	-	17 (51.5)	<0.001§
Response to verbal stimulus†	28 (50)	-	28 (84.8)	<0.001§
Automatism†	12 (21.5)	9 (39.1)	3 (9)	<0.001§
Post-spell symptom† (crying/irritability/confusion)	6 (11)	6 (26)	-	<0.001§
Referral type†				
Other Families	3 (5.3)	2 (8)	1 (3)	
Internet	4 (7.1)	1 (4)	3 (9)	0.729§
Familiy Physician	9 (16)	4 (17.3)	5 (15)	
Pediatrician	35 (62.5)	16 (69.5)	24 (72)	
Access time to pediatric neurologist (d)*	5.53±3.23 (1-15)	4.39±3.38 (1-21)	4.63±3.17 (1-14)	0.662‡
Time until final diagnosis (d)	6.63±3.23 (2-16)	4.89±3.38 (2-24)	4.73±3.17 (2-15)	0.672‡

***:** mean±SD (Min-Max), **†:** n(%), **‡:** Mann Whitney U Test, **§:** Chi-square Test, ***ADHD:** Attention Deficit and Hyperactivity Disorder, **ASD:** Autism Spectrum Disorder, **ID:** Intellectual Disablity*

Table II: Displays the characteristics of the staring spells observed in these patients.

Epileptic Staring Spells n=23	Focal Epilepsy (n=8)	Generalized Epilepsy (n=15)	p
Duration (s)*	75 ± 31.16 (40-120)	14 ± 6.32 (10-30)	<0.001‡
Frequency at onset (w)*	4.35 ± 3.02 (1-10)	4.4 ± 4.67 (1-15)	0.767‡
Increase in frequency†	5 (62.5)	11 (73)	0.467§
Response to verbal stimulus	-	-	
Automatism†	5 (62.5)	4 (26.6)	0.110§
Post-spell symptom† (crying/irritability/confusion)	6 (75)	-	<0.001§
Presence of staring spells (w)*	18.37 ± 9.99 (7-35)	12.46 ± 8.05 (3-29)	0.137‡

*: *mean±SD (min-max),* †: *n(%)* ‡: Mann Whitney U Test, §: Chi-square Test

The final diagnoses for the non-epileptic group were ADHD (7/33, 21.2%), autism (5/33, 15.1%), and normal behavior (19/33, 57.5%). Generalized and focal epilepsy were diagnosed in 15/56 (26.7%) and 8/56 (14.2%) patients, respectively.

The leading non-epileptic diagnoses had longer spell durations, with a higher frequency averaging 136 seconds with 11.2 spells per week. Epileptic staring spell group patients had shorter spell durations (35.2 seconds) and less frequent spell episodes (4.4 per week). Longer spell durations (>120 seconds) were more prevalent among patients without an epilepsy diagnosis (p =0.001).

Response the verbal stimulation was more common in patients without an epilepsy diagnosis (p<0.001). Automatisms were observed in 12 patients and were detected higher prevalence in the epileptic group (9 out of 23; 39.1%) compared to the non-epileptic group (3 out of 33; 9%) (p<0.001). Additionally, post-spell symptoms were more commonly observed in the epileptic group (p<0.001).

The epileptic spell group was further divided into two subgroups based on EEG characteristics as generalized epilepsy group (n=15) and the focal epilepsy group (n=8). It is worth noting that all patients in the epilepsy group had EEG abnormalities (n=23). Table II displays the characteristics of the staring spells observed in these patients.

The study revealed a statistically significant difference in the duration of a spell between the focal and the generalized epilepsy group (75±31.16 vs 14±6.32, p=0.001). No response to verbal stimuli was detected in either group. There was no statistically significant difference between the groups in the frequency of spells at baseline, the increase in the frequency of spells at follow-up, or the presence of automatism (p=0.110). Postictal findings were more prevalent in the focal epilepsy group (p<0.001).

Upon questioning the units responsible for referring patients to the pediatric neurology department, it was observed that the majority of patients (62.5%) were referred by pediatricians, followed by family physicians (16%) (p<0.001). However, 8 out of 56 patients were referred by non-medical units. The mean access time to the pediatric neurology unit was 5.5 days and to reach the final diagnosis was calculated as 6.6 days.

DISCUSSION

Staring spells are one of the common paroxysmal non-epileptic events in children, often unrecognized by families (6). A definite diagnosis can be made with a VEEG recording of the spell. However, the availability of VEEG requires financial resources and is not always possible in non-specialized clinics (7).

In this study, we aimed to highlight the factors that may be crucial in distinguishing epileptic and non-epileptic causes in clinics without VEEG. To determine the etiology of newly emerging staring spells in our clinic, we routinely conduct a sleep and wakefulness EEG after a detailed evaluation of the patient's medical history and staring spell characteristics, including duration, frequency, automatisms, and post-spell symptoms. We ensure that the EEG results are normal or show specific interictal epileptiform findings.

Therefore, the development of more accessible diagnostic methods may aid in clarifying the etiology, preventing unnecessary fees for families and states, reducing the workload for physicians, and most importantly, identifying which patients may not require investigating.

The research illustrates that various underlying causes can manifest as staring spells, often resembling epileptic seizures. Among individuals experiencing newly occurring staring spells, 41% received a diagnosis of epileptic staring spells. Similar outcomes have been noted in prior studies, where rates have varied between 11% to 57%, indicating the diverse nature of conditions that can mimic or present similarly to epileptic staring spells (8,9).

The assessment of whether staring spells constitute epileptic seizures has focused on clinical factors. Patel et al. (9) devised a scoring system incorporating past EEG results, medication history, and the duration of the spell to determine which patients should undergo extended hospitalization for follow-up care. Among 276 admissions, only 29 patients (11%) received a diagnosis of seizures attributed to staring spells.

Our findings align with recent studies indicating that children experiencing nonepileptic staring spells were younger compared to those diagnosed with epileptic seizures. Additionally, individuals with nonepileptic staring spells were more prone to having neuropsychiatric comorbidities (8,10,11).

In the study conducted by Goenka et al. (12) staring spells were classified by age, and the most frequent diagnoses were summarized. The most common diagnoses for children aged 0-3 years were normal behavior and gratification response. However, diagnoses of epilepsy, attention deficit and hyperactivity disorder, and psychogenic non-epileptic seizures increased with age. Our study found that comorbidities, particularly attention deficit and hyperactivity disorder and autism spectrum disorder, were statistically more frequent in the non-epileptic group.

Additionally, the duration of spells was significantly lower in the epilepsy group compared to the non-epileptic group. Within the epilepsy group, focal seizures had a higher spell time than generalized seizures. Based on our analysis, we have concluded that the duration of spells lasting less than one minute are more significant in terms of generalized epileptic etiology while lasting more than two minutes are more significant in terms of non-epileptic etiology. These findings are consistent with those of Kim et al.(13). Furthermore, our study indicates a decrease in the frequency of non-epileptic etiology episodes over time, while the frequency of staring spells with epileptic etiology increased.

Another noteworthy finding is the lack of response to verbal stimulation in epileptic seizures, while 28 out of 33 (84.8%) non-epileptic seizures responded to verbal stimulation. This phenomenon has been observed in the literature across different age groups. In staring spells with epileptic etiology, there was no response to verbal stimulation. However, it was observed that 28 out of 33 attacks (84.8%) with non-epileptic etiology responded to verbal stimulation. This finding is consistent with similar observations in the literature across different age groups (12).

The epileptic group showed a statistically significant increase in the presence of automatisms and post-spell symptoms. Within the epileptic group, the focal epilepsy group had a higher incidence of these symptoms. However, it is important to note that although automatisms are more suggestive of an epileptic etiology, they may rarely accompany non-epileptic staring spells. The EEG showed a higher likelihood of abnormalities among children diagnosed with epilepsy. Among children experiencing focal seizures and displaying abnormal EEG results, the most frequent localization of epileptiform discharges was observed in the temporal lobe. Additionally, in all cases of absence seizures, EEG readings revealed 3-Hz generalized spike-and-wave discharges.

Our study revealed a new aspect, which is interesting for the literature. Although patients were generally referred by pediatricians or family physicians, a high rate of referrals from the internet and other families was observed. This suggests that while physicians are knowledgeable about staring spells, information from non-healthcare sources is also significant. It is worth noting that preschool teachers have also been reported to have a high awareness of this issue in the literature (14).

In comparison to the literature, our center has demonstrated a significantly shorter time to reach a pediatric neurologist and complete the diagnosis process. A recent article found that the mean time to reach a pediatric neurologist for children aged 0-17 years with staring spells was 0.7 years, which is much longer than our study.

In patients with staring spells, access time to initial neurological care appeared to be associated with race/ethnicity, insurance, and annual county per capita personal income. In our study, race/ethnicity, insurance, and annual county per capita personal income did not appear to be associated with access time to initial neurological care in patients with staring spells. These variables were among the reasons that significantly shortened the time for our patients, unlike in other centers (15).

In conclusion, the history, the semiology of spells, and routine EEG are important in the differential diagnosis of children presenting with staring spells. In addition, it has been observed that access time to pediatric neurologists and reaching time to final diagnosis are shorter in our country compared to the literature. With these results, it can be concluded that pediatricians and family physicians have a high awareness of staring spells.

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