

Outcomes of Inpatient Child Neurology Consultations

Yatan Hasta Çocuk Nörolojisi Konsültasyon Sonuçları

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Abstract

Child neurology covers a wide range of relevant topics. Both doctors and parents are concerned when a child complains of being unable to walk or having a headache, and they are afraid of postponing the diagnosis. The goal of this study was to assess pediatric neurology inpatient consults. A total of 1,669 requests for pediatric neurology inpatient consultations were reviewed retrospectively during a one-year period. Seizure and febrile seizure were the most common reasons for child neurology consultations (60,6% and 12,2%, respectively). Neuromotor developmental delay (5,7%), syncope (3,4%), headache (2,6%), altered mental status (2,1%), acute complaint of inability to walk (1,8%), facial nerve paralysis (1,4%), ataxia (1,2%), and monoparesis/hemiparesis (1,2%) were among the other reasons for child neurology consultations (1%). Fifty-seven patients (8,8%) who were consulted owing to a seizure were not diagnosed as having seizures. The most common cause of changed mental status was meningoencephalitis. Nine (47,4%) of the patients with acute inability to walk were evaluated as viral myositis. In a patient with acute neurological symptoms, there may be a simple underlying cause or a serious cause.

Keywords: Child, consultation, inpatient, neurology

Özet

Çocuk nörolojisi, çok çeşitli ilgili konuları kapsar. Bir çocuk yürüyememeden veya baş ağrısından şikayet ettiğinde hem doktorlar hem de ebeveynler endişelenir ve teşhisi ertelemekten korkarlar. Bu çalışmanın amacı, pediatrik nöroloji yatan hasta konsültasyonlarını değerlendirmektir. Pediatrik nöroloji yatan hasta konsültasyonları için toplam 1.669 talep, bir yıllık süre içinde geriye dönük olarak incelendi. Çocuk nörolojisi konsültasyonlarının en sık nedenleri nöbet ve ateşli nöbet (sırasıyla %60,6 ve %12,2) idi. Nöromotor gelişimsel gecikme (%5,7), senkop (%3,4), baş ağrısı (%2,6), mental durum değişikliği (%2,1), akut yürüyememe şikayeti (%1,8), fasiyal sinir felci (%1,4), ataksi (%1,2) ve monoparezi/hemiparezi (%1) çocuk nörolojisi konsültasyonlarının diğer nedenleri arasındaydı. Nöbet nedeniyle konsülte edilen 57 hastaya (%8,8) nöbet tanısı konulmadı. Mental durum değişikliğinin en sık nedeni meningoensefalit idi. Akut yürüyememe şikayeti olan hastaların 9'u (%47,4) viral miyozit olarak değerlendirildi. Akut nörolojik semptomları olan bir hastada altta yatan basit bir neden olabileceği gibi ciddi bir neden de olabilir.

Anahtar Kelimeler: Çocuk, konsültasyon, yatan hasta, nöroloji

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1. Introduction

Child neurologist is dealing with the diagnosing and treating disorders of the nervous system (brain, spinal cord, muscles, nerves). Seizures, developmental, mobility, neurometabolic, and neuromuscular illness are all relevant topics in child neurology. A simple symptom like a headache or dizziness can sometimes be a very important illness finding. The family anxiety also increases the doctor's anxiety. Sometimes, for this reason, unnecessary further tests are required.

The purpose of this study was to describe pediatric neurology inpatient consultations at a children's teaching hospital.

2. Materials and Methods

A total of 1,669 requests for pediatric neurology inpatient consultations at Bursa Yüksek İhtisas Training and Research Hospital were reviewed retrospectively during a one-year period. Consultations are required on weekdays. On the same day as the request, all patients were seen by one of the two child neurologist. Age, gender, kind of referral, consultation date and month, consultation reasons, and final diagnosis were all noted. The study protocol was approved by the Institutional clinical research ethics committee (2011-KAEK-25 2019/06-01) in accordance with the tenets of the declaration of Helsinki.

The statistical analysis was performed using the version 18.0 of the SPSS software. Frequency was used for qualitative variables and mean±standard deviation was employed for quantitative variables. A comparison among the subgroups was performed using the chi-square test. P of less than 0.05 were considered significant.

3. Results

Among the total of 1069 pediatric patients for whom pediatric neurology consultation was requested, 565 (52.9%) were males and 504 (47.1%) were females (male:female ratio 1.2:1). The mean age was 69.93 months±48.00 months (age range: 1 days-18 years). The most consultation was requested in January and June. The day for the most consultation was Monday. The distribution of patients by month of consultation is shown in Table 1 and days is shown in Table 2. The most common requesting department was general pediatrics (GP) for 994 (93%), consultations followed by intensive care unit for 32 (3%). Nine hundred and ninety-four (93%) of pediatric neurology consults were requested from pediatric services, with 54 (5.1%) from the pediatric critical care unit and 21 (1.9%) from the neonatal intensive care unit.

Table 1. The distribution of patients by month of consultation

Month of the consultation	Patients (n:1069)	(%)
January	120	11,2
February	91	8,5
March	77	7,2
April	22	2,1
May	101	9,4
June	100	9,4
July	123	11,5
August	78	7,3
September	84	7,9
October	101	9,4
November	82	7,7
December	90	8,4

Table 2. The distribution of patients by days of consultation

Day of the consultation	Patients (n:1069)	(%)
Monday	355	33,2
Tuesday	248	23,2
Wednesday	193	18,1
Thursday	125	11,7
Friday	148	13,8

Seizure (60,6%) and febrile seizure (FS) (12.2%) were the most common reasons for pediatric neurology consultations. The distribution of reasons for consultation are shown in Table 3. Five hundred ninety one (91.2%) of the 648 (60.6%) patients consulted for seizures were diagnosed as seizures, and 201 (34%) of them had previously been diagnosed with epilepsy. Five of these patients (0.9%) had cerebral hemorrhage, three (0.5%) had hypocalcemia, and one (0.2%) had hypoglycemia. Fifty-seven (8.8%) patients were not evaluated as seizure. Of these patients, 46 patients (7.1%) were evaluated as paroxysmal nonepileptic events (PNEEs), 10 patients (1.5%) were pseudoseizure and one patient (0.2%) was dystonia. Consultation was requested from 130 patients (12.2%) due to FS. Ninety (69.2%) of them had undergone FS for the first time and 40 (30.8%) of them had more than one FS. Seventeen (2.9%) of the patients with seizures were status epilepticus. Five of them had febrile status epilepticus, and three had previously been diagnosed with epilepsy.

Consultation was requested from 28 patients (2.6%) due to headache. Pseudotumor cerebri, brain abscess, optic neuritis, and posterior reversible encephalopathy were all identified in four (14.3%) of these patients. Neuromotor developmental delay (5.7%) and syncope (3.4%) were other common causes of consultation. The cause of any syncope was not associated with a neurological reason and all of them had normal EEG. Due to acute changed mental status, twenty-two (2.1%) patients requested consultation. Eleven patients (50%) were diagnosed with meningoencephalitis, three patients (13.6%)

with metabolic disease, one patient (4.5%) with sepsis, one patient (4.5%) with intracranial infarction, one patient (4.5%) with intoxication, one patient (4.5%) with brain abscess, and one patient (4.5%) with cerebral bleeding. Three patients' (13.6%) consciousness improved within 24 hours, could not be linked to any cause. Nineteen patients (1.8%) with acute complaints of unable to walk were consulted. Nine (47.4%) of these patients were evaluated as viral myositis, four (21%) were Guillain Barre syndrome (GBS), one (5.3%) were transverse myelitis, and one (5.3%) was a spinal mass. Two patients (10.5%) were unable to stand for a short period of time after injection. Two patients (10.5%) were associated with non-neurological causes (intra-articular bleeding, rheumatological cause).

Eleven (73.4%) of the 15 individuals (1.4%) who were assessed for facial nerve paralysis (FNP) were classified as peripheral FNP, while two (13.3%) were classified as central FNP (trauma and polyneuritis cranialis). Two children (13.3%), aged one month and 1.5 years, were identified with hypoplasia of the depressor angularis oris muscle. Seven (53.8%) of the 13 patients (1.2 %) with ataxia were diagnosed with postinfectious cerebellar ataxia, three (23.1%) with due to trauma, two (15.4%) with acute cerebellitis, and one (7.7%) with brainstem encephalitis. Six (54.5%) of 11 patients (1%) who were consulted due to monoparesis or hemiparesis had intracranial infarction, transient ischemic attack in three (27.3%), brachial plexus palsy in one (9.1%), and cerebral hemorrhage in one (9.1%).

Table 3. The distribution of reasons for consultation

Reasons for consultation	Patients (n:1069)	(%)
Seizure	648	60,6
Febril seizure	130	12,2
Neurodevelopmental delay	61	5,7
Syncope	36	3,4
Headache	25	2,3
Altered mental status	22	2,1
Gait disturbance	22	2,1
Facial paralysis	15	1,4
Ataxia	13	1,2
Hemiparesis / monoparesis	11	1
Dizziness	9	0,8
Hypotonia	9	0,8
Hypoxic ischemic encephalopathy	8	0,7
Paresthesia	8	0,7
Increased muscle tone	7	0,6
Trauma	6	0,5
Brachial paralysis	5	0,5
Tremor	5	0,5
Brain death	4	0,4
Involuntary movement	4	0,4
Neurocutaneous syndrome	4	0,4
Meningomyelocele	3	0,3
Strabismus	3	0,3
Speech disorder	3	0,3
Microcephaly	2	0,2
Antiepileptic drug-induced thrombocytopenia	2	0,2
Macrocephaly	1	0,1
Hiccup	1	0,1
Ptosis	1	0,1
Sleeping disorder	1	0,1

Consultation was requested from six patients (0.9%) with trauma. Four of them had cerebral bleeding. Patients with increased muscle tonus were those with cerebral palsy and neurometabolic disease. Two of the four patients with involuntary movements were patients with neurometabolic disease. Two patients were evaluated as Sydenham chorea. Three patients were diagnosed with neurofibromatosis type 1, and one patient was diagnosed with Sturge Weber syndrome, for whom consultation was required in terms of neurocutaneous syndrome. Of the four patients who consulted for the assessment of brain death, two patients were traumatic, one patient hypoxia due to foreign body aspiration and one patient was burned. The patient with ALL who complained of hiccups had normal neuroimaging, and cyclophosphamide was thought to be a side effect. None of the patients with paresthesia, dizziness, strabismus, speech dysfunction, ptosis, or sleeping disturbance had any neurological issues.

4. Discussion

A sudden change in consciousness, inability to walk, or a seizure is a highly concerning circumstance for both parents and pediatricians. These circumstances can arise from a simple cause or a serious one that can result in morbidity and mortality. There are few articles on child neurology consultation in the literature. In this study, 1069 pediatric neurology inpatient consultations at a tertiary care teaching hospital were reviewed retrospectively during a one-year period. There was a slight male preponderance with a male:female ratio of 1.2:1. The mean age was 69.93 months ± 48.00 months (age range: 1 days-18 years). The most consultation was requested in January (11.2%) and June (11.5%). In these two months, the reason for frequent consultations could not be assessed. Monday was the busiest day for consultations (33,2%). The large number of consultations on Monday was assumed to be attributable to the high demand for weekend consultations on

Monday. The greatest consultation was requested from general pediatrics (93%) due to the high number of beds.

The most common reasons of child neurology consultation was seizure (60,6%) and FS (12.2%). We thought that the FS were less common than afebrile seizure because of the referral of afebrile seizures to our tertiary hospital and FS could be followed up in other hospitals without a child neurologist. Fifty seven (8.8%) of 648 patients who were consulted for seizures were not considered as seizures. The majority of these were evaluated as PNEEs, while the others were evaluated as pseudo-seizure and dystonia. PNEEs and pseudoseizure can mimic seizures. It is important to distinguish between seizure to avoid unnecessary testing and unnecessary antiepileptic treatment. The diagnosis can be made with detailed history and careful observation. In infants, relatively common conditions such as apnea, jitteriness and breath-holding spells can be more easily distinguished from seizures (1). Pseudoseizure also called "psychogenic nonepileptic seizure" consist of paroxysmal changes in responsiveness, movements, sensations, and/or behavior that are similar to epileptic seizures, but do not have a neurological origin and are not associated with electrophysiological changes of the epileptic seizures (2,3). It is not always possible to differentiate between seizure and PNEEs or pseudoseizure easily. 20% to 30% of people diagnosed with epilepsy who are evaluated at epilepsy centers are found to have been misdiagnosed (4-6).

Headache and syncope are among the most common reasons for referral to pediatric emergency services and pediatric neurology outpatient clinics. Because the consultations of inpatients were evaluated in this study, consultation was rarely requested with the diagnosis of syncope (3.4%) and headache (2.6%). Pseudotumor cerebri, brain abscess, optic neuritis and posterior reversible encephalopathy were detected in 14.3% of the patients with headache. Headache can be seen due to primary and secondary causes. It can be due to a simple infection as well, though rarely due to intracerebral hemorrhage, meningitis or a brain tumor. Imaging studies

and specialist consultation are required in children presenting with neurological findings, first and worst headache, with atypical features including, intractable vomiting, headache arousing the child from sleep, occipital headache, a change from previous headache pattern, subacute onset with a progressive severity, immunosuppressed child with fresh-onset headache, history of recent trauma, presence of ventriculoperitoneal shunt and age younger than 5 years (7). In this study, the accompanying headache symptom to important diseases was also attributed to the inpatient consultation request. In the vast majority of pediatric patients, the cause of syncope is benign. The most common cause of syncope is vasomotor instability leading to low blood pressure and decreased cerebral perfusion (8-10). In this study, none of the patients presenting with syncope had a neurological cause.

Altered mental status in a child can be stressful for patients and their families and pose a challenge for the clinician to diagnose and manage emergently. Etiologies of altered mental status in children varied widely including vascular, toxin-mediated, infectious, metabolic, and traumatic causes and often an underlying diagnosis was not found. It has been reported that the most common cause of etiology in children under the age of 12 is neurological, and the most common cause in children older than 12 years is toxicological (11). In this study, the reason for seeking consultation in 2.1% was the acute altered mental status. Infectious causes were the most common cause (meningoencephalitis, sepsis, brain abscess). The other causes were metabolic disease, intracranial infarction, intoxication and cerebral bleeding. 13.6% of patients' consciousness improved within 24 hours, could not be linked to any cause.

In this study, approximately half of the patients consulted with the complaint of acute inability to walk were evaluated as acute viral myositis. Four patients (21%) had GBS, one (5.3%) had transverse myelitis, and one (5.3%) had a spinal mass. Two patients (10.5%) were associated with non-neurological causes (joint bleeding, rheumatological cause). Many underlying

causes such as acute myositis, GBS, transverse myelitis, polymyositis, juvenile dermatomyositis, osteomyelitis, arthritis and deep vein thrombosis can be found in children presenting with the complaint of not being able to walk (12). First of all, it is desired to rule out the neurological conditions. Early diagnosis and treatment of GBS and transverse myelitis are important in terms of preventing morbidity and mortality (13). A child who complains of being unable to walk is quickly referred to a pediatric neurologist for these reasons. Benign acute childhood myositis is a temporary and inflammatory condition seen in school and preschool period, characterized by elevated creatine kinase levels (14). Early diagnosis will help reduce unnecessary invasive investigations. And also non-neurological causes should also be kept in mind.

Acute ataxia is fairly common in children. Acute ataxia in children has a variety of reasons, but it can also be an indication of a serious illness. The most common causes of acute ataxia in children are excessive drug ingestion, drug intoxications and post-infectious cerebellitis. Careful screening for an infectious etiology should be considered in patients with acute cerebellar ataxia (15). Postinfectious cerebellar ataxia (53.8%) was the most common cause of ataxia in our study. Trauma (23.1%), acute cerebellitis (15.4%) and brainstem encephalitis (7.7%) were the other causes. In a study evaluating 11 year cases of ataxia, it was reported that the most common cause was postinfectious cerebellar ataxia

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(59%), followed by drug intoxication, opsoclonus-myoclonus ataxia syndrome, episodic ataxia, acute cerebellitis, cerebellar stroke, ADEM, meningitis, cerebral vein thrombosis, Leigh's disease, Miller-Fisher syndrome, and concussion (16).

A wide variety of complaints and diseases are associated with child neurology. Facial paralysis, trauma, increased muscle tone, involuntary movements, meningomyelocele, brain death, hiccup, paresthesia, dizziness, strabismus, speech disorder, ptosis, microcephaly, macrocephaly, antiepileptic drug-induced thrombocytopenia and sleeping disorder were the other causes of consultation in this study.

Children with considered to have acute neurological emergencies by their families, present to the emergency department with a wide range of symptoms. Patients, hospitalized for follow-up, examination and treatment are requested for a consultation from child neurology. Unable to walk, headache, syncope, change of consciousness, unbalanced walking cause important concerns for both doctors and parents, and fear of skipping or delaying the diagnosis. In this study, the most common reason of child neurology consultation were febrile or afebrile seizure, syncope, headache and altered mental status. In a patient with acute neurological symptoms, there could be a simple or important underlying reason, as demonstrated in this study.

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