

# ÇOCUK ACİL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine



ÇOCUK ACİL TIP  
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# ÇOCUK ACİL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine



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# ÇOCUK ACIL ve YOĞUN BAKIM DERGİSİ

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Journal of Pediatric Emergency and Intensive Care Medicine



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The journal publishes original research, case reports, reviews, articles like letters to the editor, clinical reports, medical opinions and related educational and scientific notifications. The basic sections of the contents are composed of medical systems of pediatric emergency, academic pediatric emergency medicine and education, management of pediatric emergency department, disaster and environmental emergency, trauma, case reports, adolescence emergencies, pediatric emergencies, new born emergency, health policy, ethics, intoxication, pediatric emergency nursery, pediatric intensive care nursery, preventive medicine, pediatric intensive care, critical diseases, critical patient management, diagnostic methods, sepsis and septic shock, organ and system failures, intensive care technology, invasive and non-invasive monitorization, invasive and non-invasive ventilation, extra-corporal body support systems, ethical assessment, laboratory, emergent radiology and interventional procedures.

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## YAZARLARA BİLGİ

Yayımlanmaya 2014 yılında başlayan Çocuk Acil ve Yoğun Bakım Dergisi, ulusal ve uluslararası makaleleri yayımlayan, çift-kör hakemlik ilkeleri çerçevesinde yayın yapan bir dergidir. Dergi özgün araştırma, olgu sunumu, derleme, editöre mektup türündeki makaleleri, klinik raporları, tıbbi düşünceleri ve ilgili eğitimsel ve bilimsel duyuruları yayımlar.

Dergi içeriğinde temel bölümler çocuk acil tıp sistemleri, akademik çocuk acil tıp ve çocuk acil tıp eğitimi, çocuk acil servis yönetimi, afet, çevresel aciller, travma, olgu sunumları, ergen acilleri, çocuk acilleri, yenidoğan acilleri, sağlık politikaları, etik, zehirlenme, çocuk acil hemşireliği, çocuk yoğun hemşireliği, koruyucu hekimlik, Çocuk Yoğun Bakımı, kritik hastalıklar, kritik hasta yönetimi, tanı yöntemleri, sepsis ve septik şok, organ ve sistem yetersizlikleri, yoğun bakım teknolojisi, non-invazif ve invazif monitörizasyon, non-invazif ve invazif ventilasyon, vücut dışı destek sistemleri, etik değerlendirmeler, laboratuvar, acil radyoloji ve girişimsel işlemlerden oluşmaktadır.

**Derginin İngilizce kısaltması; "J Pediatr Emerg Intensive Care Med" olarak kaydedilmiştir.**

Editörler ve Yayın Kurulu üç yılda bir Ocak ayında Çocuk Acil Tıp ve Yoğun Bakım Derneği Yönetim Kurulu tarafından belirlenir.

Türkçe yazılarda Türk Dil Kurumu'nun Türkçe Sözlüğü ve Yazım Kılavuzu temel alınmalıdır.

**Çocuk Acil ve Yoğun Bakım Dergisi, hiçbir makale başvuru veya işlem ücreti uygulamamaktadır.**

Dergiye yayımlanmak üzere gönderilen tüm yazılar "iThenticate" programı ile taranarak intihal kontrolünden geçmektedir. İntihal taraması sonucuna göre yazılar ret ya da iade edilebilir.

Çocuk Acil ve Yoğun Bakım Dergisi, Türk Tıp Dizini koşullarına uygun olarak bir yıl içindeki toplam özgün araştırma makalesi sayısı 15'den az olmayacak ve toplam makale sayısının (özgün araştırma makalesi, olgu sunumu, kitap kritiği, editöre mektup, derleme, kılavuzlar) en az %50'sini oluşturacak şekilde yayımlanır. Her sayıda en az 5 araştırma, en fazla araştırma makalesi sayısı kadar olgu sunumu ve/veya derleme yayımlar. Derlemeler editörün daveti üzerine hazırlanır.

Derginin arşiv sisteminde tüm hakem kararları, başvuru yazılarının imzalı örnekleri ve düzeltme yazıları en az beş yıl süreyle saklanır.

Dergide yayımlanan makaleler, içindekiler sayfasında ve makale başlık sayfalarında türlerine göre (araştırma, olgu sunumu, kısa rapor, derleme, editöre mektup vb.) sınıflandırılır.

Yazarlar ilk gönderim sırasında aşağıdaki formalrı sağladığından emin olmalıdır:

- Telif Hakkı Devir ve Yazarlık Katkı Formu
- ICMJE Potansiyel Çıkar Çatışması Formu tüm yazarlar tarafından imzalanması gerekir.

### HAKEM DEĞERLENDİRME SÜRECİ

Çocuk Acil ve Yoğun Bakım Dergisi'ne gönderilen yazılar ilk olarak editör tarafından değerlendirilir. Editör her yazıyı değerlendirmeye alınıp alınmaması konusunda gözden geçirir ve yazıya editör yardımcısı atar. Editör ve yazıya atanan editör yardımcısı yazıyı değerlendirmeye uygun bulursa, iki hakem veya bir hakem ve bir yayın/danışma kurulu üyesine değerlendirmek üzere gönderir. Eğer yazı bilimsel değerliliğinin ve orijinalliğinin olmaması, kritik hasta çocuk alanına ve

dergi okuyucu kitlesine hitap etmemesi gibi nedenlerle yayın/danışma kurulu üyelerinin veya hakem değerlendirmesini gerektirmiyorsa yazı değerlendirme altına alınmaz.

Yazarların bilimsel ve etik sorumlulukları yazarlara, telif hakkı ise Çocuk Acil ve Yoğun Bakım Dergisi'ne aittir. Yazıların içeriğinden ve kaynakların doğruluğundan yazarlar sorumludur. Yazarlar, yayın haklarının devredildiğini belirten onay belgesini (Yayın Hakkı Devir Formu) yazıları ile birlikte göndermelidirler. Bu belgenin tüm yazarlar tarafından imzalanarak dergiye gönderilmesi ile birlikte yazarlar, gönderdikleri çalışmanın başka bir dergide yayımlanmadığı ve/veya yayımlanmak üzere incelemede olmadığı konusunda garanti vermiş, bilimsel katkı ve sorumluluklarını beyan etmiş sayılırlar.

### MAKALE KATEGORİLERİ

**Özgün Araştırma Makaleleri:** Kritik hasta çocuk alanında yapılmış temel veya klinik araştırma makaleleridir. Kaynaklar ve İngilizce özet gereklidir (Bkz. Yazı hazırlığı bölümü). En fazla 5000 sözcük (20 çift aralıklı sayfa), yedi tablo ve/veya resim, ek olarak İngilizce, Türkçe özet ve kaynakları içermelidir. Etik kurul onayı çalışma içinde bahsedilmelidir.

**Olgu Sunumları:** Çocuk Acil Tıp ve Çocuk Yoğun Bakım alanında karşılaşılan eğitimsel yönü olan klinik olguların veya komplikasyonların sunumudur. Bu bölüme yayım için gönderilen yazılarda daha önce bilimsel literatürde sıklıkla bildirilmemiş klinik durumları, bilinen bir hastalığın bildirilmemiş klinik yansımaları veya komplikasyonlarını, bilinen tedavilerin bilinmeyen yan etkilerini veya yeni araştırmaları tetikleyebilecek bilimsel mesajlar içermesi gibi özellikler aranmaktadır. Olgu sunumları Türkçe ve İngilizce özet, giriş, olgu sunumu ve sunulan olguya yönelik tartışmayı içermelidir. En fazla uzunluk 2000 sözcük (8 çift aralıklı sayfa), 15 veya daha az kaynak, üç tablo veya resim içermelidir.

**Özet Raporlar:** Ön çalışma verileri ve bulguları, daha ileri araştırmaları gerektiren küçük sayılı araştırmalar. Kaynaklar ve İngilizce özet gereklidir (Bkz. yazı hazırlığı bölümü). En çok uzunluk 3000 sözcük (sekiz çift aralıklı sayfa), ek olarak İngilizce ve Türkçe özet, 15 veya aşağı sayıda referans, üç tablo ve/veya şekil. Etik kurul onayı gereklidir.

**Konseptler:** Çocuk acil tıp ve çocuk yoğun bakım ile ilgili ve bu alanı geliştirmeye yönelik klinik veya klinik olmayan konularda yazıdır. Kaynaklar ve İngilizce özet gereklidir. En çok uzunluk 4000 kelime (16 çift aralıklı sayfa), ek olarak İngilizce ve Türkçe özet (her biri 150 kelimenin altında) ve kaynaklar içermelidir.

**Derleme Yazıları (Reviews):** Çocuk acil tıp ve çocuk yoğun bakım ile ilgili ve konuyla ilgili son ulusal ve dünya literatürlerini içeren geniş inceleme yazıdır. Çocuk Acil ve Yoğun Bakım Dergisi davetli derleme yazısı yayımlanmaktadır. Davetli olmayan derleme başvuruları öncesinde editör ile iletişime geçilmelidir. En çok 5000 kelime (20 çift aralıklı sayfa). Kaynak sayısı konusunda sınırlama yoktur. Derleme yazma konusunda gerekli bilgi aşağıdaki makaleden elde edilebilir;

Burney RF, Tintinalli JE: How to write a collective review. Ann Emerg Med 1987;16:1402.

**Kanıtı Dayalı Bilgi:** Klinik ve tıbbi uygulamalara yönelik sorulara yanıt verebilen makaleler. Makale şu bölümleri içermelidir; Klinik senaryo, soru ve sorular, en iyi kanıtın araştırılması ve seçilmesi, kanıtın ayrıntılı incelenmesi ve kanıtın uygulanması. En çok 4000 kelime (15 çift aralıklı sayfa), ek olarak Türkçe ve İngilizce özet. Yazarlar kullandıkları makalelerin kopyasını da ekte editöre göndermelidir.

# ÇOCUK ACIL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine



**Editöre Mektup:** Çocuk acil tıp ve çocuk yoğun bakım ile ilgili konulardaki görüşler, çözüm önerileri, Çocuk Acil ve Yoğun Bakım Dergisi'nde veya diğer dergilerde yayımlanan makaleler hakkında yorumları içeren yazılardır. En çok 1500 kelime (altı çift aralıklı sayfa), ek olarak kaynaklar yer almalıdır.

**Nöbet Öyküleri:** Çocuk acil tıp ve çocuk yoğun bakımın doğasını ve dinamizmini yansıtan, çocuk acil tıbbın ve çocuk yoğun bakımın mizahi yönünü yakalamış kişisel ve/veya ekip deneyimleri. En çok 1000 sözcük içermelidir.

## Makale Başvurusu

Makale Gönderim Sözleşmesi: Çocuk Acil ve Yoğun Bakım Dergisi'nin her yeni baskısında yer almakta olup, ihtiyaç duyulması halinde Çocuk Acil ve Yoğun Bakım Derneği ve internet sitesinde de yer almaktadır. Tüm makale gönderimlerinde doldurulmalıdır.

**Kapak Mektubu:** Yazar, bu mektupta, araştırmasının veya yazısının kısa bir açıklamasını, çalışmanın türünü (randomize, çift kör, kontrollü vb.), gönderildiği kategoriyi, bilimsel bir toplantıda sunulup sunulmadığını ayrıntılı olarak belirtmelidir. Ayrıca yazı ile ilgili iletişim kurulacak kişinin adresi, telefonu, faks numaraları ve e-posta adresi yazının alt kısmında yer almalıdır.

Makale gönderilirken yazışma yazarının ORCID (Open Researcher and Contributor ID) numarası verilmelidir. <http://orcid.org> adresinden ücretsiz kayıt oluşturulabilir.

## MAKALE HAZIRLAMA

**Biçim:** Başvurusunu yaptığınız yazının kopyasını saklayın. Makale çift aralıklı olarak (1,5 aralık kullanmayın) A4 kağıdına standart kenar boşlukları (tüm kenarlardan ikişer santim) kullanılarak Arial yazı formatında 10 punto ile hazırlanmış olarak dört kopya gönderilmelidir. Online başvurularda basılı kopya gönderilmesine gerek yoktur.

**Başlık Sayfası:** Bu sayfa başlık, yazarların tam isimleri, bir yazar için ikiye aşmayacak akademik derece, çalışma yapıldığı anda yazarların adresi şehri de içerecek şekilde, eğer yazı her hangi bir bilimsel toplantıda sunulmuş veya sunulmak için kabul edilmiş ise bu toplantı, kongre, vb.'nin tarihi, yer ve adı (buna ilişkin kanıt), alınan finansal destek ve kimden olduğu, yazıya katkısı bulunan konsültan varsa ismi akademik derecesi ve adresi, makalenin kelime sayısı (Türkçe, İngilizce özetler ve referanslar hariç), yazı konusunda bağlantıya geçilecek kişinin ismi, adresi, telefon-faks numaraları ve varsa e-mail adresi mektubun alt bölümünde yer almalıdır.

**Kör Ön Değerlendirme İçin:** Makalenin sayfalarında ve Türkçe-İngilizce özet sayfalarında yazarların isminin, akademik derecesinin, adresinin, şehrinin yer almamasına dikkat edin. Bu şartı bulundurmamayan makaleler geri gönderilebilir.

**Türkçe ve İngilizce Özet:** Özgün makaleler ve özet raporlar 250 sözcüğü aşmayan hipotez veya amaç, yöntemler, sonuçlar, tartışma içeren özet bulundurulmalıdır. Konsept ve olgu sunumları için 150 kelimeyi aşmayan Türkçe ve İngilizce özet bulunmalıdır. Anahtar sözcükler, her türlü yazıda Türkçe ve İngilizce özetlerin altındaki sayfada 3-10 adet verilmelidir. Anahtar sözcük olarak Index Medicus'un Tıbbi Konu Başlıkları'nda (Medical Subject Headings, MeSH) yer alan terimler kullanılmalıdır.

**İstatistiksel Testler:** Çalışmalar istatistik alanında deneyimli kişilerin kontrolünde değerlendirilmelidir. Sonuçlar için güven aralığı, P değerleri verilmelidir.

## Yazı İçeriği:

Araştırma makaleleri aşağıdaki bölümleri içermelidir;

- Giriş
- Gereç ve Yöntem
- Bulgular
- Tartışma
- Çalışmanın Kısıtlılıkları
- Sonuç

**Değerler:** Kullanılan madde, ilaç, laboratuvar sonuçları değerlerinde genel standartlara uyulmalıdır. İlaçlar: Jenerik isimler kullanılmalıdır.

**Kaynaklar:** Kaynaklar çift aralıkla ayrı bir sayfada yazılmalıdır. Kaynakları makale içinde kullanım sırasına göre numaralandırılmalıdır. Alfabetik sıralama yapılmamalıdır. Özet olarak yararlanılmış makaleler için parantez içinde İngilizce yazılar için "abstract", Türkçe yazılar için "öz" yazılmalıdır. Bir kaynaktaki yazarların sadece ilk beşi belirtilmeli, geri kalanlar için İngilizce kaynaklar için "et al.", Türkçe kaynaklar için "ve ark." kısaltmasını kullanın. Kaynakların doğruluğu yazarların sorumluluğundadır.

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## XXVI. Türk Mikrobiyoloji

- Basılmamış Kurslar, Sunumlar: Sokolove PE, Needlesticks and high-risk exposure. Course lecture presented at: American College of Emergency Physicians, Scientific Assembly, October 12, 1998, San Diego, CA.

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**Tablolar:** Tablolar verileri özetleyen kolay okunur bir biçimde olmalıdır. Tablo'da yer alan veriler, makalenin metin kısmında yer almamalıdır. Tablo numaraları yazıda ardaşık yer aldığı biçimde verilmelidir. Metinde tabloları işaret eden cümle bulunmalıdır. Her tablo "Kaynaklar" sayfasından sonra her sayfaya bir tablo gelecek şekilde gönderilmelidir. Tablolar hazırlanırken sayfa kenarı kurallarına uyulmalıdır. Metin içinde her tabloya atıfta bulunulduğuna emin olunmalıdır. Yazı içindeki grafik, şekil ve tablolar "Arabik" sayılarla numaralandırılmalıdır. Her tablo ayrı bir sayfaya çift aralıklı olarak basılmalıdır. Tabloları metindeki sıralarına göre numaralayıp, her birine kısa bir başlık verilmelidir. MS Word 2000 ve üstü sürümlerde otomatik tablo seçeneğinde "tablo klasik 1" ya da "tablo basit 1" seçeneklerine göre tablolar hazırlanmalıdır. Yazarlar açıklamaları başlıkta değil, dipnotlarda yapmalıdır. Dipnotlarda standart olmayan tüm kısaltmalar açıklanmalıdır. Dipnotlar için sırasıyla aşağıdaki semboller kullanılmalıdır: (\*, +, ^, \$, ii, I, \*\*, ++, ^ ^).

**Şekiller/Resimler:** Şeklin/Resmin içerdiği bilgi metinde tekrarlanmamalıdır. Metin ile şekilleri/resimleri işaret eden cümle bulunmalıdır. Resimler EPS veya TIF formatında kaydedilmelidir. Renkli resimler en az 300 DPI, gri tondaki resimlerin az 300 DPI ve çizgi resimler en az 1200 DPI çözünürlükte olmalıdır.

## DERGİ POLİTİKASI

**Orijinal Araştırma Makalesi:** Yeni bilgi ve veri içeren makaleler daha önce bir bilimsel dergide yayınlanmamış ve yayınlanması için aynı anda bir başka dergiye başvurulmamış olmalıdır. Bu sınırlama özet halinde bilimsel toplantı ve kongrelerde sunulmuş çalışmalar için geçerli değildir.

**Birden Fazla Yazar:** Makalede yer alan tüm yazarlar makalenin içeriğindeki bilgilerin sorumluluğunu ve makale hazırlanma basamaklarındaki görevleri paylaşırlar.

**İstatistik Editörü:** İstatistiksel analiz içeren tüm makaleler istatistik uzmanına danışılmış olmalıdır. Yazarlardan biri ya da yazarların dışında belirlenmiş ve istatistik konusunda deneyimli ve yetki sahibi bir kişi bu analizin sorumluluğunu üstlenmelidir. İstatistiksel değerlendirme için kullanılan istatistik uzmanının ismi başlık sayfasında belirtilmelidir.

**Randomize Kontrollü Çalışmalar:** Dergi bu tip çalışmaları yayınlamayı yeğlemektedir.

**İzimler:** Makalede yer alan herhangi bir resim, tablo vs. daha önceden başka bir bilimsel dergi veya kitapta yayınlanmış ise bu tablo ve resimlerin kullanılabilirliğine dair yazı alınması gerekmektedir.

**Etik Komite Onayı İzni:** Yazarlar, eğer çalışmaları insan ve hayvanlar üzerinde araştırmayı gerektiriyorsa, yayın değerlendirme kurulundan (araştırma etik kurulları) yazılı onay belgesini almalıdırlar.

## DEĞERLENDİRME VE BASIM SÜRECİ

**Ön değerlendirme:** Dergi kör ön değerlendirmeyi tüm makale tipleri için uygulamaktadır. Tüm makaleler dergi editörü tarafından incelenir ve uygun bulunan makaleler ön değerlendirme amacıyla danışmanlara (editör yardımcılarına) iletilir. Dergi editöründen doğrudan yazara geri gönderilen yazılar Çocuk Acil ve Yoğun Bakım Dergisi'nde basılamaz. Başvuru ile derginin ön değerlendirmeye alınma arasında geçen süre en çok 15 gündür. Yazının alındığına ve durum bildirir mektup dergi editörünce yazara bu süre içinde bildirilir. Dergide basımı uygun bulunmayan makaleler geri gönderilmez.

Tüm makaleler editörlerce dergi yazım kuralları ve bilimsel içerik açısından değerlendirilir. Gerekli görüldüğünde yazıda istenen değişiklikler yazara editörlerce yazılı olarak bildirilir.

**Yazının Sorumluluğu:** Yazarlar yayınlanmış halde olan makalelerinde bulunan bilgilerin tüm sorumluluğunu üstlenirler. Dergi bu makalelerin sorumluluğunu üstlenmez. Yazarlar basılı haldeki makalenin bir kopyasını alır.

**Basım Hakkı:** Dergide yayınlanmış bir makalenin tamamı veya bir kısmı, makaleye ait resimler veya tablolar Çocuk Acil ve Yoğun Bakım Dergisi editörü ve Çocuk Acil Tıp ve Yoğun Bakım Derneği Yönetim Kurulu, bilgisi ve yazılı izni olmadan başka bir dergide yayınlanamaz..

**Gerekli Bilgiler:** Dergi editörleri ön değerlendirme sürecinde gerek duyduklarında makalenin dayandırıldığı verileri incelemek için yazardan isteyebilirler. Bu nedenle yazara kolay ulaşımı sağlayacak adres ve diğer iletişim araçlarının başlık sayfasında yer alması önemlidir.

**Ek:** Yayın kurulu, yazarların iznini alarak yazıda değişiklikler yapabilir. Editör ve dil editörü dil, imla ve kaynakların Index Medicus'ta geçtiği gibi yazılmasında ve benzer konularda tam yetkilidir.

Makale yayınlanmak üzere gönderildikten sonra yazarlardan hiçbiri, tüm yazarların yazılı izni olmadan yazar listesinden silinemez, ayrıca yeni bir isim yazar olarak eklenemez ve yazar sırası değiştirilemez.

**Ölçüm Birimleri:** Uzunluk, ağırlık ve hacim birimleri metrik (metre, kilogram, litre) sistemde ve bunların onlu katları şeklinde rapor edilmelidir. Sıcaklıklar celsius derecesi, kan basıncı milimetre civa cinsinden olmalıdır. Ölçü birimlerinde hem yerel hem de Uluslararası Birim Sistemleri'ni (International System of Units, SI) kullanmalıdır. İlaç konsantrasyonları ya SI ya da kütle birimi olarak verilir, seçenek olarak parantez içinde verilebilir.

**Kısaltmalar ve Semboller:** Sadece standart kısaltmaları kullanın, standart olmayan kısaltmalar okuyucu için çok kafa karıştırıcı olabilir. Başlıkta kısaltmadan kaçınılmalıdır. Standart bir ölçüm birimi olmadıkça kısaltmaların uzun hali ilk kullanışlarında açık, kısaltılmış hali parantez içinde verilmelidir.

**Teşekkür(ler)/Acknowledgement(s):** Yazının sonunda kaynaklardan önce teşekkür(ler)/ acknowledgement(s) bölümüne yer verilir. Bu bölümde yazı hazırlanırken içeriğe, düzene, bilgilerin istatistiksel analizine katkıları olanlar belirtilebilir.

**Kaynaklara Ek:** Tek tip kurallar esas olarak Amerikan Ulusal Tıp Kütüphanesi (National Library of Medicine, NLM) tarafından uyarlanmış olan bir ANSI standart stilini kabul etmiştir. Kaynak atıfta bulunma örnekleri için yazar(lar) [http://www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html) sitesine başvurabilir(ler).

Dergi isimleri Index Medicus'taki şekilleriyle kısaltılmamalıdır. Aynı bir yayın olarak yıllık basılan ve Index Medicus'un Ocak sayısında da liste olarak

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yer alan Index Medicus'taki Dergiler Listesi'ne (List of Journals Indexed in Index Medicus) başvurulabilir. Liste ayrıca <http://www.nlm.nih.gov> sitesinden de elde edilebilir.

## ETİK

**Bilimsel Sorumluluk:** Makalelerin bilimsel kurallara uygunluğu yazarların sorumluluğundadır. Tüm yazarların gönderilen makalede akademik ve bilimsel olarak doğrudan katkısı olmalıdır. Bu bağlamda "yazar" yayınlanan bir araştırmanın kavramsallaştırılmasına ve desenine, verilerin elde edilmesi, analizi ya da yorumlanmasına belirgin katkı yapan, yazının müsveddese ya da bunun içerik açısından eleştirel biçimde gözden geçirilmesinde görev yapan birisi olarak görülür. Yazar karışılmasının diğer koşulları ise, makaledeki çalışmayı planlamak veya icra etmek ve/veya makaleyi yazmak veya revize etmektir.

Fon sağlanması, veri toplanması ya da araştırma grubunun genel süpervizyonu tek başlarına yazarlık hakkı kazandırmaz. Yazar olarak gösterilen tüm bireyler sayılan tüm ölçütleri karşılamalıdır ve yukarıdaki ölçütleri karşılayan her birey yazar olarak gösterilebilir. Çok merkezli çalışmalarda grubun tüm üyelerinin yukarıda belirtilen şartları karşılaması gereklidir. Yazarların isim sıralaması ortak verilen bir karar olmalıdır. Tüm yazarlar yazar sıralamasını Telif Hakkı Devir Formu'nda imzalı olarak belirtmek zorundadırlar.

Yazarlık için yeterli ölçütleri karşılamayan ancak çalışmaya katkısı olan tüm bireyler "teşekkür/bilgiler" kısmında sıralanmalıdır. Bunlara örnek olarak ise sadece teknik destek sağlayan, yazıma yardımcı olan ya da sadece genel bir destek sağlayan kişiler verilebilir. Finansal ve materyal destekleri de belirtilmelidir.

Yazıya materyal olarak destek veren ancak yazarlık için gerekli ölçütleri karşılamayan kişiler "klinik araştırmacılar" ya da "yardımcı araştırmacılar" gibi başlıklar altında toplanmalı ve bunların işlevleri ya da katılımları "bilimsel danışmanlık yaptı", "çalışma önerisini gözden geçirdi", "veri topladı" ya da "çalışma hastalarının bakımını üstlendi" gibi belirtilmelidir. Teşekkür (acknowledgement) kısmında belirtilecek bu bireylerden de yazılı izin alınması gerekir.

**Etik Sorumluluk:** Çocuk Acil ve Yoğun Bakım Dergisi, 1975 Helsinki Deklarasyonu'nun 2013 yılında revize edilen İnsan Deneyleri Komitesi'nin etik standartlarına uymayı ilke edinmiş bir dergidir.

Bu yüzden Çocuk Acil Ve Yoğun Bakım Dergisi'nde yayınlanmak üzere gönderilen klinik deneylere katılan sağlıklı bireyler/hastalarla ilgili olarak belirtilen komitenin etik standartlarına uyulduğunun mutlaka belirtilmesi ve deneyin türüne göre gerekli olan yerel veya ulusal etik komitelerden alınan onay yazılarının yazı ile birlikte gönderilmesi ve ayrıca deneye katılan kişi/hastalardan ve hastalar eğer temyiz kudretine sahip değilse hastaların vasilerinden yazılı bilgilendirilmiş onam (informed consent) alındığını belirten bir yazı ve tüm yazarlar tarafından imzalanmış bir belgenin editöre gönderilmesi gerekir.

Bu tip çalışmaların varlığında yazarlar, makalenin YÖNTEM(LER) bölümünde bu prensiplere uygun olarak çalışmayı yaptıklarını,

kurumlarının etik kurullarından ve çalışmaya katılmış insanlardan bilgilendirilmiş onam (informed consent) aldıklarını belirtmek zorundadırlar. Çalışmada "deney hayvanı" kullanılmış ise yazarlar, makalenin YÖNTEM(LER) bölümünde "Guide for the Care and Use of Laboratory Animals" ilkeleri doğrultusunda çalışmalarında hayvan haklarını koruduklarını ve kurumlarının etik kurullarından onay aldıklarını belirtmek zorundadırlar.

Hayvan deneyleri rapor edilirken yazarlar laboratuvar hayvanlarının bakımı ve kullanımı ile ilgili kurumsal ve ulusal rehberlere uyup uymadıklarını yazılı olarak bildirmek zorundadırlar.

Makalelerin kurallara uygunluğu yazarın sorumluluğundadır. Çocuk Acil ve Yoğun Bakım Dergisi, ticari kaygılara bağlı olmaksızın makalelerin en iyi etik ve bilimsel standartlarda olmasını şart koşar.

Reklam amaçlı yayınlanan ticari ürünlerin özellikleri ve açıklamaları konusunda editör ve yayıncı hiçbir garanti vermez ve sorumluluk kabul etmez. Makale ile doğrudan veya dolaylı olarak ilişkili herhangi bir kurum veya maddi destek veren herhangi bir kurum varsa yazarlar ticari ürün, ilaç, ilaç şirketi vb. hakkında kaynaklar sayfasında bilgi vermek zorundadırlar.

## Hastaların ve Çalışmaya Katılanların Gizliliği ve Mahremiyeti:

Hastaların izni olmaksızın mahremiyet bozulamaz. Hastaların isimleri, isimlerinin büyük harfleri veya hastane protokol numaraları, fotoğrafları ve aile bilgi verileri gibi aynı bilgi verileri, bilimsel amaç için gerekli olmadıkça ve hastadan veya vasilerinden bilgilendirilmiş onam alınmadıkça yayınlanamaz.

Özellikle olgu sunumlarında, esas olarak gerekli olmadıkça hastanın kimlik bilgileri çıkarılmalıdır. Örneğin; fotoğraflarda sadece göz bölgesini maskelemek kimliği gizlemek için yeterli değildir. Kimliği gizlemek için veriler değiştirilmişse, yazarlar bu değişikliklerin bilimsel anlamları etkilemediğine dair güvence vermelidir. Ayrıca maddede bilgilendirilmiş onam alındığı belirtilmelidir.

**Editör, Yazarlar ve Hakemlerle İlişkiler:** Editör, makaleler hakkındaki bilgileri (makale alma, içerik, inceleme süresi durumu, hakem eleştirileri veya sonuçları) hakemler ve yazarlar dışında kimseyle paylaşmamalıdır.

Editör, inceleme için kendilerine gönderilen makalelerin yazarların özel mülkü olduğunu ve bu iletişimin ayrıcalıklı olduğunu hakemlere açıkça belirtir. Hakemler ve yayın kurulu üyeleri makaleleri kamuya açık olarak tartışamazlar.

Hakemlerin makalelerin bir kopyasını kendilerine almalarına izin verilmez ve editörün izni olmadan başkalarına makale veremezler. Hakemler incelemelerini bitirdikten sonra makalenin kopyalarını imha etmeli veya editöre geri göndermelidir. Dergimizin editörü, reddedilen veya geri gönderilen yazıların kopyalarını da imha eder.

Hakem, yazar ve editörün izni olmadan, hakemlerin revizyonları basılamaz veya açıklanamaz. Hakemlerin kimliği itina ile gizlenmelidir.

## INSTRUCTION FOR AUTHORS

The Journal of Pediatric Emergency and Intensive Care, which started to be published in 2014, is a journal that publishes national and international articles and publishes within the framework of double-blind peer-review principles. The journal publishes original research, case reports, reviews, letters to the editor, clinical reports, medical opinions and related educational and scientific announcements.

The main sections in the content of the journal are pediatric emergency medicine systems, academic pediatric emergency medicine and pediatric emergency medicine education, pediatric emergency management, disaster, environmental emergencies, trauma, case reports, adolescent emergencies, pediatric emergencies, neonatal emergencies, health policies, ethics, poisoning, pediatric emergency nursing, pediatric intensive nursing, preventive medicine, Pediatric Intensive Care, critical diseases, critical patient management, diagnostic methods, sepsis and septic shock, organ and system deficiencies, intensive care technology, non-invasive and invasive monitoring, non-invasive and It consists of invasive ventilation, extracorporeal support systems, ethical evaluations, laboratory, emergency radiology and interventional procedures.

The abbreviation of the journal in English is recorded as “**J Pediatr Emerg Intensive Care Med**”.

Editors and Editorial Board are determined every three years in January by the Board of the Pediatric Emergency Medicine and Intensive Care Association.

In Turkish articles, the Turkish Dictionary and Spelling Guide of the Turkish Language Association should be taken as a basis.

Journal of Pediatric Emergency and Intensive Care Medicine does not charge any article submission or processing fee.

All manuscripts submitted to the Journal of Pediatric Emergency and Pediatric Intensive Care are screened for plagiarism using the ‘iThenticate’ software. Articles may get rejected or returned due to the result of plagiarism check.

The Journal of Pediatric Emergency and Pediatric Intensive Care is published as including original articles (original research article, case report, book critics, letter to editor, review, guides) not less than 50% and as a number not less than 15 in total per year. In every issue, at least 5 research articles, case reports and/or reviews are not more than the research article number. Reviews are prepared due to the invitation of the editor.

All of the reviewers’ decisions, and samples of submitted manuscripts with signatures and corrections are preserved at least for 5 years in the journal archive.

Articles in the journal are published in content pages and article title pages, as classified according to their types (research, case report, short report, review, letter to editor etc.)

### Authors should submit the following during the initial submission:

- Copyright Transfer and Author Contributions Form
- ICMJE Potential Conflict of Interest Disclosure Form which has to be filled in by each author.

### PEER REVIEW PROCESS

The manuscripts sent to the Journal of Pediatric Emergency and Pediatric Intensive Care are firstly evaluated by the editor. The editor checks up every manuscript, whether they are worth evaluating or not and assigns an assistant for each. If the editor and the assistant find the manuscript

worth evaluating, they send it to two reviewers or one reviewer with one editorial board member for evaluation. The manuscript is not under evaluation if it does not require the evaluation of the reviewer or editorial board members because it has no scientific value and is not original, or it does not fit the reader population.

The scientific and ethical responsibility of the articles belongs to the writer, but copyright belongs to the Journal of Pediatric Emergency and Pediatric Intensive Care. The authors are responsible for the content and resources of the articles. The authors should send the certificate of approval (Copyright Transfer Form) with their articles which states that copyright is transferred to the journal. These certificate documents written by the authors mean the writers declare their scientific responsibilities and guarantee that the study had never been published or not to be published in the near future by another journal.

### MANUSCRIPT TYPES

**Original Research Articles:** Basic or clinical research articles about critical pediatric patient. References and an English summary are required (see writing preparation section). At most 5000 words (20 double-spaced pages), 7 tables and/or figures, additionally abstract and references in Turkish and English. Ethics committee approval should be mentioned in the study.

**Case Reports:** Presentation of clinical cases having an educational value that are faced about Pediatric Emergency medicine and Pediatric Intensive Care. For the manuscripts sent to this part, we are looking for the clinical cases that are infrequently reported in scientific literature previously, unreported clinical reflections or complications of a well-known disease, unknown adverse reactions of known treatments, or case reports including scientific messages that might trigger further new research, preferably. Case reports should include Turkish and English abstracts, cases and discussions. It should include 2000 words (8 double-spaced pages), 15 or fewer references, and three tables or pictures.

**Abstract Reports:** Research with small numbers that have preliminary study data and findings which require further studies. References and English abstract required (see Manuscript Preparation section). At most 3000 words in length (8 double-spaced pages), additionally English and Turkish abstract, 15 or fewer references, 3 tables and/or figures. Ethics committee approval required.

**Concepts:** Clinical or non-clinical manuscripts about Pediatric Emergency Medicine and Pediatric Intensive Care issues and about the improvement of this field. References and English abstract required. At most 4000 words (16 double-spaced pages), additionally English and Turkish abstract (each less than 150 words), and references must be included.

**Review Articles:** Extent investigation writings including the latest national and worldwide literature about Pediatric Emergency and intensive care issues. Journal of Pediatric Emergency and Intensive Care publishes invited review articles. Contact with the editor should be provided before the submission of uninvited reviews. At most 5000 words (20 double-spaced pages). There is no limitation on the number of references. Related information is available in the following article; Burney RF, Tintinalli JE: How to write a collective review. *Ann Emerg Med* 1987;16:1402.

**Evidence-based Information:** Articles that could answer to the problems of clinical and medical applications. The article should include these sections; clinical vignette, questions and problems, research and selection of the best evidence, a detailed examination of the evidence,

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and implementation of the evidence. At most 4000 words (15 double-spaced pages), additional Turkish and English abstract. Authors should also send copies of their articles to the editor.

**Letter to Editor:** These are the articles that include opinions and solution advice about the pediatric emergency medicine and pediatric intensive care issues, and comments about the articles published in the Journal of Pediatric Emergency and Pediatric Intensive Care or other journals. At most 1500 words (6 double-spaced pages), additionally, references should be included.

**Seizure Stories:** Personal or team experiences reflecting the nature and dynamism of Pediatric Emergency Medicine and Pediatric intensive care issues which also considers the humor of pediatric emergency medicine and pediatric intensive care. At most 1000 words should be included.

## MANUSCRIPT SUBMISSION

**Manuscript Submission Agreement:** It is available in every new print of the Pediatric Emergency and Intensive Care journal, and if required, it may also be provided through the Pediatric Emergency Medicine and Intensive Care Association, editorial of the journal and, also found on the website of the journal. It should be filled in all article submissions.

**Cover Letter:** The author, in this letter, should imply a short explanation of his research or writing, the type of the study (random, double-blind, controlled, etc.), the category it is sent for, and whether it has been presented in a scientific meeting or not, in details. Additionally, the address, phone, fax numbers, and e-mail address of the person for contact about the writing should be present at the lower pole of the letter.

The **ORCID** (Open Researcher and Contributor ID) number of the correspondence author should be provided while sending the manuscript. A free registration can create at <http://orcid.org>.

## MANUSCRIPT PREPARATION

**Format:** Preserve the copy of the manuscript you applied for. The article should be sent as 4 copies which is written as double spaced (do not use 1,5 space) on A4 paper with standard side spaces (2 cm away from each side) in format of Arial 10 point writing style. No need for a printed copy for the online submissions.

**Main Page:** This page includes title, full name of the authors, academic degree not more than two for each author, address and city of the authors at time of writing; if the manuscript was presented or excepted to be presented at any scientific meeting, the date, place and the name of that meeting (related evidence), financial support and the owner of it, if there is a consultant, the name, academic degree, and address, the count of words of the article (except Turkish, English abstracts and references), the name, address, phone-fax numbers and e-mail address of the contact person all should be located at the bottom of the letter.

**For Blind Preliminary Assessment:** Be sure that no name, academic career, address or city of authors is present on the pages of the article and Turkish-English abstracts. The articles which don't obey this rule can be rejected or returned.

**Turkish and English Abstract:** Original articles and summary reports should have an abstract including hypothesis or aim, methods, results and conclusions not more than 250 words total. Turkish and English abstracts not more than 150 words should be included for concepts and case reports. Keywords should be given as 3-10 pieces for any kind of writings below the page of Turkish and English abstracts. The terms

found in medical topics of Index Medicus (Medical Subject Headings, MeSH) should be used as Keywords.

**Statistical Tests:** Studies should be assessed under the control of individuals experienced in statistics. Confidence interval and P values should be given for the results.

## Contents of the Article:

Research articles should include the following sections;

- Introduction
- Material and Methods
- Results
- Discussion
- Limitations of the study
- Conclusions

**Values:** General standards should be obeyed considering the material, drug, and laboratory result values used in the study.

**References:** References should be written on a separate page in double spaces. References should be numbered according to the order they are used in the article. No alphabetic order should be done. The articles are referred as abstracts, they should be written in parenthesis as "öz" for Turkish manuscripts and "abstract" for English manuscripts. Only the first five authors of a reference, the remaining ones should be implied as "et al." for English manuscripts and "ve ark." for Turkish manuscripts. The authenticity of the reference is the responsibility of the author.

## Examples;

- Article: Raftery KA, Smith-Coggins R, Chen AHM. Gender-associated differences in emergency department pain management. *Ann Emerg Med.* 1995;26:414-21.
- For Article in Printing: Littlewhite HB, Donald JA. Pulmonary blood flow regulation in an aquatic snake. *Science* 2002 (in print)
- Book: Callahan ML. *Current Practice of Emergency Medicine.* 2nd ed. St. Luis, MO: Mosby; 1991.
- Book chapter: Mengert TJ, Eisenberg MS. Prehospital and emergency medicine thrombolytic therapy. In: Tintinalli JE, Ruiz E, Krome RL (eds). *Emergency Medicine: A Comprehensive Study Guide.* 4th ed. New York, NY: McGraw-Hill; 1996:337-43.
- For a part of Book, If there is Editor: Mc Nab S. Lacrimal surgery. In: Willshaw H (ed). *Practical Ophthalmic Surgery.* New York: Churchill Livingstone Inc, 1992: 191-211
- Turkish book Section: Yilmaz HL. Pediatric Emergency Architecture. Including: Karaböcücüoğlu M, Yılmaz HL, Duman M (ed.ler). *Pediatric Emergency Medicine: Comprehensive and Easy Approach.* 1. Edition. İstanbul, İstanbul Tıp Kitabevi, 2012:7-13
- If editors are also the writers of the text or the texts in the book: First the name of the text cited and the name of the book is written with the words starting with Capital letters: Diener HC, Wilkinson M (editors). *Drug-induced headac-he.* In *Headache.* First ed., New York: Springer-Verlag, 1988: 45-67
- For citation from Translated Book: Milkman HB, Sederer LI. *Treatment Options in Alcoholism and Substance Abuse.* Doğan Y, Özden A, İzmir M (Çevirenler) 1. Edition, Ankara: Ankara University Publish House, 1994: 79-96
- For Congress Reports: Felek S, Kılıç SS, Akbulut A, Yıldız M. A Case of

Shigellosis accompanied by Visual Hallucination.

## XXVI. Turkish Microbiology

- Un-published Courses, Presentations: Sokolove PE, Needlesticks and high-risk exposure. Course lecture presented at: American College of Emergency Physicians, Scientific Assembly, October 12, 1998, San Diego, CA.
- For citation from a Thesis study: Kılıç C. General Health Survey: Reliability and Validity Study. Un-published Proficiency Thesis, Hacettepe University Faculty of Medicine, Department of Psychiatry, Ankara: 1992
- İnternet: Fingland MJ. ACEP opposes the House GOP managed care bill. American College of Emergency Physi-cians Web site. Available at: <http://www.acep.org/press/pi980724.html> Accessed August 26,1999.
- Personal Consultancy: Avoid referring to Personal Consultants. However if it is very inevitable, record the name, academic degree, date and send a letter which ensures the approval of consultant person that we could use this knowledge.

**Tables:** Tables should be legible summarizing the data. Data in the table should not be present in the text of the article. Table numerization should be respectively as located in the text. A sentence pointing the table should be present in the text. Each table should be sent as located one table in one page order after "References" page. Page site rules should be obeyed while the tables are prepared. Be sure that each table is referred in the text. Graphics, figures and tables in the text should be numbered by "Arabic" numbers. Each table should be printed in a separate page as double spaced.

A short title should be set for each table by numerating them in the order as they are in the text. MS Tables should be prepared due to "table classic1" or "table simple 1" automatic table options of Word 2000 end further versions. Authors should write explanations in footnotes, not in titles. All abbreviations which are not standard should be explained in footnotes. The following symbols should be used for the footnotes respectively: (\*, +, ^, \$, ii, I, \*\*, ++, ^ ^).

**Figures/Pictures:** Information in the Figure/Picture should not be repeated in the text. A sentence pointing out the figure/picture should be present in the text. Pictures should be recorded in EPS or TIF format. Colorful pictures must be at least 300 DPI, pictures in grey tone at least 300 DPI, and drawings at least 1200 DPI resolution.

## JOURNAL POLICY

**Original Article:** Articles that include new information and data should not have been printed in another scientific journal before or should not have been applied to any journal to be printed. This limitation is not valid for the studies that have been presented as a summary in previous scientific meetings or congress.

**More than One Author:** All of the authors included in the article share the responsibility of the information and duties during the steps of preparation of the article.

**Statistical Editor:** All articles, including statistical analysis should be consulted by a statistical consultant. One of the authors or someone other than the authors who are experienced and licensed in statistics should take the responsibility for this analysis. The name of the person used for statistical analysis should be specified on the main page.

**Random Controlled Studies:** This journal favors this kind of studies.

**Permissions:** Any picture, table etc., in the article, if it has been published in any scientific journal or book before, a document must be provided regarding the availability of them.

**Ethics Committee Approval Permission:** Authors should get the written approval forms from editor assessment board (ethical research board), if their study requires research on humans and animals.

## EVALUATION AND PUBLICATION PROCESS

**Preliminary Evaluation:** Journal applies blind preliminary assessment for all article types. All articles are examined by the journal editor and the appropriate ones are sent to consultants (editor assistants) for preliminary assessment. The writings that are sent from the editor of the journal directly to the writer can not be printed in the Journal of Pediatric Emergency and Intensive Care. The duration period between the application and the preliminary assessment time is maximum of 15 days. Letter informing the status of writing is reported by the editor to the author in this period. The articles which are found inappropriate are not sent back.

All articles are assessed by editors regarding the journal writing rules and scientific content. When necessary, required changes in the writing are reported to the author in a written letter by editors.

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# Etiology of Acute Ataxia in Children: A Single Center Experience

## Çocuklarda Akut Ataksi Etiyolojisi: Tek Merkez Deneyimi

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### Abstract

**Introduction:** Acute ataxia often develops due to mild and self-limiting disorders, but can also result from serious life-threatening disorders. However, limited data are available on its etiology, especially in developing countries. In this study, it was aimed to determine the etiology in children presenting with acute ataxia.

**Methods:** The charts of patients who presented with acute ataxia between September 2012 and September 2017 were retrospectively analyzed. The final diagnosis, demographic, clinical, laboratory and imaging results of the patients were recorded.

**Results:** A total of 97 patients were included in the study. Of the patients 56.7% (n=55) were male. The average age was 6.7 ( $\pm$  4.2) years. By etiology, 58 (59.8%) of 97 patients were diagnosed with acute postinfectious cerebellar ataxia and 14 (14.4%) acute disseminated encephalomyelitis (ADEM). Encephalitis, migraine, Miller Fisher syndrome, epilepsy, and trauma were found to be less common etiological causes, while psychogenic ataxia was found in six patients (6.2%). When compared to other patients, the age was younger, the history of pre-ataxia infection and drug use was higher, and the magnetic resonance imaging abnormality was less in patients with acute postinfectious cerebellar ataxia.

**Conclusion:** The most common cause of acute ataxia in children is acute postinfectious cerebellar ataxia. Ataxia may also be the first sign of disorders with high mortality and morbidity such as encephalitis, ADEM, MS, Miller Fisher syndrome, trauma.

**Keywords:** Acute ataxia, child, postinfectious cerebellar ataxia

### Öz

**Giriş:** Akut ataksi daha çok hafif seyirli ve kendiliğinden düzelen bozukluklara bağlı olmakla birlikte hayatı tehdit eden ciddi nedenlere bağlı da olabilir. Bununla birlikte özellikle gelişmekte olan ülkelerde ataksi etiyojisine yönelik çalışmalar sınırlıdır. Bu çalışmada akut ataksi nedeniyle başvuran çocuklarda etiyojinin belirlenmesi amaçlandı.

**Yöntemler:** Eylül 2012-Eylül 2017 tarihleri arasında akut ataksi ön tanısı ile başvuran hastaların dosyaları geriye dönük olarak incelendi. Hastaların son tanıları ile demografik, klinik, laboratuvar ve görüntüleme sonuçları kaydedildi.

**Bulgular:** Çalışmaya toplam 97 hasta dahil edildi. Hastaların %56,7'si (n=55) erkekti. Başvuru yaşı ortalama 6,7 ( $\pm$  4,2) yıl idi. Ataksi etiyojisi açısından incelendiklerinde 97 hastanın 58'i (%59,8) akut postenfeksiyöz serebellar ataksi, 14'ü (%14,4) akut dissemine ensefalomyelit (ADEM) tanısı aldı. Ensefalit, migren, Miller Fisher sendromu, epilepsi, travma daha az görülen etiyojik neden olarak saptanırken altı hastada (%6,2) psikojenik ataksi saptandı. Akut postenfeksiyöz ataksi hastalarında yaşın daha küçük, ataksi öncesi enfeksiyon ve ilaç kullanım öyküsünün daha fazla, manyetik rezonans görüntüleme anormalliğinin ise daha az olduğu görüldü.

**Sonuç:** Çocuklarda akut ataksinin en sık görülen nedeni akut postenfeksiyöz serebellar ataksidir. Bunun yanında ADEM, MS, Miller Fisher sendromu, ensefalit, travma gibi mortalite ve morbiditesi yüksek hastalıkların da ilk belirtisi ataksi olabilir.

**Anahtar Kelimeler:** Akut ataksi, çocuk, postenfeksiyöz serebellar ataksi

### Introduction

Acute ataxia is a condition in which walking, speech and/or eye movements cannot be performed correctly, harmoniously and in a balanced manner due to the incoordination of voluntary

muscle movements related with various reasons, especially cerebellar pathologies, that started suddenly in a previously healthy child.<sup>1</sup> It is usually seen in children as unsteady gait or walking refusal. It is not a common symptom in childhood, but is seen with a frequency of 1/100,000-500,000, and

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it constitutes 0.02% of pediatric emergency department admissions.<sup>2,4</sup> In the etiology, there are many causes such as cerebellar pathologies, infections, postinfectious inflammatory diseases, toxins and trauma, especially postinfectious and drug-induced cerebellar ataxias.<sup>5,6</sup> Studies on the etiology of ataxia are insufficient and mostly done in developed countries. It is thought that acute ataxia is mostly seen due to infectious and genetically inherited diseases in developing countries, which receive a lot of immigration from abroad and where the frequency of consanguineous marriages is high. However, studies on this are very limited. In this study, it was aimed to determine the causes of acute ataxia in our country and thus to determine which diagnostic tests should be done first.

## Materials and Methods

The files of 2,197 patients who were admitted to the outpatient clinic with the prediagnoses of acute ataxia, chronic ataxia, balance disorder, and gait disorder between September 2012 and September 2017 in University of Health Sciences Turkey, Dr. Behçet Uz Children's Education and Research and Surgery MDG or who were hospitalized in any department of our hospital were retrospectively reviewed. After excluding 2001 patients with these signs and symptoms, chronic metabolic disease, cerebral palsy, hydrocephalus, meningitis sequelae, orthopedic diseases and congenital hip dislocation, and a total of 99 patients with missing data and refused medical procedures, a total of 97 patients were included in the study. Approval for this study was obtained from the Local Ethics Committee of University of Health Sciences Turkey, Dr. Behçet Uz Children's Education and Research Hospital, and Surgery Training and Research Hospital (date: 30.03.2017, protocol no: 2016/119).

Age, gender, diagnosis, history of trauma, history of consanguinity, vaccination history, recent infection history of the subjects included in the study were recorded. Complete blood count, serum alanine transferase, aspartate transferase, C-reactive protein, sedimentation, glucose in cerebrospinal fluid (CSF), chlorine, protein, CSF culture, CSF viral polymerase chain reaction (PCR), hepatitis serology, toxoplasma -rubella-cytomegalovirus-herpes virus, Ebstein-Barr virus, human immunodeficiency virus serology, respiratory viral PCR and urine toxic substance results were recorded. Cranial magnetic resonance imaging (MRI), electroencephalography (EEG), electroneuromyography, and visual evoked potential examination reports were evaluated.

Physical examination, laboratory and imaging records in the files were examined to confirm the etiological diagnoses. Bacteriological cultures (blood and CSF culture) and viral serology results were evaluated for the diagnosis of bacterial or viral infection. Imaging methods were used when necessary

for the differential diagnosis of acute ataxia. The two most common etiologic causes, postinfectious cerebellar ataxia and acute disseminated encephalomyelitis (ADEM) groups were compared with the other diagnosis group.

## Statistical Analysis

The study was planned as a cross-sectional study and statistical analyzes were performed using SPSS V.17.0 software. The conformity of the variables to the normal distribution was examined using analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Descriptive statistics were presented by giving the mean  $\pm$  standard deviation for normally distributed variables, and by giving the median (interquartile range interval) value for non-normally distributed variables. In the comparisons between continuous variables in triple independent groups, Kruskal-Wallis test and post-hoc Dunn's test, in paired groups, variables with normal distribution were analyzed with t-test in independent groups and Mann-Whitney U test in case of non-normal distribution. Chi-square trend and post-hoc Benjamini-Hochberg test were used for comparisons between discrete (categorical) variables in triple-independent groups, and Pearson's chi-square test or Fisher's Exact chi-square test was used in paired groups. Cases with a p-value below 0.05 were considered statistically significant.

## Results

A total of 97 patients with ataxia were included in the study between September 2012 and September 2017. The mean age at admission was 6.7 ( $\pm$  4.2) years. It was determined that 56.7% (n=55) of the patients were male and 43.3% (n=42) were female. When examined in terms of ataxia etiology, 58 (59.8%) of 97 patients were diagnosed with acute post-infectious cerebellar ataxia and 14 (14.4%) were diagnosed with ADEM (Table 1). In terms of infectious agents, it was seen that the most common cause was secondary to upper respiratory tract infections. However, the most common cause of ataxia secondary to infections was found to be postinfectious cerebellar ataxia.

A detailed history was taken and physical examination was performed in all patients in terms of possible trauma. Only one patient had a history of trauma. The MRI of the patient, who had a history of head trauma due to falling from the stairs, was found to be normal. Complete recovery was achieved in the follow-up of the patient, who was followed up with the diagnosis of concussion syndrome.

When the drug use histories were questioned before the ataxia complaint started, it was seen that 21 (21.6%) patients used antibiotics. Ataxic gait was detected in one patient after meningococcal vaccination two days ago. This patient refused imaging and lumbar puncture. Post-vaccination undesirable

effects were reported to the Turkish General Directorate of Primary Health Care Services of the Ministry of Health. It was decided that ataxia was coincidental because a cause-effect relationship could not be established between ataxia and the vaccine due to the inability to obtain the necessary sample for appropriate research and analysis. However, ataxia was thought to be due to the vaccine, since no etiology could be found in the history, examination and other examinations, there was a close temporal relationship between ataxia and vaccination, and spontaneous recovery was observed.

When 97 patients who were investigated for the etiology of ataxia were examined in terms of infections they had before their complaints started, it was found that 30 (30.9%) patients had upper respiratory tract infection (URTI) and 12 (12.4%) patients had chickenpox. Nine of these patients were born before 2011, and three of them were after 2011. It was learned that two of the three patients who were born after 2011 and were not vaccinated against varicella belonged to families who had migrated from Syria, and one of them did not have any vaccine other than BCG vaccine. According to the results of respiratory PCR samples taken from patients with URTI symptoms and then admitted with ataxia, rhinovirus and influenza B virus were detected at most (Table 2).

When acute postinfectious ataxia, central nervous system demyelinating disease and other etiology groups were compared, it was seen that the age of acute postinfectious ataxia group was younger, the history of infection and drug use before ataxia was higher, and MRI abnormality was lower. There was no difference in routine laboratory tests. As expected, MRI abnormalities were more common in the group consisting of ADEM and MS patients (Table 3).

## Discussion

Although acute ataxia may occur due to life-threatening diseases such as central nervous system tumors or infections, it is mostly seen as a result of mild and self-resolving disorders.<sup>5,7,8</sup> Etiology can be determined in most of the patients with the history, detailed physical and neurological examination, routine examinations and neuroimaging methods. Studies have reported that the most common causes of acute ataxia are acute postinfectious cerebellar ataxia, drug intoxications, Guillain-Barré syndrome (GBS) and migraine, respectively.<sup>2,7,9</sup> In this study, it was seen that the cause was postinfectious cerebellar ataxia in 60% of children presenting with acute ataxia, followed by causes such as ADEM, psychogenic ataxia, encephalitis, MS, and migraine.

Postinfectious cerebellar ataxia, which is the most common cause of acute ataxia in children and reported in the range of 30-75% in previous studies, was similarly found to be the

etiological cause in 60% of the patients in our study.<sup>2,5,7,8,10,11</sup> Similar to another study, the age of children diagnosed with acute postinfectious cerebellar ataxia was found to be lower than that of children due to other causes.<sup>11</sup> The duration of ataxia was short and ataxia resolved spontaneously in most patients. Ataxia may be related to acute cerebellitis, which may rarely cause tonsillar herniation.<sup>12</sup> Although acute cerebellitis was not detected in any patient in our study, acute cerebellitis should be considered in the differential diagnosis of all children presenting with acute ataxia, since it is associated with high mortality if not treated promptly.

While pre-ataxia varicella infection was detected in 50-70% of patients with postinfectious cerebellar ataxia in studies conducted before varicella vaccination, in another study (n=71/120) in which varicella vaccination was routinely performed, none of the patients with postinfectious cerebellar ataxia had a history of varicella infection.<sup>4,5,7,13</sup> The frequency of varicella 12% in patients with acute postinfectious cerebellar ataxia in our study was lower than in prevaccine studies, as expected. However, the reason why it is higher than the rates in patients who receive routine vaccination may be that

**Table 1. Distribution of patients presenting with ataxia according to clinical diagnoses**

Diagnosis	Number	Percentage (%)
Acute postinfectious cerebellar ataxia	58	59.8
CNS demyelinating diseases	18	18.5
ADEM	14	14.4
Multiple sclerosis	4	4.1
Conversion	6	6.2
Encephalitis	5	5.2
Migraine	3	3.1
Miller Fisher syndrome	2	2.1
Neurometabolic disease	2	2.1
Epileptic ataxia	1	1.0
Kawasaki disease	1	1.0
Trauma	1	1.0
Total	97	100

ADEM: Acute disseminated encephalomyelitis, CNS: Central nervous system

**Table 2. Distribution of recent infections of patients presenting with ataxia complaints**

Infection	Number	Percentage (%)
None	42	43.3
Upper respiratory tract infection	30	30.9
Chickenpox	12	12.4
Acute gastroenteritis	9	9.3
Urinary tract infection	2	2.1
Acute otitis media	2	2.1
Total	97	100

**Table 3. Comparison of acute postinfectious cerebellar ataxia patients with CNS demyelinating (ADEM, MS) and other etiology groups**

Characteristics	Acute postinfectious cerebellar ataxia n=57	CNS demyelinating diseases n=18	Other n=22	p
Gender, number (%)				0.204
Male	36 (63.2%)	10 (55.6)	9 (40.9)	
Girl	21 (36.8%)	8 (44.4)	13 (59.1)	
Age, year, avg. (min./max.)	5 (1/15)	8 (2/16) B	7.75 (2/16)	<b>0.009</b> <sup>a</sup> <b>0.015</b> <sup>b</sup> 0.219 <sup>c</sup> 0.986
Prior infection history, number (%)	47 (82.5)	5 (27.8%)	3 (13.6)	<b>&lt;0.001</b> <sup>a</sup> <b>&lt;0.001</b> <sup>b</sup> <b>&lt;0.001</b> <sup>c</sup> ns
History of previous drug use, number (%)	18 (33.3)	1 (5.6)	3 (13.6)	<b>0.027</b> <sup>a</sup> <b>0.020</b> <sup>b</sup> ns <sup>c</sup> ns
Hemoglobin, <11 gr, number (%)	10 (17.5)	3 (21.4)	1 (4.5)	0.881
Leukocytes <10000, number (%)	35 (61.4)	13 (64.3)	14 (63.6)	0.958
AST, high, number (%)	4 (7.0)	2 (11.1)	0 (0.0)	0.360
ALT, high, number (%)	2 (3.5)	3 (16.7)	0 (0.0)	0.058
CRP, high, number (%)	9 (15.8)	2 (11.1)	2 (9.1)	0.850
Sedimentation, >20, number (%)	20 (58.8)	5 (56.6)		0.436
Abnormal cranial MRI, number (%)	0/39	18/18 (100)	3 (15.0)	<b>&lt;0.001</b> <sup>a</sup> <b>&lt;0.001</b> <sup>b</sup> ns <sup>c</sup> <b>&lt;0.001</b>

ADEM: Acute disseminated encephalomyelitis, MS: Multiple sclerosis, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, CRP: C-reactive protein, MRI: Magnetic resonance imaging, ns: Not significant, n: Number, CNS: Central nervous system  
<sup>a</sup>Pairwise comparison of patients with acute postinfectious cerebellar ataxia with patients with CNS demyelinating (ADEM, MS)  
<sup>b</sup>Pairwise comparison of patients with acute postinfectious cerebellar ataxia with the other etiology group  
<sup>c</sup>Pairwise comparison of CNS demyelinating (ADEM, MS) patients with the other etiology group

varicella vaccination has been included in the vaccination calendar since 2011 in our country and that vaccination is not routinely administered in those born before 2011.

In our study, acute ataxia was detected in 12 children after chickenpox. Nine of these patients were born before 2011, and three of them were after 2011. It was learned that two of the three patients who were born after 2011 and were not vaccinated against varicella belonged to families who had migrated from Syria, and one of them did not have any vaccine other than BCG vaccine. Many causes other than varicella virus, such as coxsackievirus, echovirus, enteroviruses, hepatitis A virus, herpes simplex virus, and rotavirus, may cause postinfectious cerebellar ataxia.<sup>8,11</sup> In our study, most of the patients had a history of various upper respiratory tract and gastrointestinal infections. The development of symptoms after vaccination in only one patient suggests that vaccination is less likely to be associated with acute ataxia than the viral diseases it prevents.

Typically, ataxia can be seen in 15% of GBS patients who cause ascending weakness due to inflammatory demyelinating polyneuropathy.<sup>1,4</sup> Ataxia may be the first clinical finding in Miller Fischer syndrome, which is a variant of GBS.<sup>14</sup> In our study, Miller Fischer syndrome was found in two patients with ataxia.

In previous studies, a history of drug use was reported in up to 30% of the patients.<sup>1,4</sup> In our study, 21 of the patients who applied for ataxia had a history of drug use before the development of ataxia, but the drugs used in these patients were antibiotics and antipyretic drugs. In these patients, the cause of ataxia was thought to be an infection rather than the drugs used. It may not be determined whether ataxia developing in patients using drugs for infection is due to infection or drug. While ataxia that occurs during drug use is thought to be due to toxic exposure, ataxia that occurs a few days after infection and therefore drug use is defined as postinfectious cerebellar ataxia.

Migraine and benign paroxysmal vertigo can cause acute ataxia.<sup>6</sup> In our study, migraine was found to be the cause of ataxia in 3% of the patients.

Psychogenic causes were found in a significant portion of children presenting with ataxia. Similar to the previously reported rate of 5%, ataxia due to psychogenic causes was found in 6% of the patients in this study.<sup>11</sup> Before diagnosing psychogenic ataxia, especially life-threatening causes of ataxia should be excluded.

Trauma is one of the rare but serious causes of acute ataxia.<sup>7</sup> In our study, trauma-related ataxia was found in only one patient. However, trauma should be questioned in all children presenting with ataxia because it is associated with high mortality and morbidity.

Ataxia due to cerebrovascular causes is very rare in children.<sup>10,11,15</sup> The reason for this is that cerebrovascular events are much rarer in children than in adults. In parallel with this, stroke was not found as the cause of ataxia in any patient in our study.

In a previously published review, it was reported that 43% of lumbar punctures, 42% of EEG and 49% of toxic scans performed in patients presenting with acute ataxia had abnormal results, but most of these abnormal results were not diagnostic.<sup>5</sup> In patients presenting with ataxia emergency neuroimaging is recommended in the presence of changes in consciousness, signs of increased intracranial pressure, focal neurological signs, asymmetric ataxia, or a history of trauma.<sup>1,6,16,17</sup> However, there are researchers who recommend neuroimaging in all children who present with ataxia in order not to miss a serious underlying cause.<sup>5</sup> In our study, the diagnosis could be made in 70% of the patients by history, physical examination and routine laboratory tests. However, the diagnosis could be made with the help of cranial MRI in 18 patients (19%) who were diagnosed with ADEM and MS. Again, CSF examination was required in five patients diagnosed with encephalitis and in two patients diagnosed with Miller Fischer syndrome, EEG in one patient diagnosed with epilepsy, and further metabolic examinations in two patients diagnosed with metabolic disease. The following conclusions can be drawn from these results: most of the patients can be diagnosed with a careful history and detailed physical and neurological examination in children presenting with acute ataxia; lumbar puncture, EEG and metabolic examinations are not necessary in every patient and should be requested according to the history and physical examination findings and neuroimaging should be performed in all children whose exact cause of ataxia cannot be determined.

### Study Limitations

The most important limitation of the study is that it is retrospective and limited to file information. Other limitations

are that not every patient has been evaluated with the same algorithm, the time of evaluation by the pediatric neurologist is different, some patients have varicella vaccine and others do not.

### Conclusion

The most common cause of acute ataxia in children is acute postinfectious cerebellar ataxia. In addition, ataxia may be the first symptom of diseases with high mortality and morbidity such as encephalitis, ADEM, MS, Miller Fisher syndrome and trauma. Therefore, differential diagnosis should be made based on a careful history and detailed physical and neurological examination findings.

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### Ethics

**Ethics Committee Approval:** Approval for this study was obtained from the Local Ethics Committee of University of Health Sciences Turkey, Dr. Behçet Uz Children's Education and Research Hospital, and Surgery Training and Research Hospital (date: 30.03.2017, protocol no: 2016/119).

**Informed Consent:** Retrospective study.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Concept: T.Ç., Ü.Y., M.B., Design: T.Ç., Ü.Y., Data Collection or Processing: M.B., T.Ç., Analysis or Interpretation: T.Ç., Ü.Y., Literature Search: T.Ç., Ü.Y., M.B., Writing: T.Ç., Ü.Y.

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# Evaluation of Children and Adolescents Admitted to Emergency Service with Suicide Attempt

## Acil Servise İntihar Girişimi Nedeniyle Başvuran Çocuk ve Ergenlerin Değerlendirilmesi

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### Abstract

**Introduction:** Although the number of studies conducted on suicide attempt with adult patients is very high, it is very few in adolescents. In this study, it was aimed to evaluate the characteristics of children and adolescents who admitted to the pediatric emergency unit due to suicide attempt.

**Methods:** This study was carried out by analyzing the files of cases retrospectively who applied to the pediatric emergency unit between 01/01/2018 and 31/12/2020 due to suicide attempt and consulted to child and adolescent psychiatry unit.

**Results:** Of the 60 subjects, 48 (80%) were female and 12 (20%) were male. The average age was 15.01±1.73 years. The most common method was overdose drug intake (63.3%) and followed by incision (18.3%). Conflict with the family was found the most common reason for suicide attempt (36.7%). The most common psychiatric diagnosis was major depressive disorder (30%) and followed by anxiety disorders and conduct disorders (both 16%). Multiple suicide attempts were also significantly associated with substance use and staying in child welfare institution. Although it was not statistically significant, the rate of multiple suicide attempts (40.5% vs. 16.7%) was higher in those with comorbid psychiatric disorders than those without a psychiatric disorder. Only 55% (n=33) of the cases applied to the child psychiatry outpatient clinic appointment, which was recommended when they were discharged from the emergency service.

**Conclusion:** Due to the low rate of those presenting to the child psychiatry outpatient clinic after the emergency service, strategies to increase the awareness of families about suicide should be developed.

**Keywords:** Suicide attempt, adolescent, psychiatry

### Öz

**Giriş:** Erişkin hastalarda özkıyım girişimi konusunda yapılan çalışma sayısı çok yüksek olmasına rağmen çocuk ve ergenlerde çok azdır. Bu çalışmada çocuk acil servisine özkıyım girişimi nedeniyle başvuran çocuk ve ergenlerin özelliklerinin değerlendirilmesi amaçlanmıştır.

**Yöntemler:** Bu çalışma 01/01/2018-31/12/2020 tarihleri arasında çocuk acil servisine özkıyım girişimi nedeniyle başvuran ve çocuk ve ergen psikiyatri birimine konsülte edilen olguların dosyaları geriye dönük olarak incelenerek gerçekleştirildi.

**Bulgular:** Altmış olgunun 48'i (%80) kız ve 12'si (%20) erkekti. Ortalama yaş 15,01±1,73'tü. En yaygın yöntem aşırı doz ilaç alımı (%63,3) ve ardından kesi (%18,3) idi. Özkıyım girişimi için en yaygın neden aile ile çatışma olarak bulundu (%36,7). En yaygın psikiyatrik tanı majör depresif bozukluktu (%30) ve bunu anksiyete bozuklukları ve davranış bozuklukları (her ikisi de %16) izlemekteydi. Madde kullanımı ve çocuk esirgeme kurumunda kalma, çoğul özkıyım girişimi ile anlamlı olarak ilişkiliydi. İstatistiksel olarak anlamlı olmamakla birlikte çoğul özkıyım girişimi oranı (%40,5 vs. %16,7) ek psikiyatrik bozukluğu olanlarda psikiyatrik bozukluğu olmayanlara göre daha yüksekti. Acil servisten taburcu edilirken önerilmiş olan çocuk psikiyatri polikliniği randevusuna olguların sadece %55'inin (n=33) başvurduğu öğrenildi.

**Sonuç:** Acil servis sonrasında önerilen çocuk psikiyatrisi polikliniğine başvuru oranlarının düşük olması nedeniyle ailelerin özkıyım konusundaki farkındalığını artırmaya yönelik stratejiler geliştirilmelidir.

**Anahtar Kelimeler:** Özkıyım girişimi, ergen, psikiyatri

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## Introduction

Suicide is an important public health problem. Suicide attempt is defined as potentially harmful behavior that is executed with the intention of dying but has a non-fatal outcome. Completed suicide refers to actions that result in death.<sup>1</sup> Suicide is currently the second leading cause of death among individuals aged 10-24 (17.4% of all deaths).<sup>2</sup> Suicidal ideation is rare in children, but it increases gradually between the ages of 10 and 12 and faster during adolescence.<sup>3,4</sup> The prevalence rates for suicidal ideation among young people range from 19.8% to 24% and for suicidal attempts between 3.1% and 8.8%.<sup>5</sup> Suicide is accounted for 14% of deaths in adolescents aged 15 to 19 years, and 8% of deaths in children aged 10 to 14 years.<sup>6</sup>

Suicidal thoughts and behaviors are the most common mental health emergencies among adolescents.<sup>7</sup> Investigation of risk factors for suicide attempts is of great importance, especially in issues related to prevention.<sup>3</sup> The characteristics of suicidality in children and adolescents are different from those occurring in adults and there is a need for tools to identify the youth at higher risk.<sup>8</sup> Numerous factors can contribute to suicide, and every suicide is caused by an extremely unique, complex and dynamic interaction of social, psychological, genetic, and biological factors.<sup>9</sup> Various risk factors have been identified for adolescent suicide, including individual, familial, social, school, and peer-related factors.<sup>1,10</sup> Mental disorders, previous suicide attempts, specific personality characteristics, impulse control (e.g., aggression, substance abuse), family history of mood disorder and/or suicidal behavior and triggering psychosocial stressors are key risk factors in youth suicide.<sup>9,11</sup>

Investigating which adolescents are most likely to reattempt suicide will help to formulate prevention and intervention strategies for suicidal tendencies in children and adolescents. In this study, it is aimed to draw attention to youth suicides and the precautions that can be taken in our country by presenting the characteristics of children and adolescents who applied to the pediatric emergency unit due to suicide attempt.

## Materials and Methods

This study was carried out by analyzing the retrospective files of the cases who applied to the pediatric emergency department between 01/01/2018 and 31/12/2020 due to suicide attempt and consulted to child and adolescent psychiatry unit. In total, 60 of the 348 subjects consulted during this period were related to the suicide attempt. Obtaining from the files of the patients, the data regarding the age, gender, reasons and type of suicide attempt (drug consumption, pesticide, incision with cutting tools, jumping from high places, etc.) was noted.

Data usage permission from the Akdeniz University Hospital and Ethics Committee Approval were obtained for the study (date: 23/12/2020- protocol number: 953).

## Statistical Analysis

IBM SPSS 23.0 program was used for statistical analysis. Descriptive statistics including number, percentage, mean and standard deviation values were used in the analysis of the data. Chi-square test was used to compare categorical data.

## Results

In this study, sixty patients who were referred to the emergency department due to suicide attempt were included. Of the total 60 suicide attempts, 15 (25.0%) were in 2018, 23 (38.3%) in 2019, and 22 (36.7%) in 2020. Of the 60 cases, 48 (80%) were female and 12 (20%) were male (Table 1). The average age was 15.01±1.73 years. Most of the cases (96.6%) were between 13 and 17 years old, one case was a 7-year-old male and one case was an 11-year-old male.

Fifty (83.3%) of the 60 cases were living with their families, and 10 (16.7%) were staying in the child welfare institution. Of the 60 cases, 24 were brought by ambulance, 32 were

**Table 1. Demographic data of cases with suicide attempt**

	Number	Percentage (%)
<b>Sex</b>		
Girls	48	80
Boys	12	20
<b>Living place</b>		
With family	50	83.3
Child welfare institution	10	16.7
<b>Way of suicide</b>		
Taking drug overdose	38	63.3
Incision	11	18.3
Jumping from high places	5	8.3
Hanging	2	3.3
Pesticide	1	1.7
Missed data	3	5.0
<b>Numbers of suicide attempt</b>		
Single	40	66.7
Multiple	20	33.3
<b>Reasons of suicide attempt</b>		
Conflict with family	22	36.7
Individual reasons	21	35.0
Problems with partner	8	13.3
Problems with friends	3	5.0
Academic difficulties	5	8.3
<b>After evaluation in the emergency unit</b>		
Discharge	48	80.0
Hospitalization	10	16.7
Intensive care unit	2	3.3
<b>Child psychiatry outpatient control after discharge</b>		
Applied	33	55
Non-applied	27	45

by family, 1 was by friends. Regarding the distribution of suicide attempts by month of the attempt, it was found that it was most common in April (16.7%) and at least in May (1.7%). Considering the course of the cases after their evaluation and treatment in the emergency room, 48 (80.0%) were discharged from the emergency service, 10 (16.7%) were hospitalized in the pediatric service, and 2 (3.3%) were transferred to the intensive care unit.

When suicide attempt methods were evaluated, the most common method of suicide attempt was by taking drugs overdose (63.3%). This was followed by cutting oneself (18.3%) and jumping from high places (8.3%). It was found that 20 (33.3%) of the cases had attempted suicide before. It was showed that 52 (86.7%) of the suicide attempts were in an impulsive manner, and 8 (13.3%) of them were previously planned. Among those who attempted suicide by taking drugs, 17 (28.3%) attempted suicide by taking one type of drug, and 21 (71.7%) by taking more than one type of drug. The most frequently preferred drug group for suicide were non-steroidal anti-inflammatory drugs (n=23, 40.4%), antidepressants (n=6, 10.5%), and antibiotics (n=5, 8.8%), respectively.

When the reasons for a suicide attempt were evaluated, it was found that conflict with the family (36.7%) was the most common, followed by individual reasons (such as loneliness, unhappiness) (35.0%) and problems with romantic-partner (13.3%). According to the information obtained from the files of the cases, the most common psychiatric diagnosis was major depressive disorder (30.0%), followed by anxiety disorder (16.0%) and conduct disorder (16.0%) (Table 2). Concomitant substance use was present in 5 (8.3%) patients. 55% (n=33) of the cases applied to the child psychiatry outpatient clinic appointment, which was recommended when they were discharged from the emergency service.

Although it was not statistically significant, the rate of multiple suicide attempts was higher in those with comorbid psychiatric diseases than those without a psychiatric disorder (40.5% vs 16.7%) (p=0.65). When the suicide attempt was evaluated in terms of whether it was multiple or single, no significant difference was found between genders (Table 3).

However, the rate of multiple suicide attempts was significantly higher in those living in child welfare institutions than in those living with their family (p=0.012). In addition, the rate of multiple suicide attempts was found significantly higher in those with substance use compared to those who did not (p=0.038).

## Discussion

This study is one of the rare studies evaluating child and adolescent suicides in our country. In the present study,

adolescents who applied to a university hospital with suicide attempt were evaluated and the majority of the cases were girls. Studies conducted in our country have found that girls attempted suicide more than boys.<sup>12-15</sup> This may be because suicide attempts in women are more easily tolerated in our society and can be interpreted as a call to the environment. Moreover, depressive disorders are a risk factor for suicidal ideation and attempt, and depressive disorders are more common in girls than boys in adolescence and post-adolescence.<sup>16</sup> On the other hand, comorbid alcohol use and aggression are more common in men, and men prefer more lethal methods that lead to completed suicides.<sup>1,17</sup> It was also stated that men would not be exposed to humiliation from the environment as a result of such an incomplete suicide attempt.<sup>3</sup>

When suicide attempt methods were evaluated in the present study, the most common method of suicide attempt was by taking drugs overdose (63.3%). In studies conducted in our country and other countries, the most common method of suicide attempt was also the same.<sup>14,15,18</sup> The most commonly preferred drug group for suicide was non-steroidal anti-inflammatory drugs, and this finding is consistent with the

**Table 2. Psychiatric disorders of the subjects**

Diagnoses	Number	Percentage (%)
Major depressive disorder	18	30.0
Anxiety disorder	10	16.0
Conduct disorder	10	16.0
Bipolar disorder	3	5.0
Attention deficit hyperactivity disorder	5	8.3
Dissociative disorder	2	3.3
Psychosis	1	1.7
Obsessive-compulsive disorder	1	1.7
Adjustment disorder	1	1.7

**Table 3. Comparison of multiple suicide attempts vs single suicide attempts**

	Multiple suicide attempts	Single suicide attempt	p*
<b>Gender</b>			
Girls n, (%)	15 (31.2)	33 (68.8)	0.511
Boys n, (%)	5 (41.7)	7 (58.3)	
<b>Living place</b>			
Living with family	13 (26)	37 (74)	<b>0.012</b>
Child welfare institution	7 (70)	3 (30)	
<b>Substance use</b>			
Yes	4 (80.0)	1 (20.0)	<b>0.038</b>
No	16 (29.1)	39 (70.9)	
<b>Psychiatric disorder</b>			
Yes	17 (40.5)	25 (59.5)	0.073
No	3 (16.7)	15 (83.3)	

\*Chi-square test. Significant values are bolded in font

studies conducted in adolescents.<sup>13,18,19</sup> Therefore, it was thought that drugs such as analgesics and anti-inflammatories, which are available in many homes and are easily accessible, pose a risk for suicide attempts, as they don't need to come with a prescription. On the other hand, a suicidal attempt with low lethality does not indicate low suicidal intention, especially in young children whose cognitive maturity is inadequate to formulate and execute a suicide plan. For an impulsive person if a lethal agent such as paracetamol or a firearm is present and accessible, an attempt even with relatively low intention may result in a medically serious or even fatal consequences. Therefore, it seems necessary to take any attempt seriously, even if it is not accompanied by a desire to die.

Conflict with the family was the most common reason for suicide attempts in this study. In studies conducted in our country on suicide attempts in adolescents, the most common cause was also conflict with the family.<sup>12-15</sup> It was also reported that family conflict was associated with between 30% and 75% increased risk of suicidality.<sup>20</sup>

According to the information obtained from the file notes of the cases, the most common psychiatric diagnosis was major depressive disorder, followed by anxiety disorder and conduct disorder. This finding is consistent with studies on adolescent suicide conducted in our country.<sup>12,13,18</sup> Empirical studies have shown that the factor most associated with suicide in girls was major depression (increases risk up to 20 times), followed by previous suicide attempts. In men, it was stated that previous suicide attempts were the most associated factor with suicide risk, followed by depression, alcohol and substance use, and destructive behaviors.<sup>21-23</sup> In our study, although it was not significant, the rate of multiple suicide attempts was higher in patients with comorbid psychiatric diseases than those without a diagnosis of psychiatric disease. However, previous studies reported that the single most important risk factor for completed suicide was a previous suicide attempt, even after controlling the psychiatric disorder.<sup>1</sup> On the other hand, considering that the chronicity, severity and complexity of psychiatric disorder (for example, comorbidity) are also related to suicide risk,<sup>22</sup> it seems likely that early diagnosis and early symptomatic relief are important components of the prevention and treatment of adolescent suicidal behavior. In the present study, multiple suicide attempts were also significantly associated with substance use and staying in child welfare institution. Clinicians should pay more attention to children with these risk factors in terms of multiple suicide attempts.

In this study, it was found that 45% of the cases did not apply to our child and adolescent psychiatry outpatient clinic that recommended during discharge from the emergency service.

In a study conducted in our country, this rate was 71%.<sup>13</sup> In another study, it was stated that 70.4% of the cases did not apply to outpatient clinic control that was recommended.<sup>18</sup> Considering that previous suicide attempts are an important risk factor for subsequent suicides, the low rate of referral to child psychiatry outpatient clinic control is a major problem.

### Study Limitations

Since the data of this study were obtained retrospectively from patient files, data such as examination findings could not be included due to inadequate records. In addition, since the records of the patients in this study were only in a university hospital and contained data for a short period of three years, it is not possible to generalize the results of the study to all emergency psychiatric patients.

### Conclusion

Although it is not possible to completely prevent suicide attempts, repetitive suicide attempts and attempts resulting in death can be reduced by evaluating the risk factors of suicide attempts and conducting studies on this subject. In the present study, although it was not significant, the rate of multiple suicide attempts was higher in patients with comorbid psychiatric diseases than those without a diagnosis of psychiatric disease. Multiple suicide attempts were also associated with substance use and staying in child welfare institutions. In addition, only 55% of the cases applied to the child psychiatry outpatient clinic, which was recommended during discharge. Therefore, parent education programs should be organized for the parents of adolescents to increase awareness about suicide, and also strategies related to health measures should be developed in adolescents who attempt suicide.

### Ethics

**Ethics Committee Approval:** The study was approved by the Institutional Ethics Committee of Akdeniz University Faculty of Medicine (date: 23.12.2020, number: 953).

**Informed Consent:** As this is a retrospective study, the information is received from the medical records of the hospital. Therefore, there is no informed consent received from the cases individual.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Concept: Ö.G.Ç., Design: Ö.G.Ç., A.Ö., Data Collection or Processing: M.E.G., A.Ö., Analysis or Interpretation: M.E.G., A.Ö., Ö.G.Ç., Literature Search and Writing: Ö.G.Ç., M.E.G., A.Ö.

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# Neutrophil-lymphocyte and Platelet-lymphocyte Ratios in Febrile Seizures

## Febril Konvülsiyonlarda Nötrofil-lenfosit ve Platelet-lenfosit Oranları

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### Abstract

**Introduction:** The neutrophil-lymphocyte ratio (NLR) and the platelet-lymphocyte ratio (PLR) are accepted as the indicators of systemic inflammatory response. The aim of this study was to evaluate the value of the changes in NLR and PLR values as a biomarker in patients presenting with febrile seizure.

**Methods:** Patients with a diagnosis of febrile seizure were retrospectively evaluated. A total of 175 febrile seizure patients and 150 healthy children constituting the control group were included in the study. The febrile seizure type was simple in 113 and complicated in 62 subjects.

**Results:** The NLR value was higher in the febrile seizure group (3.36±3.28) than in the control group (1.82±2.21) with statistical significance ( $p=0.000$ ). The PLR value was also higher in the febrile seizure group (135.10±80.44) than in the control group (123.43±67.06) but without statistical significance ( $p>0.05$ ). There was no statistically significant relationship between the NLR or PLR values and age. The main characteristic influencing the NLR and PLR values in the febrile seizure group was found to be the type of febrile seizure.

**Conclusion:** Febrile seizure diagnosis and typing is done clinically, if the examination is performed for any reason, the NLR and PLR values can provide guidance in the differentiation of simple and complex febrile seizures.

**Keywords:** Febrile seizure, neutrophil-lymphocyte ratio, platelet-lymphocyte ratio

### Öz

**Giriş:** Nötrofil/lenfosit oranı (NLO) ve platelet/lenfosit oranı (PLO) sistemik enflamatuvar cevabın göstergesi olarak kabul edilmektedir. Burada febril konvülsiyon ile başvuran hastalarda NLO ve PLO değerlerinde meydana gelen değişikliklerin ve bir biyobelirteç olarak kullanılabilirliğinin değerlendirilmesi amaçlandı.

**Yöntemler:** Febril konvülsiyon tanısı alan hastalar geriye dönük olarak incelendi. Çalışmaya febril konvülsiyonlu 175 hasta ile kontrol grubu olarak sağlıklı 150 çocuk alındı. Febril konvülsiyon tipi, hastaların 113'ünde basit, 62'sinde komplike idi.

**Bulgular:** Febril konvülsiyon grubunda NLO değeri (3,36±3,28), kontrol grubuna (1,82±2,21) göre yüksekti ve bu yükseklik istatistiksel olarak anlamlı saptandı ( $p=0,000$ ). PLO değeri de febril konvülsiyon grubunda (135,10±80,44) kontrol grubuna (123,43±67,06) göre yüksek saptandı, ancak bu farklılık istatistiksel olarak anlamlı saptanmadı ( $p>0,05$ ). Yaş ile NLO-PLO değerleri arasında ilişki saptanmadı. Febril konvülsiyonlu hastalarda NLO ve PLO değerini etkileyen temel özelliğin febril konvülsiyonun tipi olduğu saptandı.

**Sonuç:** Febril konvülsiyon tanısı ve tiplmesi klinik olarak yapılır, herhangi bir nedenle tetkik yapıldıysa NLO ve PLO değerleri basit ve komplike febril konvülsiyon ayırımında yol gösterici olabilir.

**Anahtar Kelimeler:** Febril konvülsiyon, nötrofil-lenfosit oranı, platelet-lenfosit oranı

### Introduction

Febrile seizure (FS) is the most common seizure of childhood between 6 months-6 years age group. In the definition of American Academy of Pediatrics (AAP), there should be no intracranial infection, metabolic disorder, or history of afebrile

seizure to diagnose FS. The condition is called simple febrile seizures (SFS) if the seizures are generalized and last less than 15 minutes and do not recur within 24 hours while other cases are called complex febrile seizures (CFS).<sup>1</sup> The typing of the FS is important for patient management and determining the condition's prognosis.<sup>2</sup> Both types are generally not

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expected to have long-term sequela on motor or cognitive development, although CFS has been associated with a slightly higher rate of epilepsy.

The most of FS occurs at home or on the way to the hospital so anamnesis is very important for diagnosis. Serious anxiety, panic and fear caused by FS in parents cause a decrease in anamnesis reliability. In addition, physical examination findings have often changed or resolved upon admission. Therefore, there is difficulties in the differential diagnosis with events such as febrile reaction, cutis marmorata, hyporesponsive state, breath holding spell as well as the clinical typing of FS types. A side from clinical identification, some recent research evaluated the laboratory parameters in description of seizure types and in determining the prognosis and medical treatment to be used. The neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) are inexpensive and simple inflammation indicators with gradually increasing popularity and can easily be calculated using the neutrophil, lymphocyte, and platelet values from the complete blood count test. Neutrophils can only survive for a short time, about one day, in the blood and their numbers increase in systemic infection or inflammatory response. There are many studies in the literature on the association of the NLR value with various clinical conditions.<sup>3-7</sup> Platelet activation increases in case of inflammation. Increased mean platelet volume is an indicator of platelet activation in FS.<sup>8</sup> The possibility of using the PLR value as an inflammation indicator is also recognized.<sup>9-11</sup> In this study, we aimed to evaluate the NLR and the PLR for differentiating of FS types.

## Materials and Methods

Patients who had referred to the Ankara Yıldırım Beyazıt University Yenimahalle Training and Research Hospital's Pediatric Emergency Department with FS between 1 January 2015 and 1 November 2016 were evaluated. Medical data of the patients who had complete blood count examination was reviewed retrospectively. Age matched healthy children were evaluated as a control group. AAP criteria was used to confirm the diagnosis of FS. Patients with a history of afebrile seizure, a structural or developmental anomaly, metabolic disorder, central nervous system infection findings or toxic encephalopathy were excluded. The demographic features, seizure type, and complete blood count results were evaluated. Routine laboratory testing is not required for patients presenting with FS. Therefore, the complete blood count of the patients who were requested in relation to the current infection at the time of admission was evaluated. The NLR and PLR values were calculated by dividing the neutrophil and platelet count to the lymphocyte count, as obtained from the complete blood count test results.

The ethics committee approval for the study was obtained from the Ankara Yıldırım Beyazıt University Yenimahalle Training and Research Hospital's Clinical Studies Ethics Committee (2016/59). Written informed consent could not be obtained from the patients because it was a retrospective study.

## Statistical Analysis

We used IBM SPSS Statistics for Windows 21.0 (Armonk, NY: IBM Corp) to analyze the data. Descriptive statistics were used for the demographic characteristics of the patients. The categorical variables were expressed as numbers and percentages; the numerical data were expressed as mean  $\pm$  standard deviation. The student's t-test was used for normally distributed variables, and Mann-Whitney U test was used for quantitative or ordinary scaled variables. The chi-square or Fisher's Exact tests was used to analyze the proportions accurately. P-value  $<0.05$  was accepted statistically significant.

## Results

One hundred and seventy-five patients were included in the study. The mean age of patients was  $23.1 \pm 1.36$  months, and 100 (57.1%) subjects were male. The control group included 150 healthy children. The FS type was simple in 113 patients and complex in 62 patients. The mean age was higher in the CFS group while there was no difference regarding gender. A family history of FS was present in 43 patients (24.6%) and of epilepsy in 26 patients (14.9%).

Comparison of the FS and control group showed a statistically significant difference regarding the leukocyte, neutrophil, lymphocyte, and platelet counts ( $p < 0.05$ ). The mean NLR value was  $3.36 \pm 3.28$  in the FS group and  $1.82 \pm 2.21$  in the control group with a statistically significant difference ( $p < 0.001$ ). The mean PLR value was  $135.10 \pm 80.44$  in the FS group and  $123.43 \pm 67.06$  in the control group with no statistically significant difference ( $p > 0.05$ ) (Table 1).

Separating the FS patients into SFS and CFS groups revealed a statistically significant difference between the groups for both the NLR and PLR values (Table 2). The increase in the neutrophil count was not significant while there was a statistically significant decrease in the lymphocyte count in the CFS group.

## Discussion

The etiopathogenesis of FS has not been fully explained but some immune mechanisms are thought to be involved. The NLR and the PLR are accepted as an indicator of the systemic inflammatory response. The neutrophils and lymphocytes are the main cells of the immune system and can initiate and

**Table 1. Demographic and laboratory results of febrile seizure and control groups**

	Febrile seizure (n=175)	Control (n=150)	p
Age (month)	23.1±1.36	23.7±1.61	0.762
Gender (male)	100 (57.1%)	79 (52.6%)	0.435
White blood cell count (10 <sup>3</sup> /mm <sup>3</sup> )	11.08±4.83	7.99±1.93	<b>0.000</b>
Neutrophil count (10 <sup>3</sup> /mm <sup>3</sup> )	7.27±4.61	3.93±2.13	<b>0.000</b>
Lymphocyte count (10 <sup>3</sup> /mm <sup>3</sup> )	2.93±1.64	3.18±1.36	<b>0.017</b>
Platelet (10 <sup>3</sup> /mm <sup>3</sup> )	312.52±103.27	328.94±85.99	<b>0.033</b>
Neutrophil to lymphocyte ratio	3.36±3.28	1.82±2.21	<b>0.000</b>
Platelet lymphocyte ratio	135.10±80.44	123.43±67.06	0.134

increase the release of cytokines that leads to the start of inflammation. Recently, NLR has been used as a predictor for differentiating FS types.<sup>12,13</sup> We evaluated whether NLR and PLR had any diagnostic importance in patients with FS and whether they could be used as a biomarker in differentiating SFS and CFS. We determined that the PLR value could be used as a marker to differentiate SFS and CFS while the NLR value could be used to differentiate both SFS and CFS and the FS and control groups. FS patients may have neutrophil and lymphocyte concentration changes as an indicator of their cellular stress due to the underlying infection.

Studies from our country have revealed that FS is more common in males and that the mean age of CFS patients is low but without statistical significance.<sup>12,13</sup> We also found no difference regarding gender in our study and the mean age of the CFS patients was higher than the SFS group.

Aydin et al.<sup>14</sup> have reported that NLR values are the lowest in the ≤1 years age group and increase with age. The highest value was found to be 1.86 in the ≤1 years age group and 1.97 in the 1-2 years age group. They also found a significant difference in the NLR values between the genders between the ages of 1 and 10 years.<sup>14</sup> The NLR value of the FS group in our study where most of the subjects were aged 2 years or below was above the normal reference value.

The NLR value has been shown to increase in disorders such as asthma, cardiovascular diseases, Kawasaki disease, familial Mediterranean fever and *Brucellosis* in children<sup>3-7</sup>, and acute pancreatitis, septicemia, status epilepticus and restless legs syndrome in adults.<sup>15-18</sup> It is known that the PLR value can be used as an inflammatory marker in disorders such as pneumonia, Guillain-Barré syndrome, and rheumatoid arthritis.<sup>9-11</sup> The PLR value has been shown to increase with increasing cancer stage in adult gastric cancer patients.<sup>19</sup> A review of previous studies reveals that the common mechanism is a response to increased inflammation. We are not aware of a previous study evaluating the status of the PLR value in FS. We have demonstrated that the PLR value can help when determining the type of FS in this study.

**Table 2. Demographic and laboratory results of SFS and CFS groups**

	SFS (n=113)	CFS (n=62)	p
Age (month)	20.98±1.21	26.96±1.53	<b>0.011</b>
Gender (male)	64 (56.6%)	36 (58.0%)	0.855
White blood cell count (10 <sup>3</sup> /mm <sup>3</sup> )	11.19±4.77	10.88±4.96	0.625
Neutrophil count (10 <sup>3</sup> /mm <sup>3</sup> )	7.22±4.83	7.35±4.20	0.571
Lymphocyte count (10 <sup>3</sup> /mm <sup>3</sup> )	3.15±1.74	2.51±1.35	<b>0.019</b>
Platelet (10 <sup>3</sup> /mm <sup>3</sup> )	305.38±102.20	325.53±104.77	0.162
Neutrophil to lymphocyte ratio	3.16±3.23	3.74±3.37	<b>0.043</b>
Platelet lymphocyte ratio	121.84±65.89	159.27±97.81	<b>0.002</b>

SFS: Simple febrile seizures, CFS: Complex febrile seizures

Goksugur et al.<sup>12</sup> and Yigit et al.<sup>13</sup> have reported different NLR values in the SFS and CFS groups. We similarly found a significant difference in NLR values. Liu et al.<sup>20</sup> reported that elevated NLR and MPV/PLT ratio (MPR) effect the FS risk. They confirmed that NLR is an independent predictor in differentiating of FS types and emphasized that NLR and MPR may have a synergistic effect.<sup>20</sup> This state may be related to increased neutrophil-mediated inflammation and reduced anti-inflammation response.<sup>21,22</sup>

Infection-related tests were requested to some patients for the treatment and follow-up of the concomitant infection is independent of the diagnosis of FS and is related to the follow-up and treatment process of the infection. Therefore, there is no routine laboratory test for patients with FS in our center, as is the case all over the world.

### Study Limitations

The limitations of our study were low patient numbers and retrospective nature. Further longitudinal studies on a larger sample are needed to validate the present results and postulate a possible diagnostic potential.



## Conclusion

FS diagnosis and typing is done clinically, if the examination is performed for any reason, the neutrophil-lymphocyte and PLRs can provide guidance in the differentiation of simple and complex FS.

## Ethics

**Ethics Committee Approval:** The ethics committee approval for the study was obtained from the Ankara Yıldırım Beyazıt University Yenimahalle Training and Research Hospital's Clinical Studies Ethics Committee (2016/59).

**Informed Consent:** Written informed consent could not be obtained from the patients because it was a retrospective study.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: S.İ.Ö., H.A., A.N.Ç.K., Concept: S.İ.Ö., H.A., A.N.Ç.K., Design: S.İ.Ö., H.A., A.N.Ç.K., Data Collection or Processing: S.İ.Ö., H.A., A.N.Ç.K., Analysis or Interpretation: S.İ.Ö., H.A., A.N.Ç.K., Literature Search: S.İ.Ö., H.A., A.N.Ç.K., Writing: S.İ.Ö., H.A., A.N.Ç.K.

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# The High-flow Nasal Cannula Practices of Pediatric Intensive Care and Pediatric Emergency Specialists in Turkey

Türkiye'deki Çocuk Yoğun Bakım ve Çocuk Acil Uzmanlarının Yüksek Akışlı Nazal Kanülle Oksijen Tedavisi Uygulamaları

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## Abstract

**Introduction:** To date, no consensus has been reached on the start, monitoring and termination methods for high-flow nasal cannula oxygen (HFNC) treatment in children. Therefore the aim of this study was to evaluate the HFNC practices of pediatric emergency and pediatric intensive care specialists in Turkey.

**Methods:** A total of 85 pediatric emergency and pediatric intensive care specialists from 22 cities participated in this questionnaire study. The questionnaire consisted of 20 items related to HFNC indications, complications, preferred settings, follow-up and weaning methods.

**Results:** To start HFNC, 22.4% of the respondents reported using a scoring system. It was reported with  $FiO_2 >50\%$  by 57.6% and  $<50\%$  by 42.4% of the respondents. The decision to terminate HFNC was stated to be based on a scoring system by 31.7%. It was stated by 91.8% of respondents that HFNC treatment was terminated by reducing the flow, and 8.2% directly terminated the treatment. The most common indication for HFNC was acute bronchiolitis in both the emergency department and pediatric intensive care.

**Conclusion:** It was determined that the majority of pediatric emergency and pediatric intensive care specialists based their decisions for starting, monitoring and terminating HFNC on the examination findings of the patient and did not use any scoring system or protocol.

**Keywords:** Respiratory failure, high flow nasal cannula, pediatric intensive care, pediatric emergency

## Öz

**Giriş:** Çocuk hastalarda yüksek akışlı nazal kanül oksijen (YANKO) tedavisinin başlama, izleme ve sonlandırma yöntemleri konusunda fikir birliği bulunmamaktadır. Bu çalışmada, Türkiye'deki çocuk acil ve çocuk yoğun bakım uzmanlarının YANKO uygulamaları araştırılmıştır.

**Yöntemler:** Bu anket çalışmasına 22 şehirden toplam 85 çocuk acil ve çocuk yoğun bakım hekimi katıldı. Yirmi sorudan oluşan ankette, YANKO endikasyonları, komplikasyonları, tercih edilen ayarlar, takip ve ayırma yöntemleri araştırıldı.

**Bulgular:** YANKO tedavisi başlamak için, katılımcıların %22,4'ü bir puanlama sistemi kullandığını bildirdi. Katılımcıların %57,6'sı %50'nin üzerinde ve %42,4'ü %50'nin altında bir  $FiO_2$  ile tedaviye başlamaktaydı. YANKO'yu sonlandırma kararı %31,7 oranında puanlama sistemine dayalıydı. Ankete katılanların %91,8'i YANKO tedavisini akışı azaltarak sonlandırırken %8,2'si doğrudan tedaviyi sonlandırmaktaydı. YANKO için en yaygın endikasyon hem çocuk acil hem de çocuk yoğun bakımda akut bronşiolitti.

**Sonuç:** Çocuk acil ve çocuk yoğun bakım hekimlerinin büyük çoğunluğunun YANKO başlatma, izleme ve sonlandırma kararlarını hastanın muayene bulgularına göre verdiklerini ve herhangi bir skorlama sistemi veya protokolü kullanmadıkları belirlendi.

**Anahtar Kelimeler:** Solunum yetmezliği, yüksek akışlı nazal kanül, çocuk yoğun bakım, çocuk acil

## Introduction

High-flow nasal cannula (HFNC) oxygen treatment is a non-invasive method that provides acute respiratory support to improve ventilation and oxygenation in respiratory tract

diseases in children. This method facilitates mucociliary transport, reduces airway secretions and viscosity, prevents the collapse of the upper airway, and increases residual functional capacity.

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In the literature, there are studies reporting that it is effective and safe in the indications of acute bronchiolitis, asthma, pneumonia, sleep apnea syndrome, patient transport, post-extubation respiratory support in children.<sup>14</sup> The greatest concern during the use of HFNC is the delay in switching to advanced respiratory support methods in the event of HFNC failure. Therefore, studies focused on determining the parameters that can be used to predict HFNC failure in children.<sup>5-8</sup>

Despite the increasing use, no consensus has yet been reached on the indications and initial settings, duration and weaning method for HFNC in pediatric patients. The aim of this study was to determine the indications of pediatric emergency and pediatric intensive care unit (PICU) specialists in Turkey for starting HFNC and the methods of initiation, maintenance and weaning, and to determine the frequency of scoring use in these stages.

## Materials and Methods

A 20-item questionnaire was prepared to be delivered over the internet to physicians working as specialists, medical residents and faculty members in pediatric emergency and PICUs. Open-ended, single and multiple answer questions were asked. The questionnaire form can be seen in Table 1. The participants were asked about initiation, maintenance, and weaning methods for HFNC treatment, whether scoring is used, device brands, indications and complications. Approval for the study was granted by the Clinical Research Ethics Committee of Ondokuz Mayıs University (date: 27.02.2020, no: 2020/92).

### Statistical Analysis

Data obtained in the study were analyzed statistically using SPSS vn. 20.0 for Windows software. Descriptive statistics were stated as number (n) and percentage (%) for categorical variables, and as mean ± standard deviation, or median for continuous variables. The data of all the centres were collected and analysed in total. A value of p<0.05 was accepted as the level of statistical alpha significance.

## Results

A total of 85 specialists from 22 Turkish cities participated in the study, including 51 from pediatric emergency units and PICUs. The geographical distribution of the participants is shown in Figure 1. There were 21 PICU faculty members, 23 PICU specialists, 17 PICU medical residents, 7 pediatric emergency faculty members, 8 pediatric emergency specialists and 9 pediatric emergency medical residents (Table 2).

The HFNC devices used in the centres in the study were AIRVO (41 centres, 80.4%), OMNIOX (6 centres, 11.8%) and VAPOTHERM (5 centres, 9.8%). In 6 centres (11.8%), HFNC was applied using a hospital type mechanical ventilator (HAMILTON C3 and BELLA VISTA-100). The pediatric emergency units participating in the study had a mean of 17.1±6.7 beds and 4.3±3.1 HFNC devices. The PICUs had mean 13.8±9.7 beds

**Table 1. Survey questions asked in the study**

What is the province of work?	
Please specify your employed health institution.	
Please specify your title.	
Please specify number of beds in the unit.	
Please specify number of devices in the unit.	
Please specify brand of HFNC device used.	
Please select the approximate number of patients you have given HFNC treatment in one year?	<ul style="list-style-type: none"> <li>• &lt;25</li> <li>• 25-50</li> <li>• 50-75</li> <li>• 75-100</li> <li>• 100-125</li> <li>• 125&lt;</li> </ul>
Where is your HFNC treatment starting place? (more than one answer can be selected)	<ul style="list-style-type: none"> <li>• Pediatric emergency room</li> <li>• Pediatric intensive care</li> <li>• General ward</li> </ul>
What is your frequency of using HFNC according to diagnoses? (more than one answer can be given)	
What is your initial FiO <sub>2</sub> setting?	<ul style="list-style-type: none"> <li>• &lt;50%</li> <li>• &gt;50%</li> </ul>
Do you use scoring to initiate HFNC therapy?	(Yes/no)
Do you use scoring to evaluate HFNC treatment efficacy?	(Yes/no)
What conditions do you consider as treatment failure? (more than one answer can be given)	
What is your frequency of evaluation of HFNC treatment efficacy?	<ul style="list-style-type: none"> <li>• Hourly</li> <li>• First hourly, then every 2 hours</li> <li>• Every 2 hours</li> <li>• Every 4 hours</li> </ul>
Is there a standard protocol you use for weaning?	(Yes/no)
What is your weaning method?	<ul style="list-style-type: none"> <li>• By reducing the flow</li> <li>• Directly</li> </ul>
Which oxygen support method you choose after HFNC treatment? (more than one answer can be selected)	<ul style="list-style-type: none"> <li>• Mask with reservoir</li> <li>• Nasal cannula</li> <li>• Hood</li> <li>• Room air (21%)</li> </ul>
What are the complications you encounter with the use of HFNC? (more than one answer can be given)	
Do you routinely use sedation?	(Yes/no)
If yes, what is your preferred sedative drug?	
HFNC: High-flow nasal cannula oxygen	

and  $4.7 \pm 4.03$  HFNC devices. The ratio of HFNC devices to beds was calculated as 0.25 in pediatric emergency units and 0.34 in PICUs. The frequency of applying HFNC in a year in the unit was reported to be >125 times by 25.5%, 100-125 times by 7.8%, 75-99 times by 19.6%, 50-74 times by 27.5%, 25-49 times by 11.8%, and <25 times by 7.8%.



Figure 1. The geographical distribution of the participants

For the initiation of HFNC treatment, 77.6% stated that they did not use any clinical scoring system and 22.4% said that there was a scoring system in their unit. Treatment was started with  $FiO_2 \geq 50\%$  by 57.6% of the respondents and  $< 50\%$  by 42.4%. In the evaluation of treatment efficacy, 54 (63.5%) stated that patients were evaluated hourly then every 2 hours, and 21 (24.7%) made evaluations with hourly monitoring. The decision to terminate HFNC treatment was made using a scoring system by 31.7%. While 91.8% applied weaning by reducing the flow, HFNC treatment was directly terminated by 8.2%. After the termination of HFNC, oxygen treatment was preferred with reservoir oxygen mask by 65.8%, nasal cannula by 47.1%, room air by 22.4%, and hood by 11.8% (Table 2).

The indications for HFNC use indicated by pediatric emergency specialists were bronchiolitis, pneumonia, asthma,

	Pediatric emergency	Pediatric intensive care	Total (%)
<b>Number of centers</b>	15	36	51
<b>Number of physicians</b>	24	61	85
<b>Faculty members</b>	7	21	28
<b>Specialists</b>	8	23	31
<b>Minor branch assistants</b>	9	17	26
<b>Number of devices</b>	$4.3 \pm 3.1$	$4.7 \pm 4.04$	$4.61 \pm 3.76$
<b>Number of beds</b>	$17.1 \pm 6.7$	$13.8 \pm 9.7$	$14.8 \pm 9.05$
<b>Device/bed ratio</b>	0.25	0.34	0.31
<b>HFNC patients per year</b>			
25>	1	3	4 (7.8%)
25-49	4	2	6 (11.8%)
50-74	3	11	14 (27.5%)
75-99	2	8	10 (19.6%)
100-125	1	3	4 (7.8%)
125<	4	9	13 (25.5%)
<b>HFNC initial scoring</b>			
Yes	8 (33.4%)	11 (18.1%)	19/85 (22.4%)
No	16 (66.6%)	50 (81.9%)	66/85 (77.6%)
<b>HFNC termination scoring</b>			
Yes	11 (45.9%)	16 (26.3%)	27/85 (31.7%)
No	13 (54.1%)	45 (73.7%)	58/85 (68.3%)
<b>Initial <math>FiO_2</math></b>			
<50%	9 (37.5%)	27 (44.3%)	36 (42.4%)
$\geq 50\%$	15 (62.5%)	34 (55.7%)	49 (57.6%)
<b>Frequency of evaluation</b>			
Hourly	6 (25%)	15 (24.6%)	21 (24.7%)
First hourly, then every 2 hours	12 (50%)	42 (68.9%)	54 (63.5%)
Every 2 hours	2 (8.3%)	1 (1.6%)	3 (3.5%)
Every 4 hours	4 (16.7%)	3 (4.9%)	7 (8.2%)
<b>Weaning method</b>			
By reducing the flow	22 (91.7%)	56 (91.8%)	78 (91.8%)
Directly	2 (8.3%)	5 (8.2%)	7 (8.2%)
<b>Oxygen after weaning</b>			
Mask with reservoir	18 (75%)	38 (62.3%)	56/85 (65.8%)
Nasal cannula	5 (20.8%)	35 (57.4%)	40/85 (47.1%)
Hood	2 (8.3%)	8 (13.1%)	10/85 (11.8%)
Room air (21%)	6 (25%)	13 (21.3%)	19/85 (22.4%)

HFNC: High-flow nasal cannula oxygen

chronic lung diseases, bronchopulmonary dysplasia, lung edema, acute respiratory distress syndrome, respectively. For PICU specialists, these indications were post-extubation, bronchiolitis, pneumonia, chronic lung diseases, asthma, bronchopulmonary dysplasia, and upper airway stenosis, respectively. The conditions accepted as failure in HFNC treatment are shown in Table 3. None of the participants reported that routine sedation was initiated at the start of HFNC treatment.

When asked about the frequency of HFNC complications, they were listed as patient incompatibility, nasal obstruction, cannula obstruction, abdominal distention, dermatitis according to pediatric emergency specialists, and nasal obstruction, cannula obstruction, patient incompatibility, dermatitis, abdominal distention according to intensive care specialists.

## Discussion

The results of this questionnaire study showed that the majority of respondents did not use a scoring system for starting and monitoring HFNC treatment, and the rate of use of a scoring system was determined as 22.4%. In the decision to terminate treatment 31.7% of the study participants stated that they used a scoring system. It was determined that those who did not use a scoring system based their decisions for starting, maintaining, monitoring and terminating HFNC treatment on the examination findings of the patient. In a recent international study of the HFNC practices of PICU specialists, it was reported that HFNC treatment efficacy was usually evaluated by examining respiratory count and respiratory workload, and only 16% used a respiratory scoring system.<sup>9</sup>

Close monitoring of response to treatment in patients who have started HFNC and early identification of treatment failure and intervention are important in respect of patient prognosis. In the current study, 63.5% of the respondents stated that they evaluated patients hourly at first then once

every 2 hours in the first 24 hours of HFNC treatment, 24.7% stated that they made hourly evaluations, 3.5% stated 2-hour intervals and 8.2%, 4-hour intervals. The most commonly accepted finding of treatment failure was hypoxemia. In countries with limited resources, such as Turkey with the total number of HFNC devices per bed as 0.31, it can be considered more appropriate to use a respiratory scoring system for initiation, monitoring and termination, to prevent unnecessary lengthy use of the devices. The use of a scoring system during follow-up could also contribute to the early identification of treatment failure.

The most common diagnosis for which HFNC is applied in the pediatric age group is acute bronchiolitis. In a randomized, controlled study of pediatric acute bronchiolitis patients requiring oxygen treatment, HFNC treatment was seen to significantly reduce treatment failure compared to standard oxygen therapy.<sup>10</sup> Other indications in children that have been reported in literature include asthma, sleep apnea, pneumonia, critical patient transport and the need for respiratory support after extubation.<sup>2</sup> In the current study, the most common indication for HFNC was reported to be acute bronchiolitis by both the emergency and PICU specialists.

In HFNC treatment, it is necessary to set the two parameters of flow speed and FiO<sub>2</sub>. There is no protocol related to the most appropriate initial settings for children. In a study that compared the efficacy of HFNC and continuous positive airway pressure, there were reported to be great differences between centres in respect of the highest flows given to pediatric patients.<sup>11</sup> Besnier et al.<sup>12</sup> reported that initial settings varied in adults with 58% of participants reporting that they started with 100% FiO<sub>2</sub> and gradually reduced the flow, and 28% reported starting at >50 L/min. In the current study, the initial FiO<sub>2</sub> value was stated to be >50% by 57.6% of the respondents and <50% by 42.4% of the respondents. There can be considered to be a clear need for further studies related to the optimum initial flow and FiO<sub>2</sub> settings for pediatric patients.

The respective frequency of complications was seen to be similar according to the pediatric emergency and PICU specialists. Patient incompatibility was the most common complication reported by the pediatric emergency specialists and the 3<sup>rd</sup> most common complication after nasal or cannula obstruction by the PICU specialists. Patient tolerance is higher in PICUs, which may be associated with sedation and analgesia agents started for other reasons. There are also fewer external factors that may cause agitation in children in pediatric emergency units. None of the study participants stated routinely starting sedation and analgesia during HFNC treatment but stated that they would start it if necessary. No data could be found in literature related to the administration

**Table 3. Conditions or symptoms indicating HFNC treatment failure**

	Pediatric emergency	Pediatric intensive care
1	Hypoxemia	Hypoxemia
2	Increase of retractions	Worsening of mental status
3	High FiO <sub>2</sub> requirement	Increase of retractions
4	Hypercapnia	Hypercapnia
5	Worsening of mental status	Circulatory disorder
6	Circulatory disorder	High FiO <sub>2</sub> requirement
7	Tachycardia	Tachycardia
8	Patient incompatibility	Patient incompatibility
9	Mucus hypersecretion	Mucus hypersecretion

HFNC: High-flow nasal cannula oxygen

of analgesia and sedation during HFNC treatment or which agents are preferable if applied. The current study participants stated a preference for 55% (n=47) ketamine 31% (n=26) dexmedetomidine and 14% (n=12) midazolam for sedation and analgesia.

There is no consensus on the procedure for weaning pediatric patients off HFNC treatment. Betters et al.<sup>13</sup> defined the "HFNC holiday" protocol for this purpose and reported that 89% of patients with a score of <6 in 12 hours when evaluated with a "respiratory assessment score", formed according to the patient respiratory findings, could be successfully weaned in mean 18 hours.

In a questionnaire study related to practices for adult patients, 81% of respondents reported that it was necessary to reduce FiO<sub>2</sub> first, 6% said to reduce flow first and 13% said to reduce both at the same time.<sup>14</sup> In a study by Franklin et al.<sup>10</sup> patients were monitored for 4 hours at FiO<sub>2</sub> 20% and if saturations could be held at the target of 92-94%, treatment was terminated. In the current study, 31.7% of the respondents used a protocol to terminate HFNC treatment, 91.8% by reducing flow and 8.2% by direct termination. There is a need for standardization of the weaning method by reducing flow, and this would have a positive effect on the duration of HFNC and the length of stay in intensive care and hospital. As weaning may be unsuccessful due to the underlying disease of the patient or the reason for starting HFNC, there is a need for further studies to establish how weaning should be achieved in which patients.

### Study Limitations

Our study has some limitations. The number of participants in the study is low, and our results may not reflect the practices of all pediatric emergency and intensive care specialists in our country. In addition, since the practices of the participants working in centers with HFNC application protocols will be similar, the selection of participants without such a distinction is another limitation.

### Conclusion

The results of this study showed that the majority of pediatric emergency and PICU specialists did not use a scoring system and based their decisions for starting, monitoring, and terminating HFNC treatment on the examination findings of the patient. There is a need for further studies to standardise HFNC practices in terms of using limited devices for appropriate patients and for the required time, the early determination of failure, and for there to be comparable results of studies.

**Information:** This study was presented as a verbal report at the Pediatric Emergency and Intensive Care Symposium on February 27, 2021.

### Ethics

**Ethics Committee Approval:** Approval for the study was granted by the Clinical Research Ethics Committee of Ondokuz Mayıs University (date: 27.02.2020, no: 2020/92).

**Informed Consent:** Informed consent was obtained.

**Peer-review:** Internally and externally peer-reviewed.

### Authorship Contributions

Concept: M.Ü., Design: M.Ü., N.Y., Data Collection or Processing: M.Ü., H.A., Analysis or Interpretation: M.Ü., N.Y., Literature Search: M.Ü., H.A., Writing: M.Ü., N.Y.

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# The Caregiver Burden of Mothers of Patients Who Received Tracheostomy in a University Hospital Pediatric Intensive Care Unit

Bir Üniversite Hastanesi Çocuk Yoğun Bakım Servisinde Trakeostomi Açılan Hastaların Annelerinin Bakım Verme Yükü

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## Abstract

**Introduction:** The aim of this study was to determine the caregiver burden of mothers of patients who were treated in a university hospital pediatric intensive care unit and had tracheostomy.

**Methods:** The mothers of 41 patients who were hospitalized and received tracheostomy at Çukurova University Medical Faculty Pediatric Intensive Care Unit between 10.06.2020-31.12.2020 were included in the study. A data collection form consisting of three parts was used to collect the data. With the "caregiver and socio-demographic information form" in the first section, the data belonging to the mother and family were obtained. With the "care given information form" in the second section, the data belonging to the child with tracheostomy were obtained. With the "caregiver burden inventory" in the third section, the caregiver burden of mothers was determined.

**Results:** The mean caregiver burden total score of the mothers was 40.2±14.3 (16.0-81.75). The caregiver burden sub-scores were detected from the highest to the lowest in the form of time-dependence burden, developmental burden, physical burden, social burden and emotional burden. The caregiver burden total score was found significantly higher in mothers whose families receive economic support, who have health problems after their child's tracheostomy care has started, who have difficulties in caring for their children, who have difficulties in meeting the needs of other members of their family.

**Conclusion:** It is of great importance to reduce the caregiver burden of mothers who care for children with tracheostomy to provide effective care and to protect and improve the health status of both the mother and the child with tracheostomy.

**Keywords:** Mothers, caregiver burden, tracheostomy, child with tracheostomy

## Öz

**Giriş:** Bu araştırmanın amacı bir üniversite hastanesi çocuk yoğun bakım servisinde tedavi görmüş ve trakeostomi açılmış hastaların annelerinin bakım verme yükünün saptanmasıdır.

**Yöntemler:** Çukurova Üniversitesi Tıp Fakültesi Çocuk Yoğun Bakım Servisi'nde 10.06.2020-31.12.2020 tarihleri arasında yatarak tedavi görmüş ve trakeostomi açılarak izlenmiş 41 hastanın annesi araştırmaya dahil edilmiştir. Verilerin toplanmasında üç bölümden oluşan bir veri toplama formu kullanılmıştır. Birinci bölümde yer alan "bakım veren ve sosyo-demografik bilgi formu" ile anne ve aileye ait veriler elde edilmiştir. İkinci bölümde yer alan "bakım verilen bilgi formu" ile trakeostomili çocuğa ait veriler elde edilmiştir. Üçüncü bölümde yer alan "Bakım verenlerin yükü envanteri" ile annelerin bakım verme yükü belirlenmiştir.

**Bulgular:** Annelerin bakım verme yükü toplam puanı ortalaması 40,2±14,3 (16,0-81,75) olarak saptanmıştır. Bakım verme yükü alt puanlarının en yüksekte en düşüğe doğru zaman-bağımlılık yükü, gelişimsel yük, fiziksel yük, sosyal yük ve duygusal yük şeklinde olduğu saptanmıştır. Ailesi ekonomik destek alan, çocuğunun trakeostomi bakımı başladıktan sonra rahatsızlık yaşayan, çocuğunun bakımında zorlanan ve ailesinin diğer bireylerinin ihtiyaçlarını karşılamakta zorlanan annelerde, bakım verme yükü toplam puanı anlamlı olarak yüksek bulunmuştur.

**Sonuç:** Trakeostomili çocuklara bakım veren annelerin etkili bir şekilde bakım verebilmesi, hem annenin hem de hasta çocuğun sağlığının korunması ve iyileştirilmesi için annelerin bakım verme yükünün azaltılması büyük önem taşımaktadır.

**Anahtar Kelimeler:** Anneler, bakım veren yükü, trakeostomi, trakeostomili çocuk

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## Introduction

Childhood chronic diseases are increasing gradually and appear as an important health problem in our country as well as in many countries of the world.<sup>1,2</sup> As a result of the developments in intensive care units and the increasing use of mechanical ventilators, tracheostomy has become one of the most frequently performed surgical procedures in children today.<sup>3,5</sup> Since the use of long-term ventilation support in children, the concepts of home mechanical ventilation and long-term care have begun to develop.<sup>4</sup> With home respiratory support, it is aimed to prolong the life of children, prevent them from getting other diseases, improve their physical and psychological conditions, and improve the quality of life of the child and family. Despite all these positive effects, the care of technology-dependent children with tracheostomy can cause fear, anxiety and panic in families.<sup>6,7</sup>

Responsibility for home care of the child brings a lot of burden to the family due to reasons such as treatment method, course of treatment, daily activity restriction, and long-term effects.<sup>2</sup> The concept of caregiving burden is used to express the physical, psychological, emotional, social and economic reactions that can be experienced while providing care to an individual who is unable to perform the activities of daily living due to a physical or mental illness.<sup>1,3</sup> Studies have shown that mothers generally take on the responsibility of providing care for children with chronic diseases, which is due to the widespread view that mothers are more compassionate, have a stronger emotional relationship with their children, and cope with problems better than men.<sup>2,5</sup> In order for parents, especially mothers, to provide effective care in this difficult process, it is of great importance to determine and reduce the burden of caregiving for mothers. In our country, no study has been found about the caregiving burden of caregivers of technology-dependent pediatric patients with tracheostomy, who need continuous and attentive special care. The aim of this study is to determine the caregiving burden of the mothers of the patients who were treated in the pediatric intensive care unit of a university hospital and performed tracheostomy.<sup>8</sup>

## Materials and Methods

The research was designed in descriptive and cross-sectional type. The universe of the study included the mothers of all patients who were hospitalized for treatment and performed tracheotomy in Çukurova University Medical Faculty Pediatric Intensive Care Unit between 10.06.2020 and 31.12.2020, or those responsible for the primary care of children in the absence of mothers. The primary caregivers of all children with tracheostomy who were hospitalized in the pediatric intensive

care unit between the specified dates were informed about the study and the written consent of 41 mothers who agreed to participate in the study was obtained for the study. The research was conducted in accordance with the principles of the Declaration of Helsinki. Ethics committee approval of the study was obtained from Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee with the decision no: 12 on 05.06.2020.

## Data Collection

A data collection form consisting of three parts was used to collect the data. The dependent variable of the study was "caregiving burden of mothers" and it was determined with the "caregiver burden inventory" in the third part of the data collection form. The independent variables of the study were the variables questioned in the "caregiver and socio-demographic information form" and "care receiver information form" in the first and second parts of the data collection form. The data collection form was implemented by the researchers with face-to-face interview technique. Some data such as diagnosis, disease duration, and tracheostomy opening time were obtained from the files of the patients.

**Caregiver and socio-demographic information form:** This section consists of 35 items questioning socio-demographic information such as about mother's age, mother's and father's educational status, their employment status and occupation, marital status of parents, permanent place of residence, number of children in the family, the presence of children with other chronic diseases and in need of care in the family, the presence of other people living with the family and those in need of care, the presence of chronic diseases in the mother and father, the perception of income, the family's getting any financial support, the difficulty in meeting the child's health expenses, and the presence of social security, and some information related to mother and care of child with tracheostomy.

**Care receiver information form:** Data on the age and gender of the child with tracheostomy, the diagnosis of the disease requiring tracheostomy, the duration of the disease, the time spent with tracheostomy, the presence of additional disease, whether the child was ventilator-dependent and bedridden were evaluated with 8 questions. Age, duration of disease, and time spent with tracheostomy were calculated based on the day the data were collected.

**Caregiver burden inventory:** It was developed by Novak and Guest<sup>9</sup> and its Turkish validity and reliability study was performed by Küçükgüçlü et al.<sup>8</sup> The caregiver burden inventory is a Likert-type (0-4) scale consisting of 24 questions. Scoring is as follows: (0) Point for "never defined", (1) point for "less defined", (2) points for "moderately defined", (3)

points for “highly defined”, and (4) points for “very much defined”. The total score for burden of caregiving total burden (TB) varies between 0 and 100. In addition, sub-scores of time-dependence burden (TDB), developmental burden (DB), physical burden (PB), social burden (SB) and emotional burden (EB) can also be calculated, each scored between 0 and 20 points. In the PB subscale, which consists of four items, the score obtained from each item (0-4) is multiplied by 1.25 and a maximum of 20 points is yielded from this section. The caregiver burden inventory is evaluated as the score increases, the burden of care also increases.<sup>8,9</sup>

### Statistical Analysis

The data obtained from the research were analyzed using the SPSS 22.0 software. The conformity of the data to the normal distribution was evaluated with the Shapiro-Wilk test and histogram, and it was determined that the data other than “mothers’ age” and “caregiver burden inventory TB score” did not comply with the normal distribution. The descriptive data of the study group were evaluated with number and percentage for categorical variables, with mean and standard deviation for continuous variables with normal distribution, and with median, minimum and maximum values for continuous variables without normal distribution. The Mann-Whitney U test was used because parametric conditions could not be met in the pairwise group comparison of the scores obtained from the “caregiver burden inventory”. The relationship between continuous variables and scale scores was evaluated with correlation analyses. The significance level for all analyses was accepted as  $p < 0.05$ .

### Results

In our study, all primary caregivers of children with tracheostomy were mothers (Table 1). More than half of the mothers stated that they had difficulty in meeting the health expenses of their sick children and they received financial support. Of them, 17 received state aid, 3 of them only received financial aid from their family, and 1 of them received both state aid and aid from their family (Table 2).

Of the 4 mothers who stated that they had a chronic disease, 2 stated that they had chronic asthma, 1 had hypertension and thalassemia carrier, and 1 had lumbar hernia. Out of 10 fathers with chronic disease, 2 had chronic heart disease, 2 had hypertension, 1 had diabetes and hypertension, 1 had chronic heart disease and hypertension, 1 had cancer, 1 had epilepsy, 1 had hormonal disorder, and 1 had ankylosing spondylitis. Although none of the families had another children in need of care due to their illness, only one family had a person in need of care other than the child because the father had cancer.

**Table 1. Socio-demographic data of mothers and families**

Characteristic (n=41)	n	%
<b>Primary caregiver</b>		
Mother	41	100.0
<b>Educational status of mother</b>		
Illiterate	2	4.9
Primary school	16	39.0
Middle school	6	14.6
High school	9	22.0
University and above	8	19.5
<b>Working status of mother</b>		
Yes	6	14.6
No	35	85.4
<b>Occupation of mother</b>		
Housewife	35	85.4
Civil servant (5 teachers, 1 health technician)	5	14.6
<b>Educational status of father</b>		
Primary school	11	26.8
Middle school	4	9.8
High school	17	41.5
University and above	9	22.0
<b>Working status of father</b>		
Yes	34	82.9
No	7	17.1
<b>Occupation of father</b>		
Without a specific occupation	4	9.8
Tradesman	9	22.0
Worker	21	51.2
Civil servant	7	17.1
<b>Marital status of parents</b>		
Parents are married and live together	39	95.2
Parents divorced	2	4.8
<b>Permanent residence</b>		
City center	31	75.6
District/town/village	10	24.4
<b>Income perception of family</b>		
My income is less than my expenses	20	48.8
My income covers my expenses	19	46.3
My income is more than my expenses	2	4.9
<b>Family's difficulty in meeting the health expenses of the sick child</b>		
Yes	25	61.0
No	16	39.0
<b>Family's getting financial support</b>		
Yes	21	51.2
No	20	48.8
<b>Family's having social insurance</b>		
Yes	35	85.4
No	6	14.6

Table 1. Continued		
Characteristic (n=41)	n	%
<b>Presence of any chronic disease in mother</b>		
Yes	4	9.8
No	37	90.2
<b>Presence of any chronic disease in father</b>		
Yes	10	24.4
No	31	75.6
<b>Presence of other people living in the home with the family</b>		
Yes	4	9.8
No	37	90.2
<b>Presence of other people in need of care in the family</b>		
Yes (father)	1	2.4
No	40	97.6
Characteristic (n=41)	Minimum-maximum	
Age of mothers (median ± SD)	35.1±7.5	(24.0-55.0)
Number of children in the family (median)	2.0	(1.0-5.0)
SD: Standard deviation		

It was detected that one third of the fathers helped the housework and half of them supported the care of the sick child. Mothers who received help with housework and taking care of sick children stated that they mostly got support from family members such as grandmother and aunt, and from paid helpers. Out of 12 mothers who stated that they developed discomfort after their children's having started tracheostomy care, 5 developed lumbar and neck hernia, 2 psychological problems, 1 psychological problems and lumbar hernia, 1 hypertension, 1 urticaria, and 2 insomnia (Table 2).

The mothers specified that the first 3 situations in which they had difficulty in the care of their children were bathing, carrying, and tracheostomy cannula care/nasogastric tube change, respectively. Mothers stated that they called 112 after providing aspiration and respiratory support when they encountered an emergency.

The age and disease duration of children with tracheostomy ranged from 3 months to 17 years, and the time spent with tracheostomy displayed a wide range between 1 month and 12 years. Eleven of 17 children with comorbidities had epilepsy and/or hydrocephalia (Table 3).

In comparisons with the Mann-Whitney U test, the total score of caregiving burden was found to be significantly higher in mothers whose families received financial support, who had discomfort after the start of their child's tracheostomy care, who had difficulty in caring for their child, and who had difficulties in meeting the needs of other members of their family ( $p=0.030$ ,  $p=0.014$ ,  $p=0.011$ , and  $p=0.016$ , respectively) (Tables 4, 5).

Table 2. Some information about the mother and care of the child with a tracheostomy		
Characteristic (n=41)	n	%
<b>Mother's getting support in housework</b>		
Yes	17	41.5
No	24	58.5
<b>Mother's getting support in care of the child with tracheostomy</b>		
Yes	26	63.4
No	15	36.6
<b>Mother's having difficulty in meeting the needs of other members of the family</b>		
Yes	19	46.3
No	22	53.7
<b>Mother's ability to spare time for her husband and, if any, other children</b>		
Yes	21	51.2
No	20	48.8
<b>Development of any discomfort in the mother after the child's tracheostomy care has started</b>		
Yes	12	29.3
No	29	70.7
<b>Mother's receiving psychological support due to her child's illness</b>		
Yes	4	9.8
No	37	90.2
<b>Mother's seeing her own level of knowledge adequate about her child's illness</b>		
Yes	32	78.0
No	9	22.0
<b>Mother's having difficulty in care of the child</b>		
Yes	30	73.2
No	11	26.8
<b>Mother's knowing what to do in case of an emergency</b>		
Yes	41	100.0
<b>Availability of access to a doctor or nurse when needed</b>		
Yes	34	82.9
No	7	17.1
<b>Difficulty in reaching the hospital</b>		
Yes	4	9.8
No	37	90.2
<b>Taking the child for regular controls</b>		
Yes	35	85.4
No	6	14.6
<b>Having difficulty related to ventilator and equipment</b>		
Yes	10	24.4
No	31	75.6
<b>Having problems with the supply of materials</b>		
Yes	14	34.1
No	27	65.9

Characteristic (n=41)	n	%
<b>Gender</b>		
Girl	22	53.7
Boy	19	46.3
<b>Diagnosis of the child's disease requiring tracheostomy</b>		
Spinal muscular atrophy	15	36.6
Neurological/syndromic diseases	14	34.2
Metabolic diseases	6	14.6
Trauma	3	7.3
Chronic lung disease	2	4.9
Arrhythmia	1	2.4
<b>Presence of any comorbidities</b>		
Yes	17	41.5
No	24	58.5
<b>The condition of the child being connected to the ventilator</b>		
Yes	39	95.1
No	2	4.9
<b>The condition of the child being bedridden</b>		
Yes	36	87.8
No	5	12.2
<b>Characteristic (n=41)</b>	<b>Median</b>	<b>Minimum -maximum</b>
Age (year)	5.0	0.25-17.0
Duration of the child's disease (year)	3.0	0.25-17.0
Time spent with tracheostomy (year)	2.0	0.08-12.0

The sub-scores of TDB, DB, PB, SB and EB, and TB score were found to have no significant relationship with the variables of educational status of the parents, working status of the mother, marital status of the parents, permanent place of residence, perception of income, presence of social security, presence of chronic illness in the father, presence of other people living with the family at home, the mother's getting support in housework and in taking care of the sick child, the mother's getting psychological support, the mother's level of knowledge about her child's disease, being able to reach a doctor or nurse when needed, having difficulty in reaching the hospital, taking the child to the control examinations regularly, having problems with the ventilator and equipment and the supply of materials, the child's being ventilator-dependent and bedridden ( $p>0.05$ ).

In the correlation analyses performed, no significant relationship was detected between the age of the mother, the number of children in the family, the age of the child with tracheostomy, the duration of the disease, and the time spent with tracheostomy, and the sub-scores of TDB, DB, PB, SB and EB, and TB score ( $p>0.05$ ).

Caregiving burden sub-dimensions (n=41)	Median	Minimum-maximum
Time-dependence burden (TDB)	19.0	16.0-20.0
Developmental burden (DB)	8.0	0.0-18.0
Physical burden (PB)	7.5	0.0-20.0
Social burden (SB)	3.0	0.0-17.0
Emotional burden (EB)	0.0	0.0-20.0
<b>Total burden (TB) (mean <math>\pm</math> SD)</b>	<b>40.2<math>\pm</math>14.3</b>	<b>16.0-81.75</b>
While the TB score is in accordance with the normal distribution, the sub-scores of TDB, DB, PB, SB, and EB do not comply with the normal distribution. SD: Standard deviation		

## Discussion

Our research has been an important study in terms of determining the caregiving burden of the mothers of pediatric patients with tracheostomy and examining the factors affecting this situation. In our study, all primary caregivers of children with tracheostomy were mothers. Similarly, in the study conducted by Şişmanlar Eyuboglu et al.<sup>10</sup>, all the caregivers of children with tracheostomy were reported to be mothers. In various studies conducted in our country, it is stated that mothers are mostly responsible for providing care for children with chronic diseases, and this supports the findings of our study.<sup>1-5,11-13</sup>

The TDB sub-score was found to be significantly higher when the father was working than when he was not working. While calculating the TDB sub-score, the level of care receiver's dependency in daily routine activities and in meeting basic needs (eating, drinking, bathing, dressing, etc.) is questioned. Considering that almost all of the pediatric patients with tracheostomy in this study were bedridden, and TDB score constituted the highest part of the total caregiving burden score of the mothers, it is seen that the burden of the mothers in meeting the basic needs of the sick child is quite high. It is thought that this result was reached because most of the fathers worked, they less supported the mother and they could not share the burden of the mother sufficiently.

The EB sub-score was found to be significantly higher in mothers with chronic disease compared to those without. Studies have shown that individuals who care for people with chronic diseases experience depression, fatigue, and burnout as well as feelings of fear, anxiety, anger, helplessness, and anxiety.<sup>1,2,4,13,14</sup> It is an expected result that the process of caring for a child with tracheostomy, which is quite difficult even for healthy individuals, is much more difficult and emotionally more exhausting for mothers with chronic diseases.

The EB sub-score was found to be significantly higher in those who had other family members in need of care compared to those who did not. Similarly, the EB sub-score was detected to be significantly higher in those with three or more children

**Table 5. The effect of some variables on mothers' caregiving burden scores**

Variables		TDB	p	DB	p	PB	p	SB	p	EB	p	TB	p
Working status of father	Yes	20.00	<b>0.036</b>	6.50	0.986	7.50	0.753	2.00	0.427	0.00	0.352	37.88	0.862
	No	17.00		9.00		7.50		4.00		0.00		41.00	
Presence of any chronic disease in mother	Yes	20.00	0.180	7.50	0.929	20.00	0.066	5.00	0.282	1.00	<b>0.042</b>	55.50	0.147
	No	19.00		8.00		6.25		2.00		0.00		38.00	
Presence of other people in need of care in the family	Yes	19.00	0.786	9.00	0.865	6.25	0.733	5.00	0.379	2.00	<b>0.023</b>	41.25	0.672
	No	19.50		7.50		8.13		2.50		0.00		39.25	
Family's getting financial support	Yes	19.00	0.616	10.00	0.054	10.00	0.134	4.00	0.197	1.00	<b>0.011</b>	41.25	<b>0.030</b>
	No	19.50		4.50		6.25		0.50		0.00		33.13	
Family's difficulty in meeting the health expenses of the sick child	Yes	20.00	0.474	10.00	<b>0.035</b>	8.75	0.427	4.00	<b>0.022</b>	0.00	0.240	41.00	0.059
	No	19.00		4.500		6.25		0.00		0.00		31.38	
Development of any discomfort in the mother after the child's tracheostomy care has started	Yes	20.00	0.915	10.00	0.370	15.00	<b>0.004</b>	4.00	0.101	0.00	0.200	49.5	<b>0.014</b>
	No	19.00		6.00		6.25		2.00		0.00		33.25	
Mother's having difficulty in care of the child	Yes	19.50	0.264	8.50	0.091	9.38	0.054	4.00	<b>0.004</b>	0.00	0.473	41.00	<b>0.011</b>
	No	18.00		2.00		5.00		0.00		0.00		30.00	
Mother's having difficulty in meeting the needs of other members of the family	Yes	20.00	<b>0.024</b>	9.00	0.316	10.00	0.144	4.00	<b>0.003</b>	0.00	0.251	41.25	<b>0.016</b>
	No	18.00		6.00		6.25		0.00		0.00		32.75	
Mother's ability to spare time for her husband and, if any, other children	Yes	19.00	0.181	8.00	0.813	6.25	0.400	0.00	<b>0.008</b>	0.00	0.329	38.00	0.155
	No	20.00		7.50		8.13		4.50		0.00		40.75	
Mother having two or less children		19.00		0.756		0.186		0.769		0.601		<b>0.028</b>	
Mother having three or more children		20.00	19.00	10.00	6.00	8.75	6.88	3.00	2.50	1.00	0.00	41.00	36.50

Mann-Whitney U test was performed, TDB: Time-dependence burden, DB: Developmental burden, PB: Physical burden, SB: Social burden, EB: Emotional burden, TB: Total burden

compared to those with two or fewer children. The burden of caregiving is expected to be high in those who care for more than one person. The results of Erdem et al.'s<sup>2</sup> study also support this expectation. The high EB score in our study was interpreted as mothers who cared for more than one person had difficulty mostly in emotional aspect.

The EB sub-score and TB score were found to be significantly higher in those whose families received financial support compared to those who did not. Although this result suggests that it should be the opposite at first glance, it is an expected result when it is considered that "the people who receive economic support are the ones who need economic support the most and therefore have the most financial difficulties". In the study by Erdem et al.<sup>2</sup>, it was seen that the mothers in the group who stated that they had economic difficulties most were also the mothers in the group that received the higher support. In parallel with this result, in our study, DB and SB sub-scores were found to be significantly higher in those who had difficulty in meeting their child's health expenses compared to those who did not. While calculating the DB sub-score, the caregiver's thoughts about his/her own life, expectations from life and sense of burnout are questioned.

While calculating the SB sub-score, the caregiver's relationship with family members and other individuals and his/her social life are questioned. Considering the continuous care of the sick child, mother usually withdraws from working life and has to deal with the child's care and housework all day, while father may have to work harder to meet the needs of family members and the sick child due to financial difficulties. This situation negatively affects family dynamics, personal relationships and social life, causing a feeling of inadequacy and burnout. In addition, the care of the child with tracheostomy can create an extra financial burden on the family, as he/she is technology dependent and requires special equipment and materials.<sup>2,4,5,15-17</sup> Therefore, in our study, it was thought that the sub-scores of TB and EB, DB, SB were higher in those who had financial difficulties.

In mothers who experienced discomfort after their child's tracheostomy care started, the PB sub-score and TB score were found to be significantly higher, compared to those who did not. While calculating the PB sub-score, mothers' physical health, fatigue level, and sleep quality are questioned. Approximately one-third of the mothers stated that they developed discomfort after their child started tracheostomy

care. Similar to our findings, in the study of Erdem et al.<sup>2</sup>, it was reported that health problems developed in almost half of the mothers following the diagnosis of their child.

Home care of a child with tracheostomy is a complex process that requires knowledge and skills about tracheotomy care and what to do in an emergency. The fact that the child with tracheostomy is mostly dependent on the machine and the bed brings full day responsibility to the caregiver and causes limitations in the daily activities and social lives of the families.<sup>4,17-19</sup> Supporting all these, in our study, the SB sub-score and TB score were found to be significantly higher in mothers who had difficulty in caring for their child with tracheostomy compared to those who did not.

Mothers who had difficulty in meeting the needs of other members of their family had significantly higher TDB and SB sub-scores and TB score than those who did not. Parallel to this finding, the SB sub-score was found to be significantly higher in mothers who could not spare time for their spouse and other children compared to those who could. In our study, it was determined that a significant part of the mothers took on the burden of the care of the sick child alone. In Kiran's study<sup>4</sup>, families having children with tracheostomy stated their most experienced difficulties as that they could not spare enough time for themselves, they made their daily plans according to their sick children, they had difficulties in meeting the needs of other individuals in the house and they could not spare enough time for them, which supports our findings.

Most of the studies in the literature are those on children with chronic diseases and they have been conducted using the zarit caregiver burden scale.<sup>20,21</sup> The reason why we preferred the "caregiver burden inventory" developed by Novak and Guest<sup>9</sup> is that it offers the opportunity to evaluate the care burden in 5 different sub-dimensions in addition to the total score of caregiver burden.<sup>8</sup> The strength of this study is that it is the first study in our country to evaluate the burden of caregiving from five different perspectives on mothers who care for children with tracheostomy.

### Study Limitations

The limitation of the study is that the number of participants was limited to 41 people, as the patients with tracheostomy were not admitted to the intensive care unit unless they were in a very difficult situation due to the pandemic.

### Conclusion

The total score of caregiving burden was found to be significantly higher in mothers who had financial difficulties, had discomfort after their child's tracheostomy care started, had difficulty in caring for their children with tracheostomy,

and had difficulty in meeting the needs of other members of the family. In addition, the caregiving burden sub-scores of mothers who cared for children with tracheostomy were found to be time-dependent burden, developmental burden, physical burden, social burden and emotional burden, from the highest to the lowest. It is of great importance to reduce the caregiving burden of mothers in order to protect and improve the health of both the mother and the sick child, so that mothers could provide effective care for children with tracheostomy. In line with the results obtained from this research, in order to reduce the burden of caregiving, it is recommended to support mothers both in terms of labor force and financially, to meet their physical health and psychosocial needs professionally, to share individuals, institutions and organizations that can provide financial and moral support with the family, and to develop home care and monitoring policies for children in need of home care.

### Ethics

**Ethics Committee Approval:** Ethics committee approval of the study was obtained from Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee with the decision no: 12 on 05.06.2020.

**Informed Consent:** The primary caregivers of all children with tracheostomy who were hospitalized in the pediatric intensive care unit between the specified dates were informed about the study and the written consent of 41 mothers who agreed to participate in the study was obtained for the study.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Concept: D.Ö.H., C.H., Ö.Ö.M., D.Y., Design: D.Ö.H., C.H., Ö.Ö.M., D.Y., Data Collection or Processing: D.Ö.H., C.H., Ö.Ö.M., Analysis or Interpretation: D.Ö.H., Literature Search: D.Ö.H., C.H., Ö.Ö.M., D.Y., Writing: D.Ö.H.

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# Determination of the Knowledge Levels of Nurses Regarding Central Venous Catheter Care

## Pediyatri Hemşirelerinin Santral Venöz Kateter Bakımı Konusunda Bilgi Düzeylerinin Belirlenmesi

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### Abstract

**Introduction:** It is important that pediatric nurses have sufficient knowledge in the prevention of central catheter-related blood circulation infections. This study was carried out to determine knowledge levels of the nurses, who were working in pediatric clinics, regarding central venous catheter care.

**Methods:** The universe of the study was composed of 118 nurses, who were working in pediatric clinic of a public hospital (n=50) and a training hospital (n=68) between May-June 2019. No sample was selected; and 88 nurses, who were eligible for the sample and study criteria and approved to participate during the dates of data collection (May-June 2019) were included in the study. 75% of the universe was reached. Personal information form for the identification of demographic characteristics and working lives of the nurses and the form for the knowledge levels of the nurses regarding central venous catheter care were used to collect data.

**Results:** At the end of statistical assessment, central venous catheter care mean score of nurses was found to be 8.35+2.36 (0-12). In addition, it was determined that no significant differences were found between central venous catheter scores of the nurses based on age, sex, marital status, working institution, working department, working year and their states of providing central venous catheter care (p>0.05). A significant difference was detected between nurses' states of having knowledge and education regarding central venous catheter and their central venous catheter scores (p<0.05).

**Conclusion:** It was found that the knowledge points of the nurses for central venous catheter care were insufficient. It is recommended to increase in-service training in line with the protocol/procedure/instructions regarding central venous catheter care.

**Keywords:** Central venous catheter, nursing care, knowledge level, pediatric nurse

### Öz

**Giriş:** Çocuk hemşirelerinin santral venöz kateter ilişkili kan dolaşımı enfeksiyonların önlenmesinde yeterli bilgi düzeyine sahip olması önemlidir. Bu araştırma, çocuk kliniklerinde çalışan hemşirelerin santral venöz kateter bakımı ile ilgili bilgi düzeylerinin saptanması amacıyla gerçekleştirildi.

**Yöntemler:** Araştırmanın evrenini Mayıs-Haziran 2019 tarihleri arasında bir üniversite hastanesi (n=68) ve devlet hastanesinin (n=50) çocuk kliniklerinde görev yapan 118 hemşire oluşturmuştur. Çalışmada örneklem seçimine gidilmeyip, çalışmanın verilerinin toplandığı tarihlerde (Mayıs-Haziran 2019) çalışmanın örneklem ve uygulanma ölçütlerine uygun olan ve çalışmaya katılmayı kabul eden 88 hemşire ile çalışılmıştır. Verilerin toplanmasında hemşirelerin demografik özellikleri ve iş yaşamıyla ilgili özelliklerini belirlemeye yönelik kişisel bilgiler formu ve hemşirelerin santral venöz kateter bakımına ilişkin bilgi düzeyi formu kullanılmıştır.

**Bulgular:** Yapılan istatistiksel değerlendirme sonucunda hemşirelerin santral venöz kateter bakımı puan ortalaması 8,35+2,36 (0-12) olarak bulunmuştur. Ayrıca hemşirelerin santral venöz kateter bakımı bilgi puan ortalamalarının hemşirelerin yaş, cinsiyet, medeni durum, çalıştıkları kurum, çalıştıkları bölüm, çalıştıkları yıl ve santral venöz kateter bakımı vermiş olma durumlarına göre anlamlı bir farklılık göstermediği belirlenmiştir (p>0,05). Hemşirelerin santral venöz kateter hakkında bilgi alma ve eğitim durumlarına göre santral venöz kateter bakımı bilgi puan ortalamaları arasında anlamlı farklılık tespit edilmiştir (p<0,05).

**Sonuç:** Hemşirelerin santral venöz kateter bakımı bilgi puan ortalamalarının yetersiz olduğu bulunmuştur. Santral venöz kateter bakımı ile ilgili protokol/prosedür/talimatlara uygun şekilde bakım verilmesi doğrultusunda hizmet içi eğitimlerin artırılması önerilmektedir.

**Anahtar Kelimeler:** Santral venöz kateter, hemşirelik bakımı, bilgi düzeyi, çocuk hemşiresi

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## Introduction

Central venous catheterization, which is an important part of vital support in intensive care units, is the procedure of placing a catheter in a vein that directly joins the heart.<sup>1,2</sup> Central venous catheters (CVCs) are accepted as one of the most basic applications of modern clinical treatment and are the most commonly used catheters after peripheral venous catheters.<sup>3</sup> CVC is frequently used for fluid and drug therapy, transfusion of blood and blood products, total parenteral nutrition, extracorporeal treatment application such as hemodialysis and plasmapheresis, and monitoring of hemodynamic parameters.<sup>4,6</sup> Due to these advantages it provides, the use of CVC in pediatric patients has increased considerably in recent years.<sup>4,7</sup> In addition to the benefits it provides, CVC has its own complications, such as bleeding, arterial and nerve injuries, pneumothorax, hemothorax, thrombosis, and embolism, as in every medical intervention.<sup>5,6</sup> However, among these complications, central catheter-related bloodstream infections (CR-BSIs) are among the major causes of healthcare-associated infections in pediatric patients, and they are also an important problem that threatens patient safety.<sup>4,8</sup> The morbidity and mortality rates of CR-BSI are quite high. In studies conducted with pediatric patients, the CR-BSI was reported to be between 0.5 and 4.53 per 1000 catheter days.<sup>5,6,9,10</sup> In a study performed by Tsuchida et al.,<sup>11</sup> it was determined that it decreased from 4.0 to 1.1 per 1000 catheter days with the measures taken by nurses for the problems associated with catheter care. In studies conducted at the national and international level, it was determined that CR-BSI increased the mortality rate in pediatric patients by 1-1.5% and prolonged the length of hospitalization.<sup>4,6,10,12,13</sup>

It is important for pediatric nurses to have sufficient knowledge in the prevention of CR-BSIs. However, in studies conducted on the subject, it was concluded that the knowledge level of nurses on adult CVC care was insufficient and they should be trained on this subject.<sup>14,15</sup> In addition, when the literature was reviewed, it was determined that there were few studies evaluating the knowledge levels of nurses about CVC care, and that these studies were conducted with nurses working in the adult intensive care unit.<sup>2,16,17</sup> No study was found in Turkey that evaluated the knowledge level of pediatric nurses about CVC care. The aim of this study was to determine the knowledge level of pediatric nurses about CVC care. It is important to determine the knowledge level of nurses about CVC care and also to reveal which variables affect the level of CVC knowledge positively or negatively in terms of determining the steps to be taken in order to improve the knowledge level of nurses.

## Research Questions

- 1) How do pediatric nurses perform CVC care?
- 2) Have pediatric nurses been given information about CVC?
- 3) Do the socio-demographic characteristics of pediatric nurses affect their CVC care knowledge scores?
- 4) Do the work life characteristics of pediatric nurses affect their CVC care knowledge scores?

## Materials and Methods

The population of this descriptive-comparative study consisted of a total of 118 nurses working in the pediatric clinics of a university hospital (n=68) and a state hospital (n=50) in a city center between May and June 2019. Sample selection was not made in the study, and 88 nurses who agreed to participate in the study and who were suitable for the sampling and application criteria of the study at the time of data collection (May-June 2019) were studied. The rate of participation in the research was 75.0%. Thirty nurses who refused to participate in the study, who were on leave between the specified dates and who could not be reached were excluded from the study.

The "personal information form" to determine the socio-demographic and work life-related characteristics of nurses and the "knowledge level form for nurses on CVC care" to determine the knowledge level of nurses about CVC care were used while collecting data in the study. Before starting the application, the nurses were informed about the purpose of the study by the researcher and informed verbal and written consent was obtained, stating that their participation was on a voluntary basis. After informing the volunteer nurses about the study by the researchers, an introductory information form and a nurses' knowledge level form on CVC care were given and the participants were asked to fill in the questionnaires themselves when appropriate. The application time of the data collection forms required an average of 10 minutes. Questionnaires filled in by the nurses were collected by the researchers by visiting pediatric clinics over a two-month period.

### Personal Information Form

The form created by the researcher aims to determine the characteristics of nurses such as age, gender, marital status, educational status, institution and clinic, working time in this clinic, obtaining information about CVC and its way, giving CVC care in the institution where they work and how they practice.

### Knowledge Level Form for Nurses on CVC Care

In order to determine the knowledge level of nurses on CVC care, the researcher created this form by using the

2019 National Vascular Access Management Guideline as a source.<sup>18</sup> In order to determine the principles of safe insertion, management and removal of venous catheters (peripheral and central) in health institutions and organizations in our country, the "National Vascular Access Management Guideline 2019" was cooperatively created by the Turkish Internal Medicine Specialization Association, Turkish Society of Hospital Infections and Control, Turkish Society of Intensive Care, Turkish Anesthesiology and Reanimation Society, Oncology Nursing Society, Turkish Society of Intensive Care Nurses, Turkish Nurses Association and Association of Neonatal Nursing Association in the light of current literature.

The guideline consists of three parts. The third part of the guideline is about CVCs and includes recommendations on central venous catheter indications, selection, placement and insertion, dressing and clothing change, intravenous flushing/locking, management of various complications, especially central venous catheter-related bloodstream infections. The guideline includes recommendations for pediatric patients.

The Knowledge Level Form for Nurses on CVC Care consists of 13 items. Each item in the form can be answered as "correct", "wrong" and "no idea". The scores from the items are obtained by coding the answers as 1 (for correct answers) and 0 (for answers stated as wrong and no idea). The scores to be taken from the form range from 0 to 13. The increase in the scores obtained from the information form indicates that the knowledge levels of the nurses increase. For the evaluation of the form, it was sent to 15 specialists in the fields of pediatric nursing, pediatrics, pediatric intensive care and hospital infections, and feedback was received from 10 specialists. The form was finalized in line with the suggestions received from the specialists. The preliminary application of the study was carried out in April 2019 with 10 nurses working in the general intensive care and general surgery clinics of the state hospital in the city center, where the research was conducted. As a result of the preliminary application, the opinions of the participants were taken and no changes were made on the questionnaire since it was determined that the questions were understandable and explanatory.

Ethical approval (dated 30.04.2019 and numbered 564) was obtained from the Bülent Ecevit University Human Research Ethics Committee in the province where the research was conducted. In addition, legal permission was obtained from the hospital administrations for the study. The nurses were informed about the purpose of the study and the participants were included in the study after their consent was obtained in line with the principle of willingness and voluntariness. The nurses were informed that they should not write their names on the questionnaire and that the data obtained would be used for scientific purposes.

## Statistical Analysis

SPSS (IBM, version 22.0, Chicago, IL) statistical software was used in the research. Descriptive statistics such as frequency, percentage, arithmetic mean and standard deviation were used in the study. The Kolmogorov-Smirnov (K-S) test (n=88), skewness and kurtosis coefficients and Z-scores were examined to determine whether the scores obtained from the study exhibited a normal distribution. In the study, it was seen that the kurtosis value was above +1, the K-S test scores were below 0.05, and the Z-scores were above +1.96. In addition, due to the low number of individuals in the categories (n<30) in the groups whose scores would be compared in line with the research questions, the Mann-Whitney U test for Independent Samples was used to compare the difference between the averages of two independent groups from non-parametric statistics in the study. The Kruskal-Wallis H test was used to compare the averages of more than two groups. The Mann-Whitney U test with Benferroni correction was used to determine which group the differences originated from. The results were evaluated within the 95% confidence interval, and the p<0.05 level was considered significant.

## Results

It was seen that 54.5% of the nurses participating in the research were between the ages of 26-33 years, 94.3% were women, 60.0% were married, and 63.6% had undergraduate degree. It was detected that 55.7% of the nurses participating in the research were working in the pediatric units of a university hospital, 34.1% in the neonatal intensive care unit, 40.9% of them had been working for more than 5 years. 48.9% of the nurses got information on CVC, 55.8% gained this knowledge through in-service training, 58.0% did not give care for patients with CVC, and 59.5% of the caregivers stated that they provided care in accordance with the CVC-related protocol of the working place.

The scores obtained from the form to determine the knowledge level of nurses about CVC care range from 0 to 13. When the scores of the nurses obtained from the questionnaire were examined, it was found that the minimum score was 0, the maximum score was 12, and the mean score was 8.35±2.36 (Table 1).

It was revealed that the mean knowledge scores of nurses on CVC care differed according to their educational status (p<0.05) (Table 2). According to the results of the Mann-Whitney U test conducted to determine the difference between the groups,

**Table 1. Mean knowledge scores on CVC care**

	Min.	Max.	Arithmetic avg.	SD
<b>CVC knowledge level</b>	0	12	8.35	2.36

CVC: Central venous catheter, SD: Standard deviation

it was found that the mean CVC knowledge score for CVC care was significantly higher for nurses who had associate, undergraduate and graduate degrees compared to those who graduated from health vocational high school ( $p < 0.05$ ) (Table 2). It was observed that the mean knowledge scores of nurses on CVC care differed according to their status of getting information about CVC ( $p < 0.05$ ) (Table 3). Accordingly, it was seen that the mean knowledge score for CVC care was significantly higher in nurses

who received information about CVC than those who did not. In our study, no significant difference was found between the nurses' CVC scores, age, gender, marital status, institution, department, duration of working, and having provided CVC care ( $p > 0.05$ ) (Tables 2, 3).

In Table 4, when the percentages of the responses "correct", "wrong", and "no idea" about the knowledge level of nurses

about CVC were examined, it was found that the items most correctly known by the nurses were 1<sup>st</sup> item (93.2%), which aimed at ensuring hand hygiene, and 5<sup>th</sup> item (93.2%) and 6<sup>th</sup> item (93.2%) about changing the cover and dressing of the catheter insertion site. On the other hand, it was observed that the items that were known at the lowest rate were 10<sup>th</sup> item (12.5%) about solutions used in catheter flushing in newborns, 11<sup>th</sup> item (30.7%) about the supply of blood and blood components from CVC and 13<sup>th</sup> item (31.8%) about topical creams used during catheter insertion or maintenance in the umbilical region.

## Discussion

The CVC method, which has been used successfully in adult patients for a long time, is increasingly being used in pediatric patients as well. The most serious complication of CVCs is

**Table 2. Comparison of mean knowledge scores on CVC care according to some socio-demographic characteristics of nurses**

Characteristics	Variables (n)	Mean + SD	Median (Min-max)	Test stat.	p
<b>Age groups</b>	18-25 years (21)	8.33+2.59	9 (0-12)	$\chi^2=1.703$	0.63 <sup>1</sup>
	26-33 years (48)	8.37+2.40	9 (1-12)		
	34-41 years (12)	8.66+2.42	9 (4-12)		
	42 years and over (7)	7.7+1.38	7 (6-10)		
<b>Gender</b>	Female (83)	8.42+2.23	9 (1-12)	U=189	736 <sup>2</sup>
	Male (5)	7.20+4.20	9 (0-10)		
<b>Educational status</b> (Difference=2,3,4>1)	Health vocational high school (11)	6.45+2.73	6 (1-10)	$\chi^2=9.773$	<b>0.02<sup>1</sup></b>
	Associate degree (13)	8.76+1.64	9 (6-11)		
	Undergraduate (56)	8.41+2.34	9 (0-12)		
	Graduate (8)	9.87+1.55	10 (7-12)		

<sup>1</sup> $\chi^2$ : Kruskal-Wallis H test, <sup>2</sup>U: Mann-Whitney U test, CVC: Central venous catheter, SD: Standard deviation

**Table 3. Comparison of mean knowledge scores on CVC care according to some worklife characteristics of nurses**

Characteristics	Variables (n)	Mean + SD	Median (Min-max)	Test. stat.	p
<b>Institution</b>	State hospital (39)	8.35+2.33	9 (4-12)	U=932	0.842 <sup>2</sup>
	University hospital (49)	8.34+2.36	9 (0-12)		
<b>Clinic</b>	Pediatric emergency (19)	7.94+2.83	9 (1-12)	$\chi^2=4.001$	0.40 <sup>1</sup>
	Pediatric intensive care (12)	7.66+3.28	9 (0-12)		
	Neonatal intensive care (30)	8.83+2.18	9 (4-12)		
	Pediatrics clinic (18)	7.93+1.56	7.5 (5-10)		
	Pediatric oncology (9)	9.11+1.69	9 (5-11)		
<b>Duration of working</b>	Below 1 year (25)	8.72+2.52	9 (0-12)	$\chi^2=3.516$	0.17 <sup>1</sup>
	1-5 years (27)	8.62+2.27	9 (4-12)		
	5 years and over (36)	7.88+2.30	8 (1-12)		
<b>Getting information on CVC</b>	Yes (43)	8.97+2.28	9 (0-12)	<b>U=654.0</b>	<b>0.00<sup>2</sup></b>
	No (45)	7.75+2.30	8 (1-11)		
<b>Giving care</b>	Yes (37)	8.89+1.95	9 (5-12)	U=769.50	0.13 <sup>2</sup>
	No (51)	7.96+2.56	9 (0-12)		

<sup>1</sup> $\chi^2$ : Kruskal-Wallis H test, <sup>2</sup>U: Mann-Whitney U test, CVC: Central venous catheter, SD: Standard deviation

**Table 4. Comparison of the percentages of nurses' responses to the items in the knowledge level form about CVC care**

	Correct		Wrong		No opinion	
	f	%	f	%	f	%
1. "Hand hygiene" must be ensured before and after CVC care. Effective hand hygiene can be achieved by rubbing hands with alcohol-based hand antiseptic until they are dry or by washing with soap and water.	82	93.2*	2	2.3	4	4.5
2. The skin should be cleaned with an antiseptic solution while placing CVC.	79	89.8*	2	2.3	7	8
3. There is insufficient evidence regarding the use of 2% chlorhexidine when providing CVC care in premature infants and children under 2 months of age. Its use is controversial because of the risk of skin irritation and chemical burns.	51	58*	2	2.3	3.5	39.8
4. One of the most important goals of CVC follow-up and nursing care is to prevent catheter-related bloodstream infections.	72	81.8*	6	6.8	10	11.4
5. Changing the dressing and cover of the catheter insertion site should be done at regular intervals (every 2 days if sterile gauze has been used; every 5-7 days if a polyurethane dressing has been used) using aseptic technique, and the date of catheter care and dressing change should be recorded.	82	93.2*	-	-	6	6.8
6. If the cover is damaged, loosened, wet, visibly soiled, or if moisture, drainage fluid/blood is found under the cover, cover is changed immediately.	82	93.2*	1	1.1	5	5.7
7. If there is no sign of infection at the catheter insertion site, there is no need for catheter care.	2	2.3	77	87.5*	9	10.2
8. Two types of covers can be used for catheter care. The first is sterile, transparent, semi-permeable and adhesive polyurethane covers or sterile gauze and covers.	52	59.1*	2	2.3	34	38.6
9. If blood samples are to be collected from central venous catheters, all samples should be taken at once.	37	42*	11	12.5	40	45.5
10. When washing the catheter in newborns, solutions containing preservatives should be used in all washings in order to prevent toxicity.	34	38.6	11	12.5*	43	48.9
11. Infusion sets given blood, blood products, or lipid emulsions from a central venous catheter should be changed within 48 hours.	38	43.2	27	30.7*	23	26.1
12. The use of iodize tincture should be avoided because of its potential harmful effects on the thyroid gland in newborns.	52	59.1*	1	1.1	35	39.8
13. Topical antibiotic creams should be used during catheter insertion or maintenance in the umbilical region.	27	30.7	28	31.8*	33	37.5

Correct answers are marked with \*. CVC: Central venous catheter

CR-BSI, which is defined among the "most preventable" infections among nosocomial infections. For this reason, pediatric nurses should be aware of the fact that CR-BSI is preventable, have up-to-date information on the prevention and control of infections that are valid all over the world, and provide the most effective care to patients by reinforcing this knowledge with practice. At this point, it is important that pediatric nurses have sufficient knowledge in the prevention of CR-BSI. The mean CVC knowledge score of the nurses was 41.97±15.31 out of 100 points in the study of Aydoğdu and Akgün<sup>15</sup> performed in 2018 and 6.81±2.1 out of 14 points in the study of Batı and Özyürek.<sup>14</sup> In the study conducted by Mankan and Karakaşıkçı<sup>19</sup> on "Determining the Precautions to be Taken Against Hospital Infections", the knowledge score of nurses about CVC was determined as 63.46 out of 100 points. In the limited number of national and international studies, it was determined that the knowledge level of nurses about CVC care was insufficient.<sup>2,16,20</sup> In the present study, similar to the literature, the knowledge level of pediatric nurses was found to be at an insufficient level (8.35±2.36).

The reason for this can be shown as the fact that nearly half of the nurses do not receive course/in-service training on the subject. However, it is emphasized in the literature that it is an important strategy for nurses to receive training on evidence-based current practices for the prevention of CVC-related infections.

In this study, it was found that the CVC knowledge scores of the nurses differed according to their status of getting information on CVC, and the CVC knowledge levels of the nurses who received information about CVC were significantly higher than those of the nurses who did not. This finding is important in terms of that it supports the positive relationship between the knowledge level and education about CVC care in pediatric nurses. In parallel with the findings of the study, it was determined that the CVC knowledge scores of the nurses who received training on CVC care were higher in studies conducted to determine the knowledge level of nurses about CVC care and the factors affecting it.<sup>14,15</sup> In a study conducted by Öztürk et al.<sup>21</sup> with 164 healthcare professionals, the difference between pre- and post-training knowledge levels

(success rate increased from 72.0% to 83%) was found to be statistically significant ( $p=0.00$ ). In the study of Coopersmith et al.<sup>22</sup> performed to examine the effect of the education program on the reduction of catheter-related infections in the surgical intensive care unit, it was determined that the infection rate decreased from 11.8 to 3.7 in 1000 catheter days and decreased by 66% compared to the pre-training period. As a result, it is seen that the knowledge gained by nurses through congresses, seminars, courses and literature, especially in-service training, is important. In this sense, the findings of our study were found to be compatible with the literature. Considering the results of the study, it is thought that it would be effective to provide pediatric nurses with training on catheter care and evidence-based practices to prevent CR-BSI during orientation training and to repeat in-service trainings or clinical trainings at regular intervals. It is also recommended to closely follow the current guidelines on the subject and update the protocols applied in the clinics.

It is seen that the knowledge levels of nurses about CVC care differ according to their educational status ( $p<0.05$ ). It was found that the CVC knowledge scores of the nurses who had associate, undergraduate and graduate education degrees were significantly higher than those of the nurses who graduated from health vocational high school. Accordingly, it can be said that the educational status of nurses is an effective factor on their CVC knowledge levels. In the study conducted by Köse et al.,<sup>23</sup> a significant difference was observed between the education level of nurses and their level of knowledge. In a study conducted by Diker<sup>24</sup>, it was determined that as the education level of nurses increased, their knowledge scores on preventing hospital infections also increased. The data of the study were found to be compatible with the existing literature. The fact that nurses with undergraduate and graduate degrees attended more courses, congresses, seminars and followed up-to-date information more closely may have been effective.

In our study, it was concluded that the CVC knowledge levels of the nurses did not differ according to the clinic they worked in, but the average score of the nurses working in the pediatric oncology clinic was higher than the nurses working in other units, and the lowest average score was in the nurses working in the pediatric health and diseases clinic. In the study conducted by Batı and Özyürek,<sup>14</sup> which gave similar results with our study, it was reported that there was no statistically significant difference in the knowledge score averages of the nurses according to the quality of the ICU they worked in. Again, in the study conducted by Diker,<sup>24</sup> no significant difference was found in the knowledge scores of nurses to prevent nosocomial infections according to the clinics they worked in. Contrary to these studies, Aydoğdu and Akgün<sup>15</sup> found in their study that there was a statistically

significant difference in the knowledge levels of nurses about CVC according to the units they worked in. It is thought that this difference between the studies is due to the fact that Aydoğdu and Akgün<sup>15</sup> included nurses working in the service in the study but in the other studies, they only included nurses working in intensive care units.

The item "Hand hygiene must be ensured before and after CVC care. Effective hand hygiene can be achieved by rubbing hands with alcohol-based hand antiseptic until they are dry or by washing with soap and water" was one of the most correctly answered questions by pediatric nurses with a correct response rate of 93.2%. The easiest and most effective method for infection is to provide hand hygiene. Nurses have a very effective role in preventing possible infection that may develop in patients.<sup>25</sup> In the study of Aydoğdu and Akgün,<sup>15</sup> nurses were asked, "Which hand washing method do you use in patients with CVC?" and 77.2% of them answered the question correctly. In studies conducted to determine handwashing habits among healthcare workers, nurses' handwashing compliance score was reported to be 86% by Toraman et al.,<sup>26</sup> 81.44% by Mankan and Karakaşıkçı,<sup>19</sup> and 91.6% by Garcell et al.<sup>27</sup> In the literature, it is seen that the handwashing compliance of nurses is higher than other healthcare workers, but it is not at the desired level.<sup>28</sup> When the data of our study are examined, it is seen that it is compatible with the data of the literature. In the studies, it is stated that the most important reason affecting hand washing is the inadequate number of nurses per patient.<sup>29,30</sup> In the study, it is predicted that nurses' handwashing compliance rates not at the desired level may be due to the high number of patients per nurse in the institution, in line with the literature.

The items about the frequency of changing dressing in the catheter insertion site, recording of the change date, and immediate change of cover in case of being dirty or getting wet were the items that were answered most correctly in our study, with the same correct response rate as hand hygiene (93.2%). It is the nurse's responsibility to cover the catheter insertion site with sterile gauze, to change the dressing every 48 hours as long as it does not deteriorate, and to record it.<sup>31,32</sup> This is a pleasing finding. Different from our research findings, it was determined that most of the nurses did not know the frequency of changing dressings (gas/transparent) in CVC entrance and the recommended dressings.<sup>14,15,33,34</sup>

In the study, only 27 nurses knew that the item "Infusion sets given blood and blood components from CVC should be changed within 48 hours" was incorrect. In the study conducted by Batı and Özyürek,<sup>14</sup> 77.9% of the nurses answered correctly. On the other hand, In the study of Aydoğdu and Akgün<sup>15</sup> and in the study of Mankan and Karakaşıkçı,<sup>19</sup> 46.0% and 54.5%, respectively, of the nurses gave the wrong

answer to the item about the changing times of the infusion sets.<sup>14,15,19</sup> The study finding is not compatible with the stated study findings because it is higher than them. The reason for this is thought to be due to the questioning of the change date of the infusion sets through which total parenteral nutrition (TPN) solution, which is used more frequently and is thought to be known, is sent in some literature studies. At the same time, one of the factors that we think to have affected the data of the study is the quite higher number of the universe compared to ours. Consistent with the data of our study, Aytaç et al.<sup>35</sup> conducted a study to determine knowledge levels of nurses working in the intensive care units about the prevention of hospital infections and they applied a questionnaire on 210 nurses, only 27.1% of whom gave the correct answer to the question "How often should you change the serum sets?".

### Study Limitations

This study has some limitations as well as contributing to the literature on determining the knowledge level of nurses working in pediatric clinics about central venous catheter care. One of these limitations is that the study was conducted in a state and a university hospital located in the province where it was conducted, and its findings were restricted to this sample only. Another limitation is that the entire targeted population could not be involved because some nurses could not be reached for various reasons. Therefore, this situation may have limited the generalizability of the research findings.

### Conclusion

Nurses are directly responsible for the monitoring and care of CVCs. CR-BSI is a preventable complication that is frequently encountered especially in intensive care units and can be fatal. The incidence of many complications related to CVCs can be reduced with qualified nursing care. In the study, it was determined that the knowledge level of nurses on CVC was insufficient, and that educational status and having received training on CVC were important variables that increased the knowledge levels of nurses. Based on these results obtained, it is recommended that in-service training be increased in line with the protocol/procedure/instructions regarding CVC care, or that nurses should be encouraged to attend congresses/seminars/courses on this subject and to follow recent studies.

### Acknowledgement

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### Information

The study is derived from our thesis titled "Determination of the Knowledge Levels of Pediatric Nurses About Central Venous Catheter Care", for which I was thesis supervisor.

### Ethics

**Ethics Committee Approval:** Ethical approval (dated 30.04.2019 and numbered 564) was obtained from the Bülent Ecevit University Human Research Ethics Committee in the province where the research was conducted.

**Informed Consent:** Informed consent was obtained.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Concept: H.T., T.K.A., Design: H.T., T.K.A., Data Collection or Processing: H.T., Analysis or Interpretation: H.T., T.K.A., M.S., Literature Search: H.T., T.K.A., M.S., Writing: H.T., T.K.A., M.S.

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# Esmolol Treatment in a Child with Severe Hypotension due to Salbutamol Intoxication: A Case Report

## Salbutamol İntoksikasyonuna Bağlı Ciddi Hipotansiyonlu Bir Çocukta Esmolol Tedavisi: Bir Olgu Sunumu

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### Abstract

The short-acting  $\beta_2$  sympathomimetic amine salbutamol is very frequently used in the treatment of bronchospasm in patients with asthma and bronchiolitis. Tremor, hyperactivity, tachycardia, convulsion, hypomagnesemia, lactic acidosis, hyperglycemia, hypokalemia, hypotension, congestive heart failure, arrhythmia, and sudden cardiac arrest may occur in high-dose salbutamol use. Salbutamol use for suicidal purposes is very rare. In this article, an overview of salbutamol intoxication from a child who used 300 mg of salbutamol for suicide purposes and the approach to salbutamol poisoning in the accompanied by literature information were discussed.

**Keywords:** Salbutamol, child, intoxication, esmolol, hypotension

### Öz

Kısa etkili  $\beta_2$  sempatomimetik amin salbutamol, astım ve bronşiyolitli hastalarda bronkospazm tedavisinde sık kullanılmaktadır. Yüksek doz salbutamol kullanımında tremor, hiperaktivite, taşikardi, konvülsiyon, hipomagnezemi, laktik asidoz, hiperglisemi, hipokalemi, hipotansiyon, konjestif kalp yetersizliği, aritmi ve ani kardiyak arrest görülebilir. Salbutamolün özkıyım amaçlı kullanımı çok nadirdir. Bu yazıda özkıyım amaçlı 300 mg salbutamol kullanan bir çocukta salbutamol zehirlenmesine genel bir bakış ve salbutamol zehirlenmesine yaklaşım literatür bilgileri eşliğinde tartışıldı.

**Anahtar Kelimeler:** Salbutamol, çocuk, zehirlenme, esmolol, hipotansiyon

### Introduction

The short-acting  $\beta_2$  sympathomimetic amine salbutamol activates the adenyl cyclase enzyme via beta-adrenergic receptors and facilitates the conversion of adenosine triphosphate (ATP) to cyclic accelerating medicines partnership (AMP). The increased cyclic AMP levels relax the bronchial smooth muscles. It also reduces the release of early hypersensitivity mediators from mast cells. These effects are widely used in the treatment of bronchospasm in patients with asthma and bronchiolitis.<sup>1,2</sup> It exhibits a bronchodilator effect at therapeutic doses by stimulating the bronchial smooth muscles with its  $\beta_2$  adrenergic effects. Besides this effect, it increases the potassium flow into the cell by stimulating Na-K ATPase pump. Due to this effect, salbutamol inhalation is used as an option in the management of acute hyperkalemia.<sup>3</sup>

The symptoms of salbutamol toxicity are tremor, hyperactivity, tachycardia, convulsion, hypomagnesemia, lactic acidosis, hyperglycemia, hypokalemia, hypotension, congestive heart failure, arrhythmia and sudden cardiac arrest.<sup>2,4-6</sup> In this article we report a case who had ingested 75 tablets of 4 mg salbutamol in an attempt to commit suicide and, review the treatment strategy of salbutamol intoxication.

### Case Report

A 16-year-old female patient was found unconscious in her bed approximately 1 hour after ingesting 75 tablets of 4 mg salbutamol (300 mg) in an attempt to commit suicide and was referred to the emergency department. On admission, her temperature 37 °C (axillary), pulse rate 165 beats/min, and

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blood pressure was 100/45 mmHg. On physical examination, she was conscious, cooperative, agitated and had a significant tremor in the extremities. Gastric lavage was performed, and 1 g/kg active charcoal was administered. The patient was admitted to the pediatric intensive care unit (PICU) for monitoring. Her respiratory, neurologic, and abdominal examinations were initially normal. The electrocardiographic (ECG) examination revealed sinus tachycardia of 160 beats per minute (bpm) and QTc prolongation (QTc: 0.48 ms). Echocardiogram showed normal ventricular function. The arterial blood gas results were: pH: 7.30, Pa<sub>CO2</sub>: 37, HCO<sub>3</sub><sup>-</sup>: 18, K<sup>+</sup>: 2.3 mEq/L, lactate: 6.7, the base excess: -7 mmol/L. The laboratory tests revealed a serum glucose level of 287 mg/dL, a potassium level of 2.3 mEq/L and a magnesium level of 1.4 mg/dL. The complete blood count, the other biochemical parameters, the pro-BNP, CK-MB, and the troponin values were normal. She had one more hypotensive episode during PICU admission, blood pressure dropped to 75/30 mmHg and mean arterial pressure 45 mmHg (blood pressure <1 p, <-2,33 SDS) and heart rate 145-150/minute. The ECG examination revealed sinus tachycardia. She was treated with a 30 mL/kg fluid bolus and intravenous (IV) potassium chloride 1 mL/kg infusion for hypopotassemia. There was no change in the patient's tachycardia or hypotension. Since the excessive beta-adrenergic stimulation continued in the patient with life-threatening cardiovascular system symptoms, the beta-blocker esmolol was given as a bolus dose of 25 mcg/kg over 1 minute. It was observed that the patient's tachycardia improved and the blood pressure increased. Therefore, IV esmolol of 100 mcg/kg/min infusion was continued. Hyperglycemia and hypopotassemia resolved. Magnesium was 40 mg/kg replaced for hypomagnesemia. The patient's esmolol infusion was gradually decreased and ceased in the course of 12 hours. The patient had no symptoms afterward and was discharged on day 2 of admission.

## Discussion

Salbutamol is a beta-adrenomimetic drug that acts on  $\beta_2$  receptors in the bronchial smooth muscles and is widely used in the treatment of asthma and bronchiolitis.<sup>2</sup> The daily dose is 0.3-0.8 mg/kg/day in children and the half-life is 4-6 hours.<sup>5,7,8</sup> Treatment of salbutamol intoxication is symptomatic and supportive treatment. Gastric lavage and active charcoal administration may be beneficial in those presenting within 4-6 hours of intoxication.<sup>2,5</sup> Cardiac monitoring, serial ECG examination (especially QTc) and serum electrolyte monitoring are essential for recognized side effects.<sup>7</sup>

Even when used in therapeutic levels, cardiac side effects such as tachycardia may occur due to stimulation of cardiac muscle  $\beta_2$  receptors.<sup>2,5,6</sup> When ingested at high doses, tremor,

hyperactivity, convulsion, fever and, metabolic effects such as hyperglycemia, hypomagnesemia and lactic acidosis may develop. Peripheral vasodilation and hypotension with a widened pulse pressure, tachycardia, arrhythmias, heart failure and sudden cardiac arrest have reported after overdose.<sup>4,7</sup> The use of beta-blocker (propranolol 0.01-0.02 mg/kg IV, esmolol 25-100 mcg/kg/min IV) is recommended for severe hypotension, tachycardia and ventricular arrhythmias due to excessive beta-adrenergic stimulation.<sup>5</sup> In our case, IV esmolol treatment was initiated as beta-receptor for fluid-unresponsive hypotension, tachycardia and persisted lactic acidosis. The beta-blocker infusion was ceased gradually over 12 hours. The patient's tachycardia resolved, and blood pressure increased.

In the literature, a three-year-old who had accidentally ingested 53 mg of salbutamol suspension, a four-year-old who had accidentally ingested 60 mg of salbutamol suspension, and a 15-year-old who had ingested 200 mg of salbutamol tablets in an attempt to commit suicide have been reported previously.<sup>9-11</sup> No specific treatment was required for those patients since their symptoms were milder. A 9-year-old patient who had accidentally ingested 2.5 mg/kg oral suspension was administered 0.25 mg/kg oral propranolol twice for persisted tachycardia.<sup>12</sup>

In a recent study that evaluated 95 children with ingestion of high doses of salbutamol, agitation, tachycardia, and tremor were the most common symptoms. The oral salbutamol doses these patients had ingested varied between 2 to 96 mg, and the dose/weight ratios had been measured as 0.3 and 6.3 mg/kg. The patients in this series were followed up at the emergency department and did not require any treatment other than gastrointestinal decontamination.<sup>13</sup>

Uysal et al.<sup>14</sup> has reported an adult case in which IV beta-blocker was used for salbutamol intoxication. In this report, the 24-year-old patient received an infusion of metoprolol for the cardiac side effect supraventricular tachycardia that developed after ingesting 76 mg of salbutamol tablets in an attempt to commit suicide.<sup>14</sup> To our knowledge, our case is the first pediatric case who receive IV beta blocker therapy.

In conclusion, acute salbutamol intoxication may cause severe side effects, especially related to the cardiovascular system. In patients unresponsive to supportive and symptomatic treatment with life-threatening symptoms, IV beta-blocker using should be considered. Under close hemodynamic monitoring, IV beta-blocker is a safe treatment option in children with the life-threatening complications of salbutamol toxicity.

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### Ethics

**Informed Consent:** Written informed consent was obtained from the parents for the publication of their personal and clinical details with any identifying images in this study.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Concept: G.K., B.K., Design: E.E.T., Data Collection or Processing: İ.E., P.Y.Ö., Analysis or Interpretation: B.K., Literature Search: E.E.T., B.K., Writing: P.Y.Ö.

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# Neonatal Septic Arthritis - A Case Report

## Neonatal Septik Artrit - Bir Olgu Sunumu

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### Abstract

Neonatal septic arthritis is a rare condition, and yet it is an orthopaedic emergency due to the potential of devastating consequences. Signs and symptoms, laboratory test, and imaging studies might not always be typical. A prompt diagnosis and treatment should be made. We presented a 24-day-old premature neonatal patient was brought to the hospital with complaint of redness and swelling of his left shoulder.

**Keywords:** Septic arthritis, neonatal, shoulder

### Öz

Neonatal septik artrit nadir görülen bir durumdur, ancak yıkıcı sonuçları olma potansiyeli nedeniyle ortopedik bir acildir. Belirti ve semptomlar, laboratuvar testleri ve görüntüleme çalışmaları her zaman tipik olmayabilir. Derhal teşhis ve tedavi yapılmalıdır. Bu çalışmada sol omzunda kızarıklık ve şişlik şikayeti ile hastaneye getirilen 24 günlük prematüre yenidoğan hasta sunulmaktadır.

**Anahtar Kelimeler:** Septik artrit, neonatal, omuz

### Introduction

Septic arthritis is a condition in which bacterial infection invades the synovial joint. Septic arthritis in neonate is a rare condition, however, is an orthopaedic emergency.<sup>1,2</sup> It is more prevalent in the knee or hip and less in the shoulder.<sup>3</sup> Failure of early diagnosis and management in septic arthritis could lead to osteomyelitis and septic shock.<sup>4</sup> Unfortunately, initial clinical symptoms and signs may not be specific. Prompt diagnosis and treatment are important in enhancing patient outcomes.<sup>1</sup>

### Case Report

A 24-day-old, 1.700 grams, male neonate was admitted. His parents complained of redness and swelling of his left shoulder for two days prior to admission. The complaint was accompanied by fever and he was given paracetamol by his parents. There was no history of trauma. He was born via caesarean section at 31<sup>st</sup>-32<sup>nd</sup> week of pregnancy due to severe pre-eclampsia suffered by his mother. History of unspontaneous breathing after birth was reported. Weight

of birth was 1.455 grams. He was admitted in the neonatal intensive care unit (NICU) at other hospital for unknown reasons for 13 days, by which the patient's parents then declined proposed treatment and the patient was self-discharged. He has an older twin brother who presented healthy.

On physical examination, the patient appeared weak, pulse 147 beats/minute, febrile with a temperature of 38.1 °C. There was swelling, redness, heat on the left shoulder. No deformity or wound was seen. Limitation of motion was also shown. On palpation and on the attempt to make a passive movement of his left shoulder, the patient cried.

Laboratory examination results were obtained as followed: White blood cells (WBC) 25,810/mm<sup>3</sup> (reference: 5.0-18.0/mm<sup>3</sup>), erythrocyte sedimentation rate (ESR) 19.00 mm/hour (reference: 0.0-15.0 mm/h), high sensitivity C-reactive-protein (hs-CRP) 197.46 mg/L (reference: 0.1-4.1 mg/L), procalcitonin 0.41 ng/mL (reference: 0.0-0.05 ng/mL). Left shoulder X-ray showed soft tissue swelling and no sign of fracture or dislocation. Ultrasonography of left shoulder detected the presence of joint effusion.

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The patient was referred to the consultant orthopedic surgeon, who decided to proceed with conservative treatment. While waiting for the blood culture, the patient was treated with parenteral ampicillin-sulbactam combination at a dose of 100 mg every 8 hours, and parenteral cefotaxime at a dose of 60 mg every 12 hours. Care was given under close observation.

On the fourth day, the blood culture result was done, identifying a methicillin-sensitive *Staphylococcus aureus*. The isolate was sensitive to meropenem, clindamycin, amoxicillin-clavulanic acid, and was resistant to benzylpenicillin. The antibiotics were then switched to parenteral meropenem with a dose of 24 mg every 8 hours. After seven days of meropenem, blood work was taken for evaluation, and showed improvement: WBC  $12.31 \times 10^3/\mu\text{L}$ ; ESR 13.00 mm/hour; hs-CRP 11.98 mg/L.

Clinical signs and symptoms were remarkably improved after 21 days of treatment. The child was able to move his shoulder. Blood work was obtained, showing WBC  $7.43 \times 10^3/\mu\text{L}$ ; ESR 25.00 mm/hour; hs-CRP 3.16 mg/L; and negative culture. The ultrasound showed normal findings. Antibiotics were switched to oral clindamycin at a dose of 10 mg/kg every 8 hours, and the patient was discharged. At the end of the treatment, the patient showed complete recovery and was able to make active and passive shoulder movement.

## Discussion

In children, acute septic arthritis is often a hematogenous spread infection. Slow blood flow in children's metaphyseal capillaries facilitates the condition, making bones more vulnerable to infection of hematogenous seeding from any trauma or infection.<sup>5</sup> In this case, the child might have a high risk of infection, regarding his vague history of NICU hospitalization for 13 days.

The annual incidence of septic arthritis in developed countries is around 4-5 cases in every 100,000 children. Septic arthritis is more frequent in boys than girls with a ratio of 2:1. The most frequent location are large joints such as hip, knee, and ankle joints,<sup>5</sup> while shoulder constituted only 3-5% of all septic joint incidence.<sup>3</sup> The most common cause of septic arthritis are *Staphylococcus aureus*, group B *streptococcus* and Gram-positive enterococcus, respectively.<sup>2</sup> Though joint aspiration was not done in this case, the blood culture showed a *Staphylococcus aureus*-positive result.

Clinical manifestations in children with septic arthritis may not be specific. The clinical signs of generalized infection are commonly found. Meanwhile, the most consistent sign indicating septic arthritis is pseudo-paralysis, in which the patient tries to maintain the absence of active movement of the infected joint. The posture is generally kept to hold the joint in the position that maximizes intracapsular volume. This

sign is also accompanied by painful sensation on attempted passive motion. There are other suggestive symptoms like fever, malaise, and prominent localizing signs such as erythema, local heat, and significant pain at the affected joint. However, these clinical features are less noticeable if deep joints, like hip, are involved.<sup>6</sup>

Physical examination can be difficult because neonate may present with untypical findings. The child may show irritability, anorexia, lethargy, and unwillingness to move the affected limb. Clinically, limitation of movement and local swelling are shown to be the most important findings in neonatal SA.<sup>2</sup> Our patient had a limited movement of the affected shoulder, giving the impression of pseudo-paralysis. Positive passive movement was also found in this case.

Septicemia does not always result in fever or a toxic appearance, thus patients are often afebrile. Serologic tests consist of WBC count with differential, CRP, ESR, and blood cultures should be taken.<sup>7</sup> Those tests are useful in the evaluation of acute joint, nevertheless are not diagnostic.<sup>3</sup> Synovial culture is the only investigation with predictive laboratory value. However, synovial fluid culture can be found negative in 30-70% SA patients.<sup>5</sup> This is the basis of why our orthopedic surgeon decided not to do a joint aspiration. Besides, synovial white cell count is suggested not to be better than the gold standard, which is clinical diagnosis made by a physician who is an expert in musculoskeletal diseases.<sup>3</sup>

Imaging studies may not always be reliable in distinguishing septic arthritis from other inflammatory joint diseases. Despite that, X-ray should always be performed as baseline test to exclude other underlying diseases. Computed tomography-scan is not recommended for septic arthritis in children, because it is less sensitive than MRI and has a higher radiation. Magnetic resonance imaging (MRI) is not generally indicated for septic arthritis but could add any informative value and should be done if osteomyelitis-septic arthritis or other complication is suspected. Ultrasonography may be the most informative imaging study due to the high sensitivity of joint swelling. Yet it should be noted that sonography has a lower specificity. If fluid is detected in the joint, a diagnostic aspiration under ultrasound guidance can be considered.<sup>5,7</sup>

Other diseases such as transient synovitis and osteomyelitis are also mimic septic arthritis in presentation. Due to a more serious nature, children presenting with joint irritability should be considered to have septic arthritis, until proven otherwise. Manifestation in osteomyelitis is also similar to septic arthritis, in which pain, limping and fever may be found. Bone scan can be used to confirm osteomyelitis.<sup>1</sup> Treatment has to be executed immediately because delay to treatment may lead to avascular necrosis, osteomyelitis, chondrolysis, recurrent SA, and/or systemic sepsis.<sup>4</sup>

Various opinions have been asserted regarding the right management of septic arthritis. The guideline from European Society for Pediatric Infectious Diseases (ESPID) mentioned that joint drainage and irrigation are recommended if the diagnosis of septic arthritis is suspected.<sup>7</sup> Similarly, Wall and Donnan<sup>1</sup> concluded that surgical drainage and lavage of the joint followed by antibiotics are the definitive treatment of septic arthritis.

Nonetheless, other authors have a different point of view. Surgery was reported to have a minor role in uncomplicated cases, even in hip or shoulder arthritis.<sup>8</sup> Castellazi et al.<sup>9</sup> also reckoned that surgery is not necessary for acute uncomplicated osteoarticular infections and is considered if patients do not respond to antibiotic treatment.

Management needs to be started immediately after synovial fluid and blood samples have been taken for analysis. Empiric treatment should primarily cover *S. aureus* and should always take the microbial resistance tendency into judgement. First-generation cephalosporin and clindamycin are the choice of treatment.<sup>5</sup> Once the microorganism has been isolated and sensitivity as well as resistance of microorganism has been confirmed, therapy should always be adjusted according to the result. The length of antibiotic therapy, including intravenous and per oral routes, should be on average of 2-3 weeks. Longer therapy may be needed in some situations: resistant or unusual pathogens (e.g. MRSA, PVL+, and *Salmonella*); newborns and young infants (<3 months); slow/poor response or complications; complex infection involvement of pelvis or spinal column; sepsis or in immunocompromised children.<sup>7</sup>

Intravenous antibiotics should be continued until clinical is improving and the inflammatory markers are normalizing.<sup>1</sup> To monitor patient's recovery, measurement of sequential CRP can be useful, while ESR is not recommended because it reacts too slowly towards the changes of clinical course.<sup>5</sup> The following conditions should be achieved before switching to oral antibiotic: afebrile for 24-48 hours; symptoms improvement (decreased inflammation and pain); decrease of CRP about 30-50% from maximum value; no signs of complications, such as metastatic foci or DVT; absence of virulent pathogens; negative blood cultures if initially positive. Before stopping the therapy, symptoms should have disappeared, and the CRP should reach normal value (<2 mg/dL).<sup>7</sup>

In this case report, the patient was given parenteral ampicillin-sulbactam combination and parenteral cefotaxime as empirical therapy, since *S. aureus* is the most common cause of childhood septic arthritis in all age group. Furthermore, ESPID clinical guideline also suggested the combination of cefazolin and gentamicin or combination of anti-staphylococcal penicillin and cefotaxime as an empirical therapy for up to 3-month-old patients.<sup>7</sup> After blood culture was obtained, patient was

given intravenous meropenem. Aside from the sensitivity of the culture, meropenem was chosen taking into account that its activity against numerous community-acquired and nosocomial pediatric pathogens.<sup>10</sup> The orthopaedist also decided not to do any invasive intervention, regarding the patient's condition.

However, if the drainage of the pus is considered, several approaches are offered, such as joint puncture, arthroscopy, and open arthrotomy.<sup>5</sup> The exact mode of surgery has been the topic of controversy. In the pediatric population, the surgical approach often subjects to the location of affected joint. Arthroscopic approach is generally done in knee and shoulder joints, and arthrotomy is commonly performed for hip and ankle joints. Arthroscopic instruments might be too large for very young children, hence arthrotomy is often preferred.<sup>1</sup> It should be noted that the prognosis of septic arthritis in children depends on the site, age, time to treatment, and the causative pathogen.<sup>11</sup>

Septic arthritis in children can cause horrible consequences however the initial clinical signs and symptoms could be tricky. This is a case with untypical location of septic arthritis. Fortunately, diagnosis was suspected promptly, and treatment was given immediately. At final follow up, the patient showed complete resolution. Therefore, we emphasized on the importance of prompt diagnosis and management in neonatal septic arthritis in order to preserve joint anatomy and function as well as preventing further sequelae or complication.

## Ethics

**Informed Consent:** Informed consent was obtained.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Concept: K.C., H.C., Design: K.C., H.C., Writing: K.C., H.C.

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# Auto-amputation of the Limbs and Early Colostomy's Effect on Life Quality and Survival on the Patients with Severe Meningococemia Related Purpura Fulminans: Two New and Different Approaches

Meningokoksemiye Bağlı Şiddetli Purpura Fulminans Hastalarında Ekstremitelerin Otoampütasyonu ve Erken Kolostominin Yaşam Kalitesi ve Sağkalıma Etkisi: İki Yeni ve Farklı Yaklaşım

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## Abstract

Purpura fulminans (PF) is a rare but fatal thrombotic disease caused by microvascular thrombosis due to coagulation disorder. Necrosis can progress to muscle and bone tissue contributing to late mortality and morbidity. A healthy 4-month-old girl and a 7-month-old girl had previously admitted to our intensive care unit with severe PF due to meningococemia. Both patients had a severe and critical period in the pediatric intensive care unit and were supported with extracorporeal treatments. We opened colostomy for perineal infection because of large and deep skin lesions. In addition, we waited for a full auto-amputation involving all extremities instead of early surgical amputation. Both survived and acceptable limb function and some mobilization capacity were preserved. In conclusion, we think that early colostomy in severe perineal infections and auto-amputation options in severe extremity involvement should be preferred in order to get better results.

**Keywords:** Purpura fulminans, pediatric intensive care, auto-amputation, colostomy, children

## Öz

Purpura fulminans (PF), pıhtılaşma bozukluğuna bağlı mikrovasküler trombozun neden olduğu nadir fakat ölümcül bir trombotik hastalıktır. Nekroz, kas ve kemik dokusuna ilerleyerek geç mortalite ve morbiditeye katkıda bulunabilir. Dört aylık sağlıklı bir kız ve 7 aylık bir kız çocuğu daha önce yoğun bakım ünitemize meningokoksemiye bağlı şiddetli PF ile başvurmuştu. Her iki hasta da çocuk yoğun bakım ünitesinde ağır ve kritik bir dönem geçirdi ve ekstrakorporeal tedavilerle desteklendi. Geniş ve derin deri lezyonları nedeniyle perineal enfeksiyon için kolostomi açtık. Ayrıca erken cerrahi ampütasyon yerine tüm ekstremiteleri kapsayan tam bir otoampütasyon beklendi. Hem hayatta kalmış hem de kabul edilebilir uzuv işlevi ve bazı mobilizasyon kapasitesi korunmuştur. Sonuç olarak, şiddetli perineal enfeksiyonlarda erken kolostomi, ağır ekstremitte tutulumlarında otoampütasyon seçeneklerinin daha iyi sonuç almak için tercih edilmesi gerektiğini düşünmekteyiz.

**Anahtar Kelimeler:** Purpura fulminans, pediyatrik yoğun bakım, otoampütasyon, kolostomi, çocuk

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## Introduction

Purpura fulminans (PF) is a mortal thrombotic disease caused by coagulation disorder related microvascular thromboses which leads to rapid skin necrosis and disseminated intravascular coagulation.<sup>1</sup> PF related morbidity consists of scarring and amputation of fingers and extremities.<sup>2</sup>

Patients should be evaluated rapidly with support of airway, breathing and circulation in case of need, high concentrate oxygen administration, intravenous (IV) or intraosseous line access with rapid fluid resuscitation followed by needed culture studies and IV antibiotic administration. Patients non-responsive to IV fluid resuscitation should be given inotropic or vasopressor agents.<sup>3</sup> We would like to share our experience and management of two pediatric PF cases.

## Case Reports

### Case 1

Previously healthy 4-month-old girl was admitted to another hospital with 38.6 °C axillary temperature and petechial rash on legs. Patient's clinical status deteriorated rapidly in following few hours with rash spreading to arms and trunk.

Glasgow Coma scale was 7 and therefore patient was intubated (Figure 1A). Patient was given 20 cc/kg 0.9% normal saline 4 times for severe hypotension afterwards adrenalin infusion (0.2 mcg/kg/min), noradrenaline infusion (0.1 mcg/kg/min) and dopamine infusion (10 mcg/kg/min) had started for refractory septic shock. Despite being given catecholamine infusions, patient's shock findings continued, so hydrocortisone treatment was added (50 mg/m<sup>2</sup>), adrenaline and noradrenaline doses were titrated for refractory hypotension. Blood culture was positive for *Neisseria meningitidis* whereas cerebrospinal fluid (CSF) culture did not reveal any organisms. The 6<sup>th</sup> day of her hospitalization, she had oliguria unresponsive to furosemide

treatment which progressed to pulmonary edema, so patient received venovenous hemodialysis for 4 days. Patient was consulted to pediatric immunology and allergy department for severe disease, but work-up and patient's history showed no sign of immune deficiency. On the 25<sup>th</sup> day she was extubated and proceeded to high flow nasal cannula oxygenation. On the 23<sup>rd</sup> day, colostomy was opened by pediatric surgery department for severe tissue loss of anogenital region (Figure 1B). On the 87<sup>th</sup> day; after epithelization of perianal and gluteal lesions; colostomy was closed. Patient was consulted to plastic surgery department for distal extremity necrosis hence debridement of lesions was made (Figure 1C). The patient was discharged on the 127<sup>th</sup> day. After being discharged, the patient received 2 operations for tissue loss of extremities. The first operation was made by plastic surgery department at 21 months of age for tissue loss of lower extremities with skin graft taken from patient's back. In operation, elongated bleeding led to evaluation of coagulation factors hence her factor VII level was found to be low (21.1%). She was operated for the second time at 26 months of age for correction of upper extremity contractures. She is now 28 months old; her cognitive functions are well. She can sit and walk on her own. She can use her right hand and fingers despite losing her distal fingers of right hand. She also has upper and lower extremity contractures (Figure 1D).

### Case 2

Previously healthy 7-month-old girl was admitted from another hospital with 2-day history of fever and purpuric rash on her body (Figure 2A). First physical examination at pediatric intensive care unit (PICU) showed that the patient as in generally bad condition with bilateral poor light reflexes, She was given 20 cc/kg serum physiologic 3 times for her tachycardia, hypotension and prolonged capillary refill time. In the following hours, patient remained hypotensive and her lactate levels increased, therefore adrenaline (0.1 mcg/



**Figure 1.** 1A) Diffuse purpuric rash, 1B) recovery after colostomy, 1C) ischemia and necrosis of PF, 1D) Auto-amputated right foot and right leg contracture  
PF: Purpura fulminans



kg/min), noradrenaline (0.1 mcg/kg/min) and dopamine (10 mcg/kg/min) infusions were started and increased as needed. Patient's both legs appeared ischemic on the end of the second day. Doppler ultrasonography showed no signs of blood flow on the distal extremities, so IV nitroglycerine infusion was started for vasodilator effect. Bacterial panel of CSF was positive for *N. meningitidis*. Patient was consulted to pediatric immunology and allergy department for severe disease, but work-up and patient's history showed no sign of immune deficiency. In the following days, the lesions on the trunk, face and arms fell off but remained ischemic in both legs (Figure 2B). There were also lesions in the epiglottis. Doppler ultrasonography of the lower extremities revealed blood flow in the femoral, popliteal and posterior tibial arteries. On the 25<sup>th</sup> day, a colostomy was opened for deep tissue loss and delayed healing of perineal lesions. After the colostomy was opened, patient's perianal lesions rapidly healed. Necrosis in the lower extremities and fingers of the patient was left to auto-amputation. The patient was extubated on the 26<sup>th</sup> day. Currently 17 months old, his right foot was lost due to auto-amputation. He can sit on his own but cannot walk. The patient's colostomy was closed by the pediatric surgery department after 2 months (Figure 2C).

## Discussion

PF is a mortal syndrome with acute onset, progressive necrosis and cutaneous bleeding and usually associated with meningococemia, sepsis, varicella zoster, pneumococcal and meningitis infections.<sup>4</sup> In a study of Gürgey et al.<sup>5</sup> on showed that, 16 patients whose ages were between 3.5 months and 12 years with PF were caused by infections on 7. Our first patient's blood culture and second patient's CSF culture was showed to be positive for *N. meningitidis*. First patient was diagnosed with factor VII deficiency. PF can be observed in neonatal period because of congenital or acquired protein

C deficiency or other coagulation disorders.<sup>6</sup> Prothrombotic risk factors such as factor V Leiden mutation, prothrombin G20210A mutation and antiphospholipid antibody were all negative in our cases.

PF related lesions are mostly seen on trauma and pressure exposed regions such as hip, extremities, trunk and scalp. Treatment usually consists of debridement and skin graft surgeries.<sup>7</sup> Our two case showed lesions mostly on upper and lower extremity, additionally our first case had lesions on her left lower eyelid whereas our second case had lesions on her epiglottis. Debridement of necrotic tissues in the lower and upper extremities was performed by the plastic surgery department.

PF treatment consists of treating the underlying cause, recovery of normal coagulation functions, preventing thrombosis related tissue damage and decreasing mortality and morbidity. There isn't a globally accepted treatment strategy for treating PF but antimicrobial therapy and TDP administration is suggested.<sup>8</sup> A 10-year study of Warner et al.<sup>6</sup> showed that, among 70 patients (mean age: 13) with PF, proven etiology was *N. meningitidis* among children whereas *Streptococcus pneumoniae* was the main etiologic agent among adults. Patients were given fast antibiotic administration, fluid resuscitation, respiratory and inotropic support with corticosteroid therapy and protein c replacement if needed. 90% of the patient's lesions led to complete layer skin necrosis with a need for debridement and 25% of the patients received surgical limb amputation.<sup>6</sup> Ahmad et al.<sup>9</sup> reported on their 2 case that, meningococemia related PF should be managed by PICU for vital functions, plastic surgery consultation should be made if wide purpuric-necrotic lesions are present and should be given multidisciplinary approach. Both of our cases were consulted to plastic surgery department for skin necrosis and debridement and skin grafting were made by them. Additionally, we experienced that partial exchange had a positive effect on recovery.



**Figure 2.** 2A) Whole body was covered by PF, 2B) necrotic tissue of the limbs, 2C) auto-amputation of the right foot  
PF: Purpura fulminans

PF's mortality rate is approximately 40%.<sup>6</sup> Despite the fact that our two cases had severe illness with perineal scar which resulted with colostomy, No literature unnecessary need of long term mechanic ventilation and continuous renal replacement therapy; we managed to give survival and good prognosis. Perianal lesions may cause gastrointestinal flora associated severe sepsis which was reported to have high mortality rates of 78%.<sup>10</sup> In immunocompromised patients, pseudomonas aeruginosa infections remain to be one of the main reasons for disseminated infections which can progress to deep tissues.<sup>11</sup> Necrosis of perianal region may cause sphincter dysfunction and therefore secondary incontinence. Treatment strategy consists of antimicrobial therapy, debridement of necrotic tissue and skin transplantation.<sup>12</sup> Colostomy may be needed for speeding the recovery of affected colon and skin.<sup>12</sup> irrelevant We decided to open colostomy for preventing the necrotic tissue from contamination with gastrointestinal flora via stool, therefore preventing secondary infections and fastening recovery of the skin.

Perianal lesions may cause severe sepsis due to gastrointestinal flora, which has been reported to have a high mortality rate of 78%.<sup>10</sup> We decided to open a colostomy to prevent contamination of necrotic tissue with the gastrointestinal flora through feces, thus preventing secondary infections and accelerating the healing of the skin. It resulted in rapid recovery of perianal lesions.<sup>13</sup>

Meningococemia, wide purpuric necrosis of the extremities may result with amputations. If necrosis induces sepsis itself, amputation is indicated.<sup>14</sup> Gürgey et al.<sup>5</sup> reported that, out of the 16 patients of their PF study, 3 of them had bilaterally hand, 2 of them had finger, 3 of them had foot finger, 1 of them right hand and 1 of them bilaterally lower extremity amputations. Ghosh et al.<sup>15</sup> reported (similar results) on 28 pediatric patients with PF. One patient had to undergo a below knee surgical amputation and one patient had auto-amputation of the digits. Powars et al.<sup>16</sup> they reported that 10 of 28 patients with PF developed deforming auto-amputation secondary to dermal microvascular thrombosis and hemorrhagic necrosis. Both of our cases were left to auto-amputation. Although only partially compatible with literature, we observed auto-amputation to be related with better life quality, posture and walk. Therefore, we think that auto-amputation is a better extremity protected approach rather than surgical amputation.

In conclusion, meningococemia related PF is a rare and highly mortal disease. Early term colostomy prevents secondary sepsis and quicken perianal open scars. Lastly, we think that meningococemia and PF related ischemic tissue loss should be managed with auto-amputation rather than surgical amputation for we think that auto-amputation results

with more extremity tissue and life quality. Therefore, in the presence of meningococemia related extremity ischemia, surgical amputation should not be preferred. Further studies and case reports are needed in this subject.

## Ethics

**Informed Consent:** Approval was obtained from the family of the participants.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Concept: E.B., T.K., E.İ., E.Ç.T., H.Ö., Design: E.B., T.K., E.İ., E.Ç.T., H.Ö., Data Collection or Processing: C.Y., E.B., E.G., A.G., Writing: E.B., T.K., E.G., C.Y., A.G., B.B., F.K., S.S., E.Ç.T., H.Ö., E.Ç., E.İ.

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# Life-threatening Blue Whale Violent Video Game: A Case Report

## Hayatı Tehdit Eden Mavi Balina Video Oyunu: Bir Olgu Sunumu

© Mutlu Uysal Yazıcı<sup>1</sup>, © Emine Gülşah Torun<sup>2</sup>, © Zeynelabidin Öztürk<sup>1</sup>, © Mehmet Çeleğen<sup>1</sup>, © Benan Bayrakçı<sup>1</sup>

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### Abstract

The use of the internet has increased among adolescents in recent years. Although internet offers many opportunities such as socializing, obtaining information, it also has the potential to affect vulnerable individuals negatively. Recently the blue whale game, known as the blue whale challenge has attracted the attention of the public with numerous reports that young people from all over the world have harmed themselves due to the commands requested in the game. This and similar dangers should be recognized, and families should be warned and the necessary actions should be taken to protect children and adolescents in society. We describe a suicide case followed in the pediatric intensive care unit in order to raise awareness that computer games such as the blue whale game that adolescents can easily access via the internet can have fatal consequences

**Keywords:** Adolescent, blue whale, computer game, suicide

### Öz

Gençler arasında internet kullanımı son yıllarda giderek arttı. İnternet sosyalleşme, bilgi edinme gibi birçok fırsat sunsa da savunmasız bireyleri olumsuz etkileme potansiyeline de sahiptir. Son zamanlarda mavi balina oyunu, gençlerin oyunda istenen komutlar nedeniyle kendilerine zarar verdiğine dair haber çıkması nedeniyle kamuoyunun dikkatini çekmiştir. Bu tür tehlikelerin farkına varılmalı, aileler uyarılmalı ve toplumdaki çocuk ve ergenlerin korunması için gerekli önlemler alınmalıdır. Çocuk yoğun bakımda takip ettiğimiz bu özkıyım olgusunu mavi balina oyunu gibi ergenlerin internet üzerinden kolayca ulaşabilecekleri bilgisayar oyunlarının ölümcül sonuçlara yol açabileceği konusunda farkındalık yaratmak amacıyla sunmaktayız.

**Anahtar Kelimeler:** Ergen, mavi balina, bilgisayar oyunu, özkıyım

### Introduction

In recent years, the use of the internet has increased among adolescents as the internet has become necessary for schoolwork, information gathering, and socialization. Social media networks such as Facebook, Instagram, Twitter, and YouTube, where they can develop public accounts or profiles to connect with other individuals, have become increasingly popular and common among adolescents.<sup>1</sup> Although social media offers many opportunities such as socializing, obtaining information, it also has the potential to affect vulnerable individuals negatively.<sup>2</sup>

Computer-based online games have become part of popular culture these days. Online games create an environment

where many people can interact with each other using graphics and sound technologies at the same time.<sup>3</sup> Recently the blue whale game, known as the blue whale challenge has attracted the attention of the public with numerous reports that young people from all over the world have harmed themselves due to the commands requested in the game. The first step of the game is to carve F57 on the hand or the arm with a razor and to prove this by taking its photo. This duty is followed by 50 violent containing tasks based on self-harming such as self-pricking, carve a whale on the arm, and at the end game commit suicide by hanging themselves or jumping off a high building.<sup>4</sup>

Herein, we describe a suicide case followed in the pediatric intensive care unit in order to raise awareness that computer

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games such as the Blue Whale game that adolescents can easily access via the internet can have fatal consequences

## Case Report

A 15-years-old girl presented to the emergency room with a loss of consciousness as a result of the suicide attempt. Her father was working at the consulate. She has lived in America since childhood. However, she has moved to Turkey two years ago and she has been living in Turkey for the last two years and started to private college school in Turkey. She took videos of her singing and uploaded them to social media. She was spending too much time on the internet.

When the history of the patient was detailed; her mother reported that she heard voices from her room at 4 am. She was watching a horror movie, but she told her mother that she had set her alarm wrong. Her parents stated that she had carved a whale on his arm a year ago, but they could not understand why she did it. She told her friends that she would die soon, get rid of her troubles, and be born again. Her father could not closely follow her daughter, because he was working abroad, and her parents could not understand that she was playing the blue whale game. After the questions and explanations regarding the steps of the blue whale game, her parents were noticed that their daughter had been playing the game and moving forward to the end of the game step by step.

She hung herself on a natural gas pipe in the kitchen with her music headset. Unfortunately, it was determined that the patient set up her tablet for a video shoot before hanging herself and broadcasted her suicide live to her friends and all social media. The patient was brought to the hospital after cardiopulmonary resuscitation. At admission, physical examination revealed Glasgow Coma scale was 3. There were hanging traces in her neck and a wound scar carved with a razor. She developed generalized tonic-clonic seizures. The patient who had no brainstem reflexes and spontaneous breathing underwent cranial magnetic resonance imaging which revealed signal changes compatible with diffuse hypoxic involvement. At the follow-up, the patient was diagnosed with brain death. The patient died on day 18. Informed consent was received from the family.

## Discussion

Suicide is a serious public health problem. Suicides can be prevented by knowing risk factors and recognizing warning signs and timely intervention. The World Health Organization reports that approximately 800,000 people die each year from suicide, and suicide is the second leading cause of death among 15-29-year-olds worldwide. The link between suicide

and mental disorders (especially depression and alcohol use disorders) is well established. Other risk factors that increase suicidality include the experience of loss, loneliness, a relationship break-up, discrimination, financial problems, chronic pain and illness, violence, abuse, and conflict.<sup>5</sup>

Computer-based online games have emerged in recent years that are thought to encourage adolescents through online challenges and assignments to violence, self-harm, and even suicide.<sup>4,6,7</sup> It has been shown that adolescents who play many hours of action category video games, which tend to be more violent, have more lethal self-harm behavior and a tendency to commit suicide.<sup>6</sup> Longitudinal data indicated that self-cutting is a significant risk factor for suicide among young people.<sup>7</sup> The “blue whale challenge” encourages the player to repeatedly cut herself/himself and complete other dangerous missions. These repetitive self-harming behaviors and other dangerous missions gradually increase the risk of suicide by reducing and normalizing the fear of the player.

Computer-based online games can lead to self-harm and suicide, but cannot be seen as the only cause of suicide. These challenges can be considered as triggering factors for suicide. Strategies to protect adolescents with risk factors for problematic Internet use such as depression, emotional difficulties, and social isolation or peer problems are important.<sup>8</sup> Parental monitoring might affect internet addiction and violent video gaming of adolescents. A study has shown that leisure boredom and involvement in internet and social activities increase the probability of internet addiction and might create a tendency to play violent video games; however, family and outdoor activities along with participative and supportive parental monitoring decrease these tendencies.<sup>9</sup>

The most important professional recommendations on this issue were declared by India United Nations Children’s Fund. Internet access sites must be controlled and should be provided to the adolescents in common usage areas of the family. Parents need to know new trends on the internet. Vigilance is recommended in the cases of unexpected changes such as changed mood, decreased communication, and unwillingness for studying, and decreased school marks. If such changes are recognized, internet activities of adolescents should be closely monitored, school authorities should be met, or a psychologist should be consulted. The Blue Whale game is a lethal reality, which enters up our homes with the virtual world. This and similar dangers should be recognized, and families should be warned and the necessary actions should be taken to protect children and adolescents in society.<sup>10</sup>

## Ethics

**Informed Consent:** Informed consent was received from the family.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Concept: M.U.Y., Design: M.U.Y., Data Collection or Processing: M.U.Y., E.G.T., Analysis or Interpretation: M.U.Y., Z.Ö., M.Ç., B.B., Literature Search: M.U.Y., E.G.T., Posted by: M.U.Y., E.G.T.

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

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# A Case of *Elizabethkingia meningoseptica* in the Neonatal Intensive Care Unit

Yenidoğan Yoğun Bakım Ünitesinde *Elizabethkingia meningoseptica* Olgusu

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## Abstract

*Elizabethkingia meningoseptica* (*E. meningoseptica*) is a Gram-negative rod that is commonly found in the natural environmental such as soil, plants, foodstuffs, water but is rarely causes human infection. It can cause many clinical conditions like urinary tract infection, meningitis, septicemia, osteomyelitis, necrotizing fasciitis, cellulitis, endocarditis, abdominal abscess, endophthalmitis. Especially immunosuppressed patients and premature infants are risky groups for *E. meningoseptica* infections. The case was born in another center by cesarean section at 36<sup>th</sup> gestational week and 2.830 grams and was referred to our hospital with the diagnosis of prematurity, respiratory distress, septicemia, stage 4 intraventricular hemorrhage, hydrocephalus on the 27<sup>th</sup> postnatal day. The patient had no laboratory findings suggestive of infection other than elevated C-reactive protein level in his routine examinations and an external drainage catheter was implanted because of hydrocephalus. *E. meningoseptica* was produced in the cerebrospinal fluid sample taken simultaneously. Empirically, meropenem, colistin and vancomycin treatments were initiated and the treatment was not changed according to the culture antibiogram results. Infant was discharged 45 days after hospitalization. Neonatal meningitis caused by *E. meningoseptica* is fatal in more than half of the cases. In this case, it was aimed to draw attention to the importance of early diagnosis and treatment of microorganism, as well as virulence in terms of clinical course.

**Keywords:** Newborn, BOS, *E. meningoseptica*

## Öz

*Elizabethkingia meningoseptica* (*E. meningoseptica*) genellikle toprak, bitki, gıda maddeleri, su gibi çevre ortamında yaygın olarak bulunan, nadiren insanda enfeksiyona neden olan, Gram-negatif çomaktır. Üriner sistem enfeksiyonu, menenjit, sepsis, osteomyelit, nekrotizan fasiit, selülit, endokardit, abdominal apse, endoftalmit gibi pek çok klinik tabloya neden olabilmektedir. İmmüno-suprese hastalar, prematüre bebekler *E. meningoseptica* enfeksiyonları açısından riskli gruplardır. Olgu, başka bir merkezde sezaryan ile 36 haftalık, 2,830 gram olarak doğmuş ve prematürite, solunum sıkıntısı, sepsis, evre 4 intraventriküler kanama, hidrosefali tanılıyla, şant takılmak üzere postnatal 27. günde hastanemize sevk edilmiştir. Rutin tetkiklerinde C-reaktif protein düzeyi yüksekliği dışında enfeksiyon varlığını düşündürecek herhangi bir laboratuvar bulgusuna rastlanmayan olguya, hidrosefali nedeni ile eksternal drenaj kateteri takılmış, bu sırada alınan beyin omurilik sıvısı örneğinde *E. meningoseptica* üretilmiştir. Ampirik olarak meropenem, kolistin ve vankomisin tedavileri başlanan olgunun kültür antibiyogram sonucuna göre tedavisi değiştirilmemiş olup, yatışından 45 gün sonra taburcu edilmiştir. *E. meningoseptica*'nin neden olduğu neonatal menenjit, olguların yarısından çoğunda fatal seyirlidir. Bu olgu ile mikroorganizmanın erken teşhis ve tedavisinin yanı sıra virülansının klinik seyir açısından önemli olduğuna dikkat çekmek istenmiştir.

**Anahtar Kelimeler:** Yenidoğan, BOS, *E. meningoseptica*

## Introduction

*E. meningoseptica*, previously known as CDC Group IIa, *Flavobacterium meningosepticum* (1959), *Chryseobacterium meningosepticum* (1994), is from the *Flavobacteriaceae* family, and a non-motile, catalase, oxidase and indole positive,

non-glucose fermenting, Gram-negative aerobic rod.<sup>1-3</sup> It is commonly found in environmental media such as soil, plants, foodstuffs, and water.<sup>3,4</sup> After 24 hours of incubation at 37° on blood agar, it forms 1-2 mm in size, smooth-edged (Smooth) colonies with slight yellow pigmentation. It is naturally

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resistant to third and fourth generation cephalosporins, carbapenems, aztreonam, and aminoglycosides used in the prevention of infections caused by Gram-negative microorganisms.<sup>1,4</sup> However, *E. meningoseptica*, which is frequently sensitive to antibiotics effective against Gram-positive microorganisms such as rifampin, vancomycin, and clindamycin, may rarely cause infection in humans, but may occur in sporadic cases and epidemics.<sup>1,3,4</sup> Immunosuppressed patients, premature babies, and especially newborns receiving multiple antibiotic therapy are at risk of being infected with these microorganisms.<sup>5,6</sup> They frequently cause meningitis, and secondly, bacteremia.<sup>6</sup> Neonatal meningitis has a fatal course in more than half of the cases, and complications such as hydrocephalus, deafness, and brain abscess are frequently seen in survivors.<sup>3,7</sup>

In this case, a newborn patient with *E. meningoseptica* growth in CSF culture while in the intensive care unit is discussed.

## Case Report

The patient, who was born with a cesarean section from a 34-year-old mother at 36 weeks and weighed 2.830 grams in another center and was followed up with the diagnoses of prematurity, respiratory distress, sepsis, and stage 4 intraventricular hemorrhage, developed hydrocephalus, and was referred to our hospital on the postnatal 27<sup>th</sup> day for a shunt. It was learned that after the delivery, the patient was given respiratory support with a mechanical ventilator for 7 days, fluid support with an umbilical vein catheter for 12 days, total parenteral nutrition support for 6 days, ampicillin, gentamicin for 5 days, and vancomycin and meropenem for 22 days.

In the physical examination of the patient who was hospitalized in the neonatal intensive care unit, it was detected that the patient had: Height 48 cm (10-25 percentile), body weight 2.780 grams (10-25 percentile), head circumference 36 cm (90 percentile), heart rate 112/min, respiratory rate 40/min, body temperature as rectal 37 °C and normal values. His general condition was moderate, hypotonic, hypoactive, respiratory sounds, heart and abdominal examination were normal, suction was weak, fontanelle was found to be curved, hemoglobin was 10.2 g/dL, white blood cell was 16.200/mm<sup>3</sup>, in peripheral smear 50% lymphocytes, 24% polymorph core. leukocytes, 10% rods, 16% metamyelocytes were seen and platelet count was found to be 427,000/mm<sup>3</sup>. In other routine biochemistry and microbiology tests, there was no finding suggesting the presence of infection other than a high C-reactive protein level (39 mg/L), and the patient's *Toxoplasma*, CMV, *Rubella* IgM and IgG were also negative. When the patient was evaluated radiologically, there was bilateral mild infiltration in the chest X-ray, severe

dilatation in the third, fourth and both lateral ventricles in the cranial tomography, effacement in the hemispheric sulcus and fissures, partial thinning of the cerebellar and cerebral parenchyma, and partial decrease in density in the white matter. CSF samples were taken from the patient, who had an external drainage catheter due to hydrocephalus, and sent to the biochemistry and microbiology laboratories. When the sample was examined biochemically, it was determined that the protein increased 403 mg/dL, glucose <5 mg/dL decreased, and the cell increased 20x10<sup>4</sup>/mL. Gram and Giemsa stains were made from the CSF sample sent to the microbiology laboratory, inoculated on blood agar, MacConkey agar, Sabouraud dextrose agar and chocolate agar for culture and incubated in an oven with carbon dioxide at 37° for 16-24 hours. Abundant PNL and Gram-negative *Coccobacilli* were observed in the direct Gram stain evaluation of the sample. The next day, small, dull colonies grew on blood agar, Gram staining of the colonies showed that the microorganism was Gram-negative rod, and catalase, oxidase and indole tests were evaluated as positive. The bacterium was identified as *E. meningoseptica* by MALDI-TOF MS (Bruker, Germany) and Vitek 2 (BioMérieux, France) systems. Since the Vitek 2 device was not sensitive to microorganisms, Kirby-Bauer disk diffusion test was performed in line with EUCAST's recommendations, and the zone diameters were calculated as piperacillin-tazobactam 25 mm, trimethoprim-sulfamethoxazole 25 mm, and ciprofloxacin 28 mm. For carbapenems, aminoglycosides, colistin, and second and third generation cephalosporins, the zone diameter was 0 mm. Vancomycin susceptibility was evaluated with both Kirby-Bauer disc diffusion method (20 mm) and gradient test (0.75 µg/mL) (MIC Test Strips, Bioanalyse, Turkey).

Empirically, intravenous meropenem, colistin and vancomycin treatments from external ventricular shunt were initiated, and the patient's treatment was not changed according to the culture antibiogram results. In the follow-up, it was observed that the CSF protein decreased from 403 to 96 mg/dL and there was no growth in the control CSF cultures. All treatments were discontinued on the 21<sup>st</sup> day and the external shunt was removed, and then a permanent ventriculoperitoneal shunt was inserted. The patient was discharged because there were no signs of shunt dysfunction.

## Discussion

*E. meningoseptica* was first described as a meningitis agent under the name *Flavobacterium meningosepticum* in an article published in 1959.<sup>8</sup> Bacteria appear as neonatal meningitis in the first two weeks of life in premature infants and are reported as an opportunistic nosocomial pathogen in more than 75% of cases in infants ≤3 months old.<sup>3,4</sup> In



the development of infection, especially prematurity is the primary risk factor for the host, and mortality rates are quite high in infants with low birth weight (<2.500 grams).<sup>9,10</sup> Other risk factors are suppression of the immune system, underlying medical diseases, long hospital stay, use of broad spectrum antibiotics, chronic dialysis, and use of invasive devices such as central venous catheters.<sup>9,11</sup>

In our case, the patient was born 36 weeks old, 2.830 g and was diagnosed with prematurity, respiratory distress, sepsis, stage 4 intraventricular hemorrhage, hydrocephalus and was referred to our hospital for treatment. He was a risky newborn for *E. meningoseptica* infections due to mechanical ventilator support, need for central venous catheter, broad-spectrum antibiotics and the use of total parenteral nutrition.

The source of infection in infants is usually colonization of *E. meningoseptica* in their noses, respiratory systems or gastrointestinal systems.<sup>4</sup> In various studies, it has been shown that bacteria are prone to colonization on surfaces such as faucets, mechanical ventilators, washing solutions, some disinfectants, baby feeding liquids, injectors, and bed rails.<sup>4,12,13</sup> The effectiveness of chlorination for disinfection in hospital water systems and even municipal water facilities is insufficient on this bacteria.<sup>4</sup>

Since the case was the only case seen in our hospital, it is thought that colonization and even infection of *E. meningoseptica* produced in the CSF culture taken during shunt insertion developed before the patient was referred to our hospital.

Bacteria produce chromosomally simultaneous metallo beta-lactamases and broad-spectrum beta-lactamases, and thus have intrinsic resistance to many antibiotics, including polymyxins and tigecycline. This feature reduces treatment options.<sup>14</sup> In a study, the mortality rate was found to be 57% in cases of meningitis caused by *Elizabethkingia*.<sup>10</sup> It is also thought that early diagnosis and treatment, and even empirical treatment, are very important in reducing mortality rates.<sup>10</sup> Although some studies suggest the use of vancomycin alone in infections caused by *E. meningoseptica*, Kirby et al.<sup>7</sup> found that antimicrobial agents used in infections with vancomycin and other Gram-positive microorganisms showed weak activity against this bacterium.<sup>15</sup> In various *in vitro* studies, while the combination of intravenous vancomycin and rifampin is recommended in neonatal meningitis cases caused by *E. meningoseptica*, it is also stated that the combination of meropenem and vancomycin should be avoided due to its antagonistic effect.<sup>15</sup> In addition, studies have reported that new quinolones are promising in the treatment of *E. meningoseptica* infections.<sup>7,15</sup> In our case, empirical intravenous meropenem, external ventricular shunt colistin

and vancomycin treatments were started, but according to the patient's culture results, no quinolone antibiotic was added to the treatment.

Bacteremia is the second most common manifestation of *E. meningoseptica* infections in both newborns and adults. Mortality in infants is lower than meningitis. In their literature review, Bloch et al.<sup>10</sup> also found that bloodstream infections were associated with contaminated anesthetics in nine of 15 cases, systemic symptoms disappeared within 72 hours without specific antibiotic therapy, this is an indication of low virulence of the bacterium, and it was cleaned quickly by the the bacterium's immune system in a normal host.<sup>7</sup>

In this case, it is thought that the patient's discharge without changing the empirical treatment according to the culture result is due to the low virulence of the microorganism, the early vancomycin treatment started from the external ventricular shunt, and the supply of infected CSF drainage with the inserted shunt.

Like many microorganisms that rarely cause infection, there are no standardized *in vitro* antimicrobial susceptibility tests for *E. meningoseptica* and limit value ranges in which the results can be evaluated, therefore, treatment approaches for such microorganisms are formed by clinical experience.

The liquid microdilution method is the valid method for antibiotic susceptibility results of *E. meningoseptica*. However, since the liquid microdilution method was not studied in our laboratory, the zone diameters determined by the Kirby-Bauer disk diffusion method were considered as a guide.

## Information

Our case was presented as a poster at the 5<sup>th</sup> National Congress of Clinical Microbiology. Poster no: P211 (28 October-1 November 2019, İzmir).

## Ethics

**Informed Consent:** Informed consent was obtained.

**Peer-review:** Internally and externally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: H.D., Y.Ü.S., Concept: İ.K., Design: İ.K., Y.Ü.S., Data Collection or Processing: H.D., İ.K., Analysis or Interpretation: İ.K., Y.Ü.S., Literature Search: H.D., İ.K., Writing: H.D., İ.K.

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

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