ÇOCUK ACİL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine

ÇOCUK ACİL TIP VE YOĞUN BAKIM DERNEĞİ

Volume / Cilt: 9 **Issue / Sayı:** 2 **Year / Yıl:** 2022

E-ISSN: 2148-7332

2

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The Journal of Pediatric Emergency and Intensive Care Medicine is a publication of "Society of Pediatric Emergency and Intensive Care Medicine".

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Web: www.galenos.com.tr
Yayıncı Sertifika No/Publisher Certificate Number: 14521

Yayın Tarihi/Publication Date: Mart 2022/ March 2022
ISSN: 2146-2399 **E-ISSN:** 2148-7332

Yılda üç kez yayımlanan süreli yayındır.
International periodical journal published three times in a year.

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AMAÇ VE KAPSAM

2014 yılında yayımlanmaya başlayan Çocuk Acil ve Yoğun Bakım Dergisi, "kritik hasta çocuk" konusundaki Türkiye'deki tek dergi olarak ulusal ve uluslararası makaleleri yayımlayan, hakemli-ön değerlendirmeli bir dergidir. İngilizce ve Türkçe dillerinde yayın kabul eden dergimiz, elektronik olarak yayımlanmaktadır. Yayın sıklığı dört ayda bir olmak üzere; yılda 3 sayı (Nisan, Ağustos, Aralık) şeklindedir. Çocuk Acil ve Yoğun Bakım Dergisi; çocuk acil tıp, çocuk acil sağlık hizmetleri, çocuk kritik hasta bakımı ve çocuk yoğun bakım hizmetleri konusunda bilimsel içerikli makaleleri yayınlamaktadır.

Dergi; özgün araştırma, olgu sunumu, derleme, editöre mektup türündeki makaleleri, klinik raporları, tıbbi düşünceleri ve ilgili eğitimsel ve bilimsel duyuruları yayınlar. 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 editöryal ve yayın süreçleri ile etik kuralları International Committee of Medical Journal Editors (ICMJE), World Association of Medical Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), ve National Information Standards Organization (NISO) gibi uluslararası kuruluşların kurallarına uygun olarak şekillenmektedir. Dergimiz, şeffaf olma ilkeleri ve "DOAJ Akademik Yayıncılıkta En İyi Uygulama İlkeleri" ile uyum içindedir.

Çocuk Acil ve Yoğun Bakım Dergisi editörü veya editörleri Çocuk Acil Tıp ve Yoğun Bakım Derneği Yönetim Kurulu tarafından, üç yılda bir Ocak ayında belirlenir.

Çocuk Acil ve Yoğun Bakım Dergisi, **Tübitak-ULAKBİM TR Dizini, Directory of Open Access Journals (DOAJ), CINAHL Complete, Gale, ProQuest, Embase, Index Copernicus, Directory of Research Journal Indexing (DRJI), J-Gate, Livivo-German National Library of Medicine (ZB MED), BASE - Bielefeld Academic Search Engine, Ulrich's Periodicals Directory, Ebsco, CiteFactor, IdealOnline, Türkiye Atıf Dizini, Hinari, GOALI, ARDI, OARE, AGORA, WorldCat ve Türk Medline** tarafından indekslenmektedir.

Dergi Adı: Çocuk Acil ve Yoğun Bakım Dergisi

Dergi Adı (İngilizce): The Journal of Pediatric Emergency and Intensive Care Medicine

Dergi resmi kısaltması: J Pediatr Emerg Yoğun Bakım Med

E-ISSN: 2717-9206

Eski E-ISSN (2014-2021): 2146-2399

Eski ISSN (2014-2020): 2148-7332

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Bu dergi, araştırmaları halka ücretsiz olarak sunmanın daha büyük bir küresel bilgi alışverişini desteklediği ilkesine dayanarak içeriğine anında açık erişim sağlar.

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AIMS AND SCOPE

The Journal of Pediatric Emergency and Intensive Care Medicine is a peer-reviewed periodical journal that publishes national and international articles since 2014, and it is the first journal that is about "Critical pediatric patient" field in Turkey. Our journal, which accepts publications in English and Turkish languages, is published electronically. The publication frequency is 3 times a year (April, August, December) in every 4 months. The Journal of Pediatric Emergency and Intensive Care Medicine publishes the scientific articles that are written about pediatric emergency medicine, pediatric emergency health services, pediatric critical patient care, and pediatric intensive care issues.

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.

The editorial and publication processes of the journal are shaped in accordance with the guidelines of the International Committee of Medical Journal Editors (ICMJE), World Association of Medical Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), and National Information Standards Organization (NISO). The journal is in conformity with the Principles of Transparency and Best Practice in Scholarly Publishing.

The editors of the Journal of Pediatric Emergency and Intensive Care are determined by the Administrative Board of Society of Pediatric Emergency and Intensive Care Medicine periodically every 3 years at January.

The Journal of Pediatric Emergency and Intensive Care Medicine is indexed in **Tübitak-ULAKBİM TR Dizini, Directory of Open Access Journals (DOAJ), CINAHL Complete, Gale, ProQuest, Embase, Index Copernicus, Directory of Research Journal Indexing (DRJI), J-Gate, Livivo-German National Library of Medicine (ZB MED), BASE - Bielefeld Academic Search Engine, Ulrich's Periodicals Directory, EBSCO Host, CiteFactor, IdealOnline, Türkiye Atıf Dizini, Hinari, GOALI, ARDI, OARE, AGORA, WorldCat** and **Türk Medline.**

Title: The Journal of Pediatric Emergency and Intensive Care Medicine

Title in Turkish: Çocuk Acil ve Yoğun Bakım Dergisi

Journal abbreviation: J Pediatr Emerg Intensive Care Med

E-ISSN: 2717-9206

Former E-ISSN (2014-2021): 2146-2399

Former ISSN (2014-2020): 2148-7332

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Publisher: Galenos Publishing House

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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 yayınlar.

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.

Yazıların 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 yayınlanmadığı ve/veya yayınlanmak 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 yazılardır. 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 yazılarıdır. Çocuk Acil ve Yoğun Bakım Dergisi davetli derleme yazısı yayımlamaktadır. 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.

Kanıta 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 ACİL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine

ÇOCUK ACİL TIP VE YOĞUN BAKIM DERNEĞİ

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 ikiyi 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 tarih, 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 bulundurmayan makaleler geri gönderilebilir.

Türkçe ve İngilizce Özet: Özgün makaleler ve özet raporlar 250 sözcüğü aşmayan hipotez veya amaç, yöntemler, sonuçlar, tartışma içeren özet bulundurmalıdır. 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.

Örnekler;

- Makale: Raftery KA, Smith-Coggins R, Chen AHM. Gender-associated differences in emergency department pain management. Ann Emerg Med. 1995;26:414-21.
- Baskıdaki Makale için: Littlewhite HB, Donald JA. Pulmonary blood flow regulation in an aquatic snake. Science 2002 (baskıda)
- Kitap: Callaham ML. Current Practice of Emergency Medicine. 2nd ed. St. Luis, MO:Mosby;1991.
- Kitap Bölümü: Mengert TJ, Eisenberg MS. Prehospital and emergency medicine thrombolytic therapy. In: Tintinal-li JE, Ruiz E, Krome RL (eds). Emergency Medicine: A Comprehensive Study Guide. 4th ed. New York, NY:McGraw-Hill;1996:337-43.
- Kitaptan Bir Bölüm için, Bir Editör Varsa: Mc Nab S. Lacrimal surgery. In: Willshaw H (ed). Practical Ophthalmic Surgery. NewYork: Churchill Livingstone Inc, 1992: 191-211
- Türkçe Kitap Bölümü: Yilmaz HL. Çocuk Acil Mimarisi. İçinde: Karaböcüoğlu M, Yılmaz HL, Duman M (ed.ler). Çocuk Acil Tıp: Kapsamlı ve Kolay Yaklaşım. 1. Baskı. İstanbul, İstanbul Tıp Kitabevi, 2012:7-13
- Editörler Aynı Zamanda Kitabın İçindeki Metin ya da Metinlerin Yazarı ise: Önce alınan metin ve takiben kitabın ismi yine kelimeler büyük harfle başlatılarak yazılır: Diener HC, Wilkinson M (editors). Drug-induced headac-he. In Headache. First ed., New York: Springer-Verlag, 1988: 45-67
- Çeviri Kitaptan Alıntı için: Milkman HB, Sederer LI. Alkolizm ve Madde Bağımlılığında Tedavi Seçenekleri. Doğan Y, Özden A, İzmir M (Çevirenler) 1. Baskı, Ankara: Ankara Üniversitesi Basımevi, 1994: 79-96
- Kongre Bildirileri için: Felek S, Kılıç SS, Akbulut A, Yıldız M. Görsel halüsinasyonla seyreden bir şigelloz olgusu.

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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ÇOCUK ACİL ve YOĞUN BAKIM DERGİSİ

Journal of Pediatric Emergency and Intensive Care Medicine

- Tezden Alıntı için: Kılıç C. Genel Sağlık Anketi: Güvenirlik ve Geçerlilik Çalışması. Yayınlanmamış Uzmanlık Tezi, Hacettepe Üniversitesi Tıp Fakültesi, Psikiyatri AD, Ankara: 1992
- İnternet: Fingland MJ. ACEP opposes the House GOP managed care bill. American College of Emergency Physici-ans Web site. Available at: http://www.acep.org/press/pi980724.html . Accessed August 26,1999.
- Kişisel Danışmanlık: Kişisel danışmanları kaynak göstermekten kaçının. Fakat eğer çok gerekli ise kişinin adı, akademik derecesi, ay, yıl bilgilerine ek olarak kişiden yazılı olarak bu bilgiyi kullanabileceğinize dair mektubu makale ile birlikte gönderin.

Tablolar: Tablolar verileri özetleyen kolay okunur bir biçimde olmalıdır. Tablo'da yer alan veriler, makalenin metin kısmında yer almamalıdır. Tablo numaraları yazıda ardışık 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 resimleren 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.

İzinler: 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 değerlendirilirler. 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 alırlar.

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 kullanılışlarında 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 sitesine başvurabilir(ler).

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

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 müsveddesi ya da bunun içerik açısından eleştirel biçimde gözden geçirilmesinde görev yapan birisi olarak görülür. Yazar olabilmenin 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 araştırıcılar" ya da "yardımcı araştırıcılar" 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.

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- 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
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DOI: 10.4274/cayd.galenos.2021.93823
J Pediatr Emerg Intensive Care Med 2022;9:66-73

A Dimension of Child Emergency: Psychiatric Emergency and Nursing Approach

Çocuk Acilin Bir Boyutu: Psikiyatrik Aciller ve Hemşirelik Yaklaşımı

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Abstract

In recent years, there has been a significant increase in applications to pediatric emergency services. Psychiatric emergencies are one of the frequent applications made to pediatric emergency services. Psychiatric emergencies are the first places that children and families will go to, as a situation that applications urgent intervention. However, in cases that do not require emergency intervention, children and families should apply to psychiatry services, while most of the applications are made to emergency services. Psychiatric emergencies constitute 3-12% of the applications made to emergency services. Therefore, in this review, psychiatric emergencies, risk factors, incidence, identification and evaluation of psychiatric emergencies, specific psychiatric emergencies and nursing approach are discussed in this review.

Keywords: Emergency nursing, child, psychiatric emergency services

Öz

Son yıllarda çocuk acil servislerine başvurularda belirgin bir artış görülmektedir. Çocuk acil servislerine yapılan sık başvurulardan biri de psikiyatrik acillerdir. Psikiyatrik aciller, acil müdahale edilmesi gereken bir durum olması sebebiyle çocuk ve ailelerin ilk başvuracakları yerlerdir. Ancak acil müdahale gerektirmeyen durumlarda çocuk ve ailelerin psikiyatri servislerine başvuru yapması gerekirken başvuruların çoğunluğunun acil servislere yapılmaktadır. Psikiyatrik aciller, acil servislere yapılan başvuruların %3-12'sini oluşturmaktadır. Bu nedenle bu derlemede çocukluk çağındaki psikiyatrik aciller, risk faktörleri, insidansı, saptanması, değerlendirilmesi ve hemşirelik yaklaşımı ele alınmıştır.

Anahtar Kelimeler: Acil hemşireliği, çocuk, psikiyatrik acil hizmetleri

Introduction

Psychiatric emergencies are a medical condition occurring suddenly in one or more of the individual's behaviors, thoughts and emotion areas, and requiring immediate intervention.[1,2] Psychiatric emergencies that require urgent intervention may develop due to substance use, drug interaction, poisoning, medical conditions and drug side effects as well as due to stress, chronic mental illnesses and negative situations resulting from psychosocial factors (peer quarrels, loss-grief process).[3] Psychiatric emergencies constitute 3-12% of the applications to the emergency services.[4,5] Since psychiatric emergencies are a situation that requires urgent intervention, patients and their relatives first apply to emergency services.[6,7] Intervention and quality care services have a very important place in these applications.[7-9] The patient and his/her family, who apply to the psychiatric emergency, should be guided early and appropriately, the correct diagnosis should be established on time, and the treatment should be planned and implemented urgently.[10,11] Comprehensive evaluation of the patient when he/she comes to the emergency department will facilitate the emergency that may develop in the next period and his/her compliance with the treatment in the following processes.[12] First of all, the patient and his/her family should be calmed before starting treatment in psychiatric emergencies. Afterwards, the patient should be treated and psychiatric symptoms should be reduced.[13] In addition, healthcare professionals need to have knowledge

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Received/Geliş Tarihi: 30.05.2021 **Accepted/Kabul Tarihi:** 08.11.2021

and skills in many aspects when intervening in psychiatric emergencies.[8,14] Psychiatric emergencies are classified under 3 separate headings. This classification is as follows: Psychiatric emergencies that threaten the life of the individual, including "major depression, suicide attempt, conflict, acute paranoia, alcohol and substance intoxication", psychiatric emergencies that threaten the life of others, including "aggressive, impulsive and homicidal behaviors", and psychiatric emergencies that threaten the flow of life, including "rape, psychosis, grief process, panic attacks, abuse, conversion, anxiety, psychosomatic symptoms, physical or sexual traumas".[13]

Psychiatric Emergencies in Children

Child psychiatric emergencies are those that are perceived as a potential threat to the safety or well-being of the child and his/her family. In these cases, in the event of danger, intense symptoms may occur in the presence of an urgent and sudden negative event.[9,12,13] Children's psychological health and well-being largely depend on their families, schools and the society in which they live. Child psychiatric emergencies mostly arise as a result of a long history of emotional and behavioral difficulties as well as sudden situations.[9,12,13,15]

In many developing regions of the world, children live in extremely difficult social conditions. As a result of disease epidemics, wars, disasters, long-term hospital stays due to diseases and other cultural practices, children have to be separated from their families. Today, children cannot go to school due to extreme poverty, violence and social events (war, battle, migration). All these factors increase the vulnerability of children to psychiatric emergencies. Therefore, a psychiatric condition in the child reflects the family and society system. This situation of the child is defined as an emergency by the parents or other people around their.[15-19]

Considering today's malnutrition and high rates of infectious diseases, pathological conditions are the underlying cause of many psychiatric emergencies in children. For example, acute organic brain syndromes can cause varying degrees of behavioral disorders in children, often requiring immediate psychiatric intervention. In addition, self-harming behavior among adolescents sometimes leads to negative psychosocial events in the person or family.[3,15-19] Parents often accept a child's behavioral problems as an emergency when they can no longer cope with the behavior.

Psychiatric emergencies in children include suicide, depression, psychosomatic disorders, sudden psychotic symptoms, anxiety disorder, severe eating disorders, panic, conversion disorders, non-organic pain, running away from home, sleep disorders, behavioral disorders, dissociative children, substance abuse, thought disorders, abuses, phobias, negligence, hallucinations, substance addiction, acute stress reactions, self-harming and mood disorders.[3,13,18-21]

Risk Factors for Psychiatric Emergencies in Children

Psychiatric emergencies in children are affected by individual, familial, social and school-related factors. Individual factors include "physical and mental disability, chronic physical illness, isolation, impulsive behaviors, poor social skills and separation"; familial factors include "poor parent-child communication, exposure to abuse by caregivers, parental separation, divorce, parental abandonment, and occurrence of illness or death in the family"; school-related factors include "academic failure, problems with peers, peer bullying, failing the class and being expelled from school" and social factors include "low socio-economic level, social discrimination, isolation, bullying and religious beliefs".[3,15-19] In general, a psychiatric disorder that exists in a child occurs as an acute traumatic experience, a medical condition, or a complication of treatment.[16-19]

Incidence of Psychiatric Emergencies in Children

In the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) guideline prepared by the American Psychiatric Association (APA), it is stated that psychiatric disorders are seen at a rate of 10-15% in childhood and adolescence, and anxiety disorders are the most frequently diagnosed psychiatric disorders.[22-24] According to the national survey data of hospital outpatient medical care, the rate of admissions to the emergency department due to psychiatric conditions increased from 4.4% in 2001 to 7.2% in 2011. In addition, it was reported in this study that psychiatric cases admitted to the emergency department were between the ages of 12 and 17 years.[25]

In developed countries, the rate of children applying to psychiatric emergencies is higher than that in developing countries.[25,26] Zachary and Mannix[27] stated in their study that applications to psychiatric emergencies increased in children. The incidence of psychiatric emergencies in children varies depending on the school calendar. According to the studies, the use of emergency services by children is less in the summer months and generally in the evening hours.[28,29]

The incidence of psychiatric emergencies in children increases with age. Psychiatric problems are seen in 10.2% of pre-school children, 13.2% of pre-adolescent children and 16.5% of adolescents.[30] In addition, it was reported in another study that the majority of psychiatric emergencies occur during adolescence.[26] In the study conducted by Tokgöz et al.,[31] the incidence of psychiatric diseases was reported as 0.7% in children and 4.2% in adolescents. In a study conducted in Turkey, it was reported that 3.3% of the applications

made to the pediatric emergency service were psychiatric emergencies.[32] In the international literature, there are studies evaluating the incidence of children admitted to the pediatric emergency department due to psychiatric emergencies.[26,28-30] However, there are limited studies to determine this incidence in Turkey, and such studies are needed to be conducted.[31,32]

Detection and Evaluation of Psychiatric Emergencies in Children

Psychiatric emergencies in children are determined by parents, school teachers, counselling service, nurses caring for hospitalized children, family physicians, pediatricians, psychologists, other family members, friends and social environment.[33-35]

The clinical presentation of psychiatric problems in children and adolescents is different from adults. While most adults seek help on their own behalf, children rarely do so. In addition, depending on age and development, some children are unable to provide historically and clinically relevant information. Therefore, parents or caregivers are often the primary source of information about the child's condition. However, this does not mean that children should be excluded from the process of obtaining information. In order to make the right decision about the child's behavior, the developmental appropriateness of the behavior should be determined. Moreover, it requires clinical assessment, a detailed history, mental state examination, combining all available data on biological, psychological, and social aspects, diagnosis, and differential diagnosis. In order to transfer this information to the patient and their family, a treatment plan should be created.[33-41]

Assessment

Evaluation of psychiatric emergencies admitted to the pediatric emergency should be done as follows:

- The attribution and causes of the emergency should be recorded from the information source.
- His or her past feelings, thoughts and mood about the child's family, school and living conditions as well as current difficulties should be collected.
- The factors that have caused or may cause the onset and emergence of these problems (genetic, developmental, familial, social, medical) should be determined.
- Existing problems should be identified for the treatment of the child.
- The presence of one or more psychiatric disorders in the child should be determined.
- It should be tried to form an idea about the factor that causes the emergency situation in the child.
- Possible risk situations for the safety of the child and his/her family should be determined.
- The extent to which the disease affects the child's daily life should be evaluated.
- It should be determined whether the child is at risk of harming himself/herself or others.
- Interventions that include situations that create difficulties for the child and that can improve them should be identified.
- The child and his/her family should be evaluated as a whole.
- Strength areas, sources of support and social environment within the family should be defined.
- A safe environment should be created regarding how and where the child's treatment will be carried out.
- It should be determined whether admission to the psychiatry service is necessary.[33-41]

Psychiatric Interview

The specialist who will evaluate the child's mental health should use interview and observation skills to encourage the child to talk. During the interview, this specialist should pay attention to the child's both verbal and non-verbal cues. He/she should attempt to meet with adolescent children privately in a separate room and encourage them to talk freely about their concerns.[1,2,6,33-36] The points that the specialist who communicates with the child should pay attention are as follows;

- The specialist should introduce himself/herself to the child with a short greeting.
- The specialist should explain to the child who he/she is and what he/she wants to do in clear and understandable language.
- The specialist should take into account the age and developmental level of the child when meeting with the child.
- The situation of the child may create a crisis effect. The child may want to talk about the situation, be quiet or withdrawn. Persistent behavior while talking to the child may cause a feeling of being forced into treatment.
- The child may be overwhelmed and frightened by the reaction to his/her actions. Because of this, the child may try to hide the problem. Therefore, specialists should be careful in this regard.
- No matter how bad the behavior is, one should not be accusatory against the child.
- Questions about behavior or feelings when interviewing the child should be simple.

- The child's relationship with family members and participation in solving problems should be observed.
- When meeting with the child, it should be learned how the child feels, thinks or behaves.
- With young children, it may be helpful to first talk about neutral topics to reassure the child. With this approach, the child's speech, emotion and thought patterns are evaluated.
- Adolescents value their privacy and independence and are more likely to share information if they know it will be kept confidential. In line with this information, the child should be contacted.
- Interview time with the child should not be prolonged.[1,2,6,13,33-41]

Evaluation of Mental State

It is important to take the history of psychiatric illness in the evaluation of the child's mental health. The most distinctive point here is to know that acute psychiatric disorders and mental health problems have different treatments. Psychiatric emergencies in children include delirium, aggression, violence, psychosis, depression, conversion, schizophrenia, phobia, bipolar disorder, somatic symptom disorder, eating disorders, anxiety disorders, post-traumatic stress disorder, dissociative disorders, panic disorder, behavioral disorder, intentional self-harm, suicide attempt, child abuse and neglect.[1,2,13,15,33,36,37,40,41] The following should be considered during the mental state examination of children;

- Impairment in consciousness, attention, memory, and orientation
- Neurological and physical diseases
- Neurological symptoms such as slurred speech, ataxia and apraxia
- Crisis assessment
- Inconsistency of thought and speech
- Weak memory
- Thoughts of suicide or murder
- Psychomotor agitation or retardation, restlessness
- Aggressive threats or thoughts
- Perceptual disturbances
- Impulsivity
- Poor judgment and insight
- Limited intelligence
- Withdrawal syndrome
- Hallucinations, delusions
- Drug-substance poisoning
- Depressive or aggressive mood, mood changes[13-15,33-41]

Co-occurring Disorders

In emergency situations, the most prominent acute disorder should be addressed first. For example, the mania state of an adolescent who presents to the emergency room with the diagnoses of mania and attention deficit hyperactivity disorder is first intervened. Primary psychiatric disorders that are not life-threatening should be intervened at a different time in the outpatient setting.[1,2,37,39,41]

Evaluation of Family

An immediate evaluation should focus on high-risk family mental health problems such as suicide, substance abuse, mood disorders, and psychosis. Children with a family history of psychiatric illness are at higher risk.[2,6,31,33,36]

Treatment History

Inventory and evaluation of previous treatments, including pharmacotherapy and psychotherapy, are essential in the treatment of child psychiatric emergencies. Information regarding the child's previous treatment, duration, drug doses, side effects, hypersensitivity, and adherence to treatment should be reviewed in detail.[1,2,12-15,33-40]

Nursing Approach to Pediatric Patients in Psychiatric Emergencies

Nursing interventions in psychiatric emergencies in children are mostly made for the acute stages of the disease or the first periods of the onset of the disease. After the evaluation of the child patient is completed, the nurse should cooperate with the patient and his/her family to make appropriate nursing interventions.[1,2,5,18,41] Nursing approach towards the child admitted to the psychiatric emergency is as follows;

- The nurse should himself/herself to the child and express that he/she is here to help.
- While communicating with the child, the nurse should adjust the tone of voice and make him/her feel that they are there to help.
- When the communication between the nurse and the child begins, the child should be listened and given the opportunity to express his/her feelings as he/she wishes.
- Open-ended questions should be asked during communication with the child.
- When the communication between the nurse and the child begins, the child should be listened and the nurse should make confirmative sentences indicating that he/she is listening. If the child thinks that he/she is not taken into consideration while he/she is trying to explain the events or answering the questions the nurse asks, he/she

may suddenly cut-off communication, show agitation and aggression.

- The nurse should ensure personal safety while communicating with the child.
- Aggression status should be examined in restless and agitated children, and in case of aggression, the child should be kept at a distance.
- After creating a safe environment between the child and the nurse, the patient's vital signs should be evaluated and recorded.
- In many psychiatric conditions, the negative experiences and events experienced by the child can create agitation at a level that "does not even allow you to touch and examine him/her". The nurse should approach the child in a very calm and quiet manner. In such cases, one should not be overly insistent and try to calm the child.
- "Standard first and second examinations" should be done after the child accepts the examination and assistance. While the standard first examination includes the patient's "detailed history, mental state, physical and neurological examination, laboratory and imaging tests", the second examination includes a detailed approach to "an underlying medical illness, acute psychiatric disorder and mental health".
- Among the most overlooked events in psychiatric emergencies, there are physical illnesses that may alter the child's mental state, head trauma, substance abuse, metabolic diseases, cerebrovascular diseases and drug use. For this reason, the necessary medical examinations and procedures should be performed in addition to the psychiatric evaluation of the child.
- The nurse should distinguish between acute psychiatric disorder and acute mental health while evaluating the child. With the knowledge of psychiatric emergencies, pediatric patients can be detected in the early period, their risks can be reduced and treatment can be started in the early period. Late detection of psychiatric emergencies may cause both the disease to be chronic and negative consequences such as suicide.
- During the examination, the nurse should evaluate alcohol use (alcohol smell in the breath), trauma (head and chest trauma), drug use (injection scars), and possible penetrating stab wound (scars on the body). After a short and rapid neurological examination of the child, a physical examination should be performed.[1,2,5,7,11-14,18,41]

Physical Examination

It is stated that the physical examination of the child will be carried out by a physician or a healthcare professional under the supervision of a physician, according to the regulation on "Physical Examination, Genetic Examinations and Determination of Physical Identity in Criminal Procedure".[42] One of the data collection methods regarding the child's condition within the scope of the nursing diagnosis process is physical examination.[43] While performing the physical examination of the child, first "inspection" and then "palpation method" should be used. During the physical examination, the room lighting should be sufficient and the necessary medical supplies should be available. The nurse should inform the child about the physical examination in a language that he/she can understand, and then obtain the child's verbal consent, and both verbal and written consent from the parents. Relatives of the child should not be present in the room during the physical examination. Depending on the child's wishes, another nurse may also attend the physical examination. The nurse should reassure and calm the child during the physical examination. If there is a "suspect for forensic case", the forensic law enforcement officers should be notified regardless of the nature of the case while medical treatment is being administered.[43,44] The child, who is thought to be a forensic case, should be prevented from "taking a bath and changing the clothes on before the examination".[43-45]

In this process, the nurse is the first person to see the child, to communicate with his/her family, and to deal with the laboratory samples.[46] While examining and treating pediatric cases, deficiencies and mistakes may occur from time to time in the detection, collection, documentation, protection and storage of all evidence that can constitute forensic evidence. Particularly documentation of information and evidence that can be considered as evidence is very important in terms of preventing the loss of evidence, the judicial process to hinder and unfair victimization.[47,48]

Physicians and nurses should wear gloves while collecting forensic evidence so that the collected evidence is not contaminated, and they should change their gloves while collecting each different evidence. When collecting evidence, attention should be paid to the child's clothing and traces. In case of penetrating stab wounds, the holes should not be damaged when removing the child's clothes, and if there are suspicious stains, they should be circled and documented with a photograph.[49-51] In order not to lose the evidence in the clothes, the child is provided to undress standing on a wide and white sheet. In cases where the clothes cannot be removed, the clothes should be cut as far as possible from the area of the wound and the procedure should be noted as "clothing was cut".[52,53] All lesions on the skin such as wounds, burns, abrasions, ecchymosis (bruises) and scars should be determined. If there are traces of substance use in the child's body, a blood sample should be taken within the first 48 hours and a urine sample within 120 hours for

the detection of the drug substance. Samples taken should be placed in two sterile containers.[54] The entire lesioned area is measured and camera recording should be made simultaneously. The "color, shape, appearance, location and measurement results" of the lesion on the skin should be recorded.[49,55,56] All evidence obtained should be placed in separate paper bags in a dry condition. If the evidence is wet or damp, it should be left to air dry and delivered to the laboratory where the drying process will be carried out as soon as possible.[55] The person collecting the evidence enumerates each of the paper bags and writes "the name of the accused/victim, the protocol number, gender, date/time of arrival, date of birth, complaints, findings, examinations, wounds, the examination performed, the name of the examining doctor and the name of the nurse who collected it" for recording.[49-51,53,55]

Treatment

After making a rapid evaluation of the child who applied to the emergency department with psychiatric complaints, the physician should intervene by evaluating the previous treatment history for the "child's mood, thought and behavioral disorders". These interventions aim the psychiatric and medical differential diagnosis of the child and includes medical and surgical treatment, pharmacotherapy, psychotherapy, and social therapy.[4]

Pharmacotherapy changes depending on the psychiatric diagnosis of the child. Among the pharmacotherapies recommended in the pediatric emergency department are "lorazepam, risperidone, biperiden, sertraline, aripiprazole, olanzapine, fluoxetine, hydroxyzine, clonazepam, haloperidol, quetiapine, valproic acid, escitalopram, paroxetine, and mirtazapine."[3,57] In the management of pharmacotherapy, the emergency nurse is responsible for "collecting data on drug use, knowing and observing the effects and side effects of drugs, administering the drug (by knowing the dose and route of administration), evaluating the response to the drug, recording it, organizing the treatment program in cooperation with the treatment team, and giving education to the individual and the family on the continuation of drug use after discharge".[58,59] The points that should be paid attention by the pediatric emergency nurse while administering medication to the child patient are as follows:

- Before administering the treatment, the child and family should be informed about the treatment.
- The child's and parents' questions about treatment should be answered clearly.
- The nurse should have knowledge about the "pharmacokinetic and pharmacodynamic effects" of the drugs administered to the child and should administer the treatment accordingly.
- The nurse should administer the drug to the child in line with the "10 right principles".
- The nurse should inform the child and parents about "how the drug to be administered is taken, its effect, side effects, management of side effects and duration of effect".
- Medications in the emergency room should be kept in locked cabinets in rooms where patients cannot reach.
- The child should be observed to ensure that he/she gets the drug during the treatment.
- The nurse should inform the physician if the child vomits the drug and should repeat the administration of the drug in line with the doctor's recommendation.
- The nurse should observe the child's reaction to the drug and inform other members of the team.[60,61]

If "the child's affection, thinking, and impulse control is impaired to such an extent that it harms him/herself and his/her surroundings, his/her lifestyle becomes so confused as to disintegrate his/her psychic structure, the risk of suicide is high and social support is weakened", the physician should contact the child and adolescent psychiatrist after completing the examination. If necessary, hospitalization of the child can be decided. The child's hospitalization is carried out after getting the informed consent of the parents.[57,62,63]

Conclusion

In this review, general information about childhood psychiatric emergencies, risk factors, incidence, detection, evaluation and nursing approach is given. Pediatric emergency services play a vital role in the management of pediatric patients with psychiatric emergencies. Psychiatric conditions in children and adolescents are predicted to be an increasing risk factor globally in the near future. A multidisciplinary approach is very important in the management of psychiatric emergencies in childhood. In order to display this approach, parents, nurses, pediatricians, emergency specialists, psychiatrists and psychologists should be included in this team. After the evaluation of the child patient is completed, especially pediatric, emergency and psychiatry nurses should cooperate with the child and their family.

Ethics

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: B.A., İ.K., Design: B.A., İ.K., Literature Search: B.A., İ.K., Writing: B.A., İ.K.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2021.99815
J Pediatr Emerg Intensive Care Med 2022;9:74-9

Retrospective Evaluation of Cases Accepted by Inter-hospital Transfer to the Pediatric Emergency Clinic

Çocuk Acil Kliniğine Hastaneler-arası Transferle Kabul Edilen Olguların Retrospektif Değerlendirilmesi

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Abstract

Introduction: Inter-hospital transport is an important process of pediatric emergency and pediatric intensive care; the patient is transferred to another center with the emergency medical services. Inter-hospital transport can be life-saving for pediatric patients, but the process can logistically be difficult and risky. The actions required to prevent unwanted events during transport depend mostly on the accurate and reliable data obtained. We think that research on the transport of pediatric patients is limited in our country. Our study investigated the characteristics of pediatric patients transferred to our unit by ambulance and the problems during transport.

Methods: One hundred and eighty-three patients under the age of 18 who were referred to the pediatric emergency service between June 2017 and June 2019, whose data were regularly recorded, were included in our study. Data of patients who were sent to the external center for consultation via 112 were excluded. The list of the transferred patients was obtained from 112 command centers in our city and the patient records were analyzed retrospectively with the hospital information management system.

Results: Fifty-nine percent of the 183 patients included in our study were male. The mean age of the patients was 62.2±39.1 months. Fourty-two percent of the patients were between 1 month and 3 years old. We found that the most frequent transports are in the spring with 42.6% and 50.9% of the transports took place between 16.00-00.00 hours. We found that the most common transported patients were pneumonia with 28.4% and respiratory distress was the most common adverse event during transport with 7.1%.

Conclusion: In the transfer of pediatric patients between hospitals, every step, from the training of staff to the equipment in the ambulance, should be planned in detail. We believe that more studies are needed to examine transport protocols for children's emergency medical services, the level of education required by the transport team, the state of the medical device used in the transport process, the patient's pre and posttransport stability, and the safety of the patient during the transport period.

Keywords: Child, ambulance, patient transfer, emergency medical services

Öz

Giriş: Hastaneler arası nakil çocuk acil ve çocuk yoğun bakımın önemli bir süreci olup; acil tıp hizmetleri ile hasta gerektiğinde başka bir merkeze nakledilir. Hastaneler arası nakil çocuk hastalar için hayat kurtarıcı olabilir ancak bu süreç lojistik açıdan zor ve risklidir. Nakil sırasında istenmeyen olayları engellemeye yönelik eylemlerimiz çoğunlukla elde edilen doğru ve güvenilir verilere bağlıdır. Literatürde çocuk hastaların hastaneler arası nakli ile ilgili yapılan çalışmaların kısıtlı olduğunu düşünüyoruz. Çalışmamızda ünitemize ambulansla nakledilen çocuk hastaların özelliklerini ve nakil sırasında yaşadığı sorunları araştırmayı amaçladık.

Yöntemler: Haziran 2017-Haziran 2019 tarihleri arasında, 3. basamak sağlık merkezi olan hastanemiz çocuk sağlığı ve hastalıkları acil servise nakil olması kabul edilmiş 18 yaşından küçük 183 hasta alındı.

Bulgular: Çalışmamıza katılan 183 hastanın %59'u erkekti. Hastaların yaş ortalamasının 62,2±39,1 ay idi. Nakledilen hastaların %42,1'i 1 ay-3 yaş arasında idi. En sık naklin %42,6 ile ilkbahar mevsiminde olduğunu ve %50,9'unun 16.00-00.00 arasında naklediğini saptadık. Transport tanıları açıdan değerlendirildiğinde %28,4 ile en sık pnömoni hastalarının nakil edildiğini ve nakil sırasında istenmeyen olay olarak %7,1 ile solunum sıkıntısı olduğunu bulduk.

Sonuç: Hastaneler arası çocuk hastaların naklinde; çalışanların eğitiminden ambulansta bulunan ekipmanlara kadar her basamak ayrıntılı bir şekilde planlanmalıdır. Çocuklar için acil tıp hizmetlerinin nakil protokollerini, nakil ekibinin gereksinim duyacağı eğitim düzeyini, nakil işleminde kullanılan tıbbi cihaz durumunu, hastanın nakil öncesinde ve sonrasındaki stabilizasyonunu ve nakil süresinde hasta güvenliğini araştıran daha geniş ve kapsamlı çalışmalara ihtiyaç olduğunu düşünüyoruz.

Anahtar Kelimeler: Çocuk, ambulans, hasta transferi, acil tıp hizmetleri

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Received/Geliş Tarihi: 25.12.2020 **Accepted/Kabul Tarihi:** 19.04.2021

Introduction

Emergency medical services are the provision of appropriate health care outside of hospital, during transport, or at a hospital when a person requires immediate medical attention if suddenly becoming ill or injured.[1] Children's emergency services are the components of emergency medical services which address children's medical needs. These pediatric emergency services consist of protection from injuries, pre-hospital medical care, hospital medical treatment, rehabilitation, and transport between hospitals.[2] Within emergency medical services, inter-hospital transport is an important process that pediatric emergency and intensive care units rely on transfering a patient to another center when necessary. Inter-hospital transport can be life-saving for pediatric patients, but the process can logistically be difficult and risky, especially if it causes the patient's physiology to deteriorate and triggers unwanted events.[3] The frequency of undesirable events is proportional to the duration of the transfer, the severity of the pre-transfer disease, and the experience of the emergency medical personnel.[4,5] Identifying the main problems that may occur during pediatric patient transport will reinforce our knowledge for addressing children's needs during emergency situations, and the actions required to prevent unwanted events during transport depend mostly on the accurate and reliable data obtained.[6] We think that research on the transport of pediatric patients is limited in our country. Our study investigated the characteristics of pediatric patients transferred to our unit by ambulance and the problems that are experienced during transport.

Materials and Methods

One hundred and eighty-three patients under the age of 18 who were referred to the Çanakkale Onsekiz Mart University Pediatric Emergency Service between June 2017 and June 2019, whose data were regularly recorded, were included in our study. Data of patients who were sent to the external center for consultation via 112 were excluded. The list of the transferred patients was obtained from 112 command centers in our city and the patient records were analyzed retrospectively with the "hospital information management system". Our study was approved by the Çanakkale Onsekiz Mart University Ethics Committee on 20.08.2020 with the decision number 2020-11. A form was created that included age, gender, referral diagnosis, distance between centers, time of transport, duration of transport and problems encountered during transport. After the patient was admitted to the 112 command center; the time between the patient's departure from the first center and his arrival at our hospital was accepted as the golden hour. Ambulances with 12-channel ECG, a monitor with pulse peak, minute respiratory rate, transport ventilator and aspirator device were used by 112 command centers for patient transport.

Statistical Analysis

IBM Statistics 23.0 (SPSS) statistical package program was used to evaluate the statistical data in our study. Number, percentage, mean and standard deviation were calculated in the presentation of descriptive data.

Results

Fifty-nine percent of the 183 patients included in our study were male. The mean age of the patients was 62.2±39.1 months. Within the patient sample, 11.5% were newborns, 42.1% were 1 month to 3 years old, 7.1% were 3-5 years old, 34.9% were 5-15 years old, and 4.4% were older than 15 years (Table 1). Considering the seasonal variations in transport between hospitals; transports most commonly occurred in the spring. It was observed that the transfer frequency was 42.6% in the spring, 38.7% in the winter, 17.3% in the summer, and 1.4% in the autumn. In 2018, the frequency of transport was 20.7% in the spring, 19.6% in winter, and 9.2% in summer. In 2019, it was found to be 21.9% in spring, 19.1% in winter,

Table 1. Epidemiological characteristics of transport patients

	Mean ± SD (min-max)		
Age (month)	**62.2±39.1 (1-192)**		
	n (%)		
Gender			
Female	75 (41)		
Male	108 (59)		
Age			
0-1 month	21 (11.5)		
1 month-3 years	77 (42.1)		
3-5 years	13 (7.1)		
5-15 years	64 (34.9)		
>15 years	8 (4.4)		
	n (%)	**2018 (n) (%)**	**2019 (n) (%)**
Season			
Spring	78 (42.6)	38 (20.7)	40 (21.9)
Winter	71 (38.7)	36 (19.6)	35 (19.1)
Summer	32 (17.3)	17 (9.2)	15 (8.1)
Autumn	2 (1.4)	1 (0.7)	1 (0.7)
Transport time			
08.00-16.00	65 (35.5)		
16.00-00.00	93 (50.9)		
00.00-08.00	25 (13.6)		
Transport reason			
Further examination and treatment	158 (86.3)		
Need for intensive care	25 (13.7)		
Referring center			
Second level state	174 (95.1%)		
Third level state	2 (1.1%)		
Private hospital	7 (3.8%)		
Total	183 (100)		

SD: Standard deviation, n: Number of cases

and 8.1% in summer (Figure 1). Considering the distribution of patient transfers throughout the day; it was seen that transports most frequently took place outside of official working hours with 50.9% of the patient transports occurring between 16:00-00:00 hours, 35.5% between 08:00-16:00 hours, and 13.6% between 00:00-08:00 hours (Table 1). While 86.3% of the patients were referred for further examination and treatment, 13.7% were referred because of the need for intensive care. Ninety-five percent of the transferred patients were referred from the second level hospital, 1.1% from the third level state hospital, and 3.8% from the private hospital (Table 1). When the patients transferred by ambulance were evaluated, the diagnosis frequencies were as follows: 28.4% pneumonia, 24.6% bacteremia, 20.8% central nervous system pathologies, 7.1% intoxication, 7.1% gastrointestinal system pathologies, 5.5% trauma, 2.8% hematological diseases, and rarer diseases was neuromuscular pathologies, cardiac pathologies, malignancy, epiglottitis, and soft tissue diseases (Table 2, 3) (Figure 2). Twelve of the patients (6.5%) transported by ambulance were intubated. While 7.1% of the patients had dyspnea, 5.5% were unconscious, two patients had arrhythmia, and two patients had hypotension (Table 4). During the transfer of the patients, there were no complications related to the equipment, such as misplacement or lack of endotracheal tubes or vascular access, monitoring, and ventilator devices. The average transport distance was determined to be 51.4±30.0 kilometers. The time elapsed between the admission of patients from 112 command centers and arrival at our hospital was 55.7±39.1 minutes. The mean transfer time of patients who were less than 50 kilometers away from our center was 41.1±3.8 minutes, while it was 63.6±3.3 minutes for those between 50-150 kilometers, and 128.3±16.3 minutes for distances further than 150 kilometers (Table 5). An ambulance helicopter was used for one patient being transferred from a distance further than 150 kilometers. It was observed that the duration of the transport using an ambulance helicopter was reduced to 30 minutes and no complications occurred during the transport.

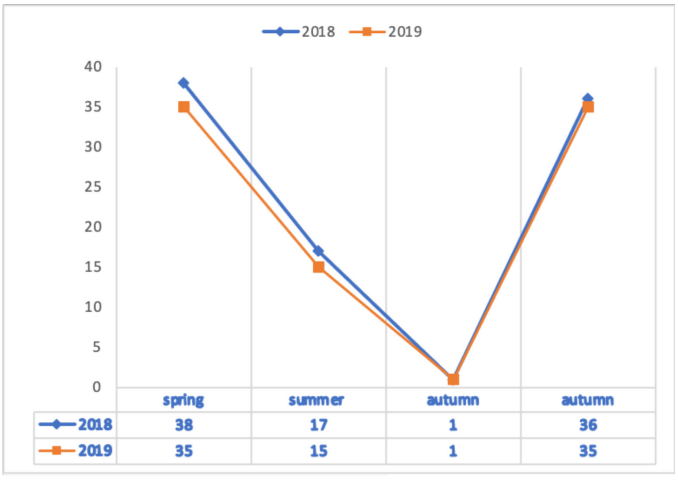

Figure 1. Transport patients according to the seasons

Discussion

In our study, in which we investigated the problems and characteristics of pediatric patients during transport, we found that 42.1% of the patients transferred to our unit were between the ages of 1 month and 3 years, and 11.5% were newborns. Chaichotjinda et al.[7] in a study conducted on 122 pediatric patients in 2020, 30% of the patients were younger than 1 year old. Gupta and Rettiganti[8] they also reported that 59.6% of the 401 patients they evaluated the transport process in 2020 were younger than 1 year old, and 20.9% were newborns. Qui et al.[9] they reported that 22.9% of them were in the neonatal group in their study on 9.231 children. In our study, the reasons for the lower neonatal transfer rate compared to other studies in the literature are; In studies, we evaluated the high rate of transport of children with malformations, transfers of mothers requiring neonatal hospitalization before birth and low fertility rate in our location (1.47 children in our city and the province with the tenth lowest rate in our country).[10]

In our study, patients referred with a diagnosis of pneumonia were observed more frequently in winter months, while more patients were referred for bacteremia and central nervous system diseases in spring and summer months. Qui et al.[9] reported that 29.9% of the transports were made in winter and 29.5% in spring. We think that the reason for the seasonal change in the number of cases is the seasonal changes of childhood pneumonia and viral infections. In our study, 28.9% of transport patients were diagnosed with pneumonia and 21.9% were neurological system diseases. In the study conducted by Chaichotjinda et al.[7], 17% of the

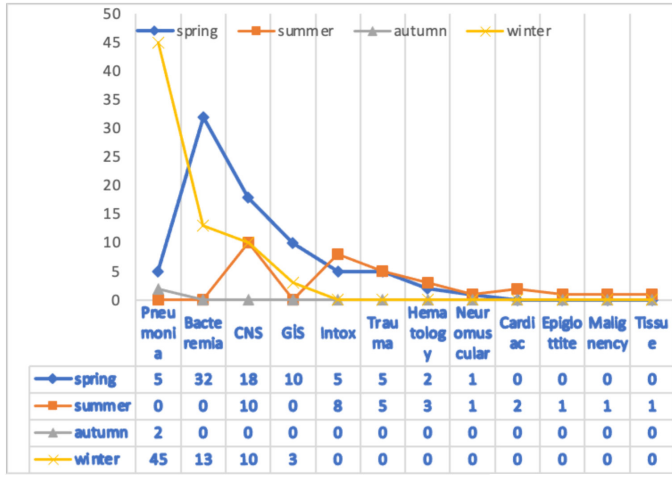

Figure 2. Transported patient diagnoses according to the seasons
CNS: Central nervous system, GIS: Gastrointestinal system

Table 2. Evaluation of transport time and diagnosis of transport patients

	n (%)	08.00-16.00 (n) (%)	16.00-00.00 (n) (%)	00-08.00 (n) (%)	
	Transport time (mean ± SD) (minutes)				
Pneumonia	52 (28.4)	23 (12.5)	25 (13.6)	4 (2.3)	47±25
Bacteremia	45 (24.6)	9 (4.2)	30 (16.2)	6 (3.2)	52±31
CNS pathology	38 (20.8)	10 (5.4)	21 (11.6)	7 (3.8)	56±38
GIS pathology	13 (7.1)	7 (3.7)	3 (1.7)	3 (1.7)	77±50
Intoxication	13 (7.1)	6 (3.4)	4 (2.0)	3 (1.7)	54±16
Trauma	10 (5.5)	5 (2.8)	3 (1.7)	2 (1.0)	80±68
Hematological diseases	5 (2.8)	2 (1.0)	3 (1.8)	0 (0.0)	65±17
Neuromuscular pathology	2 (1.1)	1 (0.5)	1 (0.5)	0 (0.0)	37±3
Cardiac pathology	2 (1.1)	1 (0.5)	1 (0.5)	0 (0.0)	57±45
Epiglottite	1 (0.5)	1 (0.5)	0 (0.0)	0 (0.0)	80
Malignancy	1 (0.5)	0 (0.0)	1 (0.5)	0 (0.0)	60
Tissue diseases	1 (0.5)	0 (0.0)	1 (0.5)	0 (0.0)	75
Total	183 (100)	65 (35.5)	93 (50.9)	25 (13.6)	55.7±39.1

SD: Standard deviation, n: Number of cases, CNS: Central nervous system, GIS: Gastrointestinal system

Table 3. Evaluation of season and diagnosis of transport patients

	n (%)	Spring	Winter	Summer	Autumn
Pneumonia	52 (28.4)	5 (2.7)	45 (24.3)	0 (0.00)	2 (1.4)
Bacteremia	45 (24.6)	32 (17.4)	13 (7.2)	0 (0.00)	0 (0.00)
CNS pathology	38 (20.8)	18 (10.0)	10 (5.4)	10 (5.4)	0 (0.00)
GIS pathology	13 (7.1)	10 (6.2)	3 (1.9)	0 (0.00)	0 (0.00)
Intoxication	13 (7.1)	5 (2.7)	0 (0.00)	8 (4.3)	0 (0.00)
Trauma	10 (5.5)	5 (2.7)	0 (0.00)	5 (2.7)	0 (0.00)
Hematological diseases	5 (2.8)	2 (1.1)	0 (0.00)	3 (1.7)	0 (0.00)
Neuromuscular pathology	2 (1.1)	1 (0.5)	0 (0.00)	1 (0.5)	0 (0.00)
Cardiac pathology	2 (1.1)	0 (0.00)	0 (0.00)	2 (1.1)	0 (0.00)
Epiglottite	1 (0.5)	0 (0.00)	0 (0.00)	1 (0.5)	0 (0.00)
Malignancy	1 (0.5)	0 (0.00)	0 (0.00)	1 (0.5)	0 (0.00)
Tissue diseases	1 (0.5)	0 (0.00)	0 (0.00)	1 (0.5)	0 (0.00)
Total	183 (100)	78 (42.6)	71 (38.8)	32 (17.5)	2 (1.1)

n: Number of cases, CNS: Central nervous system, GIS: Gastrointestinal system

patients were transported for respiratory system diseases and 22% for neurological system diseases. Hamrin et al.[11] they reported transportation due to respiratory system diseases with a rate of 45.9%. In the study conducted by Qui et al.[9] the rate of respiratory system diseases was 30%, and the rate of neurological system diseases was 18.8%. Walls et al.[12] In the study they evaluated 3.288 in 2015, 23% of respiratory system-borne diseases and 8% were neurological pathologies. Similar to the literature, in our study, it was observed that respiratory and neurological pathologies were more common in patients referred to our unit. Soysal et al.[13] in the study in which 1.666 patients evaluated the transportation process in 2004, 18.7% were respiratory system-related diseases and 21.7% were neurological diseases.

In our study, we found that patients were most frequently referred to our unit between 16:00 and 00:00. The most likely reason for the transfer of patients during these hours may be as a result of the insufficient number of specialist physicians in referring institutions outside of official working hours. We found that pneumonia (13.6%) and bacteremia (16.2%) cases were referred to our unit between 16:00 and 00:00. Qui et al.[9] the found that the transfer hours were concentrated between 08:00 and 16:00. The study by Chaichotjinda et al.[7] reported that transports occurred more frequently between 16:00-00:00 hours. It would be useful to plan more studies to explore other reasons for the timing of transfers.

In our study, adverse events were encountered in 21.3% of the patients during transport, with respiratory distress being

Table 4. Problems encountered during transport	
	n (%)
Respiratory distress	13 (7.1)
Intubation	12 (6.5)
Impaired consciousness	10 (5.5)
Arrhythmia	2 (1.1)
Hypotension	2 (1.1)
Total	39 (21.3)
n: Number of cases	

Table 5. Distance of transport patients and transport time		
Kilometer	**n (%)**	**Transport TIME (mean ± SD) (minutes)**
<50	96 (52.5)	41.1±3.8
50-150	78 (42.6)	63.6±3.3
>150	9 (4.9)	128.3±16.3
Total	183 (100)	55.7±39.1
SD: Standard deviation, n: Number of cases		

the most frequent complication in 7.1% of the patients. In the study conducted by Hatherill et al.[14], it was reported that 18% of 71 pediatric patients who were transported had undesirable events, with respiratory distress occurring in 6% of the patients. In the study performed by Ligtenberg et al.[15], in which transport patients were evaluated, they reported 10% of patients having respiratory distress. In their study, Chaichotjinda et al.[7] reported that the majority of hardware malfunctions were related to endotracheal tube slippage, loss of vascular access, oxygen depletion, and insufficient battery reserves for medical equipment. We believe the results from our study coincide with the results in the literature, but our study differed from the literature in that there were no hardware malfunctions, such as oxygen deficiency and lack of batteries, in the records. In our study, we could not determine whether the patients were exposed to hypo/hyperglycemia during the transfer because their blood sugar could not be checked. In order to prevent undesirable events, we believe it is vital to verify the hardware that may be required during transportation before the transfer begins.

There are studies in the literature that have investigated the time between the decision to transport and the time of leaving the center.[16,17] In the study conducted by Qui et al.[9], the mean transport time of the patient from the primary center was found to be 30 minutes. We investigated the golden hour application described by Stroud et al.[18] and found this time to be 55.7±39.1 minutes. While the average transport distance was 51.4±30.0 kilometers, we saw that the longer the transport distance, the longer the transport time. In a study of 100 patients performed by Ligtenberg et al.[15], the mean transport time for a distance of 57±43 kilometers was found to be 47±30 minutes. Hamrin et al.[11] they reported the mean transport distance as 115 kilometers. In our study, the mean transfer time of patients referred with a diagnosis of pneumonia was found to be 47±25 minutes, those referred with a diagnosis of bacteremia was 52±31 minutes, and those referred with a diagnosis of gastrointestinal system pathologies was 56±38 minutes. There were, however, limited studies in the literature for comparing data for this subject.

Study Limitations

The limitations of our study is that our study was single-centered, end-tidal carbon dioxide could not be measured during transport, blood glucose was not monitored for illness, and the number and education level of the personnel who performed the transport were unknown. The strength of our study is that it is one of the first studies to describe the socio-demographic data and adverse events during the transport of pediatric patients transferred to our hospital in the South Marmara.

Conclusion

The results of this study will be useful information to develop a referral guide to improve the quality of the pediatric patient transport system in the future.

Ethics

Ethics Committee Approval: Our study was approved by the Çanakkale Onsekiz Mart University Ethics Committee on 20.08.2020 with the decision number 2020-11.

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: T.Ç., S.G., F.B., Concept: T.Ç., S.G., F.B., Design: T.Ç., S.G., F.B., Data Collection or Processing: T.Ç., S.G., F.B., Analysis or Interpretation: T.Ç., S.G., F.B., Literature Search: T.Ç., S.G., F.B., Writing: T.Ç., S.G., F.B.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2021.58569
J Pediatr Emerg Intensive Care Med 2022;9:80-4

Hemovigilance Questionnaire in Pediatric Emergency and Pediatric Intensive Care Units

Çocuk Acil ve Çocuk Yoğun Bakım Ünitelerinde Hemovijilans Anket Çalışması

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Abstract

Introduction: Hemovigilance is a monitoring procedure that covers all transfusion steps from the collection of blood and blood components to the follow-up of end recipients. This procedure provides information about unexpected and undesirable effects caused by the use of blood products and evaluates them, and aims to prevent their occurrence and recurrence.

Methods: Data were collected by filling in the questionnaire form created to determine the level of knowledge of pediatric emergency and pediatric intensive care nurses on blood and blood products transfusion via the online access link.

Results: A total of 45 people answered the questionnaire sent. It was learned that 88.9% of the participants in the study completed undergraduate and graduate degrees. Of the responding nurses, 31 (68.9%) reported that there were hemovigilance nurses in their hospitals, and 39 (86.7%) received in-service training on the use of blood and blood products. The questions that the nurses gave the most wrong answers were about the storage periods of blood products. The question "If it is not transfused how long can the blood product be stored in the refrigerator for the longest time?" was answered correctly at a rate of 40%. The correct answer was 33.3% to the question "How long is fresh frozen plasma stored after thawing" and 20% to the question "What are the storage conditions of thrombocyte suspension". All the nurses answered, "If there is a reaction during transfusion, I will stop the transfusion".

Conclusion: The hemovigilance system has emerged as a tool to increase the quality and safety of transfusions. This study provides data on the knowledge gaps of nurses who care for critically ill children. We think that the educations will contribute to hemovigilance practices by increasing the knowledge level of transfusion with both national-level pieces of training and in-service training for healthcare personnel.

Keywords: Hemovigilance, blood transfusion, transfusion reaction, pediatric intensive care

Öz

Giriş: Hemovijilans; kan ve kan bileşenlerinin elde edilmesinden başlayarak son alıcıların takibine kadar bütün transfüzyon basamaklarını kapsayan, kan ürünlerinin kullanımı sonucu oluşan beklenmeyen ve istenmeyen etkiler hakkında bilgi toplanması ve değerlendirilmesini sağlayan, bunların oluşumunu ve tekrarlamasını önlenmeyi hedefleyen izleme prosedürüdür. Ülkemizde de 2016 yılından itibaren ulusal hemovijilans sistemi uygulaması başlatılmıştır.

Yöntemler: Çocuk acil ve çocuk yoğun bakım hemşirelerinin kan ve kan ürünleri transfüzyonu konusunda bilgi düzeylerinin belirlenmesi amacıyla oluşturulan anket formunun internet erişimli link üzerinden doldurulması ile veriler toplanmıştır.

Bulgular: İnternet üzerinden gönderilen anketi toplamda 45 kişi yanıtladı. Çalışmaya katılanların %88,9'unun lisans ve yüksek lisans tamamladığı öğrenildi. Yanıt veren hemşirelerden 31'i (%68,9) hastanelerinde hemovijilans hemşiresi bulunduğunu, 39'u (%86,7) kan ve kan ürünleri kullanımı hakkında hizmet içi eğitim aldığını bildirmiştir. Çalışmaya katılan hemşirelerin en çok yanlış cevap verdikleri sorular kan ürünlerinin saklanma süreleri ile ilgili olanlardı. "Kan merkezinden getirtilen kan ürünü transfüze edilmedi ise en uzun ne kadar süre buzdolabında saklanabilir?" sorusuna %40, "Taze donmuş plazma eritildikten sonra hangi koşullarda ne kadar süre saklanır?" sorusuna %33,3 ve "Trombosit süspansiyonunun saklama koşulları nelerdir?" sorusuna %20 oranında doğru cevap verildi. Tüm hemşireler "Transfüzyon sırasında reaksiyon olursa transfüzyonu durdururum" doğru cevabını verdiler.

Sonuç: Hemovijilans sistemi transfüzyonların kalitesini ve güvenliğini artırmaya yönelik bir araç olarak ortaya çıkmıştır. Bu çalışma kritik hasta çocuklara bakım veren hemşirelerin bilgi eksikliklerine ilişkin veri sağlamaktadır. Sağlık personeline yönelik gerek ulusal düzeyde gerekse hizmet içi eğitimlerin transfüzyon konusunda bilgi düzeylerini artırılarak hemovijilans uygulamalarına katkıda bulunacağını düşünmekteyiz.

Anahtar Kelimeler: Hemovijilans, kan transfüzyonu, transfüzyon reaksiyonu, çocuk yoğun bakım

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Received/Geliş Tarihi: 02.02.2021 **Accepted/Kabul Tarihi:** 25.04.2021

Introduction

Although it is known that there has been experience in blood transfusion since ancient times, blood and blood components came into routine use with the discovery of blood group antigens, typing methods and donor-recipient comparison tests at the beginning of the 20th century.[1] As well as determining the indications for use of blood and/or blood components, it is very important to store the components, to transport them safely to the recipient, and to know and follow the reactions that occur during or after the transfusion of the component.[2] Hemovigilance is a series of follow-up procedures that cover the entire transfusion chain from collection of blood and blood components to follow-up of recipients, aiming to collect and evaluate information about unexpected and undesirable effects resulting from the therapeutic use of blood products, and to prevent their occurrence and recurrence. Hemovigilance was first defined in France in 1993, and then came to the fore in the European Union documents in 1995.[3] Definitions related to the hemovigilance system may differ from country to country. The main goal of hemovigilance is to increase the safety of the blood donor and recipient by preventing the recurrence of undesirable reactions and events. The data in the hemovigilance system should be analyzed periodically, the results should be reported, and the reports should be shared with the relevant authority so that undesirable events and effects do not recur. According to the results, preventive and corrective measures should be taken, and early warning systems should be established.[4]

Studies on hemovigilance in our country first started in 2004, and the establishment of a transfusion committee became obligatory in hospitals using blood and blood components with the published circular. The working principles and duties of the committee included evaluating the transfusion reactions observed in the hospital and taking precautions to prevent them. With the National Blood and Blood Products Guideline published in 2009 in addition to the Blood and Blood Products Regulation, standard forms for hemovigilance notifications came into force. In 2016, hemovigilance system implementation was started in our country within the scope of national legislation.[4]

In our country, some studies have been carried out in order to evaluate blood transfusion safety and knowledge level. However, although awareness about hemovigilance and interest in hemovigilance nursing have increased recently, no studies have been conducted on this subject in pediatric intensive care units before. In this study, it was aimed to determine the level of knowledge of pediatric emergency and pediatric intensive care nurses about transfusion and its reactions and to evaluate the practices related to transfusion in a multicenter manner. After the study, it was planned to increase the knowledge level of health personnel about hemovigilance by adjusting the trainings and to draw attention to the importance of hemovigilance nursing.

Materials and Methods

In the study, a questionnaire form was created by using the literature in order to determine the level of knowledge of pediatric emergency and pediatric intensive care nurses about blood and blood product transfusion. The data of the research were collected by filling out the prepared questionnaire form by the participants via an internet-accessible link. Data collection period was determined as 2 months. In total, questionnaires were sent to 112 people from 48 centers and responses were received from 45 people. The questionnaire consisted of 15 questions to measure the knowledge level of hemovigilance, as well as questions about age, gender, years of working in the profession, working position, department, and whether or not they received in-service training on hemovigilance.

Statistical Analysis

Demographic data were presented in the study. Results were given as percentages and numbers.

The study was conducted with the approval of the Akdeniz University Clinical Research Ethics Committee (date: 13.01.2021, no: KAEK-11).

Results

Responses were received from a total of 45 people who were sent internet-enabled survey link. Thirty (66.7%) of the participants were in the age range of 25-35 years, 3 (6.6%) were under the age of 24 years, and 12 (26.7%) were over the age of 35 years. Considering the educational status, it was learned that 5 people (11.1%) completed an associate degree, 40 people (88.9%) had a bachelor's and master's degree. Eighteen (40%) of all participants worked in the responsible nurse position, while 36 (80%) worked in the pediatric intensive care unit. There were 8 (17.8%) nurses whose working period was less than 4 years, 23 (51.1%) nurses working between 5-9 years and 14 (31.1%) nurses with a working period over 10 years. Among the respondents, 36 nurses (80%) were working in the pediatric intensive care unit, and 9 nurses (20%) were working in the pediatric emergency service.

Of the nurses who responded, 31 (68.9%) reported that there were hemovigilance nurses in their hospitals, and 39 (86.7%) received in-service training on the use of blood and blood products. Demographic characteristics of the study group are shown in Table 1.

Table 1. Demographic characteristics of the study group

	Yes	No
Is there a hemovigilance nurse in your institution?	68.8%	31.1%
Have you received in-service training on blood transfusion?	86.7%	13.3%
Do you have/do you use consent form from patient and relatives for blood transfusion?	84.5%	15.5%
Do you do cross-match control at the bedside? (For erythrocyte suspension or whole blood)	57.8%	42.2%
Do you routinely use a leukocyte filter?	53.3%	46.6%
Do you check the components during blood transfusion, do you record them on your forms?	77.8%	22.2%

Seven (15.6%) nurses reported that there was no consent form for patients and their relatives for blood transfusion, and 3 (6.7%) nurses reported that the forms were not used routinely. Thirty-five (77.8%) nurses reported that component control and recording with a special form were routinely performed during blood transfusion. It was reported that the transfusion control form was signed by the physician and nurse together in 66.7%, by two nurses in 24.4%, by two physicians in 4.4%, by a single nurse in 2.2% and by any health personnel in 2.2%. Eighteen (40%) nurses gave the correct answer to the question "If the blood product brought from the blood center is not transfused to the patient, how long can it be stored in the refrigerator?". The question "How long and under what conditions is FFP stored after melting?" was answered correctly by 33.3% (n=15) and the question "What are the storage conditions of the platelet suspension?" was answered correctly by 20% (n=9). The rate of correct answer for the question "How is temperature control ensured before blood transfusion is given?" was 80% (n=36). Bedside cross match was performed at a rate of 57.8% (n=26), and leukocyte filter was routinely used at a rate of 53.3% (n=24). The rate of answering the question "If you are using a leukocyte filter, for which blood products do you use?" was 88.9% (n=40), the rate of answering the question "In which blood product or products is the leukocyte filter definitely not used?" was 73.3% (n=33). The correct answer was given by 33.4% (n=15) for the question "Which components can be used with blood transfusion?". All nurses gave the correct answer, "If there is a reaction during the transfusion, I will stop the transfusion". The rate of answering the question "What should be the initial rate of blood transfusion?" was 66.7% (n=30). The answers of the study group to all questions related to hemovigilance are given in Table 2.

Discussion

Transfusion of blood products in critically ill patients is among common procedures in pediatric intensive care units. Erythrocyte suspension, thrombocyte suspension and fresh frozen plasma transfusions are performed mainly. It should not be forgotten that these procedures, which have positive effects on the survival and healing process of the patients, can also cause side effects and increase morbidity and mortality. In addition, this practice is not without risk as it may lead to undesirable events or accidents for both the donor and the receiver.[5] The hemovigilance system has emerged as a tool dedicated to improving the quality and safety of transfusions.[6] It is very important for healthcare professionals to have sufficient knowledge and skills in order to perform safe blood transfusion. The person administering the transfusion should have sufficient knowledge and skills about giving the right blood to the right patient, informing the patient or his/her relatives about the transfusion, keeping the blood appropriately, observing the patient for signs of reaction during warming and transfusion, preventing possible complications and knowing what to do when complications develop.[7]

In his study on the hemovigilance system, Demirağ and Hindistan[8] found that 84.6% of the nurses knew that they were supervised by a hemovigilance nurse. In our study, 68.9% of the respondents stated that there were hemovigilance nurses in their hospitals; however, as stated in the 2020 National Hemovigilance Guideline, there are hemovigilance nurses in all secondary and tertiary hospitals in our country.[4]

It is very important to bring the blood and blood products to the appropriate temperature before the transfusion and to use the correct method to be applied for this. In the survey

Table 2. Responses of the study group to questions related to hemovigilance

	Correct	Incorrect
If the blood product brought from the blood center is not transfused to the patient, how long can it be stored in the refrigerator?	40%	60%
How is temperature control ensured before blood transfusion is given?	80%	20%
In which blood product or products is the leukocyte filter definitely not used?	50%	50%
Which components can be used with blood transfusion? (you can tick a few options)	33.3%	66.7%
What is the first application you will do if the patient develops a reaction in blood transfusion?	100%	0%
What should be the initial rate of blood transfusion?	33.3%	66.7%
How long and under what conditions is FFP stored after melting? (You can tick more than one option)	33.3%	66.7%
What are the storage conditions of the PLT suspension?	20%	80%
If you are using a leukocyte filter, for which blood products do you use?	40%	60%

we conducted, the rate of giving the correct answer to the question about how to provide heat control was 80%. Although this rate remained around 40% in a study conducted by Hijji et al.[9], in a study conducted by Erkoç[10] in Northern Cyprus, the rate of correct answers to this question by the nurses participating in the study was found to be 75.5%.

However, there are also studies in which it is seen that nurses do not know enough about the appropriate methods to be used to bring the blood to the appropriate temperature.[7,11,12]

The pre-transfusion control procedure should be performed at the patient's bedside, with the recipient and donor identities double-checked. All labels and compliance tests also need to be double checked. 93.5% of the respondents stated that these controls were carried out by at least two health personnel (2 nurses or 1 physician and 1 nurse). It has been emphasized in the literature that pre-transfusion controls should be performed by at least two healthcare professionals.[13] In this way, it has been shown that incorrect transfusions are reduced.

The results of our survey also show that healthcare professionals have good knowledge on this subject.

In the study by Demirkol et al.[14] on acute transfusion reactions in critically ill children, the frequency of acute transfusion reactions was found to be 17.8%. In case of a reaction development during transfusion, the transfusion should be stopped immediately and vital signs should be checked rapidly. All of the nurses participating in the survey gave the correct answer of "I stop the transfusion when a reaction develops during the transfusion". This rate was found to be 97.8% in the study by Panchawagh et al.[15] Similar rates have been found in many studies conducted on this subject, and this can be attributed to the fact that this subject is given a lot of attention in the training given since the results of transfusion reactions can significantly increase mortality and morbidity.

The questions for which the nurses who participated in the study mostly gave wrong answers were about the storage times of blood products. Only 20% of the participants gave correct answer for the platelet storage conditions, and 33.3% gave correct answer for waiting conditions right after the FFP was melted. The question about platelet storage conditions was the least correctly answered question in the questionnaire, and the platelet suspension can be stored for up to 5 days by shaking horizontally at +20-24 °C, longer storage increases the risk of bacterial proliferation and septicemia.[16] The second most common wrong answer was given to the question "How long and under what conditions is FFP stored after melting?". After melting, fresh frozen plasma can be stored in the refrigerator at +2 to +6 °C for 24 hours.[16] Panchawagh et al.[15] also reported that the question on the storage conditions of blood products was answered incorrectly at a rate of 78.2% in his study performed in India. We can attribute this situation to the confusion caused by the fact that many blood products can be stored in different storage conditions and times, and to the lack of information as stated in similar studies.

One of the frequently misunderstood issues is about the fluids with which blood products are compatible. 33.3% of the respondents answered this question correctly. Physiological saline, ABO compatible plasma and 5% albumin are compatible fluids. Apart from these, no liquid or medicine should be given or pushed from the same set with the blood set. It has been reported that acute hemolytic reaction develops with the administration of inappropriate fluids with transfusion.[16]

Although 86.7% of the respondents stated that they received in-service training on the use of blood and blood products, it is striking that there is a lack of information on blood and blood product transfusion, especially on storage conditions. In his study, Tramalloni et al.[17] revealed that hospitals would improve their transfusion practices in a positive way when effective training on transfusion was provided.

Study Limitations

A total of 45 people were able to participate in the survey, wider participation could have been more effective in determining the needs. Since some of the nurses participating in the survey were chief nurses and some were clinical nurses, the answers were not the answers of a homogeneous group. These two points constitute the limitations of our study.

Conclusion

We think that with national trainings and in-service trainings for health personnel, the level of knowledge on transfusion can be increased and these trainings will contribute to hemovigilance practices. In addition, it will be useful to determine which processes of hemovigilance are not well-known by health workers and to carry out studies on that subject. In addition to educational studies on hemovigilance, it may be beneficial to prepare and distribute guides and booklets about the subjects for which there is lack of knowledge.

The contribution of the hemovigilance system, which includes corrective and preventive actions to detect undesirable errors and events in the blood transfusion chain and to prevent their occurrence and recurrence, to blood transfusion safety is undoubtedly very important for our country as well as all over the world.

Ethics

Ethics Committee Approval: The study was conducted with the approval of the Akdeniz University Clinical Research Ethics Committee (date: 13.01.2021, no: KAEK-11).

Informed Consent: Survey work.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.K., N.Ü.T., G.A., Concept: A.K., N.Ü.T., P.A., Design: A.K., N.Ü.T., P.A., O.D., Data Collection or Processing: P.A., G.A., Analysis or Interpretation: A.K., N.Ü.T., P.A., O.D., Literature Search: A.K. N.Ü.T., O.D., Writing: A.K. N.Ü.T., O.D.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2021.65768
J Pediatr Emerg Intensive Care Med 2022;9:85-93

Are the Clinical Evaluation Scales and Laboratory Tests Adequate in Determining Dehydratation Degree in Acute Diarrhea?

Akut İshalde Dehidratasyon Derecesinin Belirlenmesinde Klinik Değerlendirme Ölçekleri ve Laboratuvar Tetkikleri Yeterli mi?

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Abstract

Introduction: The aim is to evaluate the reliability of the "World Health Organization dehydration scale (WHODO)", "clinical dehydration scale (CAS)" and "Gorelick scale (GS)" in determining the true degree of dehydration (DH) in children diagnosed with acute diarrhea, together with laboratory tests.

Methods: This study was conducted on children aged 3 months to 5 years who were diagnosed with acute diarrhea. Patients' admission weight, clinical findings and urea, creatinine, glucose, sodium, potassium, blood gases, and complete urine test results were recorded; DH grades of the patients were evaluated using WHODO, CAS and GS.The weight recorded within 48-72 hours after discharge was accepted as the actual weight of the patient. The gold standard in determining the degree of DH was considered to be the ratio of the patient's weight at admission to the weight after treatment.

Results: One hundred eight children with acute diarrhea were included in the study. WHODO, CAS and GS sensitivity rates, 90%, 52%, 54% for mild DH, 49.4%, 80%, 83% for moderate DH, 96.3%, 86%, 44% for severe DH. Specificity rates are 50%, 75%, 97% in mild DH, 87.5%, 26%, 53% in moderate DH, 44.4%, 73.9% and 96% in severe DH, respectively. In determining patients with DH degree ≥10%, the likelihood ratio of WHODS's positive test result was 11.0, GS's was 14.7. In determining mild DH, the likelihood ratio of the positive test result of GS was found to be 18.0. A significant correlation was found between actual DH degrees and pH, HCO_3, creatinine and urine density ($p<0.05$).

Conclusion: It was determined that WHODS and GS were successful in detecting ≥10% dehydration, GS was successful in determining mild dehydration, and situations where the child's weight was not known could be used. We think that pH and HCO_3, creatinine and

Öz

Giriş: Amaç, akut ishal tanısı alan, çocuklarda, ''Dünya Sağlık Örgütü Dehidratasyon Ölçeği (DSÖDÖ)'', "klinik dehidratasyon ölçeği (KDÖ)" ve "Gorelick ölçeğinin (GÖ)" laboratuvar testleri ile birlikte gerçek dehidratasyon (DH) derecesini saptamadaki güvenirliliklerini değerlendirmektir.

Yöntemler: Bu çalışma, çocuk acil polikliniğinde akut ishal tanısı alan 3 ay-5 yaş arası çocuklarda yapıldı. Hastaların başvuru kilosu, klinik bulgu ve üre, kreatinin, glukoz, sodyum, potasyum, kan gazları, tam idrar tetkiki sonuçları kayıt edildi; hastaların DH dereceleri, DSÖDÖ, KDÖ ve GÖ kullanılarak değerlendirildi. Taburculuk sonrası 48-72. saatte kaydedilen tartı hastanın gerçek kilosu olarak kabul edildi. DH derecesini belirlemede altın standart, hastanın başvurusundaki tartısının, tedavi sonrasındaki tartısına oranı olarak kabul edildi.

Bulgular: Çalışmaya 108 akut ishalli çocuk kabul edildi. DSÖDÖ, KDÖ ve GÖ duyarlılık oranları, hafif DH'de %90, %52, %54, orta derecede DH'de %49,4, %80, %83, ağır DH'de %96,3, %86, %44 olarak saptandı. Özgüllük oranları aynı sıra ile hafif DH'de %50, %75, %97, orta DH'de %87,5, %26, %53, ağır DH'de %44,4, %73,9 ve %96,9 olarak bulundu. DH derecesi ≥%10 olan hastaları belirlemede DSÖDÖ'nün pozitif test sonucu olabilirlik oranı 11,0, GÖ'nün 14,7 idi. Hafif DH belirlemede ise GÖ'nün pozitif test sonucu olabilirlik oranı 18,0 saptandı. Gerçek DH dereceleri ile pH, HCO_3, kreatinin ve idrar dansitesi arasında anlamlı ilişki olduğu tespit edildi ($p<0,05$).

Sonuç: DSÖDÖ ve GÖ'nün ≥%10 DH'yi saptamada başarılı oldukları, hafif DH'yi belirlemede GÖ'nün başarılı olduğu ve çocuğun kilosunun bilinmediği durumlarda bu ölçeklerin kullanılabileceği saptandı. Ayrıca pH ve HCO_3, serum kreatinin ve idrar dansitesinin de DH derecesini saptamada yararlı olduğu görüldü.

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Received/Geliş Tarihi: 02.02.2021 **Accepted/Kabul Tarihi:** 25.04.2021

urine density will be useful in determining the degree of dehydration in cases where the child's weight is not known.

Keywords: Child, acute gastroenteritis, dehydration degree, World Health Organization dehydration scale, clinical dehydration scale, Gorelick scale

Anahtar Kelimeler: Çocuk, akut ishal, dehidratasyon derecesi, Dünya Sağlık Örgütü dehidratasyon ölçeği, klinik dehidratasyon ölçeği, Gorelick ölçeği

Introduction

Diarrhea, which is one of the most common diseases in childhood, is still an important cause of morbidity and mortality today.[1-4] According to the data of the World Health Organization (WHO), it is the second most common cause of death in children under the age of 5 years, and approximately 525,000 children in this age group die from diarrhea each year.[1] In developing countries, it was reported that 1 billion 731 million cases of diarrhea were seen in children under the age of 5 years in 2010, and 36 millions of them had a severe course requiring hospitalization.[5] In the health statistics 2017 data of the Ministry of Health in our country, it was stated that 32.3% of children aged 0-6 years had at least one episode of diarrhea in a six-month period.[6]

Dehydration management and determining the degree of dehydration form the basis of the treatment of a child diagnosed with acute diarrhea.[5,7-9] Overestimation of dehydration may result in unnecessary treatment with intravenous fluids and unnecessary hospitalizations. On the other hand, underestimating dehydration can lead to delayed treatment and progression of symptoms.[7,8] Therefore, it is important to evaluate the degree of dehydration in the patient well. The best indicator of dehydration in a child presenting with acute diarrhea is the loss of body weight as percentage during the illness.[9] Since the pre-disease weight of the child is not usually known at the hospital admission, the physician uses clinical scales to estimate the degree of dehydration and thus to determine the treatment steps. In cases with dehydration, the method known as the "5%, 10%, 15% rule" is used to estimate the body weight lost by using skin turgor, absence of tears, dry mucous membranes, increased heart rate, decreased blood pressure and decreased urine output.[5,7,10]

While clinical scales may produce different results in every population, the accuracy rates of symptoms and signs used to show the degree of dehydration are also very low.[11] Therefore, different scales have been developed to obtain more reliable and valid results. The most commonly known and used scales are the WHO scale for dehydration, the clinical dehydration scale (CDS), and the Gorelick scale (GS).[5,12-14]

There are publications showing that the use of laboratory tests, in addition to clinical observations and the scales used, for the identification of the degree of dehydration in pediatric patients with acute diarrhea and, as a result, for the determination of treatment will give more accurate results.[15-17] However, there are conflicting results regarding whether there is a relationship between biochemical tests and the severity of dehydration.[18,19]

The aim of this study is to reveal the diagnostic accuracy of "WHO" scale for dehydration, "CDS" and "GS" in determining the degree of dehydration in children aged between three months and five years, who were admitted to the pediatric emergency service of our hospital with the complaint of diarrhea and were diagnosed with acute diarrhea, and to evaluate their importance in the detection of the actual degree of dehydration together with laboratory tests. In our country, there is no study evaluating the validity of these three dehydration scales.

Materials and Methods

Our hospital is a tertiary pediatric hospital and serves approximately 150,000 patients annually. This cross-sectional study was carried out in University of Health Sciences Turkey, Ankara Health Application and Research Center, Pediatric Emergency Outpatient Clinic between 1 June 2018 and 1 January 2019. It was carried out in line with the approval of the University of Health Sciences Turkey, Ankara Training and Research Hospital Education Planning and Coordination Board with the decision dated 03.10.2018 and numbered 572. Verbal consent was obtained from all families. Children aged between 3 months and 5 years, who were admitted with the complaint of diarrhea and diagnosed with acute diarrhea, were included in the study.

Diarrhea was defined as three or more defecations per day, stool fluid content higher than normal, or increased defecation frequency.[5,9]

Patients with diarrhea lasting longer than 5 days, those with a history of renal/cardiac failure, those with a disease that might affect the hydration assessment such as diabetes mellitus, those with a history of head, chest and abdominal trauma or surgery in the last 7 days, those receiving intravenous fluid therapy in the last 24 hours, and those with hyponatremia (Na<130) or hypernatremia (Na>150) detected in clinical examination, which might affect turgor assessment, were excluded from the study.

The symptoms, clinical findings and weights of the patients with the diagnosis of acute diarrhea, who were included in the

study, were recorded at admission. All patients were weighed on the same scale by the responsible researcher. The patient's daily activity, the presence of sunken eyes, the presence of tears if crying, the desire to drink water and the amount of urine in the last 24 hours (the number of wet diapers taken if using diapers), in case of vomititng the amount and number of it, and the amount of liquids that could be given orally to the patient during this time were questioned. The patient's respiratory rate, capillary refill time, heart apex beat, blood pressure, pulse fullness, and skin turgor were evaluated and noted.

The degree of dehydration of the patients at admission was evaluated by the responsible researcher using WHO scale for dehydration, CDS, and GS. According to the results of the evaluation, the treatment of the patient was arranged according to the recommendations of the European Society of Pediatric Gastroenterology, Hepatology and Nutrition.[9] Fluid therapy of the patient was performed considering the formula "pre-admission weight (gr)-weight at admission (gr)/100" if the pre-admission weight was known, or according to the degree of dehydration calculated with the WHO scale for dehydration if it was not known.

The gold standard in determining the degree of dehydration was accepted as the ratio of the patient's weight at admission to that after treatment.[9]

All patients were taken to emergency observation, and their blood and urine samples were evaluated before the treatment. The results of the complete blood count, urea, creatinine, glucose, sodium, potassium, blood gases, and urinalysis were recorded by the researcher.

In monitoring, the clinical condition and weight of the patient were evaluated, and the patient was discharged provided that the need for intravenous fluid was eliminated and the oral fluid intake compensated for the loss. Their weights at discharge were recorded. The patients were called for control examinations after 48-72 hours after discharge; their weights were recorded, and these weights were accepted as pre-disease weights. The difference between the patient's weight at the time of admission and the control weight was recorded in each patient's file as the degree of dehydration.

Height and body weight measurements were evaluated using a baby scale sensitive to 10 grams for children younger than 24 months and a weight scale with stadiometer sensitive to 100 grams for children older than 24 months. The patients' clothes were removed and the measurement was recorded only with clean diapers. Weight loss was calculated by weighing under the same conditions and on the same scale at the control examinations.

Clinical Scales Used in the Study

WHO scale for dehydration: It is a scale that evaluates general appearance, eyeballs, thirst, and turgor (Table 1).[5,20] With the scale, the presence of maximum two findings in parts B and C is evaluated as mild dehydration (<5% loss), the presence of findings more than two in part B is evaluated as moderate dehydration (5-10% loss), and the presence of findings more than two in part C is evaluated as severe dehydration (>10% loss).

Clinical dehydration scale: The scale developed by the center for disease control and prevention evaluates general appearance, eyeballs, mucous membranes, and tears (Table 2).[12] According to the presence of findings, 0,1,2 points are given. The total score is between 0 and 8 points. A score of "0" means no dehydration (<3% loss), "1-4" means moderate dehydration (3-6% loss), and "5-8" means moderate-severe dehydration (>6% loss).

GS: A dehydration scale using 10 findings was developed by Gorelick et al.[13] to define fluid losses of 5% or more (Table 3). With the multiple logistic regression model, they showed that four out of 10 findings were independently associated with dehydration. In the model consisting of four findings, two findings indicate >5% fluid loss, while three or more findings indicate >10% fluid loss. In the model consisting of ten findings, more than three findings indicate >5% fluid loss, and seven or more findings indicate >10% fluid loss.[21,22]

Statistical Analysis

Size of sample was calculated by using the formula developed by Flahaut et al.[22] following the study by Falszewska et al.[21]. One hundred-eight patients were included in the study with 80% sensitivity and 65% lowest acceptability parameters and 10% exclusion assumption.

Data analysis was performed using SPSS (Statistical Package Fort He Social Sciences for Windows 20.0) software. Whether the distribution of continuous and discrete numerical variables was close to normal was investigated using the Kolmogorov-

Table 1. World Health Organization scale for dehydration (5)

	A	B	C
General appearance	Good, active	Restless	Somnolence or unresponsive
Eyes	Normal	Sunken	Sunken
Thirst	No feeling of thirst	Severe thirst	Severe thirst, unwillingness for water
Skin turgor	Fast return to normal	Slow return to normal	Very slow return to normal

Table 2. Clinical dehydration scale (12)

Features	0	1	2
General appearance	Normal	Thirsty, restless or lethargic	Sleepy, limp, cold or sweaty, unconscious
Eyes	Normal	A little sunken	Very sunken
Mucous membranes	Moist	Sticky	Dry
Tears	Normal	Decreased	None

Smirnov test. Descriptive statistics were presented as mean ± standard deviation or median (minimum-maximum) for continuous and discrete numerical variables, and as number of cases and "%" for categorical variables.

After evaluating the normality of the distribution of numerical data, the significance of the difference between the groups in terms of mean values was investigated with the Student's t-test, and the significance of the difference in terms of median values was investigated with the Mann-Whitney U and Kruskal-Wallis Tests. Categorical variables were evaluated with the Pearson's chi-square or Fisher's Exact chi-square tests. For correlation evaluation, the Pearson or Spearman correlation test was used according to data distribution; $p<0.05$ was considered significant.

Whether the dehydration scales were determinative in detecting actual dehydration was evaluated by calculating the receiver operation characteristic (ROC) curve, calculating the area under the curve with different ROC analysis.

Results

Among the patients who applied to the pediatric emergency outpatient clinic with the complaint of diarrhea between 1 June 2018 and 1 January 2019 and were diagnosed with acute diarrhea, 116 patients who met the inclusion criteria for the study were included in the study. Three patients were excluded from the study because they left the hospital during the treatment, and five patients were excluded because they did not come for follow-up after treatment. The study was completed with 108 patients.

The mean age of the study group was 22.3±14.7 months (the youngest: 3 months-the oldest: 60 months), and 39 (36.1%) were girls and 69 (63.9%) were boys.

When the clinical findings of the patients were evaluated at admission, it was found that 50.9% (n=55) were restless, 78.7% (n=85) had sunken eyes, and 45.4% (n=49) had decreased tears (Table 4).

The degree of dehydration in the patients was evaluated according to the dehydration scales (Table 5). When the actual degree of dehydration of the patients was evaluated according to their body weight loss, it was found that 69.4% (n=75) of the patients had mild, 22.2% (n=24) had moderate, 8.3% (n=9) had severe dehydration.

Table 3. Gorelick dehydration scale (13)

	Absent or mild dehydration	Moderate to severe dehydration
General appearance	Active, lively	Lethargic, restless
Capillary refill time	≤2 sec	>2 sec
Tears	Normal	None
Mucous membrane	Moist	Dry
eyes	Normal	Sunken
Respiratory	Normal	Deep
Pulse	Normal	Weak
Skin turgor	Normal	Return to normal >2 sec
Heartbeat	Normal	Tachycardia
Urine output	Normal	Decreased

Table 4. Clinical characteristics of the study group

		n	%
General appearance	**Good**	50	46.3
	Restless	55	50.9
	Lethargic	3	2.8
Eyes	**Normal**	20	18.5
	Sunken	85	78.7
	Very sunken	3	2.8
Tears	**Normal**	55	50.9
	Decreased	49	45.4
	None	4	3.7
Skin turgor	**Normal**	28	25.9
	Decreased	77	71.3
	Very decreased	3	2.8
Capillary refill time	**Normal**	103	95.4
	Prolonged (>2 seconds)	5	4.6
Mucous membranes	**Moist**	60	55.5
	Dry	46	42.6
	Very dry	2	1.9
Solunum	**Normal**	104	96.3
	Deep	3	2.8
	Deep-fast	1	0.9
Pulse	**Normal, full**	104	96.3
	Fast, weak	4	3.7
Heart rate	**Normal**	90	83.3
	Tachycardia	18	16.7
Urine	**Normal**	80	74.1
	Decreased	28	25.9

Considering the actual degree of dehydration in the patients, the success of the dehydration scales in detecting the degree of dehydration was evaluated (Table 6, Figure 1).

In identifying the patients with a degree of dehydration greater than 10%, the likelihood ratio of a positive test result

Table 5. Evaluation of the degree of dehydration in the study group according to the World Health Organization scale for dehydration, clinical dehydration scale and Gorelick scale

Scales		n	%
World Health Organization scale for dehydration	Mild	41	38.0
	Moderate	63	58.3
	Severe	4	3.7
Clinical dehydration scale	Normal	8	7.4
	Moderate	96	88.9
	Severe	4	3.7
Gorelick scale	Normal	42	38.9
	Moderate	59	54.6
	Severe	7	6.5

was calculated as 11.0 for the WHO scale for dehydration and as 14.7 for GS; thus, it was found that the WHO scale for dehydration and GS were successful in detecting dehydration greater than ≥10%. In determining mild and/or minimal dehydration, the likelihood ratio of a positive test result for GS was found to be 18.0, and it was found to be successful in detecting mild dehydration (Table 6).

Among the biochemical values of the study group at the time of admission, pH was measured as 7.34±0.07 (min-max: 7.1-7.5), bicarbonate as 16.0±4.1 mmol/L (min-max: 7-24), urea as 27.1±13.2 mg/dL (min-max: 5-74), creatinine as 0.3±0.1 mg/dl (min-max: 0.1-0.9), sodium as 137.8±4.6 mEq/L (min-max: 129-160), potassium as 4.3±0.5 mEq/L (min-max: 2.9-5.8), and urine density as 1019±7 (min- max: 1003-1036).

When the relationship between the actual degree of dehydration (<5%, 5-10%, >10%) and biochemical variables was evaluated, it was determined that as the actual degree of dehydration increased, pH and $cHCO_3$ values decreased, creatinine and urine density increased, and this difference was statistically significant (p=0.013; 0.001; 0.010; 0.009, respectively).

When the relationship between the WHO scale for dehydration, CDS and GS and biochemical variables was examined, it was observed that the WHO scale for dehydration displayed a negative correlation with blood pH (p=0.001, r=-0.392) and HCO_3 (p=0.001, r=-0.367), and a statistically significantly positive correlation with serum creatinine (p=0.004, r=0.27), serum sodium (p=0.007, r=0.26) and urine density (p=0.01, r=0.23). CDS demonstrated a negative correlation with blood pH (p=0.002, r=-0.302) and HCO_3 (p=0.001, r=-0.296), and a statistically positive correlation with serum creatinine (p=0.001, r=0.35), serum sodium (p=0.001, r=0.348) and blood urea (p=0.001, r=0.33) values. GS was found to have a negative correlation with blood pH (p=0.001, r=-0.367) and HCO_3 (p=0.001, r=-0.445), and a statistically positive correlation with serum creatinine (p=0.01, r=0.23), serum sodium p=0.001, r=0.31), and urine density (p=0.001, r=0.31).

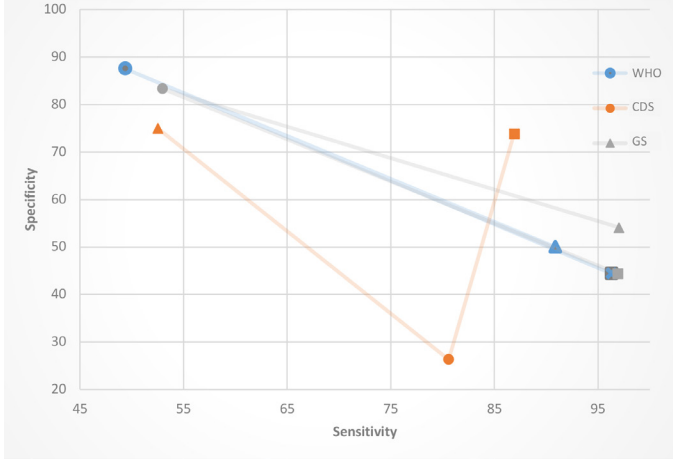

Figure 1. Sensitivity and specificity of scales. Triangles represent mild, round shapes represent moderate, squares represent severe dehydration

WHO: World Health Organization, CDS: Clinical dehydration scale, GS: Gorelick scale

Discussion

Studies have reported that dehydration assessment scales may have different results depending on the demographic structure of the population.[21,23,24] Although our country has a middle income level, our hospital serves the low socioeconomic region. The answer to the question of how to

Table 6. Sensitivity and specificity values of the World Health Organization scale for dehydration, clinical dehydration scale, and Gorelick scale compared to actual degrees of dehydration

	World Health Organization scale for dehydration			Clinical dehydration scale			Gorelick scale		
Degree of dehydration (%)	5	5-10	>10	<3	3-6	>6	5	5-10	>10
Specificity (%)	50	87.5	44.4	75.0	26.3	73.9	54.1	83.3	44.4
Sensitivity (%)	90.9	49.4	96.3	52.5	80.6	86.9	97.0	53.0	96.9
Llikelihood ratio of positive test result	5.56	1.72	11.0	1.56	1.3	5.69	18.0	1.77	14.7
Llikelihood ratio of negative test result	0.55	0.25	0.58	0.48	0.92	0.29	0.47	0.32	0.57
Prevalance (%)	37.4	58.9	3.7	7.0	71.0	22.0	38.3	55.1	6.5

increase the optimal evaluation with laboratory tests and to investigate the diagnostic accuracy of these scales in patients followed up in our hospital for acute diarrhea was sought.

Diarrhea treatment in children is based on determining the degree of dehydration and meeting the losses with appropriate hydration.[5] Overestimating dehydration may lead to overtreatment with intravenous fluids and unnecessary hospitalizations, while underestimating dehydration may lead to delayed treatment and progression of symptoms.[7,8] The gold standard in determining the degree of dehydration is the ratio of the difference between the weights measured before and during the disease to the weight of the patient.[5,9,11]

Since it is very rare to know the pre-disease weight of the patients, the assessment of the severity of dehydration is based on the findings obtained from the clinical examination.[5,11] In the literature, there are publications reporting that the accuracy of each finding used in the evaluation of dehydration is quite low.[12,13,25] Instead, scaling tables consisting of a group of symptoms and clinical findings give more accurate diagnostic results.[12,13,21,25]

Many organizations and research institutes have developed scaling tables consisting of clinical signs and symptoms to estimate dehydration rates. The most important ones are the WHO scale for dehydration developed by WHO, CDS developed by Toronto Children's Hospital, and GS developed by Philadelphia Children's Hospital.[5,12,13,20] The severity of dehydration is determined by the physical signs that are present. It is observed that the degree of dehydration estimated by each scaling table also differs from each other.

The WHO scale for dehydration is used in the evaluation of children aged 1 month to 5 years in terms of dehydration.[5,19] In a meta-analysis evaluating the WHO scale for dehydration, seven studies were evaluated. Of these, four were implemented in low-income countries, while only one had significant data with moderate (5-10%) and severe dehydration (>10%) scaling results.[26] Jauregui et al.[20] conducted a study with 113 patients, and they found the sensitivity of the WHO scale for dehydration in predicting the degree of dehydration as 25% and the specificity as 84%, and they reported that it was not significant. In a study conducted by Falszewska et al.[21] in high-income countries, they reported that the WHO scale for dehydration was not significant in detecting and excluding mild and moderate dehydration, and they could not define its accuracy in recognizing severe dehydration since there were no severely dehydrated patients. In our study, the sensitivity rate of this scale was 90% in mildly dehydrated patients, 49.4% in moderately dehydrated patients, and 96.3% in severely dehydrated patients. In the same scale, the specificity rates were determined as 50%, 87.5%, and 44.4%, respectively. For the WHO scale for dehydration, the likelihood ratio of a positive test result in severely dehydrated patients (>10%) was found to be 11.0, and it was found to be quite reliable in detecting severely dehydrated patients.

The CDS is used to evaluate the dehydration of patients aged one month to three years.[12,14] Kinlin and Freedman[27] evaluated the reliability and validity of CDS in 208 patients aged 3 months to 5 years, who needed intravenous fluids due to the diagnosis of acute diarrhea. They did not find CDS as statistical significant in the evaluation of weight gain (difference between weight at admission and weight after treatment). However, they found a correlation between an increase in the number of defecations per day, a decrease in serum bicarbonate and pH value, and an increase in the length of hospital stay and an increase in the degree of dehydration. However, they showed that it was not valuable in distinguishing between patients without dehydration and mild/moderately dehydrated patients and in determining the need for treatment with intravenous fluids. In the study of Bailey et al.[28], 150 patients aged one month to five years with a diagnosis of acute diarrhea were evaluated. In this study, it was observed that CDS was beneficial in the length of hospital stay, intravenous hydration, and the use of laboratory tests. Gravel et al.[29] conducted a study on 219 patients with a diagnosis of acute diarrhea and reported that they found a significant relationship between this scale and weight loss, serum bicarbonate level, length of hospital stay, and the need for intravenous hydration. In a meta-analysis by Falszewska et al.[23], in which six studies were reviewed, it was reported that while the diagnostic accuracy of CDS was significant in predicting moderate/severe dehydration in high-income countries (likelihood ratio of positive test result: 3.9-11.79), it had limited value in exclusion (likelihood ratio of negative positive test result: 0.55-0.71). In low/middle-income countries, they found that its diagnostic accuracy in recognizing and excluding dehydration was quite low. In our study, the sensitivity rates of CDS were found to be 52% in mildly dehydrated patients, 80% in moderately dehydrated patients, and 86% in severely dehydrated patients. In the same scale, the specificity rates were determined as 75%, 26%, and 73.9%, respectively. The likelihood of positive test result for CDS in detecting dehydration (in mild-moderate-severely dehydrated patients) was found to be low, and it was not found reliable in detecting dehydrated patients.

The GS is used in the evaluation of dehydration in patients aged 1 month to 5 years.[13] In this scale, general appearance, capillary refill time, tears, mucous membranes, eyes, respiration, pulse, skin turgor, heart rate, and urine output are evaluated and dual classification is used as no dehydration or moderate/severe dehydration according to the severity of symptoms. Gorelick et al.[13] stated that the 10-point scale had 82% sensitivity and 90% specificity to predict dehydration

in children. Hoxha et al.[24] found the sensitivity of GS to be 89% and the specificity to be 52% in detecting moderate/severe dehydration (>5%), and they found it significant in detecting whether there was dehydration. Falszewska et al.[21] evaluated 117 patients with GS, and the sensitivity for moderate dehydration (5-10%) was only 10%, while the specificity was 77%. Since there was no severely dehydrated patient group in the study, no evaluation could be made, and they stated that GS had no value in detecting and excluding ≥5% dehydration. In our study, GS sensitivity rates were 54% in mildly dehydrated patients, 83% in moderately dehydrated patients, and 44% in severely dehydrated patients, while specificity rates were 97%, 53%, and 96.9%, respectively. The likelihood ratio of a positive test result of GS was 18.0 in mildly dehydrated patients, and 14.7 in severely dehydrated patients (>10%), and it was found to be quite reliable in detecting mildly and severely dehydrated patients.

In the literature, in a study in which three dehydration clinical scales were compared in countries with middle-low income level, the sensitivity and specificity were found to be18% and 91% for CDS, and 90% and 54% for the WHO scale for dehydration.[24] In the study of Pringle et al.[26], conducted with patients under the age of 18 years with acute diarrhea in low-income countries, it was reported that the WHO scale for dehydration, CDS, and GS were not significant in predicting dehydration. On the other hand, Hoxha et al.[24] found that the WHO scale for dehydration and GS were significant in detecting dehydration in patients with acute diarrhea in developing countries, while CDS was insufficient to detect dehydration. In our study, when the three scales were compared, the WHO scale for dehydration was found to be successful in detecting severely dehydrated patients, while GS was successful in detecting mild and severely dehydrated patients. Although it has been reported that CDS is useful in determining dehydration in developed countries, we did not find it significant in our study.

Various laboratory parameters have been proposed to increase the accuracy of clinical dehydration assessment.[15-19] There are publications that accept and do not accept the importance of these laboratory variables in predicting the degree of dehydration. While the most studied serum urea value was found to be significant in predicting dehydration in some studies, it was found to be insignificant in other studies.[11,18,19]

In the studies, serum sodium, potassium, pH, bicarbonate, glucose, blood urea nitrogen, creatinine and urine density were used to evaluate the degree of dehydration. In the literature, while there are publications reporting that there is a relationship between serum blood urea nitrogen, serum bicarbonate level <15-22 mmol/L and severe dehydration, there are studies reporting no relationship.[15,17,19] In the results of our study, it was determined that there was a significant relationship between the actual dehydration degrees and pH and $cHCO_3$, creatinine and urine density.

Hoxha et al.[17] have reported in a study that blood gas, when combined with clinical examination, is the most useful parameter in evaluating the degree of dehydration, and that serum creatinine and urea values are the most specific tests in the diagnosis of severe dehydration although they are insufficient in distinguishing mild and moderate dehydration. In the study of Yilmaz et al.[30], it was found that serum urea and bicarbonate values were useful in determining the degree of dehydration, and their sensitivity and specificity increased when combined with dehydration scales. Vega and Avner[31] showed in their study that an absolute bicarbonate concentration of less than 17 mEq/L was significant in detecting 5% and above dehydration. On the other hand, in the study conducted by Teach et al.[18], it was reported that the increase in uric acid and anion gap was not significant in detecting dehydration. In a meta-analysis by Steiner et al.[11], it was stated that in children with acute diarrhea, the measurement of urine output amount, urine density and ketone amount was not a valid method for determining the degree of dehydration. Yilmaz et al.[30], who investigated the usefulness of laboratory tests in estimating the degree of dehydration in 168 patients with acute diarrhea aged 1-21 months, found that as the degree of dehydration increased, there was an increase in urea and bicarbonate, and there was no relationship between sodium values and the degree of dehydration. Shaoul et al.[15] evaluated 300 children with diarrhea and reported that urea was useful in demonstrating the degree of dehydration, while other laboratory findings were not significant. Mackenzie et al.[32] reported that high urea, low pH and increased base deficit were associated with the degree of dehydration.

In our study, it was determined that the percentage that we accepted as the actual degree of dehydration (weight after disease-weight at admission)/weight after disease x100) was associated with pH, HCO_3, creatinine levels and urine density. However, we believe that it would not be correct to make a decision based on laboratory findings only in estimating the degree of dehydration because although studies show that serum urea, pH and bicarbonate levels are helpful in the evaluation of dehydration, they also state that they are insufficient for a definitive decision.[11,19,30] However, unlike these studies, the most valuable result of our study is that clinical scales can be used together with these biochemical parameters and can guide the physician in determining the degree of dehydration of the patient.

Conclusion

It is the first study in our country to evaluate the WHO scale for dehydration, CDS and GS used to detect acute dehydration. It was determined that the WHO scale for dehydration and GS were successful in detecting ≥10% dehydration, GS was successful in detecting mild dehydration, and these scales could be used in cases when the child's weight was unknown. On the other hand, it was seen that the CDS was not useful. In addition, pH and HCO_3, serum creatinine and urine density were also found to be helpful in determining the degree of dehydration.

Ethics

Ethics Committee Approval: This cross-sectional study was carried out in University of Health Sciences Turkey, Ankara Health Application and Research Center, Pediatric Emergency Outpatient Clinic between 1 June 2018 and 1 January 2019. It was carried out in line with the approval of the University of Health Sciences Turkey, Ankara Training and Research Hospital Education Planning and Coordination Board with the decision dated 03.10.2018 and numbered 572.

Informed Consent: Informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Y.Y.C., M.A.T., Concept: Y.Y.C., M.A.T., A.U.G., Design: Y.Y.C., M.A.T., Data Collection or Processing: Y.Y.C., M.A.T., Analysis or Interpretation: Y.Y.C., M.A.T., Literature Search: Y.Y.C., A.U.G., Writing: Y.Y.C., M.A.T.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2021.64426
J Pediatr Emerg Intensive Care Med 2022;9:94-100

Socio-demographic Characteristics and Sleeping Habits of Children with Suicide Attempt Abstract

Özkıyım Girişiminde Bulunan Çocukların Sosyo-demografik Özellikleri ve Uyku Alışkanlıkları

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Abstract

Introduction: To compare the sleeping habits of children who attempt suicide with healthy children, to detect disorders, to identify children with risk factors and to take measures to prevent suicide attempts.

Methods: Patients who applied to the Pediatric Emergency Service of University of Health Sciences Turkey, Ankara Training and Research Hospital between April 2019 and April 2020 with suicide attempt were included in the study group, and healthy children who had never attempted suicide before were included in the control group. It has been done prospectively and cross-sectionally. The data were analyzed using SPSS 18.0 package program and Microsoft Office Excel 2003 program.

Results: The total number of patients participating in our study was 248, 138 (55.6%) of whom had attempted suicide, 110 (44.4%) were from the control group who did not attempt suicide for any other reason. Of the patients in the group who attempted suicide, 102 (73.9%) were female, 36 (26.1%) were male, 67 (60.9%) of the patients in the control group were female, and 43 (39.1%) were male. The median age of the patients in the group who attempted suicide was 16 (minimum: 13, maximum: 18), and the median age of the patients in the control group was 16 (minimum: 12, maximum: 18). Social and physical problems were more common in the group who attempted suicide than in the control group (p=0.001, p=0.004). In the sleep habits questionnaire applied to the patients; the patients in the group who attempted suicide had more problems falling asleep, frequent waking up, and difficulty in waking up compared to the control group (p=0.001, p=0.047 p=0.003). In addition, daytime sleepiness, change in sleep time, listening to music before sleep, and playing with a mobile phone were higher in the group who attempted suicide compared to the control group

Öz

Giriş: Özkıyım girişiminde bulunan çocukların uyku alışkanlıklarını sağlıklı çocuklarla karşılaştırmak, bozuklukları saptamak, risk faktörleri olan çocukları belirleyerek özkıyım girişimlerini önlemek için önlemlerin alınmasını sağlamaktır.

Yöntemler: Sağlık Bilimleri Üniversitesi, Ankara Eğitim ve Araştırma Hastanesi, Çocuk Acil Servisi'ne Nisan 2019 ve Nisan 2020 yılı arasında özkıyım girişimiyle başvuran hastalar ile daha önce özkıyım girişiminde bulunmamış sağlıklı çocuklar çalışmaya alınmıştır. Çalışma kesitsel, olgu-kontrol olarak yapılmıştır. Hastalara demografik veriler ile çalışmacılar tarafından hazırlanmış uyku alışkanlıklarını sorgulayan 15 soruluk anket uygulanmıştır. Veriler SPSS 18.0 paket programı kullanılarak analiz edilmiştir.

Bulgular: Çalışmamıza özkıyım girişimde bulunan 138 (%55,6), özkıyım girişimi olmayan ve herhangi bir nedenle çocuk acil servise başvuran 110 (%44,4), toplam 248 hasta kabul edildi. Özkıyım girişiminde bulunan gruptaki hastalar ile kontrol grubu arasında yaş ve cinsiyet yönünden fark saptanmadı (p>0,05). Hastalara uygulanan uyku alışkanlığı anketinde özkıyım girişiminde bulunan hastaların uykuya dalma sorunu, sık sık uyanma, uyanmakta zorlanma problemleri kontrol grubuna göre daha sık idi (sırası ile, p=0,001; 0,047; 0,003). Ayrıca özkıyım girişiminde bulunan grupta gündüz uyuklama, uyku saatinde değişiklik, uykudan önce müzik dinleme, cep telefonu ile oynama alışkanlığı kontrol grubuna göre fazlaydı (p=0,012, p=0,001, p=0,022, p=0,005). Ayrıca, özkıyım girşiminde bulunan grupta kabus görme, uyurgezerlik, horlama daha sık görülmüştür (p=0,046).

Sonuç: Sonuç olarak özkıyım girişimi ergenlerde giderek artan bir sorun olup, risk faktörlerinin iyi belirlenip ailelerin ve hekimlerin farkındalığının artırılması ve koruyucu önlemlerin alınması

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Received/Geliş Tarihi: 30.03.2021 **Accepted/Kabul Tarihi:** 30.04.2021

(p=0.012, p=0.001 p=0.022, p=0.005). In addition, nightmares, sleepwalking, and snoring were more common in the group who attempted suicide (p=0.046).

Conclusion: Suicide attempt is an increasing problem in adolescents, it should be ensured that the risk factors are determined well, the awareness of families and physicians is increased and preventive measures should be taken. It is very important to take sleep problems more seriously in this age group and to convey the importance of this to families.

Keywords: Suicide, pediatric emergency, sleep disorder

sağlanmalıdır. Uyku sorunlarının bu yaş grubunda daha çok ciddiye alınması, ailelere bunun öneminin aktarılması çok önemlidir.

Anahtar Kelimeler: Özkıyım, çocuk acil, uyku bozuklukları

Introduction

Sleep is one of the basic and indispensable activities of daily life, which contributes significantly to cognitive, behavioral and emotional skills and affects the quality of life and health of individuals.[1] Sleep deprivation has been shown to increase daytime sleepiness, fatigue, cognitive dysfunction, psychological deterioration, behavioral problems, as well as inattentive and risky behaviors in children and adolescents.[2] Sleep disorders are associated with anxiety, depression, and suicidal behavior. In addition, sleep abnormalities have been identified as a stand-alone risk factor for suicidal ideation, attempts, and death. Appropriate treatment of sleep disorders is vital, and reduces psychiatric disorders and suicidal tendencies.[3]

Suicide is one of the preventable causes of death and is an important public health problem. The risk is particularly high during adolescence.[4] The lifetime suicide attempt rate is between 3.1% and 8.8%. In addition, deaths due to suicide attempts in adolescence constitute 8.5% of all deaths.[5]

Many studies show that insufficient sleep is associated with increased self-harming thoughts and behaviors (with or without suicidal intent) in adolescents.[6,7] Insomnia and/or nightmares may contribute to suicidal ideation and behavior by intensifying the feelings of hopelessness, loneliness, and distress in relation to the individual's lack of sleep, while being awake at night may result in a reduction in frontal lobe function (i.e. hypoactivation of the frontal lobes due to circadian effects, sleep loss/sleep deprivation). This hypofrontality may lead to decreased problem-solving skills and increased impulsive behaviors, and both can be expected to increase the risk of suicide.[8]

In our study, we aimed to compare the sleep habits of children with suicide attempts with those of healthy children, to determine the risk factors, and to ensure that measures would be taken to prevent suicide attempts by identifying children with these factors.

Materials and Methods

Patients admitted to the Pediatric Emergency Service of University of Health Sciences Turkey, Ankara Training and Research Hospital with a suicide attempt between April 2019 and April 2020 were included in the study group, and healthy children who had never attempted suicide before were included in the control group. The study is a cross-sectional, case-control study. The control group consisted of patients who came to our healthy children outpatient clinic for routine examinations and laboratory tests, did not have a known psychiatric disease, and did not use medication.

The patients and their parents were informed about the study before the study, and a consent form was obtained. A 15-question questionnaire, questioning demographic data such as age, gender, and sleep habits, was applied to the patients who read the voluntary consent form and wanted to be included in the study. In this questionnaire, the participants were asked about having any sleep problem (if yes, what kind of problems), the presence of any change in sleep habits after adolescence, problems concerning sleeping habits, having any habits that would facilitate the transition to sleep before going to sleep (if yes, what they were), liking listening to music or not, listening to music before going to sleep (if yes, what kind of music), electronic devices available at home (computer, game console, playstation, tablet), internet network at home, having a mobile phone, having an internet connection on his/her mobile phone, and how many hours a day he/she spent on his/her mobile phone and computer. Three patients who did not sign the voluntary informed consent form, who refused treatment and who left the hospital without permission were not included in the study.

Statistical Analysis

Statistical analysis of the research was performed using SPSS 18.0 and Microsoft Office Excel 2003. Since the numerical data were not normally distributed, descriptive statistics were given as the median (minimum-maximum). The chi-square and One-Way ANOVA tests were used for categorical comparison of the groups. In cases where there was no normal distribution between the two groups, the Mann-Whitney U test, which is a non-parametric test, was used. A p-value of <0.05 was considered statistically significant.

Results

The total number of patients included in our study was 248, of which 138 (55.6%) were adolescents who attempted suicide and 110 (44.4%) were from the control group (Figure 1). 73.9% (n=102) of the patients in the suicide attempt group were female, 26.1% (n=36) were male. 70% (n=77) of the patients in the control group were female and 30% (n=33) were male (p=0.065). The median age of the patients in the suicide attempt group was 16 (minimum: 13- maximum: 18) years, and the median age of the patients in the control group was 16 (minimum: 12- maximum: 18) years (p=0.072) (Table 1).

School attendance and school success of the patients in the suicide attempt group were lower than in the control group (both, p=0.001). Social and physical problems were more common in the suicide attempt group than in the control

Table 1. Socio-demographic characteristics of the study group

	Total n=248	Patients with suicide attempt =138	Control group n=110	p
Gender (n, %)				
Girl	169 (68.1)	102 (73.9)	77 (70.0)	0.065
Boy	79 (31.9)	36 (26.1)	33 (30.0)	
Age (year) (median, range)	16 (12-18)	16 (13-18)	16 (12-18)	0.72
Going to school (n, %)				
Yes	277 (91.5)	119 (86.2)	108 (98.2)	**0.001**
No	21 (8.5)	19 (13.8)	2 (1.8)	
School success (n, %)				
Good	107 (43.1)	38 (27.5)	69 (62.7)	**0.001**
Bad	105 (42.3)	69 (50.0)	36 (32.7)	
Moderate	36 (14.5)	31 (22.5)	5 (4.5)	
Transcript success (n, %)				
Poor	99 (39.9)	78 (56.5)	21 (19.1)	**0.001**
Certificate of achievement	91 (36.5)	43 (31.2)	48 (43.6)	
Certificate of high achievement	58 (23.4)	17 (12.3)	41 (37.3)	
Working status (n, %)				
Yes	43 (17.3)	17 (12.3)	26 (23.6)	**0.020**
No	205 (82.7)	121 (87.7)	84 (76.4)	
Living with family (n, %)				
Yes	237 (95.6)	133 (96.4)	104 (94.5)	0.488
No	11 (4.4)	5 (3.6)	6 (5.5)	
Habits (n,%)				
Smoking				
Yes	62 (25.0)	50 (36.2)	12 (10.9)	**0.001**
No	186 (75.0)	88 (63.8)	98 (89.1)	
Alcohol				
Yes	11 (4.4)	8 (5.8)	3 (2.7)	0.232
No	237 (95.6)	130 (94.2)	107 (97.3)	
Opiate drug				
Yes	3 (1.2)	3 (2.2)	0 (0.0)	0.060
No	245 (98.8)	135 (97.8)	110 (100.0)	
Chronic disease (n,%)				
Yes	24 (9.7)	15 (10.9)	9 (8.2)	0.474
No	224 (90.3)	123 (89.1)	101 (91.8)	
Social problems (n, %)				
Yes	45 (18.1)	40 (29.0)	5 (4.5)	**0.001**
No	203 (81.9)	98 (71.0)	105 (95.5)	
Physical problems (n, %)				
Yes	35 (14.1)	27 (19.6)	8 (7.3)	**0.004**
No	213 (85.9)	111 (80.4)	102 (92.7)	
Change in appetite in the last one month (n, %)				
Yes	121 (48.8)	78 (56.5)	43 (37.1)	**0.006**
No	127 (85.9)	60 (43.5)	67 (60.9)	
History of a previous psychiatric disorder (n,%)				
Yes	38 (15.3)	28 (20.3)	10 (9.1)	**0.013**
No	210 (84.7)	110 (79.7)	100 (90.9)	

group (p=0.001; 0.004, respectively) (Table 1). Smoking habit and a history of previous psychiatric illness were higher in the suicide attempt group than in the control group (p=0.001; 0.013, respectively).

Considering the mother's education level, it was found that mothers with educational level of high school or above were more common in the control group (p=0.020). Parental separation was more common in patients who attempted suicide than in the control group (p=0.012) (Table 2).

In the sleep habit questionnaire administered to the patients, the problems of falling asleep, waking up frequently, and difficulty in waking up were found to be higher in the patients with suicide attempt compared to the control group (p=0.001; 0.047; 0.003, respectively) (Table 3).

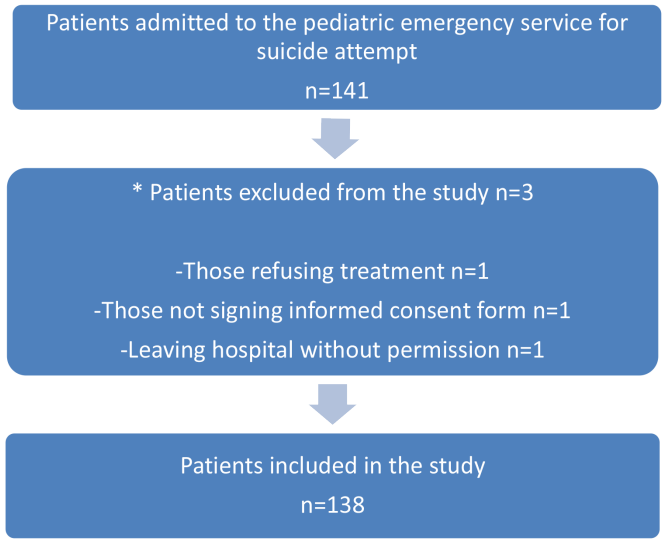

Figure 1. Flow chart of patients

Discussion

Suicide attempts among children and adolescents have reached alarming proportions in recent years. While deaths from other causes have decreased, suicide attempts have

Table 2. Socio-demographic characteristics of the family

	Total n=248	Patients with suicide attempt =138	Control group n=110	p
Age of mother (year) (median, range)	40 (29-58)	40 (29-57)	40 (31-58)	0.289
Age of father (year) (median, range)	43 (31-67)	43 (31-63)	44 (35-67)	0.654
Number of siblings (n, range)	3 (1-7)	3 (1-6)	3 (1-7)	0.92
Mother's working status (n, %) Yes No	 63 (25.4) 185 (74.6)	 38 (27.5) 100 (72.5)	 25 (22.7) 85 (77.3)	0.386
Mother's educational status (n, %) Primary school Secondary school High school and over	 24 (9.7) 164 (66.1) 60 (24.2)	 15 (10.9) 99 (71.7) 24 (17.4)	 9 (8.2) 65 (59.1) 36 (32.7)	**0.020**
Father's educational status (n, %) Primary school Secondary school High school and over	 18 (7.3) 131 (52.8) 99 (39.9)	 8 (5.8) 78 (56.5) 52 (37.7)	 10 (9.1) 53 (48.2) 47 (42.7)	0.349
Parents (n, %) Together Divorced	 207 (83.5) 41 (16.5)	 108 (78.3) 30 (21.7)	 99 (90.0) 11 (10.0)	**0.012**
Do the people you live with have physical-psychological problems? (n, %) Yes No	 25 (10.1) 223 (89.1)	 17 (12.3) 121 (87.7)	 8 (7.3) 102 (92.7)	0.184
Familial income level (n, %) Below minimum wage Minimum wage and above	 107 (43.1) 141 (56.9)	 67 (48.6) 71 (51.4)	 40 (36.4) 70 (63.6)	0.054
The presence of a chronic disease in the family (n,%) Yes No	 47 (19.0) 201 (81.0)	 26 (18.8) 112 (81.2)	 21 (19.1) 89 (80.9)	0.96

Table 3. Sleep habits of the study group

	Total n=248	Patients with suicide attempt =138	Control group n=110	p
Difficulty in falling asleep				
Yes	61 (24.6)	45 (32.6)	16 (14.5)	**0.001**
No	187 (75.4)	93 (67.4)	94 (85.5)	
Waking up frequently				
Yes	28 (11.3)	21 (15.2)	7 (6.4)	**0.047**
No	220 (88.7)	117 (84.8)	103 (93.6)	
Having trouble in waking up				
Yes	53 (21.4)	39 (28.3)	14 (12.7)	**0.003**
No	195 (78.6)	99 (71.7)	96 (87.3)	
Daytime napping				
Yes	40 (16.1)	30 (21.7)	10 (9.1)	**0.012**
No	208 (83.9)	108 (78.3)	100 (90.9)	
Change in sleep time				
Yes	47 (19.0)	38 (27.5)	9 (8.2)	**0.001**
No	201 (81.0)	100 (72.5)	101 (91.8)	
Sleep disorders (sleep-walking, nightmares..)				
Yes	9 (3.6)	8 (5.8)	1 (0.9)	**0.046**
No	239 (96.4)	130 (94.2)	109 (99.1)	
The habit of playing with a mobile phone				
Yes	70 (28.2)	47 (34.1)	23 (20.9)	0.022
No	178 (71.8)	91 (65.9)	87 (79.1)	
Listening to music before sleep				
Yes	192 (77.4)	116 (84.1)	76 (69.1)	**0.005**
No	56 (22.6)	22 (15.9)	34 (30.9)	
Listening to arabesque music				
Yes	45 (18.1)	32 (23.2)	13 (11.8)	**0.032**
No	203 (81.9)	106 (76.8)	97 (88.2)	
Having an internet connection at home				
Yes	168 (67.7)	84 (60.9)	84 (76.4)	**0.010**
No	80 (32.2)	54 (39.1)	26 (23.6)	
Spending time with mobile phone (hour) (median, range)		6 (0-24)	4 (0-24)	**0.017**

remained high.[9] Therefore, studies on this subject have become very important in order to determine the causes of suicide and to take measures for these factors. There are various factors affecting suicide attempts.[10] In our study, adolescents who attempted suicide and those who had never attempted suicide were compared in terms of their socio-cultural, physical, and psychological states and sleep habits. It was determined that the group of patients who attempted suicide had more physical and psychological problems, bad habits and especially sleep problems.

Physical, psychological, socio-cultural and environmental factors can be counted among the reasons that increase the suicide attempt. The most common ones are psychiatric problems, substance/alcohol use, and drug abuse.[11,12] In studies, it has been determined that depressive patients have a high risk for sleep disorders and suicide attempts, and the risk of suicide is significantly increased in other psychiatric diseases such as mood disorder, panic disorder and post-traumatic stress disorder.[13] Alcohol abuse and substance intake trigger suicide attempts by increasing drunkenness and impulsivity, depressive and suicidal thoughts, limiting cognitive functions and reducing barriers to self-harm. Alcohol abuse and substance use increase suicide attempts, especially in people with psychiatric problems. Consistent with the literature,[14] in our study, the rate of patients with pre-existing psychiatric disorders among those with suicide attempts was found to be significantly higher, and alcohol and substance intake was found to be higher than in the control group.

In young people with low school performance, the feeling of failure triggers the idea of suicide and the tendency to self-harm. In our study, in accordance with the literature,[15] the school success of our patient group was significantly low.

Familial factors, socio-cultural structure of the family, and whether the parents live together or not are important for suicide attempts. In particular, the education level of parents is effective in approaching the problems of adolescents and sharing common issues, and it is important to emphasize especially the education of mothers. In addition, suicide attempts are frequently seen in adolescents living in

environments where their parents are separated and communication problems are intense.[16] In our study, in accordance with the literature, the educational level of the mother was significantly lower and the rate of parents living separately was significantly higher in the group with suicide attempts.

There is a positive relationship between suicide attempt and sleep disorders. It has been determined that patients with sleep disorders are more likely to exhibit various suicidal behaviors, including suicidal ideation, attempt, and completed suicide. Many studies have emphasized that 5-hydroxytryptamine (5-HT) activity plays a major role in this relationship. 5-HT promotes sleep initiation and wakefulness by continuously inhibiting REM sleep including slow-wave sleep and rapid eye movements. 5-HT dysfunction also leads to sleep disorders. In addition, it has been determined that 5 hydroxyindoleacetic acid (5-HIAA), the metabolite of 5-HT, triggers depression, creates a tendency to impulsive behavior and poses a risk for suicide attempts. Therefore, serotonin dysfunction is thought to play an important role in the relationship between sleep problems and suicide attempts.[17] Suicide attempts were found to be high, especially in those with insomnia and nightmares.[18] In some studies, a long duration of nightmares was found to be a high risk for a suicide attempt.[19] Again, in another study, a relationship was found between short sleep duration and frequent nightmares and suicide attempts in university students.[6] In another study, it was emphasized that nightmares impaired sleep quality, young people with deteriorated sleep quality were more alone and isolated themselves from social life, and suicide attempts were prominent in this group.[4]

A meta-analysis showed that nightmares posed a risk twice higher than insomnia, but both insomnia and nightmares were significantly associated with a risk for suicide attempt.[17] In our study, sleep-walking and nightmares, difficulty in falling asleep and difficulty in waking up were significantly more common in our patient group.

Study Limitations

The biggest limitation of our study is that it was conducted in a single center. According to our study, we have shown that sleep problems such as nightmares and sleep-walking are closely related to suicide attempts. Especially in adolescents, sleep problems should be followed more carefully, risky groups should be evaluated together with child psychiatry, and families should be made aware of this issue.

Conclusion

Since suicide attempt is an increasing problem in adolescents, risk factors should be well determined, awareness of families and physicians should be increased, and protective measures should be taken.

Ethics

Ethics Committee Approval: This study was approved by the Ethics Committee of University of Health Sciences Turkey, Ankara Training and Research Hospital (date/number: 3.4.2019/786).

Informed Consent: A questionnaire was applied by obtaining consent from the legal guardians of the patients who applied to the Pediatric Emergency Service of University of Health Sciences Turkey, Ankara Training and Research pediatrics with a suicide attempt between April 2019 and April 2020, and of the healthy children who had not attempted suicide before.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: İ.F., M.A.T., R.Ü.S., Design: İ.F., M.A.T., R.Ü.S., Data Collection or Processing: M.A.T., R.Ü.S., Analysis or Interpretation: İ.F., M.A.T., Literature Search: İ.F., Writing: İ.F.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2021.35682
J Pediatr Emerg Intensive Care Med 2022;9:101-8

Comparison of Opinions and Practices of Pediatric Intensive Care and Pediatric Emergency Departments in High-flow Nasal Cannula Oxygen Therapy: A National Survey Study

Çocuk Yoğun Bakım ve Çocuk Acil Servislerinin Yüksek Akışlı Nazal Kanül Oksijen Tedavisindeki Görüş ve Uygulamalarının Karşılaştırılması: Bir Ulusal Anket Çalışması

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Abstract

Introduction: The purpose of this study is to compare the practice and opinions of tertiary pediatric intensive care units and pediatric emergency departments on high flow nasal cannula oxygen therapy in Turkey.

Methods: A questionnaire was sent to the clinical chiefs of the tertiary intensive care units or pediatric emergency departments who are members of the Pediatric Emergency and Intensive Care Association via e-mail. In the questionnaire, the features of the unit, the high-flow nasal cannula oxygen therapy practice and their opinions on this treatment were asked. Pathologies using high-flow nasal cannula and the success expected were asked to score between 0 and 10 (0: Completely ineffective; 10: Very effective).

Results: A total of 14 pediatric intensive care units and 17 pediatric emergency departments were included in the study. The most frequently used and the highest success score belonged to bronchiolitis. It is used more frequently for neuromuscular diseases in emergency departments ($p<0.05$). Sepsis, lung contusion, rapid sequential intubation, and non-invasive mechanical ventilation incompatibility were most frequent indications in intensive care units ($p<0.05$). There was no difference in terms of maximum flow rates among intensive care units and emergency departments ($p>0.05$). In the follow-up, intensive care units use the chest radiography and the emergency departments use a respiratory severity score more frequently ($p<0.05$). Complication of air leak syndrome was more common in intensive care units (35.7% vs. 0; $p<0.05$). All units described high-flow nasal cannula oxygen therapy as an easy-to-use method. 94.1% of the emergency departments and all intensive care units stated that the treatment was comfortable for the patient.

Öz

Giriş: Çalışmanın amacı, Türkiye'de üçüncü basamak çocuk yoğun bakım üniteleri ve çocuk acil servislerinin yüksek akışlı nazal kanül oksijen tedavisi pratiklerini ve görüşlerini karşılaştırmaktır.

Yöntemler: Çocuk Acil ve Yoğun Bakım Derneği'ne üye olup bir üçüncü basamak çocuk yoğun bakım ünitesi veya çocuk acil servisi sorumluluğunu yürüten hekimlere dernek e-posta sistemi üzerinden anket gönderildi. Ankette ünitenin özellikleri, yüksek akışlı nazal kanül oksijen tedavisi pratiği ve bu tedavi ile ilgili görüşleri soruldu. Yüksek akışlı nazal kanülün kullanıldığı patolojiler ve beklenen başarıya 0 ile 10 arasında puan verilmesi istendi (0: Tamamen etkisiz; 10: Çok etkili).

Bulgular: Toplam 14 çocuk yoğun bakım ve 17 çocuk acil servis çalışmaya dahil edildi. En sık kullanılan ve en yüksek başarı puanı olan patoloji bronşiyolitti. Nöromusküler hastalıklarda kullanım acil serviste daha sıktı ($p<0,05$). Sepsis, akciğer kontüzyonu, hızlı ardışık entübasyon ve non-invaziv mekanik ventilasyon uyumsuzluğu nedeniyle kullanım yoğun bakımda daha sıktı ($p<0,05$). Maksimum akış hızları açısından yoğun bakım ve acil servisler açısından fark saptanmadı ($p>0,05$). İzlemde, yoğun bakımlar akciğer grafisini ve acil servisler bir solunum şiddet skorunu daha sık kullanıyordu ($p<0,05$). Hava kaçağı sendromu komplikasyonu yoğun bakımlarda daha sıktı (%35,7'ye karşılık 0; $p<0,05$). Tüm üniteler yüksek akışlı nazal kanül oksijen tedavisini uygulaması kolay bir yöntem olarak tanımladı. Acil servislerin %94,1'i ve tüm yoğun bakım üniteleri tedavinin hasta için rahat olduğunu belirtti.

Sonuç: Yüksek akışlı nazal kanül oksijen tedavisi solunum sıkıntısına neden olan çeşitli patolojilerde kullanılmaktadır. Ünitelerin bu

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Received/Geliş Tarihi: 01.07.2020 **Accepted/Kabul Tarihi:** 18.05.2021

Conclusion: High flow nasal cannula oxygen therapy is used in various pathologies that cause respiratory distress. The treatment practice of the units partially overlaps. It is considered to be easy to apply, comfortable and effective treatment for patients.

Keywords: High flow nasal cannula oxygen therapy, pediatric intensive care, pediatric emergency department, respiratory distress, bronchiolitis

tedaviyi kullanım pratikleri kısmen örtüşmektedir. Uygulaması kolay, hasta konforunu artıran ve etkin bir yöntem olarak düşünülmektedir.

Anahtar Kelimeler: Yüksek akışlı nazal kanül oksijen tedavisi, çocuk yoğun bakım, çocuk acil servisi, solunum sıkıntısı, bronşiyolit

Introduction

High-flow nasal cannula oxygen therapy (HFNCOT) is a non-invasive respiratory support therapy method that has been used in newborns, infants, children and adults in recent years.[1-3] The device consists of an air/oxygen mixer, an active humidifier, a heated circuit and a nasal cannula. A flow rate above 4 L/minute cannot be used in standard nasal cannula oxygen therapy. At higher currents, the patient cannot tolerate the treatment because there is not enough humidification and airflow is given at lower temperatures than body temperature.[4] When oxygen is given with HFNCOT, airflow at a level close to body temperature is provided to the patient through nasal way, with better humidification. Thus, the respiratory workload decreases, oxygenation increases and some continuous positive pressure is provided.[2] Heated and humidified oxygen reduces irritation in the airway mucosa; the oxygen concentration can be titrated according to the patient's needs, and as a result, the patient tolerates higher flow better.[1,5] Studies have been conducted on respiratory system diseases, especially bronchiolitis.[3,6-8] However, there are a limited number of studies in the literature indicating that it can also be used for diseases of other systems that cause respiratory distress, such as sepsis, heart failure and metabolic diseases. Studies were often conducted in intensive care or emergency room conditions.[2,5-10]

For HFNCOT, which has been used with increasing frequency in the last 10 years, there are no accepted guidelines yet on the indications, contraindications, flow rates, monitoring and administration of drugs by nebulization while under HFNCOT. Each center uses HFNCOT by interpreting the literature with their own experiences.[11-13] In the world, there are few survey studies in which HFNCOT practice is evaluated at the national level.[13-18] No similar study has been found in our country.

The aim of this study is to determine and compare the HFNCOT practices and opinions of tertiary pediatric intensive care units (PICU) and pediatric emergency services (PES) in our country.

Materials and Methods

The study was carried out between 01.08.2018 and 30.09.2018 by means of a questionnaire. Surveys created through the SurveyMonkey® (www.tr.surveymonkey.com) portal were sent to physicians, who were the members of the Pediatric Emergency and Intensive Care Association and carried out the responsibility of a tertiary PICU and PES, via e-mail. The first part of the questionnaire consisted of items about the unit's characteristics, annual patient capacity, and HFNCOT experience. The questions in the second part of the questionnaire were about HFNCOT practice. Pathologies in which high-flow nasal cannula was used and the expected success of HFNCOT in these pathologies were requested to be scored between 0 and 10 (0: Completely ineffective; 10: Very effective). For four different age groups (<12 months; 1-5 years, 5-12 years and >12 years), maximum flow rates that were used, clinical and laboratory parameters used in follow-up, use of drugs for sedation, methods used in nebulized drug administration, and the side effects they experienced were asked.

In the last part, they were asked to answer as Yes/No to the standard sentences prepared about HFNCOT. The last question was an open-ended question and the participants expressed their views on HFNCOT in a few sentences. Then, the answers given by the authors to this question were categorized.

Ethics committee approval was obtained for the survey. Participation in the survey was on a voluntary basis. Physicians who wanted to participate in the study filled out the questionnaire sent to their e-mails.

Statistical Analysis

Categorical data were expressed as numbers (n) and percentage (%). The scores given by the units regarding the effectiveness of HFNCOT were shown with the median and interquartile range (IQR). The non-parametric numerical data of two independent groups were compared with the Mann-Whitney U test. The chi-square or Fischer's Exact test was used in the comparison of categorical data in two independent groups. IBM SPSS 20.0 Statistics (IBM Corporation, New York, USA) software was used for statistical analysis. The value of $p<0.05$ was considered as statistically significant.

Results

General Characteristics of Units

A questionnaire was sent to 25 PICU and 33 PES charge physicians in 15 provinces. Sixteen PICU and 25 PES charge

physicians in 14 different provinces responded to the survey. Two PICUs and 9 PESs were excluded because they did not use HFNCOT. A total of 14 PICUs and 17 PESs were included in the study. The median annual number of patients followed in the PICUs participating in the study was 581 (IQR: 400-910); The median annual number of pediatric patients admitted to PESs was 112 951 (IQR: 66 175-161 000) (Table 1).

Indications

Those responsible ones for the emergency and intensive care units were asked to rate the pathological conditions in which they used HFNCOT and their views on the success of HFNCOT treatment in these pathologies. The pathology in which HFNCOT was used most frequently in both PICUs and PESs was bronchiolitis, and the highest expected success score belonged to bronchiolitis. HFNCOT for oxygen support in neuromuscular diseases was preferred more frequently in PESs compared to PICUs (p=0.028). Sepsis, lung contusion, preoxygenation of rapid successive intubation, and mask incompatibility in non-invasive mechanical ventilation (NIV) were the most preferred indications in PICUs (p<0.05), and the expected success of HFNCOT was higher (p<0.05) (Table 2).

Flow Rates

The physicians responsible for the units who participated in the survey were asked about the maximum flow rates they

Table 1. Characteristics of PICU and PES participating in the survey and using HFNCOT

No	Institution	Unit	Minor education	Patient number (n/year)	HFNCOT number (n/year)	HFNCOT experience (year)	HFNCOT protocol
1.	University	PICU	No	230	150	3	No
2.	University	PICU	Yes	587	300	3	No
3.	TRH	PICU	Yes	900	150	3.5	Yes
4.	TRH	PICU	No	720	397	4	No
5.	University	PICU	Yes	500	100	2	No
6.	University	PICU	Yes	575	70	3	No
7.	TRH	PICU	No	1200	25	1	No
8.	TRH	PICU	No	1247	250	2	No
9.	TRH	PICU	No	400	200	4	No
10.	TRH	PICU	Yes	400	220	5	Yes
11.	University	PICU	Yes	166	50	2	No
12.	University	PICU	Yes	524	42	2	No
13.	TRH	PICU	No	750	300	4	Yes
14.	University	PICU	Yes	940	48	3	Yes
15.	TRH	PES	Yes	167000	250	4	Yes
16.	University	PES	Yes	76000	200	4	Yes
17.	TRH	PES	No	155000	200	2	Yes
18.	University	PES	Yes	99286	10	2	No
19.	TRH	PES	No	140000	30	4	No
20.	TRH	PES	No	-	70	1.5	No
21.	University	PES	Yes	45300	60	2	Yes
22.	University	PES	Yes	112951	70	2.5	No
23.	University	PES	Yes	40000	50	2	Yes
24.	TRH	PES	No	321000	450	2	Yes
25.	TRH	PES	No	113660	41	1	Yes
26.	TRH	PES	No	135568	50	1.5	Yes
27.	TRH	PES	No	229000	50	1.5	No
28.	University	PES	Yes	87474	90	3	Yes
29.	TRH	PES	No	350000	20	1.5	No
30.	University	PES	Yes	62350	200	1	Yes
31.	University	PES	Yes	70000	100	4	Yes

TRH: Training and research hospital, PICU: Pediatric intensive care unit, PES: Pediatric emergency service, HFNCOT: High flow nasal cannula oxygen therapy

used in HFNCOT according to their age groups. There was no statistical difference between PICUs and PESs in terms of maximum flow rates used in those younger than one year (p=0.812), 1-5 years old (p=0.906), 5-12 years old (p=0.531), and older than 12 years (p=0.865) (Figure 1).

Monitoring

All units participating in the survey had determined respiration and pulse rate as routine monitoring parameters. 50% of intensive care units used chest X-ray (p=0.001) and 50% of PESs used a standard respiratory severity score (p=0.009) in their routine monitoring (Table 3).

Frequency of Using Sedative Drugs and Administration Methods for Nebulization Therapy

When asked about the frequency of using drugs for sedation during HFNCOT, 13 (92.9%) PICUs and 11 (64.7%) PESs stated that they used sedative drugs when necessary (p=0.094). When drug administrations with nebulization were questioned, the units stated that they used various nebulization techniques at different times. Accordingly, giving the patient nebulization therapy with a mask during HFNCOT [PICU: 5 (35.7%); PES: 12 (70.6%)]; Administering nebulization therapy by connecting a conventional jet nebulizer to the circuit with a spacer during HFNCOT [PICU: 5 (35.7%); PES: 7 (50%]; applying nebulization therapy by connecting the vibrating mesh nebulizer to the circuit with a spacer during HFNCOT [PICU: 3 (21.4%); PES: 4 (23.5%)]; interrupting HFNCOT and giving nebulization therapy via jet nebulizer and mask [PICU: 6 (42.9%); PES: 3 (17.6%)] were the preferred methods, but there was no statistically significant difference between PICU and PES in terms of the frequency of using these methods (p=0.341).

Complications

Five (35.7%) PICUs participating in the study stated that they had air leak syndrome due to HFNCOT; however, none of the PESs reported this complication (p=0.012). When asked about minor complications, all 14 (100%) PICUs stated that they encountered at least one side effect (2 gastric distention, 3 dermatitis, 4 agitation, 4 cannula removal, 1 condensation in circuit). Only 1 (5.9%) PES reported that they encountered with nasal irritation (p<0.001).

Opinions of Units About High Flow Nasal Cannula Oxygen Therapy

All PESs and PICUs participating in the survey see HFNCOT as an easy method to implement. Sixteen (94.1%) of the emergency departments and 14 (100%) of the PICUs think that the treatment is comfortable for the patient (Table 4).

Discussion

In this study, the use of HFNCOT in PICUs and PESs was evaluated for the first time with a national survey. HFNCT is used in many pathologies that cause respiratory distress. The using practice of intensive care and emergency services

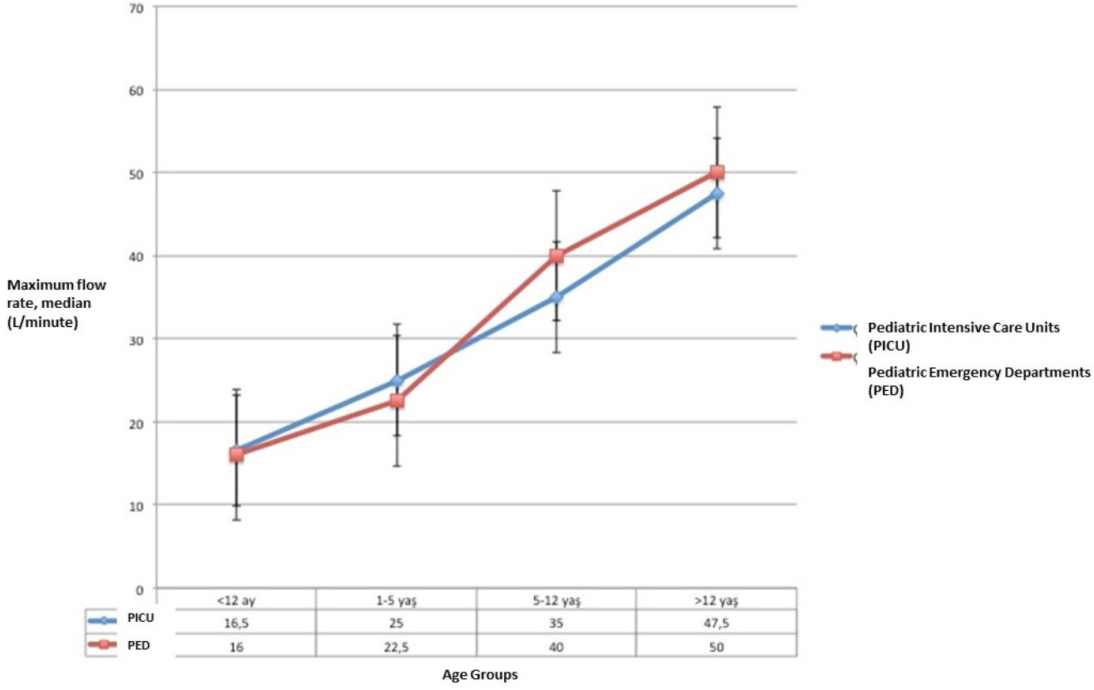

Figure 1. Comparison of maximum flow rates by age groups in patients receiving high-flow nasal cannula oxygen therapy (HFNCOT) in the pediatric intensive care unit (PICU) and pediatric emergency service (PES)

Table 2. Indications for HFNCOT and expected success score (0: Unsuccessful; 10: Very successful) in the PICU and PES

Diseases (%)	Indication for PE (n=17) n (%)	Indication for PICU (n=14) n (%)	p	PES score, median (IQR)	PICU score, median (IQR)	p[1]
Bronchiolitis	17 (100)	14 (100)	>0.999*	9 (8-10)	10 (8-10)	0.131
Pneumonia	17 (100)	13 (92.9)	0.452*	8 (7-9)	8 (8-9)	0.746
Neuromuscular diseases	16 (94.1)	8 (57.1)	**0.028***	6 (1-8)	6 (4-7)	0.934
Asthma	15 (88.2)	13 (92.9)	>0.999*	8 (7-9)	8 (7-9)	0.625
Sepsis	7 (41.8)	11 (78.6)	**0.036****	0 (0-7)	7 (6-8)	**0.017**
Upper airway obstruction	6 (35.3)	9 (64.3)	0.108**	1 (0-8)	8 (7-9)	0.016
ARDS	5 (29.4)	7 (50)	0.242**	0 (0-3)	5 (2-6)	**0.032**
Pulmonary edema	4 (23.5)	8 (57.1)	0.056**	0 (0-0)	6 (0-8)	**0.006**
Lung contusion	2 (11.8)	8 (57.1)	**0.018***	0 (0-0)	7 (0-8)	**0.001**
Preoxygenation in RSI	2 (11.8)	8 (57.1)	**0.018***	0 (0-0)	9 (0-10)	**0.015**
Respiratory distress in a patient with tracheostomy	1 (5.9)	4 (28.6)	0.148*	0 (0-0)	5 (0-7)	0.114
Mask incompatibility in NIV	5 (29.4)	13 (92.9)	**<0.001****	0 (0-7)	8 (7-9)	**0.001**
Postextubation	-	14 (100)	-	-	9 (8-10)	-

ARDS: Acute respiratory distress syndrome, RSI: Rapid successive intubation, NIV: Non-invasive ventilation, [1]: Mann-Whitney U test, *Fischer's Exact test, **: Chi-square test, HFNCOT: High flow nasal cannula oxygen therapy, PICU: Pediatric intensive care unit, PES: Pediatric emergency service

Table 3. Parameters routinely used in the monitoring of patients receiving HFNCOT in 14 PICU and 17 PES

Monitoring parameters	PES (n=17)	PICU (n=14)	p
Respiratory rate	17 (100)	14 (100)	-
Heart rate	17 (100)	14 (100)	-
Withdrawal	16 (94.1)	14 (100)	>0.999*
SpO_2	16 (94.1)	14 (100)	>0.999*
Patient comfort/compliance with treatment	15 (88.2)	13 (92.9)	>0.999*
Consciousness level	14 (82.3)	11 (78.6)	>0.999*
FiO_2	14 (82.3)	13 (92.9)	0.607*
SpO_2/FiO_2	10 (58.8)	7 (50)	0.623**
Blood gas before HFNCOT	13 (76.4)	7 (50)	0.153*
Follow-up blood gas analysis	11 (64.7)	9 (64.3)	>0.999*
Blood pressure	10 (58.8)	10 (71.4)	0.707*
Capillary filling time	9 (52.9)	8 (57.1)	0.815**
Standard respiratory score	7 (41.8)	0	**0.009***
Lung X-ray	0	7 (50)	**0.001***

SpO_2: Oxygen saturation, FiO_2: The fraction of inspired oxygen, *Fisher's Exact test, **: Chi-square test, HFNCOT: High flow nasal cannula oxygen therapy, PICU: Pediatric intensive care unit, PES: Pediatric emergency service

Table 4. Opinions of PICU and PES participating in the study on HFNCOT

Opinions on HFNCOT n (%)	PES (n=17)	PICU (n=14)	p
A comfortable method for the patient	16 (94.1)	14 (100)	>0.999*
An easy method	17 (100)	14 (100)	-
An expensive method compared to its effectiveness	4 (23.5)	0	0.107**
It has similar efficacy with simple oxygen delivery methods.	0	0	-
Between simple oxygen delivery methods and NIV in terms of efficacy	10 (58.8)	11 (78.6)	0.280*
An NIV method	7 (41.8)	3 (21.4)	**0.016****
It may delay intubation and be harmful to the patient.	3 (17.7)	0	0.232*
It decreases the need for intubation	15 (88.2)	11 (78.6)	0.636*
It reduces hospitalization in PICU	15 (88.2)	11 (78.6)	0.636*
It reduces admissions to pediatric services apart from the PICU	7 (41.8)	-	-
It shortens the monitoring time in the emergency department	9 (52.9)	-	-

HFNCOT: High flow nasal cannula oxygen therapy, PICU: Pediatric intensive care unit, PES: Pediatric emergency service, NIV: Non-invasive mechanical ventilation, *: Fisher's Exact test, **: Chi-square test

partially overlaps. The differences are usually due to the unique conditions of intensive care and emergency services and the lack of an accepted standard guideline. Tertiary units serving critically ill patients generally accept HFNCOT as an easy-to-use, comfortable and effective method.

The pathology in which HFNCOT is most commonly used, except in the neonatal period, is bronchiolitis.[1-3,6,8-11] There are limited studies on its less frequently use in pneumonia,[1,2,10,11] asthma attack,[2,10,11,16] sepsis,[2,11] upper airway obstruction,[2,11] neuromuscular diseases, acute respiratory distress syndrome (ARDS),[2,16] rapid successive intubation,[13] and postextubation[2]. Two survey studies about the use of HFNCOT in pediatric patients are available in the literature. In the survey conducted in PICUs in Germany, the most common indications were reported as bronchiolitis, pneumonia, rapid successive intubation, postextubation, and NIV incompatibility.[13] In the survey conducted among respiratory therapists in the United States, the most common indications were found to be bronchiolitis, asthma attack, pneumonia, postoperative respiratory support and ARDS. No questionnaire including PESs was found in the literature. In our study, in accordance with the literature, bronchiolitis, pneumonia and asthma attacks came to the fore as the most preferred indications in intensive care and emergency services. However, PICUs stated that they used HFNCOT more frequently in sepsis, rapid successive intubation, NIV incompatibility, and lung contusion, compared to PESs. Additionally, PICUs had higher expected benefit from HFNCOT in sepsis, upper airway obstruction, ARDS, pulmonary edema, rapid successive intubation, NIV incompatibility, and lung contusion. On the other hand, PESs preferred HFNCOT more frequently in neuromuscular diseases. However, in these patients, there was no difference in terms of the expected success of HFNCOT between intensive care and emergency services. Since there is no similar study in the literature, a comparison could not be made. However, we can interpret these results in the light of our experience. We think that indications for HFNCOT reported by pediatric intensive care and emergency services reflect the differences in intensive care and emergency medicine practice. Patients with pathologies frequently used by the PICU are not followed up in the emergency and general pediatric services, and their treatment is carried out under intensive care conditions. In addition, NIV support is generally given in intensive care conditions. Respiratory problems in neuromuscular diseases are type 2 respiratory failures, in which the partial carbon dioxide level is usually high, unless there is an additional disease. The success of HFNCOT in type 2 respiratory failure is quite low. These patients benefit more from NIV or invasive mechanical ventilation.[19] Because emergency departments follow these patients for a shorter time and then hospitalize them in the PICU, they use HFNCOT for a short time at the admission. The fact that both units have similar expectations from HFNCOT in these patients supports our opinion.

There is no accepted standard protocol for HFNCOT in the world yet.[16,19,20] One-third of PICUs in the United States use a protocol based on age and body weight, established by each institution.[16] In a Finnish study investigating oxygen supplementation in bronchiolitis, it was reported that 60% of centers had a standard HFNCOT initiation protocol and 40% had a HFNCOT outcome protocol.[15] Even in neonatal units where body weight does not change much, there are differences in practice.[17,18] In Germany, there are significant differences among PICUs in terms of preferred maximum flow values.[13] Compared to PICUs in our country, PESs have created a standard HFNCOT protocol within themselves. Considering the age groups, there was no difference between institutions in terms of maximum flow rates. Common parameters used in patient follow-up reflected the typical clinical monitoring of a patient with respiratory distress. However, parameters such as SpO_2/FiO_2, blood gas analysis, chest X-ray or capillary refill time were not common monitoring tools used by all units. In particular, the fact that some of the emergency services created a standard HFNCOT protocol and preferred respiratory severity scoring more frequently in the follow-up was interpreted as the standardization efforts of busy emergency services within themselves. We think that this anonymity has been resulted from the partial overlap in indications, expectations and maximum flow rates; the fact that all the institutions where the survey was conducted are tertiary units; the fact that the questionnaire was filled by the members of the pediatric emergency and intensive care associations; and the fact that HFNCOT has been emphasized frequently in the scientific programs of the national congresses held in our country in recent years.

In order to reduce hypoxemia due to the patient's agitation during non-invasive mechanical ventilation, administration of sedation to the patient in certain clinical situations increases the success of the treatment. However, there is a risk of respiratory depression due to pharmacological sedation. A standard sedation protocol has not yet been determined for both NIV and HFNCOT.[21] In our survey, almost all of the PICUs and more than half of the PESs stated that they used sedative drugs when necessary during HFNCOT.

A significant rate of patients receiving HFNCOT require nebulized drug therapy. The ideal way of drug administration by nebulization in this patient group is not yet known. Nebulized drug therapy is recommended to be administered with a vibrating mesh nebulizer, which is connected to the circuit with a spacer by reducing the flow rate to 2-4 L/min while the patient is under HFNCOT support.[12,22,23] In a survey conducted in the United States, more than 70% of

respiratory therapists stated that they administered nebulized medication with a vibrating mesh nebulizer during HFNCOT. However, few people specified that they reduced the flow rate while applying the drug.[16] In our survey, participants used various methods of nebulization and there was no standard. Connecting the mesh nebulizer to the HFNCOT circuit with the spacer, which is suggested in the literature, was one of the least used methods. In our opinion, it is the least effective method to apply nebulized medication with a face mask to the patient at the same time while taking HFNCOT. We think that the patient's nostrils being partially closed with HFNCOT cannulas and the high-speed oxygen intake from the cannulas at this time will prevent the nebulized drug from reaching the lower airways. However, one-third of PICUs and approximately 70% of PESs sometimes preferred this method.

The most serious complication associated with HFNCOT is air leak syndrome. However, very few cases have been reported in the literature. Apart from this, few and less clinically important complications such as nasal cannula damage to the nasal mucosa and gastric distension can be seen. High-flow nasal cannula oxygen support is generally considered to be a reliable treatment method in pediatric patients.[2-4,13,19,24,25] In our study, approximately one third of PICUs stated that they had air leak syndrome due to HFNCOT. In addition, all of these units encountered at least one minor complication. On the other hand, no air leak syndrome due to HFNCOT was reported in any of the emergency services. Minor complications were very few. The main reason for this difference may be longer follow-up of critically ill patients in PICUs compared to PESs. As the follow-up period increases, the incidence of complications will also increase.

Although there are limited data on HFNCOT, onset time, flow rate, and weaning patients from treatment in PESs, HFNCOT is used especially in patients with a diagnosis of bronchiolitis and is thought to be effective.[26] In a survey study conducted in PICUs in Germany, it has been revealed that HFNCOT is preferred in many cases with respiratory distress, although there are limited data in the literature, except for bronchiolitis.[13] In a survey study investigating NIV methods applied in children with bronchiolitis in England, it has been revealed that HFNCOT is preferred in many hospitals because it is very easy to apply.[14] In our study, HFNCOT is seen as a reliable and easy-to-apply method in tertiary pediatric intensive care and emergency services in our country. The common view of all participants is that HFNCOT is a higher-level method than simple oxygen delivery methods. In fact, some of the physicians responsible for PESs accept HFNCOT as an NIV method. In general, HFNCOT is thought to reduce intubation and hospitalization. Unlike intensive care units, pediatric emergency personnel are concerned that it may cause loss of time in critically ill patients who need intubation, since it is an easy method to apply. As it can be understood from the annual patient capacities of the centers participating in the study, PESs serve under a serious patient load. We think that the fear that a possible deterioration or lack of improvement in a patient due to HFNCOT may not be noticed under such a patient density may be the reason for this statement.

Study Limitations

Our survey study is the first in Turkey in terms of reflecting the use and views of tertiary pediatric intensive care and emergency services about HFNCOT. This type of research is limited in the world. However, the most important limitation is that the data on the HFNCOT practice are based on the statements of the responsible physicians. At this point, the medical records of the hospitals were not used.

Conclusion

As a result, the majority of senior pediatric intensive care and emergency services in our country use HFNCOT in many pathologies that cause respiratory distress, although there are not enough data in the literature. It is accepted as an effective method that is easy to apply, increasing patient comfort. The HFNCOT practices of the units partially overlap. The differences are due to the lack of standards and the specific operating conditions of the units. These results highlight the necessity of establishing a standardized guideline for HFNCOT in critically ill children.

Ethics

Ethics Committee Approval: Approval for the survey was obtained from the İzmir Katip Çelebi University Ethics Committee (date: 02.04.2018, number: 140).

Informed Consent: Participation in the survey was on a voluntary basis. Physicians who wanted to participate in the study filled out the questionnaire sent to their e-mails.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: M.A., A.B.A., Design: M.A., Data Collection or Processing: M.A., A.B.A., F.K., Analysis or Interpretation: M.A., A.B.A., F.K., Literature Search: M.A., A.B.A., F.K., Writing: M.A.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2021.21033
J Pediatr Emerg Intensive Care Med 2022;9:109-15

The Pediatric Tracheostomy Practice During COVID-19 Pandemic at a PICU

COVID-19 Pandemi Sürecinde Çocuk Yoğun Bakımda Pediyatrik Trakeostomi Deneyimi

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Abstract

Introduction: To evaluate pediatric tracheostomies performed at a tertiary care pediatric intensive care unit (PICU) before and after the Coronavirus disease-2019 (COVID-19) pandemic.

Methods: A total of 57 pediatric tracheostomy patients performed at a tertiary care PICU were included. Prognostic scores including pediatric risk of mortality 2, pediatric index of mortality 2 and pediatric logistic organ dysfunction scores, the family education process and time to home discharge were evaluated according to time of tracheostomy (pre-pandemic vs. after pandemic) and responsible surgeon (pediatric surgeon vs. otolaryngologist). MedCalc® Statistical Software version 19.7.2 (MedCalc Software Ltd, Ostend, Belgium; https: //www.medcalc.org; 2021) was used for statistical analysis.

Results: A non-significant tendency for higher rate of pediatric surgery-based tracheostomies was noted after the pandemic (76.0 vs. 24.0%, p=0.134). No significant difference was noted between tracheostomies performed before vs. after the COVID-19 pandemic and those performed by otolaryngologists vs. pediatric surgeons in terms of prognostic scores and time to home discharge.

Conclusion: Our findings emphasize the maintenance of high quality patient care for pediatric tracheostomy patients in accordance with standardized tracheostomy protocols and policies during the pandemic period with no significant difference between tracheostomies performed before and after the COVID-19 pandemic and those performed by pediatric surgeons vs. otolaryngologists in terms of prognostic scores and time to home discharge.

Keywords: Pediatric tracheostomy, pediatric surgeons, otolaryngologists, PICU, COVID-19

Öz

Giriş: Koronavirüs hastalığı-2019 (COVID-19) pandemisi öncesi ve sonrası çocuk yoğun bakım (ÇYB) ünitesinde trakeostomi durumunu değerlendirmek amaçlandı.

Yöntemler: Üçüncü basamak ÇYB ünitesindeki toplam 57 çocuk trakeostomili hasta geriye dönük olarak değerlendirildi. Çocuk mortalite riski 2, çocuk mortalite indeksi ve çocuk lojistik organ disfonksiyonu skorlarını içeren prognostik skorlar, trakeostomi açılma endikasyonları, aile eğitimi süreci, eve taburcu edilme süreçleri ve trakeostomiyi uygulayan sorumlu cerrahın taburculuk sürecine etkileri değerlendirildi. İstatistik analiz için MedCalc® Statistical Software version 19.7.2 (MedCalc Software Ltd, Ostend, Belgium; https: //www.medcalc.org; 2021) kullanıldı.

Bulgular: Kurumumuzda pandemi sürecinde pediyatrik cerrahların trakeostomi açma eğilimi daha yüksek oranda; ancak anlamlı olmayan bir eğilim göstermiştir (76,0 vs %24,0, p=0,134). COVID-19 pandemisinden önce ve sonra; otolaringologlar ve pediyatrik cerrahlar tarafından uygulanan trakeostomiler arasında prognostik skorlar, eve taburcu olma süreleri açısından istatistiksel anlamlı fark bulunamadı. İstatistiksel anlamlı olmamakla birlikte pandemi sürecinde hastaların ebeveynlerinin (tek kişi eğitimi tercih edildi) eğitim süreleri ve hastaların eve verilme süreçleri daha kısa olarak saptandı.

Sonuç: Bulgularımız, pandemi koşullarına rağmen çocuk trakeostomi hastaları için standart protokollere uygun, ebeveyn eğitimi için izole alan eğitimine uygun, yüksek kaliteli hasta bakımının; COVID-19 pandemisinden önce ve sonra, otolaringolog ve pediyatrik cerrahlar tarafından açılan trakeostomiler arasında prognostik skorlar, eve verilme süreleri arasında anlamlı fark olmaksızın sürdürülebildiğini vurgulamaktadır.

Anahtar Kelimeler: Pediyatrik trakeostomi, pediatrik cerrahi, otolaringolog, ÇYB, COVID-19

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Received/Geliş Tarihi: 17.10.2021 **Accepted/Kabul Tarihi:** 08.12.2021

Introduction

The coronavirus disease-2019 (COVID-19), has become a rapidly spreading pandemic associated with increasing burden on the healthcare system and a drastic change in healthcare delivery since its first emergence in Wuhan, China, at the end of 2019.[1,2]

Most health workers have deviated toward COVID care delivery along with postponing of elective and non-essential services, while the otolaryngology surgical volume of tracheostomy has considerably increased given the prolonged intubation need among adult COVID-19 patients with severe acute respiratory distress syndrome (ARDS).[3-6]

Along with significant changes in the management of critically ill children and consideration of prolonged mechanical ventilation (MV) as the primary indication for tracheostomy, tracheostomy has become an increasingly performed procedure in pediatric patients as an important option for earlier transition of children from the pediatric intensive care unit (PICU) and earlier home discharge.[7-10]

This seems notable given that tracheostomy, similar to several procedures in the otolaryngology practice, is an aerosol generating procedure that poses a high risk of exposure to COVID-19, while in the pediatric otolaryngology practice another difficulty is the examining and operating within a potentially asymptomatic population affected by COVID-19.[5,6,11-13]

Hence, in addition to ongoing controversies regarding the optimal timing, technique and home care for pediatric tracheostomy in routine PICU clinical practice,[9,10] management of patients with tracheostomy in COVID-19 pandemic is also considered challenging in terms of continued provision of quality of care in the presence of patient-specific factors, transmission risks and clinical environment.[13]

During the pandemic, pediatric COVID-19 patients were accepted to our PICU and 2 of 8 beds served these patients. No change occurred in the number of beds and adult COVID-19 patients were not accepted at out PICU during the pandemic, while family visitation was limited to specified cases and elective surgeries were delayed as per the standard policy of the institution. Besides, in our hospital, pediatric tracheostomies are performed not only by the otolaryngologists but also by the pediatric surgeons. Hence, given the likelihood of prolonged PICU stay and increase in related complications in patients with tracheostomy indication due to postponing of elective surgeries in pandemic conditions in our hospital, this study presented our clinical experience with pediatric tracheostomies performed at a tertiary care PICU within a 2-year period extending from 2018 to early outbreak period in 2020 and to evaluate potential changes in tracheostomy patient care before and after the COVID-19 pandemic.

Materials and Methods

Study population

A total of 57 pediatric tracheostomies (mean age: 66.5, ranged 2 to 204 months, 66.7% were boys) performed at a tertiary care PICU between May 2018 and May 2020 were included in this retrospective study. The tracheostomies were divided into two groups based on the time of intervention, including pre-pandemic (n=32) and after-pandemic (n=25) tracheostomies.

The study was conducted in accordance with the ethical principles stated in the "Declaration of Helsinki" and approved by the Celal Bayar University Faculty of Medicine Health Sciences Ethics Committee along with the permission for the use of patient data for publication purposes (date of approval: 10/02/2021 reference number/protocol no: 20.478.486/748).

Assessments

Data on patient demographics, primary diagnosis, presence of chronic disease, responsible surgeon (pediatric surgeon, otolaryngologist), prognostic scores including Pediatric Risk of Mortality 2 (PRISM 2), the pediatric index of mortality 2 (PIM 2) and pediatric logistic organ dysfunction (PELOD) scores, duration of family education and time to home discharge from tracheostomy were recorded in each patient. Study parameters were evaluated according to the time of tracheostomy (pre-pandemic vs. after pandemic) and responsible surgeon (pediatric surgeon vs. otolaryngologist).

Tracheostomy indications and the timing of tracheostomy were determined by the treating PICU physician and the surgeon. After confirmation of COVID-19 negativity via two successive real-time reverse transcription-polymerase chain reaction (RT-PCR) analyses, all tracheostomies were performed electively under general anesthesia using the same surgical procedure by the same group of otolaryngologists/pediatric surgeons.

All patients were cases with failed extubation before tracheostomy and were discharged home with long-term ventilator. The parents and/or formal caregivers of patients were educated prior to home discharge of the patient about the stoma care, suctioning, changing the tracheostomy tube, the equipment required for emergency situations, and routine care.

Statistical Analysis

Statistical analysis was made using MedCalc® Statistical Software version 19.7.2 (MedCalc Software Ltd, Ostend,

Belgium; https://www.medcalc.org; 2021). Chi-square test and Yates Continuity Correction were used for analysis of categorical data, while Mann-Whitney U test was used for analysis of the parametric variables. Data were expressed as mean (standard deviation), median (minimum-maximum) and percent (%) where appropriate. P<0.05 was considered statistically significant.

Results

Baseline characteristics

Overall, mean patient age was 66.5 months (range, 2 to 204 months) and 66.7% of patients were boys. Primary diagnosis was neurological disease in 61.4% of patients, and chronic disease was evident in 78.9% (Table 1).

No significant difference was noted between pre-pandemic and post-pandemic tracheostomy patients in terms of age, primary diagnosis or presence of chronic disease (Table 1).

Tracheostomy indications and the responsible surgeon

The prolonged MV was the major tracheostomy indication overall (89.5%) and in both pre-pandemic (87.5%) and post-pandemic (92.0%) operations, being related to neurological problems in most of patients (42.9% overall, 40.6% pre-pandemic and 44.0% after pandemic) (Table 1).

Tracheostomies were performed by pediatric surgeons in 63.2% of cases and by otolaryngologists in 36.8%. Although not statistically significant, a tendency for higher rate of pediatric surgery-based tracheostomies was noted after the pandemic (76.0 vs. 24.0%, p=0.134) (Table 1).

Prognostic scores, timing of tracheostomy, family education and home discharge

Overall, the median PRISM 2, PIM 2 and PELOD scores were 16.0 (range, 3 to 41), 36.0 (range, 4 to 93) and 12.0 (range, 2 to 46), respectively. Median duration of tracheostomy timing was 30 days (range, 0 to 300) before pandemic and 35 days (range, 12 to 150) after pandemic period. Median duration of family education was 7 days (range, 4 to 25) and time to home discharge was 61 days (range, 19 to 362 days) (Table 2).

No significant difference was noted between tracheostomies performed before and after pandemic in terms of prognostic scores and time to home discharge, while the duration of family education was significantly shorter in tracheostomies performed after pandemic than in those performed before the pandemic (median 6 vs. 8 days, p=0.007) (Table 2, Figure 1).

Prognostic scores, and home discharge according to the responsible surgeon

No significant difference was noted between tracheostomies performed by otolaryngologists vs. pediatric surgeons in terms of prognostic scores, length of PICU stay (before and after tracheostomy) and time to home discharge (Table 3, Figure 2).

Table 1. Baseline characteristics, tracheostomy indications and the responsible surgeon

		Total (n=57)	Pre-pandemic (n=32)	After-pandemic (n=25)
Age (year)	Mean (SD)	66.5 (68.8)	74.4 (69.7)	56.5 (67.6)
	Median (min-max)	36 (2-204)	48 (2-204)	24 (3-204)
Primary diagnosis, n (%)				
Neurological disease		35 (61.4)	17 (53.1)	18 (72.0)
Respiratory disease		12 (21.1)	8 (25.0)	4 (16.0)
Trauma		5 (8.8)	3 (9.4)	2 (8.0)
Cardiovascular disease		3 (5.3)	3 (9.4)	0 (0.0)
Infection		2 (3.5)	1 (3.1)	1 (4.0)
Chronic disease, n (%)				
Yes		45 (78.9)	25 (43.9)	20 (35.0)
No		12 (21.1)	7 (12.2)	5 (8.9)
Tracheostomy indication, n (%)				
Prolonged MV		51 (89.5)	28 (87.5)	23 (92.0)
Neurological problems		24 (42.9)	13 (40.6)	11 (44.0)
Neuromuscular problems		16 (28.6)	7 (21.9)	9 (36.0)
Pulmonary problems		11 (19.6)	8 (25.0)	3 (12.0)
Upper airway obstruction		6 (10.5)	4 (12.5)	2 (8.0)
Responsible surgeon, n (%)				
Pediatric surgeon		36 (63.2)	17 (53.1)	19 (76.0)*
Otolaryngologist		21 (36.8)	15 (46.9)	6 (24.0)

MV: Mechanical ventilation, SD: Standard deviation, Yates Continuity correction, *p=0.134

Table 2. Prognostic scores, timing of tracheostomy, family education and home discharge according to time of tracheostomy

		Total (n=57)	Pre-pandemic (n=32)	After-pandemic (n=25)	p
PRISM 2	Mean (SD)	18.2 (10.1)	18.7 (9.7)	17.5 (10.8)	0.606
	Median (min-max)	16.0 (3-41)	18.0 (5-41)	13.0 (3-39)	
PIM 2	Mean (SD)	38.4 (24.7)	35.1 (26.1)	42.6 (22.8)	0.145
	Median (min-max)	36.0 (4-93)	33 (4-93)	40.0 (10-88)	
PELOD	Mean (SD)	16.6 (12.1)	16.7 (13.8)	16.4 (9.6)	0.591
	Median (min-max)	12.0 (2-46)	11.0 (2-46)	20 (2-33)	
Timing of tracheostomy (day)	Mean (SD) Median (min-max)	43.0 (44.1) 31 (0-300)	44.7 (53.4) 30 (0-300)	40.8 (29.1) 35 (12-150)	0.742
Duration of family education (day)	Mean (SD)	8.5 (4.7)	10.2 (5.5)	6.3 (2.2)	0.007
	Median (min-max)	7.0 (3-25)	8.0 (4-25)	6.0 (3-10)	
Time to home discharge (day)	Mean (SD)	85.3 (74.8)	90.3 (77.3)	79.0 (73.1)	0.769
	Median (min-max)	61.0 (19-362)	52.5 (20-320)	67.0 (19-362)	

PRISM 2: Pediatric risk of mortality 2, SD: Standard deviation, PIM 2: Pediatric index of mortality 2, PELOD: Pediatric logistic organ dysfunction, Mann-Whitney U test

Discussion

Our findings regarding the 2-year experience of pediatric tracheostomies in a tertiary care PICU revealed that most of tracheostomies were performed due to prolonged MV related to neurological problems and were performed by pediatric surgeons rather than otolaryngologist, particularly during the pandemic period. A shorter duration of family education was noted in tracheostomies performed in the post-pandemic vs. pre-pandemic period. During the pre-post pandemic, caregivers of the patients with tracheostomy were educated by the pediatric intensive care nurse and the responsible physician. No significant difference was noted between the tracheostomies performed before vs. after pandemic or by pediatric surgeon vs. otolaryngologist in terms of prognostic scores or time to home discharge.

During COVID-19 pandemic, early tracheostomy to wean intubation in certain patients with severe ARDS and thus to allow them to be transferred to a ventilatory weaning unit has become a strategy adopted by many ICUs, to free up all possible ICU beds for new patients.[3-5]

Notably, in a past study on the impact of the COVID-19 pandemic on the surgical volume of otolaryngology

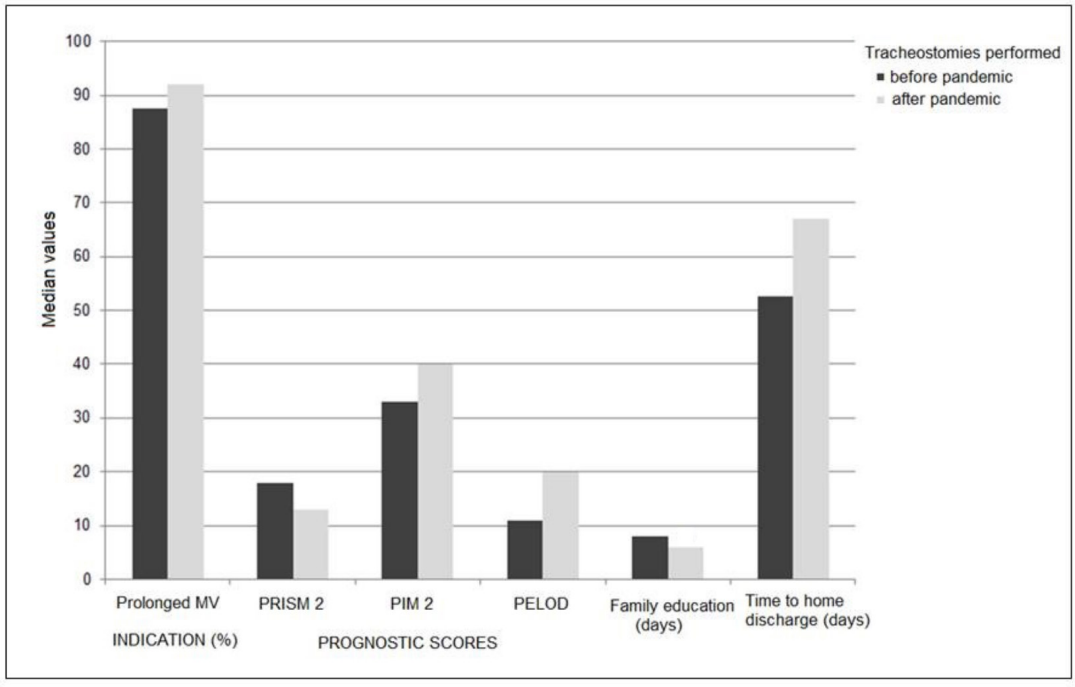

Figure 1. Comparison of tracheostomies performed before vs. after the COVID-19 pandemic
COVID-19: Coronavirus disease-2019, MV: Mechanical ventilation, PRISM 2: Pediatric risk of mortality 2, PIM 2: Pediatric index of mortality 2, PELOD: Pediatric logistic organ dysfunction

Table 3. Prognostic scores, length of PICU stay and home discharge according to responsible surgeon

	Total (n=57)	Responsible surgeon		
		Pediatric surgeon (n=36)	Otolaryngologist (n=21)	p
Prognostic scores, median (min-max)				
PRISM 2	16.0 (3-41)	18.0 (3-39)	13.0 (5-41)	0.188
PIM 2	36.0 (4-93)	41.0 (6.5-93)	29.0 (4-89)	0.132
PELOD	12.0 (2-46)	12.0 (2-46)	12.0 (2-42)	0.431
Length of PICU stay (day), median (min-max)				
Before tracheostomy	31 (0-300)	29 (0-150)	35 (10-300)	0.085
After tracheostomy	23 (2-670)	29.5 (2-670)	22 (8-90)	0.456
Time to home discharge (day), median (min-max)	61 (19-362)	56 (19-362)	64 (20-320)	0.535

PRISM 2: Pediatric risk of mortality 2, PIM 2: Pediatric index of mortality 2, PELOD: Pediatric logistic organ dysfunction, PICU: Pediatric intensive care unit, Mann-Whitney U test

departments in France, the authors reported that while the number of functional otolaryngology surgeries decreased by 84% during the first month of the COVID-19 epidemic, the number of planned tracheostomies increased.[5] Hence, the decrease in the pediatric tracheostomies performed by otolaryngologists in our hospital during COVID-19 pandemic may be explained by the increased otolaryngology surgical volume of tracheostomy for adult COVID-19 patients, given that patients with COVID-19-related ARDS may require prolonged intubation, justifying tracheostomy and otolaryngologists were logically asked to perform this procedure.[5,14]

In this regard, our findings emphasize the likelihood of an increased participation of pediatric surgeons in implementation of pediatric tracheostomies during the COVID-19 pandemic in our hospital to enable the continued routine tracheostomy care with no delay or deviation from the standard protocol during the pandemic period. Also, there were no significant differences in prognostic scores, length of PICU stay and time to home discharge in pediatric tracheostomies performed before vs. after pandemic or by pediatric surgeons vs. otolaryngologists.

Hence, our findings indicate a favorable outcome in pediatric tracheostomy interventions performed during the pandemic conditions, indicating a maintained provision of high-quality healthcare delivery to non-COVID patients. This seems notable given that in a past study regarding the experience of a surgeon at the emergency department during COVID-19 pandemic, the authors indicated a worrying change in indications of tracheostomies performed during the pandemic (i.e., chronic suppurative otitis media and retropharyngeal abscess) which were preventable in normal circumstances.[6]

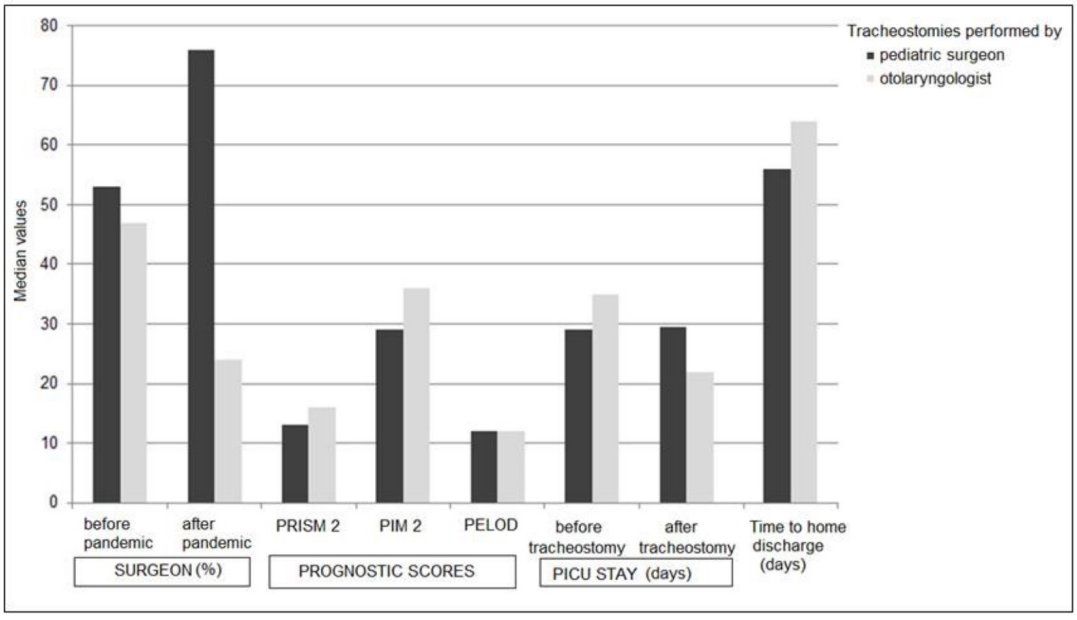

Figure 2. Comparison of tracheostomies performed by pediatric surgeons vs. otolaryngologists
PRISM 2: Pediatric risk of mortality 2, PIM 2: Pediatric index of mortality 2, PELOD: Pediatric logistic organ dysfunction, PICU: Pediatric intensive care unit

Notably, in a study providing data on a South African tertiary center experience on COVID-19 and pediatric lung disease as of September 2020, the authors reported that while the children with tracheostomies are generally considered to be at increased risk of lower respiratory tract infections, severe COVID-19 was not observed in their patient cohort.[15] The authors also noted that pandemic-related limitations in caregiver support as well as hospital regulations restricting the movement of caregivers in and out of hospital have had significant impact on family dynamics, especially in families with children who required prolonged hospitalization for training in tracheostomy care.[15] In this regard, it should be noted that the only difference between tracheostomies performed before and after pandemic period in the current study was a shorter course of patient education provided by the pediatric surgeons after the COVID-19 pandemic. Indeed, family involvement and broad staff education are considered amongst the key factors in improving the quality of care for pediatric tracheostomy patients in addition to contribution of multidisciplinary tracheostomy care teams and the use of standardized tracheostomy protocols and policies.[7]

Owing to the growing increase in the number of pediatric patients with chronic diseases who require prolonged ventilator assistance for survival and PICU discharge, prolonged MV has become the main indication for tracheostomy.[9,16-18] Accordingly, our findings support the data from previous studies indicated long-term ventilation as the most common indication for pediatric tracheostomy (range 20-61%), followed by subglottic stenosis (range 14-36.8%).[9,17-21]

When compared to our previous study regarding the retrospective review of pediatric tracheostomies from 2008 to 2014[9] findings in the current study period (2018-2020) revealed that the most common indication for tracheostomy continued to be the prolonged MV (85.7% in 2008-2014 period, 89.5% in the current study) due to neurologic, neuromuscular, muscular, or respiratory problems. Nonetheless, when compared to our earlier study[9] the current findings revealed higher PRISM 2 scores on admission (median 13.2 vs. 18.0) and a shorter PICU stay after tracheostomy (median 37 days vs. 23 days) along with similar rate of chronic diseases (81.0 vs. 78.9%) and similar duration of PICU stay before tracheostomy (median 32 days vs. 31 days).

The median duration of PICU stay in our study was also similar to other studies reported from Turkey.[22,23] Although the right time for tracheostomy in infants and children requiring long-term respiratory support is still controversial, most of the studies revealed the median duration of ventilation before pediatric tracheostomy to range from 4.3 to 30.4 days[7,16,24,25] while median time periods of up to 3 months before tracheostomy have also been reported.[26] Indeed, the potential benefits of early tracheostomy after 2 weeks of intubation in a child who is stable on the ventilator has been suggested, given the association of a longer duration of ventilation before tracheostomy with increased ICU morbidities and longer ICU stay.[7]

While the COVID-19 was ruled out via two successive PCR analyses before tracheostomy in our patients, given that examinations and interventions in the pediatric otolaryngology practice occur in anatomical locations with high possibility of aerosol generation and also in a potentially asymptomatic population affected by COVID-19, all pediatric patients undergoing urgent otolaryngology procedures is considered to be treated as suspected COVID-19 cases until proven otherwise.[11,12,27] Besides, given that not all patients requiring urgent tracheostomy will have been tested, tracheostomy necessitates the surgeon to pay meticulous attention for infection control to reduce the cross-contamination and their own risk for contracting the infection.[11,12,28]

Study Limitations

Certain limitations to this study should be considered. First, potential lack of generalizability is an important limitation due to single-center study design with relatively small sample size. Second, the lack of data on decannulation procedures, long-term post-discharge outcome and the potential risk factors in non-survivors is another limitation which otherwise would extend the knowledge achieved in the current study.

Conclusion

Our findings indicate the active participation of pediatric surgeons besides the otolaryngologists in implementation of pediatric tracheostomies at a tertiary care PICU, particularly after the emergence of COVID-19 pandemic. Accordingly, our findings indicate the maintenance of high quality patient care for pediatric tracheostomy patients in accordance with standardized tracheostomy protocols and policies during the pandemic period with no significant difference between tracheostomies performed before and after the COVID-19 pandemic and those performed by pediatric surgeons vs. otolaryngologists in terms of prognostic scores and time to home discharge.

Ethics

Ethics Committee Approval: The study was conducted in accordance with the ethical principles stated in the "Declaration of Helsinki" and approved by the Celal Bayar University Faculty of Medicine Health Sciences Ethics Committee along with the permission for the use of patient data for publication purposes (date of approval: 10/02/2021 reference number/ protocol no: 20.478.486/748).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: N.Z., A.B., Design: N.Z., A.B., Data Collection or Processing: N.Z., A.B., O.O.C., H.İ.T., Analysis or Interpretation: N.Z., A.B., O.O.C., H.İ.T., Writing: N.Z., A.B., O.O.C., H.İ.T.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2022.44227
J Pediatr Emerg Intensive Care Med 2022;9:116-22

Did the COVID-19 Pandemic Affect the Emergency Service and Outpatient Clinic Applications of Pediatric Patients?

COVID-19 Pandemisi Çocuk Hastaların Acil Servis ve Poliklinik Başvurularını Etkiledi mi?

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Abstract

Introduction: In the Coronavirus disease-2019 (COVID-19) pandemic, hospital admission rates was observed same difference in due to masks, closure of schools, and curfews. In our study; we aimed to compare the pediatric health and diseases department applications, triage, diagnosis distribution and hospitalization rates during the pandemic period with those before the pandemic.

Methods: In this study, 240.440 patients who applied to Kütahya Health Sciences University Hospital Pediatrics Department between 11.03.2019 and 11.03.2021 were evaluated retrospectively. The patients were analyzed in two groups as pre-pandemic and pandemic period. Diagnosis distribution was evaluated in October-November-December. Chi-square test was used to compare categorical variables, and multiple comparisons were analyzed using Bonferroni-corrected Z-test. Significance level was acceppted as p<0.050. Ethics committee approval was obtained for the study.

Results: Pediatrics department visits decreased by 68.5% during the pandemic period (p<0.001). During the pandemic period, while the rate of application to pediatric clinic, endocrinology and neonatal intensive care units increased and the rate of admission to pediatric emergency, allergy and cardiology departments decreased (p<0.001). While the diagnoses of respiratory tract infections, nausea-vomiting, cough, and fever were high before the pandemic. Gastroenteritis, urinary system infection, headache, constipation, urticaria, and neonatal hyperbilirubinemia were high in the pandemic period (p<0.001). Hospitalization rates during the pandemic period; it was determined that while the rates of pediatrics, allergy and cardiology hospitalizations decreased, the rate of hospitalization in emergency and neonatal intensive care units increased (p<0.001). No difference was found between mortality rates in pediatric and neonatal intensive care units (p=1.00). It was analyzed that while the green area application rate was higher before the pandemic, the yellow and red area application rate was higher during the pandemic period (p<0.001).

Öz

Giriş: Koronavirüs hastalığı-2019 (COVID-19) pandemisinde maske, okulların kapanması, sokağa çıkma kısıtlamaları nedeniyle hastaneye başvuru oranlarında değişiklik gözlenmiştir. Çalışmamızda; pandemi döneminde çocuk sağlığı ve hastalıkları bölüm başvurularının, triyaj, tanı dağılımları ve yatış oranlarının pandemi öncesi ile karşılaştırılması amaçlandı.

Yöntemler: 11.03.2019-11.03.2021 tarihleri arasında, Kütahya Sağlık Bilimleri Üniversite Hastanesi, Çocuk Sağlığı Bölümü'ne başvuran 240,440 hasta geriye dönük olarak değerlendirildi. Hastalar COVID-19 pandemi öncesi ve pandemi dönemi olmak üzere iki grupta incelendi. Tanı dağılımı Ekim-Kasım-Aralık ayları değerlendirildi. Kategorik değişkenlerin karşılaştırılmasında ki-kare testi, çoklu karşılaştırmalar Bonferroni düzeltmeli Z-testi ile analiz edildi. Önem düzeyi p<0,050 olarak alındı. Çalışma için etik kurul onayı alındı.

Bulgular: Pandemi döneminde çocuk hastalıkları bölümüne yıllık başvuru %68,5 azaldığı saptandı (p<0,001). Pandemi döneminde çocuk sağlığı ve hastalıkları, endokrinoloji ve yenidoğan yoğun bakıma başvuru oranında artarken çocuk acil, alerji, kardiyoloji bölümlerine başvuru oranının azaldığı saptandı (p<0,001). Pandemi öncesi solunum yolu enfeksiyonları, bulantı-kusma, öksürük, ateş tanıları yüksek iken pandemi döneminde gastroenterit, üriner sistem enfeksiyonu, baş ağrısı, kabızlık, ürtiker, yenidoğan sarılığı yüksek sıklıkta olduğu görüldü (p<0,001). Pandemi döneminde yatış oranları; çocuk hastalıkları, alerji ve kardiyoloji yatış oranlarının azalırken acil servisten verilen ve yenidoğan yoğun bakım yatış oranının arttığı saptandı (p<0,001). Çocuk ve yenidoğan yoğun bakım yıllık mortalite oranları arasında istatistiksel olarak fark saptanmadı (p=1,00). Pandemi öncesi yeşil alan başvuru oranı daha yüksek iken pandemi döneminde sarı ve kırmızı alan başvuru oranının daha yüksek olduğu analiz edildi (p<0,001).

Sonuç: Pandemi döneminde hastane başvuru oranları önemli ölçüde düşerken, maske ve okulların kapanması nedeniyle diğer solunum

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Received/Geliş Tarihi: 16.06.2021 **Accepted/Kabul Tarihi:** 21.01.2022

Conclusion: While the rates of admission in pediatric patients decreased significantly during the pandemic period, it was thought that other respiratory tract infections decreased due to the closure of masks and schools. In addition, measures and seasonal arrangements should be made to reduce the applications for green area in the pediatric emergency services.

Keywords: COVID-19, pandemic, pediatric emergency, triage, hospitalization rates, mortality

yolu enfeksiyonlarının azaldığı düşünüldü. Ayrıca acil servis yeşil alan başvurularının azaltılması için önlemler ve mevsimsel düzenlemelerin yapılması gerektiği düşünülmektedir.

Anahtar Kelimeler: COVID-19, pandemi, çocuk acil, triyaj, yatış oranları, mortalite

Introduction

Patients with non-urgent and mild complaints often prefer the emergency service because of the ease of access to the physician.[1-3] The fact that green area patients apply to the emergency service instead of applying to the primary health care services causes the density in the hospitals and the insufficient and poor quality delivery of care in the health system.[3-5] This excessive workload causes patients to wait for a long time and delays in providing services to those with serious illnesses, resulting in dissatisfaction, increased patient treatment costs, and serious problems in terms of safety.[3-7]

With the declaration of the Coronavirus disease-2019 (COVID-19) pandemic on March 11, 2020 in the world and in our country, restrictions had to be made in the health system and social life. A decrease is observed in hospital admissions due to mask use, social distance rules, closure of schools, curfews in the country and fear of COVID-19 infection.[8-10] In this study, it was aimed to evaluate the hospital admission rates, triage status, diagnosis distribution, hospitalization and mortality rates of pediatric patients during the pandemic period.

Materials and Methods

Cases admitted to the Department of Child Health and Diseases of the University of Health Sciences between 11.03.2019 and 11.03.2021 were analyzed with the cross-sectional observational study method. Patient information was scanned retrospectively from the hospital automation system, and data of 240,440 patients aged 0-18 years were recorded. All of the applications were analyzed in two groups as pre-pandemic COVID-19 (11.03.2019-11.03.2020) and pandemic period (11.03.2020-11.03.2021). Diagnostic distribution of emergency applications in October-November-December selected from the autumn and winter seasons was evaluated in two groups as pre-pandemic (01.10.2019-30.12.2019) and pandemic periods (01.10.2020-31.12.2020). The triage characteristics, admission times, medical diagnoses and the results of the procedures (observation, hospitalization) of the children who applied to the emergency service during these periods were recorded. During the pandemic period, patients with fever, cough, and COVID-19 contact/positive diagnosis after triage were referred to the newly opened pediatric pandemic outpatient clinic. Our hospital is the only center providing tertiary care in our province. In our hospital, cases are coded according to the International Classification of Diseases-10 system. For the study, all patients who applied to our pediatric health and diseases departments (cardiology, endocrine, allergy, pediatric health and diseases, pandemic, emergency and pediatric services, pediatric and neonatal intensive care units) between the specified dates and who received inpatient treatment were included. As exclusion criteria from the study, those with missing data in the file and those who presented with trauma were excluded from the study. Our study was approved by the Kütahya Health Sciences University Non-Interventional Ethics Committee (E-41997688-050.99-10324) and the study was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

Data were analyzed with IBM SPSS V23. The chi-square test was used to compare categorical variables before and after the pandemic, and pairwise comparisons were evaluated with the Bonferroni correction Z-test. Analysis results were presented as frequency (percentage). Significance level was taken as $p<0.05$.

Results

While the annual rate of application to the pediatric emergency and pediatric outpatient clinics per child before the COVID-19 pandemic was approximately 3 between March 2019 and March 2020, one application was detected during the pandemic period (minor branches were excluded). Considering the annual total patient applications, it was seen that the annual rate of admissions to the pediatric department during the pandemic period decreased by 68.5% from 182,779 to 57,661, compared to the pre-pandemic period (Table 1). Considering the distribution of outpatient clinic

applications, while 48.8% of the pre-pandemic applications were to emergency, 32.4% to pediatric health and diseases, and 19% to minor clinics, 38.5% of the applications were found to be to emergency, 34.1% to pediatric health and diseases, 5.5% to pandemic, and 21.9% to minor clinics during the pandemic period (Table 1, Figure 1). A statistically significant difference was found between pre-pandemic and pandemic periods in terms of the distribution of outpatient clinic admissions in the department of pediatric diseases ($p<0.05$). It was analyzed that the number of applications to pediatric health and diseases and endocrinology outpatient clinics and neonatal intensive care units increased and the number of applications to pediatric emergency, allergy and cardiology outpatient clinics decreased during the pandemic period ($p<0.05$) (Table 1).

It was observed that in October-November-December, when pediatric patients were intense, the number of emergency department admissions decreased significantly during the pandemic period. All diagnosis distributions and rates in these months are detailed in Table 2. A statistically significant difference was found for the distribution of diagnoses between pre-pandemic and pandemic periods ($p<0.05$). It was determined that the diagnosis rates of respiratory tract infections, nausea-vomiting, cough and fever were higher before the pandemic and the diagnosis rates of gastroenteritis, urinary system infection, headache, constipation, urticaria, and neonatal jaundice were higher during the pandemic period ($p<0.05$) (Table 2).

Considering the hospitalization rates of the patients who applied to the department of pediatrics, a statistically significant difference was found between pre-pandemic and pandemic periods ($p<0.05$) (Table 3). While it was determined that the rates of hospitalization in pediatrics, allergy and cardiology services decreased during the pandemic period, it was found that the rates of hospitalization in the emergency department and in the neonatal intensive care unit increased ($p<0.05$) (Table 3). Similarly, it was observed that the rate of hospitalization in the pediatric intensive care unit increased during the pandemic period ($p=0.041$). Considering the annual mortality rates of intensive care units, the mortality rate of pediatric intensive care unit was 3.5% before the pandemic, while it was 3.4% during the pandemic period. On the other hand, the mortality rate of neonatal intensive care unit was 0.6% before and during the pandemic, which did not change with the pandemic. There was no statistical difference between the mortality rates of pediatric and neonatal intensive care units during the pandemic period ($p=1.0$).

A statistically significant difference was found in terms of the annual distribution of pediatric emergency triage characteristics between the pre-pandemic and pandemic periods ($p<0.05$). It was analyzed that while the rate of applications for green areas was higher before the pandemic, the rates of applications for yellow and red areas were higher during the pandemic period ($p<0.05$) (Table 4).

Discussion

When the triage distribution of pediatric emergency service admissions is examined, it is seen that most are for the green area. Green area applications consist of diseases that are not urgent or that can be treated in the outpatient clinic, and should be treated primarily in primary health care institutions.[11-15] In a study conducted in the Black Sea Region of our country, when the triage distribution of the patients was examined, it was found that 55.7% of them applied for green area, 43.9% for yellow area, and 0.4% for red area.[16] In a study conducted in the pandemic period, it was observed that non-urgent green area applications to emergency services decreased and applications with emergencies for yellow areas increased.[17,18] In our study, it was determined that applications for green area decreased and applications

Table 1. Number and % distribution of outpatient clinic applications to pediatric diseases department before and during the pandemic

Child health and diseases outpatient clinics	Pre-pandemic	Pandemic period	p
Child health and diseases	59212 (32.4)[a]	19688 (34.1)[b]	
Pediatric endocrinology	9028 (4.9)[a]	4608 (8)[b]	
Pediatric allergy	12126 (6.6)[a]	3440 (6)[b]	
Pediatric cardiology	10267 (5.6)[a]	2495 (4.3)[b]	**<0.05**
Newborn	3039 (1.7)[a]	2094 (3.6)[b]	
Pediatric emergency	89107 (48.8)[a]	22169 (38.4)[b]	
Pediatric pandemic	0 (0)	3167 (5.5)**	
Annual number of applications	182779 (100%)	57661 (100%)	

*Chi-square test, [a,b]: A statistically significant difference was found among those with different letters in each outpatient clinic, **Pairwise comparison was not made as it was 0 before the pandemic

Table 2. Diagnostic distribution of pediatric emergency service admissions in November-December-January before and during the pandemic

Diagnosis and symptoms at admission	Pre-pandemic	Pandemic period	p
Upper respiratory tract infection	21693 (44.8)[a]	3022 (33)[b]	
Otitis	730 (1.5)	61 (0.7)	
Tonsillitis	586 (1.2)	45 (0.5)	
Pharyngitis	232 (0.5)	18 (0.2)	
Sinusitis	160 (0.3)	8 (0.1)	
Undefined upper respiratory tract infection	19985 (41.3)	2890 (31.6)	
Nausea-vomiting	4000 (8.3)[a]	374 (4.1)[b]	
Stomachache	3780 (7.8)[a]	792 (8.7)[b]	
Cough	2725 (5.6)[a]	40 (0.4)[b]	
Acute gastroenteritis	2400 (5)[a]	784 (8.6)[b]	
Fever	2372 (4.9)[a]	180 (2)[b]	**<0.05**
Restlessness, agitation	589 (1.2)[a]	88 (1)[b]	
Urinary tract infection	577 (1.2)[a]	156 (1.7)[b]	
Lower respiratory tract infection	490 (1)[a]	38 (0.4)[b]	
Being bitten by mammals	499 (1)[a]	171 (1.9)[b]	
Headache	418 (0.9)[a]	108 (1.2)[b]	
Constipation	300 (0.6)[a]	99 (1.1)[b]	
Urticaria	287 (0.6)[a]	158 (1.7)[b]	
Neonatal jaundice	130 (0.3)[a]	127 (1.4)[b]	
Other diagnoses	8138 (16.8)[a]	1694 (18.5)[b]	
Pandemic outpatient clinic	0 (0)	1319 (14.4)**	
Total number of applications for 3 months	48398 (100)	9150 (100)	

*Chi-square test, [a,b]: A statistically significant difference was found among those with different letters in each case, **Pairwise comparison was not made as it was 0 before the pandemic

Table 3. Distribution of the annual number of patients hospitalized in pediatric health and diseases departments before and during the pandemic

Clinics of hospitalization	Pre-pandemic	Pandemic period	p
Child health and diseases	3918 (44)[a]	1232 (27.9)[b]	
Pediatric allergy	114 (1.3)[a]	17 (0.4)[b]	
Pediatric cardiology	35 (0.4)[a]	6 (0.1)[b]	
Pediatric emergency	2934 (33)[a]	1142 (25.9)[b]	<0.05
Pediatric intensive care	405 (4.5)[a]	236 (5.4)[b]	
Neonatal intensive care	1117 (12.5)[a]	1145 (26)[b]	
Pediatric pandemic	0 (0)	450 (10.2)**	
Pediatric endocrinology	381 (4.3)[a]	180 (4.1)[a]	>0.05
Total number of hospitalized patients	8904 (100%)	4408 (100%)	

*Chi-square test, [a,b]: A statistically significant difference was found among those with different letters in each case, **Pairwise comparison was not made as it was 0 before the pandemic

Table 4. Triage distribution of pediatric emergency service admissions before and during the pandemic

Triage characteristics	Pre-pandemic	Pandemic period	p
• Green area	52175 (58.6)[a]	5362 (24.2)[b]	
• Yellow area	36550 (41)[a]	16435 (74.1)[b]	<0.05
• Red area	381 (0.4)[a]	372 (1.7)[b]	
Annual number of patients admitted to the emergency department	2934 (3.3)	1142 (5.2)	
Annual number of emergency service admissions	89106 (100)	22169 (100)	

*Chi-square test, [a,b]: A statistically significant difference was found among those with different letters in each case

for yellow area increased during the pandemic, which is in line with the literature. The reason for this was thought to be due to the late admission of patients to the hospital, the reduction of respiratory tract infections as a result of the use of masks, and the physicians' use of laboratory and radiological examinations recommended in the guideline

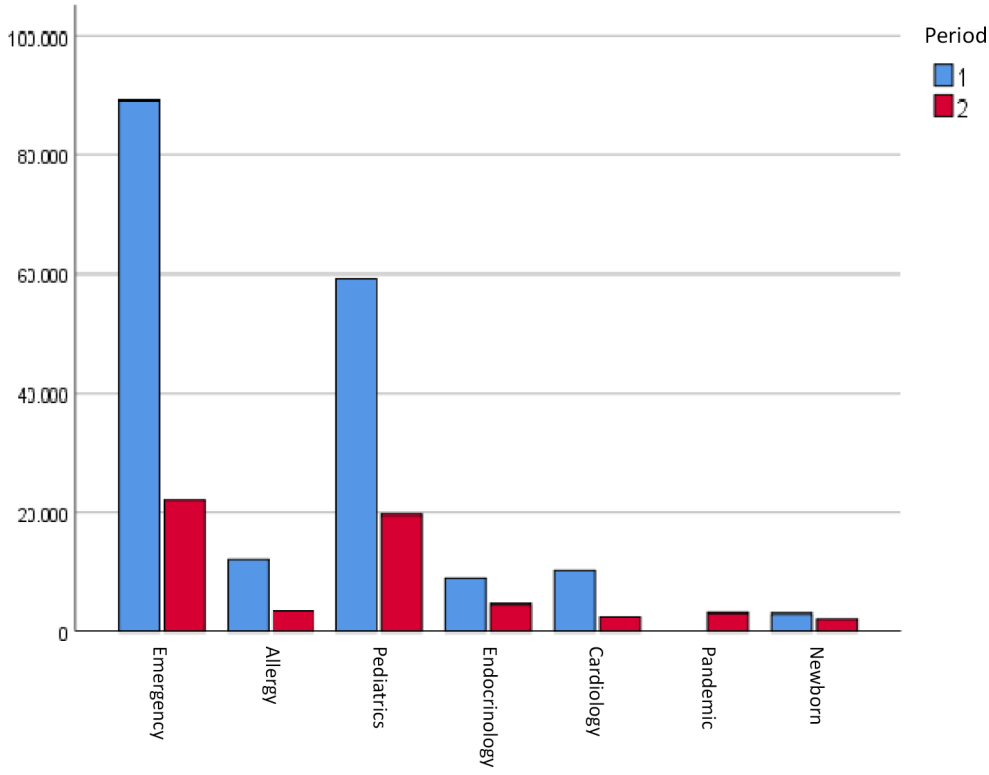

Figure 1. Annual numbers of admissions to pediatric diseases department before and during the pandemic. Period 1: Pre-pandemic, Period 2: Pandemic period

of the Ministry of Health for the differential diagnosis of COVID-19 and other respiratory diseases.[19-22]

In a study conducted in Italy, evaluating pediatric emergency service admissions and hospitalization rates, it was reported that emergency service applications decreased by 69% during the pandemic period and the hospitalization rate increased from 9.5% to 15.9%.[10] In our study, it was observed that annual admissions to the emergency department decreased during the pandemic period, but the rates of hospitalization from the emergency department increased, which is consistent with the literature.

Considering the hospitalization rates from the pediatric emergency department before the pandemic, the hospitalization rates reported by two different universities were 4.1% and 5.1%.[23,24] In our study, it was observed that the rate of hospitalization from the emergency room was 3.3% before the pandemic, and increased to 5.2% during the pandemic period. The reason for this was thought to be due to applications at the advanced stage of the disease and the increase in yellow area applications.

Considering the diagnosis distribution made during the pandemic period, in the publication reported from Europe, it was stated that there were differences in the diagnosis distributions before and after the pandemic, as in our study, and that respiratory tract infections in particular decreased.[10,17-22] In our study, it was determined that there was a decrease in respiratory tract infections during the pandemic period, which was consistent with the literature.

Considering the rates of hospitalization in intensive care units during the pandemic period, a study conducted in Italy reported that although the number of hospitalizations in the pediatric intensive care unit decreased numerically, no significant difference was found in the total percentage distribution.[18] In our study, although the number of hospitalizations in the pediatric intensive care unit decreased numerically during the pandemic period, the number of hospitalizations in the neonatal intensive care unit was found to be similar. However, it was found that the rates of hospitalization in neonatal and pediatric intensive care units increased statistically during the pandemic period. The reason for this was thought to be due to late admission to the hospital, as well as the increase in applications for yellow and red areas.

Study Limitations

Due to the scarcity of similar studies in our country, more detailed epidemiological data are needed. In addition, the fact that the data were not presented by analyzing the periods of

full closure and the periods when the schools were closed is one of the most important limitations of our study.

Conclusion

It was observed that the hospital admissions and hospitalization rates of children decreased due to restrictions, mask use and fear of the disease during the pandemic period. This study is one of the comprehensive studies evaluating the impact of the COVID-19 pandemic on hospital admissions in our country. We believe that this study will contribute to our country's health system policies and preventive public health services while obtaining information about patient density. In addition, with this study, it was pointed out that excessive green area applications to the emergency services before the pandemic could cause a negative workload problem, and the importance of primary health care units was emphasized.

Ethics

Ethics Committee Approval: Our study was approved by the Kütahya Health Sciences University Non-Interventional Ethics Committee (E-41997688-050.99-10324) and the study was conducted in accordance with the Declaration of Helsinki.

Informed Consent: Retrospective study.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: D.G., Concept: D.G., R.Ö., Design: D.G., Data Collection or Processing: D.G., Analysis or Interpretation: D.G., R.Ö., Literature Search: D.G., Writing: D.G., R.Ö.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Research Article / Özgün Araştırma

DOI: 10.4274/cayd.galenos.2022.87609
J Pediatr Emerg Intensive Care Med 2022;9:123-9

The Usefulness of Perfusion Index for Predicting Mortality in Pediatric Intensive Care Unit

Perfüzyon İndeksinin Çocuk Yoğun Bakım Ünitesinde Mortaliteyi Öngörmede Kullanılabilirliği

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Abstract

Introduction: The aim of this study is to the usefulness of the perfusion index to predict mortality in the pediatric intensive care unit.

Methods: The study included patients aged >28 days and <18 years old, who were admitted to Mersin University Faculty of Medicine, Department of Pediatric Intensive Care Unit between 2018 and 2019. Characteristic variables of patients, pediatric risk of mortality III and pediatric logistic organ dysfunction scores, the reason for hospitalization, surgical history, underlying disease, mechanical ventilation, transfusion, perfusion index value at the zeroth hour (at the admission) and at the sixth hour, lactate levels, and prognosis were recorded.

Results: A total of 372 patients who met the study criteria were included in the study. Median perfusion index values at the zeroth and sixth hours were significantly lower in patients who were exitus than the survivors (p<0.001). Considering mortality and organ failure scores, the median values of pediatric risk of mortality III and pediatric logistic organ dysfunction scores were higher in those who were exitus and when compared with the perfusion index values at the zeroth hour, a negative significance was found between them. In receiver operating characteristic analysis, the specificity and sensitivity values for mortality were 90.1% and 75.9% at a perfusion index cut-off of ≤0.63, respectively.

Conclusion: Perfusion index is a reliable method to predict mortality for patients admitted to pediatric intensive care unit.

Keywords: Perfusion index, pediatric intensive care unit, mortality

Öz

Giriş: Bu çalışmanın amacı perfüzyon indeksinin çocuk yoğun bakım ünitesinde mortaliteyi öngörmede kullanılabilirliğinin araştırılmasıdır.

Yöntemler: 2018-2019 yıllarında, >28 gün- <18 yaş aralığında Mersin Üniversitesi Tıp Fakültesi, Çocuk Yoğun Bakım Ünitesi'ne yatan hastalar çalışmaya alındı. Hastaların karekteristik değişkenleri, pediyatrik ölüm riski III, pediyatrik lojistik organ disfonksiyon skorları, yatış nedeni, cerrahi öyküsü, altta yatan hastalık, mekanik ventilatör izlemi, transfüzyon, perfüzyon indeksi 0. saat (yatış anında) ve 6. saat değerleri, laktat ölçümleri ve devir/taburcu bilgileri kaydedildi.

Bulgular: Çalışma kriterlerine uygun 372 hasta çalışmaya dahil edildi. Perfüzyon indeksi 0. ve 6. saat medyan değerleri eksitus olan hastalarda anlamlı derecede düşüktü (p<0,001). Mortalite ve organ yetmezliği skorları bakımından pediyatrik ölüm riski III ve pediyatrik lojistik organ disfonksiyonu medyan değerleri eksitus olanlarda daha yüksek saptanırken perfüzyon indeksi 0. saat ile karşılaştırıldığında aralarında negatif bir anlamlılık saptandı. Alıcı işletim karakteristiği analizinde perfüzyon indeksi ≤0,63 cut-off değerinde mortalite için spesifitesi %90,1 iken sensitivitesi %75,9 saptandı.

Sonuç: Perfüzyon indeksinin non-invazif bir yöntem olarak çocuk yoğun bakım ünitesinde mortalitenin öngörülmesinde kullanılabileceğini düşünmekteyiz.

Anahtar Kelimeler: Perfüzyon indeksi, çocuk yoğun bakım ünitesi, mortalite

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Received/Geliş Tarihi: 18.01.2022 **Accepted/Kabul Tarihi:** 23.05.2022

Introduction

The perfusion index (PI) is a parameter calculated as the ratio of pulsatile arterial blood flow [alternating current (AC)] to non-pulsatile [direct current (DC)] in the peripheral tissues measured by the pulse oximeter (AC/DC x 100). The mean PI value of 1.4 is considered normal. The PI provides that peripheral perfusion can be monitored non-invasively and continuously using pulse oximetry.[1,2]

The PI value can also provide information about peripheral vasomotor tonus. Low PI represents high peripheral vasomotor tonus whereas high PI represents low peripheral vasomotor tonus. In other words, perfusion decreases as the PI value decreases. Therefore, it is thought that PI can be used to determine the severity of the disease in critical patients in the intensive care unit (ICU). In a limited number of studies on this subject, low PI value has been shown to be compatible with peripheral perfusion disorder.[2]

However, normal values and limits in pediatric patients are not clear. While there are studies on this subject in newborns, there is no study involving children.[3] Therefore, there is a need for new studies to investigate the use of PI in predicting prognosis in pediatric intensive care units (PICU). This study aimed to reveal the effectiveness and usability of PI in predicting mortality in PICU and to investigate the correlation of PI with pediatric risk of mortality III (PRISM III) and pediatric logistic organ dysfunction (PELOD) scores, which were scoring systems used to predict mortality and morbidity.

Materials and Methods

The study included patients within the age range of >28 days to <18 years, who were admitted to Pediatric ICU between September 2018 and September 2019. The following parameters of the patients whose file information could be accessed were recorded: Characteristic and demographic variables, PRISM III and PELOD scores, reason for hospitalization, presence of surgery, underlying disease, mechanical ventilation, transfusion status, PI values at the zeroth hour (at the time of hospitalization) and sixth hour, lactate levels and prognosis (survive or exitus). The admission diagnosises with low number of patients (<5) were evaluated in a group called the other. The PI value was recorded when it was in its brightest and steady-state using the Masimo Root™ device with the help of pulse oximeter. Patients whose PI value was measured incorrectly due to technical problems or not measured and those with missing information in their files were excluded from the study. The study was approved by Mersin University Clinical Research and Ethics Committee (2019/169). Informed consent was obtained from the patients.

Statistical Analysis

The Shapiro-Wilk test was used to determine whether continuous variables distributed normally. Student's t-test and One-Way ANOVA tests were used for the comparison of parameters following a normal distribution whereas the Mann-Whitney U test was used for the comparison of parameters that did not follow a normal distribution. Descriptive data were expressed as mean and standard deviation for normally distributed parameters whereas the parameters that did not follow a normal distribution were expressed as minimum, maximum, median, and 25-75% percentages. Spearman's rank correlation coefficient was used for the correlation coefficient of continuous measurements. Receiver operating characteristic (ROC) analysis was used to determine the cut-off point for the PI value at the zeroth hour. A p-value of <0.05 was considered statistically significant.

Results

A total of 372 patients, including 188 (50.5%) females and 184 (49.5%) males, who met the study criteria, among 380 patients who were hospitalized in the PICU were included in the study. The mean age of the patients was 77.7±72.0 months. The mean age was 70.7±69.1 months in female patients and 84.7±74.5 months in male patients. Characteristic features of patients and mean PI values at zeroth hour are shown in Table 1.

The mean PI value was found to be higher in male patients compared to females (p=0.04). The PI value was found to increase with advancing age. There was no statistically significant correlation between PI and fever, saturation, white blood cell, and platelet count. There was an inverse statistical significance between the PI value and respiratory rate and heart rate whereas a positive statistical significance was found with high blood pressure. The comparison of the PI values at the zeroth and sixth hours showed that the sixth-hour measurements were significantly higher (p<0.001). Table 2 shows the comparison of all parameters and statistical significance.

The differences between PI values in terms of hospitalization were found to be significant (p<0.001). When these differences were examined, the zeroth-hour PI values of the patients hospitalized due to sepsis, septic shock, and disseminated intravascular coagulation (DIC) were found to be lower compared to those of patients hospitalized due to trauma and post-operative reasons (p=0.015). The zeroth hour PI values of the patients hospitalized due to sepsis, septic shock, and DIC were lower than those of patients hospitalized due to other reasons (p=0.001). A statistically significant difference was observed between patients hospitalized due

Table 1. Characteristics of the patients

		Number (n)	Percent (%)	PI 0.h	p
Gender	Female	188	50.5	1.63±1.20	0.040
	Male	184	49.5	1.90±1.32	
Causes of hospitalization	1- Sepsis, septic shock, disseminated intravascular coagulation (DIC)	60	16.1	1.31±1.16	<0.001
	2- Respiratory and infectious diseases	64	17.2	1.57±1.10	
	3- Neurological diseases	56	15.1	1.54±0.78	
	4- Trauma and post-operative patients	142	38.2	1.93±1.32	
	5- Hematological diseases and bleeding	12	3.2	2.12±2.09	
	Other	38	10.2	2.45±1.38*,†,‡,#	
Surgical operation	No	304	81.7	1.77±1.28	0.829
	Yes	68	18.3	1.74±1.20	
Underlying disease	No	163	43.8	2.12±1.41	<0.001
	Yes	209	56.2	1.49±1.07	
Mechanical ventilation in the first 24 hours	No	313	84.1	1.85±1.29	0.001
	Yes	59	15.9	1.34±1.02	
Transfusion	No	340	91.4	1.82±1.28	0.007
	Yes	32	8.6	1.19±0.96	
Result	Survived	343	92.2	1.85±1.25	<0.001
	Exitus	29	7.8	0.83±1.06	

Characteristics of the patients staying in the pediatric intensive care unit, perfusion index values, and significance level of perfusion index comparisons (p<0.05) *: Refers to the differences with the first category; †: Refers to the differences with the second category; ‡: Refers to the differences with the third category, #: Refers to the differences with the fourth category, PI: Perfusion index, h: Hour

to respiratory and infectious diseases and those hospitalized due to other diseases (p=0.016). There was a statistically significant difference between patients hospitalized due to neurological diseases and those in the other group (p=0.007).

The PI value of the group with a comorbidity or an underlying disease was found to be lower (p<0.001). There was no significant difference between patients undergoing post-traumatic or elective surgery and requiring intensive care and those not undergoing surgery and staying in the ICU (p=0.829).

There was a positive linear relationship between hemoglobin value and PI during hospitalization. The PI value was found to be lower in patients who received erythrocyte transfusion during hospitalization compared to those who were not transfused (p=0.07). When the effect of transfusion on PI was evaluated, no significant difference was observed between PI measured at sixth and zeroth hours.

The zeroth hour PI values of the patients, who received mechanical ventilation due to respiratory failure, hemodynamic instability, severe septic shock, and multiple organ failure, were found to be lower than those who were not received mechanical ventilation (p=0.001). Similarly, the sixth hour PI values were found to be significantly higher in those who received mechanical ventilation (p<0.02).

A negative correlation was found between PI and lactate. The PI value was seen to decrease significantly as the lactate value increased (p<0.01) (Table 2).

Comparison of vital signs, lactate values, and mean hemoglobin levels of the patients, who recovered and died, and statistically significant differences are shown in Table 3. There was a significant decrease in systolic and diastolic blood pressure and a significant increase in lactate values in patients who were exitus compared to those who were transferred to the service or discharged.

There was a significant decrease in the median PI values at zeroth and sixth hours in patients who were exitus. When mortality and organ failure scores of the patients were evaluated, median PRISM III and PELOD scores were found to be higher in those who were exitus compared to those who survived (Table 4).

A negative significance was found between PI values and PRISM III and PELOD scores. In patients with high PRISM III and PELOD scores, the PI value was found to be low. In receiver operating characteristic (ROC) analysis, the specificity and sensitivity values for mortality were 90.1% and 75.9% at a PI cut-off of ≤0.63, respectively (Figure 1).

Table 2. Comparison of variables and statistical significance

		Age	PI 6.h	PRISM III	PELOD	Peak heart rate	Blood pressure (systolic)	Blood pressure (diastolic)	Saturation	Lactate	Hemoglobin	White sphere	Platelet count	Length of stay (day)
PI 0.h	r	0.290	0.820	-0.188	-0.179	-0.307	0.203	0.121	0.098	-0.190	0.194	-0.050	-0.058	-0.154
	p	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.020	0.058	<0.001	<0.001	0.333	0.264	0.003
Age	r		0.294	-0.002	0.009	-0.526	0.356	0.187	0.078	-0.083	0.339	0.009	-0.288	-0.119
	p		<0.001	0.965	0.865	<0.001	<0.001	<0.001	0.133	0.110	<0.001	0.858	<0.001	0.022
PI 6h	r			-0.127	-0.120	-0.258	0.157	0.083	0.084	-0.184	0.139	-0.039	-0.085	-0.148
	p			0.015	0.021	<0.001	0.003	0.112	0.107	<0.001	0.007	0.461	0.104	0.005
PRISM III	r				0.801	0.018	-0.122	-0.169	-0.052	0.164	-0.133	0.019	-0.058	0.074
	p				<0.001	0.723	0.019	0.001	0.319	0.002	0.010	0.722	0.263	0.156
PELOD	r					0.038	-0.176	-0.203	-0.131	0.140	-0.113	0.010	-0.096	0.104
	p					0.468	0.001	<0.001	0.012	0.007	0.030	0.853	0.064	0.045
Peak heart rate	r						-0.101	0.009	-0.096	0.092	-0.304	0.027	0.198	0.114
	p						0.052	0.857	0.064	0.077	<0.001	0.599	<0.001	0.027
Systolic blood pressure	r							0.748	0.092	-0.020	0.151	0.020	-0.054	-0.070
	p							<0.001	0.077	0.707	0.004	0.696	0.298	0.178
Diastolic blood pressure	r								0.080	-0.025	0.138	0.048	0.024	-0.033
	p								0.123	0.631	0.008	0.356	0.644	0.522
O_2 saturation	r									-0.035	-0.049	-0.005	-0.008	-0.118
	p									0.508	0.347	0.930	0.879	0.023
Lactate	r										-0.144	0.091	-0.109	0.110
	p										0.006	0.082	0.036	0.035
Hemoglobin	r											-0.117	0.059	-0.039
	p											0.024	0.253	0.459
Leucocyte count	r												-0.064	-0.033
	p												0.216	0.525
Platelet count	r													0.025
	p													0.625

PI: Perfusion index, h: Hour, PRISM III: Risk of mortality score III, PELOD: Pediatric logistic organ dysfunction

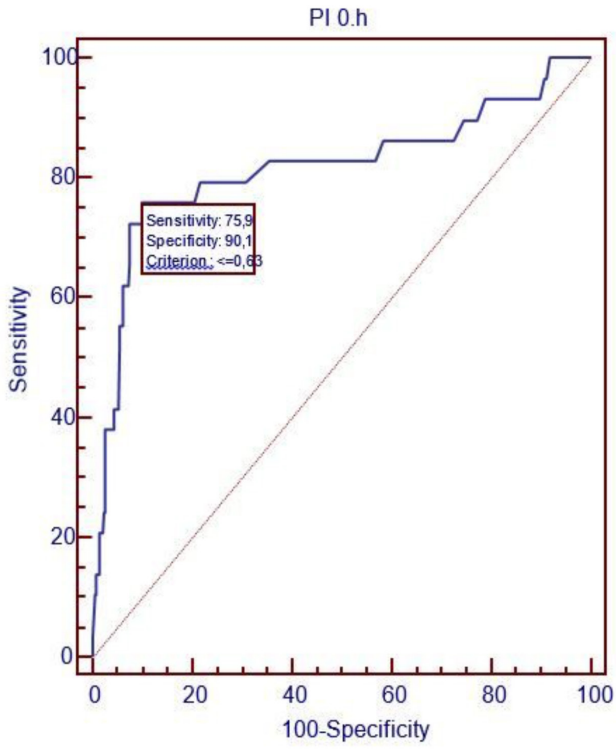

Figure 1. ROC analysis results

Discussion

The PI is a non-invasive measurement method made by using a pulse oximeter. There is no clear data on the normal and pathological values of PI in children, and current studies on this subject include patients in the newborn age group.[3,4] Granelli and Ostman-Smith[4] showed that a PI value of <0.7 may be indicative of disease in newborns and that the measurement should be repeated if the PI value is >4.5. In a study by Lima et al.[2] involving adult ICU patients, a PI value of <1.4 has been reported to be associated with poor peripheral perfusion. As it can be understood from these studies, the PI value varies according to the age and vasomotor tonus of the patient. The present study has provided information about the level of PI value in pediatric age groups in PICU patients. The median value of PI was 0.4 in patients who were exitus, while it was 1.4 in the group survived. We think that low PI value in the patients who were exitus was due to the presence of peripheral perfusion disorder, higher incidence of circulatory failure, and increased vasomotor tonus. So that the PI value can be used in clinical practice as an objective method for early diagnosis, particularly in cases of circulatory disorders that are not clinically noticeable. Compared with the study by Lima et al.[2], the PI values of the patients in the present study were lower. Considering the result that the PI value increases with advancing age, it can be said that the mean value is lower in children than that of adults. The result we found in this study that the PI value increases with advancing age also supports this hypothesis. Therefore,

Table 3. Comparison of survive and exitus

	Survive (n=343)	Exitus (n=29)	p
Age (months)	77.6±72.1	77.9±72.8	0.985
Fever (°C)	36.46±0.98	35.91±1.61	0.080
Respiratory rate (/min)	32.14±14.67	35.21±11.36	0.273
Peak heart rate (/min)	125.62±32.30	134.07±33.24	0.178
Systolic blood pressure (mmHg)	110.22±19.17	98.76±23.93	0.003
Diastolic blood pressure (mmHg)	70.87±18.07	59.59±18.95	0.001
Saturation (%)	97.78±5.12	94.41±9.08	0.058
Lactate (mmol/L)	4.04±3.06	5.66±3.53	0.007
Hemoglobin (g/dL)	11.11±2.39	10.35±2.23	0.102

Comparison of vital signs, lactate, and hemoglobin values of patients, who were survive, with those who died

Table 4. Comparison of survive and exitus 2

	Survive (n=343)		Exitus (n=29)		p
	Min-max	Median (25-75% percentages)	Min-max	Median (25-75% percentages)	
PI 0.h	0.11-6.90	1.40 (0.96-2.50)	0.10-4.0	0.40 (0.265-0.765)	<0.001
PI 6.h	0.12-7.60	1.80 (1.10-2.98)	0.14-4.30	0.665 (0.3475-1.05)	<0.001
PRISM III	0-36	4 (0-7)	0-60	14 (5-24.5)	<0.001
PELOD	0-32	8 (0-8)	0-40	12 (1-28)	<0.001
Leucocyte count (x10³/µL)	0.06-659.9	14.08 (10.01-193)	0.03-123.2	12.87 (5.29-27.5)	0.806
Platelet count (x10³/µL)	1-1179	326 (239-420)	2-702	169 (42.5-357)	<0.001
Length of stay in ICU (days)	1-78	4 (3-8)	1-85	5 (1-24)	0.699

Comparison of the PI values, PRISM III and PELOD scores, white sphere, platelet count, and length of stay in ICU of patients, who were transferred to the service or discharged, and those who died. PI: Perfusion index, PRISM III: Risk of mortality score III, PELOD: Pediatric logistic organ dysfunction, ICU: Intensive care unit

normal values of PI should be determined according to age groups.

The PI values of patients hospitalized due to sepsis, septic shock, and DIC were found to be lower compared to those who were hospitalized due to other reasons. We attributed the low PI value to the fact that the vasomotor tonus increased and peripheral perfusion was low due to tissue oxygenation disorder in patients with sepsis. When the tissue perfusion was evaluated with lactate, one of the parameters globally examined in the case of septic shock, the PI value was low if the lactate levels were elevated. The positive correlation between hyperlactatemia and PI, which is one of the generally accepted indicators of circulatory disorder, is significant in terms of showing the clinical value of PI. The present study is of great importance since it is the first study to evaluate lactate and PI values together in terms of mortality in pediatric patients due to increased lactate levels and low PI values in patients who were exitus. In patients with pediatric shock, Hafez et al.[5] found a strong correlation between PI, lactate, and lactate clearance, and found that these variables provided comparable sensitivity and specificity for predicting outcomes. On the other hand, in a study involving newborns in which lactate and PI values were evaluated together, high lactate level (4 mg/dL) and low PI value (<0.5) were found to increase the incidence of premature of retinopathy and broncho pulmoner dysplasia in early term infants.[6] In a study by Bakker et al.[7] involving adults, lactate level has been reported to be one of the most important markers of hypoxia and hypoperfusion, and lactic acidosis may be a marker for mortality in critically ill patients.

The use of mechanical ventilators in respiratory failure is life-saving but it is a fact that the mortality of patients receiving mechanical ventilation is higher than non-intubated patients. The PI values of the patients who received mechanical ventilation at the time of hospitalization have been found to be significantly low compared to those who did not receive mechanical ventilation. In a study by Su et al.[8] involving adult patients, in which the effects of mechanical ventilation and peripheral PI on prognosis were investigated, patients on the mechanical ventilator were also associated with a poor prognosis if the PI value was below 1.37 and the authors emphasized that patients with high mean airway pressure and low PI value had a poor prognosis. In a study by Er et al.[9] investigating whether PI can be used to estimate the mortality of adult patients on mechanical ventilation, it has been reported that PI cannot be a marker for long-term mortality (60 days), but it can be an independent marker for short-term mortality (7 days). There may be several reasons why the PI value of patients on mechanical ventilation may be lower than that of patients who are not mechanically ventilated. First of all, it may be expected that the PI value will be low in mechanically ventilated patients since they are usually a group of patients with a poor general condition which is mostly accompanied by circulatory failure. Furthermore, the physiological effects of mechanical ventilation increase the intrathoracic pressure, reducing venous return, right ventricular filling, and right heart rate. This results in decreased cardiac output and low perfusion. That's why the reason for the low PI values may also be due to these physiological effects of mechanical ventilation.

Among the scoring systems developed to provide and standardize the comparison of patients in PICU in terms of morbidity and mortality, PRISM III score is a marker of mortality whereas PELOD has been developed to assess organ failure. The values that are found to be high following the calculations indicate that the patient has a high likelihood of mortality or organ failure. In the present study, median PRISM III and PELOD values were found to be higher in patients who were exitus compared to patients transferred to the service or discharged. When evaluated together with PI, we found low PI values were correlating with high PRISM III and PELOD scores, and this result was statistically significant. The statistically significant correlation of PI value with PRISM III and PELOD scores supports the idea that PI can be a valuable parameter in predicting mortality in the PICU. The present study is of great importance in terms of being the first study in the literature showing the relationship between the PI value and PRISM III and PELOD scores in children.

We further used ROC analysis to assess the PI value and mortality. Our ROC analysis revealed different results in terms of cut-off point and the results obtained were more variable compared to the studies in the literature. In a study by De Felice et al.[10] involving newborns, the AUC, sensitivity, and specificity values for mortality were found to be 97%, 95.5% and 93.7% at a PI cut-off of 1.24 in ROC analysis, respectively The authors reported that PI can be associated with severe disease in neonates.[9] In a study by He et al.[11] involving adults, peripheral PI variability has been shown in patients with postoperative septic shock compared to the control group and sensitivity and specificity values have been found to be 65% and 92.3% at a PI cut-off of ≤0.2. There was a significant difference between the cut-off values in both studies. Although the cut-off value was high in the study involving neonates, the specificity and sensitivity were also found to be high whereas the data were analyzed using very low PI cut-off values in the study involving adults. In the present study, the AUC, specificity, and sensitivity were found to be 82%, 90.1%, and 75.9% at a cut-off value of ≤0.63, respectively. The ROC analysis has shown that PI may be an indicator of mortality. However, the fact that it is variable by age prevents obtaining exact information about the threshold value. The cut-off point for the present study was 0.63.

Study Limitations

This study has some limitations including being a single-center study and not having enough population size to generalize the results. There is a need for more comprehensive and multicenter studies.

Conclusion

The PI measurement is a non-invasive method that is measured peripherally using a pulse oximeter. However, it also has some disadvantages. The need for a special pulse oximeter, the necessity of keeping the pulse oximeter constant, and individual variations can be listed as some of its disadvantages. The results obtained from the present study have shown that the efficacy of PI in predicting mortality cannot be ignored. We believe that PI can be used to predict mortality in PICU since it is a non-invasive and easily applicable method.

Ethics

Ethics Committee Approval: The study was approved by Mersin University Clinical Research and Ethics Committee (2019/169).

Informed Consent: Informed consent was obtained from the patients.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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

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

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.4274/cayd.galenos.2021.33254
J Pediatr Emerg Intensive Care Med 2022;9:130-3

Out-of-hospital Delivery: A Case Report

Hastane Dışı Doğum: Bir Olgu Sunumu

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Abstract

Unplanned out-of-hospital birth is defined as a birth that occurs before arrival and without a planned midwife or medical doctor. The frequency of complications in mothers and babies is higher in unplanned deliveries out of hospital. Due to the shortness of the uterus and a history of bleeding at the 17th week, a 27-year-old mother who was administered betamethasone three times intermittently and her baby who was 22 weeks old were brought to the pediatric emergency service by ambulance, with the umbilical cord not separated from the clamped placenta between the legs of the mother. The baby was hypothermic at the first evaluation. The baby was immediately warmed up, the navel was clamped and separated from the placenta, and nasal oxygen therapy was initiated. While the body temperature was 35.5 °C at the 20th minute of birth; placed in a thermal bag, placed in a transfer incubator, connected to nasal continuous positive airway pressure, and admitted to the neonatal intensive care unit. On the 9th day of her follow-up, baby died due to apnea, desaturation, and resistant acidosis and hypotension. This case is presented in order to minimize the complications related to out-of-hospital delivery and to emphasize the necessity for the healthcare professionals to be adequately trained and equipped for delivery and neonatal resuscitation management, and to develop protocols between health and ambulance services.

Keywords: Out-of-hospital delivery, mortality, perinatal morbidity, newborn

Öz

Planlanmamış hastane dışı doğum, hastaneye varmadan önce, planlı bir ebe veya tıp doktoru olmadan meydana gelen doğumdur. Hastane dışı plansız doğumlarda anne ve bebekte komplikasyon görülme sıklığı daha fazladır. Rahimin kısa olması ve 17. haftada kanama öyküsü nedeniyle üç kez aralıklı betametazon yapılan 27 yaşındaki anne ve 22 hafta olduğu öğrenilen bebeği annenin bacakları arasında göbek kordonu klempli plasentadan ayrılmamış şekilde çocuk acil servise ambulans ile getirildi. İlk değerlendirmede bebek hipotermik idi. Bebek hemen ısıtılmaya başlandı, göbek klemplenip plasentadan ayrıldı, nazal oksijen tedavisine başlandı. Doğumun 20. dakikasında vücut sıcaklığı 35,5 °C iken; termal poşete konulup transfer kuvöze yerleştirilip, nazal sürekli pozitif hava yolu basıncına bağlandı, yenidoğan yoğun bakım ünitesine yatırıldı. İzleminin 9. gününde apne, desatürasyon ve takibinde dirençli asidoz, hipotansiyon nedeniyle eksitus oldu. Bu olgu hastane dışı doğum ile ilgili komplikasyonları en aza indirmek ve doğum ile yenidoğan resüsitasyon yönetimi için sağlık görevlilerinin yeterince eğitimli ve donanımlı olmasının, sağlık ve ambulans hizmetleri arasında protokoller geliştirilmesinin gerekliliğini vurgulamak için sunulmuştur.

Anahtar Kelimeler: Hastane dışı doğum, mortalite, perinatal morbidite, yenidoğan

Introduction

Unplanned out-of-hospital (OOH) births are the deliveries that occur without a midwife or doctor prior to arrival at the hospital.[1] It is important for healthcare personnel working in ambulances as worse outcomes are reported for mothers and infants compared to in-hospital and planned home births.[2] It has been reported that healthcare professionals working in ambulances are in the second rank among healthcare personnel who encounter childbirth.[3]

The annual incidence of out-of-hospital deliveries is reported as 0.08-1.99%, which is quite low.[1,4] The frequency of complications in mother and baby is higher in out-of-hospital births than in-hospital births. Perinatal conditions and inadequate postnatal care have been reported to be the most common causes of out-of-hospital neonatal deaths.[5] Due to

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Received/Geliş Tarihi: 20.11.2020 **Accepted/Kabul Tarihi:** 07.05.2021

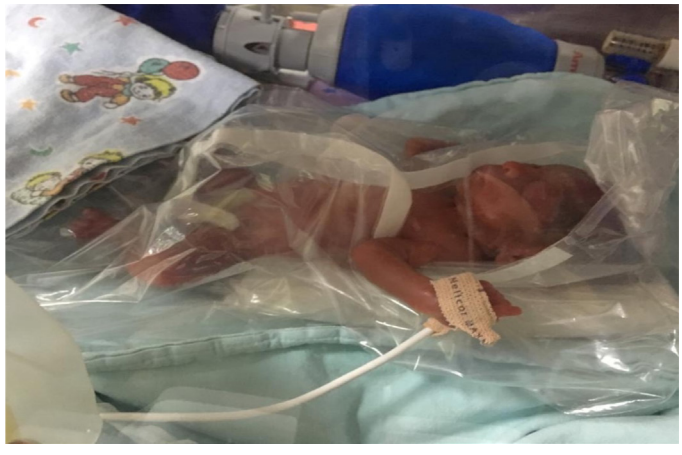
hypothermia, prematurity, asphyxia, jaundice, tetanus, and problems in the management of the placenta and umbilical cord, hospitalization in the neonatal intensive care unit (NICU) and mortality rates are higher.[6]

With this case, the problems experienced in the pre-hospital management of a 22-week-old premature baby born in an ambulance were discussed. In addition, it is presented to minimize the complications related to OOH births and to emphasize the need for the healthcare professionals to be adequately trained and equipped in neonatal resuscitation management at birth, to develop protocols between health and ambulance services, to help clinical management of the protocols, referral, and destination decisions.

Case Report

The baby of the 27-year-old mother with antenatal follow-up and uterine shortening, who had been administered betamethasone three times at the 17th week due to a history of bleeding, was from her 22-week second pregnancy and was brought by ambulance between the mother's legs. It was learned from the mother's history that she had been hospitalized in an external center due to bleeding two days ago, followed up for two days with a five-centimeter cervical dilation, and discharged the day before. The baby was born in the ambulance approximately two minutes before the admission, and was brought with the umbilical cord clamped and not separated from the placenta. The first minute APGAR score was unknown. In the evaluation at the fifth minute of birth, the 5th minute APGAR score was 7, and the baby was started to be warmed, the umbilical cord was clamped and separated from the placenta, and nasal oxygen therapy was started.

In the physical examination, the baby's general condition was moderate and he had groaning. The body weight was 470 grams (Picture 1). On arrival, his body temperature was 33.1 °C, heart rate was over 100/min, respiratory rate was 38/min, and oxygen saturation (SpO_2) in room air was 99%. The lung examination revealed tachypnea, bilateral rales, subcostal, intercostal, suprasternal retraction, and nasal flaring. Cardiovascular system examination was normal, bilateral femoral artery pulses were taken. In the neurological examination, light reflex could not be evaluated and the baby was hypotonic. There were no sucking, searching and catching reflexes. The skin was bright red-purple, thin and immature.



Picture 1. Transportation of the baby taken to the incubator in a thermal

The tenth minute body temperature was 35.1 °C, heart rate was 104/min, respiratory rate was 32/min, SpO_2 was 99%. The 20th minute body temperature was 35.5 °C, heart rate was 150/min, respiratory rate was 32/min, SpO_2 was 100%. The baby was wrapped in a thermal bag, placed in the transfer incubator, connected to nasal continuous positive airway pressure (CPAP), and admitted to the NICU.

In the blood gas taken from the umbilical vein, pH was 7.35, pCO_2 was 27.9 mmHg, HCO_3 was 15 mEq/L, lactate was 4 mmol/L, and blood glucose was 120 mg/dL, white blood cell was 10.310/mm^3, platelet was 364,000/mm^3, hemoglobin was 19.5 g/dL, hematocrit was 59.1%, C-reactive protein was 1.03 mg/L (normal range: 0-5 mg/L), interleukin 6 was 33.56 pg/mL (normal range: <7 pg/mL), procalcitonin was and 0.687 ng/mL (normal range: 0-0.5 ng/mL). Amikacin, penicillin-G, fluconazole and caffeine treatments were started for the case.

On the fourth day of the follow-up, it was switched from nasal CPAP mode to non-invasive intermittent positive pressure ventilation mode due to apnea. Chest X-ray was consistent with respiratory distress syndrome. Echocardiography showed patent foramen ovale. On the fifth day, the baby was intubated due to increased apnea frequency and desaturation. Respiratory acidosis was observed in blood gas. Antibiotic treatment of the patient who was found to have increased acute phase reactants after sepsis screening was rearranged.

In the transfontanel ultrasonography taken on the 5th day of the hospitalization, grade 1 hemorrhage and nodular appearance were observed in the left caudothalamic groove. On the seventh day of the follow-up, dopamine was initiated due to hyperglycemic resistant acidosis, high lactate, and hypotension. Then, because hypotension did not improve and peripheral circulatory disorder developed, dobutamine treatment was started. Repeated echocardiography revealed impaired systolic functions and an ejection fraction of 41%. The patient, whose hypotension did not improve, died on the ninth day of the hospitalization. Consent for the study was obtained from the family.

Discussion

Although pre-hospital unplanned deliveries are rare, perinatal mortality and neonatal morbidity rates are high. This risk increases even more in very premature (<32 weeks) and extremely premature (<28 weeks) deliveries.[7] In this case, the delivery was unplanned and happened very early and with low birth weight in the ambulance while trying to reach the hospital. The patient, whose first interventions were made in the emergency room, was quickly admitted to the NICU.

The most common complication in out-of-hospital deliveries is hypothermia and is the most important risk factor for mortality. In infants with low birth weight, every 1 °C decrease in body temperature from birth to NICU causes a 28% increase in mortality.[8] In a study examining rewarming methods in out-of-hospital deliveries, it was reported that the way to prevent heat loss during the period until the baby's admission to the NICU was the training of personnel working in the pre-hospital management, the creation and use of a checklist, and improvement with continuous feedback. In the same study, it was also stated that the best method was the use of a transport incubator.[8] Our case was hypothermic on arrival to the hospital, and it was thought that the intervention was insufficient due to lack of equipment. It is very important that health staff are trained to prevent possible complications.[2] In studies in the literature, the knowledge of healthcare professionals about neonatal life support was found to be at moderate level.[5] In a study, it was reported that there was a 75% reduction in face mask leakage with an increase in theoretical knowledge after a simulation-based training.[5] In another study, it was reported that healthcare professionals had low self-confidence in OOH births and felt unprepared to manage these cases.[9] In our case, we could not determine the level of knowledge of the paramedics in the ambulance about neonatal management. However, despite the fact that the patient was premature and had a low birth weight, the presence of spontaneous breathing during delivery and the absence of excessive bleeding in the mother was a great opportunity for patient management. Therefore, health personnel training is very important in OOH births.

Moreover, it is very important to have the necessary equipment support as well as the training of health personnel for birth.[7]

As in our case, the lack of appropriate resources at birth delays the ideal care. For this reason, having the necessary equipment for both prehospital transportation and emergency services for the management and transport of these babies will prevent the development of possible complications.

There are also major deficiencies in the intervention and documentation of out of hospital deliveries.[2] In a study, it was found that approximately one-third of the cases had missing documents, which made it difficult to determine how patients were treated.[10] In another study, it was reported that important information such as newborn evaluation, including APGAR scores, was lacking and documentation was scarce.[11] All interventions applied in order to evaluate the effectiveness of the actions taken should be written completely and accurately. In this way, the deficiencies of the health personnel, the points where they are inadequate and the deficiencies in the materials can be determined and their supply and personnel training can be arranged.[2]

Conclusion

It is important to train health personnel at regular intervals due to the bad consequences of unplanned births for mother and baby. Complication rates can be reduced by providing the necessary materials for transport in both ambulances and emergency services.

Ethics

Informed Consent: Consent for the study was obtained from the family.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: S.T.G., O.D.G., Y.M.A., İ.F., Ö.Ç., Design: S.T.G., O.D.G., Y.M.A., İ.F., Ö.Ç., Data Collection or Processing: S.T.G., O.D.G., Analysis or Interpretation: S.T.G., O.D.G., Y.M.A., İ.F., Ö.Ç., Literature Search: S.T.G., O.D.G., Writing: S.T.G., O.D.G.

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

Financial Disclosure: The authors declared that this study received no financial support.

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Case Report / Olgu Sunumu

DOI: 10.4274/cayd.galenos.2021.58076
J Pediatr Emerg Intensive Care Med 2022;9:134-7

Thrombocytopenia Developing After Centipede Bite

Kırkayak Isırığı Sonrası Trombositopeni

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Abstract

Centipede bites have been reported rarely in humans. The mechanism of centipede toxin is not fully understood. Skin reactions develop more in centipede bites. In this text, we will present a case that developed thrombocytopenia after a centipede bite. An 18-month old female infant was bitten on the back of the right hand and the right side of the forehead. She applied to the emergency department with the complaint of redness and swelling that started in the morning hours after the bite. The vital signs of the patient were stable. The patient had no systemic complaints. The patient's laboratory tests, PLT was 28,000 K/UL were determined. During follow-up of the patient, bleeding symptoms developed associated with thrombocytopenia. The follow-up examination 10 days later, thrombocyte count was determined as 302,000 in the full blood count. Centipede bites are not greatly reported and the actual incidence is undoubtedly higher than assumed. Although the majority spontaneously recover with only simple local reactions that have formed, they can lead to serious complications such as acute myocardial infarcts, acute coronary ischemia, acute renal damage, anaphylaxis, or thrombocytopenia. Therefore, following a centipede bite, patients must be evaluated carefully and attention must be paid in respect of complications.

Keywords: Centipede, thrombocytopenia, child

Öz

İnsanlarda kırkayak ısırıkları nadir olarak bildirilmiştir. Salgıladığı toksinin mekanizması tam olarak bilinmemektedir. Deri reaksiyonları daha çok gelişir. Bu yazıda; kırkayak ısırması sonrası trombositopeni gelişen bir olguyu sunacağız. On sekiz aylık kız hasta gece saatlerinde sağ el sırtından ve başın sağ ön kısmından ısırılmış. Isırık sonrası sabah saatlerinde başlayan kızarıklık ve şişlik şikayetiyle acil servise başvurdu. Hastanın yaşamsal bulguları stabildi. Bakılan tetkiklerinde trombosit sayısı 28.000 K/UL saptandı. Hastada trombositopeniye ait kanama semptomları yoktu. Kontrol amaçlı 10 gün sonra bakılan tam kan sayımında trombosit sayısı 302.000 K/UL olarak bulundu. Kırkayak ısırmaları çok fazla bildirilmese de sıklığı sanıldığından fazladır. Çoğunluğu kendiliğinden düzelen sadece basit lokal reaksiyonlar oluşturmasına rağmen akut miyokard enfarktüsü, akut koroner iskemi, akut böbrek hasarı, anaflaksi, trombositopeni gibi ciddi komplikasyonlara yol açabilirler.

Anahtar Kelimeler: Kırkayak, trombositopeni, çocuk

Introduction

Centipedes, of which more species are found in tropical and subtropical regions, are anthropods widely seen especially in homes and gardens.[1,2] More than 3.000 species have been identified.[1] Centipedes, which like dark and damp places, vary in size from 3-250 mm in length and each segment has 2 legs known as forcipules.[2] Centipedes release venoms by piercing the skin with the forcipules. The mechanism of centipede toxin is not fully understood.[3] Skin reactions develop more in centipede bites and local findings can be determined such as severe pain, edema, redness in the bite area.[4-6] More rarely, they can lead to systemic symptoms such as nausea, vomiting, headache, dizziness, and loss of consciousness.[4,7]

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Received/Geliş Tarihi: 10.02.2021 **Accepted/Kabul Tarihi:** 08.06.2021

Anaphylaxis and coronary artery ischemia have been reported in a few more serious cases after a bite, and in 2 cases, death.[2,8,9]

Centipede bites are seen more in those who live in rural areas, in people who picnic outdoors, in hikers, and in those who frequent areas where centipedes live.[10] As the majority of bites do not create any symptoms, there is generally no need to present at any healthcare facility and therefore the incidence is not fully known. Consequently, there are insufficient data in the literature related to centipede bites. The case is here presented of a patient who developed thrombocytopenia following a centipede bite, which to the best of our knowledge, has not been previously reported in the literature.

Case Report

Consent was obtained from the parents of our case for this article. An 18-month old female infant was bitten on the back of the right hand (Figure 1A) and the right side of the forehead (Figure 1B). She applied to our emergency department with the complaint of redness and swelling that started in the morning hours after the bite. The centipede that had made the bite had been caught on the infant's head and was brought to the ED in a glass jar (Figure 2).

The vital signs of the patient were stable. Around the bite location on the back of the right hand, there was observed to be slight redness, increased temperature, edema, and on the forehead, there was slight swelling and bruising around the bite location. The patient had no systemic complaints. Body temperature was measured as 36.8 °C. In the laboratory tests applied, acute phase reactants were negative, liver function and kidney function tests, electrolytes, INR, cardiac markers were determined to be within the normal reference range. In the full blood count, platelet was 28,000/mm^3, white blood cell; 11.700/mm^3, hematocrit 35.1%, and neutrophil count were 9.3/mm^3. On the peripheral blood smear, there were observed to be single large thrombocytes. The atypical cell was not seen. A peripheral blood smear was compatible with thrombocytopenia. In a full blood count taken 1 month previously, platelet had been reported as 492,000 K/UL.

A single dose tetanus injection was applied to the patient. The extremity was elevated and ice was applied because of edema. Tests were performed in respect of bleeding, DIC, and potential pathologies. Viral and bacterial tests (TORCH and *Brucella*) for thrombocytopenia were normal. Bone marrow aspiration was not performed because the platelets increased spontaneously. During follow-up of the patient, no symptom developed associated with thrombocytopenia. In the full blood counts taken daily, a gradual increase was determined in the platelet level. On the 4th day, as the thrombocyte count was 71,000 and clusters of 5 thrombocytes were observed on the peripheral blood smear, the patient was discharged with recommendations.

At the follow-up examination 10 days later, thrombocyte count was determined as 302,000 in the full blood count. Platelets were determined to be sufficient and clustered on the peripheral blood smear. No complaints were determined in the follow-up of the patient. For the case report, her family approved it.

Conclusion

Centipedes are often seen around houses, in gardens, and, fields with flowers in Turkey. They migrate in the autumn because of rainwater in the habitat. Entering houses, they settle under furniture and wooden items, and in cellars that are dark and damp. This causes them to come into greater contact with people. Human exposure to centipedes may be as bites or ingestion. A centipede bite is not a bite in the

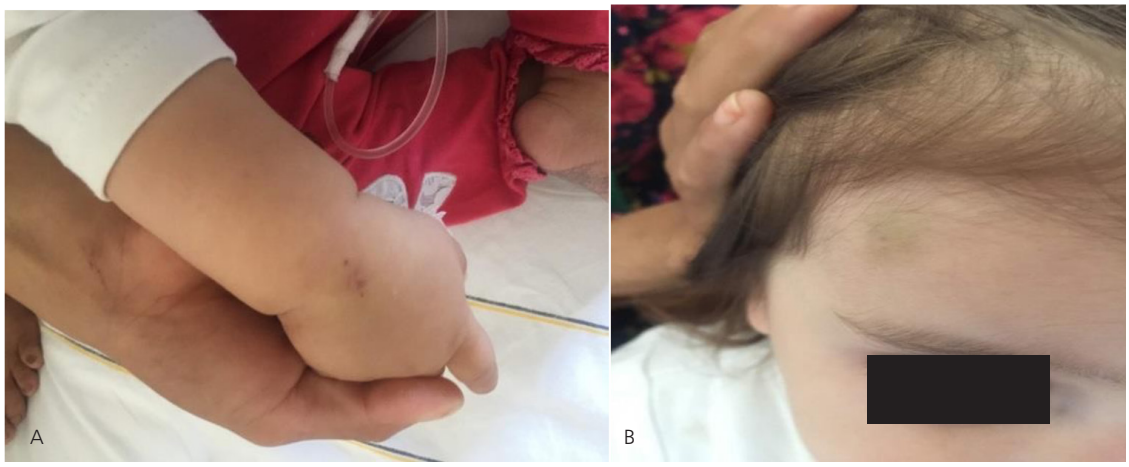

Figure 1A, B. An 18-month old female infant was bitten on the back of the right hand and on 1 the right side of the forehead

Figure 2. The centipede that had made the bite had been caught on the infant's head and was 3 brought to the emergency clinic in a glass jar

exact meaning of the word. Human skin is pierced by the legs, which are known as forcipules, and toxins are released. There is little information in the literature about the biochemical compound of centipede poison.[1] Symptoms are usually seen as local reactions in the bite localization, most often as pain, redness, and swelling.[4,7] More rarely, numbness, lymphangitis together with lymphadenitis, and bacterial superinfections have been seen in the bite region.[4,7] Mild systemic findings such as nausea, vomiting, headache, and anxiety may also be determined more rarely than local skin findings.[4,7] There have also been severe cases of centipede bite reported in the literature.[8-12]

In 1 patient, Wells syndrome, which is acute dermatitis known as eosinophilic cellulitis, was reported to have developed.[12] Hawai reported 2 cases, one of which was a 22-year old gardener who developed myocardial infarcts with ST-elevation after a centipede bite, and the other was a 44-year old female who developed acute renal failure and rhabdomyolysis requiring hemodialysis.[10] Cases have also been reported of anaphylaxis and acute coronary ischemia developing after a bite.[8,9] Mortality is not often seen after a centipede bite. To date, the fatal case has been reported. One was a 7-year old girl who died after a bite on the head.[12] Three pediatric cases have been reported to have presented following accidental or deliberate swallowing of a centipede. One was an 8-month old male infant, 1, a 9-month old male, and 1, a 1- year old female infant, and no complications were reported in any of these cases.[1] The case presented in this paper was an 18-month old female, who had been bitten in 2 places; the back of the right hand and the right frontal region of the head. The family had caught the centipede on the patient's head and brought it to the ED (Figure 2). In this patient, there was pain, redness, swelling, hyperemia in the bite region, which was consistent with the literature. The parents reported fever but in the measurements taken at the hospital, no increase in temperature was determined. Unlike other cases in the literature, the current patient developed thrombocytopenia. The patient had no history of thrombocytopenia and the platelet level had been determined as normal in a full blood count taken 1 month previously. Despite the thrombocytopenia in the patient, no findings related to thrombocytopenia were determined. Without the application of any treatment, the thrombocyte count was seen to gradually increase. This increase was confirmed from the peripheral blood smear.

There is no standard treatment for centipede bite, and it is basically in the form of supportive treatment.[9,10] There is no anti-venom.[1] The most simple treatment is the application of ice and the use of oral analgesia.[2] Antihistamines for the symptoms can be used, and anti-inflammatories are recommended for inflammation control and pain.[10] It has been reported that the duration and severity of symptoms can be reduced by providing protein denaturation with immersion in water of different temperatures after a bite.[9] The wound must be kept clean and covered to protect against secondary infection, and a tetanus injection must be administered.[4,10] In cases where bacterial superinfection develops, systemic antibiotics are recommended.[11]

Centipede bites are not greatly reported and the actual incidence is undoubtedly higher than assumed. Although the majority spontaneously recover with only simple local reactions that have formed, they can lead to serious complications such as acute myocardial infarcts, acute coronary ischemia, acute renal damage, anaphylaxis, or thrombocytopenia. Therefore, following a centipede bite, patients must be evaluated carefully and attention must be paid in respect of complications.

Ethics

Informed Consent: Consent was obtained from the parents of our case for this article.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: V.H.Ü., R.D., M.B., Concept: V.H.Ü., K.Y., Ö.O., Design: V.H.Ü., M.B., K.Y., Data Collection or Processing: V.H.Ü., M.B., Ö.O., Analysis or Interpretation: M.B., Ö.O., R.D., Literature Search: V.H.Ü., K.Y., R.D., Writing: V.H.Ü., R.D., M.B.

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

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.4274/cayd.galenos.2021.82787
J Pediatr Emerg Intensive Care Med 2022;9:138-42

Two Infant Cases Admitted with Atypical Presentation and Diagnosed as Type IV Hiatal Hernia

Atipik Prezentasyonla Tip IV Dev Paraözofageal Hiatal Herni Tanısı Alan İki İnfant Olgu

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Abstract

Type IV paraesophageal hiatal hernias are diaphragmatic hernias that are extremely rare in the pediatric age group in which the stomach and other intra-abdominal organs herniate from the esophageal hiatus of the diaphragm into the mediastinum. Since the defect in the hiatus is large, serious complications such as gastric volvulus may develop in these giant hernias as a result of the passage of a large part of the stomach into the thoracic cavity. Patients may present with atypical clinical manifestations such as growth retardation, not gaining weight, and recurrent pulmonary infections. In this report, two cases in the pediatric age group who were admitted with different clinical course and were diagnosed as type IV paraesophageal hiatal hernia who were successfully treated with surgical intervention are presented.

Keywords: Hiatal hernia, paraesophageal hernia, pediatrics, surgery, treatment, type IV

Öz

Tip IV paraözofageal hiatal herniler; mide ve diğer intraabdominal organların diyafragmanın özofageal hiatusundan mediastene herniye olduğu, çocuk yaş grubunda oldukça nadir görülen diyafragmatik hernilerdir. Hiatustaki defekt büyük olduğundan midenin büyük bir kısmının torasik kaviteye geçmesi sonucu gelişen bu dev hernilerde, mide volvulusu gibi ciddi komplikasyonlar gelişebilir. Hastalar büyüme geriliği, kilo alamama, tekrarlayan akciğer enfeksiyonu gibi atipik kliniklerle karşımıza çıkabilir. Bu yazıda çocuk yaş grubunda farklı klinik tablolar ve semptomlarla başvuran ve tip IV paraözofageal hiatal herni tanısı alıp cerrahi müdahale ile başarılı şekilde tedavi edilen iki olgu sunulmuştur.

Anahtar Kelimeler: Hiatal herni, paraözofageal herni, pediyatri, cerrahi, tedavi, tip IV

Introduction

Paraesophageal hiatal hernias are rarely seen in childhood. The Society of American Gastrointestinal Endoscopic Surgeons has defined 4 types of hiatal hernias.[1] Type I hiatal hernias are characterized by the herniation of the gastroesophageal junction into the thoracic cavity only, called a sliding hernia. Type II-III-IV hiatal hernias are true paraesophageal hernias. They are classified according to the location of the gastroesophageal junction and the organ herniated into the thoracic cavity. Type II paraesophageal hiatal hernia has a normal anatomically located gastroesophageal junction; however, a part of the stomach is herniated, mostly from the fundus hiatus. Type III paraesophageal hiatal hernia is the type in which a part of the stomach herniates from the hiatus and the gastroesophageal junction has an abnormal anatomical location. Type IV paraesophageal hiatal hernia is the type in which abnormally located gastroesophageal junction and

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Received/Geliş Tarihi: 10.02.2021 **Accepted/Kabul Tarihi:** 05.07.2021

another intra-abdominal organ, mostly the colon, herniates into the thoracic cavity.[2] If more than half of the stomach is in the thorax, it is called a giant paraesophageal hernia.

These hernias may be detected incidentally or may present as recurrent lung infections and gastrointestinal symptoms. Due to their rarity and non-specific clinical features, diagnosis may be delayed until adulthood.[3]

In this study, we presented the clinical and radiological findings of two cases with type IV giant paraesophageal hiatal hernia, who applied with different clinical symptoms and were diagnosed and treated by chance.

Case Reports

Case 1

A 10-month-old baby girl was brought to the outpatient clinic with the complaints of weight gain, diarrhea and rash. The patient's history, who was born at term, was unremarkable. Her body weight was 5850 g (<3 percentile), her height was 65 cm (5 percentile), and her head circumference was 41.5 cm (5 percentile). On physical examination, there was a maculopapular rash on the arms and the liver was palpable 4 cm on the right midclavicular line. Respiratory system and cardiovascular system examination was normal. In laboratory examinations, white blood cell (WBC) was 22.85x10^3/µL, NE was 6.35x10^3/µL, LY was 15.45x10^3/µL, platelet count (PLT) was 383x10^3/µL, Hgb was 13.2 g/dL, and C-reactive protein (CRP) was 8.4 mg/L. Biochemical test results were within normal limits. The patient was investigated for the differential diagnosis of rash, hepatomegaly, and growth retardation. Allergic and metabolic tests were sent. Posterior-anterior chest radiography (PACR) revealed gas shadow consistent with a hiatal hernia superposed to the heart and diffuse infiltration in both lungs (Figure 1a). In the esophagus-stomach-duedonum radiograph (ESD), it was observed that the esophagogastric junction and gastric fundus were located supradiaphragmatically in the retrocardiac area (Figure 1b). In non-contrast thorax computed tomography (CT), it was observed that most of the esophagogastric junction, stomach fundus and corpus were located in the mediastinum with a retrocardiac location (Figure 1c-e). A type IV paraesophageal hiatal hernia was diagnosed because there was a hiatus hernia with a diameter of 4 cm and the cardia, fundus and corpus part of the stomach from the hiatal defect, as well as the transverse colon and pancreas were herniated into the thorax (Figure 2a, b). Diffuse fibroatelectasis changes were also detected in both lungs on tomography and it was evaluated as the development of pulmonary fibrosis. The patient was operated by a pediatric surgeon. In the operation, herniated organs to the thorax were reduced into the abdomen, the hernia sac was removed, and the hiatus defect was repaired and the Nissen fundoplication was performed. The patient, who was followed up in the pediatric intensive care unit due to postoperative lung problems, was extubated after being followed up on a mechanical ventilator for 10 days. Oral feeding was started on the 4th postoperative day, and there was significant weight gain after the operation,

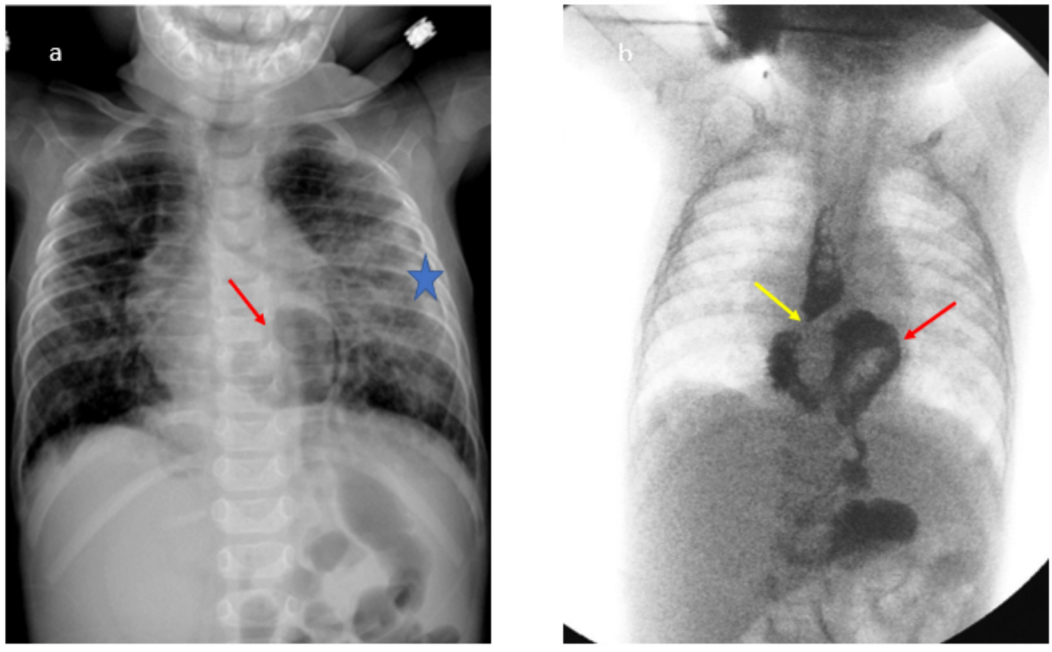

Figure 1a. A gas shadow superposed to the retrocardiac area is observed on the posterior-anterior chest radiograph (red arrow). In addition, areas of infiltration are seen in both lungs, more prominently on the left (asterisk). **b.** The esophagus-stomach-duodenal radiograph shows abnormal location of the esophagogastric junction (yellow arrow) and herniation of the gastric fundus into the thorax (red arrow)

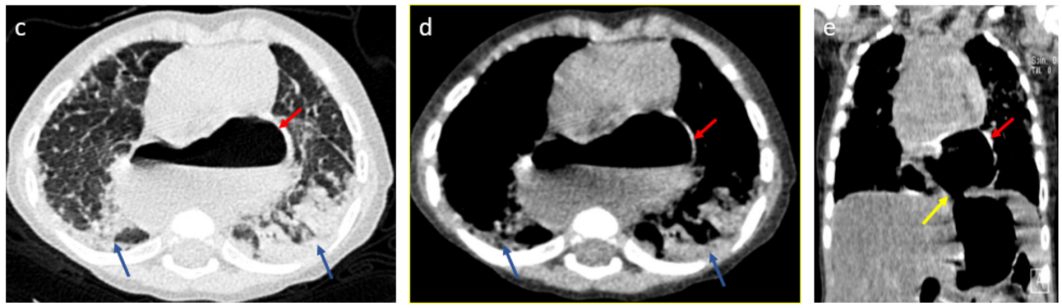

Figure 1 c-e. Herniated stomach (red arrows) in the retrocardiac area is observed in the axial lung (c) and mediastinal (d) windows in uncontrasted thorax computed tomography examination. In addition, diffuse fibroatelectasis densities are seen in the lower lobes of both lungs (blue arrows). Coronal reformat image (e) shows the presence of hiatal defect (yellow arrow) and herniation of the gastric fundus (red arrow)

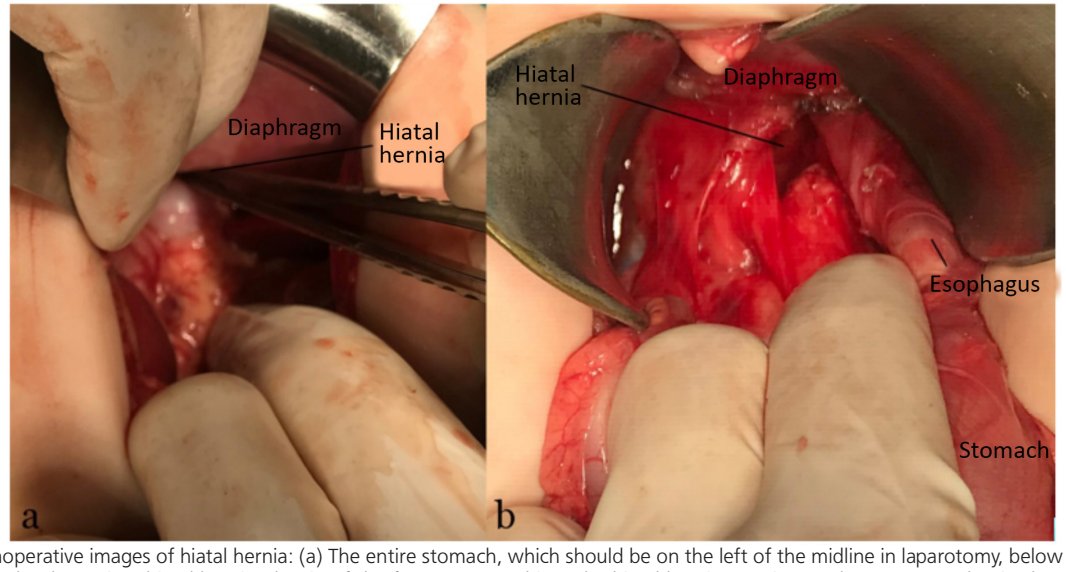

Figure 2 a, b. Intraoperative images of hiatal hernia: (a) The entire stomach, which should be on the left of the midline in laparotomy, below the left lobe of the liver, herniated into the thorax in a hiatal hernia, the tip of the forceps entered into the hiatal hernia opening, and transverse colon is observed just below the hernia sac. (b) Large hiatal hernia defect in the esophageal hiatus of the diaphragm with the stomach and esophagus reduced into the abdomen

respiratory complaints regressed, and diarrhea decreased. It was observed that there was a significant improvement in all symptoms of the patient. The general condition of the patient after discharge is good and her follow-up continues without any symptoms.

Case 2

A 2-month and 27-day-old boy was brought to the emergency department with the complaints of fever, vomiting, restlessness, and decreased sucking. It was learned that the patient, who was born at term, used medication due to gastroesophageal reflux disease. On physical examination, it was found that there was no desaturation, but respiratory sounds were decreased in the right lung base. In laboratory examinations, WBC was 12.63x10^3/μL, PLT was 733x10^3/μL, Hgb was 12.8 g/dL, NE was 6.86x10^3/μL, LY was 5.03x10^3 / μL, and CRP was <3.11 mg/L. No pathology was detected in blood gas and biochemical tests. In PACR and right lateral chest X-ray, gas shadow with the termination of the nasogastric tube was observed in the lower zone of the right hemithorax (Figure 3 a, b). In contrast-enhanced thorax CT, it was observed that the head of the pancreas and the total stomach were herniated from the midline behind the heart, from a paraesophageal defect, to the level of the right hemithorax carina; the esophagus was shifted to the right, enlarged and its contents were leveled; the stomach was folded on itself and was consistent with organoaxial volvulus (Figure 3 c-e). The findings were evaluated as consistent with type IV hiatal hernia and gastric volvulus. The patient underwent a corrective operation by the pediatric surgeon. A type IV paraesophageal hiatal hernia was detected in the operation. It was found that there was a hiatus hernia with a diameter of 6 cm and the entire stomach and pancreas tail herniated from the hiatal defect into the thorax. The herniated organs were reduced into the abdomen, the hernia sac was excised, the hiatus defect was repaired, and the Nissen fundoplication was performed. After the operation, the patient, whose pulmonary infection and respiratory symptoms improved and the complaint of vomiting regressed, was discharged. It is followed up without any problems in outpatient controls.

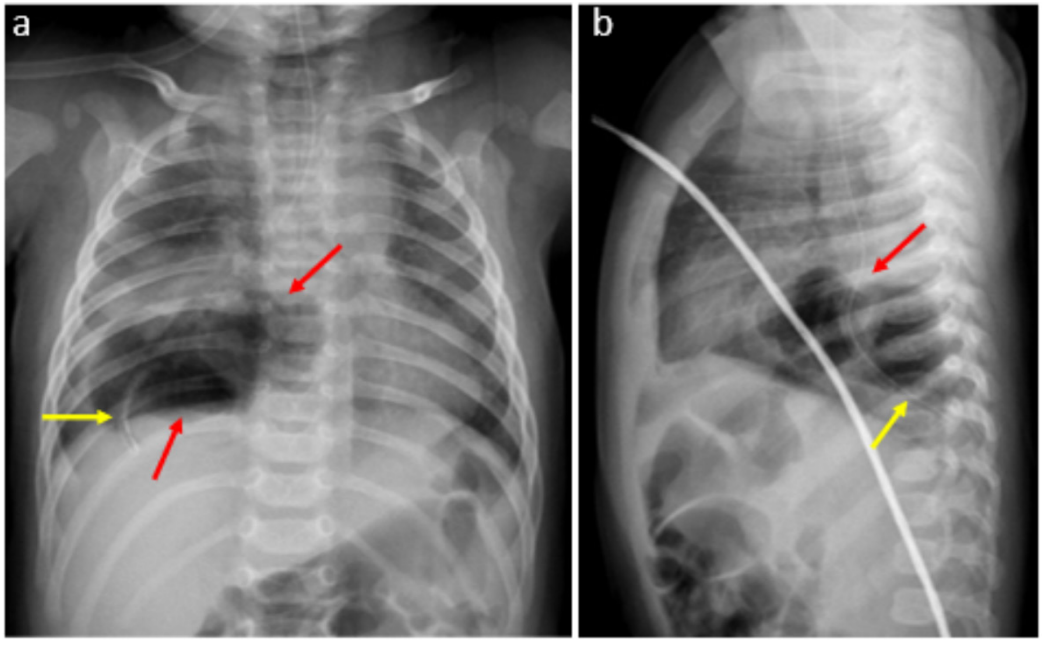

Figure 3 a, b. Posterior-anterior lung (a) and lateral lung (b) radiographs show that the stomach gas is not in its normal position and the air-containing gastric structure (red arrows) in which the nasogastric tube extends (yellow arrow) herniates into the right hemithorax

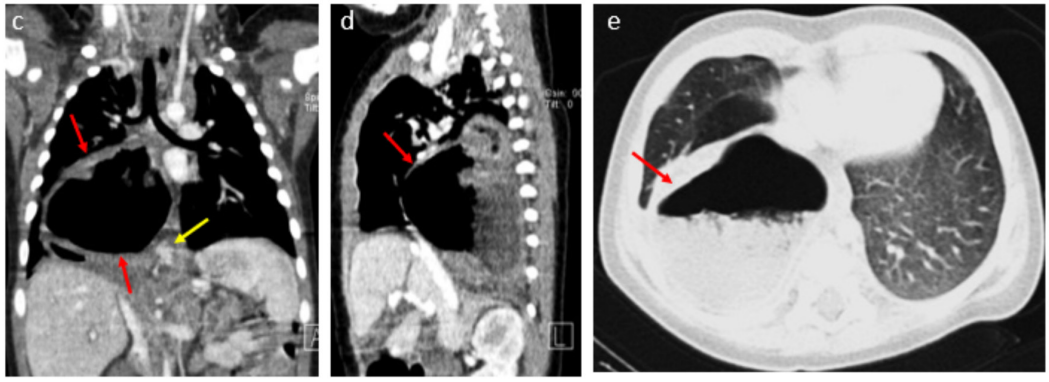

Figure 3 c-e. In contrast-enhanced thorax computed tomography examination, coronal (c) and sagittal (d) reformatted, axial plane lung window (e) images show the entire stomach (red arrows) and a part of the pancreas (yellow arrow) is herniated into the right hemithorax

Discussion

Paraesophageal hiatal hernias may present with acute or chronic findings. Acute presentation can be in the form of life-threatening complications such as incarceration, obstruction, perforation, bleeding, and anemia, or it can be in the form of respiratory system symptoms.[1,3,4]

In chronic presentation, they may present with recurrent lung infections that occur with fever and cough attacks. There may be intermittent episodes of vomiting and it can usually be attributed to gastroesophageal reflux disease, which is common in this age group.[5] Restlessness and refusal to be fed may be other symptoms. Widespread infiltrates in the lungs in the first case and recurrent vomiting attacks in the second case were associated with gastroesophageal reflux disease, and a significant improvement was observed in symptoms after surgical correction in both cases.

Especially in type IV paraesophageal hiatal hernia, respiratory symptoms, which can be seen secondary to the compression of the lung by herniated organs and accompanying gastroesophageal reflux, are more pronounced. As in our first case, microaspiration findings secondary to gastroesophageal reflux and growth retardation due to recurrent pneumonia can be seen in the lung.

As in our second case, in conditions in which most or whole of the stomach herniates into the thorax, patients can also apply in an emergency due to gastric volvulus. Since the circulation of the stomach is disrupted and perforation may develop in gastric volvulus, it may cause morbidity and mortality.[6-9]

Hiatal hernia should be considered when air densities superposed with the shadow of the heart are seen in the thoracic cavity in the chest X-ray. In suspected cases, lateral chest X-ray and visualization of the nasogastric tube in the

thorax also support the diagnosis. Opacity or air fluid level at the cardiophrenic angle may be the only clue in many cases. A definitive diagnosis is made with ESD examination and/or thorax CT and herniated organs are defined more accurately. In our cases, hernia was suspected on chest X-rays and the diagnosis was confirmed with thorax CT.[3,10]

Although type IV paraesophageal hiatal hernia is rare in the pediatric age group, it should be kept in mind in the differential diagnosis in children who have growth retardation, who cannot gain weight, who have intermittent vomiting attacks, and who have recurrent pulmonary infections.

Ethics

Informed Consent: Informed consent was obtained from the families of the patients.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: E.Ö., M.U.Y., Design: E.Ö., Ö.B., S.K.Ş., Analysis or Interpretation: E.Ö., M.U.Y., Ö.B., A.K., S.K.Ş., Literature Search: E.Ö., M.U.Y., Ö.B., Writing: E.Ö.

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

Financial Disclosure: The authors declared that this study received no financial support.

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DOI: 10.4274/cayd.galenos.2021.70894
J Pediatr Emerg Intensive Care Med 2022;9:143-6

Coexistence of COVID-19 and AML-M5: A Pediatric Case Report

COVID-19 ve AML-M5 Birlikteliği: Bir Pediyatrik Olgu Raporu

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Abstract

Coronavirus disease-2019 (COVID-19) is an infection that firstly reported in China and spread rapidly and caused a pandemic all over the world and still continues to spread. Although lung infection is the main factor affecting mortality, it can creates multisystemic involvement. Even though the clinical course is relatively mild in children, it is more severe in patients who have underlying chronic disease. A 16-year-old patient, who was previously followed up due to Familial Mediterranean Fever, was admitted to the emergency department with cough and respiratory distress, and in the evaluation of the patient, to the best our knowledge, the first case in the literature was diagnosed with pneumonia due to COVID-19 and AML-M5, simultaneously. Even if there are signs of viral infection and laboratory tests suggestive of COVID-19, the changes of hematological parameters should be examined in terms of malignancy.

Keywords: COVID-19, AML, pneumonia, pancytopenia

Öz

Koronavirüs hastalığı-2019 (COVID-19), ilk olarak Çin'de bildirilen ve hızla yayılan, tüm dünyada pandemiye neden olan ve halen yayılmaya devam eden bir enfeksiyondur. Mortaliteyi etkileyen ana faktör akciğer enfeksiyonu olmasına rağmen multisistemik tutulum yaratabilir. Çocuklarda klinik seyir nispeten hafif olsa da altta yatan kronik hastalığı olan hastalarda daha şiddetlidir. Daha önce Ailesel Akdeniz Ateşi nedeniyle izlenen 16 yaşındaki hasta, acil servise öksürük ve solunum sıkıntısı ile başvurmuştu. Hasta şuanki bilgilerimize göre literatürdeki AML-M5 ve COVID-19 pnömonisinin eş zamanlı olarak tanı aldığı ilk olgudur. Viral enfeksiyon bulguları ve COVID-19'u düşündüren laboratuvar test sonuçları olsa bile hematolojik parametrelerdeki değişiklikler malignite açısından incelenmelidir.

Anahtar Kelimeler: COVID-19, AML, pnömoni, pansitopeni

Introduction

Coronavirus disease-2019 (COVID-19) started in China at the end of 2019 and caused a pandemic all over the world. Mortality occurs by causing severe lower respiratory tract infection. Although adults are more frequently affected, the pediatric cases are not uncommon. It can cause clinical syndromes in a variety of spectrum from asymptomatic disease to massive pulmonary involvement.[1] Symptoms are more manifest in adult patients and nasal swab polymerase chain reaction (PCR) and chest tomography are used for diagnosis. Clinical symptoms in children are subtle, but similar diagnostic methods are used. While upper respiratory tract infection is more common in healthy children, lower respiratory tract infection can be seen more frequently, especially in those patients who have chronic diseases.[2] Although patients with hematological malignancies may show typical pulmonary involvement, accompanying diseases may cause complexity in diagnosis.[3]

We presented a patient who applied with signs of acute lower respiratory tract infection. In this case, both COVID-19 disease and acute myeloid leukemia-M5 (AML-M5) were diagnosed at the same time and both diseases were successfully treated.

Case Report

A 16-year-old male patient, previously followed up with a diagnosis of Familial Mediterranean Fever (FMF) and receiving colchicine treatment, was admitted to our pediatric emergency clinic with the complaint of fever and cough for about 5 days. In his medical history, it was learned that his

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Received/Geliş Tarihi: 26.03.2021 **Accepted/Kabul Tarihi:** 14.07.2021

father complained of fever and cough about 10 days ago, so he applied for treatment and the COVID-19 test was negative.

On physical examination, his body weight was 51 kg (3-10 p) and height 162 cm (<3-10 p). Body temperature: 39 °C, respiratory rate: 30/minute, blood pressure: 100/70 mmHg, oxygen saturation: 78%. Diffuse ral and rhoncus were detected in bilateral lung auscultation. The patient had dyspnea and orthopnea and had petechial rashes on the lower extremity. Hepatosplenomegaly and pathological lymphadenopathy were not detected. In laboratory tests, hemoglobin: 5.5 g/dL, white blood cell count: 3.090/mm^3, absolute neutrophil count: 140/mm^3, platelet count: 10.000/mm^3, C-reactive protein: 31 mg/dL, sedimentation: 128 mm/h, alanine aminotransferase: 10 IU/L, aspartate aminotransferase: 23 IU/L, lactate dehydrogenase: 334 IU/L, uric acid: 5.15 mg/dL, troponin I: 0.01 ng/mL.

The chest radiography of the patient showed pneumonic consolidations in the middle and lower zones of both lungs, more in the right lung (Figure 1). Pneumonic consolidations consistent with viral pneumonia and diffuse ground-glass appearance were reported in both lung parenchyma in thoracic tomography, especially in the lower lobes (Figure 2). The patient's COVID-19 nasal swab PCR was found to be positive.

Favipiravir and azithromycin were started with the diagnosis of COVID-19 pneumonia. Bone marrow aspiration was performed on the patient, since 5% of myeloid blasts were observed in the peripheral blood smear. The patient was diagnosed with AML-M5, since 34% CD45 (mode) +/SSC low cell group (monoblast) was observed in flowcytometry.

On the 6th day of the treatment, control chest radiography and thorax tomography were performed. Significant improvement was observed in the infiltrative areas (Figures 3, 4). Fourteen days after starting treatment, the control nasal swab COVID-19 PCR test became negative.

Discussion

Due to the high infectivity of COVID-19, most people are vulnerable to this virus. Patients apply to pediatric emergency clinics with a considerable picture of lower respiratory tract infection during the pandemic. As is known, COVID-19 infection is often asymptomatic or mild in children. After the diagnosis of COVID-19, these patients are mostly isolated at home by treatment, depending on their clinical condition. However, underlying chronic diseases or immunosuppressive treatments worsen the clinic.[4] We thought that in this patient, the lower respiratory tract infection clinic emerged because of immunosuppression due to AML.

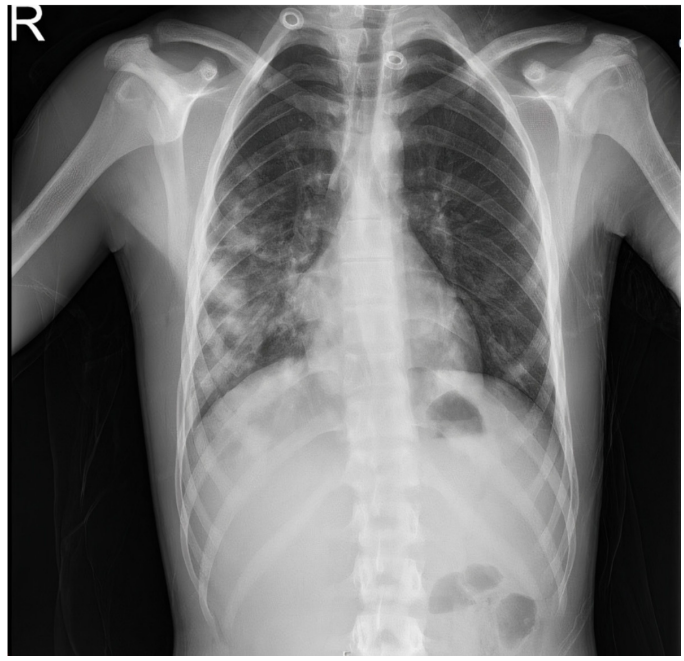


Figure 1. The chest radiography of the patient showed opacities consistent with pneumonic consolidations in the middle and lower zones of both lungs, more in the right lung

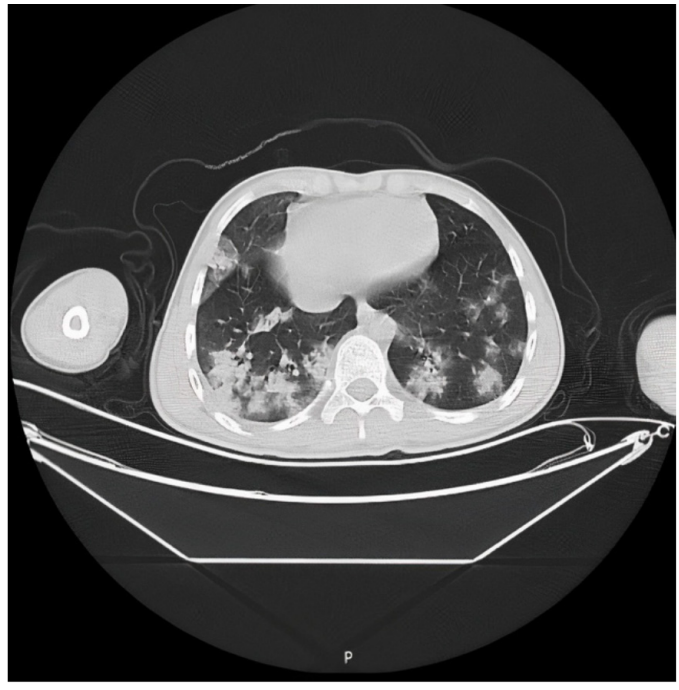
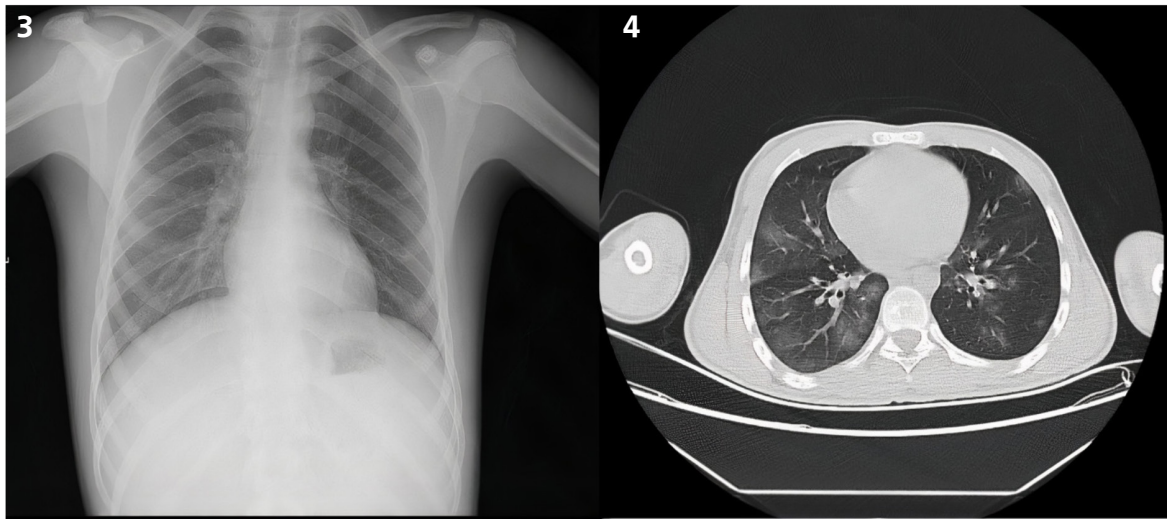


Figure 2. Pneumonic consolidations consistent with viral pneumonia and diffuse ground-glass appearance were reported in both lung parenchyma in thoracic tomography, especially in the lower lobes

Patients with underlying hematological malignancies are at higher risk for COVID-19 infection and disease progression. It is known that hematological patients have a more severe COVID-19 and higher mortality rate without correlating with the hematological type of cancer.[5] COVID-19 infection is frequently reported in the literature due to the



Figures 3, 4. On the 6th day of the treatment, control chest radiography and thorax tomography were performed. Significant improvement was observed in the infiltrative areas

immunosupression in patients with hematological malignancy and receiving chemotherapy.[6] To the best our knowledge, our case is the first report of the coexistence of COVID-19 infection in patients with just diagnosed hematologic cancer.

Therefore, an increasing number of patients with different hematological malignancies, including AML, are expected to present with concomitant COVID-19 at the time of diagnosis or during the course of the disease. The most current recommendations for COVID-19 screening aim to limit diagnostic testing to symptomatic, high-risk patients; others are instructed to isolate/quarantine. Complete blood count is only performed in patients with severe symptoms and confirmed COVID-19 infection. Since 50-75% of patients with acute leukemia have fever at the time of diagnosis, the risk of missed or delayed diagnosis is high.[7]

Patients with leukemia often have pulmonary infection, fever, and haemocytopenia similar to COVID-19 symptoms. Similarity in symptoms may confuse the diagnosis. In addition to delay in diagnosis, most patients may suffer from delayed chemotherapy due to a lack of isolation beds and blood products or a desire to avoid immunosuppressive treatments. Delay in the initiation of chemotherapy may adversely affect the prognosis, especially in young patients (<60 years) with intermediate risk disease.[8]

Detection of COVID-19 positivity, which results in a high risk of respiratory failure, may increase difficulties in the administration of optimal treatment, including delay for the underlying disease, the need for dose reduction, and drug-drug interactions.[8,9]

In our case, there was fever at the application. Fever is one of the first findings of FMF attack, leukemias, and COVID-19 infection. For this reason, this situation, which forces the clinician to make the correct diagnosis, resulted in the simultaneous diagnosis of two diseases thanks to laboratory tests and chest tomography imaging.

The patient's presence of pneumonia findings accompanying fever, the typical chest tomography findings for COVID-19, and pancytopenia in the blood tests helped us to diagnose to the association of hematological malignancies with COVID-19.

The increased case fatality rate of hospitalized patients with hematologic cancer and COVID-19, as determined in a 2-center study conducted in Wuhan, appears to be predominantly related to bacterial co-infections. This situation can be evaluated directly in terms of lower granulocyte concentration due to the diseases or their treatment. These informations suggest that protection of patients from secondary bacterial infections is more important than primary disease treatment in the coexistence of COVID-19 and leukemia.[9]

COVID-19 may have complex clinical findings in patients with hematological disease or may progress in a different clinical course than expected. The main goal we want to emphasize in our case presentation; deterioration in hematological parameters may occur due to systemic infection that develops in COVID-19 infection. This condition may be in a single blood cell series, or it may cause pancytopenia in the patients. However, the clinician should not ignore the possibility of malignancy in cases whose hematological parameters are severely affected.[10]

In conclusion, if there are signs of severe pneumonia and respiratory failure that require intensive care in an infection with milder symptoms compared to adults, especially in the childhood age group such as COVID-19, the underlying additional pathology should definitely be investigated.

Ethics

Informed Consent: Written informed consent was obtained from the mother of the patient.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: Y.S., Design: Y.S., E.N.İ., Data Collection or Processing: Y.S., Analysis or Interpretation: Y.S., E.N.İ., Literature Search: Y.S., Writing: E.N.İ.

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

Financial Disclosure: The authors declared that this study received no financial support.

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