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Journal of Pediatric Emergency and Intensive Care Medicine

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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.

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

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YAZARLARA BİLGİ

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

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

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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.

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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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- 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

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

ETİK

Bilimsel Sorumluluk: Makalelerin bilimsel kurallara uygunluğu yazarların sorumluluğundadır. Tüm yazarların gönderilen makalede akademik ve bilimsel olarak doğrudan katkısı olmalıdır. Bu bağlamda "yazar" yayınlanan bir araştırmanın kavramsallaştırılmasına ve desenine, verilerin elde edilmesi, analizi ya da yorumlanmasına belirgin katkı yapan, yazının 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.

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

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

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

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

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

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

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

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INSTRUCTION FOR AUTHORS

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

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

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

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

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

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

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

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

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

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

Authors should submit the following during the initial submission:

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

PEER REVIEW PROCESS

The manuscripts sent to the Journal of Pediatric Emergency and Pediatric Intensive Care are firstly evaluated by the editor. The editor checks up every manuscript, whether they are worth evaluating or not and assigns an assistant for each. If the editor and the assistant find the manuscript worth evaluating, they send it to two reviewers or one reviewer with one editorial board member for evaluation. The manuscript is not under evaluation if it does not require the evaluation of the reviewer or editorial board members because it has no scientific value and is not original, or it does not fit the reader population.

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

MANUSCRIPT TYPES

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

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

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

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

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

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

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

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

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

MANUSCRIPT SUBMISSION

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

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

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

MANUSCRIPT PREPARATION

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

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

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

Turkish and English Abstract: Original articles and summary reports should have an abstract including hypothesis or aim, methods, results and conclusions not more than 250 words total. Turkish and English abstracts not more than 150 words should be included for concepts and case reports. Keywords should be given as 3-10 pieces for any kind of writings below the page of Turkish and English abstracts. The terms found in medical topics of Index Medicus (Medical Subject Headings, MeSH) should be used as Keywords.

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

Contents of the Article:

Research articles should include the following sections;

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

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

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

Examples;

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

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XXVI. Turkish Microbiology

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

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

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

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

JOURNAL POLICY

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

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

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

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

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

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

EVALUATION AND PUBLICATION PROCESS

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

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

Manuscript Responsibility: Authors take all the responsibility for the information included in their printed articles. The journal takes no responsibility for the article. Authors take a copy of the printed article.

Publication Rights: The full text or a section of the article printed in journal, pictures or tables in the article can not be printed in another journal without information and written permission of the editor of Pediatric Emergency and Intensive Care journal or the administrative board of Association of Pediatric emergency and Intensive Care.

Necessary Information: Journal editors can request the basic data about the article from the author to investigate when necessary. Therefore, essentially the address and other communication data should exist on the main page.

Addition: Editorial board can make changes in the writing by taking permission from the authors. The editor and the language editor are completely authorized about the language, spelling and references, and similar subjects to be written as they are in Index Medicus.

After the article is sent to be published, none of the authors could be deleted from the list without the written permission of all other authors, and no new name could be added, and the author order cannot be changed as well.

Measurement units: The length, weight, and volume units should be reported in metric systems (meter, kilogram, liter) and decimal multiples of them. The temperature should be in Celsius degree, and blood pressure be millimeters-Mercury (mmHg). Both local and international unit systems (SI, International System of Units) should be specified as measure units. Drug concentrations will be given as SI or mass unit; it may be given as an option in parenthesis.

Abbreviations and Symbols: Use only the standard abbreviations. The non-standard abbreviations might be confusing for the reader. Abbreviations must be avoided in titles. Unless it is a standard measure unit, abbreviations should be open in the first writing, and abbreviation in parenthesis should be given as well.

Acknowledgement(s): At the end of the writing, acknowledgement(s) section should be located before references. In this part, individuals

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participating the content, order and statistical analysis of data of the article during its preparation might be mentioned.

Addition to References: Monotype rules have basically accepted an ANSI standard type adopted by American National Library of Medicine (NLM). Authors may apply to the website address of http://www.nlm.nih.gov/bsd/uniform_requirements.html for seeing examples of citations in reference.

Journal names should be abbreviated as seen in Index Medicus. The "List of Journals Indexed" in Index Medicus, which is a yearly published list and which takes place in the January edition of Index Medicus as a list, might also be a reference to look. The list is also available at "http://www.nlm.nih.gov" website.

ETHICS

Scientific Responsibility: Compliance of the article with the rules is the author's responsibility. There should be direct participation of author to the article as academically and scientifically. In this context, author is considered as an individual who participates in the design and conceptualization, data obtaining, analysis or interpretation of an article, and seen as a person taking duty on critical review of the writing or its draft. Other circumstances of being an author include planning or performing the study of article and/or writing the article or revising it.

Providing fund, data collection or general supervising of the research group do not provide any rights to author. All individuals written as authors should meet all of the criteria, and every individual meeting the criteria above may be counted as an author. All members of the group in Multi-center studies have to meet all of the criteria above. The name order of the authors must be a common consensus decision. All authors must specify the author name ordering alignment as assigned on the Copyright Transfer Form.

Individuals who do not meet enough criteria but participate in study should take place in the section of acknowledgement(s)/information in order. For instance, individuals who provide technical support , help in writing or who give only a general support might be given as example. Financial and material supports should also be mentioned separately.

The individuals who give material support but do not met the required criterion should be under the titles of "clinical researchers" or "assistant researchers" and the functions or the participations of them should be specified as "performed scientific consultancy". " reviewed the study advice". "collected data" or "takes over the care of patients in study". Written permission should also be taken from these individuals mentioned in Acknowledgement(s) sect ion as well.

Ethical Responsibility: The Journal of Pediatric Emergency and Intensive Care is a journal that adopts the principle of obeying the ethical standards of Human Experiments Committee of 1975-Helsinki Declaration, which was revised in 2013.

Therefore, it should be specified about the healthy/patient individuals participating the clinical experiments sent to be printed in the journal of Pediatric Emergency and Intensive Care, that everything is compatible with the ethical standards of the committee and the approval document required due to the type of experiment taken from the local or national ethical committee should be sent together and also informed consent forms taken from patients or healthy individuals or their guardians if they don't have the power to appeal, and a document assigned by all authors should all be sent to the editor.

In such types of studies, in the section of METHOD(S), the authors have to specify that they performed this study compatible with these principles and that they have taken informed consent forms from the people who participated in the study and from ethical boards. If "experimental animal" was used, they have to tell that they have protected the animal rights and taken the approval from ethical boards of institutions, in accordance with the principles of "Guide for the Care and Use of Laboratory Animals".

While the animal experiments are reported, authors have to inform in writing whether they have followed the institutional and national guides about the care and usage of laboratory animals or not. Also, in case presentations, informed consent forms of the patients should be taken regardless of knowing the identity of the patient or not.

The compliance of the articles with the rules is the responsibility of the author. Journal of Pediatric Emergency and Intensive Care requires the condition that articles should be of the best ethical and scientific standards, whereas it should not be dependent on commercial concerns.

Editor and publisher give no guarantee and accept no responsibility about the properties and explanations of commercial products which are published for advertisement. If there is any institution directly or indirectly related to the article or any institution giving financial support, authors have to inform in references page about the commercial product, drug, drug company etc. If there is any commercial relation or another kind (consultant, other agreements) of relationship with them or not.

Confidentiality and Privacy of Patients and Study Participants: Privacy can not be disrupted without the permission of patients. The identical information data like the names, capital letters of names, or hospital protocol numbers of the patients, photos and family information data can not be published unless they are essential for scientific purpose and without the informed consent taken from the patient (or the guardians).

Especially, in case reports, identity details of the patient should be excluded unless it is mainly necessary. For example; only masking on the eyes region in photos is not enough to hide the identity. If the data was changed to hide the identity, the authors should give assurance that these changes do not affect the scientific meanings. Also, it must be defined in the article that informed consent has been taken.

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Journal of Pediatric Emergency and Intensive Care Medicine

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Pediatric Emergency Department Visits Related to Home Accident in the Era of COVID-19 Pandemic

COVID-19 Pandemisi Döneminde Ev Kazası İlişkili Çocuk Acil Servis Başvuruları

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Abstract

Introduction: The Coronavirus disease-2019 pandemic has been caused several physical, mental and psychosocial problems alongside being a respiratory system infection. During pandemic, children were forced to stay at home as a preventative measure. Thus, we aimed to assess the number and characteristics of home accident-related visits in a pediatric emergency department during the pandemic.

Methods: This cross-sectional study included all children aged under 18 years who admitted with home accident in two curfew periods and the corresponding periods of previous year. Demographic and clinical data was consisted of age, gender, admission time, time elapsed between accident and pediatric emergency department admission, type of home accident, medical and surgical interventions, length of stay in pediatric emergency department, hospitalization, or intensive care unit admission and mortality. The data of curfew periods was compared with its control periods by using Mann-Whitney U test, t-test or chi-square. The statistical significance was defined as p≤0.05.

Results: We enrolled 744 patients. There was no significant difference in age, gender, time elapsed from the accident, ratio of hospitalization between curfew and control periods. The proportions of home accidents among all admissions were higher in two curfew periods (p=0.001 and p<0.001). The ratio of poisoning and foreign body ingestions was increased during both two curfew periods (0.7% vs. 0.3%, p=0.001 and 0.7% vs. 0.1%, p<0.001 for poisoning; 0.4% vs. 0.1%, p<0.001 and 0.8% vs. 0.1%, p<0.001 for foreign body ingestion) and the ratio of trauma was increased in the curfew-2 period (1.2% vs. 0.3%, p<0.001).

Conclusion: We suggested a higher ratio of home accidents especially poisoning and foreign body ingestions in curfew period.

Öz

Giriş: Koronavirüs hastalığı-2019, bir solunum sistemi enfeksiyonu olmasının yanı sıra çok sayıda fiziksel, zihinsel ve psikososyal problemlere yol açmaktadır. Pandemi süresince koruyucu önlem olarak çocuklar evlerinde kalmak zorunda bırakılmıştır. Bu nedenle pandemi süresince ev kazası nedenli çocuk acil servis başvurularının sayısını ve özelliklerini değerlendirmeyi amaçladık.

Yöntemler: Bu kesitsel çalışmaya sokağa çıkma yasağının olduğu iki periyod ve bu periyodların bir önceki yıl karşılıklarında ev kazası nedeniyle başvuran 18 yaş altı çocuklar dahil edildi. Demografik ve klinik veriler yaş, cinsiyet, başvuru zamanı, çocuk acile başvuruya kadar geçen süre, ev kazasının türü, tıbbi ve cerrahi müdahaleler, acil serviste kalış süresi, hastaneye ya da yoğun bakıma yatış ve mortaliteyi içermekteydi. Sokağa çıkma yasağı periyodlarına ait veriler bir önceki yıl kontrol periyod ile karşılaştırılırken Mann-Whitney U testi, t-testi ya da ki-kare testi kullanıldı. İstatistiksel anlamlılık p≤0,05 olarak kabul edildi.

Bulgular: Çalışmaya 744 hasta alındı. Sokağa çıkma yasağı periyodları ve kontrol periyodlar arasında yaş, cinsiyet, kazadan sonra geçen süre, hastaneye yatış oranları açısından anlamlı fark saptanmadı. Her iki sokağa çıkma yasağı periyodunda ev kazalarının tüm hastalara oranı kontrol periyoda göre anlamlı olarak yüksekti (p=0,001 vs. p<0,001). Her iki sokağa çıkma yasağı süresince zehirlenme ve gastrointestinal sistemde yabancı cisim oranlarında artış saptandı (%0,7 vs. %0,3, p=0,001; %0,7 vs. %0,1, p<0,001 zehirlenme için %0,4 vs. %0,1, p<0,001 vs. %0,8 vs. %0,1, p<0,001 gastrointesinal sistemde yabancı cisim için). Travma oranının ise ikinci sokağa çıkma yasağı periyodunda arttığı görüldü (%1,2 vs. %0,3, p<0,001).

Sonuç: Çalışmamızda sokağa çıkma yasağı periyolarında ev kazalarının özellikle de gastrointestinal sistemde yabancı cisim ve

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Thus, in case of global disasters such as pandemic the authorities should improve preventative and healthcare strategies to establish a safe environment for children and adolescents.

Keywords: Children, COVID-19 pandemics, emergency department, home accidents

zehirlenme oranlarının arttığını gösterdik. Bu nedenle pandemi gibi küresel felaketler durumunda sağlık otoriteleri çocuk ve ergenler için daha güvenli bir çevre yaratmak adına koruyucu hizmetler ve sağlık hizmetleri stratejilerini geliştirmelidir.

Anahtar Kelimeler: Çocuklar, COVID-19 pandemisi, acil servis, ev kazaları

Introduction

The Coronavirus disease-2019 (COVID-19) outbreak was considered as a pandemic by the declaration of the World Health Organization on March 11, 2020.[1] In the same day, the Minister of Health announced the first infected case in Turkey and the nation-wide measures have been promulgated immediately for the infection control.[2-4] School closure was one of the main public health measures which affected especially children and adolescents. Following that, "stay at home" policy was applied officially for those aged ≤20 years on April 4, 2020.[2-4] In the course of time, the restrictions was repealed gradually since May 31, 2020, but a curfew began again on November 18, 2020 by the increasing number of infected cases.[5,6]

These long periods of home confinement during pandemic can lead to a lack of socialization, longer screen time for education or social media, decreased physical activity, poor diet, disturbed sleep pattern, anxiety, post-traumatic stress disorder, depression, higher risk of domestic abuse or violence and home accidents. Hence, the pandemic has become more complicated by the consequences of these measures on the physical, mental, and emotional health of children and adolescents.[7-12] We hypothesized that the number of home accidents related admissions in our pediatric emergency department (PED) increased during the curfew periods. Thus, we aimed to compare the number and characteristics of patients with home accidents admitted to our PED between April 4-June 1, 2020 and November 18-December 18, 2020 with the same time frame of the previous year.

Materials and Methods

This cross-sectional study was conducted in PED of University of Health Sciences Turkey, Dr. Behçet Uz Child Disease and Pediatric Surgery Training and Research Hospital after the approval of Local Ethics Committee (January 28, 2021/501) and the written informed consents were obtained from parents. We included patients aged under 18 years who were admitted with home accidents during two curfew periods and the same periods in 2019. The four periods were defined as curfew period-1 (April 4-June 1, 2020), curfew period-2 (November 18-December 18, 2020), control period -1 (April 4-June 1, 2019) and control period-2 (November 18- December 18, 2019). Age, gender, admission time (daytime or night shift), time elapsed between accident and PED admission, type of home accident [trauma, foreign body ingestion (FBI), drowning, electrical injury, poisoning, foreign body in ear, nose, throat, or foreign body aspiration], medical and surgical interventions, length of stay at PED, hospitalization or intensive care unit admission and mortality were obtained from electronic medical records. Also, the data about the localization and type of foreign bodies in respiratory and gastrointestinal tract, requirement for emergent upper gastrointestinal endoscopy or bronchoscopy; type (head, thoracoabdominal, genitourinary, musculoskeletal injury) and severity of trauma; type of poisoning were recorded. The exclusion criteria were missing data, suspected but not-proven radio-opaque FBI or aspirations, intentional poisonings, and injuries.

Statistical Analysis

The descriptive statistics were presented by mean and standard deviation, median and interquartile range (IQR) or proportions for normally distributed, not normally distributed, and categorical data sequentially. The Mann-Whitney U test, t-test or chi-square test were used for the comparison of curfew and control periods. Statistical analyses were performed by SPSS software version 22.0 (IBM Corp., Armonk, NY) and p-value under 0.05 set as a statistical significance.

Results

Our PED had 5.339 and 4.675 visits during the curfew period-1 and 2; 19.405 and 21.266 visits during the control period-1 and 2. The total number of visits in the curfew period-1 and curfew period-2 were decreased 72.5% and 78.0% when compared with control periods. Among all admissions, we enrolled 744 patients with home accident. The overall median age was 30 months (IQR: 215 months) and 55.6% of patients were male. The median time elapsed between accident and admission was 1.5 hour (IQR: 2.4 hr) and 511 (68.7%) patients were admitted at night shift. Twenty-eight (3.8%) patients hospitalized. There were no pediatric intensive care unit admission and no mortality. The demographic and clinical characteristics of patients based on four different time periods are summarized in Table 1.

There were 450 (60.5%) trauma, 165 (22.2%) poisoning, 121 (16.2%) foreign body, 5 (0.7%) electrical injuries, 3 (0.3%) burns. The most common injuries were mild traumatic brain injury (mTBI) (n=243, 54.0%) and musculoskeletal injuries (n=96, 21.5%). The types of trauma are shown in Table 2. There were 96 foreign body ingestions which consisted of 31 (32.3%) coins, 21 (21.9%) sharp objects, 14 (14.6%) batteries, 2 (2.1%) single magnets, 25 (26.0%) unclassified blunt objects and 3 (3.1%) food. Upper gastrointestinal endoscopy was performed in 9 (9.4%) patients. Table 3 presented the type and location of ingested foreign bodies and the number of endoscopy procedures according to four different periods. Among foreign body in ENT and respiratory tract, only one patient in the curfew period-2 was underwent bronchoscopy. The characteristics of patients with poisoning were shown in Table 4. The proportion of trauma in Curfew-2 period was significantly higher than Control-2 period (1.2% vs. 0.3%, p<0.001). But the proportions of trauma in Curfew-1 and Control-1 period were similar (1.4% vs. 1.3%, p=0.663). During the Curfew-1 and Curfew-2 periods, the proportions of poisoning and FBI were higher when compared with their control periods (0.7% vs. 0.3%, p=0.001 and 0.7% vs. 0.1%,

Table 1. Comparison of the demographic and clinical characteristics of patients at curfew and control periods

	Curfew period-1	Curfew period-2	Control period-1	Control period-2	p-value
Home accidents/Total admissions, n/n	139/5.339	131/4.675	365/19.405	109/21.266	0.001[a] <0.001[b]
Age (months), median (IQR)	36 (38)	26 (35)	30 (50)	27 (36)	0.308[a] 0.705[b]
Age groups*, n (%)					
<2 years	49 (35.32)	59 (45.0)	152 (41.6)	49 (45.0)	
(2-5 years)	60 (43.2)	52 (39.7)	112 (30.7)	41 (37.6)	0.012[a]
(6-11 years)	27 (19.4)	17 (13.0)	72 (19.7)	17 (15.6)	0.937[b]
(12-18 years)	3 (2.2)	3 (2.3)	29 (7.9)	2 (1.8)	
Gender, n (%)					
Male	76 (54.7)	80 (61.1)	204 (55.9)	54 (49.5)	0.806[a]
Female	63 (45.3)	51 (38.9)	161 (44.1)	55 (50.5)	0.073[b]
Time elapsed from accident (hr), median (IQR)	1.5 (2.5)	1.0 (2.0)	1.5 (2.5)	1.0 (2.5)	0.338[a] 0.409[b]
Admission time, n (%)					
Night shift	111 (79.9)	87 (66.4)	238 (65.2)	75 (68.8)	0.001[a]
Day-time shift	28 (20.1)	44 (33.6)	127 (34.8)	34 (31.2)	0.693[b]
Type of home accident, n (%)					
Trauma	74 (53.2)	58 (44.2)	254 (69.6)	64 (58.7)	
Poisoning	37 (26.6)	32 (24.4)	67 (18.4)	29 (26.6)	
Foreign body	28 (20.1)	25 (26.7)	43 (11.9)	15 (13.8)	
Ear-nose-throat	4 (2.9)	5 (3.8)	6 (1.6)	3 (2.8)	
Respiratory tract	1 (0.7)	5 (3.8)	1 (0.3)	-	0.007[a]
Gastrointestinal tract	23 (16.6)	25 (19.2)	36 (9.8)	12 (11.0)	0.095[b]
Electrical injury	-	3 (2.3)	1 (0.3)	1 (0.9)	
Burn	-	3 (2.3)	-	-	
Lenght of stay at PED (hr), mean (SD)	1.9±4.5	6.6±7.7	1.8±5.4	3.6±8.2	0.858[a] 0.004[b]
Hospitalization, n (%)	10 (7.2)	4 (3.1)	11 (3.0)	3 (2.7)	0.125[a] 0.888[b]

[a]Comparison of curfew period-1 and control period-1, [b]Comparison of curfew period-2 and control period-2,
*Age groups according to National Institute of Child Health and Human Development Pediatric Terminology
SD: Standard deviation, PED: Pediatric emergency department, IQR: Interquartile range

Table 2. Type of trauma admissions according to curfew and control periods

	Curfew period-1 (n=74)	Curfew period-2 (n=58)	Control period-1 (n=254)	Control period-2 (n=64)	p-value
Mild TBI, n (%)	28 (37.8)	43 (74.1)	138 (54.3)	34 (53.1)	
Moderate-severe TBI, n (%)	1 (1.4)	-	17 (6.7)	1 (1.6)	
Thoracoabdominal injury, n (%)	1 (1.4)	-	8 (3.2)	1 (1.6)	
Genitourinary injury, n (%)	3 (4.1)	1 (1.7)	3 (1.2)	1 (1.6)	0.002[a]
Maxillofacial injury, n (%)	8 (10.8)	4 (6.8)	17 (6.7)	7 (10.9)	0.010[b]
Musculoskeletal injury, n (%)	30 (40.5)	10 (17.2)	49 (19.3)	12 (18.8)	
Multiple trauma, n (%)	3 (4.1)	-	22 (8.7)	29 (26.6)	

[a]Comparison of curfew period-1 and control period-1, [b]Comparison of curfew period-2 and control period-2, TBI: Traumatic brain injury

Table 3. The clinical features of foreign body ingestions according to curfew and control periods

	Curfew period-1 (n=23)	Curfew period-2 (n=25)	Control period-1 (n=36)	Control period-2 (n=12)	p-value
Type of foreign body, n (%)					
Coin	6 (26.1)	7 (28.0)	14 (38.9)	4 (33.3)	
Sharp object	6 (26.1)	6 (24.0)	7 (19.4)	2 (16.7)	
Battery	5 (21.7)	4 (16.0)	3 (8.3)	2 (16.7)	0.412[a]
Single magnet	-	1 (4.0)	1 (2.8)	-	0.951[b]
Unclassified blunt object	6 (26.1)	7 (28.0)	8 (22.2)	4 (33.3)	
Food	-	-	3 (8.4)	-	
Location of foreign body, n (%)					
Esophagus	3 (13.0)	1 (4.0)	2 (5.6)	1 (8.3)	
Stomach	6 (26.1)	8 (32.0)	8 (22.2)	2 (16.7)	
Intestines	10 (43.5)	8 (32.0)	20 (55.5)	7 (58.3)	0.673[a]
Unknown	4 (17.4)	8 (32.0)	6 (16.7)	2 (16.7)	0.314[b]
Endoscopy, n (%)	1 (4.3)	5 (20.0)	1 (2.8)	2 (16.7)	0.054[a] 0.661[b]

[a]Comparison of curfew period-1 and control period-1, [b]Comparison of curfew period-2 and control period-2

Table 4. The clinical features of poisonings according to curfew and control periods

	Curfew period-1 (n=37)	Curfew period-2 (n=32)	Control period-1 (n=67)	Control period-2 (n=29)	p-value
Type of poison, n (%)					
Drugs	21 (56.8)	13 (40.7)	34 (50.7)	22 (75.9)	
Caustic-corosive	15 (40.5)	14 (43.8)	25 (37.3)	4 (13.8)	
Hydrocarbon	-	3 (9.4)	4 (6.0)	2 (6.9)	0.528[a]
Alcohol	-	1 (3.1)	1 (1.5)	1 (3.4)	0.022[b]
Organophosphate	-	-	1 (1.5)	-	
Others	1 (2.7)	1 (3.1)	2 (3.0)	-	
Interventions, n (%)					
Gastric lavage	4 (10.8)	2 (6.3)	8 (11.9)	8 (27.6)	
Activated charcoal	12 (32.4)	3 (9.4)	15 (22.4)	9 (31.0)	0.489[a]
Antidote	-	-	2 (3.0)	-	0.831[b]
Haemodialysis	-	-	1 (1.5)	1 (3.4)	
Time elapsed from poisoning (hr), median (IQR)	1.0 (1.5)	1.0 (1.0)	1.5 (2.0)	1.0 (1.6)	0.027[a] 0.651[b]

[a]Comparison of curfew period-1 and control period-1, [b]Comparison of curfew period-2 and control period-2, IQR: Interquartile range

p<0.001 for poisoning; 0.4% vs 0.1%, p<0.001 and 0.8% vs. 0.1%, p<0.001 for FBI).

Discussion

To our knowledge, this is the first study from Turkey focused on the effect of pandemic restrictions in terms of pediatric home accident. We found that patients presented with home accident proportionally increased during the curfew periods despite there was no significant rise in number. Our data was supported by the study of Bressan et al.[10] that incidence rate ratio of home accidents in curfew period was higher than the same period of previous year. Similarly, it was reported that the proportion of domestic accidents in a tertiary pediatric surgical unit increased during the pandemic compared with two previous years.[13] Also, a study of extremity fractures in children and adults reported an increment of home accidents among injury mechanisms during pandemics.[14]

Another main finding of our study was increased percentage of poisoning and FBI during both curfew periods. Similarly, a study of PED utilization found a higher number of ingestion and poisoning in the social distancing period.[15] In accordance with our results, Levine et al.[16] reported an increased incidence rate ratio of pediatric exploratory ingestion calls at school hours in 2020. Unlike, a study of exposures and suspected intoxication suggested that the number of cases and the ratio of domestic accidents didn't change during the first months of 2020.[17] But it is difficult to comment on this result from the perspective of pediatric home accidents as half of the study population consisted of adults. Moreover, we emphasized a rise in poisoning with caustic-corrosive materials during the second curfew period and we believe that it was related to the frequent use of household cleaners as a transmission-based precaution at home.

Regarding FBIs, a study from Italy was in accordance with our findings. The authors reported that FBIs nearly doubled in the

first months of pandemic. Additionally, they emphasized a rise in the number of upper gastrointestinal endoscopy.[18] On the other hand, we didn't observe a significant increase in the endoscopic procedures. An explanation for this discrepancy may be that the high-risk FBIs such as batteries, sharp objects and caustic substances were increased in this study while the type of FBIs didn't change in our study. Distinctly, it was reported that the rate of hospital admission with FBI and the rate of hospitalization for endoscopic procedures were similar for the last five years. Besides they suggested an increased rate of battery ingestions in the first two months of school closure.[19] Considering the abovementioned approach based upon the type of foreign body, a higher endoscopic procedure rate would expect for this study. Nevertheless, the timing of FBI is another determining factor to make a decision about upper gastrointestinal endoscopy and these two studies had no data about the time elapsed between ingestion and admission.[20,21] But the strength of our study was that there was no significant difference in time elapsed from accident and the ratio of endoscopic procedures during curfew periods.

Trauma is one of the major non-infectious causes of PED visits. Although the number of PED admissions sharply reduced in the era of COVID-19 pandemic, relatively increased trauma-related visits were reported.[10,22,23] Compatible with the current literature, there was a higher rate of trauma-related admissions for the second curfew period in our study. Furthermore, we pointed out proportionally increased mTBI. Also another study of pediatric injuries during lockdown pointed out an apparent rise of mTBI in a level-1 trauma center.[24] Contrarily, Goyal et al.[25] reported that mild and moderate head injuries reduced during pandemic. But nearly half of the study population consisted of road traffic accidents instead of home accidents. In addition to all these, interestingly we didn't observe a distinct change in trauma-related visits during the first curfew period.

The rise of pediatric home accident during curfew can be explained by several factors. Spending a longer time at home filled with dangerous materials such as electronic devices, batteries, drugs, household cleaners and plants could establish a high-risk environment for poisoning and FBIs. Although the teleworking extended the time at home during pandemic, it might lead the lack of parental supervision. Also, inequalities of social and economic conditions and new family lifestyle after pandemic attended through the adaptation process. For handling this issue the education of parents about maintenance of a friendly physical and social environment is crucial.

Our single-center study was limited with a retrospective design. Although our data may not be generalized due to small sample size, our hospital is the only public children's hospital in İzmir and we can speculate that parents preferred to admit our PED instead of other hospitals overflowed by adults with COVID-19. Beside our hospital was not a trauma center and patients with burn managed in the burn unit. Hence there was limited number of patients with major or multiple traumas and burns. But then, we aimed to observe the changes in home accident-related visits through the curfew periods.

Conclusion

Pediatric home accident-related visits prominently increased in our PED during the curfew periods. Thus, the individual and collective level of awareness about home accidents should be raised during the pandemic and the preventative strategies for home accidents should be revised by the healthcare authorities and social services.

Ethics

Ethics Committee Approval: This cross-sectional study conducted in PED of University of Health Sciences Turkey, Dr. Behçet Uz Child Disease and Pediatric Surgery Training and Research Hospital after the approval of Local Ethics Committee (January 28, 2021/501).

Informed Consent: Written informed consents were obtained from parents.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.E., B.K.Ç., E.U., F.A., İ.G., H.A., Concept: A.E., F.A., İ.G., H.A., Design: A.E., E.U., İ.G., Data Collection or Processing: A.E., B.K.Ç., Analysis or Interpretation: A.E., İ.G., Literature Search: A.E., F.A., H.A., Writing: A.E., E.U.

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Assesment of Upper Gastrointestinal Bleeding in the Pediatric Emergency Department

Çocuk Acil Servisinde Üst Gastrointestinal Kanamalarının Değerlendirilmesi

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Abstract

Introduction: Upper gastrointestinal bleeding is an important emergency problem that can occur at any age in childhood and requires urgent treatment for the underlying cause. Etiological causes of gastrointestinal bleeding vary by age and geographic region. In this study; we aimed to investigate the demographic characteristics, etiological causes, endoscopic intervention results, and the relationship between analgesic/antipyretic drug use and bleeding in patients admitted to the pediatric emergency department with upper gastrointestinal bleeding.

Methods: The records of patients aged 1 month to 18 years who presented to our pediatric emergency department with upper gastrointestinal bleeding between January 2017 and 2019 were retrospectively reviewed. Demographic features, complaints at admission, etiological reasons, endoscopy findings, diagnoses, and antipyretic/analgesic drug use were recorded.

Results: There were 108 patients presenting with upper gastrointestinal bleeding, and 53.7% of the patients were male. The mean age was 76.7±58.3 months. Hematemesis was present in 100 patients. Symptoms of the patients; vomiting was present in 82.4%, upper respiratory tract infection in 36.1%, fever in 29.6%, and abdominal pain in 25.9%. There were 52 patients with a history of antipyretic and/or analgesic drug use. An endoscopic examination was performed in 74 patients. In patients who underwent endoscopic examination; pathological changes were detected in 26 of 32 patients who used drugs and 30 of 42 patients who did not use drugs.

Öz

Giriş: Üst gastrointestinal kanama, çocukluk çağında her yaşta ortaya çıkabilen ve altta yatan nedene yönelik acil tedavi gerektiren önemli bir acil sorundur. Gastrointestinal kanamanın etiyolojik nedenleri yaşa ve coğrafi bölgeye göre değişir. Bu çalışmada; çocuk acil servisine üst gastrointestinal kanama ile başvuran hastaların demografik özellikleri, etiyolojik nedenleri, endoskopik girişim sonuçları ve analjezik/antipiretik ilaç kullanımı ile kanama arasındaki ilişkiyi araştırmayı amaçladık.

Yöntemler: Ocak 2017-2019 tarihleri arasında çocuk acil servisimize üst gastrointestinal kanama ile başvuran 1 ay-18 yaş arası hastaların kayıtları geriye dönük olarak incelendi. Demografik özellikler, başvuru şikayetleri, etiyolojik nedenler, endoskopi bulguları, tanıları, antipiretik/analjezik ilaç kullanımı kaydedildi.

Bulgular: Üst gastrointestinal kanama ile başvuran 108 hastanın %53,7'si erkekti. Ortalama yaş 76,7±58,3 aydı. Yüz hasta hematemez şikayeti ile başvurdu. Hastaların %82,4'ünde kusma, %36,1'inde üst solunum yolu enfeksiyonu bulguları, %29,6'sında ateş ve %25,9'unda karın ağrısı şikayeti vardı. Hastaların 52'sinde antipiretik ve/veya analjezik ilaç kullanım öyküsü mevcuttu. Yetmiş dört hastaya endoskopik inceleme yapıldı. Endoskopik inceleme yapılan hastalarda; ilaç kullanan 32 hastanın 26'sında ve kullanmayan 42 hastanın 30'unda patolojik değişiklik saptandı.

Sonuç: Çocuk acil servisine üst gastrointestinal kanama ile başvuran hastalarda kanama genellikle akut başlangıçlıdır ve kendi kendini sınırlar ancak acil tanı ve tedavi gerektirir. Çalışmamızdaki hastaların

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Conclusion: In patients presenting to the pediatric emergency department with upper gastrointestinal bleeding, the bleeding is usually acute and self-limiting, but requires prompt diagnosis and treatment. Approximately half of the patients in our study had a history of antipyretic/analgesic drug use in etiology. When the endoscopic findings of drug users and non-users were compared, no statistically significant difference was observed in terms of pathological findings.

Keywords: Bleeding, drug, upper gastrointestinal

yaklaşık yarısının etiyolojide antipiretik/analjezik ilaç kullanım öyküsü mevcuttu. Bu ilaçları kullanan grup ile ilaç kullanmayan grup karşılaştırıldığında patolojik endoskopik bulgularda istatistiksel olarak anlamlı fark gözlenmedi.

Anahtar Kelimeler: Kanama, ilaç, üst gastrointestinal

Introduction

Upper gastrointestinal bleeding (UGB) is one of the important reasons for admission to the pediatric emergency department (PED). UGB is defined as bleeding anywhere between the upper part of the esophagus and the ligament of Treitz. It accounts for approximately 20% of all gastrointestinal bleeding.[1] The incidence of UGB is reported to be 6-25%.[2,3]

It may develop due to various reasons ranging from self-limiting benign conditions to serious diseases that require urgent intervention. Therefore, it is very important to evaluate the etiological cause and the location of the bleeding site.

Its etiology varies according to geographical regions and age groups. There are several risk factors for UGB. The most important of these are drugs. Paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used for pain and fever control in children thanks to their antipyretic and analgesic effects and are generally considered safe. These drugs may cause gastrointestinal mucosal damage and cause complications such as peptic ulcer, bleeding and perforation. They also facilitate bleeding from pre-existing or new lesions.[4-6] Detailed history and physical examination, early diagnosis, timely endoscopic intervention and appropriate treatment approach are important in the management of UGB.

In our study, we aimed to evaluate the demographic characteristics, laboratory findings, etiological reasons, endoscopic findings of patients who admitted to the PED with UGB, to investigate the place of analgesic and/or antipyretic drug use in etiology, and to investigate the relationship between bleeding and endoscopic findings in drug users and non-users.

Materials and Methods

Records of patients aged between 1 month and 18 years who applied to the PED of University of Health Sciences Turkey, Ankara Dr. Sami Ulus Children's Health and Diseases Training and Research Hospital, between January 2017 and January 2019 were analyzed retrospectively by using electronic data. Patients with chronic disease, long-term medication use, ingestion of corrosive substances or foreign bodies, history of gastrointestinal surgery and missing data were excluded. Patients' age, gender, presentation complaints, laboratory findings, etiology of bleeding, antipyretic and/or analgesic drug use, endoscopic findings, and treatments were analyzed. Complete blood count and coagulation tests (prothrombin time, activated partial thromboplastin time, international normalized ratio) were evaluated. Esophagogastroduodenoscopy (EGD) records were also examined.

Ethical Approval

The study protocol was performed in accordance with the Helsinki Declaration of human rights. The study was reviewed and approved by the Keçiören Training and Research Hospital Ethics Committee (2012-KAEK-15/2020).

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) 23 program was used to analyze the data. Quantitative variables were presented as mean and ± standard deviation, also categorical variables were presented as numbers and percentages. Student t-test was used for group comparison. Categorical data were analyzed using the X^2 test and Fisher's Exact tests. A value of $p<0.05$ was accepted as statistically significant.

Results

UGB was detected in 108 of 233,720 patients who applied to our PED in a 2-year period. Fifty-eight of them (53.7%) were male and the mean age was 76.7±58.3 months (2-215 months). Forty-nine (45.4%) patients were under the age of five and 59 (54.6%) were over the age of five.

On admission to the PED; 100 of 108 (92.6%) patients presented with hematemesis, 7 (6.5%) with melena, and one with hematemesis and melena. The most common symptoms were vomiting 89 (82.4%), upper respiratory tract infection 39 (36.1%), fever 32 (29.6%) and 28 (25.9%) patients had complaints of abdominal pain.

The history of using NSAIDs, acetylsalicylic acid and paracetamol was presented in 52 of 108 patients (48.1%).

Most of the patients who used drugs, 27 (51.9%) were using both ibuprofen and paracetamol.

There were 15 patients under 2 years of age, 14 patients between the ages of 2-5, 15 patients between the ages of 5-10, 8 patients aged 10 and overusing analgesic/antipyretic drugs. Thirty-two patients used antipyretic and 20 patients used analgesic drugs. In the physical evaluation-revealed pallor was detected in 5 patients, tachycardia, hypotension and shock were detected in 2 patients, and epigastric tenderness was detected in 8 patients.

The demographic characteristics, symptoms and findings, and laboratory findings of the patients are presented in Table 1.

Table 1. Characteristics of children presenting with upper gastrointestinal bleeding

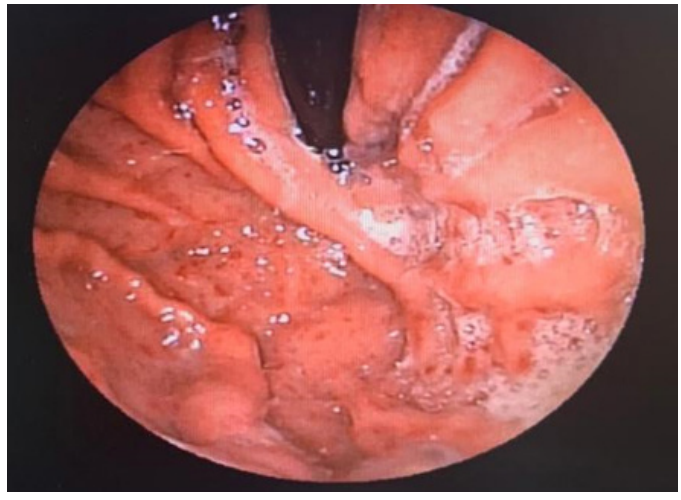
Age (months) (mean ± SD)	**76.7±58.3 (2-215)**
Age group (n, %)	
1 month-2 years	24 (22.2%)
2-5 years	25 (23.1%)
5-10 years	35 (32.4%)
10-18 years	24 (22.2%)
Gender (n, %)	
Male	58 (53.7%)
Female	50 (46.3%)
Symptoms (n, %)	
Hematemesis	100 (92.6%)
Melena	7 (6.5%)
Hematemesis and melena	1 (0.9%)
Associated symptoms (n, %)	
Vomiting	89 (82.4%)
Upper respiratory tract infection	39 (36.1%)
Fever	32 (29.6%)
Abdominal pain	28 (25.9%)
Acute gastroenteritis	15 (13.9%)
Weakness	3 (2.7%)
Dizziness	3 (2.7%)
Using analgesic/antipyretic (n, %)	
Ibuprofen and paracetamol	27 (51.9%)
Paracetamol	14 (26.9%)
Ibuprofen	7 (13.5%)
Other NSAIDs	3 (5.8%)
Acetylsalicylic acid	1 (1.9%)
Physical examination findings (n, %)	
Epigastric tenderness	8 (7.4%)
Pallor	5 (4.6%)
Tachycardia	2 (1.8%)
Hypotension	2 (1.8%)
Laboratory findings	
Hemoglobin (gr/dL) (mean ± SD) (min-max)	12.7±1.78 (5.9-16.3)
Hematocrit (%) (mean ± SD) (min-max)	38±5.24% (17.5-48.5)
Platelet (UI) mean ± SD (min-max)	326,000±103,800 (113,000-673,000)
aPTT (sn) mean ± SD (min-max)	26.1±3.3 (17.5-34.9)
PT (sn) (mean ± SD) (min-max)	13.2±1.28 (10.9-17)
INR (mean ± SD) (min-max)	1.0±0.1 (0.9-1.4)

NSAIDs: Non-steroidal anti-inflammatory drugs, PT: Prothrombin time, aPTT: Partial thromboplastin time, INR: International normalized ratio, SD: Standard deviation

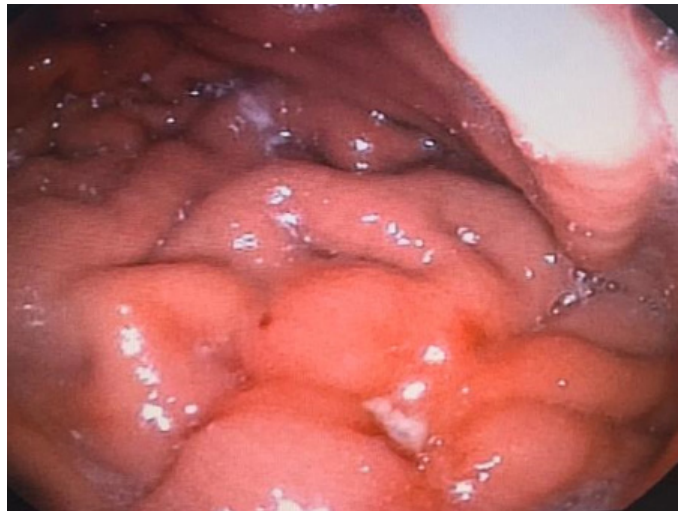
Endoscopic examination was performed in 74 (68.5%) patients. Thirty eight (51.3%) of them were male. The endoscopic results of the patients were given in Table 2. Endoscopic examination images are presented (Pictures 1-4).

Table 2. Endoscopy reports of the patients

Pathological lesion	n (%)
Gastric erosion	27 (36.5%)
Gastritis	7 (9.5%)
Gastric ulcer	7 (9.5%)
Esophageal erosion	5 (6.8%)
Gastric erosion + esophagitis	3 (4%)
Esophagitis	2 (2.7%)
Gastric erosion + duodenal ulcer	2 (2.7%)
Gastric ulcer + esophagitis	1 (1.3%)
Ulcer in the esophagus	1 (1.3%)
Duodenal ulcer	1 (1.3%)
Normal	18 (24.3%)
Total	74 (100%)

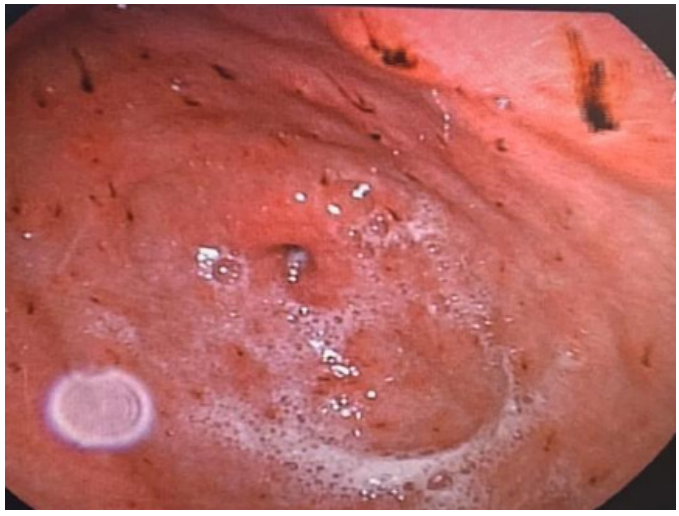


Picture 1. Superficial erosion of the fundus and bleeding areas



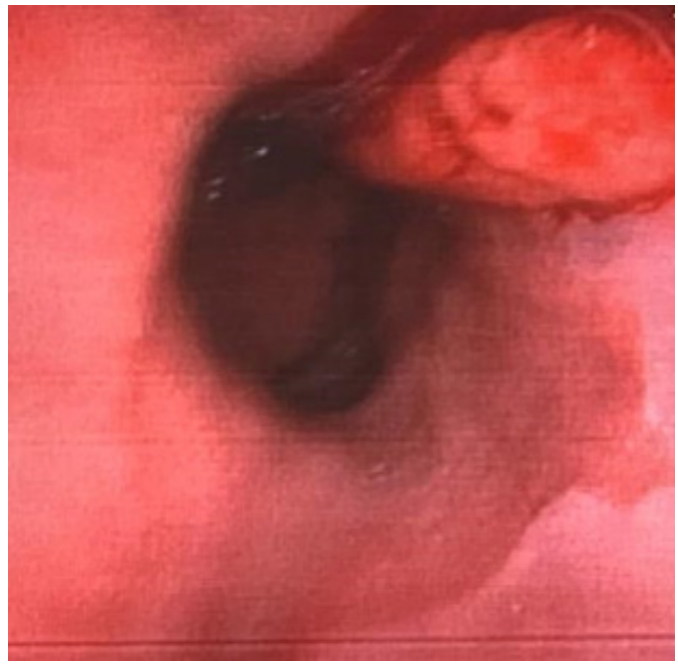
Picture 2. Ulcer in the stomach corpus

When patients were evaluated according to age groups, for children aged 1 month-2 years 56.2% of the patients stomach and 18.7% had esophageal changes; 61.5% had stomach and 30.8% had esophageal changes between 2-5 years old; 70.8% had stomach-duodenum and 4.2% had esophageal changes between 5-10 years old and 63.6% had stomach-duodenum and 22.7% had esophageal changes over 10 years old were observed.



Picture 3. Punctate bleeding areas in the stomach antrum

Pathological changes were detected in the endoscopy in 26 (81.3%) out of 32 patients using drugs and in 30 (71.4%) out of 42 patients who did not. The endoscopy findings of patients using and not using drugs are shown in Figure 1.



Picture 4. Distal esophagus erosion

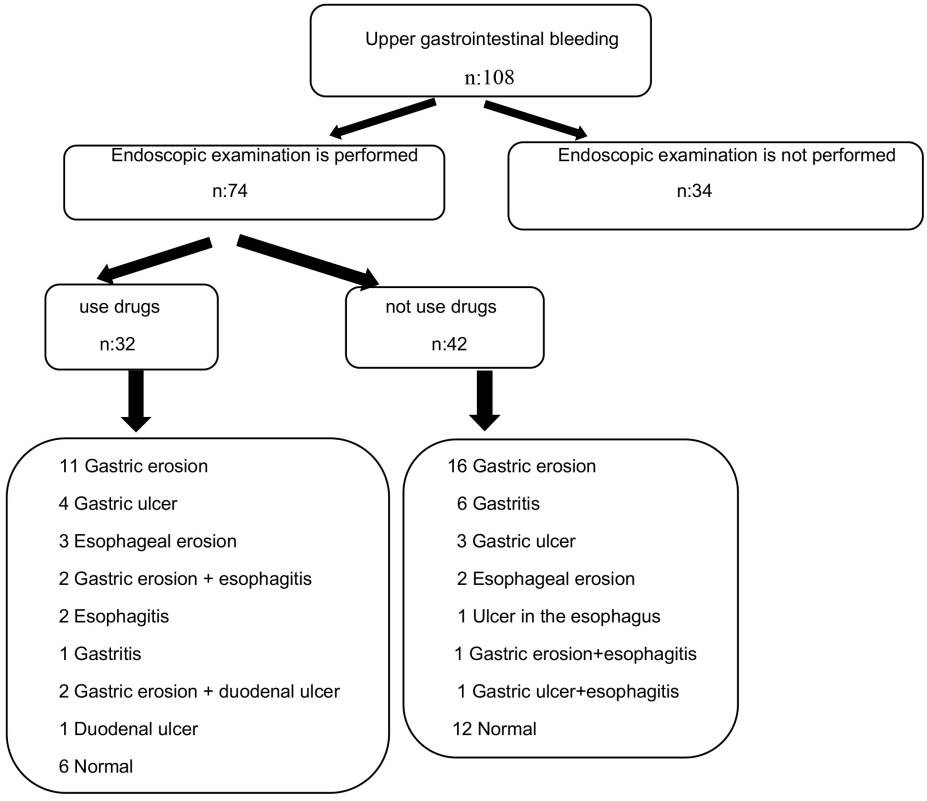


Figure 1. The endoscopy findings of the patients who use and do not use drugs are shown

All patients were followed hospitalization and 77 (71.3%) of them were followed in the PED, 28 (25.9%) of them were followed up in the pediatric wards, and 3 (2.8%) of them were followed up in the intensive care unit. Nasogastric lavage was applied to all patients, their oral intake was discontinued and medical treatment was initiated. Endoscopic treatment was applied to 10 patients with active bleeding. None of the patient died from bleeding.

Discussion

Pediatric UGB is one of the important conditions that require urgent intervention. Although most of the cases are benign serious and life-threatening bleeding should be diagnosed treated quickly.[7] There is insufficient data on the frequency of UGB in outpatient admissions and most of the studies have been conducted in pediatric intensive care units. In a study conducted in France, UGB was reported to be seen in 1-2 of 10,000 children per year and the ratio of female to male in UGB was 1.2:1.[8] In our study, 108 (0.046%) of the 233,720 patients who were admitted to the PED in a two-year period were presented with UGB and the male to female ratio of the patients was 1.16.

Hematemesis and melena are the main symptoms of upper GIB. Hematemesis refers to vomiting of either red blood or coffee-ground emesis. Melena is defined as black, tarry stools that appear a few hours after the bleeding episode. In studies, the complaints at presentation of patients were reported at the rate of 63-96.6% with hematemesis, 15-20% with melena and 2.8% with hemorrhagic shock.[9-12] Similar to the other studies, hematemesis was the most common symptom in our study. The reduced rate of melena may be due to the fact that it is not noticed by the patient and their family.

Causes of UGB in children vary according to the age and geographical region. While the most common cause in Eastern countries is varicose bleeding due to portal hypertension, non-varicose causes such as gastric and duodenal ulcers have been reported most frequently in the west.[13,14] It has been shown that the most common cause of non-varicose bleeding in childhood was gastro-duodenal diseases. Gastric erosion, gastritis and gastric ulcer were found most common ones. In various studies, this rate ranges from 35% to 69%.[10,15-21] Esophagitis ranks second among the causes of UGB, with a rate varying between 7.1% and 36% in the literature.[11,16,17,20] Similar to the literature, gastro-duodenal diseases constituted the most common cause of bleeding in this study group, while esophageal diseases were in the second place. Studies have reported that reduced erosive gastritis, increased gastric and duodenal ulcers with age.[10,22,23] Similarly, gastric erosion was common in young children, while the frequency of duodenal ulcers increased in older children in this study.

NSAIDs and viral infections are important risk factors for the development of UGB. Gastrointestinal bleeding can be seen due to the use of NSAIDs such as ibuprofen, which is commonly used in childhood.[24] It is reported that it can cause bleeding by causing gastric mucosal damage.[25-28] However, data on the gastrointestinal complications of these drugs in children are limited; evidence is based on case reports and case series.[8,29-32] NSAIDs are reported to be used in approximately 20-50% of patients with UGB.[19,33,34] Approximately half of the patients in this study had a history of drug use and 37 (71.1%) of these patients used NSAIDs. UGB has also been reported after using paracetamol, which is frequently used for fever and pain control and is usually considered to be safe. Unal et al.[24] reported that the bleeding was developed in 26.6% of the patients due to the drug and 32.5% of them used paracetamol. No difference was found in the studies comparing the rate of gastrointestinal complications secondary to paracetamol and ibuprofen use.[35,36] There were 14 patients who used only paracetamol in this study.

Thirty-two (43.2%) of the patients who undergone endoscopy used NSAIDs and/or paracetamol and pathological changes were detected in 26 of them. No significant difference was found in terms of pathological changes in endoscopy of the patients who used antipyretic and/or analgesic drugs and those who did not. Although the role of drugs in the etiology of UGB is known, it should be kept in mind that our patients had an infection like upper respiratory tract infection or gastroenteritis during this period, and these infections may increase the sensitivity of the gastric mucosa and increase the effect of antipyretic/analgesics on gastrointestinal damage. In a pediatric study, viral infections were found to be the most common cause of non-variceal UGB.[37] In our study, 26 patients with upper respiratory tract infection and gastroenteritis underwent endoscopy, and 19 (73.1%) had pathological changes. In addition, some of the patients used these drugs for abdominal pain, and it is unknown whether the patients had gastrointestinal pathologies before bleeding.

Laboratory tests are not helpful in determining the cause of gastrointestinal bleeding, but may be helpful in differential diagnosis and follow-up of patients. Complete blood count, kidney and liver function and coagulation tests should be assessed.[38] A complete blood count should be repeated in terms of ongoing bleeding. Two of our patients had anemia, and the other two had a decrease in hemoglobin in serial complete blood count tests.

The primary diagnostic method for the evaluation of UGB is EGD. Endoscopy allows the identification of the source of bleeding, determination of risk factors for the possibility of ongoing bleeding and therapeutic intervention. Most of the bleeding stops spontaneously and endoscopic intervention is not required urgently. An endoscopic examination within

the first 24-48 hours is useful for diagnosis and treatment in patients presenting with UGB. In addition, early EGD has a high probability of determining the location of bleeding, and the etiology of bleeding can be determined in 82% of patients.[38,39] The cause of bleeding cannot be clarified by endoscopy in 28-34% of the patients who were admitted to the PED with UGB.[4,40] Similarly, endoscopic examination was performed in 74 (68.5%) of the patients within the first 48 hours and the location of bleeding was determined in 56 (75.7%) patients in this study.

In the treatment of UGB, firstly the hemodynamic stabilization should be provided and then the medical and endoscopic treatments can be applied secondly.[41] Nasogastric aspiration and saline lavage should be performed to confirm the presence of gastric bleeding, to determination of the amount, to control ongoing or recurrent bleeding, to empty the stomach for endoscopic intervention and to prevent aspiration from gastric contents.[42,43] For medical therapy acid suppression and vasoactive agents are used in patients. Coagulation, band ligation, sclerosing or adrenaline injection, and clip treatments can be applied endoscopically.[44,45] In this study, all patients underwent nasogastric aspiration and lavage with saline, and acid suppression therapy was applied. As an endoscopic treatment, adrenaline injection was applied to 10 patients with active bleeding and clips were applied to one patient.

UGB, which usually has a good prognosis in childhood, stops without any for intervention. However, there is always a risk of potentially serious and life-threatening hemorrhagic shock.[46] In our study, 2 (1.8%) patients presented with hemorrhagic shock. The mortality rate varies between 1-21% depending on age, etiology, severity of bleeding, patient stabilization, diagnosis and treatment approach.[46,47] In our study, no patients died from bleeding.

Study Limitations

It was a retrospective cross-sectional study, the frequency, duration and dose compliance of families could not be determined. It is not known whether the patients had gastrointestinal pathologies before bleeding and how long after bleeding they applied to the PED.

Conclusion

UGB in children is usually self-limited, but children may present to the PED with severe life-threatening bleeding. The physician should first provide hemodynamic stabilization of the patient and then consider endoscopic evaluation within 24 hours to identify and treat the etiologic causes and source of the bleeding. Pediatric emergency physicians should plan the management and treatment of the patient together with the gastroenterologist. Approximately half of our patients had a history of antipyretic/analgesic drug use in the etiology. However, no significant difference was observed in pathological findings in endoscopy between drug users and non-users. More studies are needed to determine the use of antipyretic and/or analgesic drugs and other possible risk factors in children with UGB.

Ethics

Ethics Committee Approval: The study protocol was performed in accordance with the Helsinki Declaration of human rights. The study was reviewed and approved by the Keçiören Training and Research Hospital Ethics Committee (2012-KAEK-15/2020).

Informed Consent: The study was designed retrospectively, no written informed consent form was obtained from patients.

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Authorship Contributions

Surgical and Medical Practices: A.T., G.Ş., F.Ö.H., Concept: A.T., C.D.K., N.T., Design: A.T., G.Ş., N.T., Data Collection or Processing: A.T., G.Ş., B.Ö., İ.B., A.A.Ç., Analysis or Interpretation: A.T., G.Ş., C.D.K., N.T., Literature Search: A.T., B.Ö., F.Ö.H., İ.B., A.A.Ç., Writing: A.T., G.Ş.

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Evaluation of the Burnout Levels of Health Care Workers During the Pandemic in Pediatric and Adult Emergency Services

Çocuk ve Yetişkin Acil Servislerinde Pandemi Süresince Sağlık Çalışanlarının Tükenmişlik Düzeylerinin Değerlendirilmesi

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Abstract

Introduction: During the Coronavirus disease-2019 (COVID-19) pandemic, the emergency services provide seven days/24-hour regular health care, while the risk of burnout is gradually increasing among healthcare workers struggling with the increasing workload. Few studies monitored the mental health of doctors, nurses, and allied health personnel working in emergency departments to support frontline health workers and more data is needed.

Methods: The Maslach burnout scale (MBI) was administered voluntarily to doctors, nurses, and allied health personnel in the pediatric emergency and adult emergency services in May 2020 and December 2020. A socio-demographic information form containing questions about the institution, profession, and working conditions was distributed. The socio-demographic data of the same participants on both dates were compared with the effects of the pandemic on their daily lives, working conditions, and subscales of MBI (emotional exhaustion, depersonalization, and personal achievement scores) with an interval of six months (May 2020-December 2020).

Results: One hundred seventeen health personnel participated in our study in May 2020 and 122 in December 2020. 95.7% of respondents (112/117) in May 2020; in December 2020, 69.9% (84/122) of them met the criteria in two or more of the subscales of MBI (high emotional exhaustion and depersonalization scores, low personal achievement scores) and were found to be exhausted. In a six-month comparison, it was found that physicians, among physicians, pediatric assistants working in the pediatric emergency department, and healthcare workers aged 29 and younger were better able to cope with burnout.

Conclusion: Considering the known harmful effects of burnout on patient care and the well-being of healthcare workers, frontline personnel in emergency services may need more mental support during and after the COVID-19 pandemic. There is a need for more preventive, descriptive, protective, and remedial studies on frontline health workers' physical and mental health.

Keywords: Burnout, emergency department, pandemic, wellness

Öz

Giriş: Koronavirüs hastalığı-2019 (COVID-19) pandemisinde acil servisler limitsiz, 7 gün/24 saat düzenli sağlık hizmeti verirken, artan iş yükü ile ön saflarda mücadele eden sağlık çalışanları üzerinde tükenmişlik riski giderek artmaktadır. Acil servislerde çalışan doktor, hemşire ve yardımcı sağlık personelinin ruhsal sağlığını gözlemleyerek ve ön saflardaki sağlık çalışanlarını desteklemek için yapılan çok az çalışma vardır ve daha fazla veri ihtiyacı vardır.

Yöntemler: Çocuk acil servisi ve erişkin acil servisinde çalışan doktor, hemşire ve yardımcı sağlık personeline Mayıs 2020 ve Aralık 2020 tarihinde gönüllülük esasına dayalı bir şekilde Maslach tükenmişlik ölçeği (MTÖ) uygulandı. Kurum, meslek ve çalışma koşulları ile ilgili soruları içeren sosyo-demografik bilgiler formu ile dağıtıldı. Her iki tarihte aynı katılımcıların sosyo-demografik verileri ile, pandeminin günlük yaşamları, çalışma koşulları ve MTÖ'nün alt ölçekleri üzerindeki (duygusal tükenme, duyarsızlaşma ve kişisel başarı puanları) üzerindeki etkileri altı ay (Mayıs 2020-Aralık 2020) ara ile karşılaştırıldı.

Bulgular: Mayıs 2020'de toplam 117, Aralık 2020'de 122 sağlık personeli çalışmamıza katıldı. Mayıs 2020'de katılımcıların %95,7'si (112/117); Aralık 2020'de ise %69,9'u (84/122) MTÖ'nün alt ölçeklerinden iki veya daha fazlasında (duygusal tükenme ve duyarsızlaşma puanlarının yüksek, kişisel başarı puanı düşük) ölçütleri karşılamış ve tükenmiş olarak bulundu. Altı ay ara ile yapılan karşılaştırmada, doktorların, doktorlar içinde ise çocuk acil servisinde çalışan pediyatri asistanlarının, 29 yaş ve altındaki sağlık çalışanlarının tükenme ile daha iyi başa çıkabildiği saptandı.

Sonuç: Tükenmişliğin hasta bakımı ve sağlık çalışanlarının refahı üzerindeki bilinen zararlı etkileri düşünüldüğünde, acil servislerde ön saflarda çalışan personelin COVID-19 pandemi döneminde ve sonrasında daha fazla ruhsal desteğe ihtiyacı olabileceğini düşünmekteyiz. Ön saflarda görev alan sağlık çalışanlarının hem fiziksel hem de ruhsal sağlığı konusunda daha fazla önleyici, tanımlayıcı, koruyucu ve iyileştirici çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Tükenmişlik, acil servis, pandemi, iyilik hali

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Introduction

The Coronavirus disease-2019 (COVID-19) which caused by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) has resulted in high morbidity and mortality around the world since December 2019. Previous studies showed that the prevalence of psychological risks that could affect physical and mental health is high in conditions associated with changes in working conditions.[1] Therefore, all physicians and other health care workers who especially work in the emergency departments (ED) at the front line of care are the greatest risk of burnout since the beginning of COVID-19 pandemic.

Burnout or burnout syndrome is defined as the detachment of the profession from the original meaning and purpose of the profession and the fact that it is no longer interested in the people it serves, or the person's psychological withdrawal from his job in response to excessive stress and dissatisfaction.[2] Increasing studies on burnout of physicians and other healthcare workers have increased awareness of this issue and its impact on quality of care for patients and the quality of life of service providers.[3,4] Important studies conducted for many years have showed that the risk of extinction is higher in professions that work with people such as physicians and nurses compared to other professions.[5]

COVID-19 has disrupted the world and emergency medicine physicians are at the greatest risk of further health related and psychological injury.[6]

A survey study indicated a high prevalence of mental health symptoms such as depression and anxiety among health care workers treating patients with COVID-19 at the beginning of pandemic in China. Therefore, they draw attention to health care workers' need for mental well-being and special interventions which need to be implemented immediately. Because long-term health effects of burnout due to COVID-19 for health care workers could be a significant concern during and after pandemic.[7]

In this study, we aimed to define the frequency of burnout at the beginning of pandemic and to observe variation of burnout frequency over time during the pandemic among in pediatric and adult emergency medicine staff who work in our university hospital.

Materials and Methods

In our study, physicians (pediatric residents who work in pediatric emergency and adult emergency residents), nurses and other health care workers (environmental service staff, administrative staff) who work at our children's hospital and the adult emergency department participated as volunteers to the study. This study was conducted using survey methodology in May 2020 and December 2020 at same individuals in two time periods in the study. Thirty-four emergency residents, forty-seven nurses, fifteen environmental service staff, twenty-five administrative staff (total 121) worked in our ED. Fifty pediatric residents, twenty nurses, thirteen environmental service staff, sixteen administrative staff (total 99) worked in our PED during the study period. The Local Ethical Committee of Hacettepe University approval was received (no: 2020/09-28, date: 05.05.2020).

Physicians, nurses, and other health care workers who were in the main staff of the emergency department and had least 3 months of working experience in the emergency department were included in the study. Physicians, nurses, and health care workers who worked in the emergency department for less than 2 months, temporarily workers during the pandemic period were excluded from the study.

In this study, the effects of the pandemic on the lives, emotional exhaustion (EA), depersonalization (DP), and personal accomplishment scores of the volunteers were compared in May (earlier period of pandemic) and December (six months later as a second period). A cover letter and information sheet stated the purpose of the survey, as well as an explanation that participation was optional and that the responses would be anonymous. Information of all participants that may be related to socio-demographic and burnout evaluated together with the Maslach burnout scale. Turkish version of the Maslach burnout inventory (MBI) for healthcare personnel was applied for the first time in 1996 among 7.255 healthcare workers and was adapted (Turkish version) by preserving its original structure.[8] MBI was consisted of twenty-two questions and three major subscales. These subscales were EA, DP and decreased personal accomplishment (PA). EA was decided according to questions number 1,2,3,6,8,13,14,16,20 (total nine question), DP was decided according to questions 5,10,11,15,22 (5 questions) and decreased personal accomplishment was evaluated by questions 4,7,9,12,17,18,19,21 (8 questions). In three subscales burnout was graded as low, moderate, and high. Points according to these subscales are for EA; low <11, moderate 12-17 and high ≥18 points, for DP low <5, moderate 6-9, high ≥10 points and for personal accomplishment; low ≥26, moderate 22-25, high 0-21 points. Grades of EA and DP was increased by increasing points, for personal accomplishment by decreasing points burnout was increasing. In the current study, in general burnout was defined as the ones who get at least ≥18 points from MBI and low grade of burnout was ones who get 0-11 points from inventory.[8] Burnout defined as to high levels of both DP, EE, and low levels of PA and as the presence of at least two of these subscales.

Statistical Analysis

IBM SPSS Statistics 23 program was used for statistical analysis. While evaluating the study data, Student's t-test was used for comparing the descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum) as well as two groups of variables that showed a normal distribution, chi-square test was used to compare categorical variables. Mann-Whitney U test and Wilcoxon test used for two groups of variables that did not show normal distribution. Pearson correlation analysis and Spearman correlation analysis were used to evaluate the relationships between variables. The threshold for statistical significance was set to $p<0.05$.

Results

In May 2020, total 117 staff (53% of all workers) participated in the study. The mean age was 30.8 years and age range of the participants was 23-49 years. Fifty-three percent of the participants were female. According to MBI, respondents averaged a score of 13.4 [95% confidence interval (CI) 12.5 to 14.3], 31 (95% CI 29.7 to 32.3), and 26.7 (95% CI 25.6 to 27.8) in the subscales of DP, EA, and personal accomplishment.

The distribution of healthcare workers was 35.9% pediatric resident, 27.4% environmental service staff and administrative staff,18.8% nurses, 17.9% emergency medicine resident. 51.3% of the participants were single/divorced**,** 48% of participants were married.16.2% of the participants had a chronic illness (Table 1). Weekly working hours among in all health care workers was 55 hours a week on average. The time spent on social media was found as 1.8 hours per day, 68% of the responders made major changes in home order (Table 2). In May 2020 7.7% of participants got infected COVID-19 or under isolation. Forty seven percent of participant got COVID-19 sample. When the MBI subscales were analyzed, it was found that 78.6% of all participants working during the first pandemic period got higher scores EE and DP (Table 3). According to gender, 99.1% of the women had high level of EA. While 83.8% had high level of DP, only 16.1% had low level of personal accomplishment. Ninety-point nine percent of the men were burnt out and 98.1% of men had high level of EA. While 69% of them had high level of DP, only 21.8% of men had low level of personal accomplishment. According to age, percentage of the high-level EA aged ≤29 was 98.1%, 81.9% for high level of DP, 13.1% for low level of personal accomplishment. For aged ≥30 years, percentage of the high-level EA aged ≤29 was 100%, 71.4% for high level of DP, 25% for low level of personal accomplishment. According to the marital status, percentage of the high-level EA for the single/divorced 98.3%, 78.3% for high level of DP, 8.3% for low level of personal accomplishment. Percentage of the high level of EA in married participants was 100%, 75.4% for high level of DP, 29.8% for low level of personal accomplishment. The percentage of high level of EA for physicians was 98.4%, high level of DP was 79.6%, and low level of personal accomplishment was 17.4%. The percentage of high level of EA for non-physician personnel 100%, high level of DP was 74%, and low level of personal accomplishment was 20.3%. According to their specialization, the percentage of high level of EA of pediatric residents was 97.6%, high level of DP was 78.5%, and low level of personal accomplishment was 16.6%. The percentage of high level of EA of adult emergency medicine residents was 100%, high level of DP was 80.9%, and low level of personal accomplishment was 19% (Table 3).

In December 2020, 122 people participated in the study. The average age was 29.8 years, the age range of the participants was 23-47 years. Respondents averaged a score of 12.5 (95% CI 11.7 to 13.3), 27 (95% CI 25.5 to 28.5), and 27.1 (95% CI 25.8 to 28.5) in the subscales of DP, EA, and personal accomplishment. 52.5% of the participants were female. The distribution of healthcare workers was 34.4% pediatric residents, 28.6% environmental service staff and administrative staff, 22.2% nurses, 14.8% adult emergency medicine residents. 58.2% of the participants were single/divorced, 41.8% of participant was married and 11.5% of the participants had a chronic illness (Table 1). Weekly working hours among in all health care workers increased to 55 hours a week on average. The time spent on social media was found as 3.3 hours per day. Fifty percent of the responders made major changes in home order (Table 2). In December 2020, 67.2% of participants got infected SARS-CoV-2 or under isolation. 91.8% of participant got COVID-19 sample. According to gender, 81.2 of the women had high level of EA. While 76.5% had high level of DP, only 18.7% had low level of personal accomplishment. eighty one percent of the men were burnt out and 87.9% of men had high level of EA. While 86.2% of them had high level of DP, only 13.7% of men had low level of personal accomplishment. According to age, percentage of the high-level EA aged ≤29 was 81.3%, 82.6% for high level of DP, 18.6% for low level of personal accomplishment. For aged ≥30 years, percentage of the high-level EA aged ≤29 was 89.3%, 78.7% for high level of DP, 17% for low level of personal accomplishment. According to the marital status, percentage of the high-level EA for the single/divorced 78.8%, 80.2% for high level of DP, 15.4% for low level of personal accomplishment. Percentage of the high level of EA in married participants was 92.1%, 84.3% for high level of DP, 17.6% for low level of personal accomplishment. The percentage of high level of EA for physicians was 76.6%, high level of DP was 78.3%, and low level of personal accomplishment was 21.6%. The percentage of high level of EA for non-physician personnel 91.9%, high level of DP

was 83.8%, and low level of personal accomplishment was 11.2%. According to their specialization, the percentage of high level of EA of pediatric residents was 73.8%, high level of DP was 78.5%, and low level of personal accomplishment was 28.5%. The percentage of high level of EA of adult emergency medicine residents was 83.3%, high level of DP was 77.7%, and low level of personal accomplishment was 27.7% (Table 3). Burnout was found 75.4% in of our respondents in the second pandemic period.

The decreasing weekly working hours and increasing social media usage of the participants evaluated with 6-month intervals changed significantly. Burnout rates were significantly decreased in the whole group in December 2020 compared to May 2020 ($p<0.05$). During this period, the positive test results of COVID-19 or the rate of those who stayed in isolation increased from 7.7% to 67.2% ($p<0.05$).

Analyzing at the Maslach burnout sub-score (high level of EE, DP, and low level of PA); EA scores of men, women, age 29 and under, doctors and pediatric residents were found to be significantly decreased within 6 months period ($p<0.05$). There was no significant relationship between personal accomplishment and DP subscale score changes (Table 3).

When the participants were evaluated demographically, while the EA rates were significantly decreased in women ($p=0.001$), 30 years and older ($p=0.044$), single/divorced ($p=0.001$), doctors ($p=0.001$) and pediatricians ($p=0.02$), in contrast EA increased in those under 29 years ($p=0.02$). In the men ($p=0.025$) and non-physician group ($p=0.026$) DP increased significantly. There was no significant change in personal achievement rates (Table 3).

Table 1. Demographic features of health care providers

	May 2020	December 2020
	n (%)	n (%)
Age groups (years)		
25-29	61 (52.1)	75 (61.5)
30-34	31 (26.5)	20 (16.4)
35-39	12 (10.3)	13 (10.7)
≥40	13 (11.1)	14 (11.5)
Gender		
Female	62 (53.0)	64 (52.5)
Male	55 (47.0)	58 (47.5)
Health care providers		
Physicians	63 (53.8)	60 (49.2)
Adult emergency medicine resident	21 (17.9)	18 (14.8)
Pediatric resident	42 (35.9)	42 (34.4)
Nurse	22 (18.8)	27 (22.2)
Other health care worker	32 (27.4)	35 (28.6)
Marital status		
Single/divorced	60 (51.3)	71 (58.2)
Married	57 (48.7)	51 (41.8)
Any chronic diseases		
Yes	19 (16.2)	14 (11.5)
No	98 (83.8)	108 (88.5)
Homeowner		
Host	60 (51.3)	66 (54.1)
Rent	57 (48.7)	56 (45.9)
If staff married, their spouse's job (n=60)		
Physician	11 (18.3)	9 (17.6)
Nurse	4 (6.7)	5 (9.8)
Environmental service staff, administrative staff	6 (10.0)	1 (2.0)
Not health care worker	39 (65.0)	36 (70.6)
Child owner		
No	78 (66.7)	85 (69.7)
Yes	39 (33.3)	37 (30.3)

Table 2. The effects of pandemic on participants lives and burnout rates

	May 2020	December 2020
Weekly working hours	**55±17*⁺**	**44±9*⁺**
Time on social media (hours)	**1.8±1.6*⁺**	**3.3±1.3*⁺**
	n (%)	**n (%)**
Where was the department you worked in the previous month?		
Pediatric emergency department	25 (21.4)	10 (8.2)
Emergency department	46 (54.7)	62 (50.8)
Not emergency department	46 (39.3)	50 (41.0)
	n (%)	**n (%)**
Have any problems with your child's care?		
No	21 (56.8)	25 (46.6)
Yes	16 (43.2)	31 (55.4)
Have you used a permit in the past 3 months?		
No	107 (91.5)	83 (68.0)
Yes	10 (8.5)	39 (32.0)
Did your salary decrease during pandemic?		
No	69 (59.0)	51 (41.8)
Yes	48 (42.0)	71 (58.2)
Did you get COVID-19 PCR sample during the pandemic period?		
No	**62 (53.0) ***	**10 (8.2) ***
Yes	**55 (47.0) ***	**112 (91.8) ***
You or anybody lived with you got infected with COVID-19? And Did you get under isolation?		
Yes	**9 (7.7) ***	**82 (67.2) ***
No	**108 (92.3) ***	**40 (32.8) ***
Has there been any changes in home life and daily routine?		
Yes	68 (58.1)	61 (50.0)
No	49 (47.9)	61 (50.0)

*: $p<0.05$, statistically significant, ⁺: mean ± SD, SD: Standard deviation, PCR: Polymerase chain reaction, COVID-19: Coronavirus disease-2019

Table 3. Evaluation of changes between burnout rates and Maslach burnout scale sub-scores

		Burnout			High Level of EE			High Level of DP			Low Level of PA		
		Dec-20 n (%)	p*	May-20 n (%)	Dec-20 n (%)	p*	May-20 n (%)	Dec-20 n (%)	p*	May-20 n (%)	Dec-20 n (%)	p*	May-20 n (%)
All participants		92 (78.6%)	92 (75.4%)	0.554	116 (99.1%)	103 (84.4%)	**0.001**	90 (76.2%)	99 (81.1%)	**0.04**	22 (18.8%)	20 (16.3%)	0.81
Gender	**Women**	54 (87%)	45 (70.3%)	0.022	62 (100%)	52 (81.2%)	**0.001**	52 (83.8%)	49 (76.5)	0.278	10 (16.1%)	12 (18.7%)	0.277
	Men	38 (90.9%)	47 (81%)	0.142	54 (98.1%)	51 (87.9%)	0.101	38 (69%)	50 (86.2%)	**0.025**	12 (21.8%)	8 (13.7%)	0.374
Age	**29 and under**	50 (81.9%)	57 (76%)	0.398	60 (98.3%)	61 (81.3%)	**0.02**	50 (81.9%)	62 (82.6)	0.273	8 (13.1%)	14 (18.6%)	0.451
	30 and over	42 (75%)	35 (74.4%)	0.951	56 (100%)	47 (89.3%)	**0.044**	40 (71.4%)	37 (78.7%)	0.170	14 (25%)	8 (17%)	0.468
Marital status	**Married**	44 (77.1%)	40 (78.4%)	0.877	57 (100%)	47 (92.1%)	0.098	43 (75.4%)	43 (84.3%)	0.236	17 (29.8%)	9 (17.6%)	0.336
	Single/ divorced	48 (80%)	52 (73.2%)	0.364	59 (98.3%)	56 (78.8%)	**0.001**	47 (78.3%)	57 (80.2%)	0.155	5 (8.3%)	11 (15.4%)	0.412
Profession	**Physician**	51 (80.9%)	43 (71.6)	0.225	62 (98.4)	46 (76.6%)	**0.001**	50 (79.6%)	47 (78.3%)	0.889	11 (17.4%)	13 (21.6%)	0.635
	Non-physician	41 (75.9%)	49 (79%)	0.689	54 (100%)	57 (91.9%)	0.103	40 (74%)	52 (83.8%)	**0.026**	11 (20.3%)	7 (11.2%)	0.398
Area of expertise	**Pediatric resident**	34 (80.9%)	30 (71.4%)	0.306	41 (97.6%)	31 (73.8%)	**0.02**	33 (78.5%)	33 (78.5%)		7 (16.6%)	12 (28.5%)	0.142
	Emergency resident	17 (80.9%)	13 (72.2%)	0.519	21 (100%)	15 (83.3%)	0.089	17 (80.9%)	14 (77.7%)	0.807	4 (19%)	5 (27.7%)	0.302

*p<0.05, statistically significant, EE: Emotional exhaustion DP: Depersonalization, PA: Personal accomplishment

Discussion

In this study, the burnout rate was found 78.6% among in all participants during the earlier period of COVID-19 pandemic. Whereas its rate was found 75.4% during the second period. When the working groups separately analyzed, the burnout rate was found 80.9% in pediatric residents and in adult emergency medicine residents. After six months of this first evaluation during pandemic, 71.4% in pediatric resident and 72.2% in emergency medicine residents. These results show that healthcare personnel working in pediatric and adult ED were trying to cope with burnout in the progression of the pandemic, and they were successful to a small degree. However, the experience of burnout among physicians decreased over time, but burnout rates among non-physician workers continued to rise.

Studies on burnout among physicians have increased awareness of physician mental health and well-being in the recent years. However, the methodological heterogeneity among studies and different definitions of burnout cause to difficulty for estimation of its prevalence and interpretation of their results.[9-13] Previous studies showed that the prevalence of burnout among emergency medicine physicians at the front line of care access are at greatest risk when compared with other specialties. All physicians are most sensitive to burnout because of longer working hours, higher levels of education, and unbalanced between work and life integration than other workers.[14] In a study about describing the rates of burnout, depression and suicidality among in EM physicians in Canada before the COVID-19 pandemic, it was shown that 86.1% of 384 respondents met at least one of the burnout criteria, 14.3% had idea about attempting suicide while working in the ED. Five point nine percent of the participants had actively thought about suicide in the last year.[9] Authors concluded that EM physicians should be monitored for physical and mental risks even before the pandemic.[9] Other two different studies showed that 39.1% of pediatric residents and 70.4% in emergency medicine residents burned out.[10,11] There are also studies showing that burnout of employees in the ED starts earlier and varies between 65-74%.[12,13] In a meta-analysis to characterize the methods used to assess burnout and provide an estimate of the prevalence of physician burnout, the frequency of burnout among physicians was found 67%.[15]

EA is the most widely reported but it is not considered as a sufficient criterion in some previous studies.[11] In these studies, moderate to high scores in both EE and DP or low to moderate levels of PA were used to indicate burnout for being more comprehensive definition of burnout. In our study, we observed that the most important subscale of burnout was found as EA. If we defined burnout using only a high level of EE as being in previous studies, the frequency of burnout was

found 99.1% in our population. Interestingly, most affected subscale of burnout was also EE especially in women, 30 years and older, single/divorced, doctors and pediatricians. But there was no significant decrease in DP and PA. Notably, DP increased significantly in males and in the non-doctor group.

In our study, burnout rates in all participants were found higher in earlier period of pandemic. On the other hand, it was found burnout rates decreased in all participants after six months. The reasons of these results could be associated with significantly decreasing of improper usage of ED during the pandemic, increasing of scientific information about COVID-19 and its treatment, adaptation to safety rules and usage of personal protective equipment and increasing vaccine trial studies. Additionally, weekly working hours of the participants was shown significantly decrease because of ensuring of limited contact period with infected individuals. Conversely, the time spent in social media increased during the six months period. The reason of the increase in the use of social media may be related to follow global developments and news about COVID-19 more closely. Because increasing of social media usage can also be a method of dealing with stress or an instrument for filling free times. In addition to these possible explanations, improvement of burnout frequency in pediatric residents in six months can be explained by less severe symptoms in children with COVID-19.

Long-term health effects for those working on the front lines due to COVID-19 during and after the pandemic should be a major concern for governments, hospitals and doctors.[9] Healthcare workers are considered to have a high risk of burnout or psychological conditions due to the COVID-19 outbreak.[16] Previous studies showed that health care workers feared contagion of their family and colleagues and reported experiencing high levels of stress, anxiety and depression symptoms during pandemics.[17,18] In a study from China, it was shown that a significant proportion of participants experienced anxiety, depression, and insomnia symptoms, and more than 70% reported psychological distress.[7] Sources of distress of health care workers in an epidemic of infectious diseases may include feelings of vulnerability or loss of control and concerns about health of self, spread of virus, health of family and others, changes in work, and being isolated.[13] Long-term effects are including increased substance abuse, depression and suicidal ideation.[3] Studies have indicated a risk of depression, anxiety, and mental health complaints in the frontlines in China during the early days of COVID-19.[7] Therefore, these conditions need to be continuously monitored and responded in a timely manner to improve the preparedness of health care systems to protect the health of professionals and face the medium and long-term consequences of the epidemic. Timely and effective psychological support and prevention preparedness interventions are essential to ensure the sustainability of a resilient workforce in the long run of a global pandemic while moving quickly. Therefore, the most important step is recognition and prevent depletion during the pandemic period. Other suggestions could be reducing the factors that may put pressure on healthcare working time, establishing a balance between work life and private life, acquiring hobbies to ease itself. On the other hand, the implementation of methods of coping with burnout developed institutionally will yield more effective results.

Study Limitations

Our study has some limitations. First, our study was a single center and the response rate among health care workers who received an invitation to participate in the study was 53%. Second, burnout rates among in our emergency department staff before the pandemic were unknown.

The limitation of our study is that it was single-center, and the pre-pandemic burnout levels were not known. Although the questionnaires were applied to same individuals in two time periods in the study, the number of people participating in the research could not be the same. We could not find and remove five volunteers who did not participate in the study in May 2020 because the surveys were anonymous.

Conclusion

Most of emergency medicine staff at earlier period of the pandemic had concerned burnout. However, this rate decreased over the time. Although it is not known burnout rates before the pandemic, this improvement is important for frontline workers who are responsible public health. For protecting health care workers exposed to COVID-19 as an extra, special interventions should be taken into consideration.

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Ethics

Ethics Committee Approval: The Ethics Committee approval from Hacettepe University Faculty of Medicine was provided for this study (GO 20/430).

Informed Consent: Informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: E.G., Design: E.G., O.A., Ö.T., Data Collection or Processing: E.G., O.A., N.M.A., Analysis or Interpretation: E.G.,

O.A., N.M.A., Ö.T., Literature Search: E.G., O.T., Writing: E.G., O.A., N.M.A., Ö.T.

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The Comparison of Reported Ingested Paracetamol Dose with Serum Blood Concentrations and Their Relationship with N-Acetylcysteine Administration: A Retrospective Study of 117 Patients

Alındığı İddia Edilen Parasetamol Dozunun Kan Parasetamol Düzeyleri ile Karşılaştırılması ve N-Asetilsistein Kullanımı ile İlişkisi: 117 Hasta ile Geriye Dönük Bir Çalışma

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Abstract

Introduction: We aimed to compare the patient reported ingested and blood paracetamol concentrations (BPC) and to investigate the indications for N-acetylcysteine (NAC) administration in referred patients.

Methods: This is a retrospective study of acute paracetamol intoxications (API) at the tertiary paediatric emergency department (ED) between June 2015-June 2019. We evaluated the demographics, cause of intoxications, reported doses (mg/kg), BPCs (8/4/12/16 and/or 24th hours). Indications of antidote usage and referral to ED were accepted as BPC >150 mg/kg.

Results: Overall, we reviewed 117 cases of acute API. The mean age was 8.97 (±6.0) years, and 68.3% were female. The reported ingested of paracetamol (RIP) median dose was 2725 mg (mean 138±51.9 mg/kg). Adolescents had a significantly higher RIP than that of younger subjects (p<0.001). BPC was performed in 88.9% of the patients at the 4th, 8th, 12th, 16th and 24th hour in 11.1%, 9.4%, 3.5% and 3.5% of cases, respectively. Although, only 34/66 of the referred cases had a RIP dose >150 mg/kg, physicians at the first healthcare facility tended to administer activated charcoal (90.9%), gastric lavage (68%) and intravenous NAC (48%). The referring healthcare facility physicians-initiated NAC particularly for patients who reported ingesting >150 mg/kg (p=0.001).

Conclusion: RIP doses should not be used to determine the need for NAC. The antidote should be used in centres where BPCs are not available or in a group of patients who cannot be transferred to a referral centre within the first eight hours.

Keywords: Paracetamol, intoxication, N-acetylcysteine, acetaminophen, children

Öz

Giriş: Akut parasetamol zehirlenmesi (APİ) ile başvuran çocuklarda aldığı bildirilen parasetamol dozu (BPD) ile kan parasetamol düzeyini karşılaştırmak ve sevk edilen hastalarda N-asetilsistein (NAC) uygulama endikasyonlarını araştırmaktır.

Yöntemler: Çalışmamız üçüncü basamak bir hastanenin çocuk acil servisinde (AS) Haziran 2015-Haziran 2019 tarihleri arasında APİ olan çocuklarda geriye dönük olarak yapılmıştır. Demografik özellikler, zehirlenmelerin nedenleri, BPD (mg/kg) ve kan parasetamol düzeyleri (8-4-12-16. ve/veya 24. saatte) değerlendirildi. Antidot ve AS'ye sevk endikasyonu için BPD >150 mg/kg olarak kabul edildi.

Bulgular: Toplamda 117 akut APİ olgusu incelendi. Hastaların yaş ortalaması 8,97 (±6,0) yıl ve %68,3'ü kızdı. Ortanca BPD dozu 2725 mg (ortalama 138±51,9 mg/kg) idi. Ergenlerde BPD miktarlara daha küçük çocuklara göre anlamlı derecede daha yüksekti (p<0.001). Hastaların %88,9'una 4. saat KPD görülürken; 8., 12., 16. ve 24. saatte sırasıyla hastaların %11,1, %9,4, %3,5 ve %3,5'inde KPD bakılmıştı. Sevk edilenlerin sadece 34/66'sında BPD >150 mg/kg olmasına rağmen, ilk merkezdeki hekimler aktif kömür (%90,9), gastrik yıkama işlemi (%68) ve damar içi NAC (%48) uygulama eğilimindeydiler. Hekimlerin üçüncü basamağa sevk etmeden önce BPD >150 mg/kg olması durumunda NAC kullandığı görüldü (p=0,001).

Sonuç: NAC endikasyonunu belirlemek için BPD kullanılmamalıdır. Antidot kullanımı, kan parasetamol düzeyi bakılamayan merkezlerde veya ilk 8 saat içinde üst merkeze sevk edilemeyecek hastalarda kullanılmalıdır.

Anahtar Kelimeler: Parasetamol, zehirlenme, N-asetilsistein, asetaminofen, çocuklar

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Introduction

The most commonly used antipyretic analgesic drugs in children are those containing paracetamol.[1] Although it is known as a drug that can be used safely in all age groups, side effects can be seen rarely, even when it is used in the recommended dosage range.[1,2] Conversely, paracetamol toxicity is a common cause of acute liver failure in children and adolescents.[2,3] In the United States, paediatric paracetamol exposures account for approximately 30,000 reports to the National Poison Data System annually.[4] Even though the benefit of gastric decontamination is uncertain, administration of activated charcoal (if the patient presents within one hour of ingestion of more than 150 mg/kg paracetamol) should be considered.[5]

There is no recommendation to administer NAC without an obtained blood paracetamol concentration (BPC) within eight hours. If there is going to be delay beyond eight hours after the ingestion in obtaining the BPC, then treatment should be initiated (if >150 mg/kg has been ingested).[6,7] It is strongly recommended to obtain blood samples from all patients for immediate measurement of the BPC (based on Rumack-Matthew nomogram generally recommended at the fourth hour after ingestion).[5-10] The mortality rate is reported to be 5% in patients who did not receive any treatment despite a high BPC at the fourth hour after ingestion; however, it has been shown that it can be reduced to as low as 0.4% when NAC is administered.[11] Although NAC administration has many advantages in situations of paracetamol toxicity, adverse reactions to NAC are common such as refractory nausea, vomiting and anaphylactic reaction.[12] Thus, the antidote treatment should be preferred only if indicated.

This study aimed to primarily compare the estimated ingested paracetamol dose (mg/kg) with BPC. We also investigated the indications for cases who already received NAC at the referring facility.

Materials and Methods

Study Design

This study was performed in a tertiary paediatric emergency department (ED) between June 2016 and June 2020. The study adhered to the ethical principles of medical research involving human subjects of the World Medical Association Declaration of Helsinki. The medical faculty scientific research Ethics Committee of Ege University provided ethical approval prior to the study (no: 18-12/5).

Patient Selection and Data Collection

We included all patients younger than 18 years old presented directly or who were brought by ambulance to the ED due to paracetamol intoxication. Intoxication cases without paracetamol intake were excluded from the study. We evaluated the following parameters from the medical records: Demographic characteristics of the patients; the characteristics of the institution which referred the patients to the ED; the form of medication (suspension/tablet) and the amount of the alleged ingested dose; the cause of intoxication (unintentional/suicide); physical examination and laboratory findings upon arrival [aspartate aminotransferase (AST), alanine aminotransferase (ALT), prothrombin time (PT), international normalized ratio (INR)]; the duration between the drug ingestion and presentation to the ED; gastrointestinal decontamination or the status of antidote administration; BPC (4-8-12-16-24th hours); follow-up duration in the ED and the outcomes.

Definitions

The minimal toxic dose for acute ingestion is 150 mg/kg for children or 7.5 to 10 g for adolescents.[4,13] The results of samples taken from the patients to evaluate the concentration of the drug in the blood were assessed with Rumack-Matthew nomogram.[14] According to the United States Food and Drug Administration classification, among the liver function tests as an AST >3× the normal value (>35 IU/L) or a total bilirubin >2× the normal was accepted as hepatotoxicity.[15] Acute liver failure was defined as elevated transaminase (AST >35 IU/L, ALT >45 IU/L) accompanied by coagulation disorder (INR >1.5 or prothrombin activity <50%, prothrombin time >14.7 s) and/or the presence of encephalopathy.[16]

Statistical Analysis

Data were analysed using SPSS 25.0 (IBM, Armonk, NY: IBM Corp.) program. In the comparison of continuous variables, we expressed values as mean ± standard deviation (SD) for parametric tests, median (minimum, maximum, interquartile range) for non-parametric tests and number and percentage for categorical variables. When parametric test assumptions were provided, One-Way Variance Analysis was used to compare independent group differences. Kruskal-Wallis Variance Analysis (post-hoc: Bonferroni correction Mann-Whitney U test) was used as a non-parametric test. Chi-square analysis was used to examine the differences between categorical variables. A value of $p<0.05$ was accepted as statistically significant in all analyzes.

Results

During the study period, 117 patients presented to the ED with paracetamol intoxication. Most patients were female (68.3%, n=80), and female/male ratio was 2.2/1. Fifty-seven percent of the cases (67/117) applied to the ED in out of working hours and 56.4% of the patients (66/117) were

referred from another health institution and brought by an ambulance. The mean age of the patients was 8.97 (±6.0) years; 52.1% (61/117) were younger than 6 years, 38.4% (45/117) were older than 10 years. The mean time between drug ingestion and ED presentation was 2.6 h (range 0.3-20 h) (Table 1).

Unintentionally ingestion occurred in all patients younger than 10; suicide was more common (73.3%) in adolescents (p<0.001). Younger children (<6 years) were more likely (73.6%) to ingested suspension forms of the medication; however, older children ingested the tablet form [93.3% (42/45)] (Table 2). Adolescents were likely intoxicated by tablet form (p<0.001). Most children (72.7%) (85/117) had multiple drug ingestion. One five-year-old patient had iatrogenic intravenous paracetamol intoxication.

"Abnormal" vital signs were detected in a minority of patients (n=23, 19.6%). Most commonly tachycardia (9.4%) and hypertension (7.7%) were noticed upon arrival (Table 3).

The median reported ingested paracetamol dose was 2725 mg (min: 375-max: 19500 mg) and 138±51.9 mg/kg. Sixty patients (51.3%) said that they ingested >150 mg/kg, one-fifth of patients alleged that they ingested >7.5 gr (Table 4). The adolescent group reported that they ingested significantly higher doses compared with the younger age group (p<0.001) (Table 2 and Table 4).

BPC was performed in 88.9% of the patients at 4th, 8th, 12th, 16th and 24th hour in 11.1%, 9.4%, 3.5% and 3.5% of cases, respectively (Table 4). Table 4 shows the median BPCs based on the hours after drug ingestion. While BPCs were within normal limits at the 4th hour, toxic levels were detected in 1 patient at the 8th hour, in 3 patients at the 12th hour, in 3 patients at the 16th hour and in 1 patient at the 24th hour (Table 4). No significant relationship was found between the reported ingested paracetamol dose and BPC at the 4th hour (p>0.05). There was not any difference on BPCs at the 4th hour between the two age groups (<6 years vs. adolescents) (18.8 and 27.8, respectively) (p>0.05).

At the 4th hour after drug ingestion, the median AST, ALT and PT were 29.5 IU/L (range 15-56), 13.5 IU/L (range 7-64) and 15.2 s (range 9.9-123), respectively. The mean INR was 1.06 (SD ±0.09). Elevated AST was detected in 21.4%, ALT in 3.4%, AST and ALT combined in 3.4%, prolonged PT in 3.4% and raised INR in 1.7% of the patients. Although transaminase levels were normal in half of the patients with toxic BPC at the 4th hour of admission; AST and ALT values increased in the other half which were defines as hepatotoxicity. There was no significant relationship between elevated transaminase and the reported ingested dose (p>0.05).

Even though only 34/66 of referred cases reported ingesting doses >150 mg/kg, physicians at the first healthcare facility tended to administer activated charcoal (90.9%, n=60/66), gastric lavage (68%, 45/66) and intravenous NAC (48%, 32/66). Activated charcoal was more likely (42/60) administered to patients who allegedly ingested doses >150 mg/kg, whereas 76.1% (34/45) of the patients underwent gastric lavage (Table 5). The first healthcare facility physicians initiated NAC particularly for patients who allegedly ingested >150 mg/kg (26/32, 81.3%) (p=0.001) (Table 5).

Only one third of cases who presented directly to the ED were given activated charcoal and one-fifth underwent gastric lavage. When the reported toxic dose (>150 mg/kg) was seen, then NAC was administered to 56.3% and 43.7% underwent gastric lavage (Table 5). In this group NAC treatment ratio was

Table 1. Demographics and admission features to the ED of the patients

Male/female ratio	2.2/1
Age (years) [mean (± SD)]	8.97 (±6.0)
Age groups (years) (n, %) <6 ≥6 >10 (adolescent)	 61 (52.1) 56 (47.9) 45 (38.4)
Admission time (n, %) Working time Out of hours	 50 (42.8) 67 (57.2)
Admission type (n, %) by parents/friends by ambulance	 51 (43.6) 66 (56.4)
The mean duration time between drug ingestion and ED presentation (h) [median, (min-max)]	2.6 (0.3-20)
Follow-up time in the ED (h) [median, (min-max)]	5.5 (2-21)

ED: Emergency department, h: hours, SD: Standard deviation

Table 2. Causes of intoxication and paracetamol forms by age groups

	Age (years)		**Alleged ingested dose** (mg) [median, (min-max)]
	<6	**≥6**	
Causes (n, %) Unintentional Suicide	 *61 (100) 0	 23 (41.1) *33 (58.9)	 2180 (375-3600) *6900 (1500-12200)
Paracetamol forms (n, %) Liquid Tablet	 *51 (96.2) 2 (3.8)	 5 (8.9) *51 (91.1)	 2200 (375-3600) *6400 (1500-12200)

*p<0.001

4% (2/51). Although the anaphylaxis was not observed in any of the patients after NAC treatment was started; only pruritus and rash were seen in 6 patients.

Table 3. Complaints and clinical findings on the admission to the ED

	n	%
Complaints		
No	**96**	**82.1**
Nausea-vomiting	14	11.9
Right upper quadrant pain	5	4.3
Altered mental status	2	1.7
Clinical findings		
Normal	**94**	**80.4**
Abnormal	23	19.6
Tachycardia	11	9.4
Hypertension	9	7.7
Icter	1	0.8
Encephalopathy	2	1.7

ED: Emergency department

The rate of performed gastric lavage in patients who presented to the ED was significantly lower when compared to referred patients (p<0.005). A similar proportion was identified in NAC administration (4% vs. 48%) (Table 5). NAC treatment was discontinued in most referred patients (25/32) who had received NAC in the referring healthcare facility.

Median length of ED stay of the patients was 5.5 h (range 2-21). Whereas, most patients (96.6%) were discharged from the ED and 3 (2.6%) were discharged from the ward. Severe toxic hepatitis developed in one patient who admitted to the intensive care unit, received NAC treatment and underwent liver transplantation.

Discussion

Paracetamol is one of the most widely used analgesic and antipyretics worldwide. It remains a major cause of poisoning

Table 4. The comparison of age, paracetamol drug forms and the rate of toxic levels with RIP doses and BPCs

	Age (years)		**Paracetamol drug forms**		**Toxic level** (n, %)	
	<6	**≥10**	**Liquid**	**Tablet**	**+**	**-**
RIP doses (mg) [median, (min-max)]	2160 (375-7500)	*7500 (1500-19500)	2200 (375-3600)	*6400 (1500-12200)	24 (20.5)	93 (79.5)
The amount of RIP doses (mg/kg) [median, (min-max)]	150 (30-500)	165.9 (40-280)	150 (30-500)	165 (40-280)	60 (51.3)	57 (48.7)
BPC (mcg/mL) (median)						
4. hour	18.8 (5-127)	27.8 (5-119)	21.0 (1-82)	18.3 (5-127)	-	104 (88.9)
8. hour	5.0 (3.8-18)	49.6 (10-76)	5.0 (3.8-18)	49.6 (10-76)	1 (0.9)	12 (10.2)
12. hour	5.0 (5.0-5.0)	28.7 (14-57)	5.0 (5.0-5.0)	28.7 (14-57)	3 (2.6)	8 (6.8)
16. hour	-	35.3 (23-68)	35.3 (23-68)	-	3 (2.6)	1 (0.9)
24. hour	30 (30-30)	-	-	-	1 (0.9)	3 (2.6)

BPC: Blood paracetamol dose, RIP: Reported ingested dose, *p<0.001

Table 5. The relationship between the treatments-interventions and RIP doses in children who admitted or referred to the ED

Treatments-interventions	**RIP doses**		***p**
	<150 mg/kg	**≥150 mg/kg**	
Referred by another hospital/health care			
Gastric lavage (n, %)			
+	11 (24.4)	34 (75.6)	>0.05
-	8 (38.1)	13 (61.9)	
AC (n, %)			
+	18 (30)	42 (70)	>0.05
-	2 (33.3)	4 (66.7)	
NAC (n, %)			
+	6 (18.8)	*26 (71.2)	**<0.05**
-	18 (52.9)	16 (47.1)	
Admitted to the ED by parents/friends			
Gastric lavage (n, %)			
+	4 (36.4)	7 (63.6)	**<0.05**
-	*31 (77.5)	9 (22.5)	
AC (n, %)			
+	8 (47.1)	9 (52.9)	>0.05
-	27 (79.4)	7 (20.6)	
NAC (n, %)			
+	1 (50)	1 (50)	>0.05
-	34 (69.4)	15 (30.6)	

AC: Activated charcoal, ED: Emergency department, NAC: N-acetylcysteine, RIP: Reported ingested dose, ***p<0.05**

in children and is a major cause of acute liver failure. Although, poisonings are not the commonest reason for admission to the ED (0.13%), the most common drug-based intoxication is paracetamol intoxication.[17] Previously reported studies showed that unintentional (mostly exploratory) ingestions were more common among younger children; however, intentional ingestions were more prevalent among older children and adolescents.[18-20] We found that all children younger than 10 years presented with accidental ingestion; however, most of the ingestions in older children and adolescents were suicidal attempts. In our cohort, the adolescent ratio (38%) was lower than that of previous studies; however, this difference can be explained by the significant number of poisoned adolescents managed by our adult ED which is physically separated from our ED.

Kominek et al.[21] showed that adolescents who ingested the drug for suicidal purposes took higher amounts than younger children who took paracetamol unintentionally. Even though in our age groups similar data were found, no positive correlation was identified between the reported ingested dose of paracetamol and BPC at the 4th hour. Since suicide attempts are often impulsive among teenagers, the reason for the exaggerated higher drug consumption in the past medical history was a wish to attract attention to oneself.

Although non-toxic glucuronides and conjugated sulphates are effective in the metabolism of paracetamol to a large extent, cytochrome P 450 (CYP) enzymes play a role in nearly 5%. By activating CYP enzymes, the N-acetyl-p-benzoquinone imine (NAPQI) metabolite is formed. NAPQI binds to cellular proteins covalently, leading to necrosis in hepatocytes. NAPQI metabolites were found to be higher in patients with hepatic damage and they show individual variability based on the factors affecting CYP activity.[12,22]

The benefit of gastric decontamination is uncertain. Administration of activated charcoal (charcoal dose: 50 g for adults; 1 g/kg body weight for children) if the patient presents within one hour of ingestion of more than 150 mg/kg paracetamol should be considered. The administration of antidotes and usage of enhanced elimination techniques have specific implications in the paediatric population. Since NAC treatment was an effective choice to prevent hepatotoxicity, studies have showed that if the patient is at risk, intravenous acetylcysteine should be initiated.[8,23,24]

Chiew et al.[25] reported an adult study with massive paracetamol overdose and they found that BPCs were markedly reduced in those receiving activated charcoal within 4 h, and hepatotoxicity which had a lower rate was developed.[26] Buckley et al.[8] reported the similar data with 981 patients and they showed that activated charcoal reduces the need for NAC after acetaminophen (paracetamol) overdose if administered within 2 hours. The present results showed that gastrointestinal decontamination (gastric lavage, activated charcoal) was performed for most referred patients in the referring facility. However, the rate of administration of gastrointestinal decontamination in our ED rate was very low. This difference can be explained by the national poisoning centre recommendation, which states that if there is going to be delay beyond 8 h after the overdose in obtaining the BPC, NAC treatment should be started if more than 150 mg/kg paracetamol has been ingested. Most of the referring hospitals did not have an opportunity to obtain BPC, but we do. In the present study we have seen that even if non-toxic ingestion occurred, physicians from the referring center tended to perform GI decontamination as well as initiate NAC. They used NAC 12 times higher (48.5% vs. 4%) when compared to the patients who presented directly to our ED. Furthermore, the antidote was administered to one-fifth of the referred cases even when the amount of paracetamol allegedly taken was not toxic. These results may be explained by the fact that physicians do not want to take any risks, prefer defensive medical approaches and do not have appropriate knowledge on paracetamol intoxications.[27]

Waring et al.[26] examined the relationship between BPC and risk of anaphylactoid reactions and they found that low BPCs (non-toxic =0-100 mg/L) were associated with higher anaphylactoid reactions.[28] In the present cohort, a huge difference can be observed in the management of paracetamol poisoning between referring hospitals and a tertiary paediatric ED hospital. If the physicians working in these hospitals complete the knowledge, skills and toxicology courses, improper referrals, high costs and treatments can be avoided. They should keep in mind that if BPC can be obtained within 8 h of ingestion, there is normally no indication to start NAC.

In a study conducted in New Zealand, has been shown that reported dose was a good predictor of a toxic paracetamol concentration as well as NAC indication.[27] However, previous studies have shown that reported dose is an independent predictor of hepatotoxicity, this has not influenced risk assessment in paracetamol poisoning.[8,28] The findings of the present study differ from those of the New Zealand study. We believe that this difference can be explained by different age groups, study (retrospective) design and the single-centre, small sample size cohort of the present study.

Study Limitations

The limitations of the study include (1) missing patient data due to the retrospective nature of our study, (2) single-centre results with small sample size cohort and (3) well-designed, prospective with large sample size studies are required to explain the relationships in this study.

Conclusion

Our results showed that intravenous NAC was given to most patients with non-toxic paracetamol ingestion in hospitals where BPC cannot be provided even if they could refer these patients to a centre where BPC could be measured in the first 8 hours. If the patient is at risk, intravenous NAC should be given. There is normally no indication to start NAC without a BPC provided the result can be obtained and acted upon within 8 h of ingestion. If there is going to be delay beyond 8 h after the overdose in obtaining the BPC, treatment should be initiated if more than 150 mg/kg of paracetamol has been ingested.

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Ethics

Ethics Committee Approval: The study adhered to the ethical principles of medical research involving human subjects of the World Medical Association Declaration of Helsinki. The medical faculty scientific research Ethics Committee of Ege University provided ethical approval prior to the study (no: 18-12/5).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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

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The Effect of Tracheostomy Timing on Clinical Outcomes in Children

Çocuklarda Trakeostomi Zamanlamasının Klinik Sonuçlara Etkisi

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Abstract

Introduction: Optimal timing for tracheostomy in children is not well defined. Our aim is to examine the pre-tracheostomy morbidities, indications and association of early tracheostomy on clinical outcomes.

Methods: This retrospective cohort study included all patients who underwent tracheostomy in the Dokuz Eylül University Pediatric Intensive Care Unit (ICU) between January 2012 and September 2020. We categorized patients into the early and late tracheostomy groups according to time on a mechanical ventilator before tracheostomy using a cut-off of 14 days. Pre-tracheostomy morbidities [ventilator associated pneumonia (VAP), central line associated bloodstream infection], indications and clinical outcomes (including length of ICU and hospital stay, incidence of VAP and mortality) were compared between early and late groups.

Results: Of the 104 patients undergone tracheostomy, 90 were included in the study: Thirty patients in the early group, 60 patients in the late group. Tracheostomy rate of our unit was 6.06%, with a median ventilator time before tracheostomy of 20 days. VAP and lung tissue disease indication for tracheostomy independently increased pre-tracheostomy mechanical ventilation time by 8 and 12.6 days, respectively. There was no statistically significant difference in VAP rate after tracheostomy, successful decannulation and mortality between early and late group. Early group had lower post-tracheostomy ICU-length of stay (LOS) (8.5 vs. 13 days p=0.041) and total ICU-LOS (17.5 vs. 45 days p<0.001). Controlling for age, tracheostomy indication, central line associated bloodstream infection and VAP; tracheostomy timing was independently associated with ICU-LOS. Late tracheostomy timing increased the ICU-LOS by 10.7 days (p=0.041).

Conclusion: Our results suggest that early timing of tracheostomy is associated with reduced ICU-LOS and VAP in children, consistent with the current literature.

Keywords: Tracheostomy, pediatric intensive care unit, ventilator associated pneumonia

Öz

Giriş: Çocuklarda trakeostomi için optimal zamanlama net olarak tanımlanmamıştır. Çalışmamızın amacı trakeostomi zamanlamasının, trakeostomi öncesi morbiditeler, endikasyonlar ve klinik sonuçlarla ilişkisinin incelenmesidir.

Yöntemler: Bu geriye dönük kohort çalışmasına, Ocak 2012-Eylül 2020 tarihleri arasında Dokuz Eylül Üniversitesi Çocuk Yoğun Bakım Ünitesi'nde (ÇYBÜ) trakeostomi açılan hastalar dahil edildi. Hastalar trakeostomi öncesi mekanik ventilatörde geçen zaman değerlendirilerek 14 günlük sınıra göre erken ve geç trakeostomi gruplarına ayrıldı. Erken ve geç gruplar arasında trakeostomi öncesi morbiditeler [ventilatör ile ilişkili pnömoni (VİP), santral venöz kateter ilişkili kan dolaşımı enfeksiyonu], endikasyonlar ve klinik sonuçlar (YBÜ ve hastanede yatış süresi, ventilatörle ilişkili pnömoni sıklığı ve mortalite) karşılaştırıldı.

Bulgular: Trakeostomi açılan 104 hastadan 90'ı çalışmaya dahil edildi: erken grupta 30 hasta, geç grupta 60 hasta vardı. Ünitemizin trakeostomi oranı %6,06, trakeostomi öncesi ortanca ventilatör süresi 20 gün idi. VİP ve akciğer hastalığı endikasyonu ile trakestomi açılmış olması, trakeostomi öncesi mekanik ventilasyon süresinde artış ile ilişkili saptandı (8, 12,6 gün p<0,05). Trakeostomi sonrası VİP oranı, başarılı dekanülasyon ve mortalite açısından erken ve geç grup arasında istatistiksel olarak anlamlı fark yoktu. Erken grupta trakeostomi sonrası YBÜ yatış süresi (8,5'e 13 gün p=0,041) ve toplam YBÜ yatış süresi (17,5'e 45 gün p<0,001) daha düşüktü. Yaş, trakeostomi endikasyonu, santral venöz kateter ilişkili kan dolaşımı enfeksiyonu ve VİP için kontrol edildikten sonra; trakeostomi zamanlaması bağımsız olarak YBÜ yatış süresi ile ilişkilendirildi. Geç trakeostomi zamanlaması YBÜ yatış süresinde 10,7 gün artış ile ilişkili bulundu (p=0,041).

Sonuç: Çalışmamızın sonuçları, mevcut literatürle uyumlu olarak, trakeostominin erken zamanlamasının çocuklarda YBÜ yatış süresi ve VİP'nin azalması ile ilişkili olduğunu göstermektedir.

Anahtar Kelimeler: Trakeostomi, çocuk yoğun bakım, ventilatör ilişkili pnömoni

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Introduction

Children with complex neurological, cardiovascular, and respiratory diseases survive longer by virtue of development on new treatment modalities and revolutionized critical care.[1,2] These children often require long-term mechanical ventilation and pulmonary secretion clearance. Tracheostomy provides an alternative airway to orotracheal intubation in prolonged ventilation in the intensive care units (ICU). It has benefits over orotracheal intubation, including; improving oral hygiene, oral intake and speech; decreasing need for analgesia and sedation; enhancing pulmonary secretion clearance.[3,4] Although tracheostomy is a complex procedure and has procedure-related complications,[5] rate of tracheostomy is increasing in both adult and pediatric ICUs with the help of improvements in technique.[3,6] The rate of tracheostomy in critically ill adult patients ranges between 10-24%, median time to tracheostomy is reported between 9-12 days.[7-9] In the pediatric population, studies demonstrated a rate of tracheostomy between 1.5-8.5% with timing of tracheostomy between 4 and 32 days.[10-13] The optimal timing of tracheostomy is unclear in critically ill patients. Early tracheostomy in adults (≤10 days after tracheal intubation) is associated with a higher number of ventilator-free days, reduced ICU stays, lower long-term mortality.[14] Several studies have defined early timing of tracheostomy in PICU as 10 to 14 days after tracheal intubation and demonstrated that early tracheostomy was associated with reduced duration of mechanical ventilation, ICU and hospital stay, ventilator-associated pneumonia (VAP) rate.[15-17] In this study, we hypothesized that early tracheostomy (≤14 days after tracheal intubation) in children is associated with reduced ICU and hospital length of stay (LOS), VAP rate and mortality.

Materials and Methods

This study protocol was approved by the Ethics Committee of the Dokuz Eylül University Faculty of Medicine (5837-GOA-2020/28-01). We conducted a retrospective cohort study including all children admitted to our pediatric ICU who underwent tracheostomy between January 2013 and September 2020. Our PICU is a 6-bed ICU in a tertiary-care children's hospital, accepting children between 1 month-18 years of age with medical, surgical, oncological and trauma indications. We excluded patients who had tracheostomy procedure or decision before PICU admission, whose tracheostomy was performed emergently and who had no invasive ventilation before tracheostomy. Tracheostomy decisions were made on individual cases after discussing with attending and otolaryngologists. All tracheostomies were performed by open surgical technique in the operation room by the same otolaryngology team. Medical and personal records of all patients were extracted from electronical records. A standard data extraction form was prepared. Demographic and clinical data were collected from each patient, including gender, age, pediatric index of mortality 3 (PIM3), the primary reason for admission, indication for tracheostomy, duration of mechanical ventilation, length of PICU and hospital stay, VAP, central line-associated bloodstream infection (CLABSI), mortality and successful decannulation. We defined CLABSI and VAP according to CDC definition (www.cdc.gov, accessed January 12, 2021).

Early tracheostomy is defined as tracheostomies performed within 14 days of mechanical ventilation. Tracheostomies performed after 14th day of mechanical ventilation are defined as late tracheostomy. Since there is no guideline indicating optimal timing of tracheostomy in prolonged ventilation in critically ill children, we set 14 days threshold based on previous clinical studies.[16,17]

The primary reason for PICU admission was divided into 9 categories: 1) respiratory; 2) neurological; 3) cardiovascular; 4) metabolic; 5) trauma; 6) oncological; 7) post-operative (cardiac surgery); 8) post-operative (other); 9) other. Tracheostomy indication was divided into 4 categories: 1) lung tissue disease; 2) disordered control of breathing (neurological and neuromuscular diseases); 3) cardiovascular disease; 4) airway obstruction.

Statistical Analysis

Continuous non-normally distributed data were compared by Mann-Whitney U test, expressed as median (interquartile range). Multivariate regression was conducted to analyze confounders of PICU LOS and pre-tracheostomy mechanical ventilator days. Categorical variables were analyzed by chi-square or Fisher's Exact test. All tests were two tailed, and a p-value of less than 0.05 was taken as statistically significant. SPSS 22.0 software (SPSS, Chicago, IL) was used for data analysis.

Results

Of the 1714 patients admitted to PICU between January 2012 and September 2020, 104 underwent tracheostomy. We excluded 14 patients: Nine patients had no invasive ventilation before tracheostomy, three patients underwent urgent tracheostomy, and two patients were transferred to another hospital. Ninety patients were included for statistical analysis: Thirty patients were included in the early group; 60 patients were included in the late group. Tracheostomy rate of our PICU was 6.06% with a median mechanical ventilation time before a tracheostomy of 20 (11, 34.25) days. The characteristics of

the total 90 patients are shown in Table 1. Age, gender, PIM3 score, need for vasoactive drug, reason for admission to PICU and underlying diseases did not differ significantly between the early and late groups. However, patients who underwent tracheostomy due to disordered control of breathing were significantly higher in early group (p=0.004), whereas patients with lung tissue disease were higher in the late group (p<0.001). Median mechanical ventilation time of patients with lung tissue disease indication and disordered control of breathing indication were 38 days and 15 days, respectively. Among the factors affecting mechanical ventilation duration before tracheostomy, 41 patients had CLABSI, 40 patients had VAP. Multivariate regression analysis of pre-tracheostomy factors demonstrated that VAP and lung tissue disease indication for tracheostomy increased pre-tracheostomy mechanical ventilation days independently (Table 2). Age, gender and PIM3 were not associated with pre-tracheostomy ventilator days.

Table 3 shows the comparison of clinical outcomes of the early and late groups after tracheostomy. There was no significant change between the early and late groups in hospital LOS after tracheostomy. However early tracheostomy group had lower post-tracheostomy ICU LOS (p=0.041) and total ICU LOS (p<0.001). VAP rate was significantly lower in the early group (p=0.003). There was no statistically significant difference in VAP rate after tracheostomy, successful decannulation and ICU mortality between the early and late groups.

The factors affecting length of ICU stay were analyzed using multivariate regression analysis (Table 4). Controlling for age, tracheostomy indication, CLABSI and VAP, tracheostomy timing was independently associated with ICU-LOS. Late tracheostomy increased the ICU-LOS by 10.7 days (p=0.041).

Table 1. Demographics, primary diagnosis, tracheostomy indications of patients

	All (n=90)	Early tracheostomy (n=30)	Late tracheostomy (n=60)	p
Age (month)	11 (5, 87)	22 (5, 126)	10 (4, 84)	0.353
Male gender	55 (61)	19 (63)	36 (60)	0.760
Primary reason for PICU admission				
Respiratory	68 (75.6)	24 (80)	44 (73.3)	0.488
Neurological	6 (6.7)	1 (3.3)	5 (8.3)	0.659
Cardiovascular	7 (7.8)	1 (3.3)	6 (10)	0.417
Trauma	7 (7.8)	4 (13.3)	3 (5)	0.216
Other	2 (2.2)	0	2 (3.4)	1.000
Underlying disease				
Neurological	53 (58.9)	18 (60)	35 (58.3)	0.532
Cardiovascular	11 (12.2)	3 (10)	8 (13.3)	0.467
Cancer	3 (3.3)	0 (0)	3 (5)	0.291
Tracheostomy indication				
Lung disease	30 (33.3)	2 (6.7)	28 (46.7)	<0.001
Neurological impairment	46 (51.1)	22 (73.3)	24 (40)	0.004
Airway obstruction	10 (11.1)	6 (20)	4 (6.7)	0.078
Cardiovascular disease	4 (4.4)	0	4 (6.7)	0.297
Need for vasoactive drug	14 (15)	4 (13.3)	10 (16.6)	0.469
PIM 3	7.88 (5.54, 12.74)	7.17 (3.40, 11.37)	9 (6.10, 13.06)	0.107

Values are expressed as median (interquartile range) or number (%)

Table 2. Multivariate regression analysis of pre-tracheostomy factors and pre-tracheostomy mechanical ventilator days

Factors	Regression Coefficient	95% CI	p
CLABSI before tracheostomy	2.64	-2.86 to 8.15	0.343
VAP before tracheostomy	8	2.37-13.64	0.006
Chronic lung tissue disease	12.62	4.28-20.97	0.003
Neurological impairment	-4.96	-12.76 to 2.85	0.21

CLABSI: Central line-associated bloodstream infection, VAP: Ventilator associated pneumonia, CI: Confidence interval

Table 3. Comparison of clinical outcomes between early and late tracheostomy group

	Early tracheostomy (n=30)	Late tracheostomy (n=60)	p
Total length of ICU stay (day)	17.5 (14, 24)	45 (32, 59)	<0.001
Length of ICU stay after tracheostomy (day)	8.5 (7, 12)	13 (7, 19)	0.041
Length of hospital stay after tracheostomy (day)	45 (21, 100)	47.5 (27, 66)	0.691
VAP during ICU stay	8 (26.7)	36 (60)	0.003
VAP after tracheostomy	5 (16.7)	10 (16.7)	1.000
Successful decannulation	8 (26.7)	11 (18.3)	0.361
ICU mortality	1 (3.3)	2 (3.3)	1.000

Values are expressed as median (interquartile range) or number (%). ICU: Intensive care unit, VAP: Ventilator associated pneumonia

Table 4. Multivariate logistic regression analysis for predictors of VAP

Predictors	Odds ratio (95% CI)	p
Age (month)	1.004 (0.996, 1.012)	0.296
Late tracheostomy	4.506 (1.448, 14.022)	0.009
Central line associated bloodstream infection	2.588 (0.976, 6.86)	0.056
Urinary tract infection	2.170 (0.802,5.872)	0.127
Tracheostomy indication: Lung disease	0.758 (0.170, 3.389)	0.717
Tracheostomy indication: Neurological impairment	0.608 (0.151, 2.449)	0.608

CI: Confidence interval, VAP: Ventilator associated pneumonia

Table 5. Multivariate regression analysis of pre-tracheostomy factors and length of ICU stay

Variables	Regression Coefficient	95% CI	p
Age at tracheostomy	-0.06	(-0.123, 0.003)	0.06
Late tracheostomy	10.05	(0.417, 19,674)	0.041
CLABSI before tracheostomy	4.99	(-3.30, 13.29)	0.235
VAP before tracheostomy	13.73	(9.78, 20.61)	0.002
Chronic lung tissue disease	10.69	(-2.16, 23.54)	0.102
Neurological impairment	-11.08	(-22.94, 0.78)	0.067

CI: Confidence interval, CLABSI: Central line-associated bloodstream infection, VAP: Ventilator associated pneumonia, ICU: Intensive care unit

Discussion

In our pediatric ICU, 104 of 1714 patients undergone tracheostomy. Tracheostomy rate of our PICU was 6.06%, slightly higher than the current literature.[10,11,18] Median ventilator days of patients before tracheostomy was 20 days, representing an ordinary timing compared to recent studies.[11,17]

Although 75% of patients were admitted to PICU primary due to respiratory diseases, the indication for tracheostomy was predominantly disordered control of breathing (neurological and neuromuscular diseases). This high rate of neurological indication in our cohort could be explained by the large number of patients with neurometabolic disease being referred to our hospital since it is a regional referral center. Tracheostomy performed with a lung tissue disease indication was significantly higher in the late group whereas disordered control of breathing was higher in early group. These findings indicate that our multidisciplinary team consisting of intensive care physicians and otolaryngologists reached a consensus on tracheostomy indication earlier in neurological patients requiring invasive ventilation.

Among the morbidities in the ICU, VAP and CLABSI was demonstrated to increase ventilation time before tracheostomy by 16.5 and 12.7 days respectively.[17] Similarly, in our study we demonstrated that VAP before tracheostomy increased mechanical ventilation time by 8 days. These increased ventilator days could be explained by our team waiting for a longer period for recovery of pulmonary functions following appropriate antibiotic therapy. Pizza et al.[15] demonstrated that VAP rate after tracheostomy was significantly lower in the early group, unlike other studies.[16,17,19] We examined VAP

rate after tracheostomy as a clinical outcome, there was no significant difference between the early and late groups.

Controlling for CLABSI and VAP, tracheostomy indication of lung tissue disease increased pre-tracheostomy mechanical ventilation time by 12.6 days. In a recent study, indication for tracheostomy was not statistically significant between early and late group.[16] This result suggests that our team waits for a longer period for successful extubation in patients with primary lung tissue disorders, to avoid complications of tracheostomy procedure.

Several studies have demonstrated that early tracheostomy was associated with decreased ICU and hospital LOS, mechanical ventilator days.[16,17,20] In our study, patients in the early group had 4.5 lower post-tracheostomy ICU days, 27.5 days lower total ICU days. We evaluated factors affecting ICU LOS, including age, CLABSI, VAP, tracheostomy indication and timing of tracheostomy; timing of tracheostomy and VAP were independently related to ICU LOS. The late tracheostomy group had 10 more ICU days; children having at least one VAP diagnosis had 13.7 more ICU days after adjusting for other factors. Although we were unable to demonstrate a significant difference in hospital LOS; decreasing the need for prolonged ICU stay reduces ICU-related morbidities and medical cost. Additionally, reducing ICU LOS of critically ill children leads to use ICU beds more efficiently in resource limited clinical settings.

Our study showed no significant difference in PICU mortality between the early and late tracheostomy groups. Our data are consistent with current literature, which shows no significant association between timing of tracheostomy and mortality.[15,16,21]

Study Limitations

Our study has several limitations. Retrospective design of the study made it impossible to randomize patients into the early and late groups. Patients in early and late groups were heterogeneous in tracheostomy indications. The causative relationship between ICU morbidities and delayed tracheostomy timing could not be explained due to retrospective design of the study. Our sample size was not sufficient to analyze outcomes in subgroups. Finally, we were unable to control the factors affecting length of hospital stay after transfer from PICU to inpatient ward.

Conclusion

Our study suggests that early timing of tracheostomy is associated with decreased ICU stay with no significant difference in mortality. We observed a relation between timing of tracheostomy and VAP rate however, further studies in a prospective fashion are needed to analyze causative relationship between ICU morbidities and delayed tracheostomy timing.

Ethics

Ethics Committee Approval: This study protocol was approved by Ethics Committee of the Dokuz Eylül University Faculty of Medicine (5837-GOA-2020/28-01).

Informed Consent: Retrospective study.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: T.B., G.A., M.D., Design: T.B., G.A., M.D., Data Collection or Processing: T.B., G.Ö., G.E., T.A., Analysis or Interpretation: T.B., G.A., T.A., M.D., Literature Search: T.B., G.Ö., G.E., G.A., M.D., Writing: T.B., G.A., M.D.

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The Effect of Intramuscular Ondansetron Treatment on Prognosis in Patients Diagnosed with Acute Gastroenteritis

Akut Gastroenterit Tanılı Hastalarda İntramusküler Ondansetron Tedavisinin Prognoza Etkisi

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Abstract

Introduction: Vomiting is an important symptom that limits oral intake and may result in hospitalizations and prolonged hospital stays for intravenous fluid therapy. In our study, we aimed to compare the rates of hospital revisit and hospitalization due to vomiting within seven days of admission in children with acute gastroenteritis in two groups who received and did not receive intramuscular ondansetron.

Methods: Files of patients aged 6 months-15 years (without dehydration) diagnosed with acute gastroenteritis (ICD A09) in our pediatric emergency clinic between December 2015-February 2016 (non-ondansetron period) and December 2019-February 2020 (intramuscular ondansetron period) were analyzed retrospectively. The patients included in the study were evaluated in two groups, the first group receiving a single dose of intramuscular ondansetron and the second group not receiving ondansetron treatment. Our primary aim was to determine the rates of readmission and hospitalization in the first 7 days of both groups

Results: It was determined that 21% of the patients who received ondansetron and 28% of the group who did not receive ondansetron were admitted to the emergency department due to vomiting in the first 7 days. In comparison of both groups, 5% of group I patients and 13% of group II patients needed intravenous fluids (odds ratio =0.3; 95% confidence interval =0.19-0.59) at repeated admission and required hospitalization in the emergency department.

Conclusion: Intramuscular ondansetron treatment reduces the rate of hospital readmission, hospitalization and intravenous fluid requirement during re-admission in children with acute gastroenteritis with vomiting.

Keywords: Child, gastroenteritis, ondansetron

Öz

Giriş: Kusma oral alımı sınırlayan önemli bir semptomdur, hastaların damar içi sıvı tedavisi için hastane yatışına ve uzamış hastanede kalış süresine neden olabilir. Çalışmamızda akut gastroenteritli çocuklarda intramusküler ondansetron alan ve almayan iki grupta başvurudan sonraki yedi gün içinde kusma nedeniyle hastaneye yatış ve hastaneye tekrar başvuru oranlarını karşılaştırmayı amaçladık.

Yöntemler: Aralık 2015-Şubat 2016 (ondansetron olmayan dönem) ve Aralık 2019-Şubat 2020 (kas içi ondansetron dönemi) arasında çocuk acil kliniğimizde akut gastroenterit (ICD A09) tanısı alan 6 ay-15 yaş arası (dehidratasyonsuz) hastaların dosyaları) geriye dönük olarak analiz edildi. Çalışmaya dahil edilen hastalar, tek doz intramusküler ondansetron alanlar birinci grup, ondansetron tedavisi almayanlar ikinci grup olmak üzere iki grupta incelendi. Birincil amacımız her iki grubun ilk 7 gün içinde tekrar başvuru ve yatış oranlarının belirlenmesiydi.

Bulgular: Ondansetron tedavisi alan hastaların %21'inin, ondansetron almayan grubun %28'inin ilk 7 gün içinde acil servise kusma nedeniyle tekrar başvurduğu saptandı. Her iki grubun karşılaştırılmasında, tekrarlayan başvuruda grup I hastalarının %5'i ve grup II hastalarının %13'ü damar içi sıvı ihtiyacı (olasılık oranı= 0,3; %95 güven aralığı =0,19-0,59) oldu ve acil serviste yatış gerekti.

Sonuç: İntramusküler ondansetron tedavisi kusması olan akut gastroenteritli çocuklarda hastaneye tekrar başvuru oranını, tekrar başvuru esnasındaki yatış ve damar içi sıvı ihtiyacını azaltır.

Anahtar Kelimeler: Çocuk, gastroenterit, ondansetron

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Introduction

Acute gastroenteritis is a clinical picture defined by ≥3 watery stools within 24 hours with or without vomiting, fever or abdominal pain.[1] Viral gastroenteritis is one of the common causes of morbidity and mortality in developing countries, especially in young children. It is responsible for approximately 200,000 deaths annually and the frequency of epidemics increases in winter.[2] In the European guidelines published in 2014, oral and intravenous ondansetron was reported to be both effective and safe treatment in children with vomiting due to acute gastroenteritis.[1] It has been emphasized that ondansetron treatment is the only antiemetic that provides a significant reduction in the prevention of vomiting episodes, intravenous fluid requirement, and hospitalization.[3]

There are not enough studies yet on the use of intramuscular ondansetron to support oral intake in children diagnosed with acute gastroenteritis. The primary aim of this study is to examine the effects of intramuscular administration of ondansetron for the treatment of vomiting episodes in patients with acute gastroenteritis without dehydration on the rates of readmission and hospitalization. The secondary aim is to investigate whether there is a difference between the degrees of dehydration and the days of hospitalization in patients requiring hospitalization at the time of readmission.

Materials and Methods

Our study was conducted in a tertiary pediatric hospital with an annual average of 200,000 emergency department admissions. The files of the patients aged 6 months -15 years, who were admitted to our pediatric emergency clinic between December 2015 and February 2016 (non-ondansetron period) and between December 2019 and February 2020 [intramuscular (IM) ondansetron period] with vomiting and diagnosed with acute gastroenteritis (ICD A09), and who had no signs of dehydration at the time of admission according to the clinical dehydration scale of the World Health Organization (WHO), were examined retrospectively. Those with concomitant infections (meningitis, sepsis, urinary tract infection, upper respiratory tract infection, etc.), those with underlying chronic diseases, parasitic and bacterial gastroenteritis, those having food poisoning, those receiving antibiotic treatment, those using antiemetics other than ondansetron within 24 hours before the first admission to the emergency department or within 7 days after the admission, those who were operated at the time of admission, those who had signs of dehydration and need for intravenous fluids at the first admission, and/or those who were hospitalized were excluded from the study.

For group I (treatment group) and group II (control group), patients' gender, age, duration of symptoms, number of vomiting and diarrhea in the last 24 hours before admission, and presence of additional symptoms (fever, abdominal pain) were recorded from electronic medical records. Following examination or IM drug administration, both groups of patients were followed up in the emergency department for approximately 2 hours with appropriate fluid and food intake. Patients who did not vomit after oral intake were sent home.

After 7 days after the first admission, readmission to the emergency department due to vomiting, presence and degree of dehydration, hospitalization requirement, duration of hospitalization, and side effects related to ondansetron were recorded. In our study, IM ondansetron treatment was used as 0.15 mg/kg/dose (maximum dose 8 mg). The ethical approval of our study was provided from University of Health Sciences Turkey, Dr. Sami Ulus Maternity and Child Health and Diseases Training and Research Hospital on 15.09.2021 with the number E-21/09-209.

Statistical Analysis

The obtained data were evaluated using SPSS version 20 program and descriptive statistics were used. The Kolmogorov-Smirnov test was used to evaluate whether the data showed normal distribution. The categorical variables were expressed as number and percentage (%), the normally distributed numerical data as mean and standard deviation, and the non-normally distributed numerical data as median, and interquartile range. In the categorical comparisons between the groups, cross-table statistics were given and the significance levels were checked with the chi-square test. The Student's t-test was used in comparison of two independent groups for normally distributed data, and the Mann-Whitney U test was used for data not normally distributed. Odds ratio (OR) and 95% confidence interval (CI) were given to determine the risk factor between the groups. Statistical significance level was accepted as $p<0.05$.

Results

A total of 722 patients were included in the study. The cases were divided as group I, including 401 (56%) patients receiving IM ondansetron, and group II, including 321 (44%) patients not receiving the treatment. There was no significant difference between the two groups in terms of gender and age. Demographic data and clinical symptoms of the patients are given in Table 1.

Among the patients, the number of patients with recurrent admissions due to the continuation of vomiting in 7 days after admission was 84 (21%) in group I and 90 (28%) in

Table 1. Comparison of demographic and clinical characteristics of patients

	Group I	Group II	p-values
Patient n (%)	401 (55)	321 (45)	
Sex n (%)			
Male	226 (56)	201 (62)	**0.150**
Female	175 (44)	120 (38)	
Age, month, median (IQR)*	22 (14-38)	17 (10-39)	**0.058**
Complaints at admission			
Number of vomiting, mean ± SD**	4.08±2.3	4.4±1.9	**0.031**
Number of diarrhea	4.6±2.0	5.5±2.1	**<0.001**
Fever ≥38 °C	91	47	0.008
Duration of symptoms, day, mean ± SD	1.5±0.9	2.1±1.4	**<0.001**
Re-visit rate on the first 7 days n (%)	85 (21)	90 (28)	**0.036**
Hospitalization, n (%)	20 (5)	41 (13)	**<0.001**
1. degree dehydration n (%)	8 (2)	19 (6)	**0.018**
2. degree dehydration n (%)	12 (3)	22 (7)	**0.035**
IV* fluid administration in the emergency department during re-admission n (%)**	20 (5)	41(13)	**<0.001**

p<0.05 significant, statistical analysis: Student's t-test, Mann-Whitney U test, *IQR: Interquartile range, **SD: Standard deviation, ***Intravenous

group II, and there was a significant difference between the two groups (p=0.036). In recurrent emergency department admissions, 20 (5%) of group I patients and 41 (13%) of group II patients were hospitalized, and there was a significant difference between the two groups in terms of dehydration and hospitalization (Table 1). IM ondansetron use was found to be associated with a reduced probability of intravenous fluid administration and a reduced rate of hospitalization (OR=0.3; 95% CI=0.19-0.59, p<0.001). While the hospitalization period was 1.6±1.0 days in group I patients, it was 1.6±1.1 days in group II patients, and there was no significant difference between the groups (p=0.918). Urticaria developed in only one patient after ondansetron use.

Discussion

Vomiting is a disturbing condition for children and their families, but can also result in repeated emergency room visits, hospitalizations, and increased costs. A 5-hydroxytryptamine3 receptor antagonist is used safely and effectively in the treatment of nausea and vomiting outpatients and inpatients in emergency departments.[4-6] Peak plasma concentrations are reached in 20-30 minutes after intravenous administration of ondansetron and approximately in 60-90 minutes after oral administration.[7] It has been shown that ondansetron is rapidly absorbed after IM use and its bioavailability is similar to that of intravenous administration.[7] In this study, we evaluated the effect of IM ondansetron treatment on recurrent hospital admissions and hospitalization rates in children admitted to the pediatric emergency department for acute gastroenteritis. The rates of hospital readmission and hospitalization were 21% and 5%, respectively, in patients receiving IM ondansetron therapy, and these rates were significantly lower than those in the untreated group.

In the literature regarding intravenous or oral ondansetron treatment in children with acute gastroenteritis accompanied by vomiting, there are many studies showing different efficiency levels.[8-10] Moreover, some studies show that less intravenous fluid is needed with drug administration by these routes.[10,11] Besides that, in a study comparing single-dose oral ondansetron and placebo groups in children with acute gastroenteritis with mild and moderate dehydration, it was reported that oral medication had effect on vomiting, but not on readmissions to the emergency department and hospitalizations.[5] In a meta-analysis study in which intravenous or oral therapy and placebo were compared in 2313 children with acute gastroenteritis, it was revealed that drug therapy reduced the need for intravenous fluids in children with dehydration but had no significant effect on children without dehydration.[12] In a recently published study on children with acute gastroenteritis but without dehydration, no difference was found in terms of intravenous fluid requirement between the groups that received and did not receive oral ondansetron treatment.[8] The administration routes of ondansetron therapy may affect prognosis. In the ondansetron therapy, catheter placement in intravenous administration has potentially harmful effects, and patients are at risk for the development of phlebitis, longer hospital stays, and nosocomial infections. Taking oral forms of the drug requires cooperation with the patient and it is difficult to achieve this in the pediatric

population. In addition, the dose needs to be repeated in case of vomiting in the first fifteen minutes after oral administration.[5] It has been reported that IM treatment in children with acute gastroenteritis with moderate dehydration reduces hospitalizations and intravenous fluid requirement, similar to the oral route.[13] Since we do not have an oral form of ondansetron in our hospital, the IM route is used.

To our knowledge, our study is the study having the largest sample, evaluating the usefulness of IM ondansetron use in children with acute gastroenteritis. In our study, it was found that readmissions were significantly reduced with the IM ondansetron treatment in children with acute gastroenteritis but without dehydration, compared to the control group. The decrease in the rate of recurrent admissions to the hospital may be associated with the efficacy of IM ondansetron treatment. High severity of dehydration, intravenous fluid requirement and hospitalization rates were found to be significantly higher in the control group.

No serious side effects were encountered with IM administration of ondansetron. In the literature, it has been reported that the use of ondansetron causes an increase in the number of diarrhea, QT prolongation and serious cardiac arrhythmias.[14-16] Transient urticaria was observed in only one of our cases. This result supports that the use of ondansetron is safe and has minimal side effects.[10,17] Ondansetron is extensively metabolized by the liver, especially newborns and patients with reduced hepatic blood flow may be exposed to the circulating drug for a long time.[18] Because newborns, infants younger than 6 months and children with underlying chronic diseases were excluded from our study, no serious side effects were likely encountered. Since the patients included in our study had no cardiac symptoms and signs in the clinical side-effect follow-up, routine ECG recording was not performed.

Study Limitations

Our study has several limitations. Firstly, this study was conducted in a retrospective design. For this reason, information on the number of diarrhea and vomiting in the last 24 hours could not be reached during readmissions. Although the hydration assessment of the patients was made according to the WHO clinical dehydration scale included in the protocols of our clinic, the determination and management of the dehydration severity was made by the clinicians who examined the patients. Since our study was single-center, we may not have been able to identify patients admitted to different centers due to ongoing vomiting attacks.

Conclusion

It was thought that IM administration of ondansetron in outpatient patients with acute gastroenteritis accompanied by vomiting and intolerance of oral intake might reduce readmissions to emergency department, hospitalization, and intravenous fluid requirement. The IM route can be an effective and safe alternative to oral and intravenous administration. However, there is a need for randomized controlled large series studies on IM administration of ondansetron in acute gastroenteritis cases.

Ethics

Ethics Committee Approval: The ethical approval of our study was provided from University of Health Sciences Turkey, Dr. Sami Ulus Maternity and Child Health and Diseases Training and Research Hospital on 15.09.2021 with the number E-21/09-209.

Informed Consent: Retrospective study.

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Authorship Contributions

Surgical and Medical Practices: İ.B., M.M.G., B.Ö., Concept: İ.B., A.Gü., R.M.Y., Design: İ.B., C.D.K., Data Collection or Processing: İ.B., A.G., Analysis or Interpretation: İ.B., C.D.K., Literature Search: İ.B., R.M.Y., Writing: İ.B., N.T.

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Comparison of the Permanent Skin Flora of Children Who Had A Wiping Bath with Two Different Products: A Randomized Controlled Study

İki Farklı Ürün ile Silme Banyo Yapılan Çocukların Kalıcı Deri Floralarının Karşılaştırılması: Randomize Kontrollü Çalışma

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Abstract

Introduction: Microbiota in healthy individuals includes many and different microorganisms. Infections, use of antibiotics, various chemicals (antiseptic solutions, soaps, shampoos, etc.) can change the human microbiota. This study was planned to compare the effect of wiping bath with 2% daily chlorhexidine gluconate and soap-free body washing solution on the skin microbiota of the patients hospitalized in the pediatric intensive care unit.

Methods: The research was carried out as a randomized controlled experimental study with 60 children hospitalized in the pediatric intensive care unit of a training and research hospital in February 2021-January 2022. In the study, the children in group I (n=30) were given a wiping bath with 2% chlorhexidine gluconate, which is the routine application of the unit and the children in group II (n=30) were given a soap-free body wash solution. In both groups, swab samples were taken from the armpits and groin for 3 days just before the application of the wiping bath and 6 hours after the application of the wiping bath.

Results Children participating in the study 36.7% (n=22) were girls and 63.3% (n=38) were boys. The mean age of the participants was determined as 6.05±5.04. When the reproductive changes in the permanent skin flora between the groups were examined, a significant difference was found between group I and group II before and after bathing on the 1st, 2nd and 3rd days (p=0.001). Persistent skin flora decreased significantly in group I on the 1st day, while it disappeared completely on the 2nd and 3rd days. In group II, the permanent skin flora continued to be preserved for 3 days.

Öz

Giriş: Sağlıklı bireylerde flora, çok sayıda ve farklı mikroorganizmaları içermektedir. Enfeksiyonlar, antibiyotik kullanımı, çeşitli kimyasallar florayı değiştirebilmektedir. Bu çalışma çocuk yoğun bakım ünitesinde yatan çocukların günlük %2'lik klorheksidin glukonat ve sabunsuz vücut yıkama solüsyonu ile yapılan silme banyosunun kalıcı deri floralarına etkisinin karşılaştırılması amacıyla yapılmıştır.

Yöntemler: Çalışma, Şubat 2021-Ocak 2022 yılında bir eğitim ve araştırma hastanesi çocuk yoğun bakım ünitesinde yatmakta olan 60 çocuk ile randomize kontrollü deneysel olarak gerçekleştirildi. Çalışmada grup I'deki (n=30) çocuklara ünitenin rutin uygulaması olan %2'lik klorheksidin glukonat ile grup II'deki (n=30) çocuklara ise sabunsuz vücut yıkama solüsyonu ile silme banyosu uygulanmıştır. Her iki grupta da 3 gün boyunca silme banyo uygulamasından hemen önce ve 6 saat sonrasında koltuk altı ve kasıktan sürüntü örnekleri alınmıştır.

Bulgular: Çalışmamıza katılan çocukların %36,7'si (n=22) kız, %63,3'ü (n=38) erkektir. Katılımcıların ortalama yaşı 6,05±5,04 olarak belirlenmiştir. Gruplar arası kalıcı deri florasındaki üreme değişimleri incelendiğinde 1., 2. ve 3. günlerde banyo öncesi ve sonrasında grup I ve grup II arasında anlamlı düzeyde farklılık saptanmıştır (p=0,001). Birinci günde grup I'de kalıcı deri florası anlamlı düzeyde azalırken, 2. ve 3. günlerde ise tamamen yok olmuştur. Grup II'de ise 3 gün boyunca kalıcı deri florası korunmaya devam etmiştir.

Sonuç: Araştırma sonucunda çocuk yoğun bakım ünitesinde yatan çocuklarda %2'lik klorheksidin glukonatlı silme banyosunun

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Conclusion: As a result of the research, it was determined that 2% chlorhexidine gluconate wiping bath in children hospitalized in the PICU significantly reduced the persistent skin flora in the armpits and groin.

Keywords: Microbiota, permanent skin flora, wiping bath, chlorhexidine gluconate, soap-free washing body solution

koltuk altı ve kasıktaki kalıcı deri florasını anlamlı düzeyde azalttığı saptanmıştır.

Anahtar Kelimeler: Mikrobiyata, kalıcı deri florası, silme banyo, klorheksidin glukonat, sabunsuz vücut yıkama solüsyonu

Introduction

It has been found that about 15-20 years ago, the number of microorganisms in the human body was much higher than the human's own cells and the viruses, which are expressed at the quadrillion level, are located in different surfaces and spaces of our body along with approximately 10^{14} bacterial cells.[1] Microbiota is the ecosystem formed by commensal, symbiotic and pathogenic microorganisms (bacteria, eukaryotes, fungi, viruses, archaea, etc.), which are living inside and on the surface of the human body and are non-human cell.

All the genes encoding them are called the microbiome. The microbiota has about 10 times more cells than the human cells. It has been demonstrated in many studies that it is effective in the blood circulation in the tissues they are in and in its environment, immune system, metabolism and bone restructuring.[2,3] Multi-center and comprehensive studies, such as the Human Microbiome Project and the MetaHIT Project, have led to the discovery of important findings in this regard.[4]

It has been determined that microorganisms residing in different body cavities affect human health in various ways and can alter the susceptibility to infection by interacting with the host's immune system, and any change that occurs for any reason leads to pathologies.[1,4] The skin is a critical interface between the human body and its external environment, which prevents moisture loss and prevents the entry of pathogenic organisms. At the same time, the skin flora is an ecosystem that hosts living microorganisms on human skin. It has many functions; it acts as a defense and works as a regulator for the immune system.[5-7]

Flora is generally thought of as two groups; it is known that some microorganisms are "permanent" and some are "temporary" in the environment for a certain period of time. Permanent flora are microorganisms that do not mostly change in certain areas and can regenerate even if they are eliminated for a short time. Permanent flora is generally considered as common, which means that microbes are not harmful and can benefit our bodies. Temporary flora, on the other hand, include the pathogen or non-pathogen microorganisms that can be transmitted from the environment and remain in the body for different periods, besides the permanent flora. When permanent flora members disappear, they are replaced by temporary flora members.[8]

Hygienic care affects the general appearance of the individual and helps him to feel more comfortable. In other words, hygienic care responds to both physical and psychological needs of the person. Bathing of patients constitutes an important part of nursing care. It is a part of the general hygienic care and has a positive/negative effect on the skin flora. Bed bath, which is included in bedside patient care, includes basic purposes such as providing relaxation as well as hygiene of the person. When choosing the solutions used during the bath, care should be taken to ensure that they do not harm the skin, do not deteriorate the skin flora, do not dry the skin and remove dirt.[9-11]

Chlorhexidine is a product developed in the 1940s in research laboratories in England as a result of studies performed to produce an antiviral agent. Introduced as an antiseptic cream in 1953, chlorhexidine has been used since 1957 for the treatment of skin, eye and throat infections and for general disinfection in both humans and animals.[12] In recent years, it is seen that chlorhexidine has been used as an antiseptic cleaning solution in bed baths in hospitals.[13]

In healthy individuals, the flora includes many and different microorganisms. The microbiota, which begins to form immediately after birth, varies according to nutrition, genetics, age, geographical region and climate. Human skin flora may change after infections, antibiotic use, and applications such as various chemicals (antiseptic solutions, soaps, shampoos, etc.). This study was conducted to compare the effects of daily wiping bath with 2% chlorhexidine gluconate and soap-free body wash on the permanent skin flora of children hospitalized in the pediatric intensive care unit.

Research Hypotheses

H_1: Permanent skin flora of children who are applied wiping bath with 2% chlorhexidine gluconate in the pediatric intensive care unit decreases.

H_2: Permanent skin flora of children who are applied wiping bath with a soap-free body wash solution in the pediatric intensive care unit does not change.

Materials and Methods

Participants

The population of the research consisted of children who were admitted to the pediatric intensive care unit for the first time during the research process. At the time of the research, an average of 420 children were hospitalized. In order to determine the size of sample, power analysis was carried out using the G*Power (v3.1.7) program and it was decided to include 30 children in each group, considering that there should be at least 26 children in each group and that there might be losses during the study. The research was carried out between February 2021 and January 2022 in the pediatric intensive care unit of a training and research hospital.

The inclusion criteria for the study were the child's hospitalization in the intensive care unit within the first 24 hours, being hospitalized for internal reasons, having no concomitant disease, receiving no other ongoing treatment, being hospitalized in the pediatric intensive care unit during the data collection process, and parents' willingness to participate in the study. The exclusion criteria were the child's having a history of hospitalization in the intensive care unit, being inconvenient performance of a regular wiping bath every day, hospitalization after surgical procedures, the initiation of antibiotics during the study, having allergy to chlorhexidine gluconate, having conditions in which the skin integrity was impaired (burn, skin disease, etc.), having a history of immunosuppressive agent use containing antibiotics, probiotics or steroids in the last two months, receiving radiotherapy or chemotherapy, having severe septic shock, having tracheostomy, peg, permanent dialysis catheter, etc., parents' not wanting their child to participate in the research or wanting to quit the research while it was ongoing.

None of the participants were excluded from the study during data collection period.

Research Type

The study was a randomized controlled experimental study. The blocked randomization method was used in the randomization of the patients to be included in group I and group II. Based on the numbers obtained from the block randomization performed on the computer, the researcher randomized the children according to the order of hospitalization. The study was carried out as single-blind. The participants did not know which solution to use as a wiping bath.

Variables of the Study

1. Dependent variables of the study: Reproduction status in persistent skin flora.

2. Independent variables of the study: 2% chlorhexidine gluconate, soap-free body cleansing solution.

Data Collection Tools

Child information form: The child diagnosis form, developed by the researcher considering similar studies[4,14-16], consists of questions on demographic information about the child (age, gender, reason for hospitalization, date of hospitalization, etc.).

Wiping bath application chart: The wiping bath application chart was created by the researcher to record information about skin reactions that might occur in the patient during wiping bath and the reproduction status of skin flora in swab samples taken before and after children's bath applications.

Sterile culture swab: Cotton-tipped plastic durable unbreakable swabs are available as sterile in 12x150 mm polypropylene tubes. Culture sticks with sterile swab were used in the study.

Ready to use media plate: Swab samples taken in the study were cultured on Blood Agar base.

Soap-free body wash solution: Soap-free face and body wash solution (Sebamed®) was used for sensitive skin in the study. The product has a pH value of 5.5 for healthy skin to maintain the moisture balance of the skin. It supports and protects the natural barrier function of the skin's natural protective layer.

2% Chlorhexidine gluconate solution: Chlorhexidine, which is a cationic (positively charged) bisbiguanide biocide, has a strong antibacterial effect and is effective against many microorganisms. This makes it ideal for reducing the microbial load on patients' skin and preventing secondary environmental contamination. Chlorhexidine, which has been generally used safely as an antiseptic in recent years, is effective against Gram-positive and Gram-negative bacteria and it has a wide range of effects.[12]

Data Collection

In the study, children in group I (n=30) were performed a wiping bath with 2% chlorhexidine gluconate, which is the routine application of the unit. Before wiping bath, a swab sample was taken from the armpit and groin in a circular manner, covering the entire region, with the help of a sterile swab stick. After taking the sample, the children were applied a wiping bath by the researcher. Necessary materials were prepared before wiping bath. Necessary materials were nonsterile gloves and apron, antiseptic solution containing 2% chlorhexidine gluconate (obtained by diluting 4% chlorhexidine gluconate one to one with warm water), warm water (40 °C), liquid thermometer, kidney tub, hydrophilic gauze, disposable bath towels, clean sheets, clean patient gowns, and dirty laundry bags. The general condition of the child was evaluated. The application to be made for the child was explained and a suitable environment was prepared

considering his/her privacy. Hands were washed; apron and nonsterile gloves were worn. 2/3 of the kidney tub was filled with 40 °C water. The rinsing water was made ready by throwing hydrophilic gauze into the tub. Bed linens were removed, leaving only one sheet on the child, and the child's apron was removed. A swab sample was taken from the right armpit and right groin before the procedure. After the entire body surface under the child's chin was wetted with water, the entire body surface was foamed with 2% chlorhexidine gluconate for 10-15 minutes and washed. The child's body was wiped with hydrophilic gauze in the tub with clear water in the following order, from the clean area to the dirty area. Each gauze was used on one body area; right arm and armpit, left arm and armpit, anterior trunk, right leg, left leg, back, perianal region and groins. After the wiping process was completed, the patient was dried with a disposable bath towel and the gloves were removed. The child was dressed in a clean apron and, if necessary, the bed linen was changed. Dirty tools were removed from the environment. Hands were washed after the procedure. The procedure was recorded in the child's file and on the research data collection forms. The bathing process took 20-30 minutes. A swab sample was taken from the armpit and groin in a circular manner, covering the entire region, with the help of a sterile culture stick at the 6th hour after the wiping bath. The swab sample taken was kept in the transport medium of the swab until it was cultured. After inoculation on blood agar medium, it was kept at +4-8 °C for an average of 18-24 hours. A total of 12 swab samples were taken from each child and from the same regions for 3 days, and the reproductive status in the permanent skin flora was evaluated.

Children in group II (n=30) were performed a wiping bath with a soap-free body wash solution. Before wiping bath, a swab sample was taken from the armpit and groin in a circular manner, covering the entire region, with the help of a sterile swab. After taking the sample, the children were applied a wiping bath by the researcher. The wiping bath process was performed in the same way as it was applied to the children in group I. A swab sample was taken again from the armpit and groin in a circular manner, covering the entire region, with the help of a sterile swab at the 6th hour after the wiping bath. The swab sample taken was kept in the transport medium of the swab until it was cultured. After inoculation on blood agar medium, it was kept at +4-8 °C for an average of 18-24 hours. A total of 12 swab samples were taken from each child and from the same regions for 3 days, and the reproductive status in the permanent skin flora was evaluated.

Statistical Analysis

NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) software was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, median, frequency, percentage, minimum, maximum) were used while evaluating the study data. The Pearson's chi-square test, Fisher's Exact test and McNemar test were used to compare qualitative data. Statistical significance was accepted as $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of University of Health Sciences Turkey, Ümraniye Training and Research Hospital (15.02.2021/28) before starting the study. Before the research, the parents of the participants were informed about the research and written consent was obtained from the parents who agreed to have their children participate in the research. After the ethics committee approval, written permission was obtained from the İstanbul Provincial Health Directorate to conduct the study. The ClinicalTrials (Protocol Registration and Results System) registration number of the trial is NCT04845672.

Results

The study was conducted with a total of 60 children, including 36.7% (n=22) girls and 63.3% (n=38) boys, who were hospitalized in the pediatric intensive care unit. No statistically significant difference was found between the distribution of the groups according to gender ($p>0.05$). There was no statistically significant difference between the groups in age, weight and height measurements ($p>0.05$). The hospitalization period of the cases varied between 3 and 16 days, and the mean duration was determined as 5.92±3.10 days. No statistically significant difference was detected between the groups in terms of the lengths of hospitalization ($p>0.05$). No skin reaction was observed on the 1st, 2nd and 3rd days in any of the children.

In the armpit, there was a significant decrease in the permanent skin flora of the children in the chlorhexidine group compared to the soap-free cleansing solution group after the bathing on the 1st day compared to that in the pre-bathing period ($p=0.001$). On the 2nd and 3rd days, there was no statistically significant difference between the rates of reproduction after bathing and the rates before bathing ($p>0.05$), that is, the negative change in the permanent skin flora continued in the children in the chlorhexidine group compared to those in the soap-free cleansing solution group (Table 1, Figure 1).

In the groin, there was a significant decrease in the permanent skin flora of the children in the chlorhexidine group compared to the children in the soap-free cleansing solution group after the 1st day bath, compared to the pre-bath period ($p=0.001$). On the 2nd and 3rd days, there was no statistically significant difference between the growth rates after bathing and

rates before bathing (p>0.05), that is, the negative change in the permanent skin flora continued in the children in the chlorhexidine group compared to those in the soap-free cleansing solution group (Table 2, Figure 1).

Discussion

This randomized controlled experimental study was conducted to compare the effects of daily wiping bath with 2% chlorhexidine gluconate and soap-free body wash solution on the permanent skin flora of children hospitalized in the pediatric intensive care unit. In the literature, there are studies in which antiseptic solution containing chlorhexidine gluconate or soap is diluted in various proportions and used in different samples.[17-21] When these studies were examined, it was observed that the richness and diversity of skin flora decreased in patients who were daily bathed with chlorhexidine gluconate when compared with controls and/or pre-CG bathing sampling.[22-28] In our country, the number of studies using chlorhexidine gluconate in bathing is quite limited.[16,29-30]

Milstone et al.[22] reported that hand washing with chlorhexidine reduced the skin flora on the hand by 86-92%. In addition, chlorhexidine was shown to have residual activity that inhibited regrowth of persistent organisms on the skin and prolonged the duration of skin antisepsis.[22] In an experimental study conducted to determine the effect of preoperative skin preparation procedures performed by nurses in abdominal surgery on postoperative surgical site infection (SSI), Dizer et al.[29] found that skin preparation with a shaver the night before the operation and a 50 mL chlorhexidine bath performed twice in the preoperative period, excluding the head area, were useful in decreasing postopeative SSI. The strongest evidence for decolonization was for use among surgical patients as a strategy to prevent SSIs.[30] In a quasi-experimental study of 2% chlorhexidine gluconate-impregnated wipes that did not require rinsing Popovich et al.[17] showed that chlorhexidine gluconate concentrations were inversely proportional to Gram-positive colony counts in the skin of intensive care patients and were associated with decreased colony counts. However, the presence of chlorhexidine gluconate was detected in the skin for up to 24 hours.[17] Karki and Cheng[18] reviewed quasi-experimental/experimental studies conducted to evaluate the effect of body bath or skin cleansing with chlorhexidine gluconate-impregnated wipes on preventing healthcare-associated infections and colonization, and in line with the results, the use of chlorhexidine gluconate application that did not require rinsing was shown to significantly reduce the risk of Healthcare Associated Infection, Vancomycin-Resistant Enterococci, Methicillin-Resistant *Staphylococcus aerous* colonization, but not infection. Cassir et al.[13] examined the

Table 1. Comparison of changes in permanent skin flora in the armpits before and after bathing in bathing groups

Armpit			Bathing group							
			Before chlorhexidine bath				Before soap free washing solution bath			
			Reproduction (+) n (%)	Reproduction (-) n (%)	Total n (%)	p	Reproduction (+) n (%)	Reproduction (-) n (%)	Total n (%)	p
1st day	After bathing	Reproduction (+)	2 (6.7)	0 (0.0)	2 (6.7)	K=0.016	30 (100.0)	0 (0.0)	30 (100)	-
		Reproduction (-)	25 (83.3)	3 (10.0)	28 (93.3)	[c]**0.001***	0 (0.0)	0 (0.0)	0 (0.0)	-
		Total	27 (90.0)	3 (10.0)	30 (100)		30 (100)	0 (0.0)	30 (100)	
		Change (+)	25 (83.3)				0 (0.0)			[a]**0.001***
2nd day	After bathing	Reproduction (+)	0 (0.0)	0 (0.0)	0 (0.0)	-	30 (100.0)	0 (0.0)	30 (100)	-
		Reproduction (-)	3 (10.0)	27 (90.0)	30 (100)	-	0 (0.0)	0 (0.0)	0 (0.0)	-
		Total	3 (10.0)	27 (90.0)	30 (100)		30 (100)	0 (0.0)	30 (100)	
		Change (+)	3 (10.0)				0 (0.0)			[b]**0.237**
3rd day	After bathing	Reproduction (+)	0 (0.0)	0 (0.0)	0 (0.0)	-	29 (96.7)	0 (0.0)	29 (96.7)	-
		Reproduction (-)	1 (3.3)	29 (96.7)	30 (100)	-	1 (3.3)	0 (0.0)	1 (3.3)	-
		Total	1 (3.3)	29 (96.7)	30 (100)		30 (100)	0 (0.0)	30 (100)	
		Change (+)	1 (3.3)				1 (3.3)			[b]**1.000**

[a]Pearson's chi-square test, [b]Fisher's Exact test, K: Kappa coefficient, [c]McNemar test, *p<0.01

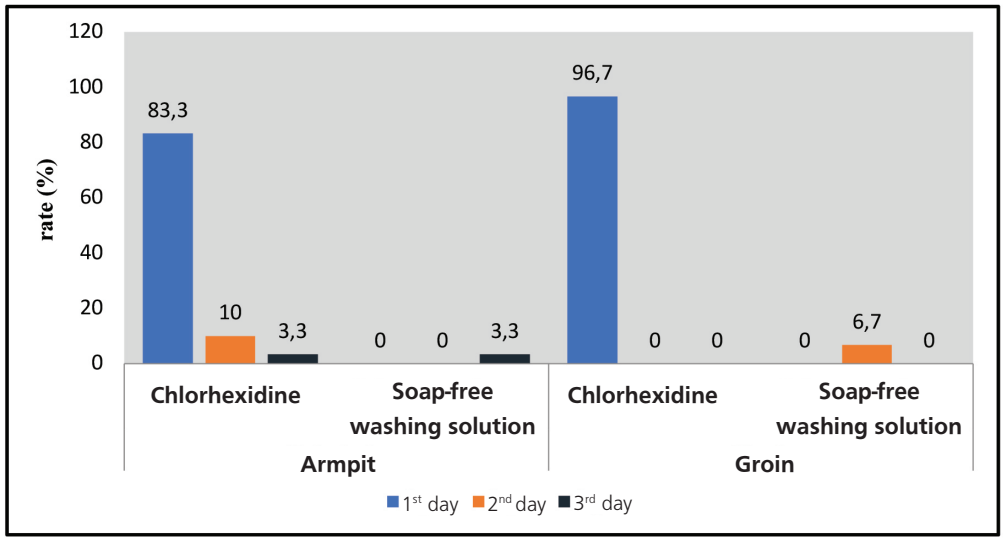

Figure 1. Changes in permanent skin flora before and after bathing according to follow-up days

effect of daily chlorhexidine bath on skin microbiota and bacterial diversity in the skin of patients hospitalized in the intensive care unit, and they mentioned that the skin was a carrier for bacterial pathogens in patients in the intensive care unit. In the study, the risk of colonization with Gram-negative bacteria was found to be higher in the water and soap group. On the other hand, in the chlorhexidine gluconate group, a decrease in bacterial diversity was observed on the skin.[13] In the study of Burnham et al.[24], chlorhexidine gluconate used for decolonization and infection prevention was shown to change the permanent skin flora. Due to its broad spectrum of action, chlorhexidine gluconate may disrupt the health-related persistent flora balance on the skin, which is an important component of colonization resistance to multidrug-resistant organisms, and culture-based studies have shown an overall reduction in microbial density.[26,28] In the cross-design experimental research conducted by Tarakçıoğlu Çelik[16] to evaluate the effect of chlorhexidine gluconate bath on the colonization of Vancomycin-Resistant Enterococci, Methicillin-Resistant *Staphylococcus aerous* in hematology-oncology patients hospitalized in the intensive care unit, it was concluded that wiping bath with chlorhexidine gluconate was effective in reducing nasal methicillin-resistant *Staphylococcus aerous* colonization and rectal Vancomycin-Resistant Enterococcus colonization.[16] In some studies on the use of chlorhexidine gluconate, it has also been observed that patients have persistent Candida auris colonization for long periods of time, despite routine 2% chlorhexidine gluconate bathing.[25,27] In an experimental study examining the effect of bathing with chlorhexidine gluconate on the skin microbiota of adult and pediatric patients, no difference was observed in pediatric patients; however, adults who bathed with chlorhexidine gluconate were found to have significantly reduced beneficial bacteria as well as numerous pathogenic bacteria species.[21]

In summary, when the results of these studies[16-18,21-30] in the literature are examined, it has been found that chlorhexidine gluconate reduces the diversity of the body's permanent skin flora as well as harmful microorganisms. The results are in parallel with our study. The children in our study group were those who were hospitalized and treated in the pediatric intensive care unit for internal reasons. In terms of affecting children's response to treatment, length of hospital stay and immunity, it is very important to preserve the permanent skin flora in these children.

Study Limitations

In our study, patients who were previously admitted to the intensive care unit but then taken to the pediatric intensive care unit as a result of surgical operation, children who received radiotherapy, chemotherapy drugs and antibiotics, and children with tracheostomy or percutaneous endoscopic gastrostomy were not included in the study because changes that may have occurred in the permanent skin flora of such patients before the study would also negatively affect the results of our study and it would be impossible to distinguish whether the changes in the skin flora were caused by these factors or the bathing methods we applied. Therefore, eliminating such confounding factors beforehand increased the reliability of our study results. This situation reveals the strength of our study.

The ambient temperature of the intensive care unit during the bathing process was 22 °C on average. In order for the children not to feel cold during the wiping bath, after one area was wiped, the children were partially covered with sheets before moving on to the other area. The limitation

Table 2. Comparison of changes in permanent skin flora of the groin before and after bathing in bathing groups

Groin		Bathing group							
		Before chlorhexidine bath				Before soap free washing solution bath			
		Reproduction (+) n (%)	Reproduction (-) n (%)	Total n (%)	p	Reproduction (+) n (%)	Reproduction (-) n (%)	Total n (%)	p
1st day	Reproduction (+)	1 (3.3)	0 (0.0)	1 (3.3)	K=0.001	26 (86.7)	0 (0.0)	26 (86.7)	K=1.000
	Reproduction (-)	29 (96.7)	0 (0.0)	29 (96.7)	-	0 (0.0)	4 (13.3)	4 (13.3)	**[c]1.000**
	Total	30 (100)	0 (0.0)	30 (100)		26 (86.7)	4 (13.3)	30 (100)	
	Change (+)	29 (96.7)				0 (0.0)			**[a]0.001****
2nd day	Reproduction (+)	0 (0.0)	0 (0.0)	0 (0.0)	-	24 (80.0)	1 (3.3)	25 (83.3)	K:0.889
	Reproduction (-)	0 (0.0)	30 (100)	30 (100)	-	0 (0.0)	5 (16.7)	5 (16.7)	**[c]1.000**
	Total	0 (0.0)	30 (100)	30 (100)		24 (80.0)	6 (20.0)	30 (100)	
	Change (+)	0 (0.0)				2 (6.7)			**[b]0.492**
3rd Day	Reproduction (+)	0 (0.0)	0 (0.0)	0 (0.0)	-	25 (83.3)	0 (0.0)	25 (83.3)	K:1.000
	Reproduction (-)	0 (0.0)	30 (100)	30 (100)	-	0 (0.0)	5 (16.7)	5 (16.7)	**[c]1.000**
	Total	0 (0.0)	30 (100)	30 (100)		25 (83.3)	5 (16.7)	30 (100)	
	Change (+)	0 (0.0)				0 (0.0)			-

After bathing / After bathing / After bathing

[a]Pearson's chi-square test, [b]Fisher's Exact test, K: Kappa coefficient, [c]McNemar test, *p<0.01

of the study is that the ambient temperature could not be increased due to the available resources.

Conclusion

In this study, it was determined that wiping bath with 2% chlorhexidine gluconate in children hospitalized in the pediatric intensive care unit significantly reduced the normal skin flora in the armpits and groin. As seen in this and many similar studies, it has been observed that chlorhexidine gluconate negatively affects the barrier function of the skin by reducing the diversity of the body's permanent skin flora as well as harmful microorganisms.

Implications for Nursing Practices

When many studies and our study are examined, it has been found that chlorhexidine gluconate reduces the diversity of the body's permanent skin flora. In routine practice, wiping bath with 2% chlorhexidine gluconate is used in some pediatric intensive care units to reduce and prevent infections. However, improper use of chlorhexidine can damage the skin, especially sensitive skin. Skin hygiene is one of the basic nursing interventions applied in the care of patients in pediatric intensive care units. The care given to children is extremely important in terms of preventing complications that may develop due to hospitalization in the intensive care unit. As a result of our study, it is thought that it will guide the use of the most appropriate and effective material in wiping bath/skin hygiene in patients hospitalized in the pediatric intensive care unit, thus contributing to safe and quality patient care. However, in line with the findings obtained in this study, it is not recommended to routinely use 2% chlorhexidine gluconate in wiping bath because it disrupts the normal skin flora and negatively affects the protective function of the skin and is a chemical product, and it should be used by nurses without forgetting that it affects the permanent skin flora.

As a result of our study, it is recommended to organize regular in-service training programs for pediatric intensive care nurses for the prevention of skin microbial colonization, to carry out studies evaluating growth by using chlorhexidine gluconate at different intensities, and to conduct new studies in similar/different sample groups using products such as lavender oil, vinegar, baking soda, clove oil etc., the positive outcomes of which are reported in the literature, instead of soap-free body wash solution.

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Information: This study was presented as an oral presentation at the congress stated below.

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Ethics

Ethics Committee Approval: Ethical approval was obtained from the Ethics Committee of University of Health Sciences Turkey, Ümraniye Training and Research Hospital (15.02.2021/28) before starting the study.

Informed Consent: The parents of the participants were informed about the research and written consent was obtained from the parents who agreed to have their children participate in the research.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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

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

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The Significance of Lung Ultrasonography in Children with COVID-19

Çocuklarda COVID-19 Enfeksiyonunda Akciğer Ultrasonografinin Önemi

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Abstract

Introduction: The infection of new Coronavirus disease-2019 (COVID-19) continues to affect both adults and children worldwide. Although there are studies of adult patients with COVID-19 that defined ultrasound findings, there is limited data available on the diagnostic use of ultrasonography in children. This study is aimed to evaluate the results of bedside lung ultrasonography (LUS) performed in pediatric patients with COVID-19.

Methods: The study included pediatric patients who were diagnosed with COVID-19. All lung areas were visualized on LUS and evaluated together with demographic, clinical, and laboratory data, and chest X-ray (CXR) findings.

Results: An evaluation was made of 102 pediatric patients, comprising 54 girls and 48 boys with a mean age of 9.65±4.78 (min 35 days-max 17) years. Forty-six percent of the patients had respiratory system symptoms, 36% were asymptomatic, and 18% had symptoms other than in the respiratory system. Pathologic findings were determined on CXR in 36% of patients, and on LUS in 57%. The difference in the detection rate of pathologic findings between LUS and CXR was statistically significant (p=0.001). Pathology was observed on LUS in 29 of 65 patients with normal CXR. The sensitivity rate for detecting pathology in patients with respiratory symptoms was 49% on CXR and 77% on LUS (p=0.001).

Conclusion: We determined that the sensitivity of LUS is higher than CXR in demonstrating lung involvement in patients with COVID-19 with respiratory symptoms. LUS may be helpful in the evaluation of pediatric patients with COVID-19 but more studies are needed to prove its feasibility in children.

Keywords: Lung, ultrasound, pediatric, COVID-19, emergency

Öz

Giriş: Yeni Koronavirüs hastalığı-2019 (COVID-19) enfeksiyonu dünya çapında hem yetişkinleri hem de çocukları etkilemeye devam etmektedir. COVID-19'lu yetişkin hastalarda ultrasonografi bulgularını tanımlayan çalışmalar olmasına rağmen, çocuklarda ultrasonografinin tanısal kullanımına ilişkin sınırlı veri mevcuttur. Bu çalışmada, COVID-19'lu çocuk hastalarda yapılan yatak başı akciğer ultrasonografisi (LUS) sonuçlarının değerlendirilmesi amaçlanmaktadır.

Yöntemler: Çalışmaya COVID-19 tanısı almış çocuk hastalar dahil edildi. Tüm akciğer alanları LUS ile görüntülendi ve demografik, klinik ve laboratuvar verileri ve akciğer grafisi (CXR) bulguları ile birlikte değerlendirildi.

Bulgular: Yaş ortalaması 9,65±4,78 (en az 35 gün-en fazla 17) yıl olan 54 kız ve 48 erkek olmak üzere 102 çocuk hasta değerlendirildi. Hastaların %46'sında solunum sistemi semptomları, %36'sı semptomsuz ve %18'inde solunum sistemi dışında semptomlar vardı. Hastaların %36'sında CXR'de, %57'sinde LUS'de patolojik bulgular saptandı. LUS ve CXR arasındaki patolojik bulguların saptanma oranlarındaki fark istatistiksel olarak anlamlıydı (p=0,001). CXR'si normal olan 65 hastanın 29'unda LUS'de patoloji gözlendi. Solunum semptomları olan hastalarda patolojiyi saptamadaki duyarlılık oranı CXR'de %49 ve LUS'de %77 idi (p=0,001).

Sonuç: Solunum semptomları olan COVID-19 hastalarında akciğer tutulumunu göstermede LUS'nin duyarlılığının CXR'den daha yüksek olduğunu belirledik. LUS, COVID-19'lu çocuk hastaların değerlendirilmesinde yardımcı olabilir, ancak çocuklarda uygulanabilirliğini kanıtlamak için daha fazla çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: Akciğer, ultrasonografi, çocuk, COVID-19, acil

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Introduction

Severe acute respiratory syndrome-coronavirus-2 virus emerged in Wuhan, China, at the end of 2019, and was found to be the agent of the novel Coronavirus disease-2019 (COVID-19), which then spread rapidly across the world. In March 2020, COVID-19 was declared a global pandemic and the infection continues to affect both adults and children worldwide. Respiratory problems are very common, and the symptoms of COVID-19 can range from mild clinical symptoms to acute respiratory distress syndrome and may even result in life-threatening multiorgan failure.[1] Throughout the pandemic, physicians have been searching for appropriate diagnostic methods to diagnose or exclude COVID-19 in patients.[2] Although reverse transcription-polymerase chain reaction (RT-PCR) has become the standard diagnostic tool for COVID-19, it only has a sensitivity of 70%.[3] Although computed tomography (CT) is considered the gold standard as the most rational and specific radiologic method for the diagnosis of COVID-19, it cannot be routinely used on children due to the high radiation content.[4] Therefore, chest X-ray (CXR) has become the preferred imaging method for pediatric patients because it is readily available, provides rapid results, and has lower radiation content than chest CT.

Ultrasound is a non-invasive imaging technique, which is widely used in pediatric emergency departments, and lung ultrasound (LUS) can be used as a reasonable alternative to CXR in the diagnosis of COVID-19. Most of the data related to LUS has been reported to be of benefit in detecting pulmonary pathology in adult patients with COVID-19, and there is little information about the role of LUS in the diagnosis and management of pediatric patients with COVID-19.[5-7] This study is aimed to compare LUS and CXR in respect of the accuracy rates of COVID-19 diagnosis in children.

Materials and Methods

This prospective observational study was conducted between November 2020 and December 2020 in the Pediatric Emergency Department of a tertiary level pediatric referral pandemic hospital in Ankara City Hospital with an average of 75,063 annual pediatric emergency visits, 6750 of them were COVID-19 positive. Ethics Committee approval was obtained for the study (Ankara City Hospital date: 14/10/2020, number: 1170). Informed consent for participation in the study was obtained from the parents or legal guardians of all the patients. The study was conducted with a convenience sample that included both symptomatic and asymptomatic patients aged <18 years with a confirmed diagnosis of COVID-19 and admitted to the hospital by the on-duty physician who performed the ultrasounds. Sample CXR is taken in the routine evaluation of COVID-19, and LUS was also performed on all the current study patients. Data were recorded in respect of age, sex, clinical symptoms and signs on presentation, comorbidities, laboratory test results [hematology parameters, standard C-reactive protein (detection limit 5 mg/L)], radiologic results, and supportive treatment administered on hospital admission. All the medical diagnostic procedures were performed as part of the standard clinical care.

On confirmation of COVID-19 positivity, LUS was performed irrespective of the patient's symptoms. Cases, where suspicion was based on symptoms and/or clinical history, were confirmed through nasopharyngeal PCR before inclusion in the study. Patients were excluded from the study if they were aged <1 month or ≥18 years, if they had comorbidities of chronic lung disease, congenital heart disease, immunodeficiency, congenital or anatomical defects of the airway, or if their parents were not willing to participate in the study.

The patients were assessed according to the symptoms and classified as asymptomatic, if they are with respiratory symptoms (the presence of fever with nasal congestion, tachypnea, dyspnea, cough, or chest pain), and patients with non-respiratory symptoms (fatigue, weakness, sore throat, nausea, vomiting, diarrhea, fatigue, headache). The severity of the disease was defined according to the clinical symptoms and CXR imaging. Disease severity was classified as asymptomatic infection (no clinical sign or symptom, CXR normal), mild (symptoms of upper respiratory tract infection, congestion of the pharynx, no auscultatory abnormalities), moderate (pneumonia, frequent fever, cough, and auscultatory abnormalities with wheezing or rales, and patients with no clinical signs or symptoms, but subclinical lung lesions on CXR), or severe/critical disease [obvious hypoxemia requiring respiratory support (invasive or non-invasive) and intensive care].[8]

All CXR findings were quantitatively evaluated using a 5-point scoring system, which is detailed in reference[9]; score 1: Normal, score 2: Patchy atelectasis and/or hyperinflation and/or bronchial wall thickening, score 3: Focal alveolar consolidation involving no more than one segment or one lobe, score 4: Multifocal consolidation, and score 5: Diffuse alveolar consolidation. Two pediatric emergency physicians with 8 years of experience in pediatric emergency, who were blinded to the all patient's data and LUS findings of patients evaluated the CXR scoring according to this 5-point scoring system. Both specialist physicians' joint decisions was accepted as scoring results. The CXR was considered positive if the score result was 2, 3, 4, or 5.

LUS was performed on all patients in the pediatric emergency department by only one same pediatric emergency physician

with 3 years of point-of-care ultrasound experience, who was blinded to all clinical information such as symptoms, history, other diagnostic tests, outcomes, and findings of CXR. Serial images and video records were obtained from LUS performed with an 7.5-11 MHz linear array transducer. Following the COVID-19 lung ultrasound in emergency department protocol, an examination was made of each hemithorax in six intercostal spaces of the superior and inferior sections of the anterior, lateral, and posterior regions.[10] LUS was performed using a posterior approach with the patient seated or held in the mother's arms, depending on their age. All the necessary precautions were taken against infection transmission including the wearing of personal protective equipment by the operator. The probe was covered with a single-use plastic sheath and the US device was disinfected after each patient to prevent the spread of the virus. Approximately 10-fifteen minutes per patient was allocated for all these procedures.

In the LUS examination of each child, an evaluation was made of the presence of pleural irregularities, subpleural consolidations, B-lines, patchy areas of the white lung, and pleural effusions. The lung was accepted as normal with the visualization of multiple horizontal A-lines (reverberation artifacts of the pleural line appear as a hyperechoic parallel line to the pleural, horizontal artifacts) with normal sliding of the pleural line. B-lines or comet-tail artifacts were defined as hyperechoic vertical lines arising from the pleural line and moving with sliding lung (representing interstitial syndrome) and erased A-lines.

The LUS features were evaluated using the following scores (10); 0: Normal lung sliding, regular pleural line, A-lines with <3 B-lines per vertical inter-costal space, 1: Irregular or thickened pleura and/or ≥3 B-lines, 2: Confluent B-lines, and/or subpleural consolidations (height <1 cm), 3: Confluent B-lines appearing as a "white lung" and/or subpleural consolidations (height ≥1 cm), and 4: Pleural effusion.

Statistical Analysis

Data obtained in the study were analyzed statistically using the Statistical Package for the Social Sciences for Windows Version 20.0 software. Conformity of the data to normal distribution was assessed using the Kolmogorov-Smirnov. Categorical variables were stated as frequency (n) and percentage (%). Continuous variables with normal distribution were stated as mean ± standard deviation values, and those not showing normal distribution as median (minimum-maximum) values. The chi-square test was used in the comparisons of categorical variables, Student's t-test was used in the comparisons of quantitative data with normal distribution, and the Mann-Whitney U test was used in comparisons of continuous variables without normal distribution. The MedCalc Statistical Software was used for the calculations of sensitivity, specificity, and positive and negative predictive values for CXR and LUS. When calculating sensitivity, specificity, and predictive values the CXR was considered negative if the score was 1 and positive if the score was 2, 3, 4, or 5. The LUS was considered negative if the score was 0, and positive if the score was 1, 2, 3, or 4. All statistical tests were two-tailed and a value of $p<0.05$ was considered statistically significant.

In a similar study, the sensitivity of LUS in COVID-19 infection was found to be 88.9%, and the sensitivity of CXR was 51.9%.[11] To determine the appropriate sample size required according to these rates, a power analysis was conducted. To obtain sufficient power (0.80) at the α=0.05 level of significance, a sample size of 46 patients was required.

Results

From the initial enrollment of 114 children, 12 were excluded from the study analyses because of comorbidities (chronic lung disease and congenital heart diseases) or unavailable CXR (Figure 1). Thus, an evaluation was made of 102 children with confirmed COVID-19, comprising 54 girls and 48 boys with a median age of 10 (min: 35 days-max: 17) years. The demographic data and clinical findings of all the patients in the study are shown in Table 1. Of the total patients, 24 were hospitalized, 15 of whom had respiratory symptoms and nine had non-respiratory symptoms. Clinically, the classification of the disease was moderate with respiratory symptoms in six patients, and these patients received oxygen and antibiotic treatments. In nine patients who were classified as mild, monitoring without treatment was performed. None of

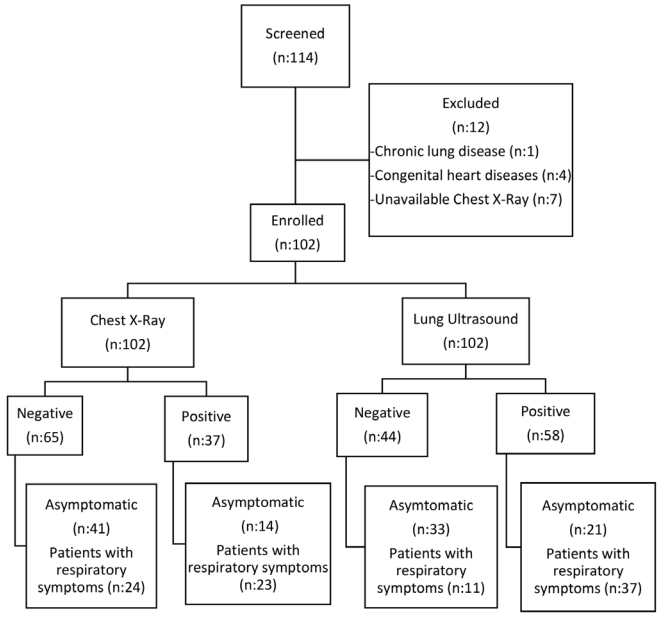

Figure 1. Flow chart documenting participants included in the study

the patients required invasive or non-invasive ventilation. According to the laboratory test results, leukopenia was determined in 55 patients, lymphopenia in 32, and a slight alteration in C-reactive protein levels in 20 patients. During hospitalization, all patients were stable, and all were discharged after follow-up.

CXR was performed on all patients. The CXR images were categorized as normal (score 1) in 65 patients. Abnormal CXR findings were detected in 37 patients (score 2; patchy atelectasis and/or hyperinflation and/or bronchial wall thickening) (Figure 2). Of the 65 patients with a normal radiograph, 41 (63.1%) were asymptomatic, and of the 37 patients with abnormal CXR, 14 (37.8%) were asymptomatic, 20 (54.0%) had mild disease, and three (8.2%) had moderate disease. The radiologic findings were unilateral in 12 (32%) patients (8 right, 4 left) and bilateral in 25 (68%) patients.

All patients underwent LUS without any problems. The time taken to perform LUS was 5-10 minutes. A normal pattern (score 0) was seen on LUS in 44 patients (Figure 3), and abnormalities were determined in 58. In 40 patients, the score was 1 (irregular or thickened pleura and/or ≥3 B-lines) (Figure 4), and the score was 2 in 15 patients (confluent B-lines and/

Table 1. Demographic and clinical findings in a series of 102 children with COVID-19

	Number of patients (%) (n=102)
Age, (median) (min-max)	10 years (35 days-17 years)
Gender	
Female	54 (52.9%)
Male	48 (47.1%)
Symptoms, n (%)	
Respiratory	47 (46.0%)
Non-respiratory	18 (17.6%)
Asymptomatic	37 (36.4%)
Cough	43 (43.1%)
Fever	30 (29.4%)
Fatigue	13 (12.7%)
Headache	10 (9.8%)
Sore throat	7 (6.9%)
Dyspnea	6 (5.9%)
Noisy	5 (4.9%)
Myalgia	5 (4.9%)
Diarrhea	4 (3.9%)
Abdominal pain	4 (3.9%)
Other (loss of smell and taste, joint pain, eye pain)	10 (9.8%)
Duration of symptoms (mean ± SD) (min-max)	2.69±1.43 (2-7) days
Lung disease severity	
Mild	41 (40.2%)
Moderate	6 (5.9%)
Severe	0 (0%)
Laboratory findings, n (%)	
Neutropenia	55 (53.9%)
Lymphopenia	32 (31.3%)
High CRP	20 (19.6%)
Chest X-ray findings	
Normal	65 (63.7%)
Anormal (patchy atelectasis and/or hyperinflation and/or bronchial wall thickening)	37 (36.3%)
Lung ultrasound findings	
Normal (A-line, normal sliding, <3 B-lines per vertical inter-costal space)	44 (43.1%)
Score 1 (Irregular or thickened pleura and/or ≥3 B-lines)	40 (39.3%)
Score 2 [Confluent B-lines and/or subpleural consolidations (height <1 cm)]	15 (14.7%)
Score 3 (Confluent B-lines appearing as a "white lung" and/or subpleural consolidations (height ≥1 cm)	3 (2.9)

COVID-19: Coronavirus disease-2019, SD: Standard deviation

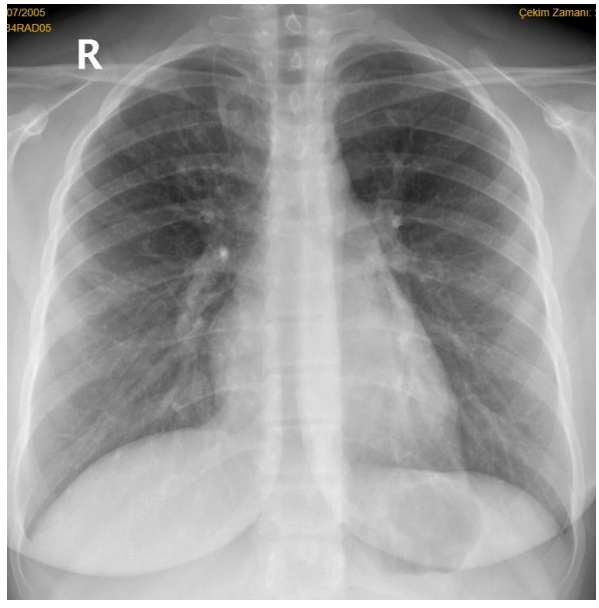

Figure 2. Abnormal chest X-ray image with bronchial wall thickening

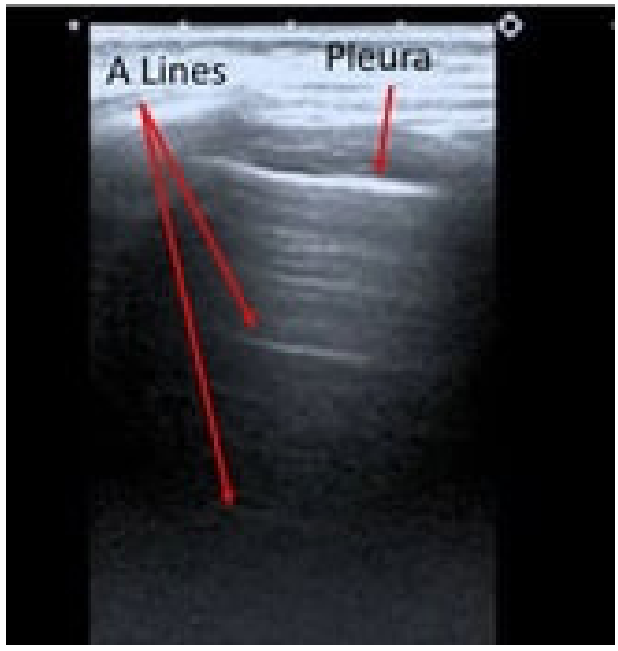

Figure 3. Normal lung ultrasound image with a regular pleural line and A-lines

or subpleural consolidations, height <1 cm) (Figure 5), and the score was 3 in three patients (confluent B-lines appearing as a "white lung" and/or subpleural consolidations, height ≥1 cm) (Figure 6). No patient presented with pleural effusion that required mechanical ventilation or admittance to the intensive care unit. Of the 58 patients with LUS abnormalities, 21 (36.2%) were asymptomatic, 33 (56.9%) had mild disease, and four had moderate disease (6.9%). No statistically significant difference was determined between patients with mild disease and those with moderate disease in respect of the LUS scores. Involvement of only the right lung was determined in 14 (24.2%) patients, only the left lung in five (8.6%), and both lungs in 39 (67.2%) patients. The infection was seen to be diffuse in the anterior, lateral, and posterior sections of the lung in four (6.9%) patients and only in the posterior section in the remainder (93.1%).

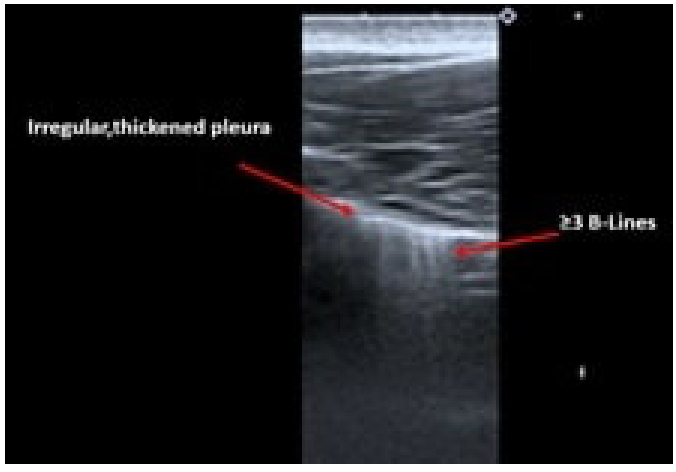

Figure 4. Abnormal lung ultrasound image (score 1) with irregular and thickened pleura and/or ≥3 B-lines

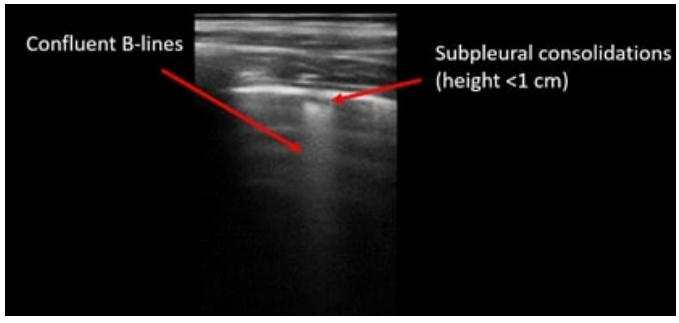

Figure 5. Abnormal lung ultrasound image (score 2) with confluent B-lines, and subpleural consolidations (height <1 cm)

All the CXR and LUS imaging findings are shown in Table 1. Pathologic findings were determined on CXR in 36% of patients, and on LUS in 57%. The difference in the detection rate of pathologic findings between the two imaging modalities was statistically significant (p=0.001). The radiologic findings were determined to be concordant in 29 of 102 patients, and despite a normal CXR in another 29 patients, there was an interstitial B-lines pattern on LUS (grade 1 in 24 and grade 2 in five). In total, eight patients with abnormal CXR were not identified with LUS. Of the 47 patients with respiratory symptoms, the LUS examination showed signs of pulmonary involvement in 36 (77%). The sensitivity in the diagnosis of lung abnormalities in the patients with COVID-19 with respiratory symptoms was determined as 77% [95% confidence interval (CI) 62-88] for LUS and 49% (95% CI: 34-64) for CXR. The specificity values of LUS and CXR were 60% (95% CI: 46-73) and 74% (95% CI: 61-85), respectively. The diagnostic performance comparisons of CXR and LUS are summarized in Table 2. A statistically significant difference was determined between CXR and LUS in respect of sensitivity (p=0.001).

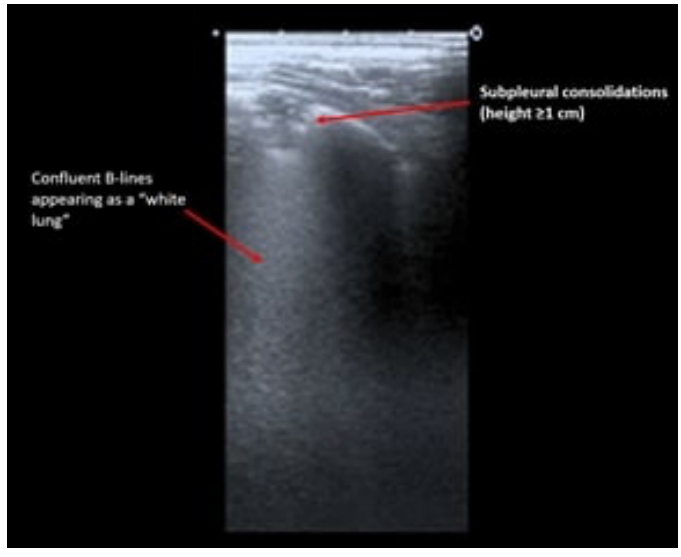

Figure 6. Abnormal lung ultrasound image (score 3) with confluent B-lines appearing as a "white lung" and subpleural consolidations (height ≥1 cm)

Table 2. Comparison of the lung ultrasound and chest X-ray in detection of COVID-19-related lung abnormalities in patients with respiratory symptoms

	Chest X-ray	Lung ultrasound	p
Sensitivity	49% (95% CI 34-64)	77% (95% CI 62-88)	0.001
Specificity	74% (95% CI 61-85)	60% (95% CI 46-73)	0.07
Positive predictive value	62% (95% CI 48-73)	62% (95% CI 53-70)	-
Negative predictive value	63% (95% CI 55-70)	75% (95% CI 63-84)	-

COVID-19: Coronavirus disease-2019, CI: Confidence interval

Chest CT was performed because of symptoms of dyspnea in four patients, two of whom with mild COVID-19 had no abnormal chest CT lung findings, and abnormal findings of ground-glass opacity were determined in the other two children with moderate COVID-19. These findings were compatible with the LUS findings.

Discussion

Imaging has a highly important role in the diagnosis of COVID-19.[12] Although COVID-19 guidelines are well established for adults, data related to the radiologic features of children with COVID-19 remain limited. Chest CT has been suggested to be the most sensitive method for the diagnosis of COVID-19 in adults. RT-PCR positivity of 30-60% has been reported in COVID-19 diagnosis in adults, and 97% sensitivity of chest CT.[13] Considering the adverse effects of ionizing radiation, pediatricians must choose the best radiologic options in terms of benefit and harm. There are several restrictions to the use of chest CT scans in children, including the increased risk of radiation-induced cancer, the rational use of resources, and the risk of contagion to healthy personnel, without providing any additional benefit to the child. It is thought that chest CT may not be necessary for the evaluation of disease severity in children because COVID-19 is relatively mild in children compared with adults, and pediatric patients with COVID-19 have been reported to have a better prognosis with very low mortality.[14-18] Therefore, the use of chest CT is avoided for screening children with COVID-19. The current study results specifically revealed that children were more often classified as asymptomatic or mild, although some studies have reported that moderate cases were more prevalent.[19,20] There have been very few reports of respiratory complications such as dyspnea and hypoxemia and there are limited data in respect of the frequency and extent of lung involvement in pediatric COVID-19.[21] In the current series, 46% of the children had respiratory symptoms, and the most common symptom was cough.

Although some guidelines have been created for the diagnosis, treatment, and prevention of COVID-19 in children,[22-24] there is no consensus on which imaging modality is most appropriate for the evaluation of the extent of lung involvement in children. CXR has been traditionally used as the preferred imaging modality for lower respiratory diseases in children, accordingly, CXR is generally performed in pediatric cases of COVID-19.[12] Previous case series have reported that despite COVID-19 positivity, most children had no findings on CXR, and a normal CXR was seen in most patients with a mild presentation of COVID-19.[20,25,26] In the current study cohort, 36.9% of symptomatic children had a normal radiograph, which was consistent with the literature.[12] This study confirmed that patchy atelectasis and/or hyperinflation and/or bronchial wall thickening were frequent findings in pediatric COVID-19, and these findings were more frequently identified bilaterally in patients on CXR. The inferior sections were seen to be the most affected area. Chest CT was performed in four patients and not performed in the remainder as there was no clinical requirement. Children must be protected from radiation, so if a child is generally well, not performing chest CT can be considered not to be of any clinical significance.

It has been reported to be significant that the auscultatory findings of COVID-19 may be subtle or normal even in the presence of advanced lower airway disease, and screening with CXR may not be sufficient.[27] Therefore, LUS may be of benefit in the evaluation of lung involvement in pediatric cases of COVID-19. Performing LUS in patients with COVID-19 pneumonia has several advantages, including that it is low-cost, readily available, portable, user-friendly, easy to disinfect, and provides accurate, high-quality examinations in the assessment of the progression of pulmonary pathology, without exposure to ionizing radiation.[14] Although there are studies of adult patients with COVID-19 which defined ultrasound findings, there is still a lack of data related to the role of LUS in the diagnosis and management of children with COVID-19.[12,28-30] In a study by Musolino et al.[31], it was reported that in the evaluation of suspicious cases, LUS could support the diagnosis and could be of benefit in the follow-up of patients. Studies in the literature evaluating the CXR and LUS findings in children are few and have only included small patient series. LUS findings are more sensitive than CXR and can successfully identify two-thirds of abnormal cases.[32-34] Most studies in the literature have given sensitivity and specificity for comparing two diagnostic techniques in COVID-19. In the studies, the sensitivity rates were 80.6% (69.1 to 88.6) and 86.4% (72.7 to 93.9) for CXR and LUS, the specificity rates were 71.5% (59.8 to 80.8) and 54.6 (35.3 to 72.6 for CXR and LUS, respectively. In the literature, while the sensitivity of LUS was higher, its specificity was found to be lower than CXR, similar to our study.[35] In the current study with a greater number of patients, LUS was determined to have good accuracy in detecting lung abnormalities compared with CXR. Based on these results, it can be considered that LUS could have a major role in the management of children with COVID-19, irrespective of the presence of respiratory symptoms, because it can be used at the bedside, and it is non-invasive, fast, reproducible, and does not involve radiation.

Peripheral lung lesions, which are easily detected on LUS, are characteristic findings of COVID-19.[31,36,37] In studies of adult patients, the most frequently observed LUS findings have been reported to be separate or confluent B-lines, and thick irregular pleural and subpleural consolidations.[38-40] The most predominant pattern is subpleural consolidations <1 cm, and

in some adult cases, alveolar consolidation has also been described.[41-43] However, in the pediatric patients in this study, consolidations were seen to be less common than the rates reported for adults.[43] The LUS findings in this study showed mostly ≥3 B-lines, and subpleural consolidations <1 cm were seen in only a few patients. In a previous case, a series of 13 pediatric patients with COVID-19, 11 (84%) were determined with positive sonographic findings of the interstitial syndrome and in five cases, these were accompanied by consolidation.[14] Some studies stated that pleural effusion might be seen in severe cases.[12,44,45] In the current study, pleural effusion was not determined in any patients and all patients with mild illness were treated on an outpatient basis with no requirement for additional treatment.

Based on current experience and the results of this study, it can be considered that LUS could play a major role in the management of pediatric patients with COVID-19. LUS could be used to rapidly assess the severity of acute COVID-19-induced pneumonia, and monitor disease progression during follow-up. Changes in LUS findings would also allow the identification of patients at a higher risk of developing respiratory failure, thereby providing the opportunity for these patients to be monitored more closely and for necessary changes to be made to the treatment.[28,41]

Study Limitations

This study had some limitations, primarily that it was conducted in a single center with a limited number of patients. Patients were excluded if they had a negative RT-PCR test result, despite a high suspicion of COVID-19 positivity because of symptoms or close contact with an infected person plus abnormal CXR or chest CT findings. There is a known possibility of false-negative RT-PCR results in patients with abnormal radiologic findings. A second limitation was that all the scans were performed by a single pediatric emergency physician, and the accuracy of the image evaluations could not be confirmed by an ultrasound expert. In addition, the LUS and chest CT could not be confirmed because of the low number of cases, that there may have been selection bias, which also constitutes a limitation. The major limitation of our study was that our results cannot be compared with the gold standard chest tomography, unfortunately, routine tomography could not be performed in children due to high radiation exposure.

All the ultrasound scans were performed during only one same pediatric emergency physician's working hours, which limits the generalizability. False-negative ultrasound or CXR results may have been obtained in the initial stage of the disease, before lung involvement, and therefore, imaging studies should have been repeated after several days. Nevertheless, this study can be considered to provide valuable information because the data in the literature related to pediatric patients with COVID-19 are limited.

Conclusion

We determined that the sensitivity of LUS is higher than CXR in demonstrating lung involvement in patients with COVID-19 with respiratory symptoms. LUS may be helpful in the evaluation of pediatric patients with COVID-19. More studies are needed to prove LUS is applicable in children with COVID-19.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained for the study (Ankara City Hospital date: 14/10/2020, number: 1170).

Informed Consent: Informed consent for participation in the study was obtained from the parents or legal guardians of all the patients.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

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

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

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Research Article / Özgün Araştırma

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Intrahospital Transport Practice in Pediatric Intensive Care Units

Çocuk Yoğun Bakım Ünitelerinde Hastane İçi Transport Uygulamaları

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Abstract

Introduction: Critically ill children often require transport during diagnosis and treatment procedures during intensive care hospitalization. With this study, it was aimed to evaluate the practice of transport and the problems encountered during transport in pediatric intensive care units in Turkey.

Methods: A questionnaire consisting of 18 questions was filled in with internet access by the head nurses of the pediatric intensive care unit, who agreed to participate in the study. Responses to questions about the characteristics of the participating centers, transport practices, problems encountered during transport, interventions and the registration system were evaluated.

Results: A total of 29 tertiary pediatric intensive care units from 8 provinces in Turkey were included in the study. The mean number of beds was 14. In most pediatric intensive care units, 5 to 10 patients (51.7%) were transferred within 1 week. It was observed that the most patients were transported to the inpatient service (89.7%), followed by the operating room (69%). There was a protocol for patient transport in 69% of the units. The transport decision was made by the responsible specialist physician at a rate of 96.6%. 65% of the participants stated that the transport was recorded on a form. Transports were accompanied by 93% nurses, 86% allied health personnel, and 79% doctors. In 20 centers (69%), transport was possible with an invasive mechanical ventilator and 11 (37.9%) with a non-invasive mechanical ventilator. The most common problem encountered during transportation was the inadequacy of the physical conditions of the hospital (48.3%). There were 4 (13.8%) participants who encountered problems during patient transport in the last week. It was stated that the oxygen tube was depleted in one of them, and respiratory arrest developed in another patient.

Conclusion: In this study, it was shown that; In our country, there are significant differences in intrahospital transport conditions, transport teams, equipment used during transport between centers. Transport standards should be established and these should take into account the conditions of our country. For these, compliance and monitoring mechanisms should be established.

Keywords: Intrahospital transport, child, intensive care

Öz

Giriş: Kritik hasta çocuklar, gerek yoğun bakım yatışı öncesinde ve gerekse yatıştan sonraki süreçte, tanı ve tedavi işlemleri sırasında sıklıkla transport gereksinimi göstermektedir. Bu çalışma ile Türkiye'de çocuk yoğun bakım ünitelerinde yapılan transport işlemlerinin ve transport sırasında karşılaşılan sorunların değerlendirilmesi amaçlanmıştır.

Yöntemler: Türkiye'de çalışmaya katılmayı kabul eden merkezlerin çocuk yoğun bakım sorumlu hemşireleri tarafından 18 sorudan oluşan anket internet erişimli olarak doldurduldu. Katılan merkezlere ait özellikler, transport ile ilgili özellikler, transport sırasında karşılaşılan sorunlar, müdahaleler ve kayıt sistemi ile ilgili sorulara verilen yanıtlar değerlendirildi.

Bulgular: Çalışmaya Türkiye'de 8 ilden toplam 29 üçüncü basamak çocuk yoğun bakım ünitesi dahil olmayı kabul etti. Ortalama yatak sayısı 14 idi. Çalışmaya katılan çocuk yoğun bakım ünitelerinin çoğunda 1 hafta içerisinde 5 ila 10 hasta transferi (%51,7) yapıldığı, en çok yataklı servise (%89,7), ikinci sırada ameliyathaneye (%69) hasta transportu yapıldığı saptandı. Ünitelerin %69'u hasta transportu ile ilgili bir protokole sahipti, %96,6'sında transport kararını sorumlu uzman hekim vermekte, %65 oranında transport kaydı tutulmaktaydı. Hasta transportlarına hemşire katılımı %93 oranında, yardımcı personel %86 oranında, doktor %79 oranında eşlik etmekteydi. Merkezlerden 20'si (%69) invaziv mekanik ventilasyon ile 11'i (%37,9) non-invaziv mekanik ventilasyonla transport olanağına sahipti. Transport sırasında en sık karşılaşılan sorun hastane fiziki koşullarının eksikliği (%48,3) idi. Dört kişi (%13,8) son bir hafta içinde gerçekleşen hasta transferleri sırasında sorun ile karşılaşıldığını yanıtladı ve bunlardan birinde oksijen tüpü bittiği, bir diğer hastada solunum arresti geliştiği belirtildi.

Sonuç: Bu çalışmada ülkemizde hastane içi transport koşullarının, oluşturulan transport ekiplerinin, transport sırasında kullanılan ekipmanıın merkezler arasında önemli farklılıklar gösterdiği saptanmıştır. Ülkemiz koşullarını gözeten transport standartları oluşturulmalı, uyum denetleme mekanizmaları kurulmalıdır.

Anahtar Kelimeler: Hastane içi transport, çocuk, yoğun bakım

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Introduction

Pediatric intensive care units are the places where critically ill children are followed up and treated, their care is maintained, and the most complex biomedical devices of hospitals are available. And, advanced technology and knowledge and performance to use this technology are required in these units. In pediatric intensive care units, a well-equipped team for emergency intervention, invasive or non-invasive mechanical ventilators for advanced respiratory support treatments, infusion pumps for appropriate treatment, and advanced monitoring devices are needed. From this point of view, the most reliable place for critically ill children is the pediatric intensive care unit. However, critically ill children often require transport during diagnosis and treatment, both before and after admission to the intensive care unit. During transport, morbidity and mortality may develop due to problems that may arise from the patient, equipment and team. Complications can be encountered at a rate of 6-71% during in-hospital transport.[1] Various studies are carried out and pre-transport checklists are created in order to ensure patient safety and to prevent medical errors in transport all over the world.[2] In this study, it was aimed to evaluate the transport procedures performed in pediatric intensive care units in Turkey and the problems encountered during transport.

Material and Methods

A questionnaire consisting of 18 questions was filled in with internet access by the nurses responsible for the pediatric intensive care units of 29 centers in Turkey, who agreed to participate in the study. Features of the participating centers (number of beds, number of transports in a week, transport units), transport-related features (determinants of transport decision, presence of transport protocol, members of the transport team, emergency bag and its contents, monitorization used during transport, oxygenation, drug infusion systems), problems encountered during transport, interventions and answers to questions about the registration system were evaluated.

Statistical Analysis

Study data were evaluated using SPSS 23 software. Categorical data were expressed as numbers and percentages. The study was conducted with the approval of the Clinical Research Ethics Committee of Akdeniz University (24.08.2022, no: KAEK-500).

Results

A total of 29 tertiary pediatric intensive care units from 8 provinces in Turkey agreed to be included in the study. While 14 health centers were university hospitals, the others were training and research hospitals. The average number of beds was 14. It was observed that 5-10 patients (51.7%) were transferred within a week in most of the pediatric intensive care units participating in the study. It was determined that most of the transfers were made to the inpatient service (89.7%), and the second place was to the operating room (69%) (Table 1). 69% of the units had a protocol for patient transport, the transport decision was made by the responsible specialist physician in 96.6%, and transport records were kept in 65%. Postoperative patient transport was performed by the intensive care team and the relevant surgical department team at a rate of 37.9% (Table 2). Each unit had an emergency bag, in which there were drugs such as adrenaline, saline and sedo-analgesics (Table 3). The participation rate of nurses in patient transports was 93%, auxiliary staff accompanied at

Table 1. Distribution of units where patients are transported from pediatric intensive care unit

Units	n (%)
Inpatient ward	26 (89.7)
Operating room	20 (69)
Radiology	19 (65.5)
Nuclear medicine	2 (6.9)
Other	5 (17.2)

Table 2. Distribution of units that transport patients from the operating room to the pediatric intensive care unit

Unit that transports patients	n (%)
Intensive care unit + related surgical unit	11 (37.9)
Related surgical unit	7 (24.1)
Intensive care unit	4 (13.8)
Intensive care unit + anesthesiology	3 (10.3)
Anesthesiology	2 (6.9)
Anesthesiology + related surgical unit	2 (6.9)

Table 3. Distribution of drugs in the transport bag

Drug	n (%)
Adrenalin	29 (100)
0.9% NaCl	28 (96.6)
Midazolam	22 (75.9)
Fentanyl/morphine	15 (51.7)
Methylprednisolone/dexamethasone	15 (51.7)
Atropine	13 (44.8)
Glucose	12 (41.4)
Calcium	10 (34.5)
Diazepam	7 (24.1)
Muscle relaxants	4 (13.8)
Bicarbonate	3 (10.4)
Propofol	1 (3.4)

the rate of 86%, and the doctors at the rate of 79%. The most common problem encountered during transport was the inadequacy of hospital's physical conditions (48.3%) (Figure 1). Twenty (69%) centers had the opportunity to transport with invasive mechanical ventilation and 11 (37.9%) centers with non-invasive mechanical ventilation. The rate of using infusion pumps was 3.4%. For monitoring purposes, transport monitor was used with a rate of 82.8%. Four (13.8%) of the 29 nurses who answered the questionnaire stated that they had encountered problems during the patient transfers in the last week, and these were depletion of oxygen tube in one patient, development of respiratory arrest in one patient, and adverse events related to the physical conditions of the hospital in two patients. For the case of a possible cardiac or pulmonary arrest during the transfer, 51.7% of the participants stated that they would start the intervention at the place where patients were and take them back to the intensive care unit.

Discussion

In this study, the situation regarding in-hospital critical patient transport in tertiary pediatric intensive care units in our country was presented cross-sectionally. In the presented study, 30.1% of the units included in the study did not have a transport protocol. It was stated that all centers participating in the study had an emergency bag, and this bag contained the necessary materials for airway management and the necessary drugs for resuscitation. It was stated that the patient transfer was accompanied by 93% nurses, 86% auxiliary staff, and 79% doctors. It has been stated in the guidelines published for patient transfer that intensive care units should have written protocols.[3] When emergency or unexpected situations occur during in-hospital transport, it is vital to have team coordination, communication, trained personnel, properly working equipment, adequate documentation and relevant checklists. The transport team should be familiar with

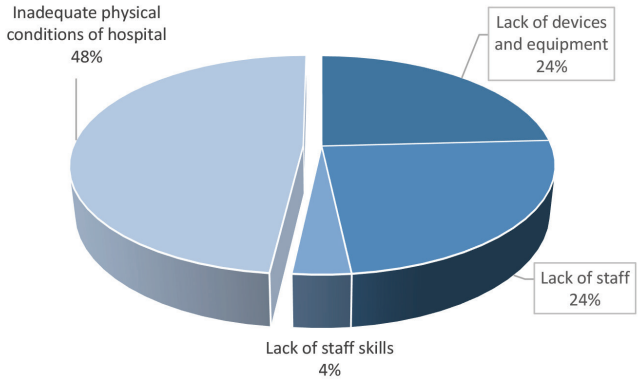

Figure 1. The most frequently observed deficiencies during transport

the equipment used, and should be experienced in emergency airway, ventilation and resuscitation management.[4,5] In addition to the necessary equipment and oxygen supply for emergency airway management, monitoring systems that can measure blood pressure and cardiac functions should be available without exception. Essential resuscitation drugs for cardiac arrest or arrhythmia should be available in sufficient quantities in the emergency bag.[3]

In our study, it was determined that patients were most frequently transported to clinics and operating rooms, and the most common problems were related to the physical conditions of the hospital. The physical conditions of the pediatric intensive care unit and its location close to the operating room are important for the rapid and convenient transportation of patients who require emergency intervention. Patient transport becomes more risky in clinics located in different places, distant or requiring ambulance transport.

In our study, 20 centers (69%) had the opportunity to transport with invasive mechanical ventilation and 11 (37.9%) centers with non-invasive mechanical ventilation during transport. A large proportion of patients followed in intensive care units, trauma patients, and perioperative patients require mechanical ventilation, and this may result in airway and pulmonary complications during in-hospital transport. Although symptomatic pneumothorax and atelectasis are seen more frequently, the risk of pneumothorax may increase 2 times and the occurrence of atelectasis may increase approximately 3 times.[6-9] Malposition of the intubation tube is also an important condition that is often not noticed but can cause serious problems. In a study conducted on newborns in the literature, it was found that the intubation tube was positioned incorrectly at a rate of 50% after transport.[10] In the study of Parmentier-Decrucq et al.[9] on the group of 262 mechanically ventilated patients, 0.4% of all adverse events during in-hospital transport were accidental extubation, 8.8% were related to low oxygen saturation (it was stated that patients who needed positive end-expiratory pressure over 6 cm H_2O constituted an important risk group) and 17.6% were related to airway equipment events (including inappropriate alarm settings, probe disengagement, and battery problems). Similar to this study, many studies have shown that the most common adverse events are equipment-related.[11,12] In addition, although it is not very common, accidental extubation is an adverse event that should be considered because it may result in the death of the patient. Another important issue is that when the transport of the mechanically ventilated patient with a balloon mask or a transport ventilator was evaluated, changes in some parameters (more than 10 mmHg in pCO_2, more than 0.05 units in pH) were found in arterial blood gas analysis with balloon mask.[2] Therefore, we think that choosing a ventilator would be safer.

In our study, it was observed that there was a very low rate of the use of infusion pumps during transport. In addition to the possibility of medication errors during patient transport, interruption of vital infusions or administration of wrong doses (fluid therapy, sedation, analgesia, vasopressor, inotropic, antiarrhythmic, etc.) bring great risks. Hypotension, hypertension, hypoglycemia, hyperglycemia, and blood gas changes may be encountered. Changes in intravenous fluid infusions, interruptions in vasoactive drug administration, as well as altered circulatory dynamics and end-organ perfusion can cause disruptions in systemic acid-base balance.[12] Acidotic conditions may alter vasopressor activity and predispose patients to arrhythmias, resulting in cardiac arrest. For this reason, to reduce or even eliminate these risks, it will be useful to ensure the continuity of the infusion during transport, if possible, with infusion pumps at the appropriate dose, and to get their calibrations made and ensure them to be fully charged if the infusion pumps are used.

Study Limitations

This study has some limitations. Due to the fact that it is a cross-sectional survey study and the number of participating centers is limited, we think that it does not accurately reflect the emergency transport management of critically ill children, but it is informative. For this reason, we suggest that further prospective studies involving more centers will be beneficial.

Conclusion

Critically ill children are at risk for significant adverse events such as airway or pulmonary complications, hemodynamic deteriorations (including cardiac arrest), nosocomial infections, acid-base imbalances, and glucose abnormalities during in-hospital transport. In this study, it was determined that in-hospital transport conditions, the transport teams, and the equipment used during transport in our country differed significantly among health centers. Transport standards should be created by taking the conditions of our country into account, and compliance inspection mechanisms should be established.

Information: This study was presented as an oral presentation at the 16th Pediatric Emergency Medicine and Intensive Care Congress, 12th Pediatric Emergency Medicine and Intensive Care Nursing Congress and won the third prize.

Ethics

Ethics Committee Approval: The study was conducted with the approval of the Clinical Research Ethics Committee of Akdeniz University (24.08.2022, no: KAEK-500).

Informed Consent: It was a survey work.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

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

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

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Case Report / Olgu Sunumu

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Efficacy of Adenosine in the Differential Diagnosis of Narrow QRS Complex Tachyarrhythmia: A Case Diagnosed with Atrial Flutter After Adenosine

Dar QRS Kompleksli Taşiaritmi Ayırıcı Tanısında Adenozinin Etkinliği: Adenozin Sonrası Atriyal Flutter Tanısı Alan Bir Olgu

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Abstract

The most common tachyarrhythmias in childhood are narrow QRS complex tachyarrhythmias. The majority of these are supraventricular tachycardia (SVT). If electrocardiography is inconsistent with typical SVT, another underlying arrhythmia should be considered. In this case, a patient with narrow complex tachycardia who was diagnosed with atrial flutter after adenosine was presented to increase awareness on the subject.

Keywords: Adenosine, atrial flutter, childhood, tachycardia

Öz

Çocukluk çağında en sık görülen taşiaritmiler dar QRS kompleksli taşiaritmilerdir. Bunların da büyük çoğunluğunu supraventriküler taşikardi (SVT) oluşturmaktadır. Çekilen elektrokardiografi tipik SVT ile uyumsuz ise altta yatabilecek başka bir aritmi olabileceği düşünülmelidir. Bu olguda, dar kompleksli taşikardi saptanıp adenozin sonrasında atriyal flutter tanısı almış hasta konu hakkındaki farkındalığı artırmak için sunuldu.

Anahtar Kelimeler: Adenozin, atriyal flutter, çocukluk çağı, taşikardi

Introduction

High heart rate for age in children is defined as tachycardia.[1] Tachycardias are classified under two main headings as narrow or wide QRS tachycardia. Supraventricular tachycardia (SVT) is the most common narrow QRS arrhythmia in childhood. SVT should be considered in cases with a sudden onset and unexplained heart rate above 200, and with abnormal P waves or without P waves on electrocardiography (ECG).[2]

Atrial flutter is a relatively common supraventricular arrhythmia characterized by rapid, regular atrial depolarizations, typically around 300 beats/min, and a regular ventricular rate corresponding to one-half or one-fourth (150 or 75 beats/minute) of the atrial rate.[3] However, both arrhythmias are not always easily recognized.

In this study, a patient diagnosed with atrial flutter after adenosine due to the presence of flutter waves, whose ECG findings were inconsistent with typical SVT, was presented to emphasize the effectiveness of adenosine in the differential diagnosis of arrhythmia.

Case Report

A 10-year-old girl patient, whose heartbeat could not be detected at the scene after an in-vehicle traffic accident, was resuscitated by health professionals. The patient, whose spontaneous circulation returned after 15 minutes of resuscitation, was intubated and brought to the emergency room. In the imaging performed here, lung contusion, brain edema, cranial infarct, spleen laceration

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and bilaterally displaced distal femur fracture were detected. After the interventions made by the relevant branches, she was hospitalized in our pediatric intensive care unit for postoperative follow-up.

The patient was started to be followed on a mechanical ventilator. Midazolam and fentanyl were started as sedoanalgesics to increase patient compliance and effective respiratory support in invasive mechanical ventilation. Piperacillin-tazobactam + teicoplanin + meropenem was given as antibiotherapy to the patient who underwent splenectomy and bilateral chest tube insertion and was operated for bilateral femur fracture. 3% hypertonic saline and mannitol were started for brain edema detected in computerized brain tomography. Inotropic adrenaline infusion (0.1 mcg/kg/min) was initiated in the hypotensive patient, and dose titrations were performed according to the need during the follow-up. Mass CK-MB: 201 ug/dL and troponin I: 0.094 ug/L were detected. Initial ECG evaluation was normal. Mild systolic dysfunction was detected in the echocardiography (ECHO) examination performed while taking inotropes, and it was recommended to continue inotropic therapy. Low molecular weight heparin (enoxaparin) was started for thromboembolism prophylaxis. Levetiracetam was given at a dose of 30 mg/kg/day as an antiepileptic. Adrenaline infusion was stopped after the ECHO examination performed on the 6th day of follow-up. On the 7th day of the follow-up, the patient was extubated and enteral nutrition was provided with the help of a nasogastric tube.

The patient, who was improving clinically and hemodynamically, had tachycardia (252 beats/min) on the 9th day of the follow-up. In the ECG, it was observed that there was an irregular tachycardia with a narrow QRS complex (Figure 1). On detailed examination, it was observed that it was an atypical supraventricular tachyarrhythmia with variable P waves morphology, which included bundle branch blocks in places, unlike classical SVT. Rapid adenosine bolus (0.1 mg/kg) was administered to the patient who underwent ECG monitoring for both treatment and differential diagnosis. A diagnosis of atrial flutter was made with the appearance of typical flutter waves after the administration of drug (Figure 2). After amiodarone loading treatment (5 mg/kg), normal sinus rhythm was restored (Figure 3). Amiodarone maintenance treatment was continued at a dose of 5 mg/kg/day. The patient, who was in good general condition and did not need

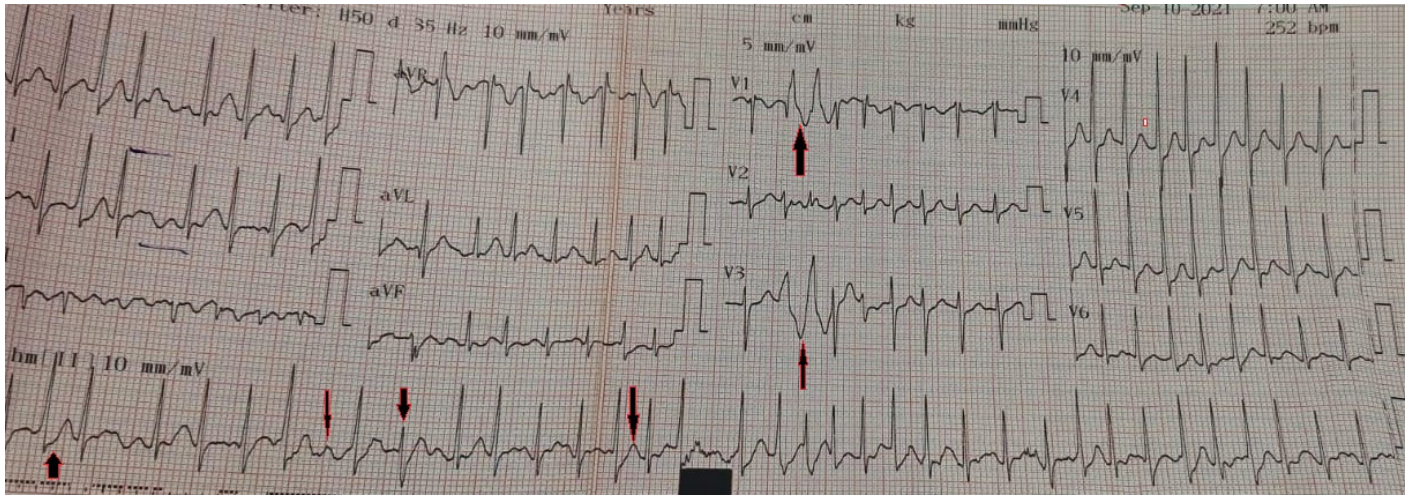

Figure 1. Before adenosine, narrow QRS complex tachycardia incompatible with typical supraventricular tachycardia. Arrows indicate the absence of well- shaped and regular P waves in front of the QRS complexes

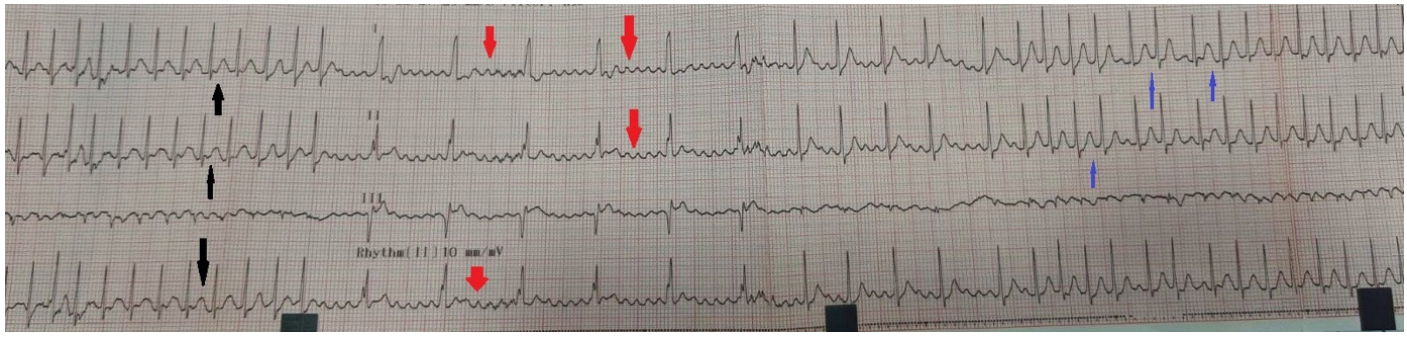

Figure 2. The appearance of typical flutter waves in the administration of adenosine. Red arrows show flutter waves, black and blue arrows show narrow complex tachyarrhythmia waves occurring when adenosine effect disappears

intensive care, was transferred to the service for rehabilitation treatments on the 21st day of her hospitalization.

Discussion

Narrow QRS complex tachycardias are common tachyarrhythmias seen in childhood. There are 3 underlying mechanisms.[4] The most common mechanism is a vicious circle that occurs via the atrium (atrial fibrillation, atrial flutter), atrioventricular (AV) node (AV node reentry tachycardia) or accessory conduction pathway (AV reentry tachycardia). The second mechanism is automaticity gain from the sinus node (sinus tachycardia) or from another part of the atrium (atrial tachycardia). The third mechanism is less common triggered tachycardias. In this study, the role of adenosine in the differential diagnosis of arrhythmia in addition to its therapeutic properties was emphasized in a patient who was initially thought of as SVT and later diagnosed as atrial flutter.

Adenosine is used more safely in the treatment of acute supraventricular arrhythmias due to its extremely short effective half-life. Adenosine has a negative dromotropic effect at the level of the AV node when administered rapidly intravenously.[5] This slowdown, and even occasional interruption of electrical impulse conduction to the AV node, can restore normal sinus rhythm in patients with reentrant SVT. Díaz-Parra et al.[5] stated that adenosine was effective in the treatment of SVT patients despite the need for repeated doses. Losek et al.[6] reported that cardioversion was achieved at the rate of 72% with adenosine administration in probable SVT patients and no side effects were observed. In addition, it was recommended as a useful diagnostic agent in patients with regular tachycardia with narrow QRS complexes of unknown origin.[7] However, a proarrhythmic effect of adenosine was reported in a patient whose diagnosis of atrial flutter was desired to be confirmed.[8] We also administered adenosine for both treatment and differential diagnosis of tachyarrhythmia with narrow QRS complex, which was present in our patient. Short-term AV dissociation was achieved in the patient and flutter waves became evident.

Atrial flutter is usually diagnosed by the presence of typical sawtooth-like flutter waves on an electrocardiogram.[3,9] Atrial flutter may remain as flutter, transform into atrial fibrillation, or turn to sinus rhythm within hours or days.[3] The mechanism of atrial flutter is macro reentry within the atrial wall. Since the AV node is not involved in the reentry circuit, adenosine cannot terminate atrial flutter, but it unmasks the flutter wave by causing AV block.[9] In our patient, while the ventricular rate was approximately 250/min before the administration of adenosine, ECG taken during adenosine push showed an atrial rate of 500/min (typical atrial flutter with 2:1 AV block). In addition, during the atrial flutter rhythm in the patient's ECG, P waves were negative in V1 and positive in V2-V4. These findings also support the diagnosis of right atrial flutter with crista terminalis localization.

Amiodarone has been shown to be beneficial in both short-term therapy and adjuvant therapy with other antiarrhythmic drugs in pediatric patients with various rhythm disorders.[10] It has been stated that standard treatments are ineffective, and intravenous amiodarone can be life-saving, especially in patients with postoperative functional ectopic tachycardia.[11,12] In one study, it was reported that amiodarone treatment successfully converted atrial flutter to normal sinus rhythm without the application of electrical cardioversion.[13] In this study, a newborn infant with narrow QRS complex tachycardia was shown to have atrial flutter with a typical sawtooth pattern underlying after intravenous administration of adenosine. In addition, flecainide acetate, amiodarone, sotalol hydrochloride or combinations of these drugs were

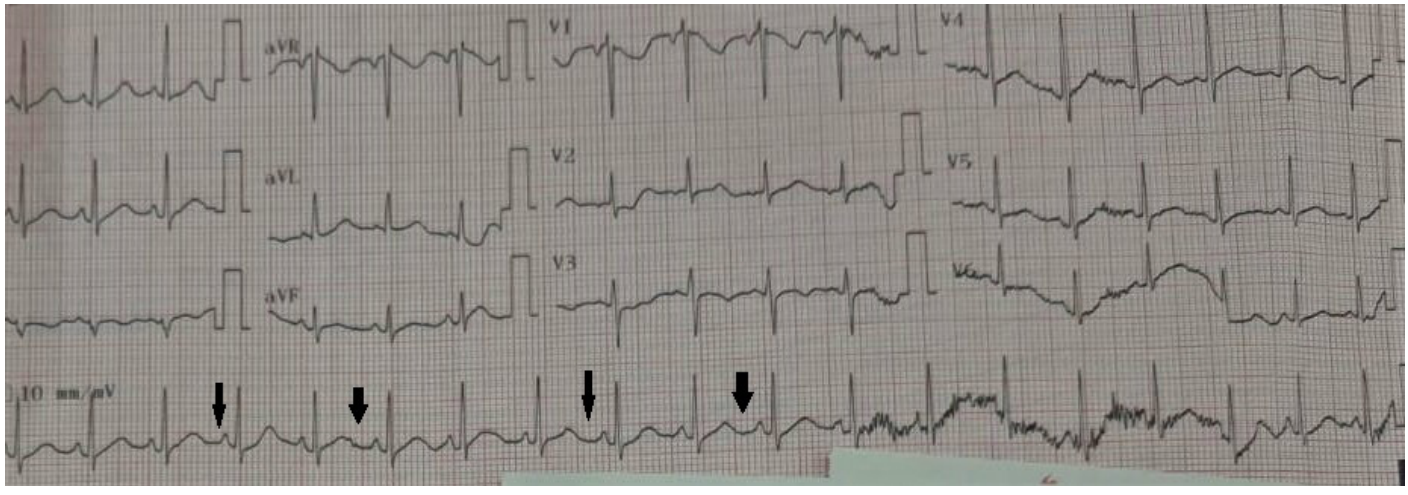

Figure 3. Electrocardiogram that returned to normal sinus rhythm after amiodarone. Arrows show reversion to sinus rhythm with a smooth P wave in front of each QRS complex

reported to be effective in patients with SVT, who were resistant to first-line drugs such as adenosine.[14]

Atrial flutter, which was masked after adenosine, was also revealed in our patient. Afterwards, a successful return to sinus rhythm was achieved with amiodarone treatment.

In conclusion, if the ECG is inconsistent with typical SVT in narrow QRS complex tachycardias, another possible underlying arrhythmia should be considered, and response to treatment with adenosine should be evaluated. Moreover, it should be remembered that successful cardioversion can be performed with amiodarone when atrial flutter is diagnosed.

Ethics

Informed Consent: Informed consent was obtained from the patient's family.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: Ç.K., C.V., Design: Ç.K., A.Z., Data Collection or Processing: Ç.K., C.V., Analysis or Interpretation: Ç.K., C.V., Literature Search: Ç.K., A.Z., Writing: Ç.K., A.Z.

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

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Case Report / Olgu Sunumu

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Type B Lactic Acidosis in A Child with Relapsed non-Hodgkin Lymphoma

Nüks non-Hodgkin Lenfomalı Bir Çocukta Tip-B Laktik Asidoz

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Abstract

Lactic acidosis is a major cause of metabolic acidosis in critically ill patients. Herein we report a child with relapsed non-Hodgkin's lymphoma admitted to the pediatric intensive care unit (PICU) with profound lactic acidosis. On admission, he was treated with fluid replacement and a vasopressor, followed by continuous veno-venous hemodiafiltration to correct acidosis. As lactic acid levels remained high despite all treatments, thiamine was added to the therapy, which did not influence metabolic status either. Lactic acidosis could only be corrected by aggressive chemotherapy during his stay in the PICU. The patient died on the 68th day of PICU admission due to underlying progressive disease. Clinicians should start aggressive chemotherapy as soon as possible in patients with a recurrence or advanced cancer who have type-B lactic acidosis.

Keywords: Non-Hodgkin lymphoma, lactic acidosis, metabolic acidosis

Öz

Laktik asidoz, kritik hastalarda metabolik asidozun başlıca nedenlerindendir. Bu olgu sunumunda, derin laktik asidoz ile çocuk yoğun bakım ünitesine yatırılan, relaps non-Hodgkin lenfomalı bir çocuğu sunuyoruz. Yatışı takiben hastaya sıvı replasmanı ve vazopresör verildi, ardından asidozun düzeltilmesi için sürekli veno-venöz hemodiyafiltrasyon uygulandı. Tüm tedavilere rağmen laktik asit seviyeleri yüksek kaldığından, tedaviye tiamin eklendi ancak asidoza yanıt alınamadı. Laktik asidoz, yoğun bakım ünitesinde kaldığı süre boyunca ancak agresif kemoterapi ile düzeltilebildi. Hasta çocuk yoğun bakım ünitesine kabulünün 68. gününde altta yatan progresif hastalık nedeniyle kaybedildi. Klinisyenler, tip-B laktik asidozlu nüks veya ilerlemiş kanserli hastalarda mümkün olan en kısa sürede agresif kemoterapiye başlamalıdır.

Anahtar Kelimeler: Non-Hodgkin lenfoma, laktik asidoz, metabolik asidoz

Introduction

One of the most common causes of metabolic acidosis in critically ill patients is lactic acidosis (LA).[1] LA is predominantly derived from impaired tissue oxygenation, which is later called type-A LA. Drugs, toxins, hereditary metabolic diseases, vitamin deficiency, and malignancy are among the causes of type-B LA, in which the lactic acid is related to cellular metabolism.[2] Herein we report a patient with lymphoma admitted to the pediatric intensive care unit (PICU) with profound type B LA, which only resolved with chemotherapy.

Case Report

A 10-year-old boy had a non-Hodgkin's lymphoma diagnosis five months ago. He had completed the BFM 2012 protocol 15 days ago. The disease relapsed as the bone marrow aspiration and biopsy revealed mature B-cell leukemia infiltration. He was admitted to the PICU due to profound LA. On admission, he had tachycardia with a heart rate of 135/minute. Arterial blood pressure was 123/79 mmHg with normal peripheral pulses and capillary refill time. Invasive mechanical ventilation was started on admission due to hyperpnea and tachypnea. Preliminary laboratory studies showed increased anion gap

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metabolic acidosis (pH: 7.04, pCO_2: 36.2 mmHg, HCO_3: 9.5 mmol/L, lactate: 9.9 mmol/L), leukocytosis, anemia, and thrombocytopenia with a white blood cell count of 25.1x10^3 cells/µL, hemoglobin of 6.3 g/dL, and platelet count of 42x10^3 cells/µL. Peripheral blood smear revealed L3 type blasts, compatible with bone marrow biopsy results. Renal function tests were normal. Aspartate aminotransferase was increased to 303 U/L, alanine aminotransferase was 42 U/L, and the glucose level was 65 mg/dL. Lactate dehydrogenase levels were extremely high at 20777 U/L. The chest X-ray was normal. Echocardiography showed normal systolic function with a 68% ejection fraction. The computer tomography scan of the chest and abdomen revealed new mediastinal and mesenteric lymphadenopathies.

Cytoreductive prophase therapy, a regimen consisting of corticosteroids (dexamethasone 10 mg/m^2 daily for 5 days) and low-dose cyclophosphamide (200 mg/m^2 daily for 2 days) was started. Noradrenaline infusion was started after adequate intravenous fluid replacement for the underlying shock, although he had no signs of impaired tissue perfusion. Red blood cell transfusion was administered to maintain the hemoglobin level above 7 g/dL. Meropenem and teicoplanin were added empirically since sepsis could not be ruled out as he had a fever of 38 °C and a mildly increased C-reactive protein of 9.2 mg/L. As lactic acid remained high (reaching a level of 15 mmol/L despite fluid replacement and vasopressors), continuous veno-venous hemodiafiltration therapy was started. It was discontinued 9 days later since it had no effect on metabolic acidosis. Type-A LA was ruled out. Thiamine 200 mg/day was administered intravenously for 5 days, which was later continued per oral with biotin 10 mg/day. Lactic acid levels did not diminish with vitamin replacement either.

On the 7th day of PICU admission, ICE chemotherapy was added to rituximab. The ICE protocol included ifosfamide (1500 mg/m^2 daily for 3 days), carboplatin (450 mg/m^2 daily for 1 day) and etoposide (100 mg/m^2 daily for 3 days). The lactate level decreased to normal throughout the 3-day ICE protocol while his white blood cell count was declining to zero (Figure 1). The patient's lactic acid remained low until the white blood cell count-mostly consisting of blasts- started rising on the 25th day of PICU admission. He received the second course of ICE therapy and regained metabolic stability immediately. During this episode, LA responded only to ICE chemotherapy (Figure 1). The patient died on the 68th day of PICU admission due to underlying progressive disease.

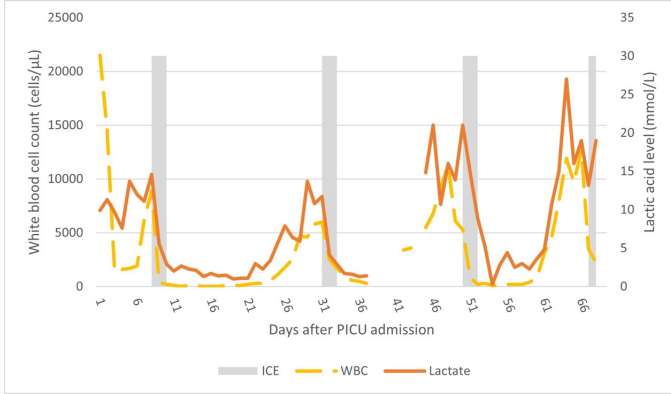

Figure 1. White blood cell count and lactate levels throughout chemotherapy
PICU: Pediatric intensive care unit, WBC: White blood cell

Discussion

LA is caused by the accumulation of lactate and protons in the body's fluids and is frequently associated with unfavorable clinical outcomes.[3] The higher lactate reflects the worse outcome.[1] Frequently, hyperlactatemia is associated with tissue hypoxia in critically ill children.[2] When our patient was admitted to the PICU, we tried conventional therapies targeted at restoring tissue perfusion and oxygenation. We started invasive ventilation, administered adequate intravenous fluid, started a vasopressor infusion, and broad-spectrum antibiotics. LA persisted despite hemodynamic stabilization.

Thiamine deficiency due to insufficient intake and replacement leads to profound LA and encephalopathy, which responds immediately to thiamin administration.[4] Due to underlying malnutrition, our patient could have developed thiamin deficiency. We tried thiamin administration, which had no influence on the lactic acid level.

We administered bicarbonate infusion on the first day of admission, then continuous veno-venous hemodiafiltration for 9 days to correct metabolic acidosis. None of these measures influenced his lactate level.

Type-B LA is thought to be a rare complication of malignancy. Lymphomas, leukemia, and less commonly, solid tumors cause LA via increased glycolytic activity of malignant cells and tumor tissue hypoxia.[2,5] Type B LA is a rare complication that has a poor prognosis in leukemia and lymphoma patients.[6] After other interventions, our patient's LA only responded to chemotherapy targeting the underlying malignancy. In conclusion, although most patients with LA have hemodynamic compromise, it may develop in the absence of impaired tissue oxygenation. Clinicians should consider the early administration of aggressive chemotherapy to cancer patients with recurrent or advanced disease who develop type B LA. Parents of the patient gave informed consent prior to this report.

Ethics

Informed Consent: Parents of the patient gave informed consent prior to this report.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: T.B., E.Ç., G.E., Design: T.B., G.Ö., G.A., Data Collection or Processing: T.B., G.E., G.A., Literature Search: T.B., E.Ç., M.D., Writing: T.B., G.A., E.Ç., M.D.

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Consider Eating Disorders in the Differential Diagnosis of Acute Abdomen in the Ages of Adolescence

Adölesan Yaşlarında Akut Batın Ayırıcı Tanısında Yeme Bozukluğu Düşünün

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Abstract

An adolescent girl applied to the pediatric emergency outpatient clinic with a complaint of acute abdomen. On abdominal ultrasonography, it was suspected of intussusception. However, when her medical history was expanded, it was discovered that she had a recent eating episode followed by multiple vomiting and had lost weight because of an intense food restriction causing severe constipation. Briefly, we presented an adolescent eating disorder patient who clinically mimics acute abdomen due to secondary hypokalemia, hypomotility, and constipation.

Keywords: Adolescent, eating disorder, acute abdomen

Öz

Akut karın şikayeti ile çocuk acil polikliniğine başvuran ve karın ultrasonografisinde invajinasyon şüphesi olan bir kız ergenin tıbbi öyküsü derinleştirildiğinde, yakın zamanda bir yeme atağının ardından çoğul kusma ve ciddi kabızlığa neden olan şiddetli besin kısıtlaması ile kilo verdiği öğrenildi. Özetle; sekonder hipokalemi, hipomotilite ve kabızlık sonucu klinik olarak akut batını taklit eden bir ergen yeme bozukluğu olgusu sunuldu.

Anahtar Kelimeler: Ergen, yeme bozukluğu, akut abdomen

Introduction

Acute abdomen is a medical emergency characterized by severe pain in the abdomen with a recent start. It is a common complaint in pediatric emergencies that can sometimes be a dramatic clinical condition. Mostly minor self-limiting medical reasons cause pain, but also life-threatening surgical/medical conditions can occur. Abdominal discomfort can be caused by a variety of systemic and local reasons. Diagnosis can be different between ages. For school children, urinary tract infection, appendicitis, acute gastroenteritis, Meckel's diverticulitis, pancreatitis, cholangitis, testicular torsion/ovarian torsion, inflammatory bowel disease, and trauma are one of the most common causes.[1]

Eating disorders are serious, potentially life-threatening illnesses afflicting individuals throughout their lifespan, with a particular impact on both the physical and psychological development of children and adolescents. It has been observed that the age of onset is more common in late adolescence and females than males. Childhood obesity, female gender, mood disorders, character traits (impulsive, perfectionist), history of abuse, and family weight concerns are possible risk factors for the disease. Most hospital admissions are not based on the eating disorder but because of medical complications related to the eating disorders (such as amenorrhea, hair loss, constipation, syncope, general weakness, and abdominal pain). Therefore, pediatricians should consider eating disorders in the differential diagnosis of such symptoms mimicking organic diseases in the adolescent age group (inflammatory bowel disease, celiac disease, surgical causes).[2,3]

Patients with eating disorders present gastrointestinal disturbances such as postprandial fullness, abdominal distention, abdominal pain, gastric distension, and early satiety, with altered esophageal motility, postprandial

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distress syndrome, superior mesenteric artery syndrome, irritable bowel syndrome, and functional constipation. In addition, binge eating may cause acute gastric dilatation and perforation, while self-induced vomiting can lead to dental caries, salivary gland enlargement, gastroesophageal reflux disease, and electrolyte imbalance.[4]

If the symptoms are thought to be suspicious, the history should be deepened in this adolescent age group, and nutritional patterns, excessive weight loss in the short term, inappropriate diets, and body image should be questioned. In our manuscript, we present a patient who was examined in our pediatric emergency department with the diagnosis of acute abdomen; invagination was found in the abdominal ultrasound. After taking anamnesis in-depth, her excessive weight loss history has learned, and she was diagnosed with "anorexia nervosa (AN)."

Case Report

A 16-year-old female adolescent was admitted to the pediatric emergency outpatient clinic with abdominal pain. Her body weight was: 31.5 kg [standard deviation (SD) score: -5.05], and her height was: 157 cm (SD Skor -0.91). The patient's vital values were between normal ranges. On physical examination, the patient was cachectic, had right lower quadrant tenderness, and defense was found on abdominal examination. No additional pathology was observed in other systemic examinations. The patient was prediagnosed with an acute abdomen in the emergency department, and her further examinations were planned. In abdominal radiography, there was no pathology observed. However, in her abdominal ultrasound, imagining "invagination between the ileo-ileal loops along a 2 cm segment with a size of 17x22 mm" was observed. In addition, the appendix is visualized with an unclear end in the right lower quadrant; it is measured in a diameter of 4 mm, its lumen is compatible with appendicolith, and the ovaries could not be visualized.

In Table 1 patient's initial blood test results are listed. In complete urinalysis: Urine density 1038, leukocyte esterase +2, urine leukocyte count was 36, and urine culture had no growth. In the patient's biochemistry analysis, potassium was measured as 2.9 mEq/L, and other analyzes were within the normal range.

The home, eating, education/employment, activities, drugs, sexuality, suicide, and safety interview,[5] it was revealed that her parents were divorced, and she was living with her father with three siblings and her mother's receiving psychiatric treatment. It was learned that she generally did not feel comfortable at school and had difficulty socializing; she did not have any plan and goals for the future. She had started to lose weight 12 months ago; initially, she reduced the number of meals while not being satisfied with her appearance. In her feeding anamnesis, she restricted her diet increasingly during her weight loss; her targeted calorie was close to 100 kcal per day for the last few months, even though she liked her appearance more after losing weight was learned. Also, it was learned that she has been eating oatmeal one meal a day, suffering from constipation for months, has not had a period for one year, and has orthostatic complaints. She continued calorie restriction, and the patient lost 22 kilos in 12 months (from 52 kg to 30 kg). She had attempted suicide by drinking paracetamol four months ago and was evaluated by a child psychiatrist after a suicide attempt, but she did not do her follow-up.

A control abdomen ultrasound was taken in the emergency department, and no obvious invaginated segment was observed. With these findings, the acute abdomen was excluded from the diagnosis. With deepened anamnesis in the foreground, secondary gastrointestinal medical complications of an eating disorder were considered.

While in pediatric emergency service, she was consulted by child and adolescent psychiatry again

Psychiatric Evaluation

In her psychiatric evaluation, she was conscious, cooperative, and oriented. The patient was able to establish a relationship with her child psychiatrist. Her mood was euthymic, and her affect was in the normal range. There was no suicidal ideation. Psychomotor activity was decreased due to her physical health. However, attention and memory examinations were

Table 1. Initial laboratory values in pediatric emergency

Parameters	Value	Normal range
WBC	6.05x10^9/L	4.5-11.4 10^9/L
Hemoglobin	11.4 g/dL	12.5-16 g/dL
Platelet	282x10^9/L	170-400x10^9/L
Erythrocyte sedimentation rate	15 mm/hour	0-20 mm/hour
Creatinine	0.65 mg/dL	0.6-1.0 mg/dL
Urea	34 mg/dL	11-39 mg/dL
Glucose	75 mg/dL	70-99 mg/dL
Sodium (Na)	137 mEq/L	132-146 mEq/L
Calcium (Ca)	8.6 mg/dL	9.1-10.3 mg/dL
Phosphorus (P)	3.5 mg/dL	3.1-5.3 mg/dL
Potassium (K)	**2.9 mEq/L**	**3.5-5.5 mEq/L**
Chlorine (Cl)	99 mEq/L	99-109 mEq/L
ALT	19 U/L	0-29 U/L
AST	21 U/L	0-25 U/L
CRP	<0.05 g/L	0-0.005

WBC: White blood cell, CRP: C-reactive protein, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase

normal. She had perfectionist thoughts and preoccupation with dieting, losing weight, and body image. She has been regularly binge-eating or purging during the last three months. She did not want to vomit but could not control her urge to vomit after binge attacks 1-2 times a week. Thus, she was diagnosed with AN binge-eating/purging type. There was no comorbid psychiatric diagnosis of eating disorder according to the fifth edition of the diagnostic and statistical manual of mental disorders criteria in her psychiatric assessment.[6] As a result, the patient was given fluoxetine 20 mg/day, and cognitive-behavioral therapy sessions were scheduled weekly.

Treatment and Clinical Follow-up

During the 7-day hospitalization, the patient was monitored for 24 hours. Daily serum electrolytes and complete urine analysis were observed. In addition, the patient's daily calorie was adjusted with daily weight and followed for refeeding (Table 2).

Potassium value returned to normal in daily electrolyte follow-up. In the first week of refeeding follow-up, the decreased serum phosphorus value returned to normal values with the support of oral phosphate solution. The patient's discharge weight was: 36,2 kg. The first week weight after discharge was 42,4 kg, and the second week was 46,5 kg. Due to rapid weight gain, she arranged the diet with a dietitian. Repeated liver function tests were normal. The patient continues to be followed up by the child psychiatry and adolescent medicine department regularly. Fluoxetine dose was increased to 40 mg, and olanzapine 2.5 mg was added during psychiatric follow-ups.

Discussion

An adolescent girl who applied to the emergency department with complaints mimicking acute abdomen and was diagnosed as having an eating disorder is presented in our case. The incidence of AN has shown an increasing trend over the century, and the lifetime prevalence of AN is 4% in female patients and 0.3% in male patients.[2] Among the complications of AN, abdominal pain, vomiting, and constipation can be seen, and electrolyte imbalances can increase the symptoms.[4]

The mechanism of gastroparesis in individuals with AN and blumia nervosa is not well understood and likely multifactorial. Smooth muscle atrophy may result from protein malnutrition. Metabolic and hormonal imbalance can develop due to poor nutrition, centrally mediated stress reactions, vomiting, or laxative abuse. Gastric dysrhythmia resulting from impaired autonomic function may produce antral hypomotility with a delay in the grinding of solid food before transport into the duodenum.[7-9]

Patients suffering from AN can have multiple gastrointestinal tract symptoms, such as oral complaints, increased esophageal sphincter tone, slower gastric emptying, gastric dysmotility, gastric dilatation, and resulting gastric necrosis, perforation may occur; also lower intestinal motility may be affected.[10,11]

Invagination means the penetration of an intestinal segment into the adjacent intestinal segment, and ileocolic intussusception is the most common type in pediatric patients. The etiology is usually idiopathic in childhood and may result from anatomical and infectious causes later.[12] Patients diagnosed with AN may suffer from gastrointestinal complaints, delayed gastric emptying, and false obstructions.[4,7] Ileo-ileal intussusception is more likely to

Table 2. Daily electrolytes of the patient/treatment

Emergency service Day 0	***Potassium: 2.9 Body weight: 31.5 kg**	**IV hydration + 40 meq/Lt KCl infusion**
Hospitalization Day 0	**Potassium: 3.1**	IV hydration + 20 meq/Lt KCl infusion
Day 1	**Potassium: 2.9 *Phosphorus: 2.2**	IV hydration + 30 meq/Lt KCl infusion and 1 cc/kg/day oral neutral phosphate solution per oral
Day 2	Potassium: 4.3 **Phosphorus: 2.8** Body weight: 33 kg	Parenteral therapy was discontinued and potassium therapy was started enterally
Day 3	Potassium: 3.7 **Phosphorus: 2.9** Body weight: 35.7 kg	Continuation of oral potassium + oral phosphate therapy
Day 4	Potassium: 4.0 Phosphorus: 3.9	Neutral phosphate treatment started to be gradually reduced
Day 6	Potassium: 4 Phosphorus: 4.1 Body weight: 36.2 kg	Oral potassium and phosphate therapy was discontinued
First week control after discharge	Potassium 3.7 Body weight: 42.4 kg	

*Normal range: Potassium: 3.5-5.5 mEq/L, phosphorus: 2.9-4.8

resolve spontaneously, especially for the short intussusceptum. In our case, the spontaneous recovery of intussusception can be explained in this way. Although there is limited information about intussusception due to eating disorders in the literature, AN may be a facilitating factor for intussusception, and early diagnosis is important regarding the risk of operations.[13-15] The reason for presenting this case is that patients with AN mostly apply for healthcare not because of the disorder but for their complications. These complications may mimic other diseases and suggest another underlying organic cause, which may cause unnecessary further investigation and wrong treatment approaches in patients. Rapid weight loss should be questioned in the anamnesis in a patient with an acute abdomen in the adolescent age group, and the diagnosis of AN should be considered in the differential diagnosis.

Ethics

Informed Consent: The authors claim to have all necessary patient consent papers. The patient(s) has/have provided their agreement in the form of their clinical information to be published in the journal. The patients know that their names and initials will not be published and that anonymity cannot be guaranteed while every effort will be taken to keep their identities hidden.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: G.G., E.A., D.T., Design: G.G., E.A., D.T., Data Collection or Processing: G.G., E.A., D.T., Analysis or Interpretation: A.Ö.A., Literature Search: G.G., D.T., A.Ö.A., Writing: G.G., E.A., D.T., A.Ö.A.

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Epiploic Appendicitis in Differential Diagnosis of Acute Abdominal Pain: A Pediatric Case

Akut Karın Ağrısı Ayırıcı Tanısında Epiploik Apandisit: Çocuk Olgu

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Abstract

Epiploic appendicitis is an uncommon and self-limiting disease. Clinically, it can often mimic acute appendicitis or acute diverticulitis, which are more common causes of acute lower abdominal pain. A 16-year-old male patient was admitted to our pediatric gastroenterology outpatient clinic with complaints of diarrhea (4 times a day) and severe abdominal pain in the epigastric region for three days. Abdominal computed tomography showed normal pancreas, hepatosteatosis, thickening of the cecum wall, multiple mesenteric lymphadenopathy in the right lower quadrant, areas similar to fat necrosis and 25x20 mm lesions compatible with EA. The patient, whose clinical and laboratory findings improved completely with antibiotic therapy, was discharged. In this study, we aimed to draw attention to epiploic appendicitis, which is one of the causes of acute lower abdominal pain in children and should be kept in mind in order to prevent unnecessary operations.

Keywords: Epiploic appendicitis, abdominal pain, pediatric case

Öz

Epiploik apandisit nadir görülen ve kendi kendini sınırlayan bir hastalıktır. Klinik olarak, sıklıkla akut alt karın ağrısının daha yaygın nedenlerinden olan akut apandisiti veya akut divertiküliti taklit edebilmektedir. On altı yaşında erkek hasta üç gündür ishal (günde 4 kez), epigastrik bölgede ve sağ alt kadranda şiddetli karın ağrısı şikayetleri ile çocuk gastroenteroloji polikliniğimize başvurdu. Karın bilgisayarlı tomografisinde pankreas normal, hepatosteatoz, çekum duvarında kalınlaşma, sağ alt kadranda çok sayıda mezenterik lenfadenopati, yağ nekrozuna benzer alanlar ve epiploik apandisit ile uyumlu 25x20 mm lezyonlar görüldü. Antibiyotik tedavisi ile klinik ve laboratuvar bulguları tamamen düzelen hasta taburcu edildi. Bu çalışmada, çocuklarda akut alt karın ağrısı nedenlerinden olan ve gereksiz operasyonların önlenmesi amacıyla akılda tutulması gereken epiploik apendisite dikkat çekmeyi amaçladık.

Anahtar Kelimeler: Epiploik apandisit, karın ağrısı, çocuk olgu

Introduction

Epiploic appendagitis (EA) is a mostly self-limiting, inflammatory/ischemic disorder that results from spontaneous torsion of fat-filled sacs formed by the peritoneum surrounding the colon or venous thrombosis.[1,2] Clinically, it can often mimic acute appendicitis or acute diverticulitis, which are more common causes of acute lower abdominal pain.[3] Clinical diagnosis of EA is difficult due to its rarity and non-specific clinical findings. However, with the increasing use of abdominal computed tomography (CT) in the investigation of acute abdominal pain, EA case reports have started to increase in the literature.[2] In our study, we aimed to draw attention to EA, which is an important differential diagnosis of acute abdominal pain that is treated conservatively and which is less common in children.

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Case Report

A 16-year-old male patient was admitted to our pediatric gastroenterology outpatient clinic with diarrhea lasting for three days (4 times/day), severe abdominal pain in the epigastric region and right lower quadrant. The patient's history and family history were unremarkable. On physical examination, blood pressure was 120/75 mmHg, heart rate was 80/min, respiratory rate was 13/min, body temperature was 37.7 °C, and there was tenderness in the epigastric region and right lower quadrant of the abdomen. His body weight was 95 kg (>97 p), his height was 168 cm (25 p), and his weight for height was 158%. In the laboratory findings, leukocytes value was 8856/μL, hemoglobin was 14.8 g/dL, platelets were 237,000/μL, C-reactive protein (CRP) was 116 mg/dL (normal: <5 mg/dL), amylase was 117 U/L (normal: <100 U/L) and lipase was 1786 U/L (normal: <55 U/L). Total/direct bilirubin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, gamma glutamyl transferase, serum electrolytes, hepatitis serology and lipid levels were within normal intervals. In the abdominal ultrasonography (USG) taken for the preliminary diagnosis of acute pancreatitis, the pancreatic head was normal, the liver size was within normal limits, and stage-1 hepatosteatosis was observed. Oral intake of the patient who was hospitalized and followed up was discontinued, intravenous (iv) hydration and pantoprazole iv were started. Abdominal CT taken on the same day showed normal pancreas, hepatosteatosis, thickened cecum wall, a few mesenteric lymphadenopathies in the right lower quadrant, fat necrosis-like areas, and 25x20 mm lesions compatible with EA (Figure 1). Ceftriaxone IV was started with the preliminary diagnosis of EA and feeding was started.

After the first dose of ceftriaxone, he had urticarial rashes, and his antibiotic therapy was changed to ampicillin/sulbactam and amikacin with the recommendation of the pediatric infection specialist. The patient's abdominal pain decreased on the second day of his treatment, and his oral intake was gradually increased. After seven days of antibiotic therapy, the patient was discharged for his clinical and laboratory findings improved completely. In the six-month follow-up, abdominal pain did not recur, and laboratory values were within the normal range. Verbal and written informed consent were obtained from the family for the case report.

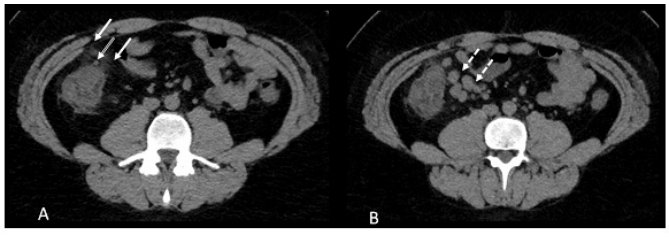

Figure 1. Abdominal computed tomography image of our case. A; At the level of the ileocecal junction, a lesion measuring 25x20 mm in fat density with a hyperdense focus (hollow arrow) in the center, high-density rim in its anterior neighborhood, and inhomogeneity compatible with inflammation in the surrounding mesenteric fatty tissue. B; adjacent mesenteric lymph nodes (dashed arrow)

Discussion

Although it is observed in higher numbers in the sigmoid colon and ileocecal region, the blood circulation of epiploic protrusions, which are about 50-100 in the whole colon, is provided by colic artery branches. Due to weak blood flow and their pedicled structures that allow free movement, they can be easily exposed to torsion and infarction, and can cause primary EA, which is usually a self-limiting, benign, rare inflammatory disease characterized by regional abdominal pain with sudden onset.[1,2,4] Secondary EA develops due to intra-abdominal inflammatory events such as acute appendicitis, cholecystitis, pancreatitis, and diverticulitis, and the main treatment is the elimination of the primary cause.[1,4,5] Although it can occur at any age, it is usually detected more frequently in men aged 20-50 years and in obese patients.[1,6-8] Our patient was a male, obese patient who was admitted with the clinic of acute pancreatitis, which was consistent with the literature. The incidence of epiploic appendicitis is estimated to be about 8.8 cases/million/year.[9]

Similar to our case for whom we considered primary EA, cases who were initially thought to have acute pancreatitis but were subsequently diagnosed and treated for EA have been reported in the literature.[10]

It presents with abdominal pain with acute onset mostly in the left lower quadrants and, in some cases, with abdominal tenderness and rebound. Fever, nausea, vomiting, diarrhea and constipation can be seen less frequently with EA.[4] There is no specific laboratory method for diagnosis, mild leukocytosis or normal leukocyte counts can be seen.[6,8] Although the leukocyte count of our patient was within the normal range, CRP positivity was detected due to acute inflammation. The lack of specific pathognomonic clinical and laboratory findings and the lack of awareness among physicians makes the diagnosis of EA difficult without the use of imaging methods.[4] EA should be considered in the differential diagnosis, especially in patients presenting with lower quadrant abdominal pain and in acute abdomen cases with suspicious laboratory and physical examination findings.[1,6] Accurate and rapid diagnosis is very important for EA that causes abdominal condition. The diagnosis of EA can be accurately and reliably made with USG and CT, and thus surgery can be avoided.[1,7] Since the physical examination of our patient revealed tenderness with superficial palpation in the epigastric and right lower quadrants, USG was first performed for diagnostic purposes.

However, the pancreas could not be fully evaluated due to the excess fat tissue in the abdomen. Therefore, abdominal CT was performed and the diagnosis of EA was established. Antibiotic treatment is rarely required in this self-limiting disease, but the use of antibiotics in addition to anti-inflammatory drugs is recommended in some studies.[4] Although anti-inflammatory conservative treatments are specified as the first treatment option in the literature, it has been reported that symptoms improve more rapidly when used together with the use of prophylactic antibiotic.[1,4,11] In our patient, CRP positivity was detected as an indicator of inflammation, and oral intake of the patient was re-opened after the condition of acute abdomen was excluded. It was observed that the abdominal pain decreased rapidly and the signs of inflammation regressed after the antibiotic was started. By the forty-eighth hour of the treatment, the abdominal pain was completely recovered. Studies on epiploic appendicitis have been reported mostly in adults in the literature, and a pediatric case was reported in this study.

Lipase is an enzyme that catalyzes the breakdown of triglycerides. In addition to pancreatic acinar cells, lipase is found in the gastrointestinal system, including the esophagus, duodenum, stomach, and colon. Knowing potential alternative causes of significantly elevated lipase is crucial for clinicians, as such levels may in some cases be erroneously interpreted as indicative of pancreatitis. Isolated increases in serum lipase can be explained by the release of non-pancreatic lipolytic enzymes into the general circulation. Various obstructive, inflammatory, ischemic, malignant, traumatic or systemic diseases induce the release of non-pancreatic lipolytic enzymes. Related causes mainly include systemic conditions such as acute cholecystitis, intestinal infarction, duodenal ulcer, obstructive or inflammatory bowel disorders, liver diseases, abdominal trauma as well as diabetic ketoacidosis and asymptomatic chronic alcoholism. In a study on 306 patients with abdominal pain, 12.5% had elevated serum lipase.[12-14] In studies on epiploic appendicitis, lipase elevation was not seen in the literature review. Although the prediagnosis of acute pancreatitis was considered due to high lipase level in our epiploic appendicitis at admission, no findings in favor of acute pancreatitis were detected in imaging studies. Lipase increase due to the release of non-pancreatic lipolytic enzymes into the general circulation was considered in the foreground in the patient whose abdominal pain was completely resolved on the 48th hour of antibiotic treatment, whose abdominal pain did not recur despite the initiation of oral intake, and whose lipase enzyme level gradually decreased and returned to normal on the 7th day.

In conclusion, since it is a rare disease in children, the diagnosis should be confirmed with CT before surgery in cases who present with the clinic of acute abdomen but the diagnosis is uncertain, and it should not be forgotten that unnecessary surgical interventions can be prevented only with conservative treatment. However, clinicians should be aware that elevated lipase and/or amylase alone may not reflect a true acute pancreatitis.

Information: Epiploic Appendicitis in the Differential Diagnosis of Acute Abdominal Pain: A Pediatric Case has been presented as an oral presentation with the title "II. International Congress on Pediatric and Obstetric Gynecological Diseases" with the abstract number S-079, held on October 21-24, 2021.

Ethics

Informed Consent: Verbal and written informed consent were obtained from the family for the case report.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.Ç., Ş.Ö., S.D., Ö.K.Ş., Concept: M.Ç., Ö.K.Ş., Design: M.Ç., Ö.K.Ş., Data Collection or Processing: M.Ç., Ş.Ö., S.D., Ö.K.Ş., Analysis or Interpretation: M.Ç., Ş.Ö., S.D., Ö.K.Ş., Literature Search: M.Ç., Ş.Ö., S.D., Ö.K.Ş., Writing: M.Ç., Ş.Ö., S.D., Ö.K.Ş.

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Case Report / Olgu Sunumu

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A Rare Cause of Newborn Apnea That Has Not Been Seen for A Very Long Time with the Effect of the Vaccine: Pertussis

Aşı Etkisiyle Çok Uzun Süredir Görülmeyen Nadir Bir Yenidoğan Apne Nedeni: Boğmaca

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Abstract

Pertussis, caused by *Bordetella pertussis*, is an important cause of morbidity and mortality in newborn and infancy. Pertussis is diagnosed clinically. It is confirmed by microbiological-serological tests. In recent years, polymerase chain reaction method has also been used in diagnosis. Macrolide group antibiotics are used in the treatment. Pertussis can occur at any age. However, it can cause mortality in infants who have not been vaccinated. A case report is presented in a 30-day-old newborn patient who was admitted to the pediatric intensive care unit due to apnea and respiratory superficial, and *Bordetella pertussis* was found to be the causative agent.

Keywords: Neonatal, apnea, pertussis

Öz

Boğmaca, *Bordetella pertussis*'in etken olduğu, yenidoğan ve süt çocukluğu döneminde önemli bir morbidite ve mortalite nedenidir. Boğmaca tanısı klinik olarak konulur, mikrobiyolojik ve serolojik testlerle kesinleştirilir. Son yıllarda tanıda polimeraz zincir reaksiyonu yöntemi de kullanılmaktadır. Tedavide makrolid grubu antibiyotikler verilir. Boğmaca, her yaşta görülebilir. Ancak aşılamaya başlanmamış bebeklerde mortaliteye neden olabilmektedir. Bu olgu sunumumuzda 30 günlük yenidoğan hastada apne ve solunum yüzeyelleşmesi nedeniyle çocuk yoğun bakım servisine yatırılan ve etken olarak boğmaca tespit edilen bir *Bordetella pertussis* olgusu sunulmuştur.

Anahtar Kelimeler: Yenidoğan, apne, boğmaca

Introduction

Babies with pertussis often require hospitalization; apnea and pneumonia are commonly seen and it may lead to seizures, encephalopathy, and rarely death.[1] In infants younger than three months of age, the catarrhal phase usually lasts for several days or is absent. The disease begins abruptly with apnea, cyanosis, and gasping attacks. Coughing is not prominent.[2] Cyanosis may follow seizures or apnea may occur without coughing. Apnea may also be the only finding.[2] In infants under one year of age, spasmodic cough attacks last longer in the paroxysmal and convalescent period.[2] In babies under two months of age, hospitalization is seen at the rate of 82%, pneumonia at the rate of 25%, convulsions at the rate of 4%, encephalopathy at the rate of 1%, and mortality at the rate of 1%.[2-4] The age group with the highest mortality include unvaccinated infants. The case of pertussis infection, which has been rare in Turkey since 2008 with effective vaccination, in this study highlights the importance of the vaccine. In a retrospective study conducted in France, it was reported that 13% of 100 deaths due to bacterial infection were due to pertussis infection and most of them were under 2 months of age.[5]

In our country, there are studies in the literature showing that pertussis in infants has a very serious course, causing hospitalization in intensive care units and causing mortality.[6,7]

In this article, we aimed to present the clinical course and response to macrolide treatment of a patient who presented with cough and bruising in the newborn period, was diagnosed with pertussis by polymerase chain reaction (PCR)

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rapid diagnostic test, and had apnea, in the light of current literature.

Case Report

A 30-day-old girl baby, who was born to a 42-year-old mother as G4P4Y3 at 37 weeks +5 days via C/S, started coughing one week ago. Due to the complaints of increased secretions and bruising, she was discharged from the outpatient center with antibiotic (clarithromycin) treatment. Afterwards, she was admitted to the Pediatric Infectious Diseases Department of the Gazi University Medical Faculty Hospital on 13/04/2022, because she had bruising and wheezing at home. The patient was hospitalized in the Pediatric Infection Clinic by starting intravenous ceftriaxone for a preliminary diagnosis of pneumonia. She was transferred to the pediatric intensive care unit due to the development of apnea, prolonged capillary filling time and respiratory distress during monitorization. The laboratory findings of the patient were as follows; hemoglobin: 11.8 g/dL, platelet count: 454,000 x10^3/uL, white blood cell: 18.600 x10^3/uL, neutrophil count: 4.100 x10^3/uL, Coronavirus PCR: negative, procalcitonin: 0.074 ng/mL. No abnormality was detected in her biochemical parameters.

It was learned from her history that her 8.5-year-old sibling died due to cardiomyopathy 2 months ago, so cardiac markers and echocardiography were evaluated. Pro-brain-type natriuretic peptide value was 3656 pg/mL and hs-troponin T-value was 90 ng/L. Echocardiography revealed left heart chambers to be dilated, but it was not clinically significant, and follow-up was recommended.

Because the patient's apnea continued in the pediatric intensive care unit, transfontanel ultrasonography was performed for etiology and found to be normal. Electrolyte abnormality was not observed. Moreover, thyroid function tests and metabolic diseases were investigated and detected to be negative.

The chest X-ray findings of the patient are shown in Figure 1.

Rapid PCR panel test for the respiratory tract was run because the patient had coughing attacks, which suggested pertussis as a clinical picture. As a result of the rapid PCR panel test, *Bordetella pertussis* was detected. Azithromycin was orally started at a single dose of 10 mg/kg/day, and the patient, whose apnea and respiratory distress improved, was transferred to the pediatric infection service. After 5-day treatment with azithromycin, the patient was discharged in good health and azithromycin prophylaxis was given by the pediatric intensive care team following the patient.

Discussion

Bordetella pertussis, the causative agent of whooping cough, is a highly contagious, hard-to-produce, gram-negative polymorphic rod. The disease is transmitted from person to person through respiratory secretions. Both vaccination and having the disease do not provide lifelong immunity. For this reason, vaccination is very important and a booster dose is administered. The disease characterized by spasmodic cough can last about 6-10 weeks. Macrolides are used in the treatment.[8]

Pertussis is seen in all age groups today, but the highest morbidity and mortality rates are observed in infants, especially in those younger than 6 months.[9] Although low antibody titers transplacentally pass from mother to baby, all babies are susceptible to pertussis from the newborn period since the level of antibodies passed is not at a level to protect the disease. Newborn babies usually get whooping cough from their parents and siblings. Armangil et al.[10] identified the source of pertussis infection as the baby's mother in a 9-day-old baby.

Protective pertussis toxin (PT) and filamentous hemagglutinin (FHA) antibodies are passed from the maternal blood to the baby through the placenta. Studies have shown that anti-PT

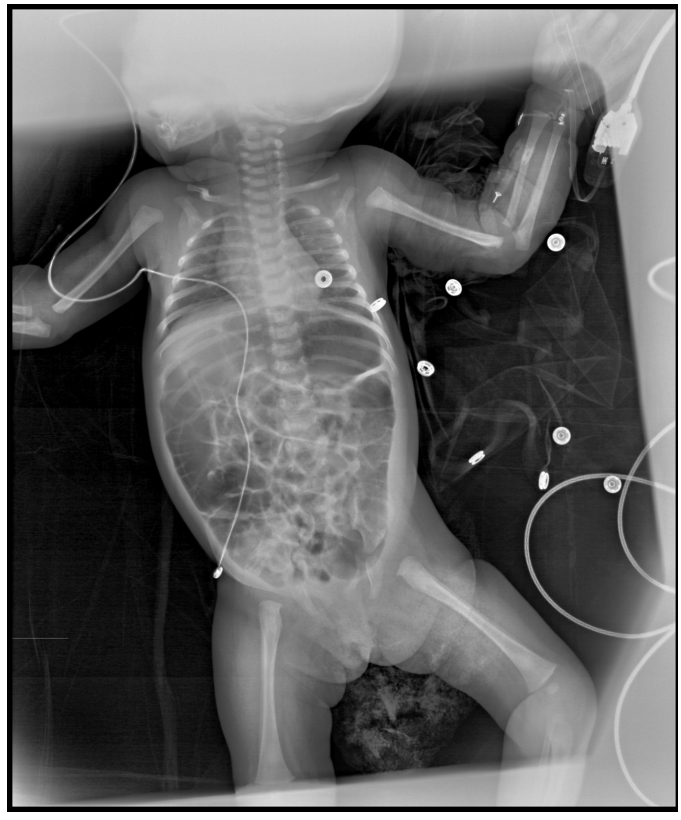

Figure 1. Chest X-ray findings of the patient: There is parallelization and flattening of the ribs, no active infiltration is observed

immunoglobulin-G levels in maternal blood and cord blood samples are close to each other, they decrease by half in the 6th week in infants, and undetectable low antibody levels are seen in the 4th month. Since there are not enough antibodies to provide effective protection until the beginning of primary immunity in babies, the probability of getting an infection is high.[11]

Apnea can be seen frequently in the neonatal period, especially in preterm infants, due to central nervous system immaturity. However, apnea in term babies mostly indicates an underlying pathology, such as sepsis, intraventricular bleeding, and seizure. Although it is rarely seen after these common pathologies, pertussis should be kept in mind in the differential diagnosis.

Culture method is the "gold standard" in the laboratory diagnosis of pertussis. However, patient-related factors (vaccination status, duration of symptoms, antibiotic use and age), sample collection and transportation conditions, and type and quality of media used affect sensitivity. In the catarrhal stage, very successful results can be obtained with direct culture. The microorganism can be isolated most frequently in the catarrhal and early paroxysmal stages, and it is rarely detected after the 3rd week of the disease. Although it turns negative and gives false results with the use of antibiotics, a positive culture provides definitive diagnosis and allows antibiotic susceptibility testing.

Different PCR methods targeting different gene regions of *Bordetella pertussis* have been developed and are used in laboratories for both diagnostic and research purposes. Among them, real-time PCR methods are preferred because they give results in a short time after DNA extraction, are closed systems that minimize contamination, and have high specificity and sensitivity captured with specific probes.

Specific antibodies against pertussis antigens can be detected by the "enzyme-linked immunosorbent assay" method. Serology is specific and sensitive, but not clinically practical. It is particularly sensitive in individuals who have been vaccinated and have a cough lasting more than two weeks. A single high level of antibodies against one or more pertussis antigens or a significant increase in the level of repetitive antibodies are diagnostic criteria. Antibodies are usually formed about two weeks after the onset of symptoms in natural infection. More than 90% of antibodies against *B. pertussis* are developed against PT and FHA. The immune response to other antigens such as pertactin (PRN) and fimbrial antigens is more variable and is seen in 30-60% of them. Past infection can be determined by measuring the increase in the titer of immunoglobulin-A against PT, FHA, PRN antigens of *B. pertussis* in individuals who have administered whole-cell vaccine. Anti-PT antibodies are specific for *B. pertussis*. Antibodies against FHA, PRN, and fimbrial antigen (FIM) can cross-react with antigens of *B. pertussis* with other microorganisms such as *B. parapertussis, H. influenzae*, and *M. pneumoniae*.[12]

Laboratory methods can be used to confirm the diagnosis in cases in which pertussis infection is clinically suspected. In the complete blood count, the leukocyte count is between 15,000 and 100,000/mm³ at the end of the catarrhal phase and in the paroxysmal phase, and lymphocytosis is typical. Lymphocytes are T and B lymphocytes and are normal cells unlike those seen in viral infections. Excessive elevation of leukocytes with the presence of thrombocytosis is the sign of poor prognosis. Perihilar infiltration, atelectasis, and sometimes butterfly-like infiltration can be seen on chest X-ray, the presence of parenchymal consolidation should be considered as the finding of secondary bacterial infiltration. Rarely, pneumothorax, pneumomediastinum or subcutaneous emphysema may develop.

At the "Global Pertussis Initiative" meeting held in 2005, various strategies were developed for vaccination against pertussis disease. These were determined as the continuation of current infant vaccination, fifth dose vaccination of all preschool children, general vaccination of adolescents, cocooning strategy (vaccination of mothers who have given birth, their families and those in close contact with newborns), selective vaccination of health workers, selective vaccination of workers in childcare centers, and general vaccination of adults.[12]

Vaccination is the best way to reduce pertussis infection and deaths caused by pertussis in early infancy. Vaccination is also of great importance in the scope of preventive medicine. In the light of current information, all babies should be vaccinated starting from the newborn period. In their study on newborns, Knuf et al.[13] showed that acellular pertussis vaccine (Tdap) was quite safe to be administered to babies on postnatal second and fifth days, and antibody titers increased significantly in the early period.[14]

In recent years, a vaccination program called the cocooning strategy has been implemented to prevent pertussis infection in newborns and early infancy. In the cocooning strategy, it is aimed to vaccinate all family members, even uncles, aunts, and babysitters, if any, together with the mother, in order to protect the newborn baby from whooping cough. With this method, the baby is surrounded by an imaginary cocoon against whooping cough. Although it is a somewhat expensive method, when evaluated in terms of cost-effectiveness, it is seen as a positive application and this strategy is applied in developed countries. In studies conducted, the source of pertussis infection in unvaccinated infants was found to be the relatives of the baby, especially the mother at a rate of 30-57%. In another study, it was determined that there was

a 65-70% decrease in the incidence of pertussis in under-risk infants of families in which the cocooning strategy was applied. For this reason, it is recommended that adults who have close contact with infants under 12 months of age should be administered a single dose of acellular pertussis (Tdap) vaccine to protect both themselves and their babies against pertussis.[15,16]

Conclusion

As in our case, pertussis should be kept in mind in the presence of recurrent apnea and bruising attacks and respiratory distress in a 30-day-old baby, and rapid PCR tests should be used for diagnosis. Cocooning strategy and vaccination should be performed in infants younger than 6 months in primary care preventive medicine. Pregnant women should be informed about acellular pertussis vaccine and they should be followed closely in this respect at regular check-ups.

Ethics

Informed Consent: Informed consent was obtained from the family.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Concept: K.K.K., M.U.Y., N.K.U., Design: K.K.K., M.U.Y., H.T., Data Collection or Processing: K.K.K., M.U.Y., Analysis or Interpretation: K.K.K., M.U.Y., N.K.U., N.A.Ü., H.T., Literature Search: K.K.K., M.U.Y.,

Writing: K.K.K., M.U.Y., N.K.U, N.A.Ü., H.T.

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