RESEARCH ARTICLE

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Evaluation of Patients Hospitalized with Skin and Soft Tissue Infections in the Pediatric Infectious Diseases Clinic

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Objective: Skin and soft tissue infections (SSTIs) are prevalent among pediatric patients. This study examines the etiological factors, clinical features, disease progression, and prognosis of children hospitalized for SSTIs over a year, alongside their clinical and laboratory data upon admission.

Materials and Methods: Patients admitted to the Pediatric Infectious Diseases Department due to SSTIs from January 1, 2023, to January 1, 2024, were retrospectively reviewed using the hospital's information management system. Their characteristics were recorded for analysis.

Results: A total of 144 patients were analyzed. Of these, 70 (48.6%) were female, and 74 (51.4%) were male. When divided by age, 24 (16.7%) were 0-2 years old, 72 (50%) were between 2 and 10 years old, and 48 (33.3%) were older than 10. Eleven patients (7.6%) had chronic diseases. A history of trauma was found in 65 (45.1%) cases. The most common symptoms at admission were fever in 121 (84%) cases, swelling in 132 (91.7%), warmth in 111 (76.4%), redness in 95 (66%), pain in 106 (73.6%), rash in 49 (34%), and itching in 22 (15.3%). Among cellulitis and abscesses, 49 (34%) cellulitis and 40 (27.8%) abscesses were located in the lower extremities. Cervical lymphadenitis was observed in 42 (29.2%) cases. Pathogens were isolated from blood cultures in 14 (9.7%) cases and from wound/abscess cultures in 51 (35.4%) cases. Among the 65 (45.1%) culture-positive cases, the most common gram-positive pathogen was community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA), while the most frequent gram-negative pathogen was *Enterobacteriaceae* species. All patients received empirical parenteral antibiotics, and 58 (40.3%) underwent drainage and/or surgical intervention. A comparison of the demographic and laboratory characteristics of patients with positive blood and wound cultures showed a significant correlation between sedimentation rate and hospitalization. During follow-up, no residual sequelae, functional impairment, or deformities secondary to SSTIs were observed.

Conclusion: Based on the literature review and local epidemiology, this study offers valuable insights for hospital-based management of common skin and soft tissue infections in pediatric patients.

Key Words: *Abscess, cellulitis, children, skin*

Çocuk Enfeksiyon Hastalıkları Kliniğinde Deri ve Yumuşak Doku Enfeksiyonları ile Yatan Hastaların Değerlendirilmesi

Amaç: Deri ve yumuşak doku enfeksiyonları (DYYE) çocuk hastalar arasında yaygın olarak görülmektedir. Bu çalışma, bir yıl boyunca DYYE nedeniyle hastaneye yatırılan çocukların etiyolojik etkenlerini, klinik özelliklerini, hastalığın seyri ve prognozunu, yatış anındaki klinik ve laboratuvar bulgularıyla birlikte değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Çocuk Enfeksiyon Hastalıkları Kliniği'ne 1 Ocak 2023 ile 1 Ocak 2024 tarihleri arasında DYYE nedeniyle yatırılan hastalar, hastane bilgi yönetim sistemi kullanılarak geriye dönük olarak incelendi. Hastalara ait demografik, klinik ve laboratuvar verileri analiz edilmek üzere kaydedildi.

Bulgular: Toplam 144 hasta incelendi. Bunların 70'i (%48.6) kız, 74'ü (%51.4) erkekti. Yaş dağılımına göre 24'ü (%16.7) 0–2 yaş, 72'si (%50) 2–10 yaş, 48'i (%33.3) ise 10 yaş üzerindeydi. On bir hastada (%7.6) kronik hastalık mevcuttu. Olguların 65'inde (%45.1) travma öyküsü saptandı. Başvuru sırasında en sık gözlenen semptomlar; ateş (%84), şişlik (%91.7), ısı artışı (%76.4), kızarıklık (%66), ağrı (%73.6), döküntü (%34) ve kaşıntı (%15.3) idi. Alt ekstremite yerleşimli 49 (%34) selülit ve 40 (%27.8) apse olgusu mevcuttu. Servikal lenfadenit 42 (%29.2) vakada görüldü. Kan kültürlerinde 14 (%9.7), yara veya apse kültürlerinde ise 51 (%35.4) vakada etken izole edildi. Kültür pozitif toplam 65 (%45.1) vakada en sık saptanan gram pozitif etken toplum kökenli metisiline dirençli *Staphylococcus aureus*, gram negatif etken ise *Enterobacteriaceae* türleri idi. Tüm hastalara ampirik parenteral antibiyotik tedavisi verildi; 58 hastaya (%40.3) drenaj ve/veya cerrahi müdahale uygulandı. Kan ve yara kültürü pozitif olan hastaların demografik ve laboratuvar verileri karşılaştırıldığında, eritrosit sedimantasyon hızı ile hastaneye yatış süresi arasında anlamlı ilişki saptandı. Takip sürecinde DYYE'ye bağlı kalıcı sekel, fonksiyon kaybı veya deformite izlenmedi.

Sonuç: Bu çalışma, literatür bilgisi ve yerel epidemiyolojik veriler ışığında, çocuk hastalarda sık görülen DYYE'nin hastane ortamındaki yönetimi konusunda değerli bilgiler sağlamaktadır.

Anahtar Kelimeler: *Apse, selülit, çocuk, deri*

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Introduction

Skin and soft tissue infections (SSTIs) are among the most common infectious diseases in childhood and represent a significant cause of hospital admissions. SSTIs involve bacterial infections affecting the epidermis, dermis, subcutaneous tissue, or deeper layers. The clinical spectrum ranges from mild impetigo to severe necrotizing fasciitis, with cellulitis, abscesses, and lymphangitis being frequently observed forms. In particular, cellulitis and abscesses are commonly encountered in pediatric patients and may lead to serious complications if not diagnosed and treated in a timely manner (1, 2).

The most common pathogens in pediatric SSTIs include *Staphylococcus aureus* and *Streptococcus pyogenes*. In recent years, an increase in cases caused by community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) has been reported, which has influenced empirical treatment approaches (3, 4). However, studies that provide comprehensive data on the clinical course, laboratory findings, and microbiological agents of SSTIs in hospitalized pediatric populations remain limited. Especially in Turkey, local epidemiological data regarding hospitalized children are scarce, despite their importance for antimicrobial stewardship and treatment protocols.

This study aims to evaluate the demographic, clinical, laboratory, and microbiological characteristics of children hospitalized with SSTIs over a one-year period, in order to contribute to the literature and assist clinicians in guiding empirical treatment based on local data.

Materials and Methods

Research and Publication Ethics: This study was approved by the Toros University Ethics Committee (Protocol No: E-23.05.2024/98).

This study was designed as a retrospective observational analysis. Pediatric patients hospitalized with a diagnosis of skin and soft tissue infections (SSTIs) in the Pediatric Infectious Diseases Clinic of a tertiary care hospital between January 1, 2023, and January 1, 2024, were evaluated using the hospital's information management system. Demographic data, clinical findings, laboratory results, treatment modalities, and culture reports were reviewed.

An abscess was defined as a fluctuant, erythematous, and tender collection of pus located in the deep dermis or subcutaneous tissue. Cellulitis was defined as a diffuse bacterial infection of the dermis and subcutaneous tissue.

Statistical analyses were performed using IBM SPSS Statistics version 23.0. The Shapiro-Wilk test was used to assess the normality of data distribution. Variables with normal distribution were presented as mean ± standard deviation (SD), while non-normally distributed data were expressed as median (minimum–maximum). The independent samples t-test was used for normally distributed variables, the Mann–Whitney U test for non-normally distributed variables, and the chi-square test for categorical variables. A p-value of <0.05 was considered statistically significant.

Results

This study retrospectively evaluated 144 pediatric patients diagnosed with SSTIs and hospitalized for treatment. Of the patients, 70 (48.6%) were female and 74 (51.4%) were male. Age distribution was as follows: 24 (16.7%) were 0–2 years old, 72 (50%) were 2–10 years old, and 48 (33.3%) were older than 10. Chronic comorbidities were present in 11 patients (7.6%), and a history of trauma was recorded in 65 (45.1%) cases.

Common symptoms included swelling in 132 (91.7%) patients, fever in 121 (84%), warmth in 111 (76.4%), pain in 106 (73.6%), erythema in 95 (66%), rash in 49 (34%), and pruritus in 22 (15.3%) cases. Cellulitis was most frequently localized to the lower extremities (n=49, 34%), followed by the periorbital (n=19, 13.2%), facial (n=7, 4.9%), and perianal (n=4, 2.8%) regions. Abscesses were most commonly observed in the extremities (n=40, 27.8%), followed by the perirectal area (n=4, 2.8%), axilla (n=3, 2.1%), and parotid gland (n=2, 1.4%). Cervical lymphadenitis was present in 42 patients (29.2%), and 8 (5.5%) had SSTIs secondary to scabies.

Culture positivity was detected in 14 (9.7%) blood cultures and 51 (35.4%) wound/abscess cultures, resulting in an overall positivity rate of 45.1% (n=65). The most common pathogen among gram-positive isolates was community-acquired methicillin-susceptible *Staphylococcus aureus* (CA-MSSA, n=40, 27.8%), while *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Escherichia coli* were each isolated in 3 patients (2.1%) among gram-negative organisms. No concurrent bacteremia was detected.

All patients received empirical parenteral antibiotic therapy. Monotherapy was used in 26 patients (18%), including ampicillin-sulbactam (n=20) and cefotaxime (n=6). Combination therapy was administered in 118 patients (81.9%), most commonly ampicillin-sulbactam plus clindamycin (n=75, 63.5%), followed by cefotaxime plus clindamycin (n=5, 4.2%) and meropenem-teicoplanin (n=2). Antibiotic changes were made in 5 cases (3.4%) based on antimicrobial susceptibility; no changes were needed due to adverse effects. Surgical drainage was performed in 58 (40.3%) patients. No sequelae, deformities, or functional impairments were observed at the end of treatment. Further details are presented in Tables 1.

At admission, the mean white blood cell (WBC) count was 15.902/mm³ (range: 3.200–21.900), absolute lymphocyte count (ALC) 3.171/mm³ (200–12,270), absolute neutrophil count (ANC) 10.426/mm³ (130–

8.880), platelet count 356.725/mm³ (47.000–798.000), median C-reactive protein (CRP) 7.72 mg/dL (0.3–35.4), and median erythrocyte sedimentation rate (ESR) 36.6 mm/hour (2–105). A significant association was found between blood culture positivity and hospital stay duration (p=0.004). In wound culture-positive patients, ESR was significantly higher (p=0.003). Further details are presented in Tables 2.

Table 1: Demographic and clinical characteristics of patients with skin and soft tissue infections

Demographic and Clinical Variables		**n (%)**
Sex, n (%) (male)		74(51,4)
Age group (years)		
	0-2 years	24(16.7)
	2-10 years	72(50)
	>10 years	48(33.3)
Comorbidity		11(7.6)
Soft tıssue injury		65(45.1)
Fever		121(84)
Swelling		132(91.7)
Heat increase		111(76,4)
Rash		22(15.3)
Hyperemia		95(66)
Itching		16(11.1)
Cellulitis location		
	Extremity	49(34)
	Preseptal	19 (13,2)
	Facial	7 (4.9)
	Perianal	4 (2.8)
Abscess location		
	Extremity	40(27.8)
	Cervical	14 (9.7)
	Perirectal	4 (2.8)
	Armpit	3 (2.1)
	Tooth Decay	2 (1.4)
	Parotitis	2 (1.4)
Cervical Lymphadenitis		42(29.2)
Scabies		8(5,5)
Growth in wound/abscess culture		51(35.4)
Growth in blood culture		14(9.7)
Drainage requirement		58(40.3)
Reproducing microorganism		
Gram posıtıve		
	MSSA	40(27.8)
	S. pneumonia	-
Gram-negative		
	P. aeruginosa	3(2.1)
	Klebsiella spp.	3(2.1)
	E. coli	3(2.1)

Min: minimum value Max: Maximum value MSSA: methicillin-susceptible *Staphylococcus aureus*.

Table 2: Comparison of Demographic and Laboratory Characteristics of Cases with Positive Blood and Wound Cultures.

Parameters	Blood Culture (Median (Min-Max))	*p*	Wound Culture (Median (Min-Max))	*p*
Leukocytes (mm^3)	19169 (7960-50610)	0.084	15602 (3740-50610)	0.550
ANS (/mm^3)	13018 (4740-32260)	0.090	10652(1400-32260)	0.447
ALS (/mm^3)	3160 (200-12270)	0.811	2808 (200-12270)	0.301
Platelets (mm^3)	354000(179000-591000)	0.368	349500(160000-619000)	0.624
ESR (mm/saat)	42 (14-105)	0.361	43 (3-105)	**0.003**
CRP (mg/dL)	10 (1.3-23.4)	0.290	8,3 (0.34-34)	0.151
Length of Stay (days)	14 (5-40)	**0.004**	11 (5-40)	**0.001**

Min: minimum value Max: Maximum value CRP: C-reactive protein, ESR: Erythrocyte sedimentation rate, ANS: Absolute Neutrophil Count, ALS: Absolute Lymphocyte Count,

Discussion

This study retrospectively examined pediatric case under the age of 18 who were hospitalized and treated in the pediatric infectious diseases clinic for SSTIs between 2023–2024. Our study, demographic, clinical, and laboratory data of SSTI cases, isolated microorganisms, antibiotics used, and hospitalization durations were evaluated. SSTIs are one of the significant reasons for pediatric patients' hospitalization and initiation of parenteral antibiotics. If not diagnosed and treated promptly, complications may develop. A three-year retrospective study in the United States analyzed 446 pediatric patients under 18 years old hospitalized for SSTIs. The study found that the average hospital stay was 11 days, with males comprising 54% of the cases and a median patient age of 10 years (4–16) (5). In our study, the hospital stay duration was 11 days (range: 4–40), and males accounted for 51.4% of the cases, aligning with findings in the literature.

Chand et al. (6) in their study investigating the clinical characteristics and treatment outcomes of cellulitis cases without abscesses in hospitalized pediatric patients, confirmed that cellulitis was the most common SSTI. Similarly, in our study, cellulitis emerged as the most prevalent type of infection. In a one-year retrospective study conducted by Elise Salleo et al. (5) in Western Australia, the extremities were identified as the most commonly affected body region in pediatric patients admitted to a tertiary hospital. Likewise, in our study, 49 cases (34%) of cellulitis and 40 cases (27.8%) of abscesses were located in the lower extremities. The same study reported that among 639 culture-positive isolates, 363 (56.8%) were community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) (7). In our study, among 65 (45.1%) culture-positive isolates, the most frequently isolated pathogen among gram-positive agents was community-acquired methicillin-sensitive *Staphylococcus aureus* (CA-MSSA) in 40 cases (27.8%). A retrospective study conducted at Istanbul University Cerrahpaşa Faculty of Medicine reported that among 35 pediatric patients hospitalized for perianal abscesses between 2009 and 2017, 54.3% underwent surgical drainage. In our study, 58 patients (40.3%) underwent surgical drainage, yielding results consistent with the literature (8). In a retrospective evaluation of 20 patients hospitalized with preseptal and orbital cellulitis at Ankara University Faculty of Medicine over eight years, no mortality was reported. Additionally, a study conducted at Ankara Sami Ulus Training and Research Hospital retrospectively analyzed 242 pediatric patients under the age of 15 diagnosed with SSTIs over four years, reporting no infection-related mortality (9, 10). In our study, no sequelae, functional impairment, or deformities associated with soft tissue infections were observed at the end of treatment, and no mortality was recorded. The treatment of suppurative complications such as abscesses requires incision and drainage before initiating parenteral antibiotics (11, 12). Abscesses are commonly reported to be caused by *Staphylococcus aureus*. Until recently, incision and drainage alone were considered the preferred method for abscess treatment without the need for antibiotics (13). In our study, *S. aureus* growth was detected in abscess cases, consistent with the literature. Antibiotic selection is generally based on clinical status. Considering the rising prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in the community, empirical antibiotic treatment should include coverage for this pathogen (14).

Recent studies have emphasized the importance of incision and drainage, demonstrating that adjunctive treatment with clindamycin or trimethoprim-sulfamethoxazole for up to seven days post-procedure offers therapeutic benefits (15). In our study, clindamycin was also added to the antibiotic regimens of treated patients. Preserving skin integrity, avoiding insect bites, and maintaining regular hand hygiene are effective measures for preventing skin infections (16). Preventing cellulitis will reduce the burden of hospitalization for children and their families. Current national guidelines for cellulitis prevention strategies include the use of insect repellents, the application of antiseptics to minor injuries, and the potential implementation of a Group A *Streptococcus* (GAS) vaccine if available in the next decade (17). In Canada, the majority of emergency department visits have been reported to be due to insect bites (21.6%) and trauma (20.3%), resulting in extremity cellulitis in most cases (69.5%) (18). In our study, similar to the literature, extremity cellulitis was more frequently observed in both groups. Pathogen identification in cellulitis remains challenging (19). This study confirms

that blood cultures in immunocompetent children do not have significant clinical value in the diagnosis of cellulitis. Our study found that blood culture positivity was not clinically significant in diagnosis, whereas wound cultures were more useful, with positive results obtained in over 80% of tested samples. Comparison of demographic and laboratory values between blood and wound culture-positive cases revealed that blood culture positivity was significantly associated with hospitalization, whereas wound culture positivity correlated with sedimentation levels and hospital stay duration. Methicillin-sensitive *Staphylococcus aureus* (MSSA) was the most frequently isolated organism, while the role of *Streptococcus pyogenes* (GAS) may not have been fully evaluated. A serology-based study in adults with cellulitis indicated that 73% of culture-negative cellulitis cases were associated with *Streptococcus pyogenes* (GAS) (20). The length of hospital stay observed in our study is consistent with findings in the international literature on cellulitis and superficial skin and soft tissue infections (SSTIs) (18, 21).

A limitation of this study is its retrospective design. Additionally, the study population is restricted to moderate to severe cellulitis cases, as mild cases are generally treated on an outpatient basis. Based on our findings, future research should evaluate the effectiveness of targeted prevention strategies for high-risk populations. Pediatric skin and soft tissue infections (SSTIs) remain a leading cause of hospitalization among children in our country. Preventing pediatric cellulitis will necessitate a comprehensive approach, incorporating strategies to prevent insect bites, reduce minor trauma, and potentially investigate future vaccination options against *Streptococcus pyogenes* (GAS).

In conclusion, skin and soft tissue infections (SSTIs) are among the most common infectious causes of hospitalization in pediatric patients. This single-center retrospective study contributes to the limited body of knowledge by providing comprehensive clinical, laboratory, and microbiological data from hospitalized children with SSTIs in a tertiary care setting in Turkey. The findings demonstrate that cellulitis and abscesses are the predominant presentations, with the lower extremities most commonly affected and *Staphylococcus aureus* (particularly CA-MSSA) being the leading pathogen. Empirical antibiotic therapy, guided by local epidemiology, was effective in the majority of cases, with no observed sequelae or mortality. Our results support the importance of wound cultures over blood cultures for pathogen detection and highlight ESR as a potential marker of disease severity. The study emphasizes the need for region-specific data to optimize empirical treatment strategies and guide infection control policies. Future prospective studies are warranted to evaluate the long-term outcomes and preventive strategies, including hygiene education and potential vaccine development for *Streptococcus pyogenes*.

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