

# Tiny Patients vs a Deadly Disease: An Epidemiologic Review of Necrotizing Fasciitis in Pediatric Patients.

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**INTRODUCTION:** Necrotizing fasciitis is a rare but potentially life-threatening infection that can occur in both pediatric and adult patients. Urgent identification and differentiation of necrotizing fasciitis from other soft tissue infections is vital to prevent associated morbidity and mortality. Given the rarity of this condition, few studies have examined necrotizing fasciitis in pediatric populations. Thus, the majority of diagnosis, prognosis, and management suggestions have been based on adult data. The goal of this study was to examine the variance in epidemiology and outcomes of pediatric and adult patients with confirmed necrotizing fasciitis from a single center.

**METHODS:** A retrospective review from a single tertiary center identified 354 patients with confirmed necrotizing fasciitis. This included 23 children (<17 years of age) and 331 adults (≥18 years of age) over a 23-year study period. Following a ICD9/10 search for patients with necrotizing fasciitis, records were individually verified for the presence of disease prior to inclusion. Demographics including age, gender, infection origin, comorbidities, causative microbe, patient presenting symptoms, and mortality rate were compared.

**RESULTS SECTION:** Between children and adults with confirmed necrotizing fasciitis, similar rates of gender and ethnic distribution were observed. Upon admission, pain, erythema, and swelling were present at similar rates between cohorts. The origin and mechanism of infection were significantly different between cohorts with children experiencing extremity infections at double the rate of adults (73.9% vs. 36.0%,  $p<0.01$ ). Children presented with lower rates of necrotizing fasciitis from infected wounds (0.0% vs. 25.8%,  $p<0.001$ ), and higher rates of necrotizing fasciitis from puncture wounds (17.4% vs. 8.1%,  $p<0.001$ ) compared to adults. Tissue culture results were significantly different between cohorts with children developing culture-negative necrotizing fasciitis at more than 5x the rate of adults (23.8% vs. 4.6%,  $p<0.001$ ). Finally, children, along with having fewer comorbidities ( $P<0.001$ ) had more favorable outcomes with shorter length-of-stay and lower rates of amputation, and multi-organ failure. Importantly, children also had lower mortality rates compared to adults (4.3% vs 19.8%,  $p<0.001$ ).

**DISCUSSION:** Cases of pediatric necrotizing fasciitis differ from those of adults with lower rates of comorbidities, different mechanisms of contracting necrotizing fasciitis, and higher rates of culture-negativity. We aim to utilize this foundational data to support a future multi-center clinical study focused on developing pediatric-specific 1) diagnostic systems to improve the detection of necrotizing fasciitis from other severe soft tissue infections, 2) prognostic algorithms to predict patient outcomes, and 3) clinical practice guidelines to direct optimal treatment. This study is underdevelopment with the Children's Orthopaedic Trauma and Infection Consortium for Evidence-based Studies (CORTICES) group (CORTICES.org).

**SIGNIFICANCE/CLINICAL RELEVANCE:** (1-2 sentences): The unique features of pediatric necrotizing fasciitis, coupled with the rapidly progressive nature and devastating sequelae should prompt high clinical suspicion, even when a child lacks traditional risk factors, disease features, and/or culture results commonly found in adults with necrotizing fasciitis.