EARLY DIAGNOSTIC MARKERS AND PROPHYLACTIC INTERVENTIONS TO PREVENT SUPPURATIVE PROGRESSION IN CHILDHOOD HEMATOGENOUS OSTEOMYELITIS

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Abstract: This study evaluates early diagnostic strategies and targeted prevention of purulent complications in pediatric hematogenous osteomyelitis. A total of 86 children received MRI-supported diagnosis and pathogen-directed antimicrobial therapy, compared with 50 children presenting with purulent complications. Early imaging combined with culture-based treatment significantly reduced abscess formation, transphyseal injury, and surgical need. Oral step-down therapy after clinical and CRP improvement demonstrated high efficacy, while MRSA cases required prolonged intravenous therapy and more frequent surgery. These findings support a multidisciplinary protocol that integrates rapid imaging, targeted antibiotics, and timely surgical decisions to prevent suppurative progression in children with osteomyelitis.

Keywords: osteomyelitis, children, purulent, MRI, antibiotics, MRSA, prevention

Introduction. Preventing purulent complications in hematogenous osteomyelitis among children requires early diagnosis, targeted antimicrobial therapy, and close clinical monitoring**.** Imaging—especially MRI—supports detection of transphyseal lesions and helps prevent long-term growth deformities (Meotti et al., 2025; Cochard et al., 2024). Prompt identification of common pathogens such as *Staphylococcus aureus* and *Kingella kingae* enables effective targeted treatment (Cochard et al., 2024). Short intravenous therapy followed by oral antibiotics is typically sufficient when clinical improvement and reduced C-reactive protein are observed (Zhang et al., 2024). In severe or MRSA-associated disease, prolonged IV therapy and possible surgical drainage may be necessary (Zhang et al., 2024). Oral step-down treatment can be as effective as outpatient parenteral therapy, with fewer risks (Olson et al., 2024). Multidisciplinary management, including timely surgery when indicated, remains critical to avoiding abscess formation and growth plate complications (Oji & Sabatini, 2024).

Aim of this study that The development of effective methods for detecting and preventing purulent complications of osteomyelitis is crucial for saving patients' lives and improving their quality of life.

Materials and methods: This prospective comparative study included 86 pediatric patients (≤18 years) diagnosed with hematogenous osteomyelitis at Fergana City Children's Hospital between 2023–2025. A comparison group of 50 children was selected from the purulent surgery department at the Andijan Regional Multidisciplinary Children's Center, presenting with purulent complications of osteomyelitis. Clinical assessment included history, physical examination, temperature monitoring, measurement of

inflammatory markers (C-reactive protein, ESR, leukocyte count), and microbiological culture from suspected sites. MRI was used to detect transphyseal lesions and evaluate abscess formation. Treatment consisted of antibiotic regimens based on pathogen identification, with surgical intervention indicated for abscesses or sequestration. Patients were followed for 3 months to assess treatment outcomes and complication rates.

Results: Among the 86 patients treated with early diagnosis and targeted antibiotic therapy, purulent complications occurred in 11.6% (n=10), whereas the comparison group demonstrated a significantly higher rate of 44% (n=22). MRI detected transphyseal involvement in 21% (n=18) of patients, and timely intervention prevented growth disturbances in 88.9% (n=16) of detected cases. Culture-based pathogen identification showed Methicillin-sensitive Staphylococcus aureus (MSSA) in 57%, Kingella kingae in 14%, and MRSA in 10%. Patients with MRSA required longer intravenous therapy (mean 18 days) and surgery in 62.5% of cases.

Oral step-down therapy after 5–7 days of intravenous treatment was successful in 82% of uncomplicated cases, with CRP reduction serving as the main criterion for transition. Treatment failure occurred in only 6.9% of patients receiving oral step-down therapy, significantly lower than in those discharged on outpatient parenteral therapy (OPAT) (14.2%).

Discussion. These findings demonstrate that early diagnosis supported by MRI, culture-based antimicrobial selection, and timely surgical intervention significantly reduces the risk of purulent complications in pediatric hematogenous osteomyelitis. Identifying MSSA and K. kingae as leading pathogens supports precise antibiotic selection, while MRSA remains a predictor of severe progression, prolonged therapy, and surgical need. Oral step-down treatment after clinical and laboratory improvement proves safe and effective, minimizing complications associated with parenteral therapy. Thus, a multidisciplinary approach combining rapid diagnostics, pathogen-oriented therapy, and individualized surgical decision-making is essential for preventing abscess formation, growth disturbances, and long-term morbidity in affected children.

Conclusion. Effective prevention of purulent complications in pediatric hematogenous osteomyelitis is achievable through early imaging-based diagnosis, targeted antimicrobial therapy, and timely surgical management. CRP-guided transitions to oral antibiotics and pathogen-specific treatment strategies substantially improve outcomes and minimize invasive complications, contributing to better long-term musculoskeletal health in children. Recommendations: 1. Use early MRI with CRP monitoring to prevent purulent progression. 2. Apply pathogen-directed antibiotics and early surgery when abscess or MRSA is suspected.

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