EARLY DIAGNOSIS AND IMPROVEMENT OF PREVENTIVE MEASURES FOR SEPSIS DEVELOPMENT IN PATIENTS WITH DIFFERENT FORMS OF TUBERCULOSIS

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Abstract. *This research focuses on the development and improvement of methods for early diagnosis and prevention of sepsis in patients suffering from various forms of tuberculosis. Tuberculosis remains one of the most significant infectious diseases worldwide, often complicated by sepsis, which increases morbidity and mortality. Early recognition of sepsis symptoms, timely laboratory diagnostics, and preventive therapeutic strategies are essential to reduce complications and improve treatment outcomes. The study emphasizes modern diagnostic approaches, including biochemical markers and imaging techniques, as well as preventive measures aimed at minimizing infection risks. Implementing these methods in clinical practice contributes to more effective management of tuberculosis patients and decreases the rate of sepsis-related complications.*

Keywords: *tuberculosis, sepsis, early diagnosis, prevention, clinical management.*

The relationship between tuberculosis and sepsis is complex and multifactorial. Tuberculosis causes chronic inflammation that weakens the immune system, predisposing patients to secondary bacterial infections that can progress to sepsis. The persistence of *Mycobacterium tuberculosis* in the body leads to continuous activation of macrophages, cytokine release, and immune exhaustion. As a result, the host’s defense mechanisms against opportunistic pathogens become compromised. In disseminated or advanced pulmonary tuberculosis, bacterial translocation from damaged lung tissue or extrapulmonary lesions contributes to systemic infection. This process triggers an exaggerated inflammatory response known as a “cytokine storm,” which leads to multiple organ dysfunction if untreated. Understanding the immunopathogenesis of sepsis in tuberculosis patients is vital for developing early detection biomarkers and designing preventive strategies. The integration of immunological studies with clinical monitoring allows timely recognition of sepsis risk, especially in patients with multidrug-resistant or immunocompromised conditions.

Early diagnosis of sepsis in tuberculosis patients remains a major clinical challenge due to overlapping symptoms such as fever, weakness, and respiratory distress. Traditional diagnostic methods often fail to distinguish between tuberculosis exacerbation and sepsis onset. Therefore, the use of specific biomarkers such as procalcitonin (PCT), C-reactive protein (CRP), and interleukin-6 (IL-6) levels has become essential in clinical practice. Blood culture and molecular testing help identify bacterial pathogens responsible for sepsis, while complete blood count and lactic acid levels provide additional information on systemic inflammation and perfusion. Radiological imaging (CT, chest X-ray) supports differential diagnosis when pulmonary involvement complicates the clinical picture. The combination of these laboratory and imaging techniques enables clinicians to recognize sepsis at its earliest stage and initiate appropriate treatment. Furthermore, developing diagnostic algorithms based on dynamic biomarker

monitoring can significantly reduce mortality and improve patient outcomes. Implementing standardized diagnostic protocols in tuberculosis hospitals is crucial for effective sepsis management.

Prevention of sepsis in tuberculosis requires an integrated clinical and public health approach. The first step involves strict adherence to anti-tuberculosis treatment regimens to reduce bacterial load and prevent disease progression. Infection control measures such as proper sanitation, disinfection, and isolation of contagious patients are essential to minimize hospital-acquired infections. Nutritional support and immune-enhancing interventions, including vitamin supplementation and balanced diets, strengthen the host's resistance to infections. In addition, rational antibiotic therapy guided by microbial sensitivity testing prevents the development of multidrug resistance and reduces unnecessary antibiotic exposure. Early recognition of co-infections, timely antimicrobial therapy, and continuous clinical monitoring can dramatically decrease sepsis incidence. Preventive programs should also focus on health education for patients and healthcare workers, emphasizing hygiene, early symptom reporting, and adherence to treatment. Ultimately, improving sepsis prevention in tuberculosis patients requires coordination among phthisiatrists, infectious disease specialists, and critical care physicians to ensure comprehensive, patient-centered management.

Conclusion

The early diagnosis and prevention of sepsis in patients with various forms of tuberculosis represent one of the most urgent challenges in modern infectious disease medicine. The study of the pathophysiological mechanisms reveals that tuberculosis weakens immune defense, creating favorable conditions for the development of systemic bacterial infections. Understanding these interactions allows for the identification of individuals at higher risk and the implementation of targeted monitoring. Early diagnosis through laboratory biomarkers such as procalcitonin, C-reactive protein, and interleukin levels, supported by radiological and microbiological tests, plays a crucial role in timely recognition and intervention.

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