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Opinion Article

Platelet Lymphocyte Balance in Diagnosing Childhood Tuberculosis

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DESCRIPTION

Pulmonary TB and latent TB infection (LTBI) represent different manifestations of *Mycobacterium tuberculosis* infection, each with distinct clinical implications. Identifying biomarkers that can aid in the diagnosis and monitoring of these conditions is crucial for improving outcomes. One such biomarker that has gained attention is the Platelet to Lymphocyte Ratio (PLR), a simple and cost-effective parameter derived from routine blood tests. The platelet to lymphocyte ratio is calculated by dividing the absolute platelet count by the absolute lymphocyte count. This ratio reflects the interplay between inflammatory and immune responses, as platelets are involved in inflammation and thrombosis, while lymphocytes are key players in adaptive immunity. An elevated PLR has been associated with various inflammatory and infectious conditions, making it a potential marker for TB. Patients with active pulmonary TB often exhibit a higher PLR compared to those with latent TB infection (LTBI) or healthy individuals. This elevation may reflect the heightened inflammatory response in active disease. Conversely, individuals with LTBI may have a relatively stable or normal PLR, indicative of a controlled immune response. As a readily accessible and inexpensive biomarker, PLR holds promise for differentiating active TB from LTBI and monitoring disease progression or treatment response.

The role of PLR in Pulmonary TB and Latent TB

Pulmonary TB: It is an active form of the disease where the bacteria actively multiply, leading to clinical symptoms such as cough, fever, weight loss, and night sweats. Active TB triggers a robust inflammatory response, often characterized by increased platelet production and changes in lymphocyte counts. Studies have demonstrated that children with pulmonary TB tend to have higher PLR values compared to healthy controls, reflecting the heightened inflammatory state.Elevated PLR in pulmonary TB may be attributed to several factors, such as increased platelet production in inflammatory cytokines, such as Interleukin-6 (IL-6), stimulate the bone marrow to produce more platelets. Lymphocyte reduction in chronic infections like TB can lead to lymphocyte apoptosis or redistribution, resulting in lower lymphocyte counts.

Latent TB Infection (LTBI): LTBI represents a state where *Mycobacterium tuberculosis* remains dormant within the host without causing active disease. Children with LTBI are asymptomatic but carry the risk of progression to active TB, especially in the absence of adequate immune control. Unlike pulmonary TB, LTBI does not usually evoke a strong systemic inflammatory response. As a result, PLR values in children with LTBI are generally lower than those observed in pulmonary TB but may still differ from those in completely healthy individuals. Monitoring PLR in LTBI could serve as an indicator of early immune changes, potentially signaling reactivation risk.

Clinical utility of Platelet to Lymphocyte ratio

Diagnostic aid: PLR can serve as a supportive diagnostic tool in differentiating between pulmonary TB, LTBI, and healthy states. While it cannot replace definitive diagnostic tests like sputum microscopy, culture, or molecular assays, it offers a rapid and non-invasive option for initial assessment.

Disease monitoring: In children undergoing treatment for pulmonary TB, PLR trends may help monitor response to therapy. A declining PLR during treatment could indicate resolution of inflammation and recovery of immune function.

Limitations of PLR

In LTBI, elevated PLR values may signal an increased risk of progression to active TB, prompting closer clinical surveillance or preventive therapy. Despite its potential, PLR has some limitations, such as elevated PLR is not specific to TB and can occur in other infectious or inflammatory conditions. Normal platelet and lymphocyte counts vary with age, requiring age-specific reference ranges for accurate interpretation. Conditions such as malnutrition, anemia, or co-infections can affect PLR, complicating its interpretation. Additionally, factors like individual variability in immune responses and the influence of comorbidities may limit the specificity of PLR in TB diagnosis. To enhance its diagnostic value, PLR could be combined with other biomarkers or diagnostic tools, such as Interferon-Gamma Release Assays (IGRAs) or molecular tests, to improve sensitivity and specificity. Ongoing research into the role of PLR in TB pathophysiology and its integration into diagnostic algorithms

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may provide valuable insights for personalized patient management and TB control efforts.

CONCLUSION

The platelet-to-lymphocyte ratio is an emerging biomarker with potential applications in the diagnosis and management of paediatric TB. Elevated PLR values in pulmonary TB reflect the systemic inflammatory response, while lower values in LTBI highlight the absence of active disease. Although PLR is not a standalone diagnostic tool, its simplicity, accessibility, and cost-effectiveness make it a valuable adjunct in TB management. Further research is needed to establish standardized reference ranges and explore its role in predicting outcomes and guiding treatment decisions in children with TB.