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THE ROLE OF TUMOR NECROSIS FACTOR ALPHA (TNF-A) IN CHRONIC RHEUMATIC HEART DISEASE IN CHILDREN

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Resume: Chronic rheumatic heart disease (CRHD) remains one of the most common causes of acquired heart defects in children, especially in developing countries. Tumor necrosis factor alpha (TNF-α), a pro-inflammatory cytokine, plays a crucial role in mediating immune and inflammatory responses in rheumatic fever and its chronic outcomes. Elevated TNF-α levels reflect the degree of myocardial and valvular inflammation, which contributes to the progression of cardiac lesions. Assessing TNF-α concentrations in the blood may improve diagnosis, monitoring, and therapeutic management of CRHD.

Key words:chronic rheumatic heart disease, TNF-α, cytokines, inflammation, children, biomarkers

Relevance
Rheumatic fever and its chronic outcome, chronic rheumatic heart disease, are still significant causes of morbidity in children in developing countries. The immune-mediated damage caused by repeated streptococcal infections leads to persistent inflammation of the heart valves and myocardium. Traditional markers like ESR and CRP are not specific for immune activation. Tumor necrosis factor alpha (TNF-α) is a cytokine that mediates inflammation and tissue damage in autoimmune and infectious diseases. Elevated TNF-α levels have been observed during active rheumatic carditis and are associated with disease severity and poor outcomes. Monitoring TNF-α may provide a more specific assessment of inflammatory activity in CRHD and guide therapy.

Purpose of the study
To evaluate the diagnostic and prognostic significance of serum TNF-α levels in children with chronic rheumatic heart disease during periods of remission and exacerbation.

Materials and Methods
A clinical and laboratory study was conducted on 82 children (aged 6–17 years) diagnosed with chronic rheumatic heart disease, hospitalized at the Pediatric Cardiorheumatology Department of the Bukhara Regional Children's Multidisciplinary Medical Center between 2022 and 2025. Patients were divided into two groups: Group I (n=45) – CRHD in active phase; Group II (n=37) – remission. A control group included 30 healthy children. Serum TNF-α levels were measured using enzyme-linked immunosorbent assay (ELISA).

Routine markers (ESR, CRP) were also determined, and echocardiography was performed to assess valvular function and myocardial activity. Statistical analysis included Student's t-test and correlation analysis using Pearson's coefficient.

Results

Serum TNF-α concentrations were significantly higher in children with active CRHD (mean 38.6 ± 9.7 pg/mL) compared to those in remission (12.4 ± 4.3 pg/mL) and healthy controls (5.6 ± 2.1 pg/mL) ($p < 0.01$). A strong positive correlation was observed between TNF-α and CRP ($r = 0.72$, $p < 0.01$), as well as between TNF-α and echocardiographic indicators of valvular inflammation ($r = 0.68$, $p < 0.01$). Children with persistently high TNF-α levels after anti-inflammatory therapy were more likely to experience early relapses of rheumatic activity.

Discussion

The study confirms the important role of TNF-α as a key mediator of inflammation in chronic rheumatic heart disease. High serum TNF-α reflects ongoing immune activation and tissue damage in the myocardium and valves. Unlike conventional markers, TNF-α directly participates in the pathogenesis of cardiac inflammation and fibrosis, which underlies the progression of valvular lesions. Regular monitoring of TNF-α levels can serve as an early indicator of disease activity and treatment efficacy. The results suggest that anti-TNF therapy or modulation of cytokine response might be beneficial in severe or recurrent cases of CRHD.

Conclusion

1. TNF-α is a reliable biomarker of inflammatory activity in children with chronic rheumatic heart disease.
2. Elevated TNF-α correlates with clinical and echocardiographic signs of active rheumatic inflammation.
3. Monitoring TNF-α levels assists in early diagnosis, prognosis, and treatment optimization in CRHD.
4. Further studies are needed to explore the therapeutic potential of cytokine modulation in pediatric CRHD.

References:

1. WHO. Rheumatic Fever and Rheumatic Heart Disease: Technical Report. Geneva, 2021.
2. Braunwald E. Heart Disease: Textbook of Cardiovascular Medicine. 12th ed., 2021.
3. Shabalov N.P. Pediatrics: textbook. St. Petersburg: SpetsLit, 2020.
4. Gupta S., et al. Role of TNF-α in the pathogenesis of rheumatic carditis. J Clin Immunol, 2022; 14(2): 135–143.
5. Kumar A., et al. Cytokine markers in rheumatic heart disease. Int J Cardiol Res, 2023; 19(3): 201–210 Pediatrics: a textbook for medical universities / edited by N. P.