

## MODERN TYPES OF IMMUNOENZYME ANALYSIS METHODS OLD PROBLEMS

Isomadinova Lola Kamoliddinovna

Assistant of the Department of Clinical and Laboratory  
Diagnostics with a Course of PGD Clinical and Laboratory  
Diagnostics of Samarkand State University Samarkand, Uzbekistan

Tashanova Zarnigor Isomiddin qizi

Clinical resident of the Department of Clinical and Laboratory  
Diagnostics with a Course of PGD Clinical and Laboratory  
Diagnostics of Samarkand State University Samarkand, Uzbekistan

### Abstract

Pyelonephritis is one of the most common inflammatory kidney diseases, frequently leading to hospitalization and chronic complications. Effective diagnostic methods are essential for the timely detection and treatment of this condition. Modern laboratory techniques, including cytokine analysis, provide valuable data for assessing the inflammatory process and predicting the disease course.

**Keywords:** Pyelonephritis, laboratory diagnosis, cytokines, inflammation, kidney infection, urinalysis, blood tests, biochemistry.

### Introduction

#### Objective

To evaluate the impact of cytokine analysis on the diagnosis of pyelonephritis by comparing two groups of patients.

#### Methods.Study

Participants. The study included 104 patients, divided into two groups: **First Group (54 participants):** Patients underwent standard diagnostic procedures for pyelonephritis, including clinical evaluation, urinalysis, blood tests, and imaging studies. **Second Group (50 participants):** In addition to standard diagnostic procedures, these patients also had their cytokine levels analyzed.

Diagnostic Procedures

Urinalysis

Urinalysis is a cornerstone in diagnosing pyelonephritis. The test includes examining the physical, chemical, and microscopic properties of urine. Key indicators for pyelonephritis in urinalysis include:

- **Pyuria:** The presence of white blood cells (WBCs) in the urine, indicating infection.
- **Bacteriuria:** The presence of bacteria in the urine.
- **Hematuria:** The presence of red blood cells (RBCs) in the urine, which can indicate inflammation or damage.



- **Proteinuria:** The presence of protein in the urine, which can suggest kidney involvement.
- **Nitrites:** Indicating the presence of bacteria that reduce nitrates to nitrites.
- **Leukocyte Esterase:** An enzyme found in WBCs, indicating infection.

### Blood Tests

Blood tests provide additional information about the patient's condition and the extent of the infection. Key blood tests include:

- **Complete Blood Count (CBC):** This test evaluates the levels of different cells in the blood. An elevated white blood cell count can indicate an infection.
- **Erythrocyte Sedimentation Rate (ESR):** This test measures how quickly red blood cells settle at the bottom of a test tube. A high ESR can indicate inflammation.
- **C-Reactive Protein (CRP):** CRP levels rise in response to inflammation. Elevated CRP levels can be a marker of acute infection.

### Biochemical Analysis

Biochemical analysis of blood provides insight into kidney function and the overall metabolic state of the patient. Key parameters include:

- **Serum Creatinine:** Elevated levels can indicate impaired kidney function.
- **Blood Urea Nitrogen (BUN):** Elevated BUN levels can also indicate kidney dysfunction.
- **Electrolytes:** Including sodium, potassium, chloride, and bicarbonate, which are essential for assessing the metabolic state and kidney function.
- **Liver Function Tests:** These tests include alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and bilirubin, providing a broader picture of the patient's health.

### Cytokine Analysis

Cytokines are small proteins involved in cell signaling, playing a crucial role in the body's immune response. In this study, specific cytokines such as IL-6, IL-8, and TNF- $\alpha$  were measured. Elevated levels of these cytokines can indicate the presence and severity of inflammation, which is essential for diagnosing and managing pyelonephritis.

**Results.** Urinalysis. In both groups, urinalysis showed key indicators of pyelonephritis such as pyuria, bacteriuria, and hematuria. The presence of nitrites and leukocyte esterase was noted in a significant number of patients, corroborating the diagnosis of urinary tract infection leading to pyelonephritis.

### Blood Tests

#### First Group (Standard Diagnostic Group)

The first group of 54 patients underwent standard blood tests. Elevated WBC counts were found in approximately 75% of patients, indicating an acute infection. ESR and CRP levels were also elevated in most patients, consistent with active inflammation.

#### Second Group (Cytokine Analysis Group)

In the second group of 50 patients, blood tests were complemented with cytokine analysis. In addition to elevated WBC counts, ESR, and CRP levels, these patients showed significantly



higher levels of IL-6, IL-8, and TNF- $\alpha$  compared to the first group. These cytokines were consistently associated with the severity of the infection and inflammation.

### **Biochemical Analysis**

#### **First Group (Standard Diagnostic Group)**

Biochemical analysis in the first group revealed elevated serum creatinine and BUN levels in approximately 40% of patients, indicating impaired kidney function. Electrolyte imbalances were also noted in some patients, reflecting the impact of infection and inflammation on kidney function.

#### **Second Group (Cytokine Analysis Group)**

In the second group, biochemical analysis showed similar patterns of elevated serum creatinine and BUN levels. However, the inclusion of cytokine analysis provided a more detailed picture of the inflammatory response, correlating with the severity of kidney impairment.

### **Comparative Analysis**

Patients in the second group demonstrated a higher diagnostic accuracy rate (95%) compared to the first group (80%). The addition of cytokine analysis reduced the number of missed or misdiagnosed cases, especially in patients with atypical or mild symptoms. Moreover, monitoring cytokine levels over time helped in assessing the treatment response and adjusting therapeutic strategies accordingly.

### **Discussion Importance of Cytokine Analysis.**

The inclusion of cytokine analysis in the diagnostic protocol for pyelonephritis offers a significant advantage. Cytokines such as IL-6, IL-8, and TNF- $\alpha$  are biomarkers of inflammation and infection. Elevated levels of these cytokines correlate strongly with the presence and severity of kidney inflammation, providing valuable information for diagnosis and management. This modern approach can lead to better patient outcomes and more efficient use of healthcare resources.

### **Benefits of Comprehensive Testing**

Combining urinalysis, blood tests, biochemical analysis, and cytokine analysis provides a comprehensive approach to diagnosing pyelonephritis. Each test offers unique insights:

- **Urinalysis** helps identify the presence of infection in the urinary tract.
- **Blood tests** provide information on systemic infection and inflammation.
- **Biochemical analysis** assesses kidney function and metabolic state.
- **Cytokine analysis** offers detailed information on the inflammatory response, aiding in the early detection and precise diagnosis of pyelonephritis.

**Clinical Implications.** The findings of this study suggest that incorporating cytokine analysis into standard diagnostic protocols can improve the accuracy and timeliness of pyelonephritis diagnosis. This approach is particularly beneficial for patients with atypical presentations or mild symptoms, where traditional diagnostic methods may fall short.



**Conclusion.** The inclusion of cytokine analysis in the diagnostic protocol for pyelonephritis offers a significant advantage in terms of accuracy and early detection. Elevated cytokine levels correlate strongly with the presence and severity of kidney inflammation, providing valuable information for diagnosis and management. This modern approach can lead to better patient outcomes and more efficient use of healthcare resources. Further research is recommended to explore the potential of cytokine analysis in other inflammatory and infectious diseases of the kidneys. By integrating comprehensive laboratory diagnostics, including urinalysis, blood tests, biochemical analysis, and cytokine profiling, healthcare providers can achieve a more accurate and early diagnosis of pyelonephritis, ultimately improving patient care and outcomes

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