International Journal of Immunology
2026, Vol. 14, No. 1, pp. 26–30
https://doi.org/10.11648/j.iji.20261401.14

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Research Article

Assessment of Inflammatory Markers in Children with Lymphadenopathy

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Abstract

Lymphadenopathy is palpable enlargement of lymph nodes. Inflammation is a normal part of your body's response to injuries and invaders. It promotes healing and helps you feel better.Inflammation is a vital biological mechanism that acts as the body's primary defense against harmful agents, such as pathogens, damaged cells, and irritants. Although acute inflammation is important for healing and recovery, chronic inflammation may result in various diseases, including cancer, cardiovascular issues, and autoimmune disorders. Inflammation can arise from numerous causes of lymphadenopathy, including microbial infections, autoimmune diseases, cancers, and other factors that contribute to elevated inflammatory markers in the bloodstream. Inflammatory markers as Erythrocyte sedimentation rate (ESR) and C Reactive Protein (CRP) were measured in serum of children with lymphadenopathy to help for monitoring the inflammation state. The erythrocyte sedimentation rate and C-reactive protein are among the oldest laboratory tests still in use. The results Showed that, there was significant increase in Erythrocyte sedimentation rate in first and second hour in children with lymphadenopathy compared to healthy control children (P value = 0.001) (P value = 0.001) respectively. There was also significant increase in serum level of C Reactive Protein in children with lymphadenopathy compared to healthy control children (P value = 0.007).

Keywords

Lymphadenopathy, Inflammation, Erythrocyte sedimentation Rate, C Reactive Protein

1. Introduction

In medical field, lymphadenopathy, also known as adenopathy, is a frequently observed aberrant finding during the physical examination. When lymphadenopathy is discovered, patients and physicians experience varied degrees of concern because a tiny percentage of instances may be brought on by infections, autoimmune diseases, tumors, or other conditions [4].

Lymphadenopathy occurs in 0.6% of the population annually, usually from a benign cause. History should focus on

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Received: 12 December 2025; **Accepted:** 29 December 2025; **Published:** 14 March 2026

lymph node location, duration of lymphadenopathy, associated symptoms (particularly fever, night sweats, and unintentional weight loss), past and current medical conditions, occupation, travel history, animal exposures, medication use, recent vaccine history, drug use, sexual history, and family history [3].

Every year, 0.6% of people get lymphadenopathy, which typically has a benign origin. The location of the lymph nodes, the length of the lymphadenopathy, related symptoms (especially fever, night sweats, and inadvertent weight loss), past and present medical conditions, occupation, travel history, animal exposures, medication use, recent vaccination history, drug use, sexual history, and family history should all be included in the history [4].

A number of things, such as pathogens, damaged cells, and harmful substances, can cause inflammation, which is a biological reaction of the immune system. The heart, pancreas, liver, kidney, lung, brain, digestive tract, and reproductive system may all experience acute or chronic inflammatory reactions as a result of these factors, which could result in tissue damage or illness [1].

The immune system's reaction to dangerous stimuli, such as pathogens, damaged cells, poisonous substances, or radiation, is inflammation. It works by eliminating harmful stimuli and starting the healing process. Thus, inflammation is an essential defence mechanism for good health. Cellular and molecular events and interactions typically effectively reduce impending damage or infection during acute inflammatory reactions. This mechanism of mitigation helps to resolve the acute inflammation and restore tissue homeostasis. But unchecked acute inflammation can develop into chronic inflammation, which can lead to a number of chronic inflammatory disorders [2, 7, 15].

Screening tests are important aids in the diagnosis of cases of cervical lymphadenopathy presenting by prolonged fever especially if lymph node biopsy and histopathological examination are not available [13].

The erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) serve as indicators of inflammatory conditions and are widely utilized by healthcare professionals in both outpatient and inpatient environments. Understanding the physiological principles underlying these two tests is crucial for clinicians to apply them correctly. For instance, fibrinogen, which ESR indirectly measures, possesses a significantly longer half-life compared to CRP. This characteristic renders ESR particularly useful for tracking chronic inflammatory conditions, while CRP is more advantageous for diagnosis and for monitoring therapeutic responses in acute inflammatory situations, such as acute infections. Numerous factors can lead to inaccurately elevated or reduced levels of ESR and CRP, making it essential to be aware of these variables. Consequently, when employed judiciously, ESR and CRP can effectively complement thorough history-taking and physical examinations in the diagnosis and management of inflammatory conditions [5].

2. Material and Methods

2.1. Sampling

Blood samples were taken from children with lymphadenopathy and healthy children at Tanta university hospital. This study was done according to guidelines of Ethics Committee of Scientific Research for medical research at Tanta University with code # 32017/02/18

This study included

1) First group: Children with lymphadenopathy (35 children; 22 males and 13 females) (their age ranged from 2 to 13 years old)
2) Second group: The control group will contain healthy children (20 children; 11 males and 9 females) (their age ranged from 2 to 13 years old).

2.2. Determination of Serum C Reactive Protein [6]

The CRP-ultrasensitive Monlab Test is a quantitative turbidimetric assay designed to measure low concentrations of C-reactive protein (CRP) in human serum or plasma. When latex particles coated with specific anti-human CRP are mixed with samples containing CRP, agglutination occurs. This agglutination results in a change in absorbance, which is dependent on the CRP levels present in the patient sample and can be quantified by comparing it to a calibrator with a known CRP concentration at Wavelength 540 nm (530-550)

2.3. Measurement of Erythrocyte Sedimentation Rate [14]

The Westergren pipette is a glass pipette 30 cm in length and 2.5 mm in diameter. The bore is uniform to within 5% throughout. A graduated scale in mm extends over the lower 20 cm.

Procedure

1) Thoroughly mix the blood sample and draw it into the Westergren pipette up to the 0 mm mark using a rubber teat.
2) Position the tube vertically in the rack, which contains a rubber cork at the base. Secure it with adjustable screws after taking out the teat.
3) Allow it to remain undisturbed for precisely 60 minutes, ensuring it is free from vibrations and not subjected to direct sunlight.
4) Measure the height of the clear plasma column above the sedimented red cells to the nearest millimeter.

Figure 1. *Westergren pipette filled with blood and placed vertically on the rubber cork in the rack.*

3. Results

3.1. Determination of Erythrocyte Sedimentation Rate

Blood samples were collected from children with lymphadenopathy and healthy children to determine Erythrocyte sedimentation rate in children with lymphadenopathy. The results in Tables 1 and 2 and Figures 2 and 3 showed that, there was significant increase in Erythrocyte sedimentation rate in first and second hour in children with lymphadenopathy compared to healthy control children (P value = 0.001) (P value = 0.001) respectively.

Table 1. *Comparison between 1st hour of ESR in children with lymphadenopathy and 1st hour of ESR in healthy control children.*

Groups	Erythrocyte sedimentation rate 1st hour						T test	
				Mean	±	SD	T-test	P-value
Children with lymphadenopathy	5	-	75	26.714	±	20.88	4.386	0.001*
Healthy control children	3	-	9	1.37	±	0.77		

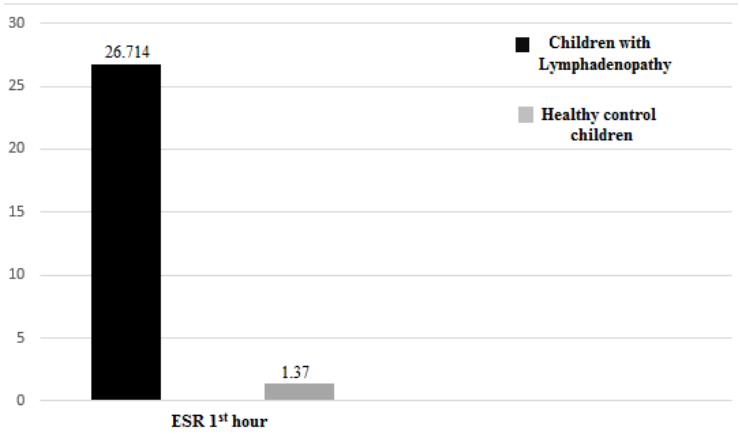

Figure 2. *Comparison between children with lymphadenopathy and healthy children as regards mean value of ESR in first hour.*

Table 2. *Comparison between 2nd hour of ESR in children with lymphadenopathy and 1st hour of ESR in healthy control children.*

Groups	Erythrocyte sedimentation rate in 2nd hour						T test	
	Range by (mg/dl)			Mean	±	SD	T-test	P-value
Children with lymphadenopathy	11	-	100	49.00	±	30.88	5.169	0.001*
Healthy control children	7	-	17	13.050	±	3.25		

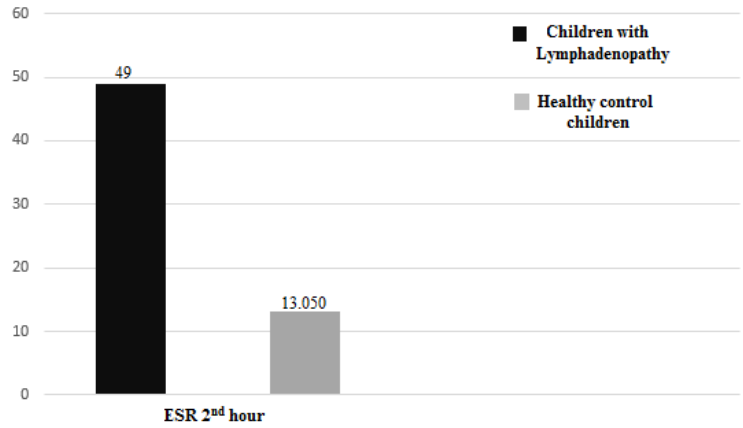

Figure 3. *Comparison between children with lymphadenopathy and healthy children as regards mean value of ESR in second hour.*

3.2. Determination of C-reactive Protein

Serum samples were collected from children with lymphadenopathy and healthy children to measure CRP. The results in Table 3 and Figure 4 showed that, there was significant increase in serum level of CRP in children with lymphadenopathy compared to healthy control children (P value = 0.007).

Table 3. *Comparison between children with lymphadenopathy and healthy control children as regards CRP.*

Groups	Serum level of C- Reactive Protein						T test	
	Range by (mg/dl)			Mean	±	SD	T-test	P-value
Children with lymphadenopathy	0.40	-	74.6	13.214	±	19.089	2.761	0.007*
Healthy control children	0.40	-	2.9	1.3750	±	0.78		

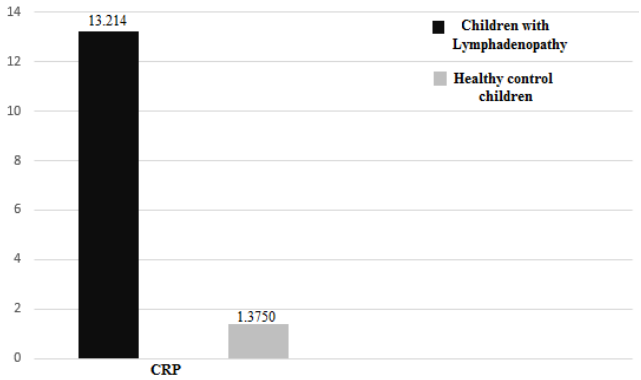

Figure 4. *Comparison between children with lymphadenopathy and healthy children as regards mean value of serum CRP.*

4. Discussion

Lymphadenopathy refers to an abnormality in the size and texture of the lymph nodes, a condition that is relatively common during childhood. When the swelling of lymph nodes results from inflammatory and infectious processes, it is termed lymphadenitis [9].

The present study revealed that; there was significant increase in ESR and serum level of CRP for children with lymphadenopathy compared to their levels in healthy control children. In the same way, [10] who reported that serum levels of CRP were significantly associated with lymph node status. Also the results similar with [12] who studied bacterial cervical lymphadenitis and this study were done on 38 children at the age between 2.5 months and 14 years. Leukocytosis and/or elevated concentrations of C-reactive protein occurred in the majority of patients. Also the results similar with, [11] who reported that ESR is a widely used hematology test that can suggest and track heightened inflammatory activity in the body due to various conditions, including autoimmune diseases, infections, or tumors. Although the ESR is not specific to any particular disease, it is utilized alongside other tests to assess the presence of increased inflammatory activity. In the same context, [8] who studied lymphadenopathy in adults on 35 patients, they reported that ESR was higher than 100 mm/hour in 25% and associated with systemic complaints. In same context, [5] reported that The ESR and CRP serve as indicators of inflammatory conditions

and are widely utilized by healthcare professionals in both outpatient and inpatient environments. Understanding the physiological principles underlying these two tests is crucial for clinicians to apply them correctly. For instance, fibrinogen, which ESR indirectly measures, possesses a significantly longer half-life compared to CRP. This characteristic renders ESR particularly useful for tracking chronic inflammatory conditions, while CRP is more advantageous for diagnosis and monitoring therapeutic responses in acute inflammatory situations, such as acute infections. Numerous factors can lead to inaccurately elevated or reduced levels of ESR and CRP, making it essential to be aware of these influences. Consequently, when employed judiciously, ESR and CRP can effectively complement thorough history taking and physical examinations in the diagnosis and management of inflammatory conditions.

Abbreviations

ESR	Erythrocyte Sedimentation Rate
CRP	C- reactive Protein
mm	Millimeter
cm	Centimeter
nm	Nanometer
ml	Milliliter

Author Contributions

Ahmed Samy El-Shafey: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Methodology, Writing– original draft, Writing – review & editing, Investigation

Saida Mohamed Amer: Supervision, Project administration

Nanis Gamal El-Din Alam: Supervision, Validation

Mohamed Ramadan El-Shanshory: Supervision, Visualization

Fatma Abdel Hamid Ibrahim: Supervision, Software

Conflicts of Interest

The authors declare no conflicts of interest.

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