Brief Report

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The Erythrocyte Sedimentation Rate in Type 1 Diabetes Mellitus

Fariba Binesh[1], Sahar Paknejadi[2], Nasim Namiranian[2], Mahtab Ordooei[2*]

[1]Department of Pathology, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[2]Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Abstract

Objective: This study aimed to investigate the comparison of the Erythrocyte Sedimentation Rate (ESR) levels in patients with type 1 diabetes mellitus (T1DM) rather than the standard ESR rate as the reference.
Materials and Methods: In this analytical cross-sectional study 80 individuals with T1DM under 14 years of age were selected from Diabetes Research Center from 2021-2022. Sampling was done by available methods. Demographic information such as age, gender, HbA1c, and ESR level was recorded. The collected data were entered into SPSS v.22 software. Pearson correlation was used for association and t-test was used for comparing means. A significance level of $P < 0.05$ was considered.
Results: thirty three (41.2%) were male and 47 (58.8%) were female. The mean (±SD) age was 9.50 (± 0.414) years. The mean (±SD) ESR in the studied samples was 11.60(±6.475), which had a significant difference with the ESR value of 10 (P= 0.031). Moreover, the ESR of both groups of studied boys -and girls was significantly higher than the standard upper limit of the society (P= 0.0001). Additionally, ESR had a statistical relationship with HbA1c (P= 0.016) and no significant relationship with age (P= 0.730).
Conclusion: ESR levels in children with T1D were significantly elevated, indicating systemic inflammation. ESR also showed a statistical relationship with HbA1c levels, suggesting its potential as a valuable marker for disease activity and management in T1D patients.

Keywords: Type 1 diabetes, Erythrocyte sedimentation rate, Inflammation

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Corresponding Author:
Mahtab Ordooei, Yazd Diabetes Research Center, Talar Honar Alley, Shahid Sadoughi Blvd., Bahonar Sq., Yazd, Iran.

Tel: (98) 353 728 0226
Email: dr.ordooei@yahoo.com
Orcid ID: 0000-0002-2466-9070

Introduction

Type 1 diabetes (T1D), is characterized by the immune-mediated destruction of insulin-producing beta cells in the pancreas (1-4). Although the autoimmune nature of the disease is widely acknowledged, the exact trigger that initiates this immune attack remains uncertain. The pathogenesis of T1D involves a complex interplay between genetic susceptibility and environmental factors, leading to the development of autoimmunity against pancreatic islet cells (5,6). While the precise origins of T1D are elusive, recent research suggests a potential connection between systemic inflammation and the disease's pathophysiology (7-9).

One vital laboratory test in the realm of inflammation is the erythrocyte sedimentation rate (ESR), which measures the rate at which red blood cells settle in anticoagulated blood over a specified timeframe (10). While ESR is a non-specific marker of inflammation, elevated levels of ESR can indicate the presence of systemic inflammation, which is associated with various diseases, including autoimmune disorders (11,12). In such conditions, heightened ESR levels serve as indicators of systemic inflammation and prove invaluable in assessing disease activity, tracking treatment responses, and predicting the risk of complications (13).

Evidence suggests that inflammation plays a critical role in the pathogenesis of T1D. Inflammatory responses, particularly those triggered by viral infections, can contribute to the autoimmune attack on pancreatic beta cells (14). As inflammation escalates, ESR levels may rise, potentially providing a clue to the autoimmune processes at play (15-19).

While ESR can serve as an indicator of inflammation in the body, its role in the onset or progression of T1D remains less clear. Understanding the relationship between ESR and T1D could have important clinical implications (19). To shed light on this connection, we conducted a study aimed at investigating the comparison of the ESR levels in patients with T1D rather than the standard ESR rate as a reference.

Material and methods

This was an analytical cross-sectional study conducted at the Diabetes Research Center. By convenience sampling method, a total of 80 children younger than 14 years with T1D were included in 2021-2022.

The exclusion criteria were as follows: (1) patients who had experienced fever or recent infections within the past 3 weeks; (2) patients with malignant tumors; and (3) patients with inflammatory disease.

Demographic information such as age, gender, and ESR level were recorded.

Scientific Accuracy and Data Reliability

The upper limit of normal ESR values for participants was calculated by the following formulas (20):

ESR (male) = age / 2

ESR (female) = (age + 10) / 2

Based on the Westergren method, the maximum standard value for the ESR for children is 10 mm/hr (21). So, the means of these ESR values were compared to reference levels of ESR 10 and the normal ESR levels for females and males in the general population.

Statistical analysis

The collected data were analyzed using the SPSS v.22 software. Descriptive analysis was performed to determine the prevalence of certain variables. Pearson correlation was used to evaluate association and a t-test was used for comparing means. A significance level of $P< 0.05$ was considered statistically significant.

Ethical considerations

This study was approved by the Institutional Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

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Results

Of the patients included in the study, 33 (41.2%) were male, 47 (58.8%) were female and the mean (± standard deviation) age was 9.50 (± 0.41) years. Moreover, the mean (±SD) HbA1c and ESR of the participants were 9.30 (±0.20) and 11.60 (±0.73) respectively.

Comparing the mean and standard deviation of ESR in the participants with the maximum standard value for the ESR (ESR=10) showed the average ESR in the studied samples was 11.60(±6.47), which had a statistically significant difference with the ESR value of 10 (*P*= 0.03).

Additionally, Based on Table 1, the mean of the upper limit of normal ESR value in the examined boys was calculated at 5.46± (1.60) which was remarkably different from the mean of the ESR level blood test in examined boys (9.81± (6.24)). Moreover, the mean blood level of ESR in the examined girls was 12.85 (±6.40), which was significantly higher than the calculated average of the upper normal limit of their ESR level (9.24 (±1.86)).

As shown in Table 2, there was a significant relationship between HbA1C and ESR (*P*= 0.016). However, no significant relationship between HbA1c and age was observed in participants (*P*= 0.730).

Conclusion

ESR levels in T1D patients reflect the presence of systemic inflammation, which plays a significant role in disease progression. Monitoring ESR levels can provide valuable insights into disease activity, risk stratification, and personalized treatment approaches. By understanding the link between systemic inflammation and T1D, healthcare professionals can improve patient outcomes and develop targeted interventions to minimize the long-term complications associated with the disease. With continued advancements in our understanding of the pathophysiology of T1D, ESR may become an integral part of comprehensive management strategies for individuals with T1D.

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Conflict of Interest

All authors interpret that they have no conflict of interest.

Authors' contributions

F.B and M.O. design the study. N.N developed the original idea and the protocol. Material preparation and data collection were performed by F.B, and S.P. Data analysis was performed by N.N. The first draft of the manuscript was written by F.B. and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Table 1. Comparison of ESR in participants relative to the upper limit of normal ESR value

Variable		Mean (±SD)	*P*-value		Mean (±SD)	*P*-value
ESR	Normal boy society Studied boy society	5.46 (±1.60) 9.81 (±6.24)	0.0001	Normal girl society Studied girl society	9.24 (±1.86) 12.85 (±6.40)	0.0001

Table 2. Correlation analysis between the studied variables

Variable		Age	HbA1c
HbA1c	Pearson r	0.170	
	P-value	0.133	
ESR	Pearson r	-0.040	0.271
	Significant	0.730	0.016

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