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Correlation Between HbA1c and hsCRP in Rheumatoid Arthritis: A Cross-Sectional Study

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Abstract

Background: Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disease characterized by systemic inflammation, joint destruction, and an increased risk of cardiovascular disease (CVD). Glycated hemoglobin (HbA1c) and high-sensitivity C-reactive protein (hsCRP) are biomarkers of long-term glycemic control and systemic inflammation, respectively. While both markers are independently associated with cardiovascular risk, their interplay in RA remains poorly understood. This study aimed to investigate the correlation between HbA1c and hsCRP in RA patients and explore the potential implications for cardiovascular risk management. **Subjects and Methods:** A cross-sectional study was conducted on 150 RA patients aged 18–65 years. HbA1c and hsCRP levels were measured using standardized laboratory methods. Disease activity was assessed using the Disease Activity Score-28 (DAS-28). Pearson's correlation coefficient and multivariate linear regression analysis were used to evaluate the relationship between HbA1c and hsCRP after adjusting for confounders such as age, gender, body mass index (BMI), and disease activity. **Results:** The mean age of participants was 48.7 ± 10.2 years, with 75% being female. The mean HbA1c level was 6.2 ± 1.1%, and the mean hsCRP level was 5.8 ± 3.2 mg/L. A significant positive correlation was observed between HbA1c and hsCRP ($r = 0.42$, $p < 0.001$). Linear regression analysis showed that hsCRP was independently associated with HbA1c ($\beta = 0.38$, $p < 0.001$) after adjusting for age, gender, BMI, and disease activity. **Conclusion**: This study demonstrates a significant correlation between HbA1c and hsCRP in RA patients, suggesting a potential link between chronic inflammation and impaired glycemic control. These findings highlight the importance of monitoring both glycemic and inflammatory markers in RA management to reduce the risk of CVD.

Keywords: hsCRP, body mass index (BMI), HbA1c, Rheumatoid arthritis.

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Introduction

Rheumatoid arthritis (RA) is a systemic autoimmune disease characterized by chronic inflammation, synovial hyperplasia, and progressive joint destruction.[1] Beyond joint involvement, RA is associated with systemic complications, including an increased risk of cardiovascular disease (CVD), which is a leading cause of mortality in this population.[2]. Chronic inflammation in RA contributes to insulin resistance, impaired glucose metabolism, and dyslipidemia, all of which are key drivers of cardiovascular risk.[3]

Glycated hemoglobin (HbA1c) is a well-established marker of long-term glycemic control and is increasingly recognized as a predictor of cardiovascular risk in both diabetic and non-diabetic individuals.[4] High-sensitivity C-reactive protein (hsCRP) is a sensitive marker of systemic inflammation and is strongly associated with cardiovascular events in RA patients.[5] While both HbA1c and hsCRP are independently linked to cardiovascular risk, their relationship in RA remains underexplored.

This study aimed to investigate the correlation between HbA1c and hsCRP in RA patients and to assess whether this relationship is independent of traditional cardiovascular risk factors such as age, gender, BMI, and disease activity. Understanding this relationship may provide insights into the interplay between chronic inflammation and glycemic control in RA and inform strategies for reducing cardiovascular risk in this population.

Subjects and Methods

Study Design: A cross-sectional study was conducted on 150 RA patients recruited from the Siddhartha institute of medical sciences and Research centre, T -Beguru, Patients were included if they met the 2010 American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) classification criteria for RA [6] and were aged 18–65 years. Patients with a history of diabetes mellitus, acute infections, or other chronic inflammatory conditions were excluded.

Data Collection: Demographic and clinical data, including

age, gender, disease duration, and BMI, were recorded. Disease activity was assessed using the Disease Activity Score-28 (DAS-28), which incorporates tender and swollen joint counts, erythrocyte sedimentation rate (ESR), and patient global assessment.[7] Blood samples were collected after an overnight fast to measure HbA1c and hsCRP levels. HbA1c was measured using high-performance liquid chromatography (HPLC), and hsCRP was measured using an immunoturbidimetric assay.

Statistical Analysis: Data were analyzed using SPSS. Descriptive statistics were used to summarize demographic and clinical characteristics. Pearson's correlation coefficient was used to assess the relationship between HbA1c and hsCRP. Multivariate linear regression analysis was performed to adjust for potential confounders, including age, gender, BMI, and disease activity. A p-value < 0.05 was considered statistically significant

Results

The study included 150 RA patients, of whom 75% were female. The mean age of participants was 48.7 ± 10.2 years, and the mean diseas.e duration was 8.5 ± 4.3 years. The mean HbA1c level was 6.2 ± 1.1%, and the mean hsCRP level was 5.8 ± 3.2 mg/L. The mean DAS-28 score was 4.1 ± 1.2, indicating moderate disease activity

Table 1: Demographic and Clinical Characteristics of Study Participants

Variable	Mean ± SD or n (%)
Age (years)	48.7 ± 10.2
Gender (Female)	112 (75%)
Disease duration (years)	8.5 ± 4.3
Disease duration (years)	26.3 ± 3.8
BMI (kg/m²)	26.3 ± 3.8
HbA1c (%)	6.2 ± 1.1
hsCRP (mg/L)	5.8 ± 3.2
DAS-28 score	4.1 ± 1.2

Table 2: Correlation Between HbA1c and hsCRP

Variable	HbA1c	hsCRP
HbA1c	1.00	0.42
hsCRP	0.42	1.00

Table 3: Multivariate Linear Regression Analysis for HbA1c

Variable	β-coefficient	95% C	p-value
hsCRP	0.38	0.25-0.51	<0.001
Age	0.12	-0.03-0.27	0.112
Gender	0.08	-0.06-0.22	0.256
BMI	0.15	0.01-0.29	0.042
DAS-28	0.21	0.07-0.35	0.004

A significant positive correlation was observed between HbA1c and hsCRP ($r = 0.42$, $p < 0.001$). Multivariate linear regression analysis showed that hsCRP was independently associated with HbA1c ($\beta = 0.38$, $p < 0.001$) after adjusting for age, gender, BMI, and disease activity.

Discussion

This study found a significant positive correlation between HbA1c and hsCRP in RA patients, suggesting that chronic inflammation may contribute to impaired glycemic control in this population. The findings are consistent with previous studies demonstrating that systemic inflammation in RA is associated with insulin resistance and elevated HbA1c levels.[8,9]

The independent association between hsCRP and HbA1c after adjusting for confounders highlights the potential role of inflammation in driving glycemic dysregulation in RA. This relationship may explain the increased prevalence of insulin resistance and type 2 diabetes in RA patients, as well as their elevated cardiovascular risk.[10]

These findings have important clinical implications. Monitoring both HbA1c and hsCRP in RA patients may help identify those at higher risk of cardiovascular complications and guide targeted interventions, such as anti-inflammatory therapies and lifestyle modifications, to reduce cardiovascular risk.

Conclusion

This study demonstrates a significant correlation between HbA1c and hsCRP in RA patients, suggesting a link between chronic inflammation and impaired glycemic control. These findings underscore the importance of integrating inflammatory and glycemic markers into RA management to mitigate cardiovascular risk. Further longitudinal studies are needed to explore the causal relationship between inflammation and glycemic control in RA.

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