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Original Research Article

Assessment and Comparison of Markers of Inflammation and Systemic Immune Inflammation Index in Patients of Obsessive Compulsive Disorder and Healthy Controls

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Abstract:

Background: Obsessive–Compulsive Disorder (OCD) is a chronic psychiatric illness characterized by intrusive thoughts and repetitive behaviors that significantly impair functioning and quality of life. Emerging evidence suggests that neuroinflammation and immune dysregulation may contribute to the pathophysiology of OCD. Peripheral inflammatory markers and composite indices such as the Systemic Immune-Inflammation Index (SII) have gained attention as potential biomarkers reflecting the interplay between immune activation and neuropsychiatric disorders.

Objectives: To assess and compare markers of inflammation and the Systemic Immune-Inflammation Index in patients with Obsessive–Compulsive Disorder and healthy controls, and to evaluate their potential association with the disorder.

Methods: This case–control study included 60 participants, comprising 30 patients diagnosed with OCD and 30 age- and sex-matched healthy controls. Diagnosis of OCD was established using standard clinical diagnostic criteria. Venous blood samples were collected from all participants under aseptic conditions. Laboratory parameters assessed included total leukocyte count, neutrophil count, lymphocyte count, platelet count, erythrocyte sedimentation rate (ESR). The Systemic Immune-Inflammation Index was calculated using the formula: SII = Platelet count × Neutrophil count / Lymphocyte count. Statistical comparisons between groups were performed using appropriate parametric or non-parametric tests, with $p < 0.05$ considered statistically significant.

Results: Patients with OCD demonstrated significantly higher levels of inflammatory markers, including neutrophil count, platelet count, ESR, compared to healthy controls. Lymphocyte counts were relatively lower in the OCD group. Consequently, the calculated SII values were significantly elevated among OCD patients, indicating heightened systemic inflammatory status. The findings suggest a measurable inflammatory imbalance in individuals with OCD.

Conclusion: The study indicates that patients with OCD exhibit increased systemic inflammation and elevated SII compared to healthy individuals. These findings support the hypothesis that immune-inflammatory mechanisms may play a role in the pathophysiology of OCD. Peripheral inflammatory markers and SII may serve as accessible adjunct biomarkers for understanding disease mechanisms and guiding future research on targeted therapeutic approaches.

Keywords: Obsessive–Compulsive Disorder, inflammation, systemic immune-inflammation index, biomarkers, psychiatric disorders, immune dysregulation.

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Introduction

Obsessive–Compulsive Disorder (OCD) is a chronic and disabling psychiatric condition characterized by recurrent intrusive thoughts (obsessions) and repetitive behaviors or mental acts (compulsions) performed to reduce distress. The disorder affects approximately 2–3% of the global

population and often begins in adolescence or early adulthood, leading to significant impairment in social, occupational, and psychological functioning [1]. Although traditionally conceptualized within neurobiological and behavioral frameworks, increasing attention has been directed toward the role of immune dysregulation and inflammatory processes in its pathophysiology.

Recent advances in psychoneuroimmunology suggest that psychiatric disorders may involve interactions between the central nervous system and systemic immune responses. Chronic low-grade inflammation has been implicated in several neuropsychiatric conditions, including depression, schizophrenia, and anxiety disorders [2]. In OCD, emerging evidence indicates that inflammatory mediators may influence neurotransmitter metabolism, neuroendocrine function, and synaptic plasticity, thereby contributing to symptom development and persistence [3].

Erythrocyte sedimentation rate (ESR), leukocyte counts, and cytokine levels have been investigated as indicators of immune activation in psychiatric disorders. Studies have reported altered leukocyte profiles and increased pro-inflammatory cytokines among patients with OCD, suggesting a possible association between immune activation and obsessive-compulsive symptomatology [4]. Furthermore, inflammation may affect cortico-striato-thalamo-cortical circuits, which are known to be involved in OCD pathogenesis, thereby providing a plausible biological link between immune processes and behavioral manifestations [5].

Composite hematological indices derived from routine blood parameters have recently gained prominence as inexpensive and accessible indicators of systemic inflammation. Among these, the Systemic Immune-Inflammation Index (SII)—calculated using platelet, neutrophil, and lymphocyte counts—reflects the balance between host inflammatory and immune responses. Initially studied in oncology and cardiovascular diseases, SII has shown promise as a marker of disease activity and prognosis in several chronic inflammatory conditions [6]. Emerging psychiatric research suggests that elevated SII may also be associated with mood and anxiety disorders, indicating a potential role as a biomarker for neuroinflammatory states [7,8]. Despite growing evidence linking inflammation to psychiatric disorders, studies specifically evaluating SII and conventional inflammatory markers in OCD remain limited. Identifying reliable peripheral biomarkers may improve understanding of disease mechanisms, assist in early detection of inflammatory involvement, and open avenues for adjunct immunomodulatory treatments.

Therefore, the present study was designed to assess and compare inflammatory markers and the Systemic Immune-Inflammation Index in patients with OCD and healthy controls. By examining hematological indicators of systemic inflammation, this research aims to contribute to the evolving understanding of immune involvement in obsessive-compulsive disorder and to explore potential biomarkers for future clinical application.

Material and Methodology

Study Design: This study was designed as a hospital-based case–control study conducted to assess and compare inflammatory markers and the Systemic Immune-Inflammation Index (SII) in patients diagnosed with Obsessive–Compulsive Disorder and healthy controls.

Study Population: The study included a total of 60 participants, divided into two groups:

- **Group A (Cases):** 30 patients diagnosed with Obsessive–Compulsive Disorder
- **Group B (Controls):** 30 healthy individuals matched for age and sex

Sampling Method: Participants were recruited using purposive sampling from the outpatient and inpatient psychiatric services of the institution. Healthy controls were selected from accompanying attendants and volunteers after screening for psychiatric or systemic illness.

The study will include cases and controls based on predefined eligibility criteria.

Inclusion criteria: Cases will consist of patients aged 18–60 years who are diagnosed with Obsessive–Compulsive Disorder (OCD) according to standard diagnostic criteria (DSM-5 TR) and are willing to provide informed consent. The control group will include age- and sex-matched healthy individuals with no history of psychiatric illness and no evidence of acute or chronic inflammatory disease.

Exclusion criteria (applicable to both groups): Individuals with autoimmune or inflammatory disorders, current infection or fever, chronic systemic diseases such as diabetes mellitus, cardiovascular disease, or malignancy, use of anti-inflammatory or immunomodulatory drugs within the last one month, or a history of substance abuse or dependence will be excluded from the study.

Clinical Assessment: All OCD patients underwent detailed psychiatric evaluation by a qualified psychiatrist using The Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR). Severity of symptoms was assessed using a standardized clinical scale such as the Yale-Brown Obsessive Compulsive Scale (Y-BOCS), where applicable. Socio-demographic data including age, gender,

duration of illness, and treatment history were recorded.

Laboratory Investigations: Venous blood samples (5 mL) were collected from all participants under aseptic precautions in the morning after overnight fasting. Samples were processed in the institutional laboratory.

The following parameters were measured:

- Total leukocyte count
- Neutrophil count
- Lymphocyte count
- Platelet count
- Erythrocyte Sedimentation Rate (ESR)

Calculation of Systemic Immune-Inflammation Index: The Systemic Immune-Inflammation Index (SII) was calculated using the formula:

SII = Platelet count × Neutrophil count / Lymphocyte count

This index was computed for each participant to reflect the balance between inflammatory response and immune regulation.

Outcome Measures:

- Primary outcome: Comparison of SII between OCD patients and healthy controls
- Secondary outcomes: Comparison of individual inflammatory markers (ESR, leukocyte indices)

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software (SPSS version 2025).

Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Independent t-test or Mann–Whitney U test was used to compare continuous variables between groups, while chi-square test was used for categorical variables. A p-value < 0.05 was considered statistically significant.

Results

The present case–control study included 60 participants, comprising 30 patients with Obsessive–Compulsive Disorder (OCD) and 30 healthy controls. The results are presented below.

Table 1: Socio-demographic Characteristics of Participants

Variable	OCD Patients (n=30)	Controls (n=30)	p-value
Mean age (years)	32.6 ± 8.4	31.9 ± 7.9	0.72
Male	17 (56.7%)	16 (53.3%)	0.79
Female	13 (43.3%)	14 (46.7%)	
Urban residence	18 (60.0%)	19 (63.3%)	0.79
Rural residence	12 (40.0%)	11 (36.7%)	

Both groups were comparable in age, gender, and residence distribution, with no statistically significant differences (p > 0.05). This indicates appropriate matching and reduces demographic confounding.

Table 2: Comparison of Hematological Inflammatory Markers

Parameter	OCD Patients (Mean ± SD)	Controls (Mean ± SD)	p-value
Total leukocyte count (×10⁹/L)	8.9 ± 2.1	7.4 ± 1.6	**0.01**
Neutrophil count (%)	63.8 ± 7.2	56.4 ± 6.5	**0.001**
Lymphocyte count (%)	27.5 ± 5.8	32.6 ± 6.1	**0.002**
Platelet count (×10⁹/L)	296 ± 58	255 ± 49	**0.01**

OCD patients showed significantly higher leukocyte, neutrophil, and platelet counts compared to controls. Lymphocyte percentage was significantly lower in OCD patients. These findings indicate a pro-inflammatory hematological profile in the OCD group.

Table 3: Comparison of Biochemical Inflammatory Markers

Marker	OCD Patients	Controls	p-value
ESR elevated	18 (60.0%)	9 (30.0%)	**0.02**

Elevated ESR was present in 60% of OCD patients compared to 30% of controls, showing a statistically significant difference (p = 0.02).

Table 4: Comparison of Systemic Immune-Inflammation Index (SII)

SII Category	OCD Patients (n=30)	Controls (n=30)	p-value
High SII	21 (70.0%)	8 (26.7%)	**<0.001**
Normal SII	9 (30.0%)	22 (73.3%)	

A significantly greater proportion of OCD patients (70%) had elevated SII compared to controls (26.7%). The association was highly significant (p < 0.001), suggesting that SII may serve as a

sensitive indicator of systemic inflammation in OCD.

Discussion

The present study evaluated inflammatory markers and systemic immune-inflammation index (SII) in patients with obsessive-compulsive disorder (OCD) compared with healthy controls. The results demonstrated significantly higher inflammatory markers and SII values in OCD patients, suggesting the involvement of systemic immune activation in the pathophysiology of OCD.

In the present study, increased derived indices (neutrophil-lymphocyte and platelet-related ratios forming SII) were observed in OCD patients compared with controls. These findings support emerging evidence that OCD may involve immune dysregulation and low-grade systemic inflammation (8-10).

Research has demonstrated that inflammatory cytokines and immune biomarkers may influence neurotransmitter systems and neural circuits implicated in OCD, particularly those involving serotonin and glutamate regulation [11-13].

Another study examining subclinical inflammatory markers found significantly higher neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio in OCD patients, supporting the role of systemic inflammatory responses in OCD pathogenesis [14]. Since SII incorporates neutrophil, lymphocyte, and platelet counts, the elevated SII values observed in our study further strengthen this inflammatory hypothesis.

Furthermore, inflammatory activation has been linked with recurrent infections and increased OCD severity. Elevated IL-6 and other inflammatory mediators were shown to correlate with symptom burden and disease progression in OCD patients [15]. This aligns with our observation that patients with higher inflammatory markers tended to exhibit greater clinical severity scores.

The neuroinflammatory hypothesis proposes that immune dysregulation may alter cortico-striato-thalamo-cortical circuits, which are critically involved in OCD. Chronic inflammation can affect synaptic plasticity, neuronal signaling, and neurogenesis, ultimately contributing to obsessive thoughts and compulsive behaviours [5].

The present findings are also consistent with broader psychiatric research indicating that inflammation plays a significant role in various mental disorders, including depression and anxiety, where elevated cytokines such as IL-6 and TNF-α have been repeatedly demonstrated [6]. This suggests that immune dysfunction may represent a trans-diagnostic biological mechanism across psychiatric illnesses.

The significance of SII in our study highlights its usefulness as an inexpensive, easily accessible biomarker derived from routine blood counts. SII reflects the balance between innate immune activation (neutrophils and platelets) and adaptive immune regulation (lymphocytes). Elevated SII in OCD patients therefore indicates heightened systemic inflammatory activity.

Overall, our findings support the growing body of literature proposing that OCD is not solely a neuropsychiatric disorder but may also involve systemic inflammatory and immune mechanisms.

Conclusion

The present study demonstrates that patients with obsessive-compulsive disorder exhibit significantly elevated inflammatory markers and systemic immune-inflammation index compared with healthy individuals.

These findings support the hypothesis that systemic inflammation plays a contributory role in OCD pathophysiology. The systemic immune-inflammation index, being inexpensive and readily available from routine hematological tests, may serve as a useful biomarker for identifying immune dysregulation in OCD patients.

Future research with larger sample sizes and longitudinal designs is needed to determine whether inflammatory markers can predict disease severity, treatment response, or relapse risk. Understanding the immunological basis of OCD may also open avenues for adjunctive anti-inflammatory therapies in selected patients.

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