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"ROLE OF SERUM ADENOSINE DEAMINASE ACTIVITY IN ASSESSING PSORIASIS SEVERITY: A HOSPITAL-BASED CROSS SECTIONAL STUDY"

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ABSTRACT

BACKGROUND: Psoriasis is a common, chronic, inflammatory and proliferative condition of the skin, often associated with systemic manifestations in multiple organ systems. World Health Organization (WHO) considered psoriasis as a global health problem. In India the prevalence of psoriasis ranges from 0.4-2.8%. The reported prevalence of psoriasis in countries ranges between 0.09% and 11.4% making psoriasis a serious global problem. PASI is recommended as the current gold standard for assessing the severity of psoriasis and for clinical trials.

AIM: To assess the role of serum adenosine deaminase (ADA) activity in predicting disease severity in psoriasis patients.

MATERIAL & METHODS: This hospital-based cross-sectional study was conducted in the Department of Biochemistry and Department of Physiology, over a period of 12 months. A total of 150 newly diagnosed psoriasis patients attending OPD and IPD were included. Disease severity was scored according to the Psoriasis Area and Severity Index (PASI).

RESULTS: The majority of patients were males (70%) with mean age 37.6 ± 10.3 years. Mean serum ADA level was 24.1 ± 5.2 U/L, significantly higher than reference values ($p<0.0001$). ADA levels increased with severity: 20.8 ± 2.1 U/L in mild, 28.6 ± 1.4 U/L in moderate, and 31.7 ± 4.2 U/L in severe psoriasis. ADA showed strong positive correlation with PASI score ($r=0.978$, $p<0.0001$).

CONCLUSION: Serum adenosine deaminase activity demonstrates a significant positive correlation with disease severity in psoriasis. It may serve as a simple, reliable biomarker for assessing disease severity and monitoring therapeutic outcomes.

KEYWORDS: Serum adenosine deaminase, Psoriasis, PASI, Inflammation, Biomarker

INTRODUCTION

Psoriasis is a chronic, immune-mediated, inflammatory, and proliferative skin disorder affecting approximately 2–3% of the global population (1). The prevalence varies widely between 0.09% and 11.4% depending on geography, ethnicity, and genetic background (2). In India, the prevalence is estimated between 0.4–2.8% (3). The disease is characterized by erythematous plaques with silvery-white scales, but its impact extends beyond the skin, affecting joints, nails, and multiple organ systems. Patients frequently suffer from psoriatic arthritis, metabolic syndrome, cardiovascular disease, diabetes, depression, and reduced quality of life, highlighting its systemic nature (4,5).

In India, prevalence is reported between 0.4–2.8%. It is characterized by abnormal keratinocyte proliferation, angiogenesis, and immune dysregulation involving T-helper 1 (Th1) and Th17 pathways. Beyond cutaneous manifestations, psoriasis is associated with metabolic syndrome, cardiovascular disease, arthritis, and depression, making it a multisystem disorder (1–3).

The exact etiology of psoriasis remains multifactorial, involving genetic susceptibility, environmental triggers, and dysregulated immune responses. Genome-wide association studies have identified multiple susceptibility loci including HLA-Cw6, IL-23R, and TNFAIP3 genes (6). Immunologically, psoriasis is driven by an abnormal interplay between keratinocytes, dendritic cells, and T lymphocytes, particularly Th1 and Th17 subsets, leading to overproduction of cytokines such as TNF-α, IL-17, and IL-23 (7–9). These cytokines orchestrate keratinocyte hyperproliferation and angiogenesis, creating the characteristic psoriatic lesions.

The Psoriasis Area and Severity Index (PASI) remains the gold standard for assessing severity, yet it is time-consuming and subjective (4,5). Therefore, identification of reliable biochemical markers that correlate with disease severity is clinically valuable.

Adenosine deaminase (ADA) is a purine catabolizing enzyme essential for T-cell differentiation and proliferation. It reflects cell-mediated immune activity and has been studied in several autoimmune and inflammatory diseases (6–8). Increased ADA activity is reported in conditions involving activated T lymphocytes, suggesting its potential as a marker of immune dysregulation in psoriasis (9–11).

Several studies have demonstrated elevated ADA activity in psoriasis patients and suggested its possible role in disease pathogenesis and monitoring (12–15). However, limited Indian data exist correlating ADA with PASI. Hence, this study aimed to assess the role of serum ADA activity in predicting psoriasis severity.

Several indices are available to measure disease severity. The Psoriasis Area and Severity Index (PASI) remains the gold standard for clinical trials and monitoring severity, but it is complex, time-consuming, and subject to inter-observer variability (10,11). Alternative tools like Physician's Global Assessment (PGA) and Dermatology Life Quality Index (DLQI) provide complementary insights but lack objectivity. Therefore, biochemical markers that reliably correlate with disease severity could serve as valuable adjuncts in clinical practice.

Adenosine deaminase (ADA) is a purine-metabolizing enzyme essential for lymphocyte proliferation and differentiation. It plays a pivotal role in cell-mediated immunity, especially in T-cell activation (12). Elevated ADA activity has been documented in several inflammatory and autoimmune conditions including rheumatoid arthritis, systemic lupus erythematosus, and pulmonary tuberculosis (13,14). The enzyme exists in two isoforms: ADA-1, predominantly in lymphocytes, and ADA-2, in monocytes and macrophages (15).

In psoriasis, heightened T-cell activation and immune dysregulation suggest a plausible role for ADA as a disease activity marker. Previous studies have demonstrated significantly elevated ADA activity in psoriatic patients compared to healthy controls and found a positive correlation with PASI scores (16–18). Moreover, ADA activity has been shown to decrease following effective therapy, suggesting its potential role in monitoring treatment response (19). However, the literature is limited in the Indian context, particularly in large sample sizes, necessitating further validation.
Thus, the present study was undertaken to evaluate the role of serum ADA activity in psoriasis and its correlation with disease severity using PASI scores, aiming to establish ADA as a cost-effective, objective biomarker for clinical use

MATERIAL AND METHODS

This hospital-based cross-sectional study was conducted in the Department of Biochemistry, over a period of 12 months i.e, June 2024 to June 2025. A total of 150 newly diagnosed psoriasis patients attending OPD and IPD were included. Disease severity was scored according to the Psoriasis Area and Severity Index (PASI).

Study Design & Setting: Hospital-based cross-sectional study conducted in the Department of Biochemistry, at a tertiary care centre, over 12 months period i.e, June 2024 to June 2025.
Participants: A total of 150 newly diagnosed psoriasis patients (clinically confirmed by dermatologist) were included.
Inclusion criteria:
Age 18–60 years, newly diagnosed psoriasis patients not on systemic therapy.
Exclusion criteria:
Patients with other autoimmune disorders, active infections, tuberculosis, malignancies, chronic liver/kidney disease, or those on immunosuppressants.
Data Collection: Demographic and clinical data were recorded. Disease severity was assessed using PASI score.
Biochemical Analysis: Venous blood samples (5 mL) were collected under aseptic precautions. Serum ADA activity was estimated using Giusti and Galanti's colorimetric method.
Statistical Analysis: Data expressed as mean ± SD. Independent t-test and ANOVA were applied for group comparisons. Pearson's correlation was used to evaluate relationship between ADA and PASI. A p-value <0.05 was considered significant.

RESULTS

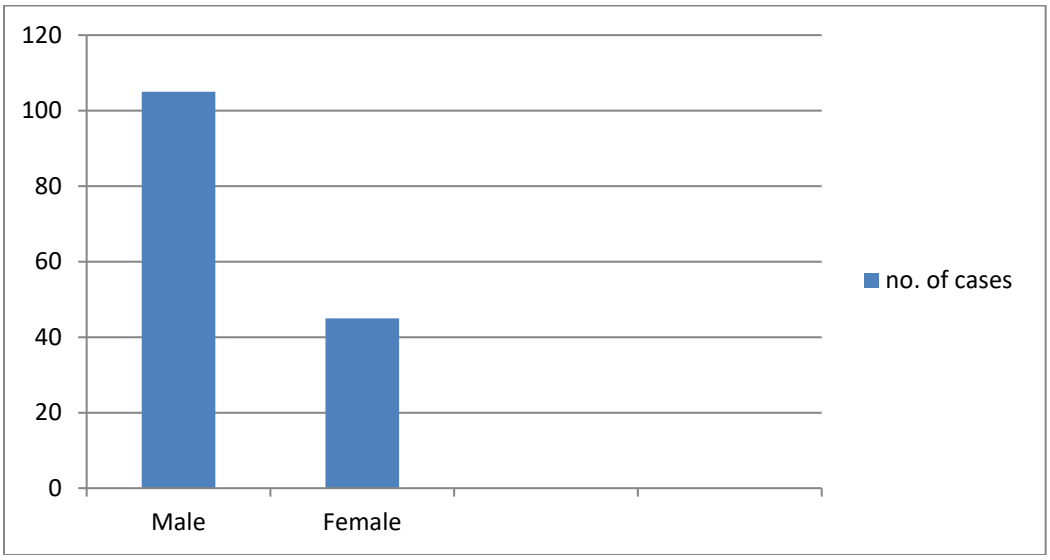
Out of 150 psoriasis patients, the majority (96; 64%) belonged to the 30–49 year age group, followed by 32 patients (21.3%) in the 18–29 year age group and 22 patients (14.7%) in the 50–60 year age group. The mean age of the study population was 37.6 ± 10.3 years. Gender-wise distribution showed a male predominance, with 105 males (70%) and 45 females (30%), indicating that psoriasis was more common among men in this cohort. These findings suggest that psoriasis is most prevalent in the middle age group, with a notable male preponderance.

Variable	Number	(%)
Age 18–29	32	21.3%
Age 30–49	96	64%
Age 50–60	22	14.7%

Table 1: Demographic Profile of Psoriasis Patients

Gender wise Distribution of the Cases	No. of Cases	(%)
Male	105	70%
Female	45	30%

Table 2: Genderwise distribution of the cases



Graph No. 1: Graphical Representation of the cases

Severity	n (%)	Mean ADA (U/L) ± SD	Mean PASI ± SD
Mild	54 (36%)	20.8 ± 2.1	6.8 ± 1.5
Moderate	74 (49.3%)	28.6 ± 1.4	13.2 ± 2.3
Severe	22 (14.7%)	31.7 ± 4.2	21.1 ± 3.6

Table 3: PASI Severity Distribution and ADA Levels

When categorized according to PASI severity, 54 patients (36%) had mild psoriasis, 74 patients (49.3%) had moderate psoriasis, and 22 patients (14.7%) presented with severe psoriasis. The mean serum ADA level was 20.8 ± 2.1 U/L in mild cases, 28.6 ± 1.4 U/L in moderate cases, and 31.7 ± 4.2 U/L in severe cases. Correspondingly, mean PASI scores increased from 6.8 ± 1.5 in mild disease to 13.2 ± 2.3 in moderate disease and 21.1 ± 3.6 in severe disease. This trend demonstrates a stepwise rise in ADA activity with increasing PASI severity, indicating a positive association between ADA levels and psoriasis severity.

Parameter	Correlation Coefficient (r)	p-value
ADA vs PASI	0.978	<0.0001

Table 4: Correlation between ADA and PASI

Statistical analysis revealed a strong positive correlation between serum ADA activity and PASI score, with a correlation coefficient of $r = 0.978$ and $p < 0.0001$. This finding confirms that higher ADA activity is significantly associated with greater disease severity. The high correlation coefficient underscores the potential role of ADA as a reliable biomarker for assessing disease activity in psoriasis patients.

DISCUSSION

The present study demonstrated that serum adenosine deaminase (ADA) activity was significantly elevated in psoriasis patients and strongly correlated with disease severity as assessed by the Psoriasis Area and Severity Index (PASI). This supports the hypothesis that ADA, as a marker of T-cell activation, reflects the immunopathological processes underlying psoriasis.

This study demonstrated that serum ADA activity is significantly elevated in psoriasis patients and correlates strongly with disease severity as assessed by PASI. The results are consistent with earlier findings by Aggarwal et al. and Bhatnagar et al., who reported increased ADA activity in psoriasis patients compared to healthy controls (6,12).

PASI, indicating ADA may serve as a surrogate biomarker for disease activity. Uyar et al. (20) in Turkey and Dogan et al. (21) further confirmed these associations in different ethnic populations.
From a pathophysiological perspective, ADA catalyzes the deamination of adenosine to inosine, thereby regulating extracellular adenosine levels. Adenosine, in turn, has immunomodulatory effects, often suppressing excessive inflammation (22). In psoriasis, overactive T lymphocytes, especially Th1 and Th17 subsets, lead to heightened ADA activity (23,24). Elevated ADA levels therefore signify enhanced T-cell proliferation and cytokine release, particularly IL-17 and TNF-α, which are central to psoriatic lesion formation (25,26).

In our cohort, ADA levels were significantly higher in patients with moderate and severe psoriasis compared to mild cases, highlighting its role as a potential marker of disease severity. This finding aligns with studies by Shukla et al. (27) and Caliskan et al. (28), who reported that ADA levels declined following successful therapeutic intervention, suggesting utility in monitoring treatment response.

While PASI is the established gold standard for disease severity assessment, it has limitations including subjectivity and complexity in routine practice (29). Biochemical markers such as ADA provide an objective, reproducible measure that could complement clinical indices. Furthermore, ADA assays are inexpensive and widely available compared to advanced cytokine profiling, which may not be feasible in resource-limited settings (30,31).

However, ADA is not psoriasis-specific. Elevated levels are also seen in infectious diseases like tuberculosis , pleural effusions , chronic hepatitis , and autoimmune disorders such as rheumatoid arthritis and systemic lupus erythematosus . Therefore, ADA should be interpreted in the context of clinical and laboratory findings to avoid misdiagnosis.

Another important consideration is the isoenzyme pattern. ADA exists as ADA-1 (ubiquitous, especially in lymphocytes) and ADA-2 (mainly in monocytes and macrophages). Emerging evidence suggests that ADA-2 may be preferentially elevated in chronic inflammatory conditions, including psoriasis (38). Future studies with isoenzyme differentiation may provide deeper insights into the immunopathogenesis of psoriasis (32).

Our study adds to existing evidence by confirming the correlation between serum ADA and PASI in a large hospital-based Indian cohort. Nevertheless, further multicentric, longitudinal studies with healthy controls are warranted to validate its role as a prognostic and therapeutic biomarker.
Importantly, ADA is a relatively inexpensive and easily available assay compared to cytokine profiling or advanced immunological markers, making it feasible for routine use in resource-limited settings. Furthermore, ADA estimation may aid in monitoring therapeutic response, as shown in studies where ADA levels declined with treatment (33,34).

Psoriasis continues to be a complex, immune-mediated condition with evolving therapeutic strategies. In 2024, investigators shed light on post-inflammatory lentiginous hyperpigmentation—a pigmentation change following lesion resolution—underscoring the need for improved patient counseling and quality-of-life assessments. Concurrently, Ahad and colleagues proposed refined phototherapy management guidelines tailored to dermatologic practices, and the PsoSerious 2024 national report highlighted persistent barriers in access to systemic and multidisciplinary care [35-37]. In 2025, a pivotal Phase III trial presented at the Society for Investigative Dermatology demonstrated that icotrokinra, an innovative oral peptide that selectively inhibits the IL-23 receptor, achieved significant skin clearance in patients with difficult-to-treat plaque psoriasis—including high-impact sites like the scalp and genital area—marking a promising advance toward more targeted systemic treatment [38].

However, ADA is not disease-specific and may be elevated in tuberculosis, hepatitis, or autoimmune disorders. Thus, while useful, ADA must be interpreted cautiously alongside clinical evaluation.

CONCLUSION

Serum ADA activity shows a significant positive correlation with psoriasis severity. It can be considered a simple, cost-effective biomarker for disease assessment and therapeutic monitoring in psoriasis patients.

DECLARATIONS:

Conflicts of interest: There is no any conflict of interest associated with this study
Consent to participate: There is consent to participate.
Consent for publication: There is consent for the publication of this paper.
Authors & contributions: Author equally contributed the work.

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