

Original Article:

Association of Serum Albumin, Globulin and Albumin-Globulin Ratio with Severity of Psoriasis

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Abstract

Background: Psoriasis is a chronic inflammatory skin disease with substantial morbidity. Alterations in serum albumin, globulin and albumin–globulin (Albumin-Globulin) ratio have been reported in psoriasis, but their relationship with disease severity is not well defined in Bangladesh. **Objective:** To assess the association of serum albumin, globulin and Albumin-Globulin ratio with psoriasis severity according to the Psoriasis Area Severity Index (PASI). **Methods:** A 12-months cross sectional study was conducted at the Department of Dermatology and Venereology, Dhaka Medical College Hospital, including 50 patients with chronic plaque psoriasis and 50 apparently healthy controls selected by purposive sampling. PASI was used to categorize psoriasis as mild, moderate or severe. Serum albumin, globulin and Albumin-Globulin ratio were measured by standard biochemical methods. Data were analyzed using SPSS Version 22 with Student's t test, Chi square test, one way ANOVA and Pearson's correlation. A p value <0.05 was considered significant. **Results:** Psoriasis patients had a mean age of 44.02 ± 12.15 years with male predominance (58%). Mean serum albumin (3.77 ± 0.25 vs 4.47 ± 0.30 g/dL, $p < 0.001$) and Albumin-Globulin ratio (1.21 ± 0.17 vs 1.55 ± 0.15 , $p < 0.001$) were significantly lower in cases than controls, whereas serum globulin was higher (3.15 ± 0.26 vs 2.89 ± 0.18 g/dL, $p < 0.001$). Among patients, 36% had mild, 44% moderate and 20% severe psoriasis. Serum albumin ($p = 0.002$), globulin ($p = 0.027$) and Albumin-Globulin ratio ($p = 0.001$) differed significantly across PASI categories. PASI correlated negatively with albumin ($r = -0.469$, $p = 0.001$) and Albumin-Globulin ratio ($r = -0.482$, $p < 0.001$) and positively with globulin ($r = 0.360$, $p = 0.010$). **Conclusion:** Serum albumin, globulin and Albumin-Globulin ratio are significantly altered in Bangladeshi patients with psoriasis and show strong associations with PASI severity, suggesting potential as simple adjunct markers of disease burden.

Keywords: Psoriasis, serum albumin, serum globulin, albumin-globulin ratio, PASI score

Introduction

Psoriasis is a chronic, immune mediated inflammatory skin disease characterized by erythematous, scaly plaques and associated with substantial physical, psychological and socioeconomic burden.¹⁻³ Its global prevalence is around 1–3%, with a reported prevalence of about 0.7% in Bangladesh, indicating a significant local disease load.⁴⁻⁶

Beyond cutaneous involvement, psoriasis is now recognized as a systemic disorder linked to chronic inflammation, oxidative stress and a range of comorbidities including metabolic syndrome, cardiovascular disease, non alcoholic fatty liver disease and depression.⁷⁻¹² These systemic manifestations are thought to be mediated by pro inflammatory cytokines

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and acute phase responses that can alter serum protein profiles.⁷⁻¹²

Serum albumin and globulin fractions, and the albumin–globulin (A/G) ratio, are inexpensive, routinely available biochemical parameters that may reflect systemic inflammation, nutritional status and liver function.¹³⁻¹⁶ Several studies from different countries have shown reduced albumin, elevated globulin and altered Albumin-Globulin ratio in patients with psoriasis, and some have suggested associations with disease severity and comorbid conditions.¹³⁻¹⁸ However, findings have not been uniform, and there is limited information from South Asian populations, particularly Bangladesh, where nutritional and comorbidity profiles may differ.¹⁹⁻²¹ Although several studies from other countries have reported altered serum albumin, globulin and Albumin-Globulin ratio in psoriasis and suggested a link with systemic inflammation and comorbidities,¹³⁻¹⁸ data from South Asian populations, particularly Bangladesh, are scarce and often do not stratify patients rigorously by PASI severity or include a control group with matched basic characteristics.¹⁹⁻²¹ In this context, the present case-control study aimed to compare serum albumin, globulin and Albumin-Globulin ratio between patients with chronic plaque psoriasis and apparently healthy controls, and to examine how these parameters vary across PASI defined severity categories in a Bangladeshi cohort, thereby providing locally relevant evidence on whether routine protein indices reflect disease burden and might complement clinical severity assessment.²²

Materials and Methods

This cross sectional analytical study was conducted in the Department of Dermatology and Venereology, Dhaka Medical College Hospital, a tertiary care centre in Bangladesh, from October 2019 to September 2020, after obtaining ethical approval from institutional review board. All participants given written informed consent prior inclusion.

A total of 100 participants were enrolled: 50 adults with clinically and/or histopathologically confirmed chronic plaque psoriasis and 50 apparently healthy controls without psoriasis, selected by purposive sampling. The minimum sample size was estimated as 30 using a psoriasis prevalence of 0.7% in Bangladesh with 95% confidence level and 3% acceptable error; 50 subjects were included in each group to increase power. Cases and controls were age and sex matched. Inclusion criteria for cases were age >18 years, chronic plaque psoriasis and no systemic antipsoriatic treatment for at least 1 month. Exclusion criteria included age <18 years, refusal to consent, concomitant skin infection, psoriatic arthritis or

other inflammatory disorders, pregnancy or lactation, known chronic diseases (such as tuberculosis, hepatitis, autoimmune disease), liver or renal disease and alcohol dependence. Controls were apparently healthy individuals >18 years without psoriasis, with the same medical exclusion criteria.

Demographic and clinical data were recorded after history and examination. Psoriasis severity was assessed using the Psoriasis Area and Severity Index (PASI), which scores erythema, induration and scaling in four body regions to give a total score from 0 to 72; psoriasis was categorized as mild (PASI <12), moderate (PASI 12–20) and severe (PASI >20). Venous blood was collected, centrifuged, and serum analyzed in the Clinical Pathology Department using an automated biochemistry analyser (X Pand). Serum total protein and albumin were measured by standard methods; globulin was calculated as total protein minus albumin, and the albumin–globulin ratio as albumin/(total protein – albumin). Normal reference ranges were 3.5–5.0 g/dL for albumin and 2.4–4.1 g/dL for globulin. All information was recorded in a structured case record form.

Written informed consent was obtained from all participants after explanation of study objectives, procedures, risks and benefits in the local language, and confidentiality was ensured.

Data were analysed using SPSS version 22 for Windows. Continuous variables were expressed as mean \pm SD and categorical variables as frequency and percentage. Between group comparisons of continuous variables used Student's t test and of categorical variables used chi square test. One way ANOVA was applied to compare means among the three PASI defined severity groups, with Bonferroni post hoc tests for multiple comparisons. Pearson's correlation was used to assess relationships between PASI and biochemical parameters. A p value <0.05 was considered statistically significant.

Diagnosis

The mean age of psoriasis cases was 44.02 \pm 12.15 years and controls 43.74 \pm 12.17 years (p=0.909). Among cases, 58% were male and 42% female, with a male–female ratio of 1.38:1; gender distribution was matched between groups (p=0.420) (Table 1).

Characteristics	Case (n=50)	Control (n=50)	p-value
Age (years)			
18-20	3 (6%)	3 (6%)	
21-30	4 (8%)	3 (6%)	
31-40	13 (26%)	16 (32%)	0.818*
41-50	16 (32%)	11 (22%)	
51-60	9 (18%)	13 (26%)	
>60	5 (10%)	4 (8%)	
Mean age	44.02±12.15	43.74±12.17	0.909†
Gender			
Male	29 (58%)	27 (54%)	0.420*
Female	21 (42%)	23 (46%)	

Table 1: Demographic characteristics of study participants (n=100).

*Chi-square Test (2) was performed to compare between two groups. !Unpaired t-test was performed to compare the mean between two groups.

Results were expressed by mean ±SD and percentage.

Serum albumin was significantly lower in cases than controls (3.77 ± 0.25 vs 4.47 ± 0.30 g/dL, $p < 0.001$), serum globulin was significantly higher (3.15 ± 0.26 vs 2.89 ± 0.18 g/dL, $p < 0.001$), and Albumin-Globulin ratio was significantly lower (1.21 ± 0.17 vs 1.55 ± 0.15 , $p < 0.001$) (Table 2).

Variable	Case Group (n=50)	Control Group (n=50)	p-value
Serum Albumin (g/dL)	3.77 ± 0.25 (3.29 4.40)	4.47 ± 0.30 (3.58 4.90)	<0.001*
Serum Globulin (g/dL)	3.15 ± 0.26 (2.37 3.44)	2.89 ± 0.18 (2.48 3.29)	<0.001*
Albumin Globulin Ratio	1.21 ± 0.17 (1.01 1.76)	1.55 ± 0.15 (1.20 1.87)	<0.001*

Table 2: Comparison of serum albumin, globulin, and Albumin-Globulin ratio between case and control groups.

*Unpaired t-test. Results expressed as mean±SD (range)
Severity of psoriasis according to PASI score

The mean PASI score was 15.73 ± 6.54 . Among cases, 36% had mild psoriasis (PASI <12), 44% moderate (PASI 12-20), and 20% severe (PASI >20) (Figure 1)

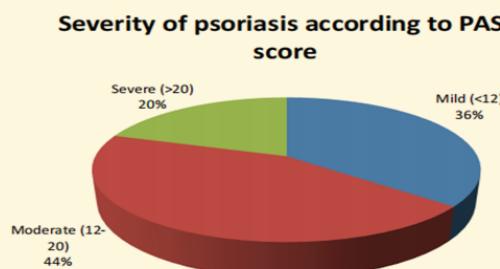


Figure 1: Severity of psoriasis according to PASI score (n=50)

Representative clinical photographs of plaque-type psoriasis with varying severity are shown in Figures 2-5.



Figure 2: Psoriasis affecting the back of and extensor surface of upper limbs, showing characteristic erythematous plaques with silvery scales trunk



Figure 3: Psoriasis on the front of trunk and upper limbs, demonstrating widespread plaque distribution



Figure 4: Psoriasis involving lower limbs, showing erythematous plaques with scaling on extensor surfaces



Figure 5: Psoriasis on the back of chest, illustrating severity and extent of involvement used in PASI scoring

Serum albumin, globulin and Albumin-Globulin ratio showed statistically significant associations with PASI severity ($p=0.002$, 0.027 and 0.001, respectively). Across mild, moderate and severe psoriasis, albumin and Albumin-Globulin ratio decreased while globulin increased (Table 3-5). Bonferroni post hoc analysis showed that mild psoriasis differed significantly from moderate and severe groups for albumin and Albumin-Globulin ratio ($p < 0.05$ and $p < 0.001$, respectively), and from moderate group for globulin ($p < 0.05$).

Variable	Mild (<12)	Moderate (12-20)	Severe (>20)	Overall	p-value
Serum Albumin (g/dL) (Mean ±SD)	3.94 ± 0.28 (3.38 -4.40)	3.69 ± 0.19 (3.35 -4.15)	3.65 ± 0.23 (3.29 -4.00)	3.77 ± 0.25 (3.29 -4.40)	0.002*

Table 3: Association between serum albumin and disease severity (n=50). *One-way ANOVA. Significant in comparison to *moderate and severe psoriasis (Bonferroni post-hoc test).

Variable	Mild (<12)	Moderate (12-20)	Severe (>20)	Overall	p-value
Serum Globulin (g/dL)	3.03±0.34 (2.37-3.40)	3.20±0.19 (2.63-3.39)	3.29±0.14 (3.06-3.51)	3.15±0.26 (2.37-3.51)	0.027*

Table 4: Association between serum globulin and disease severity (n=50). *One-way ANOVA. Significant in comparison to *moderate psoriasis (Bonferroni post-hoc test).

Variable	Mild (<12)	Moderate (12-20)	Severe (>20)	Overall	p-value
Albumin-Globulin Ratio (g/dL)	1.32±0.21 (1.05-1.76)	1.16±0.08 (1.01-1.35)	1.12±0.10 (1.01-1.29)	1.21±0.17 (1.01-1.29)	0.001*

Table 5: Association between Albumin-Globulin ratio and disease severity (n=50). *One-way ANOVA. Significant in comparison to *moderate and severe psoriasis (Bonferroni post-hoc test).

PASI score showed significant negative correlation with serum albumin ($r=-0.469$, $p=0.001$) and Albumin-Globulin ratio ($r=-0.482$, $p<0.001$), and significant positive correlation with globulin ($r=0.360$, $p=0.010$), indicating that as disease severity increased, albumin and Albumin-Globulin ratio decreased while globulin increased. (Figure 6-8).

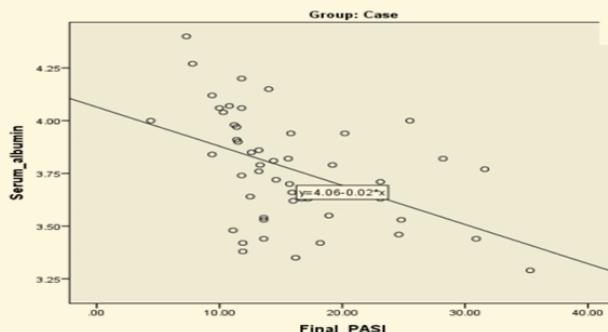


Figure 6: Relation Between PASI score with serum albumin level (n=50)

PASI score was significantly negatively correlated with serum albumin level (Pearson's $r = -0.469$, $p=0.001$).

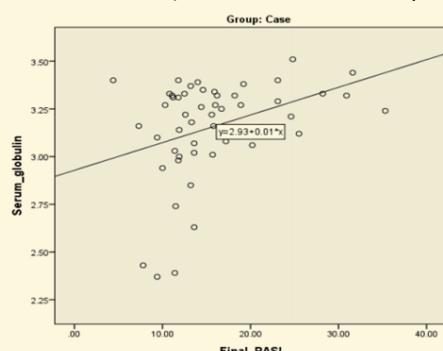


Figure 7: Relation Between PASI score with serum globulin level (n=50)

PASI score was significantly positively correlated with serum globulin level (Pearson's $r=0.360$, $p=0.010$).

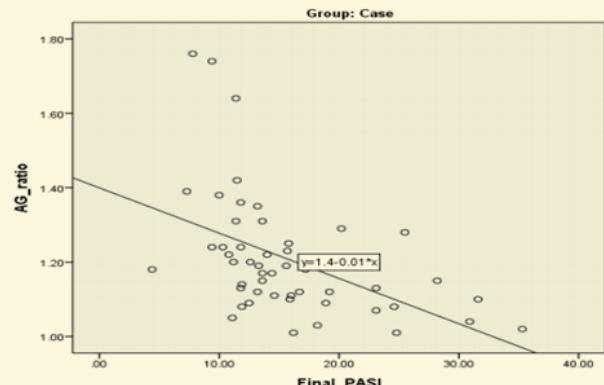


Figure 8: Relation Between PASI score with serum albumin-globulin ratio (n=50) PASI score was significantly negatively correlated with serum Albumin-Globulin ratio (Pearson's $r= -0.482$, $p<0.001$).

Discussion

This hospital-based cross-sectional analytical study assessed the association of serum albumin, globulin and albumin-globulin (A/G) ratio with psoriasis severity according to PASI in 50 patients with chronic plaque psoriasis and 50 healthy controls. The mean age of psoriatic cases (44.02 ± 12.15 years) and male predominance (male-female ratio 1.38:1) are broadly consistent with previous series from Italy, Bangladesh and neighbouring countries.^{3,5,23-26}

Serum albumin was significantly lower and globulin significantly higher in psoriatic patients than in controls, with a markedly reduced Albumin-Globulin ratio, indicating a shift in serum protein profile in psoriasis. Similar patterns of lower albumin and Albumin-Globulin ratio with higher globulin among psoriatic patients have been reported by Adapa and Pavani and by Pratyusha et al., supporting the robustness of this association.^{27,28} These alterations are biologically plausible: protein loss through extensive desquamation, increased endogenous albumin catabolism, chronic systemic inflammation and increased albumin clearance from inflamed skin, together with hepatic involvement such as NAFLD, can all contribute to reduced albumin and altered globulin fractions in psoriasis.^{9,29-31}

In this study, psoriasis severity as measured by PASI was significantly associated with serum albumin, globulin and Albumin-Globulin ratio. With increasing PASI, albumin and Albumin-Globulin ratio decreased while globulin increased, and PASI showed negative correlations with albumin and Albumin-Globulin ratio and a positive correlation with globulin. Although comparative data

specifically stratified by PASI are limited, Yin et al. demonstrated that hypoalbuminemia was more frequent in moderate to severe psoriasis and associated with longer hospital stay, while Cecchi et al. found higher urinary albumin excretion in patients with higher PASI scores, supporting a link between disease burden and albumin loss.^{9,33} Kemeriz et al. also reported significant relationships between albumin levels and psoriasis severity, suggesting that albumin may be related to disease activity, consistent with our findings.¹³

Serum albumin, globulin and albumin-globulin ratio are simple, inexpensive biomarkers that reflect psoriasis severity and systemic inflammatory burden, and may complement PASI to stratify patients, support treatment decisions and prioritize closer follow up in resource limited settings such as Bangladesh.

This study has several strengths, including prospective data collection, use of validated PASI scoring, standardized laboratory methods and inclusion of age and gender matched controls, which enhances the validity of comparisons. However, it is a single center study with a relatively small sample size and cross sectional design, limiting generalizability and causal inference. Purposive sampling may have introduced selection bias, and potentially important confounders such as detailed diet, body mass index and concurrent medications were not fully evaluated. Inflammatory biomarkers (for example C reactive protein and interleukins) were not measured, and longitudinal studies are needed to clarify how these parameters change with treatment over time.

Conclusion

This study shows that serum albumin, globulin and albumin-globulin ratio are significantly altered in psoriatic patients compared with healthy controls and are strongly associated with PASI defined disease severity. These simple, cost effective tests may complement PASI in severity assessment and treatment planning, but larger multicentre longitudinal studies are needed to confirm their value for monitoring response and predicting outcomes.

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Ethical Consideration

The study protocol was approved by the Research Review Committee of the Department of Dermatology and Venereology and the Ethical Committee of Dhaka Medical College, Dhaka. The study aims, procedures, risks and benefits were explained in the local language, and written informed consent was obtained from all participants. Confidentiality was maintained and routine patient care was not affected.

Conflict of Interest

There are no conflicts of interest among author

Sources of Funding

None

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