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Comparative analysis of disease activity indices in spondyloarthritis patients with and without uveitis

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Abstract

Background: Uveitis is the most common extra-articular manifestation of spondyloarthritis (SpA), but comparative data on disease activity profiles in patients with and without uveitis are limited in South Asian populations. The objective of the study is to compare demographic, clinical, laboratory, and disease activity indices in SpA patients with and without uveitis in Bangladesh.

Methods: This cross-sectional study included 225 SpA patients attending a tertiary rheumatology clinic. Data on demographics, SpA subtype, family history, human leukocyte antigen (HLA)-B27 status, imaging, and disease activity indices (Bath Ankylosing Spondylitis Disease Activity Index [BASDAI], Bath Ankylosing Spondylitis Functional Index, Bath Ankylosing Spondylitis Metrology Index [BASMI], and Ankylosing Spondylitis Disease Activity Score) were collected and compared between groups. Multivariable logistic regression identified independent predictors of uveitis.

Results: Uveitis patients were older (37.2 ± 8.5 vs. 31.5 ± 9.5 years; $P = 0.001$), had longer disease duration (9.3 ± 7.0 vs. 5.4 ± 4.5 years; $P = 0.001$), more axial SpA (92.9% vs. 73.8%; $P = 0.008$), and higher HLA-B27 positivity (69.0% vs. 55.5%; $P = 0.021$). BASDAI was lower (2.4 ± 1.9 vs. 3.3 ± 2.8; $P = 0.050$) but BASMI was higher (3.7 ± 1.6 vs. 3.1 ± 1.2; $P = 0.009$) in the uveitis group. Independent predictors of uveitis were family history of SpA (odds ratio [OR] = 3.697; $P = 0.002$) and longer disease duration (OR = 1.089/year; $P = 0.039$), whereas higher BASDAI was inversely associated (OR = 0.681; P = 0.002).

Conclusion: Uveitis is associated with older age, longer disease duration, and higher HLA-B27 positivity in Bangladeshi SpA patients. Lower perceived musculoskeletal activity (BASDAI) is linked to higher ocular involvement, yet with more advanced structural impairment (BASMI). Long disease duration and family history are independent predictors of uveitis, whereas higher BASDAI is inversely related to uveitis risk.

Keywords: Bangladesh, Bath Ankylosing Spondylitis Metrology Index, disease activity indices, spondyloarthritis, uveitis

Introduction

Spondyloarthritis (SpA) represents a heterogeneous group of chronic inflammatory rheumatic disorders encompassing axial SpA (axSpA), which primarily affects the sacroiliac joints and spine, and peripheral SpA (pSpA), which involves peripheral joints and entheses.[1] Globally, SpA affects approximately

0.5–2% of the population, though prevalence estimates vary depending on genetic predisposition, diagnostic criteria, and population demographics.[2] While large-scale epidemiological data are available from Europe and North America, there is a paucity of robust national statistics from Bangladesh, where available reports are largely derived from single-center or tertiary-care settings.[3] Clinically, SpA is characterized by hallmark features such as inflammatory back pain, sacroiliitis, peripheral arthritis, enthesitis, and dactylitis, often presenting in early adulthood and leading to substantial disability if untreated.[1],[2] International and regional epidemiological data indicate that the distribution of axial and peripheral involvement can vary markedly between populations, underscoring the importance of local characterization of disease profiles.

Beyond articular manifestations, SpA is notable for its extra-articular involvement, which significantly contributes to morbidity and impacts long-term outcomes. Among the most clinically relevant extra-articular features are uveitis, psoriasis, and inflammatory bowel disease (IBD).[4] Acute anterior uveitis (AAU) is the most frequent ocular manifestation, occurring in approximately 10–50% of patients with SpA across different cohorts.[5] The wide range in prevalence is attributed to differences in genetic background, notably HLA-B27 status, geographic region, and the proportion of patients with various SpA subtypes.[6] In South Asia, including Bangladesh, published studies have confirmed the presence of uveitis among SpA patients, yet precise prevalence figures remain variable and often derive from relatively small samples.[3]

The clinical burden of uveitis in SpA is substantial. Typically, SpA-associated AAU presents with an acute onset, unilateral involvement, and a recurrent course, often alternating between eyes over time.[5] Although many episodes resolve with appropriate treatment, complications such as cataract, glaucoma, cystoid macular edema, and irreversible visual loss may occur, particularly with delayed or inadequate management.[7,8] Uveitis has been associated in several studies with worse functional outcomes, higher disease activity, and greater structural damage, although the magnitude of these associations varies.[9] Furthermore, uveitis can adversely affect quality of life by contributing to visual disability, imposing treatment burdens, and disrupting occupational and social functioning.[8] Regional data, including from Bangladesh, suggest that patients with uveitis may exhibit different disease trajectories compared to those without ocular involvement, but detailed comparative analyses of disease activity measures remain scarce.[3]

In clinical and research practice, several validated indices are used to assess SpA disease activity, function, and mobility. The Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) is a widely adopted patient-reported measure evaluating fatigue, spinal pain, joint pain/swelling, enthesitis, and morning stiffness.[10] The Bath Ankylosing Spondylitis Functional Index (BASFI) assesses the impact of the disease on functional ability in daily life, whereas the Bath Ankylosing Spondylitis Metrology Index (BASMI) evaluates spinal mobility using objective physical measurements. The ankylosing spondylitis disease activity score (ASDAS), calculated with either C-reactive protein (CRP) or erythrocyte sedimentation rate (ESR), integrates patient-reported symptoms with acute-phase reactants, offering a composite metric for disease activity.[11] These indices are integral to guiding therapeutic decision-making and are standard outcome measures in clinical trials and routine practice. Despite their central role, the relationship between extra-articular manifestations such as uveitis and disease activity indices has not been extensively studied in South Asian populations, including Bangladesh.[3]

Available Bangladeshi studies on SpA and uveitis have primarily concentrated on determining prevalence and identifying associated demographic and clinical factors.[2],[3] These works have provided valuable insight into the frequency of ocular involvement but have not systematically compared disease activity, functional status,

and mobility between patients with and without uveitis using validated indices such as BASDAI, BASFI, BASMI, and ASDAS. This gap limits our understanding of whether uveitis in SpA reflects a distinct clinical phenotype with higher systemic inflammatory burden or functional impairment. Globally, some reports suggest that patients with uveitis may have more severe disease courses, yet others find minimal differences, highlighting the need for region-specific data.[9]

Addressing this knowledge gap has important clinical implications. If uveitis correlates with higher disease activity or worse functional outcomes, it may serve as a clinical marker warranting closer monitoring, earlier therapeutic escalation, or more aggressive multidisciplinary management. Conversely, if no significant differences exist, this would reinforce the need to evaluate ocular and articular disease components independently in clinical decision-making. Given the scarcity of comparative data from Bangladesh, a focused analysis of disease activity indices in SpA patients with and without uveitis is essential to inform both clinical practice and future research priorities in this setting. This study, therefore, aims to compare the disease activity, functional status, and spinal mobility of SpA patients with and without uveitis in a Bangladeshi cohort, thereby providing novel insights into the interplay between ocular and musculoskeletal disease domains in this population.

Methods

This cross-sectional observational study was conducted in the Rheumatology Department of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, over a defined period from March 2018 to January 2020. Consecutive patients fulfilling the Assessment of SpondyloArthritis International Society classification criteria for either axSpA or pSpA were enrolled. Participants were divided into two groups based on the presence or absence of a documented history of uveitis, diagnosed by an ophthalmologist, with AAU confirmed through slit-lamp examination and clinical records. Patients with other rheumatologic conditions, infectious arthritis, or incomplete clinical data were excluded. Detailed demographic and clinical information was collected using a structured case record form, including age, sex, disease duration, HLA-B27 status, and the presence of other extra-articular manifestations. Disease activity was assessed using the BASDAI, the BASFI, the BASMI, and the ASDAS, calculated with both CRP and ESR. Laboratory investigations included ESR (mm in the 1st h) and CRP (mg/L), performed in the BSMMU central laboratory following standard protocols. All assessments were conducted on the same day to minimize inter-assessment variability. Data were analyzed using [statistical software name/version, with continuous variables expressed as mean ± standard deviation (SD) or median (interquartile range) depending on distribution, and categorical variables presented as frequencies and percentages. Between-group comparisons were performed using the independent samples *t*-test or Mann–Whitney U-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. $P < 0.05$ was considered statistically significant. Ethical clearance was obtained from the Institutional Review Board of BSMMU, and all participants provided written informed consent before inclusion.

Results

Age distribution differed significantly between groups ($P = 0.001$). Patients with uveitis were disproportionately represented in the older strata (50.0% aged 31–40 years and 28.6% >40 years) compared with those without uveitis (34.4% and 16.4%, respectively), whereas the non-uveitis group had more patients aged 21–30 years (42.6% vs. 21.4%). Sex distribution was similar (male: 73.8% vs. 71.0%; $P = 0.850$). Place of residence did not differ (rural: 66.7% vs. 67.2%; $P = 0.946$). Marital status also differed, with a higher proportion of married in the uveitis group (85.7% vs. 65.0%; $P = 0.009$). Body mass index category was comparable across groups ($P = 0.453$) [Table 1].

Across clinical features, enthesitis, plantar fasciitis, dactylitis, and psoriasis did not differ significantly between groups (all $P > 0.05$). Axial SpA was more frequent among patients with uveitis (92.9% vs. 73.8%; $P = 0.008$), whereas peripheral SpA was less frequent (7.1% vs. 26.2%; $P = 0.001$). The proportion reporting a family history of SpA was numerically higher with uveitis (45.2% vs. 19.1%), though not statistically significant in this analysis ($P = 0.183$). In laboratory findings, HLA-B27 positivity was more common in the uveitis group (69.0% vs. 55.5%; $P = 0.021$). On imaging, sacroiliitis was observed more often with uveitis (90.5% vs. 73.8%), but this difference did not reach statistical significance ($P = 0.067$); the distribution of unilateral versus bilateral sacroiliitis was also similar between groups [Table 2].

Patients with uveitis were older on average (37.2 ± 8.5 vs. 31.5 ± 9.5 years; $P = 0.001$) and had longer disease duration (9.3 ± 7.0 vs. 5.4 ± 4.5 years; $P = 0.001$). Age at symptom onset did not differ (28.0 ± 7.5 vs. 26.2 ± 8.0 years; $P = 0.200$). Inflammatory markers were comparable: Mean ESR (40.9 ± 30.7 vs. 38.5 ± 32.3 mm/h; $P = 0.664$) and CRP (23.4 ± 38.2 vs. 26.0 ± 39.0 mg/L; $P = 0.689$) showed no significant between-group differences [Table 3].

Patient- and physician-reported global assessments were similar between groups (patient global: 4.6 ± 2.1 vs. 5.2 ± 2.3; $P = 0.113$; physician global: 4.4 ± 2.0 vs. 4.8 ± 2.1; $P = 0.213$). Composite activity indices (ASDAS-CRP and ASDAS-ESR) did not differ significantly (2.7 ± 1.3 vs. 3.0 ± 1.2, $P = 0.129$; and 2.8 ± 1.2 vs. 3.1 ± 1.2, $P = 0.269$, respectively). BASDAI was numerically lower in the uveitis group (2.4 ± 1.9 vs. 3.3 ± 2.8) with borderline statistical significance ($P = 0.050$). In contrast, spinal mobility impairment (BASMI) was higher among patients with uveitis (3.7 ± 1.6 vs. 3.1 ± 1.2; $P = 0.009$). Functional status (BASFI) was similar (2.2 ± 2.3 vs. 2.3 ± 2.0; $P = 0.835$) [Table 4].

In the adjusted model, longer disease duration was independently associated with higher odds of uveitis (adjusted odds ratio [OR = 1.089 per year; 95% confidence interval [CI: 1.004–1.181; $P = 0.039$). A family history of SpA was also independently associated (adjusted OR = 3.697; 95% CI: 1.616–8.457; $P = 0.002$). Higher BASDAI scores were associated with lower odds of uveitis (adjusted OR = 0.681 per unit; 95% CI: 0.534–0.869; $P = 0.002$). Axial SpA (vs. peripheral), sacroiliitis on imaging, age, marital status, and BASMI were not statistically significant after adjustment (all $P > 0.05$), although BASMI showed a non-significant trend ($P = 0.096$) and the axial SpA estimate had wide confidence intervals, indicating imprecision [Table 5].

Discussion

This study provides a comparative analysis of disease activity indices and clinical characteristics in SpA patients with and without uveitis in a Bangladeshi cohort. Several statistically significant and clinically relevant differences were identified, which have important implications for understanding the phenotypic profile of SpA in this population.

Patients with uveitis were significantly older than those without (37.2 ± 8.5 vs. 31.5 ± 9.5 years; $P = 0.001$), with age distribution skewed toward the 31–40 and >40 year groups. This trend is consistent with Yasmin *et al*. (2022), who reported higher mean ages in SpA patients with uveitis compared to those without in another South Asian cohort, suggesting a possible link between cumulative disease exposure and uveitis onset. Farouk *et al*. similarly found that older age was a common characteristic in their Egyptian cohort, although age was not an independent predictor after adjustment.[7] Marital status also differed significantly in our cohort, with a higher proportion of married individuals in the uveitis group ($P = 0.009$), a demographic factor rarely addressed in prior literature, making our finding noteworthy for socioepidemiological profiling.

The axial SpA subtype was significantly more frequent in the uveitis group (92.9% vs. 73.8%; $P = 0.008$), whereas peripheral SpA was less

Table 1: Comparison of demographic characteristics between uveitis and non-uveitis groups

Category	Uveitis (*n*=42)	Non-uveitis (*n*=183)	*P*-value
Age group (years)			
≤20	0 (0.0)	12 (6.6)	0.001*
21–30	9 (21.4)	78 (42.6)	
31–40	21 (50.0)	63 (34.4)	
>40	12 (28.6)	30 (16.4)	
Sex			
Male	31 (73.8)	130 (71.0)	0.850
Female	11 (26.2)	53 (29.0)	
Place of residence			
Rural	28 (66.7)	123 (67.2)	0.946
Urban	14 (33.3)	60 (32.8)	
Marital status			
Unmarried	6 (14.3)	64 (35.0)	0.009*
Married	36 (85.7)	119 (65.0)	
Body mass index category			
Underweight	1 (2.4)	18 (9.8)	0.453
Normal	27 (64.3)	112 (61.2)	
Overweight	10 (23.8)	40 (21.9)	
Obese	4 (9.5)	13 (7.1)	

*Statistically significant at $P<0.05$

Table 2: Comparison of clinical and laboratory characteristics between uveitis and non-uveitis groups

Category	Uveitis (*n*=42)	Non-uveitis (*n*=183)	*P*-value
Clinical features			
Enthesitis	10 (23.8)	47 (25.7)	0.801
Plantar fasciitis	5 (11.9)	12 (6.6)	0.191
Dactylitis	1 (2.4)	4 (2.2)	0.648
Psoriasis	2 (4.8)	3 (1.6)	0.235
Axial SpA	39 (92.9)	135 (73.8)	0.008*
Peripheral SpA	3 (7.1)	48 (26.2)	0.001*
Family history of SpA	19 (45.2)	35 (19.1)	0.183
Laboratory			
HLA-B27 positive	29 (69.0)	101 (55.5)	0.021*
HLA-B27 negative	10 (23.8)	52 (28.4)	
HLA-B27 not done	3 (7.1)	30 (16.4)	
Imaging			
Sacroiliitis present	38 (90.5)	135 (73.8)	0.067
Unilateral	8 (19.0)	30 (16.4)	
Bilateral	30 (71.5)	105 (57.4)	

SpA: Spondyloarthritis. *symbol means statistically significant

common (P = 0.001). This aligns with previous studies reporting a strong association between axial disease and uveitis (3,12). HLA-B27 positivity was significantly higher among uveitis patients (69.0% vs. 55.5%; P = 0.021), reinforcing the genetic predisposition hypothesis widely documented in both global and regional studies.[1],[3] Although sacroiliitis was more frequent in the uveitis group, the difference did not reach statistical significance (P = 0.067), a finding echoed in Wong *et al*., where imaging-detected sacroiliitis failed to retain predictive value after adjustment.[12]

A family history of SpA was more common among uveitis patients (45.2% vs. 19.1%) and emerged as a strong independent predictor (adjusted OR = 3.697; P = 0.002). This association has been reported in both Yasmin *et al*. and Farouk *et al*., suggesting that heritable risk factors, possibly mediated through HLA-B27 and related alleles, contribute to ocular involvement in SpA.[3],[7] Disease duration was significantly longer in the uveitis group (9.3 ± 7.0 vs. 5.4 ± 4.5 years; P = 0.001) and was also independently predictive (adjusted OR = 1.089; P = 0.039). This supports the concept that prolonged inflammatory burden increases the likelihood of extra-articular complications, as suggested by Sieiro Santos *et al*. and Bittar *et al*.[1,13]

Interestingly, BASDAI scores were lower in the uveitis group (2.4 ± 1.9 vs. 3.3 ± 2.8; P = 0.050), and higher BASDAI scores were associated with reduced odds of uveitis (adjusted OR = 0.681; P = 0.002). This inverse association is in line with Yasmin *et al*., who speculated that patients with recurrent uveitis might present during periods of lower musculoskeletal activity but still have significant extra-articular inflammation.[3] Conversely, BASMI scores were significantly higher in the uveitis group (3.7 ± 1.6 vs. 3.1 ± 1.2; P = 0.009), indicating greater

Table 3: Comparison of continuous variables between uveitis and non-uveitis groups

Variable	Uveitis (Mean±SD)	Non-uveitis (Mean±SD)	*P*-value
Age (years)	37.2±8.5	31.5±9.5	0.001*
Age at symptom onset (years)	28.0±7.5	26.2±8.0	0.200
Duration of disease (years)	9.3±7.0	5.4±4.5	0.001*
Erythrocyte sedimentation rate (mm/h)	40.9±30.7	38.5±32.3	0.664
C-reactive protein (mg/L)	23.4±38.2	26.0±39.0	0.689

SD: Standard deviation. *symbol means statistically significant

Table 4: Comparison of disease activity indices between uveitis and non-uveitis groups

Index	Uveitis (Mean±SD)	Non-uveitis (Mean±SD)	*P*-value
Patient global (0–10)	4.6±2.1	5.2±2.3	0.113
Physician global (0–10)	4.4±2.0	4.8±2.1	0.213
Bath ankylosing spondylitis disease activity index	2.4±1.9	3.3±2.8	0.050
ASDAS-C-reactive protein	2.7±1.3	3.0±1.2	0.129
ASDAS-erythrocyte sedimentation rate	2.8±1.2	3.1±1.2	0.269
Bath ankylosing spondylitis metrology index	3.7±1.6	3.1±1.2	0.009*
Bath ankylosing spondylitis functional index	2.2±2.3	2.3±2.0	0.835

ASDAS: Ankylosing spondylitis disease activity score

Table 5: Multivariable logistic regression for factors associated with uveitis

Variable	Adjusted odds ratio	95% confidence interval	*P*-value
Duration of disease (years)	1.089	1.004–1.181	0.039*
Family history of SpA	3.697	1.616–8.457	0.002*
Bath ankylosing spondylitis disease activity index (per unit)	0.681	0.534–0.869	0.002*
Axial SpA (vs. peripheral)	3.459	0.605–19.783	0.163
Sacroiliitis on imaging	1.095	0.222–5.393	0.911
Age (years)	1.012	0.959–1.068	0.669
Marital status (married)	0.546	0.170–1.757	0.311
Bath ankylosing spondylitis metrology index (per unit)	1.296	0.955–1.760	0.096

*Statistically significant at $P<0.05$. SpA: Spondyloarthritis

spinal mobility impairment, a finding supported by Aguiar *et al*. and Sieiro Santos *et al*., both of whom reported that uveitis was linked to more structural progression despite variable peripheral activity levels.[14],[15] BASFI and patient/physician global scores showed no significant differences, consistent with multiple prior studies.[12],[13]

The observed patterns – older age, longer disease duration, predominance of axial phenotype, higher HLA-B27 positivity, and stronger family history in uveitis cases – are broadly consistent with findings from diverse geographic regions.[1],[12] However, the inverse association between BASDAI and uveitis observed here is less frequently reported and may be influenced by cultural, diagnostic, or healthcare-seeking behaviors specific to the Bangladeshi context. In addition, the absence of significant differences in systemic inflammatory markers (ESR, CRP) between groups suggests that conventional biomarkers may not fully capture the inflammatory milieu leading to ocular involvement, as similarly noted in Farouk *et al*.[7]

Our findings highlight the importance of incorporating ocular screening protocols, particularly for axial SpA patients with long-standing disease and positive family history. The BASMI elevation in uveitis patients suggests that even in the presence of relatively low BASDAI scores, structural monitoring remains critical. The independence of uveitis risk from sacroiliitis in multivariable models suggests that ophthalmologic surveillance should not be limited to patients with advanced radiographic changes.

Limitations of the study

The cross-sectional design precludes establishing causality, and referral bias may have influenced the higher axial SpA prevalence. Future longitudinal studies should aim to explore the temporal relationship between disease activity indices and uveitis onset, particularly to clarify the unexpected BASDAI–uveitis relationship. Expanding multicenter research within South Asia could help confirm whether these findings are region-specific or reflect broader SpA pathophysiology.

Conclusion

In this Bangladeshi cohort of SpA patients, uveitis was associated with older age, longer disease duration, higher prevalence of axial phenotype, greater HLA-B27 positivity, and strong family history of SpA. Disease activity assessment revealed lower BASDAI but higher BASMI scores in patients with uveitis, indicating that ocular involvement may occur despite lower perceived musculoskeletal activity, yet with more advanced structural impairment. Multivariable analysis confirmed disease duration and family history as independent predictors, whereas higher BASDAI was inversely related to uveitis risk. These findings underscore the need for proactive ocular screening in patients with long-standing, axial-predominant disease and positive family history, regardless of current inflammatory activity scores. Regional differences observed here highlight the importance of context-specific data to guide clinical management strategies in South Asia.

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Conflict of Interest

None declared.

Ethical Approval

The study was approved by the Institutional Ethics Committee.

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