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Within-Day Variability in Key Assessment of SpondyloArthritis International Society Outcomes in Axial Spondyloarthritis

ABSTRACT

Background/Aims: This study aimed to investigate within-day variability in pain, stiffness, disease activity, physical function, spinal mobility, and other clinical outcomes in axial spondyloarthritis (axSpA) and identify predictors of within-day improvement.

Materials and Methods: In this single-center cross-sectional study, patients with axSpA underwent 2 standardized clinical evaluations on the same day: a morning session (9:00-10:00 AM) and an afternoon session (2:00-3:00 PM). Assessments included the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Ankylosing Spondylitis Disease Activity Score incorporating C-reactive protein (ASDAS-CRP), Bath Ankylosing Spondylitis Metrology Index (BASMI), Ankylosing Spondylitis Quality of Life (ASQoL), Bath Ankylosing Spondylitis Functional Index (BASFI). Hip internal/external rotation range of motion was assessed using a goniometer, and chest expansion was measured using standardized methods. Multivariate logistic regression identified predictors of within-day improvement.

Results: Eighty patients with axSpA were included (mean age 44.3 ± 12.4 years; 63.7% male). Significant within-day improvements were observed in pain ($P = .015$) morning stiffness ($P = .001$), BASFI ($P = .013$), BASMI ($P = .001$), and ASQoL ($P = .006$), chest expansion ($P = .032$), and hip internal/external rotation ($P = .005$, $P = .036$, respectively) in the afternoon, whereas BASDAI and ASDAS-CRP remained stable. Higher morning BASDAI and lower body mass index independently predicted within-day improvement in BASFI. Non-smoking status was a strong predictor of ASQoL improvement.

Conclusion: Clinically meaningful within-day variability exists in key clinical parameters and patient-reported outcomes in axSpA. Assessment timing significantly influences outcome interpretation and should be standardized in both clinical practice and research to enhance reliability and comparability.

Keywords: Ankylosing spondylitis, axial spondyloarthritis, diurnal variation, inflammatory rheumatic disorders

Introduction

Axial spondyloarthritis (axSpA) encompasses a spectrum of chronic inflammatory diseases predominantly affecting the sacroiliac joints and the spine. Current clinical nomenclature bifurcates the disease into 2 distinct phenotypes based on conventional imaging: radiographic axSpA, also referred to as ankylosing spondylitis (AS), which is characterized by definitive sacroiliac joint damage on plain radiographs; and non-radiographic axSpA (nr-axSpA),

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which comprises patients with similar clinical manifestations and disease burden but without radiographic sacroiliitis fulfilling classification criteria.[1] Beyond axial inflammation, patients with axSpA may also experience extra-articular manifestations such as psoriasis, uveitis, and inflammatory bowel disease, reflecting the systemic nature of the disease.[2] As disease progresses, patients frequently develop chronic pain, impaired spinal mobility, and reduced physical functioning, all of which substantially diminish quality of life and increase disease burden.[3,4]

Increasing attention has recently been directed toward the influence of diurnal or circadian rhythms on the clinical expression of rheumatic diseases. Notably, rheumatoid arthritis (RA) has been extensively studied in relation to circadian rhythms, with research demonstrating that pain, stiffness, and functional disability in RA patients tend to worsen in the morning.[5,6] This variation is thought to be driven by various mechanisms, including immune system responses, hormonal fluctuations, the circadian fluctuation of angiogenic mediators, and nervous system interactions.[5,7-9] Similar diurnal patterns have been described in other inflammatory diseases, including systemic lupus erythematosus, polymyositis, dermatomyositis, and polymyalgia rheumatica.[10] However, despite back pain and morning stiffness being hallmark features of axSpA, research on diurnal variation in axSpA remains limited.

The 2023 update to the Assessment of SpondyloArthritis International Society (ASAS) Core Outcome Set (COS) for axSpA underscores the need for standardized assessment tools evaluating essential domains such as disease activity, pain, stiffness, fatigue, physical function, and overall health.[11] While these instruments are widely validated and integral to both clinical research and practice, an important methodological gap remains: the extent to which the timing of assessment influences the interpretation of these outcomes.

Limited data suggest that diurnal variation may affect core axSpA symptoms such as pain, stiffness, and spinal mobility in patients with axSpA;[12] however, it is unknown whether these fluctuations extend to composite indices of disease activity, functional status, and quality of life in a real-world clinical setting. This knowledge gap limits the ability to understand daily symptom dynamics and may compromise the reliability of disease monitoring and the evaluation of treatment efficacy. Therefore, this study aimed to investigate the within-day variability of the key ASAS core outcome domains including disease activity, pain, stiffness, spinal mobility, physical function, and overall health and identify predictors of within-day improvement.

MAIN POINTS

- *Patients with axial spondyloarthritis (axSpA) demonstrate significant within-day variability in pain, morning stiffness, spinal mobility, and physical function from morning to afternoon.*
- *While individual symptoms show notable within-day improvement, composite disease activity indices such as Bath Ankylosing Spondylitis Disease Activity Index and Ankylosing Spondylitis Disease Activity Score incorporating C-reactive protein remain stable throughout the day.*
- *Higher morning symptom burden and lower body mass index are independent predictors of greater within-day improvement in physical function.*
- *Non-smoking status is a significant predictor of within-day improvement in quality of life among patients with axSpA.*
- *The presence of significant within-day improvement highlights the critical need to standardize assessment timing to ensure the reliability of clinical outcomes in axSpA.*

Materials and Methods

Study Design and Patient Population

This single-center cross-sectional study was conducted according to a prospectively specified protocol in which all patients underwent 2 standardized clinical evaluations on the same day. Patients with axSpA were consecutively enrolled from the rheumatology outpatient clinic of a tertiary healthcare center. Inclusion criteria were: age 18 years or older, a classification of axSpA according to the ASAS criteria,[1] and current follow-up at the rheumatology clinic. Exclusion criteria included malignancy or systemic infectious disease, pregnancy or lactation, and severe psychiatric disorders. This study was approved by the Ethical Committee of Karadeniz Technical University (protocol number 2023/130; date: October 12, 2023), and written informed consent was obtained from all participants. This study was conducted between October 2023 and June 2024. Artificial intelligence model was utilized solely for text editing and grammatical refinement. The authors critically revised, and take full responsibility for the scientific accuracy and integrity of the final text.

Outcome Measures and Assessment

Disease Activity: Disease activity was assessed using the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and the Ankylosing Spondylitis Disease Activity Score incorporating C-reactive protein (ASDAS-CRP).[13-15] The BASDAI consists of 6 items, measured on a 10 cm visual analog scale (VAS), evaluating fatigue, spinal pain, peripheral joint symptoms, localized tenderness, and the duration and severity of morning stiffness. The ASDAS-CRP is a composite index incorporating BASDAI items 2, 3, and 6, patient's global assessment, and CRP levels. The physician global assessment and VAS-pain scores were also recorded.

Spinal Mobility: Spinal mobility was evaluated using the Bath Ankylosing Spondylitis Metrology Index (BASMI), comprising cervical rotation, tragus-to-wall distance, lumbar lateral flexion, modified Schober test, and intermalleolar distance.[16]

Hip Range of Motion and Chest Expansion: Additionally, hip internal and external rotation range of motion was assessed using a universal goniometer, the mean of 3 measurements was recorded. Chest expansion was measured at the fourth intercostal space during maximal inspiration and maximal expiration using a standard non-elastic measuring tape to ensure consistency and reproducibility. The difference between the 2 measurements was recorded, with the better of 2 attempts being noted.[17]

Quality of Life and Physical Function: Quality of life was assessed using the Ankylosing Spondylitis Quality of Life (ASQOL) questionnaire, which evaluates both physical and emotional well-being.[18,19] This questionnaire includes 18 items that cover various aspects of daily life affected by AS, such as mobility, pain, fatigue, and emotional well-being. Physical function was evaluated using the Bath Ankylosing Spondylitis Functional Index (BASFI), which includes 10 questions that assess the patient's ability to perform daily tasks, such as dressing, walking, and personal care.[20,21]

Assessment of Within-Day Variability: To assess within-day (morning to afternoon) variability in disease activity and other clinical outcome measures, all participants completed 2 standardized assessment sessions on the same day: a morning session (Session 1, S1: 09:00-10:00 AM) and an afternoon session (Session 2, S2: 2:00-3:00 PM). These time intervals were selected based on a previous study demonstrating time-of-day differences in spinal mobility performance in axSpA.[12] Patients were instructed to report their symptoms over the preceding week when completing BASDAI, ASQOL, and BASFI assessments during both sessions.

To minimize the potential confounding effects of medications on assessments, participants were instructed to abstain from all nonsteroidal anti-inflammatory drugs (NSAIDs) and other symptomatic treatments for at least 12 hours prior to the morning session and to refrain from taking any such medications until the completion of the afternoon assessment. These instructions were provided verbally and in detail during the scheduling visit prior to the study day to ensure adherence. Furthermore, to control for the confounding effect of physical activity, participants were advised to avoid structured exercise, physical therapy, or unusual physical exertion on the assessment day. Routine hospital-related activities (e.g., blood sampling) were permitted, as they were unlikely to affect clinical measures. All measurements were conducted by the same investigator to maintain consistency across assessments.

Statistical Analysis

Statistical analyses were performed using SPSS software version 23.0 (IBM SPSS Corp.; Armonk, NY, USA). Continuous variables are expressed as mean ± SD, while categorical variables are presented as frequencies and percentages. The normality of the data distribution was assessed using the Shapiro–Wilk test. For comparing diurnal variations in continuous variables, paired-sample *t*-tests were used. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate.

A power analysis was conducted to determine the required sample size for detecting the predefined effect size with G*Power 3.1 software (Heinrich Heine University Düsseldorf, Düsseldorf, Germany). The analysis was performed using a paired-sample *t*-test. A minimum clinically meaningful difference was defined as Cohen's d = 0.4 (moderate effect size). The Type I error rate (α) was set at 0.05, and the statistical power (1-β) at 0.90. Based on these parameters, the required minimum sample size was calculated as 68 patients.

To examine factors associated with within-day improvement in clinical parameters, univariate logistic regression analyses were initially conducted. Variables with $P < .25$ in the univariate analysis were subsequently included in a multivariate logistic regression model using a backward stepwise approach. Separate multivariate models were constructed for within-day improvement in BASFI and ASQoL.

For the BASFI improvement model, candidate variables included body mass index (BMI), symptom duration, VAS-pain, CRP, education level, and morning BASDAI score. For the ASQoL improvement model, candidate variables included sex, VAS-pain, HLA-B27 status, CRP, smoking status, morning BASFI, and rotational hip mobility.

Model assumptions were assessed prior to analysis, and multicollinearity was evaluated using variance inflation factors. Odds ratios (ORs) with 95% CIs were reported for variables retained in the final

Results

Baseline Demographics and Disease Characteristics

A total of 80 patients with axSpA were enrolled in the study, of whom 74 (92.5%) had AS and 6 (7.5%) had nr-axSpA. The demographic profile revealed a male predominance (n = 51, 63.7%) and a mean age of 44.3 ± 12.4 years. Detailed demographic and clinical characteristics are provided in Table 1. In terms of current treatment status, the majority of the axSpA patients (n = 74, 92.5%) were receiving biologic disease-modifying antirheumatic drugs (bDMARDs). Furthermore, regular NSAID use was observed in 7.5% of the participants, whereas 16.3% reported irregular use. When stratified by subtype, 69 patients with AS (93.2%) and 5 patients with nr-axSpA (83.3%) were receiving bDMARD therapy, with

Table 1. Baseline Characteristics of the Study Population	
Age, years	44.29 ± 12.41
BMI, kg/m²	27.85 ± 4.25
Symptom duration, years	14.76 ± 8.13
Since from diagnosis, years	10.46 ± 6.54
Education status	
Primary school or low	18 (22.5)
Middle or high school	38 (47.5)
University or high	24 (30.0)
Smoking habits	
Current smoker	34 (42.4)
Ex-smoker	11 (13.8)
Non-smoker	35 (43.8)
PGA	3.49 ± 2.39
PhGA	3.09 ± 2.15
CRP (mg/L)	8.55 ± 12.46
HLAB27 (n = 65)	
Positive	48 (73.8)
Comorbidity	
No comorbidities	56 (70.0)
DM	11 (13.8)
HT	16 (20.1)
Other	2 (2.6)

BMI, body mass index; CRP, C-reactive protein; DM, diabetes mellitus; HLA-B27, human leukocyte antigen B27; HT, hypertension; PGA, patient global assessment; PhGA, physician global assessment.

no statistically significant difference between groups ($P = .375$).

Within-Day Variability in Clinical Outcomes

Analysis revealed significant within-day variability across multiple clinical domains from the morning to the afternoon session in patients with axSpA (Figure 1 and Table 2). Patient-reported outcomes such as VAS-pain ($P = .015$), BASFI ($P = .013$), and ASQoL ($P = .006$) all demonstrated statistically significant improvement. While the total BASDAI score did not change ($P = .699$), its morning stiffness component (BASDAI Q6) improved significantly ($P = .001$). In contrast, composite disease activity indices such as ASDAS-CRP remained stable ($P = .437$).

Clinician-assessed measures also showed significant within-day improvement. The BASMI score, reflecting spinal mobility, improved significantly in the afternoon assessment ($P = .001$). Similarly, hip internal and external rotation increased significantly from morning to afternoon ($P = .005$ and $P = .036$, respectively). Chest expansion exhibited a slightly but statistically significant increase, rising from 1.94 ± 1.30 cm to 2.13 ± 1.40 cm ($P = .032$).

Factors Associated with Within-Day Improvement in Clinical Outcomes

The multivariate logistic regression analysis identified key predictors of within-day improvement for distinct clinical outcomes (Table 3). For afternoon BASFI improvement, higher morning BASDAI scores emerged as a significant predictor (OR = 1.453, $P = .008$), while BMI (OR = 0.884, $P = .043$) also showed a notable association, indicating that higher BMI reduces the likelihood of improvement in BASFI. Regarding within-day improvement in quality of life, non-smokers exhibited significantly higher odds of ASQoL improvement compared to smokers (OR = 5.874, $P = .002$).

Discussion

The study highlights the existence of significant within-day variations in clinical outcomes among patients with axSpA. Significant differences in pain, stiffness, spinal mobility, physical function, quality of life, chest expansion, and hip rotation between morning and afternoon

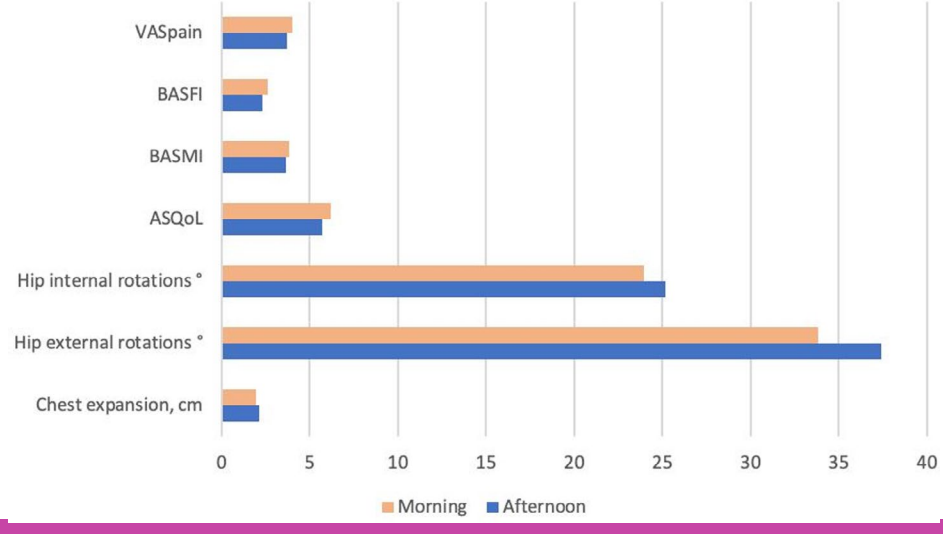


Figure 1. Morning and afternoon comparisons of disease activity, function, quality of life, and spinal mobility parameters.

Table 2. Within-Day Variation in Clinical Parameters (Paired *t*-Test)

	Morning (mean ± SD)	Afternoon (mean ± SD)	*P*	Mean Difference (95% CI)
VAS-pain	4.03 ± 2.92	3.73 ± 2.68	**.015**	0.300 (0.059-0.541)
BASDAI	3.25 ± 2.29	3.19 ± 2.50	.699	0.057 (−0.234 to 0.347)
BASDAI Q1	4.76 ± 2.88	4.29 ± 2.98	.082	0.475 (−0.062 to 1.012)
BASDAI Q2	4.50 ± 3.23	4.26 ± 3.26	.320	0.238 (−0.235 to 0.710)
BASDAI Q3	2.98 ± 3.06	3.11 ± 3.15	.606	−0.138 (−0.666 to 0.391)
BASDAI Q4	1.50 ± 2.86	1.90 ± 3.06	.116	−0.400 (−0.902 to 0.102)
BASDAI Q5	3.19 ± 3.64	3.15 ± 3.66	.851	0.038 (−0.359 to 0.434)
BASDAI Q6	1.79 ± 2.55	1.61 ± 2.54	**.001**	0.179 (0.074-0.283)
ASDAS-CRP	2.26 ± 1.04	2.23 ± 1.05	.437	0.029 (−0.045 to 0.103)
BASFI	2.59 ± 2.46	2.30 ± 2.29	**.013**	0.298 (0.064-0.531)
ASQoL	6.19 ± 5.20	5.69 ± 5.20	**.006**	0.500 (0.144-0.856)
BASMI	3.80 ± 1.14	3.67 ± 1.11	**.001**	0.124 (0.055-0.193)
Hip internal rotations,	23.94 ± 7.32	25.14 ± 6.79	**.005**	−1.194 (−2.007 to −0.381)
Hip external rotations,	33.86 ± 8.24	37.41 ± 10.36	**.036**	−3.544 (−6.857 to −0.231)
Chest expansion, cm	1.94 ± 1.30	2.13 ± 1.40	**.032**	−0.191 (-0.366 to −0.017)

Values are presented as mean ± SD.
ASDAS-CRP, Ankylosing Spondylitis Disease Activity Score with CRP; ASQoL, Ankylosing Spondylitis Quality of Life; BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; BASFI, Bath Ankylosing Spondylitis Functional Index; BASMI, Bath Ankylosing Spondylitis Metrology Index; VAS, visual analog scale.
Bold values indicate statistical significance (P < 0.05)

Table 3. Factors Associated with Improvement in BASFI and ASQoL

	B	*P*	Exp(B)	95% CI
BASFI improvement				
BMI	−0.124	**.043**	0.884	0.784-0.996
Symptom duration	0.062	.056	1.064	0.998-1.133
CRP	−0.041	.061	0.960	0.919-1.002
BASDAI morning	0.373	**.008**	1.453	1.100-1.918
ASQoL improvement				
VAS-pain	0.157	.099	1.170	0.971-1.409
Smoking status				
non-smoker	1.771	**.002**	5.874	1.864-18.509
ex-smoker	1.605	.056	4.977	0.961-25.779

ASQoL, Ankylosing Spondylitis Quality of Life; BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; BASFI, Bath Ankylosing Spondylitis Functional Index; BMI, body mass index; CRP, C-reactive protein; VAS, visual analog scale.
Bold values indicate statistical significance (P < 0.05)

assessments were observed. These findings underscore the imperative need to account for the time of day when interpreting clinical measurements in axSpA to ensure the accuracy and reliability of results.

Back pain and morning stiffness, the hallmark symptoms of axSpA, are key components of the classification criteria for inflammatory back pain and disease activity measurement.[14,22] Moreover, morning stiffness is a cornerstone of ASAS partial remission definition.[23] Despite their clinical relevance, studies exploring the diurnal variations of these symptoms remain limited in patients with axSpA. A prior study provided an overview of circadian patterns in pain and vertebral stiffness among spondyloarthritis patients, reporting a 12-hour rhythmic pattern with a primary peak between 6:00 and 9:00 AM. and a secondary peak between 6:00 and 9:00 PM.[24] Similarly, a smaller study in AS patients reported comparable findings.[25] Consistent with these observations, the study demonstrated that both pain intensity and stiffness duration were significantly higher in the morning compared to the afternoon. These results emphasize the importance of considering within-day variations in clinical assessments to ensure more accurate disease monitoring and reliable outcome evaluation in axSpA.

Recently, an observational study by Kiefer D. et al investigated diurnal variations in mobility among patients with axSpA. The study reported that spinal mobility was significantly reduced in the morning, with notable improvements in the afternoon, particularly in BASMI scores and other mobility-related measures.[12] Similarly, the findings demonstrated significant within-day improvements in spinal mobility, as measured by BASMI, with better scores in the afternoon compared to the morning. These results suggest that the observed improvements in mobility throughout the day may be closely linked to a reduction in inflammation and stiffness. This within-day variation highlights the importance of considering the timing of assessments to ensure accurate mobility evaluations and optimal patient care.

As expected, composite disease activity indices such as BASDAI and ASDAS-CRP did not exhibit significant within-day variation. But both physical function (BASFI) and quality of life scores (ASQoL) were notably better in the afternoon. The improvement in BASFI is likely

attributable to the reduction in pain and stiffness, which enhances patients' ability to perform daily tasks more effectively. Similarly, the ASQoL, a validated tool used to measure the disease's impact on quality of life, also showed more favorable outcomes in the afternoon. These findings suggest that symptom relief throughout the day plays a crucial role in enhancing both physical function and overall well-being, thereby shaping patients' perceptions of their health. Given these results, future studies should account for within-day variations, especially when evaluating patient-reported outcomes.

It should also be considered that BASFI and ASQoL assess symptoms over the preceding week and are not specifically designed to capture immediate fluctuations. Therefore, within-day differences may partly reflect contextual influences at the time of assessment. However, as the recall period was identical in both sessions and no intervention occurred between measurements, these findings are unlikely to represent a simple memory effect. Rather, reduced pain and stiffness in the afternoon may influence how patients cognitively summarize their recent experiences. This observation underscores the potential sensitivity of retrospective patient-reported outcomes to assessment timing and supports the need for standardized evaluation time points. Importantly, as both assessments referred to the same recall period, any recall bias would be expected to affect both time points similarly, making it unlikely to fully explain the observed within-day differences.

The multivariate logistic regression analysis identified several factors associated with within-day improvement in clinical outcomes, highlighting the multifactorial nature of symptom variability in axSpA. Notably, higher morning BASDAI score was independently associated with a greater likelihood of improvement in the BASFI score by the afternoon. This finding suggests that patients with a higher initial symptom burden in the morning experience a more pronounced functional improvement as the day progresses, possibly due to reductions in pain and stiffness. Additionally, a lower BMI was associated with a higher probability of BASFI improvement, reinforcing the established link between obesity and poorer functional outcomes.[26] For quality of life improvement, non-smokers were significantly more likely to achieve better ASQoL scores in the afternoon compared to smokers, potentially reflecting the detrimental effects of smoking on chest expansion, quality of life, and overall health.[27] The observed associations of lower BMI and non-smoking status with greater within-day improvement may also reflect differences in symptom dynamics rather than purely inflammatory mechanisms. Patients with higher BMI may experience a greater contribution of mechanical load and non-inflammatory pain, which may be less responsive to short-term circadian changes. Similarly, smoking has been associated with increased systemic inflammation, impaired microvascular function, and altered pain perception, which may attenuate diurnal symptom variation. However, these interpretations remain speculative and should be confirmed in future studies.

Although the precise mechanisms driving diurnal variations in axSpA are not fully elucidated, they are presumed to be multifactorial. Circadian rhythms influence various physiological processes, including immune function, hormone secretion, and inflammatory responses.[5-7] The circadian rhythm of proinflammatory cytokines like TNF-α and IL-6, which peak in the early morning, is a well-established driver of morning stiffness in inflammatory arthritis.[10] In axSpA, this is compounded by nocturnal immobility, leading to the accumulation of inflammatory mediators and fluid in the axial skeleton. The subsequent improvement with physical activity throughout the day is a clinical hallmark of the disease and likely reflects the mobilization of inflammatory exudates and a reduction in tissue stiffness.[28] Hormonal fluctuations, such as those involving cortisol, may also contribute to these diurnal changes, as cortisol typically peaks in the morning and plays a role in modulating inflammation. Melatonin and prolactin, 2 other hormones with circadian patterns, peak at night and are associated with immune stimulation.[7] Elevated levels of these hormones in RA patients have been reported to increase proinflammatory activity, particularly during the early morning when cortisol is at its lowest.[29] This hormonal imbalance may contribute to the pronounced morning stiffness and pain seen in axSpA and other inflammatory conditions.

This study has several notable strengths. Its prospective, within-day design, the control of key confounders such as medication timing and physical activity, and use of the majority of outcome measures from the ASAS COS together provide a methodologically robust framework. Assessing patients at 2 standardized time points within the same day allowed us to capture within-day variability in symptoms and function. This granular characterization of within-day variability represents an important contribution to the axSpA literature, where temporal effects are often overlooked. However, several limitations are acknowledged. The cross-sectional design precludes analysis of long-term variability or causal mechanisms underlying these fluctuations. The single-center setting and relatively homogeneous patient population may limit the generalizability of the findings to more diverse axSpA cohorts. Additionally, although diabetic patients represented only a small subset of the cohort (13.8%, n = 11), the inclusion of metabolic comorbidities may have influenced within-day variability. Furthermore, although major confounders were controlled for, data on psychosocial factors such as sleep quality, fatigue, mood, or stress were not collected, which could influence symptom perception. Future multicenter, longitudinal studies incorporating actigraphy and biomarker analysis are needed to validate the findings and further elucidate the underlying mechanisms.

In conclusion, this study provides robust insights into clinically relevant within-day variation in pain, stiffness, physical function, spinal mobility, and quality of life among patients with axSpA. Multivariate analyses indicated that higher morning disease activity, along with factors such as BMI and smoking status, was associated with greater within-day improvement. Overall, the findings highlight that assessment timing is a critical variable that can substantially influence clinical interpretation. Standardizing the timing of evaluations may enhance the reliability of outcome assessment and improve both research validity and patient management in axSpA.

Data Availability Statement: *The data that support the findings of this study are available on request from the corresponding author.*

Artificial Intelligence Usage Statement: *The authors declared that Artificial Intelligence tool was used in the preparation of the manuscript for grammar and editing.*

Ethics Committee Approval: *Ethical committee approval was received from the Ethics Committee of University of Karadeniz Technical (Approval No.: 2023/130; Date: October 12, 2023).*

Informed Consent: *Written informed consent was obtained from the patients who agreed to take part in the study.*

Peer-review: *Externally peer-reviewed.*

Author Contributions: *Concept – G.K., E.K.;Design – G.K., E.K.; Supervision – M.K., G.K.; Resources – M.K., B.Ç.; S.B.K; Materials – S.B.K., B.Ç.; Data Collection and/or Processing – B.Ç., S.B.K.; Analysis and/or Interpretation – G.K., E.K.; Literature Search – S.B.K., G.K.; Writing – G.K., E.K.; Critical Review – G.K., M.K., EK., S.B.K.*

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