Rapid Improvement of Fatigue and Sleep in Active Rheumatoid Arthritis with Anti-TNF Therapy: A Retrospective Observational Study

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Abstract

Aim: Patients with rheumatoid arthritis (RA) suffer from high burdens of fatigue and poor sleep quality which persist even when joint inflammation is controlled. We aimed to retrospectively evaluate the 3-month impact of initiating anti-TNF therapy on fatigue, sleep quality, and functional status in patients with active RA.

Methods: We conducted a 3-month single-center retrospective cohort study reviewing the records of 39 patients with active RA (Disease Activity Score 28 [DAS28] > 5.1) despite stable csDMARDs. A matched group of 36 healthy controls was used for baseline comparisons. Patients had initiated adalimumab, etanercept, or infliximab. Assessments had been performed at baseline and 3 months using the DAS28 (disease activity), Health Assessment Questionnaire (HAQ), Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF), Pittsburgh Sleep Quality Index (PSQI), and Beck Depression Inventory (BDI). Data from 31 patients who completed the 3-month follow-up were included in the final analysis.

Results: At 3 months, patients showed significant clinical improvement. Mean DAS28 decreased from 5.5 ± 1.2 to 3.3 ± 1.6 ($p < 0.001$) and 39% (12/31) achieved remission. Significant improvements were seen in patient-reported outcomes. The mean MFSI-SF total fatigue score decreased from 27.6 to 10.4 ($p < 0.001$) and the mean global PSQI score improved from 9.5 to 7.0 ($p < 0.001$). Functional status (HAQ) and depressive symptoms (BDI) also improved significantly (both $p < 0.001$). At baseline, fatigue strongly correlated with poor sleep ($r=0.626$), depression ($r=0.674$), and HAQ ($r=0.656$). Improvement in fatigue correlated moderately with improvement in depression (Δ-BDI $r=0.571$).

Conclusions: Anti-TNF therapy provides rapid and significant improvements not only in clinical disease activity but also in the key patient-reported outcomes of fatigue, sleep quality, and depression within three months of initiation.

Keywords: *Rheumatoid arthritis; anti-TNF therapy; fatigue; sleep quality; patient-reported outcomes (PROs)*

1. Introduction

Rheumatoid arthritis (RA) is a chronic systemic autoimmune disease defined by persistent synovial inflammation which leads to progressive joint destruction functional disability and chronic pain.[1-5] Although the clinical course is heterogeneous, the societal and individual burden is substantial.[1]

While medical advances focus on mitigating inflammation and structural damage the impact of RA extends deeply into patient-reported outcomes (PROs).[3] RA significantly compromises quality of life (QoL) through debilitating systemic symptoms most notably persistent fatigue and prevalent sleep disturbances.[2,8,9]

Persistent fatigue is perhaps the most pervasive systemic manifestation of RA affecting the majority of patients and often ranked as more burdensome than joint pain itself.[10,11] Correspondingly disturbed sleep is a major concern with reports suggesting 40% to over 80% of RA patients experience poor sleep quality.[2,5,12] This symptom burden is linked to RA pathophysiology: pro-inflammatory cytokines such as Tumor Necrosis Factor-alpha (TNF-α) and Interleukin-6 (IL-6) which drive joint inflammation are also known to alter circadian rhythms and induce fatigue.[2,3,5,10] Critically while fatigue correlates weakly with objective disease activity (DAS28) it shows strong relationships with pain and mood (10-12). Consequently, achieving clinical remission often leaves a large proportion of patients with residual burdensome fatigue.[10,11] As impaired sleep and chronic fatigue severely reduce functionality and diminish QoL ad-

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dressing these factors is paramount for optimizing RA treatment.[6,10-12]

The introduction of biologic disease-modifying antirheumatic drugs (bDMARDs) particularly anti-TNF agents revolutionized RA management by effectively controlling inflammation and restricting joint destruction.[1,3,5] This potent immunomodulation is hypothesized to mitigate associated systemic symptoms.[10] Previous cohorts and randomized controlled trials (RCTs) have shown that patients starting anti-TNF therapy experience significant improvements in fatigue.[10-13] Furthermore, reductions in disease activity are linked to improvements in sleep quality likely by decreasing nocturnal pain.[3,5,6,14] However robust data focusing specifically on the primary and rapid (3-month) impact of anti-TNF therapy on fatigue and sleep quality remain limited as these are frequently assessed only as secondary endpoints.[5,13]

The purpose of this study is to evaluate the 3-month effects of anti-TNF therapy on fatigue (measured by MFSI-SF) and sleep quality (PSQI) in patients with RA. Comprehensive assessments had included disease activity (DAS28), functional status (HAQ) and mood (BDI).[12,15,16] We hypothesized that patients who initiated anti-TNF therapy would have exhibited significant improvements in both fatigue and sleep quality metrics within three months. This study provides valuable real-world data from a Turkish cohort integrating changes in key PROs with objective clinical measures following targeted intervention.[16]

2. Materials and Methods

2.1. Study Design and Participants

This retrospective single-center study was conducted at the 19 Mayıs University Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Rheumatology outpatient clinic. The study protocol received approval from the 19 Mayıs University Local Research Medical Ethics Committee [Approval no: 2025/586].

We identified 39 patients with RA diagnosed according to the 1987 American College of Rheumatology (ACR) criteria who had presented between January 2010 and June 2010 and met eligibility criteria. Eligible patients had been candidates for initiating anti-TNF therapy, aged 18-75, and had active disease (Disease Activity Score 28 [DAS28] > 5.1) despite receiving stable conventional synthetic disease-modifying anti-rheumatic drug (csDMARD) therapy for at least three months. A control group of 36 healthy age- and sex-matched individuals ' records was used for baseline comparisons. Exclusion criteria for the patient group were: previous use of any anti-TNF agent; serious systemic comorbidities (e.g., uncontrolled diabetes mellitus, thyroid dysfunction, significant cardiovascular disease, malignancy, or major neurological disorders); other metabolic bone diseases; active or recent serious infections; and severe hepatic or renal dysfunction. Patients who were receiving medications known to affect bone metabolism (e.g., bisphosphonates) were also excluded. The ethics committee waived the need for individual patient consent for this retrospective chart review.

2.2. Treatment and Follow-up Protocol

Throughout the 3-month study period, patient records indicated they had continued their established csDMARD regimens at stable doses. Concomitant low-dose oral steroid use (prednisolone ≤ 10 mg/day) had been permitted. Records indicated no restrictions had been placed on non-steroidal anti-inflammatory drug (NSAID) use. Prior to treatment, patient records confirmed they had been screened for tuberculosis (TB), including a PPD test and chest radiography. Prophylactic isoniazid (300 mg/day) had been prescribed for patients at high risk for TB reactivation. The choice of anti-TNF agent (Infliximab, Etanercept, or Adalimumab) had been a shared decision between the patient and the treating rheumatologist. Regimens had been administered according to standard protocols: Infliximab (3 mg/kg intravenous infusion at weeks 0, 2, and 6, then every 8 weeks), Etanercept (25 mg subcutaneous injection twice weekly), or Adalimumab (40 mg subcutaneous injection every 2 weeks). All clinical and patient-reported outcome assessments had been performed as part of routine clinical care at baseline (week 0) and at month 3 and were extracted for this study.

2.3. Measurements and Assessment Tools

At both study visits, sociodemographic data, clinical information, and laboratory parameters had been collected and were extracted from the medical records.

Psychosocial and Functional Assessments:

- **Fatigue:** The Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF) had been used. This 30-item questionnaire assesses five subscales (General Physical Emotional Mental fatigue and Vigor). Higher scores indicate greater fatigue except for the Vigor subscale.[17]
- **Sleep Quality:** The Turkish version of the Pittsburgh Sleep Quality Index (PSQI) had been administered. This 19-item self-report measure evaluates sleep quality over the past month. It yields a global score from 0 to 21 with a score ≥5 indicating poor sleep quality.[18]
- **Depression:** The Turkish version of the Beck Depression Inventory (BDI) a 21-item scale had been used. A score ≥17 was the cut-off for clinically relevant depressive symptomatology.[19]
- **Functional Status:** Disability was assessed using the Turkish version of the Health Assessment Questionnaire (HAQ) which scores 8 categories of daily living activities from 0 (no difficulty) to 3 (unable to do).[20]

Clinical and Laboratory Assessments:

Disease activity had been measured using the DAS28 score calculated using the 28-tender joint count (TJC28) 28-swollen joint count (SJC28) Erythrocyte Sedimentation Rate (ESR) and Patient Global Health (GH 0-100 mm). Patient-reported pain Patient Global Assessment and Physician Global Assessment had been recorded using 0-10 cm Visual Analogue Scales (VAS). Laboratory assessments had included ESR (mm/hr) C-reactive protein (CRP mg/L) and Rheumatoid Factor (RF).[4]

Radiographic Assessment:

Posteroanterior radiographs of the hands and feet had been obtained at baseline. Joint damage was quantified using the Sharp/van der Heijde modification (mTSS) which assesses joint space narrowing (JSN) and bone erosions.[21] Radiographs were evaluated by a single trained reader on two separate occasions. Intra-rater reliability was assessed using the intraclass correlation coefficient (ICC), which was excellent for the total score (ICC = 0.94).

2.4. Statistical Analysis

Statistical analyses were performed using SPSS version 15.0. Descriptive statistics were presented as mean ± standard deviation (SD) or median (interquartile range) for continuous variables and as frequencies (percentages) for categorical variables. The Kolmogorov-Smirnov test assessed data normality.

Due to non-normal distribution non-parametric tests were employed. The Mann-Whitney U test was used for comparisons between independent groups. The Wilcoxon Signed-Rank test was used for paired intra-group comparisons (baseline vs. month 3). Categorical data were analyzed using the Chi-square or Fisher's exact test.

Spearman's rank correlation (r) was used to evaluate relationships. Correlation coefficients (r) were interpreted as: 0-0.24 (weak) 0.25-0.49 (moderate) 0.5-0.74 (strong) and 0.75-1.0 (very strong). A p-value < 0.05 was considered statistically significant.

3. Results

3.1. Participant Flow and Baseline Characteristics

A total of 39 patients with RA and 36 matched healthy controls were identified and included in the analysis. Review of the 3-month follow-up data revealed that one patient had discontinued anti-TNF therapy due to a severe systemic infection. An additional seven patients were lost to follow-up (i.e., had no 3-month assessment data in their records). Consequently, 31 patients had completed the 3-month assessment and were included in the longitudinal analysis. Baseline sociodemographic, clinical, laboratory, and psychosocial characteristics of the initial (N=39) patient cohort are summarized in Table 1. The cohort was predominantly female (69.2%), with a mean age of 50.7 ± 10.7 years and a long mean disease duration of 115.9 ± 100.4 months. Patients had presented with high disease activity (mean DAS28: 5.5 ± 1.2) and moderate functional impairment (mean HAQ: 0.6 ± 0.4). Psychosocial comorbidities had been highly prevalent: 90% (35/39) of patients reported fatigue (MFSI-SF ≥ 1), 85% (33/39) had poor sleep quality (PSQI ≥5), and 28% (11/39) screened positive for clinically relevant depressive symptoms (BDI ≥ 17).

3.2. Effect of Anti-TNF Therapy on Clinical and Patient-Reported Outcomes

Patients who had completed the 3-month follow-up (N=31) demonstrated rapid and significant improvements across disease activity, functional status, and psychosocial metrics. Table 2 details the changes from baseline to 3 months. Mean DAS28 score decreased significantly from 5.5 ± 1.2 to 3.3 ± 1.6 ($p < 0.001$). By month 3, 39% (12/31) of patients achieved clinical remission (DAS28 < 2.6). Based on EULAR response criteria, 68% (21/31) were good responders, 22% (7/31) were moderate responders, and 10% (3/31) were non-responders. All other measures of disease activity, including TJC, SJC, morning stiffness, HAQ, ESR, and CRP, also improved significantly (all $p \leq 0.003$). Significant improvements were observed in patient-reported fatigue and depression. The MFSI-SF total score decreased markedly from 27.6 to 10.4 ($p < 0.001$), with significant gains in General, Physical, and Emotional fatigue subscales. The Vigor subscale also improved significantly ($p < 0.001$). However, the reduction in the Mental fatigue subscale did not reach statistical significance ($p = 0.077$). The BDI score for depression also decreased significantly ($p < 0.001$). Sleep quality improved substantially.

Table 1

Baseline Characteristics of RA Patients (N=39)

Parameter	Mean ± SD (Median) or N (%)
Sociodemographic	
Age (years)	50.7 ± 10.7
Female Gender	27 (69.2%)
Disease Duration (months)	115.9 ± 100.4 (96.0)
RF Positive	25 (64.1%)
RN Positive	4 (10.3%)
Concomitant Medications	
Steroid (Prednisolone)	36 (92.3%)
Methotrexate	32 (82.1%)
Adalimumab (Initiated)	22 (56.4%)
Etanercept (Initiated)	11 (28.2%)
Infliximab (Initiated)	6 (15.4%)
Clinical & Laboratory Measures	
Morning Stiffness (min)	94.2 ± 85.3 (60.0)
DAS28 Score	5.5 ± 1.2 (5.31)
HAQ Score	0.6 ± 0.4 (0.6)
Tender Joint Count (TJC)	11.8 ± 8.3 (11.0)
Swollen Joint Count (SJC)	4.7 ± 4.1 (4.0)
ESR (mm/hr)	45.3 ± 25.2 (44.0)
CRP (mg/L)	30.9 ± 31.3 (19.6)
Modified Total Sharp Score (mTSS)	56.5 ± 74.7 (37.5)
Psychosocial & PROs	
BDI Score	13.5 ± 8.5 (14.0)
PSQI Global Score	9.3 ± 4.0 (10.0)
MFSI-SF Total Score	28.7 ± 18.0 (28.0)
MFSI-SF General Fatigue	10.1 ± 5.8 (10.0)
MFSI-SF Physical Fatigue	10.0 ± 5.6 (10.0)
MFSI-SF Emotional Fatigue	8.2 ± 4.7 (8.0)
MFSI-SF Mental Fatigue	5.6 ± 4.0 (6.0)
MFSI-SF Vigor	5.3 ± 3.3 (4.0)

BDI: Beck Depression Inventory; CRP: C-reactive protein; DAS28: Disease Activity Score 28; ESR: Erythrocyte Sedimentation Rate; HAQ: Health Assessment Questionnaire; MFSI-SF: Multidimensional Fatigue Symptom Inventory-Short Form; PROs: Patient-Reported Outcomes; PSQI: Pittsburgh Sleep Quality Index; RF: Rheumatoid Factor; RN: Rheumatoid Nodule.

Table 2

Clinical and Patient-Reported Outcomes at Baseline and 3 Months (N=31)

Parameter	Baseline	3 Months	p-value*
	Mean ± SD	Mean ± SD	
Disease Activity & Function			
DAS28 Score	5.5 ± 1.2	3.3 ± 1.6	<0.001
HAQ Score	0.6 ± 0.4	0.2 ± 0.3	<0.001
VAS Pain (0-10 cm)	5.5 ± 2.1	2.0 ± 2.5	<0.001
Tender Joint Count	12.0 ± 7.8	4.0 ± 6.3	<0.001
Swollen Joint Count	4.4 ± 4.0	1.5 ± 1.9	<0.001
Morning Stiffness (min)	92.7 ± 73.0	21.8 ± 34.5	<0.001
ESR (mm/hr)	44.5 ± 26.1	27.9 ± 24.0	0.003
CRP (mg/L)	35.4 ± 33.0	11.2 ± 16.9	<0.001
Fatigue (MFSI-SF)			
Total Score	27.6 ± 19.7	10.4 ± 18.1	<0.001
General Fatigue	9.8 ± 6.2	4.8 ± 4.2	<0.001
Physical Fatigue	9.8 ± 5.9	5.1 ± 5.1	<0.001
Emotional Fatigue	8.1 ± 5.1	4.7 ± 4.1	0.004
Mental Fatigue	5.3 ± 4.1	4.3 ± 3.7	0.077
Vigor	5.4 ± 3.6	8.6 ± 3.8	<0.001
Depression (BDI)			
BDI Score	13.8 ± 9.4	7.8 ± 8.5	<0.001
Sleep Quality (PSQI)			
Global Score	9.5 ± 3.9	7.0 ± 4.1	<0.001
Subjective Sleep Quality	1.2 ± 0.8	0.8 ± 0.9	0.002
Sleep Latency	1.5 ± 1.0	1.3 ± 0.9	0.163
Sleep Duration	2.1 ± 1.1	1.7 ± 1.3	0.016
Habitual Sleep Efficiency	2.0 ± 1.3	1.5 ± 1.4	0.013
Sleep Disturbances	1.6 ± 0.6	1.2 ± 0.8	0.001
Use of Sleep Medication	0.0 ± 0.5	0.0 ± 0.3	0.655
Daytime Dysfunction	0.7 ± 1.0	0.3 ± 0.6	0.012

**Wilcoxon Signed-Rank Test. SD: Standard Deviation. Acronyms as defined in Table 1. BDI: Beck Depression Inventory; HAQ: Health Assessment Questionnaire; MFSI-SF: Multidimensional Fatigue Symptom Inventory-Short Form; PSQI: Pittsburgh Sleep Quality Index; VAS: Visual Analogue Scale.*

Table 3

Baseline Spearman Correlation ® Matrix for Key Clinical and Psychosocial Parameters (N=39)

	MFSI-SF	PSQI	BDI	HAQ	DAS28	VAS Pain	TJC
MFSI-SF (Fatigue)	1						
PSQI (Sleep)	0.626‡	1					
BDI (Depression)	0.674‡	0.504†	1				
HAQ (Function)	0.656‡	0.498†	0.365§	1			
DAS28	0.423†	0.379§	0.278	0.717‡	1		
VAS Pain	0.409§	0.421†	-0.024	0.520†	-	1	
TJC	0.402§	0.463†	0.334§	0.681‡	-	-	1
CRP	0.201	0.022	0.338§	0.171	-	-	-
mTSS	0.051	-0.075	0.080	0.042	-	-	-

Bold values indicate statistically significant correlations. Acronyms as defined in Table 1. MFSI-SF: Multidimensional Fatigue Symptom Inventory–Short Form; PSQI: Pittsburgh Sleep Quality Index; BDI: Beck Depression Inventory; HAQ: Health Assessment Questionnaire; DAS28: Disease Activity Score 28; VAS Pain: Visual Analogue Scale for Pain; TJC: Tender Joint Count; CRP: C-reactive Protein; mTSS: Modified Total Sharp Score. Bold values indicate statistically significant correlations. † p < 0.01; ‡ p < 0.001; § p < 0.05.

The mean global PSQI score decreased from 9.5 to 7.0 ($p < 0.001$). Significant improvements were seen in the PSQI components of subjective sleep quality, sleep duration, sleep efficiency, sleep disturbances, and daytime dysfunction. Changes in sleep latency ($p = 0.163$) and use of sleep medication ($p = 0.655$) were not statistically significant.

3.3. Baseline and Treatment-Response Correlations

At baseline (N=39), psychosocial factors were strongly inter-related and linked to disease activity (Table 3). Fatigue (MFSI-SF) and poor sleep (PSQI) were strongly correlated ($r=0.626$, $p < 0.001$). Poor sleep quality also correlated moderately with DAS28 ($r=0.379$, $p=0.017$), functional disability (HAQ, $r=0.498$, $p=0.001$), pain ($r=0.421$, $p=0.008$), and depressive symptoms (BDI, $r=0.504$, $p=0.001$). Fatigue (MFSI-SF) showed strong correlations with HAQ ($r=0.656$, $p < 0.001$) and BDI ($r=0.674$, $p < 0.001$) and moderate correlations with DAS28 ($r=0.423$, $p=0.007$) and pain ($r=0.409$, $p=0.01$). Baseline radiographic damage (mTSS) correlated significantly with disease duration ($r=0.497$, $p=0.001$) and the presence of rheumatoid nodules ($p=0.004$). However, mTSS did not correlate with baseline disease activity indices, HAQ, PSQI, BDI, or MFSI-SF (all $p > 0.05$). In the longitudinal analysis of change (N=31), the magnitude of improvement in fatigue (Δ-MFSI-SF) correlated moderately with improvement in depression (Δ-BDI, $r=0.571$, $p=0.001$), improvement in sleep quality (Δ-PSQI, $r=0.382$, $p=0.034$), and reduction in inflammation (Δ-CRP, $r=0.376$, $p=0.037$). Improvement in functional disability (Δ-HAQ) was significantly correlated with the reduction in physical fatigue ($r=0.458$, $p=0.01$) and reduction in pain (Δ-VAS, $r=0.552$, $p < 0.001$). A multiple regression analysis identified baseline BDI as the strongest predictor of baseline fatigue (MFSI-SF), explaining 43.5% of the variance ($R^2=0.435$). A combined model with BDI and HAQ score explained 65% of the variance in baseline fatigue.

4. Discussion

The primary clinical objective of achieving disease control was met in this retrospective cohort evidenced by significant reductions in objective disease activity (DAS28) and functional disability (HAQ) over three months. Concomitant with these clinical gains PROs demonstrated considerable improvement: the overall measure of sleep quality (PSQI total score) and most of its subscales improved significantly as did the total fatigue score (MFSI-SF). These substantial benefits were attained alongside effective inflammatory suppression resulting in 39% of the cohort reaching DAS28 remission.[1] However specific dimensions of PROs proved more recalcitrant including the mental subscale of the MFSI-SF and the PSQI components of sleep latency and sleep medication use which did not show significant changes.

The pronounced benefits in fatigue and sleep quality support the hypothesis that targeted anti-TNF therapy mitigates systemic symptom burden through prompt suppression of pro-inflammatory activity.[1] Pro-inflammatory cytokines particularly TNF-α are known regulators of inflammation in RA and their elevation is linked to disrupted sleep patterns.[3,5] Our findings are biologically plausible reflecting the removal of this potent neuroimmune driver. These improvements are consistent with literature reporting clinically important gains in fatigue following biologics.[3,10,11] The anti-TNF agents likely exerted potent downstream effects indirectly improving sleep and fatigue by diminishing pain and enhancing functional status (HAQ).[12] This indirect pathway is important because inflammation relates to poor sleep pain and psychological distress often exerts the strongest direct effects.[2,5,11]

The lack of significant improvement in mental fatigue and sleep latency likely reflects the complex, multifactorial nature of these symptoms. While physical vigor and sleep duration may respond rapidly to the reduction of inflammation and pain, sleep latency (falling asleep) is often driven by habitual behaviors and hyperarousal which may require longer than three months to reset. Similarly, mental fatigue may be more closely linked to persistent psychological stressors or central sensitization mechanisms that lag behind peripheral inflammatory control.

The resolution of clinical disease activity was tied to a robust improvement in depressive symptoms evidenced by the reduction in BDI scores. This aligns with the high prevalence of depression in RA and its strong correlation with disease activity pain and fatigue.[6-8] Our data confirmed that baseline severity and changes in fatigue and sleep quality were significantly intertwined with BDI scores. The anti-inflammatory effect of anti-TNF therapy likely modulates neuroimmune pathways reducing the cytokine-driven burden.[7,22,23] Therefore enhanced mood may have bolstered the perceived benefits on fatigue and sleep quality reinforcing the cycle wherein pain poor sleep and depression mutually exacerbate one another.[7,22]

As expected given the short follow-up no new evidence of structural joint damage had been documented.[22] It is pertinent that while our objective inflammatory marker (DAS28) improved the persistence of certain fatigue subscales (e.g. mental fatigue) reinforces the consensus that fatigue in RA is often weakly correlated with objective inflammation.[11] Rather fatigue remains intricately connected to subjective factors like pain mood and sleep

confirming the necessity of treating PROs independently from traditional disease activity endpoints.[11]

Interpretation of these results must be balanced against several limitations. First the limited sample size and brief three-month follow-up restrict the power to detect smaller differences and preclude conclusions regarding long-term efficacy.[3,5,8] Due to the small sample size, subgroup analyses based on specific anti-TNF agents were not feasible, and results should be interpreted with caution regarding generalizability. Furthermore, our reliance on self-report questionnaires (MFSI-SF PSQI) that were collected as part of routine care introduces a risk of subjective bias and potential variability in data collection,[16] The MFSI-SF is a generic fatigue instrument not specific to RA.[10,12] We attempted to mitigate confounding by recording concomitant corticosteroid use which can affect sleep; however, the influence of residual confounders remains possible.[10,12] Lastly as a single-center study in a Turkish population generalizability may be limited. Despite these limitations the study's retrospective design and integration of validated instruments for fatigue sleep and mood provide valuable clinical data on the rapid systemic benefits of anti-TNF treatment.

In summary anti-TNF therapy enhances disease activity and significantly improves persistent systemic symptoms notably fatigue and sleep quality within the short term. These improvements appear linked to reductions in inflammation pain and psychological distress. Incorporating routine assessment of these crucial PROs is essential for optimizing comprehensive RA patient care.[5,6] While these results are encouraging, larger-scale prospective studies are warranted to confirm these findings and evaluate the long-term sustainability of symptom relief

Statement of ethics

The study protocol received approval from the 19 Mayıs University Local Research Medical Ethics Committee [Approval no: 2025/586].

genAI

No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by both authors.

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Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author contributions

Concept – BU, SK; Design – SK; Supervision – ES, AB; Resource – BU, EA; Materials – SK; Data collection and/or processing – BU, EA; Analysis and/or interpretation – ES, BU; Literature review – BU, SK; Writing – BU, SK; Critical review –BU. Both authors read and approved the final manuscript.

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