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The Impact of Disease Activity and Obesity on Kinesiophobia in Ankylosing Spondylitis Kinesiophobia and Ankylosing Spondylitis

Elif Altunel Kilinc [1] (ID), Gizem Kirmizier[1] (ID), Nurdan Orucoglu[1] (ID)

[1]Department of Rheumatology, Medical Faculty, Mersin University, 33200, Mersin, TURKEY.

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Abstract

Objective: This study aims to determine the rate of kinesiophobia in ankylosing spondylitis (AS) patients and to determine the relationship between kinesiophobia and disease activity, obesity, quality of life, functional status, fatigue, and fear of falling.

Methods: The study design is a prospective study. That included 83 ankylosing spondylitis patients and 79 age- and gender-matched healthy controls. Kinesiophobia was evaluated using the Tampa Scale for Kinesiophobia (TSK), disease activity with the Bath AS Disease Activity Index (BASDAI), functional status with the Health Assessment Questionnaire (HAQ) and Bath AS Functional Index (BASFI), fear of falling with the Falls Efficacy Scale International (FES-I) and Fatigue Severity Scale (FSS), Quality of Life Questionnaire (ASQoL), Body Mass Index (BMI). The correlation of outcome measures with kinesiophobia levels was analyzed, and all parameters were compared in patients with (TSK>37) and without kinesiophobia (TSK≤37).

Results: In AS patients, the rate of kinesiophobia was 78.3%, the mean TSK score was 43.85±9.78, while in healthy controls, the kinesiophobia rate was 17.7%, the mean TSK score was 27.07±8.46 (odds ratio (OR)=16.766, 95% confidence interval (CI): 7.697-36.518; p<0.001). TSK was positively correlated with BMI, ASQoL, BASDAI, HAQ, FES-I, FSS, and BASFI (r=0.336, r=0.457, r=0.341, r=0.447, r=0.269, r=0.371, p<0.05 for each). Patients with a BMI>25, and a BASDAI> 4 had higher TSK scores (p=0.041 and p<0.001, respectively).

Conclusion: AS patients have a very high rate of kinesiophobia. Patients with obesity and high disease activity have higher levels of kinesiophobia. Detection of kinesiophobia in patients with AS, control of weight/obesity, and reduction of disease activity should be an important goal.

Key Words: Ankylosing Spondylitis, body mass index, disease activity, kinesiophobia

Ankilozan Spondilitte Hastalık Aktivitesi ve Obezitenin Kinezyofobi Üzerindeki Etkisi

Özet

Amaç: Bu çalışmanın amacı ankilozan spondilit (AS) hastalarında kinezyofobi oranını belirlemek ve kinezyofobi ile hastalık aktivitesi, obezite, yaşam kalitesi, fonksiyonel durum, yorgunluk ve düşme korkusu arasındaki ilişkiyi saptamaktır.

Gereç ve Yöntemler: Çalışma prospektif olarak dizayn edilmiştir. Çalışmaya 83 ankilozan spondilit hastası ve yaş ve cinsiyet açısından eşleştirilmiş 79 sağlıklı kontrol dahil edildi. Kinezyofobi Tampa Kinezyofobi Ölçeği (TSK) ile, hastalık aktivitesi Bath AS Hastalık Aktivite İndeksi (BASDAI) ile, fonksiyonel durum Sağlık Değerlendirme Anketi (HAQ) ve Bath AS Fonksiyonel İndeksi (BASFI) ile, düşme korkusu Uluslararası Düşme Etkinliği Ölçeği (FES-I) ve Yorgunluk Şiddeti Ölçeği (FSS) ile, Yaşam Kalitesi Anketi (ASQoL), Vücut Kitle İndeksi (VKİ) ile değerlendirildi. Sonuç ölçümlerinin kinezyofobi düzeyleri ile korelasyonu analiz edilmiş ve tüm parametreler kinezyofobisi olan (TSK>37) ve olmayan (TSK≤37) hastalarda karşılaştırılmıştır.

Sonuçlar: AS hastalarında kinezyofobi oranı %78,3, ortalama TSK skoru 43,85±9,78 iken, sağlıklı kontrollerde kinezyofobi oranı %17,7, ortalama TSK skoru 27,07±8,46 idi (odds oranı (OR)=16,766, %95 güven aralığı (CI): 7,697-36,518; p<0,001). TSK; VKİ, ASQoL, BASDAI, HAQ, FES-I, FSS, BASFI ile pozitif korelasyon göstermiştir (r=0.336, r=0.457, r=0.341, r=0.447, r=0.269, r=0.371, her biri için p<0.05). VKİ>25 ve BASDAI>4 olan hastaların TSK skorları daha yüksekti (sırasıyla p=0.041 ve p<0.001).

Anahtar Kelimeler: Ankilozan Spondilit, vücut kitle indeksi, hastalık aktivitesi, kinezyofobi

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Address for correspondence/reprints:

Elif Altunel Kilinç

Phone number: +90 (324) 241 00 00

Fax number: +90 (324) 241 00 98

E-mail: elifaltunel@hotmail.com

INTRODUCTION

Ankylosing spondylitis (AS) is a chronic rheumatologic disease that affects the axial skeleton and sacroiliac joints, leading to low back pain, mobility restrictions, and impairments (1). AS is a progressive disease by nature, which complicates the management of treatment. Therapy for AS aims to prevent deformity, reduce pain and morning stiffness, maintain posture, and preserve both physical and psychological well-being. Physiotherapy and exercise are the most often utilized therapeutic adjuncts besides pharmacotherapy (2). Patients with AS, on the other hand, may have a fear of movement, which prevents them from performing the exercises intended to help with disease treatment and daily activities. This condition, known as kinesiophobia, is defined as the fear of performing a physical activity while feeling vulnerable to a painful injury or re-injury (3).

The experience of pain and its impact on a person is influenced by a variety of psychological factors. One of the most important factors is fear (4-7). Numerous studies have identified a link between kinesiophobia and musculoskeletal disability, pain, and quality of life (8-12). Pain and pain-related disabilities have physical, psychological, and social consequences for individuals. Individuals are unable to engage in activities for an extended period because they are concerned activity might aggravate their pain. As a result, motor activity is reduced (13). Kinesiophobia promotes a sedentary lifestyle by avoiding physical activity due to the fear of repetitive injury and pain (14). Inactivity exacerbates conditions such as osteoporosis, muscle atrophy, and falls. On the other hand, these negative clinical conditions enhance inactivity, and this creates a vicious circle.

Understanding kinesiophobia from the patient's point of view and its effects on the disease process is essential for developing treatment strategies and rehabilitative approaches. The study aims to investigate the presence of kinesiophobia in patients with AS and its relationship with body mass index (BMI), disease activity, functionality, quality of life, fatigue, and fear of falling.

METHODS

The study design is a prospective study that included AS patients and age-sex-matched

healthy controls. Various questionnaires and scales were used to assess kinesiophobia, fear of falling, fatigue, disability, disease activity, and quality of life. The following questionnaires were used; Tampa Kinesiophobia Scale (TSK), Bath AS Disease Activity Index (BASDAI), functional status Health Assessment Questionnaire (HAQ), Bath AS Functional Index (BASFI), Falls Efficacy Scale International (FES-I), Fatigue Severity Scale (FSS), Quality of Life Questionnaire (ASQoL), Body Mass Index (BMI). Statistical analysis was performed using IBM SPSS software version 22.0. The study comprised 83 AS patients diagnosed using the 1984 Modified New York Criteria (15) who applied to Mersin University Rheumatology outpatient clinic between July and November 2022, as well as 79 age-sex-matched healthy controls. Patients under the age of 18 and over the age of 70, as well as those with neurological, orthopedic, pulmonary, and cardiac diseases, severe comorbid conditions, diabetic patients, and pregnant women, were excluded from the study. Patients who participated in physical therapy and exercise programs within the last six months, as well as those with peripheral arthritis or who had intra-articular injections within the previous year, were excluded from the study. Those whose cognitive functions could not answer the questions were also excluded, as did those with severe mental disorders. Demographic data of the patients, including age and gender, and other data, such as disease duration, height, weight, BMI, smoking status, and medications used, were recorded. Comorbid diseases and extra-articular involvements were noted.

The study was approved by Mersin University (Date: 06/07/2022, Approval number: 2022/467). All participants were informed about the study's content, and their written consent was obtained. The study was conducted in compliance with the Declaration of Helsinki.

The Tampa Scale for Kinesiophobia (TSK), a 17-item self-report questionnaire, was used to assess the presence of kinesiophobia. TSK was developed to evaluate fear of movement/(re)injury in patients with chronic pain (16). The validity and reliability of the Turkish version of the TSK were evaluated by Tunca et al. (17). Each item is rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Four questions (4, 8, 12, and 16) were negatively phrased and reverse-scored. The total score ranges from 17 to 68, with higher scores reflecting stronger fear-avoidance beliefs. The scores above 37 were evaluated as the presence of kinesiophobia based on the study of Vlaeyen et al (16).

The Falls Efficacy Scale International (FES-I), a self-reported questionnaire, was used to examine the fear of falling, which measures concern levels about falls during daily activities (18). The questionnaire has 16 items, and each item is scored between 1-4 (1=not at all

concerned, 4=very interested), with a total score ranging from 16 (no concern) to 64 (extreme concern). Scores greater than 24 were considered as the presence of fear of falling. Turkish reliability and validity of the questionnaire conducted by Ulus et al (19).

The Fatigue Severity Scale (FSS) was used to assess the patients' fatigue levels. The FSS consists of nine items designed to assess overall fatigue level (20). The statements in each FSS item are rated on a seven-point Likert-type, scale with 1 being the strongest agreement and 7 being the strongest disagreement. An arithmetic mean is calculated to determine the final score. A score of 4 or above indicates severe fatigue.

The health assessment questionnaire (HAQ) was used to assess disability (21).

The Turkish version of the Ankylosing Spondylitis Quality of Life (AsQoL) Questionnaire was used to assess the quality of life of AS patients (22). The scores in the disease-specific 18-item questionnaire with yes/no answers are calculated by adding up the number of yes answers (Yes: 1 point, No: 0 points). A high score indicates poor quality of life.

The Turkish version of the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) was used to assess disease activity (23). Scores higher than four were considered high disease activity, whereas scores below four were considered low disease activity. The Bath Ankylosing Spondylitis Functional Index (BASFI) was used to assess the functional capacity of AS patients (24).

Statistical Analysis

IBM SPSS for Windows version 22.0 software was used for statistical analysis (SPSS Inc., Chicago, IL, USA). Descriptive data were presented as mean ± standard deviation (SD) or median values, whereas categorical variables were presented as numbers (n) and percentages (%). The Lilliefors test was used to determine whether the numerical data were normally distributed. Differences between groups were evaluated with Student's t-test. Pearson's correlation test was used if the correlation between the data was normally distributed, and Spearman's correlation test was used if it was not normally distributed. A p-value of <0,05 was considered statistically significant.

RESULTS

Table 1. Demographic and clinical characteristics of patients with ankylosing spondylitis and healthy controls

	AS Mean±SD (Min-Max)	Healthy Control Mean±SD (Min-Max)	*p*
Age (year)	43.7±11.6 (19-69)	43±11.9 (20-68)	0.708
BMI	26.8±5 (16.7-42.1)	26.5±4.7	0.723
TAMPA scores	43.9±9.8 (17-68)	27±8.5 (17-52)	<0.001*
Disease duration (year)	7.2±7.2 (0-34)	N/A	
BASDAI	4.8±2.2 (1.2-9.3)	N/A	
FES-I	37.7±15.6 (18-63)	N/A	
FSS	5±1.9 (1.0-6.9)	N/A	
BASFI	2±1.8 (0-8.2)	N/A	
HAQ	0.6±0.6(0-2.35)	N/A	
ASQoL	9.1±5.5 (0-18)	N/A	

Abbreviations: AS: Ankylosing Spondylitis, SD: Standart Deviation, Min: Minimum, Max: Maximum, BMI: Body Mass Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, FES-I: The Falls Efficacy Scale International, FSS: Fatigue Severity Scale, BASFI: The Bath Ankylosing Spondylitis Functional Index, HAQ: Health Assessment Questionnaire, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, N/A: Not Available, *p<0.05 (significant)

The baseline demographic and clinical characteristics of AS patients and the healthy control group are shown in Table 1. In the patient group, 53% (n=44) were female, 47% (n=39) were male, and in the healthy control group, 53.2% (n=42) were female, and 46.8% (n=37) were male. There was no difference in gender between the patient and control group. The mean age of the AS patients was 43.66±11.57 (min-max: 19-69), while the mean age of the control group was 42.97±11.84 (min-max: 20-68). There was no difference between the mean age of the patient and the control group (p=0.708). The patient group's mean disease duration was 7.18±7.21 years. The mean BMI of AS patients was 26.79±5.05 and 26.49±4.74 in the control group, and there was no difference between the two groups (p=0.723). The number of patients with AS with a BMI above 25 was 45 (54.2%). 27 (32.5%) of AS patients were smokers. The number of patients using only Non-Steroid Anti-inflammatory Drugs (NSAIDs) and/or Disease Modifying Anti-Rheumatic Drugs (DMARDs) was 36 (43.4%), while the number of patients using biological drugs (Anti-tumor necrosis factor-alpha or Interleukin-17 inhibitors) was 47 (56.6%). Uveitis history was present in 29 (34.9%) AS patients. None of the patients had recent history of peripheral arthritis or active rheumatoid arthritis.

Patients with a TSK score greater than 37 were considered to have kinesiophobia. In AS patients, the incidence of kinesiophobia was 78.3% (n=65), and the mean TSK was 43.85±9.78, while in the healthy control group, 17.7% (n=14) had kinesiophobia, the mean TSK score was 27.07±8.46 (min-max: 17-52). The rate of kinesiophobia was significantly higher in AS patients compared to the healthy controls (odds ratio (OR)=16.766, 95% confidence interval (CI): 7.697-36.518; p<0.001) (Table 1).

TAMPA scores were positively correlated with age, BMI, ASQoL, BASDAI, HAQ, FES-I, FSS, and BASFI (r: 0.237, r=0.336, r=0.457, r=0.341, r=0.441, r=0.447, r=0.269), r=0.371, respectively, p<0.05 for each) (Table 2). No correlation was found with disease duration (r= 0.043, p=0.698).

Patient were divided into two groups according to TSK scores, those with high kinesiophobia (TSK >37) and those with low kinesiophobia levels (TSK ≤37). There was no difference between the two groups regarding age, BMI, FSS, and disease duration (p=0.861, p=0.207, and p= 0.540, respectively). Patients with high kinesiophobia had higher mean ASQoL, HAQ, BASDAI, FES-I, and BASFI values than patients with low kinesiophobia (p=0.001, p=0.002,

p=0.028, p=0.006, p=0.002, respectively) (Table 3).

The difference in mean TSK scores between men and women was not statistically significant (p=0.711).

Table 2- Correlation of TAMPA scores with other parameters

	r	*p*
Age	0.237*	0.031
BMI	0.336**	0.002
ASQoL	0.457**	<0.001
BASDAI	0.341**	0.002
HAQ	0.441**	<0.001
FES-I	0.447**	<0.001
FSS	0.269*	0.014
BASFI	0.371**	0.001
Disease duration	0.043	0.698

Abbreviations: AS: Ankylosing Spondylitis, SD: Standart Deviation, Min: Minimum, Max: Maximum, BMI: Body Mass Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, FES-I: The Falls Efficacy Scale International, FSS: Fatigue Severity Scale, BASFI: The Bath Ankylosing Spondylitis Functional Index, HAQ: Health Assessment Questionnaire, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, r:correlation analysis *p<0.05 (significant), **p<0.01

Table 3. Comparison of the difference between TAMPA scores by disease duration, age, BMI, disease activity and other clinical features

	TSK ≤37	**TSK >37**	***p***
Age	43.3±10.9	43.9±12.1	0.861
BMI	25.4±4.5	27.1±5.2	0.207
ASQoL	5.3±4.9	10.2±5.3	0.001*
HAQ	0.3±0.3	0.6±0.6	0.002*
BASDAI	3.9±1.9	5.0±2.3	0.028*
FES-I	29.7±12.2	39.9±15.7	0.006*
FSS	4.4±1.8	5±1.9	0.201
BASFI	1.1±0.9	2.1±1.9	0.002*
Disease duration	8.1±8	6.9±7	0.540

Abbreviations: TSK: Tampa Scale for Kinesiophobia, BMI: Body Mass Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, FES-I: The Falls Efficacy Scale International, FSS: Fatigue Severity Scale, BASFI: The Bath Ankylosing Spondylitis Functional Index, HAQ: Health Assessment Questionnaire, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, *p<0.05

Patients with AS were divided into two subgroups: those with BMI<25 (normal and low BMI) and those with BMI>25 (overweight or obese). TSK score was significantly higher in AS patients with a BMI higher than 25 than in those with a BMI below 25 (45.86±10.48 vs. 41.47±8.11, respectively, p=0.041).

There was no statistically significant difference in TSK scores between patients receiving NSAIDs and/or DMARDs and those receiving biological agents (p=0.609).

The TSK scores of smokers and nonsmokers were not statistically different (p=0.234). Patients were divided into two groups based on their BASDAI scores: those with low disease activity/active disease (<4) and those with high disease activity/active disease (≥4). The mean TSK scores in patients with active disease were significantly higher than in patients with low disease activity (47.16±8.03 vs. 39.31±10.25, respectively, p<0.001) (Table 4).

The results indicate that a high percentage of AS patients (78.3%) had kinesiophobia, compared to a lower percentage in the healthy control group. The study found positive correlations between kinesiophobia and age, BMI, disease activity, functionality, fear of falling, fatigue, and lower quality of life. Patients with higher levels of kinesiophobia showed

worse scores in AS-related measures such as quality of life, functionality, and disease activity. Additionally, the study found that patients with a BMI above 25 had higher kinesiophobia scores, suggesting a relationship between weight and kinesiophobia in AS patients. However, there was no significant difference in kinesiophobia scores between patients receiving different treatment protocols.

Table 4. Comparison of mean TAMPA scores by gender, BMI, treatment agent, smoking status and disease activity

	Group 1 TSK	Group 2 TSK	*p*
Sex (1: Female vs. 2: Male)	43.5±9.5	44.8±10.2	0.711
BMI (1:<25 vs 2:>25)	41.5±8.4	45.9±10.5	0.041*
Treatment (1: NSAID or DMARD vs. 2: Biologic)	43.2±8.2	44.3±10.9	0.609
Smoking status (1: No vs. 2: Yes)	43±9.3	45.7±10.6	0.234
BASDAI (1:<4 vs 2: ≥4)	39.3±10.2	47.2±8	<0.001*

Abbreviations: TSK: Tampa Scale for Kinesiophobia, BMI: Body Mass Index, NSAID: Non-Steroid Anti-inflammatory Drug, DMARD: Disease Modifying Anti-Rheumatic Drug, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, *p<0.05

DISCUSSION

The treatment of ankylosing spondylitis (AS) that affects the spine and sacroiliac joints typically involves a combination of pharmacological intervention and exercise therapy. Nevertheless, the presence of kinesiophobia among patients presents a significant barrier to the implementation of physical activity, a crucial element of the therapeutic protocol. The study revealed a notable prevalence of kinesiophobia among individuals diagnosed with AS. In addition, the incidence of kinesiophobia was found to be significantly higher in patients with a high BASDAI score and a body mass index (BMI) above 25 compared to patients with a low BASDAI score and a BMI<25 and the healthy population.

In the first study evaluating the frequency of kinesiophobia in AS patients, the frequency of kinesiophobia was reported as 66.6% (12). In our study, AS patients had a higher percentage of kinesiophobia, with a rate of 78.3%. TSK was used to assess kinesiophobia in the studies. In a study evaluating the relationship between the respiratory capacity of patients with AS and their kinesiophobia levels, the mean TSK score was reported as 41.65±7.59. In our study, the mean TSK was 43.859.7, which was consistent with the previous findings (25). The high rate of kinesiophobia in patients with AS may be related to the disease's symptoms generating pain memory and a desire to avoid pain. The inflammatory nature of pain in AS gives rise thought that patients would tend to move and engage in the activity; however, the high rate of kinesiophobia in our study suggests that patients can be more concerned about the acute pain they experience at the onset of movement.

There are two studies in the literature that look at the relationship between BASDAI, a disease activity scale, and kinesiophobia in patients with AS (12,25). As a result of their research, Oskay

et al. emphasized that they expected kinesiophobia to be associated with an increase in disease activity and a decrease in mobility, but the results were unrelated (12). The findings of Er et al. were similar, with no significant relationship found between BASDAI and kinesiophobia (25). Kinesiophobia was found to be significantly higher in patients with AS who had a higher BASDAI score in our study. Because AS is a disease that, by nature, affects physical activity and functions, the presence of kinesiophobia is an expected result when the disease is active, for example, when the BASDAI score is high. We believe that functional limitations increase kinesiophobia in patients with AS who have a high BASDAI.

In our study, patients with high levels of kinesiophobia (TSK >37) had higher mean ASQoL, HAQ, FES-I, and BASFI scores than patients with low levels (TSK<37), indicating that deterioration in general health, decreased quality of life, loss of functionality and fear of falling are the factors that predispose to kinesiophobia in patients. Parallel to our study, Oskay et al. reported that kinesiophobia was associated with pain scores, BASFI, and ASQoL scores (12).

A study on kinesiophobia in Achilles tendinopathy patients revealed that those with high TSK scores had a greater BMI, more severe symptoms, and a poorer quality of life (26). Similarly, in our study, TSK was higher in AS patients with a BMI greater than 25. Obese/overweight people are more prone to suffer from musculoskeletal problems such as joint pain, functional impairment, and walking difficulty. Excess weight increases the load on the joints, leading to pain, particularly in load-bearing regions such as the waist (27). It has been shown that high BMI is related to inflammation of the entheses and new bone formation in the axial and peripheral regions (28). As a consequence, it is not surprising that kinesiophobia is high in AS patients who are overweight or obese. Vincent et al. (29) found that obese patients with chronic low back pain had higher TSK scores and Oswestry disability index than non-obese patients.

We found no statistically significant difference in TSK scores between patients treated with NSAIDs and/or DMARDs and those treated with biological agents when AS patients were separated into two groups according to their treatment protocols. To the best of our knowledge, no other study has examined the impact of treatment protocols on kinesiophobia in AS patients except ours. The result shows that patients using biological agents because of higher disease activity, symptom severity, and disease burden do not feel more vulnerable and prone to injury under adequate treatment. This may suggest that if patients receive adequate and appropriate treatment, kinesiophobia may be induced by persistent symptoms, such as

morning stiffness and pain, rather than by the intensity of the treatment they receive.

Our study has some limitations. The outcome measurements such as kinesiophobia, disease activity, quality of life, fear of falling, and fatigue severity may be subjective because they are based on patient self-assessment questionnaires. The patients' current kinesiophobia levels were tested in our study. Because the change in kinesiophobia through time, such as before and after the disease, was not assessed, the results cannot conclusively establish a cause-and-effect relationship between kinesiophobia and AS disease. In addition, the effect of individual factors such as the patient's lifestyle (e.g., active, sedentary) and occupation on kinesiophobia was not evaluated.

CONCLUSION

In conclusion, although it is a subjective self-assessment tool, the BASDAI may be a good predictor of kinesiophobia. Additionally, the fact that a high BMI is related to kinesiophobia demonstrates the significance of reducing weight and disease activity in preventing kinesiophobia. Thus, by minimizing the fear of movement, exercise participation, which is an essential component of the treatment of AS patients, may be achieved, and avoidance of activity can be prevented.

Ethics committee approval: Ethics committee approval for this study was obtained from Mersin University Clinical Research Ethics Committee (Date: 06/07/2022, Approval number: 2022/467).

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