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MUSCULOSKELETAL HEALTH IN PATIENTS WITH AXIAL SPONDYLOARTHRITIS AND ITS ASSOCIATION WITH DISEASE ACTIVITY, MOBILITY, FUNCTIONALITY, AND QUALITY OF LIFE

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Abstract

Aim: Axial spondylarthritis (axSpA) patients present with symptoms such as the limitation of spinal mobility, loss in physical functions, pain, and fatigue. Due to the heterogeneity of symptoms, disease management should include a holistic approach and a broad variety of assessments. The purpose of the present study was to evaluate musculoskeletal health in patients with axSpA and to determine its association with spinal mobility, disease activity, functionality, quality of life (QoL).

Material and Methods: Forty-two patients with axSpA were included in this study. Demographic and disease-related data were recorded. The Musculoskeletal Health Questionnaire (MSK-HQ), Bath Ankylosing Spondylitis Metrology Index (BASMI), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Bath Ankylosing Spondylitis Functional Index (BASFI), and Ankylosing Spondylitis QoL Questionnaire (ASQoL) were used to evaluate musculoskeletal health, spinal mobility, disease activity, functionality, and QoL, respectively. MSK-HQ, BASMI, BASDAI, BASFI, and ASQoL were also compared according to radiographic status and biological use.

Results: Forty-two axSpA patients (31 females and 11 males) were evaluated. MSK-HQ is significantly related to pain, BASDAI, BASFI, and ASQoL ($p<0.001$). Spinal mobility was better in the non-radiographic axSpA subgroup than in the radiographic axSpA subgroup ($p<0.001$). No other differences were found related to radiographic status or biological use ($p>0.05$).

Conclusion: Musculoskeletal health is impaired in patients with axSpA. Pain, functional capacity are closely related to musculoskeletal health. It seems that good disease management using appropriate treatment options may have a positive effect on the general health status of patients with axSpA.

Keywords: Axial spondyloarthritis, musculoskeletal health, disease activity, radiographic status, biologic use

INTRODUCTION

Axial spondylarthritis (axSpA) influences the sacroiliac joints and spine and is characterized by postural alterations, functional impairments, and inflammatory back pain (1,2). AxSpA includes two subsets of disease as radiographic axSpA (also known as ankylosing spondylitis) and non-radiographic axSpA (3). AxSpA patients present with symptoms such as limitation of spinal mobility, loss of physical functions, pain, and fatigue (4-6).

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These symptoms have adverse repercussions on Health Related Quality of Life (HRQoL), work productivity, and musculoskeletal health (7,8). Due to the heterogeneity of symptoms, disease management should include a holistic approach and a broad variety of assessments (9).

In recent years, it has become more important to assess the overall effect of the disease and the general condition of patients with axSpA. For these evaluations, clinicians use patient-reported results (PROs) that provide information about different subjective aspects of the disease (7). The Bath Ankylosing Spondylitis Functional Index (BASFI), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), and Ankylosing Spondylitis Quality of Life Questionnaire (ASQoL), which are the most commonly used PROs in axSpA patients, evaluate physical function, disease activity, and HRQoL, respectively (10,11). Because axSpA presents with a variety of musculoskeletal manifestations at multiple sites in the body, a specific clinical tool should be used that provides a holistic view (8,9). The Musculoskeletal Health Questionnaire (MSK-HQ) was developed for patients with different musculoskeletal conditions. This scale evaluates physical symptoms, such as pain and fatigue, and the impact of the illness on psychological well-being (12).

In recently published studies, Norton et al. (12) used MSK-HQ in patients with inflammatory arthritis (including patients with ankylosing spondylitis). This study provided evidence that MSK-HQ is not disease specific and has high content validity in rheumatological conditions. In the same line, Akkubak and Anaforoğlu Külünkoğlu (8) suggested that the MSK-HQ is a reliable and valid questionnaire to evaluate musculoskeletal health in Turkish patients with axSpA. However, in the present studies, the factors related to musculoskeletal health in axSpA patients have not been investigated. Therefore, the main objective of the present study was to evaluate musculoskeletal health in patients with axSpA and to determine its association with spinal mobility, disease activity, functionality and HRQoL.

MATERIAL AND METHODS

Patients

Forty-two patients with axSpA were included between February-May 2022 from Necmettin Erbakan University Hospital, Rheumatology outpatient clinic. Patients were classified as axSpA according to the Assessment of Spondyloarthritis International Society criteria (3). Patients who failed to understand the commands, not being between 18 and 65 years old, being pregnant as hormonal changes may alter spinal mobility, and had advanced spinal limitation (bamboo spine) were excluded.

Study Design

This study, which was planned as an observational, cross-sectional, and single-center, was approved by the Necmettin Erbakan University Ethics Committee (decision no: 2021/3185, date: 02.04.2021), and each of the patients signed an informed consent to participate.

Variables Studied

Socio-demographic and disease-related variables, such as age, sex, human leukocyte antigen-B27 antigen positivity, radiographic status, use of biologics disease and symptom duration, were recorded for each patient.

For evaluating musculoskeletal health, MSK-HQ was used as the main variable. The MSK-HQ includes fourteen items, which are scored between 0 and 56. These items are related to the facets of musculoskeletal health, including pain/stiffness, fatigue, physical function, symptom interference, sleep, understanding of treatment and diagnosis, psychological well-being and self-efficacy. Higher scores indicate better musculoskeletal health condition (13).

The visual analog scale, which is a 10 cm horizontal line, was applied to evaluate the general pain level. It has two ends, where 0 indicates no pain and 10 indicates the worst pain imaginably (14).

For the evaluation of spinal mobility, Bath Ankylosing Spondylitis Metrology Index (BASMI), which contains measurements as modified Schober test, tragus to wall distance, intermalleolar distance, cervical rotations, and lumbar lateral flexions was performed. Each measurement is scored between 0 and 10, and the total BASMI score is calculated by summing the scores and dividing the sum to five. Higher scores indicate more severe impairment. Each measurement was scored between 0 and 10, and the total BASMI score was obtained by adding the scores and dividing by five. High scores indicate worse spinal mobility (15).

BASDAI was performed to assess disease activity. BASDAI contains six questions, which are back pain, peripheral joint pain/swelling, localized tenderness, fatigue, and severity and duration of morning stiffness. The first five questions were scored between 0 and 10, and the duration of morning stiffness was scored on a 10-point scale (0: 0 hours, 10: 2 hours). Values related to the severity and duration of morning stiffness were collected and divided into two. The resulting value is summed up with the values of the first four questions. The total score obtained is divided by five to obtain the total BASDAI score. Higher scores indicate higher disease activity (16).

BASFI, which contains ten questions and is scored between 0 and 10, was performed to assess the functional status. The total score is obtained by taking the arithmetic average of all items. 0 indicates no functional impairment and 10 indicates maximal impairment (17).

Finally, HRQoL was evaluated using the ASQoL. The ASQoL is a self-reported questionnaire that is scored between 0 and 18. Higher scores indicate worse HRQoL (18).

Statistical Analysis

SPSS version 22.0 software (IBM Corp., Armonk, NY, USA) was used to analyze the data. Statistical significance level was considered as $p \leq 0.05$. Continuous data were presented as the means ± standard deviation, whereas categorical data were presented as frequencies and percentages.

First, the Pearson correlation test was performed to assess the presence of a linear correlation between different quantitative variables (related to musculoskeletal health, pain, spinal mobility, disease activity, functionality and HRQoL). The Pearson's correlation values were considered moderate, strong, or strong in the range of 0.40 and 0.69, 0.70 and 0.89, 0.90 and 0.99, respectively. Subsequently, Student's t-test was performed to calculate the differences in the means of the variables in different subgroups of patients (according to radiographic status, biological use).

RESULTS

Forty-two axSpA patients (31 females and 11 males) with a mean age of 37.05±7.43 yearsparticipated in the study. The most important descriptive data of axSpA patients are shown in Table 1. The mean time since symptom onset was 127.14±71.36 months, and the mean time since diagnosis was 78.57±53.08 months for axSpA patients.

The correlations between the data related to musculoskeletal health (MSK-HQ), pain, spinal mobility (BASMI), disease activity (BASDAI), functionality (BASFI), and quality of life (ASQoL) are given in Table 2. A strong positive correlation was found ($p<0.001$) between MSK-HQ and ASQoL ($r=0.852$). Significant ($p<0.001$) negative moderate correlations were obtained between MSK-HQ -BASDAI and MSK-HQ -BASFI ($r=-0.660$ and $r=-0.681$, respectively). Additionally, a negative moderate correlation ($r=-0.445$) of MSK-HQ and pain was obtained.

Musculoskeletal health, spinal mobility, disease activity, functionality, and quality of life of axSpA patients were also compared according to radiographic status (radiographic vs non-radiographic) and biological use (biologics + vs biologics-). Most patients were using biologics (54.8%) and 52.4% of patients had radiographic axSpA. No significant differences were identified related to radiographic status or the use of biologics ($p>0.05$, Table 3). However, spinal mobility was found to be better in non-radiographic axSpA than in radiographic axSpA ($p<0.001$, Table 3).

Table 1. Descriptive data of variables participated in the study (n=42)

		Mean (SD)
Gender (female), n (%)		31 (73.8)
Age (years)		37.05 (7.43)
BMI (kg/m^2)		27.02 (5.33)
HLA-B27 +, n (%)		30 (71.4)
Time since diagnosis (months)		78.57 (53.08)
Time since onset of symptoms (months)		127.14 (71.36)
Radiographic status, n (%)	Radiographic axSpA	22 (52.4)
	Non-radiographic axSpA	20 (47.6)
Biologics use, n (%)	Biologics +	23 (54.8)
	Biologics -	19 (45.2)
Pain level (VAS, cm)		5.43 (2.01)
Spinal mobility (BASMI, score)		2.61 (1.15)
Disease activity (BASDAI, score)		4.09 (1.74)
Functional status (BASFI, score)		3.24 (1.55)
Quality of life (ASQoL, score)		10.26 (3.54)
Musculoskeletal health (MSK-HQ, score)		32.93 (7.25)

BMI: Body mass index, HLA-B27: Human leukocyte antigen-B27, axSpA: Axial spondylarthritis, VAS: Visual analog scale, BASMI: Bath Ankylosing Spondylitis Metrology Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, BASFI: Bath Ankylosing Spondylitis Functional Index, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, MSK-HQ: The Musculoskeletal Health Questionnaire, SD: Standard deviation

Table 2. Correlations (Pearson's correlation coefficient) between musculoskeletal health, pain, spinal mobility, disease activity, functionality and HRQoL

MSK-HQ	r	p
Pain	-0.445	**0.003***
BASMI	-0.181	0.250
BASDAI	-0.660	**<0.001****
BASFI	-0.681	**<0.001****
ASQoL	0.852	**<0.001****

$^*p<0.05$, $^{**}p<0.001$, HRQoL: Health Related Quality of Life, BASMI: Bath Ankylosing Spondylitis Metrology Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, BASFI: Bath Ankylosing Spondylitis Functional Index, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, MSK-HQ: The Musculoskeletal Health Questionnaire

Table 3. Comparison of musculoskeletal health, spinal mobility, disease activity, functional status and QoL according to radiographic status, biologic use in axSpA patients

Radiographic status			
	Radiographic axSpA (n=22) mean (SD)	**Non-radiographic axSpA (n=20) mean (SD)**	**p value**
MSK-HQ	32.91 (6.84)	32.95 (7.86)	0.986
BASMI	3.18 (1.27)	1.98 (0.51)	**<0.001****
BASDAI	4.45 (1.93)	3.69 (1.46)	0.155
BASFI	3.24 (1.47)	3.24 (1.67)	0.997
ASQoL	10.18 (3.33)	10.35 (3.85)	0.881
Biologics use			
	Biologics + (n=23) mean (SD)	**Biologics - (n=19) mean (SD)**	**p value**
MSK-HQ	33 (7.1)	32.84 (7.53)	0.945
BASMI	2.8 (1.25)	2.38 (0.98)	0.230
BASDAI	4.28 (1.81)	3.86 (1.68)	0.443
BASFI	3.21 (1.4)	3.28 (1.75)	0.900
ASQoL	10.52 (3.47)	9.95 (3.70)	0.610

**p<0.001, axSpA: Axial spondylarthritis, BASMI: Bath Ankylosing Spondylitis Metrology Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, BASFI: Bath Ankylosing Spondylitis Functional Index, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, MSK-HQ: The Musculoskeletal Health Questionnaire, SD: Standard deviation

DISCUSSION

The main finding of this study was that musculoskeletal health, which was evaluated by MSK-HQ, deteriorated in patients with axSpA. In addition, deterioration of musculoskeletal health is significantly related to pain, functionality, disease activity, and HRQoL. Although musculoskeletal health, functionality, disease activity, and HRQoL did not differ according to radiographic status and the use of biologics, spinal mobility was found to be better in non-radiographic axSpA patients. To the best of our knowledge, this study is the first in the literature to investigate musculoskeletal health and the potential relationships between clinical characteristics in axSpA patients.

In the present study, the mean MSK-HQ was higher than the values documented in other studies, although the mean disease duration and disease activity were comparable (8,12). One possible explanation is that most the axSpA patients who participated in our study used biologics. On the other hand, the use of biologics may have a positive effect on disease management and inflammation control.

Our results suggest that worsening of MSK-HQ is significantly related to pain, BASDAI, BASFI, and ASQoL. A previously published study argued that deterioration of disease activity, loss of functionality, and worsening of ASQoL were independently associated with worsening of musculoskeletal health in axSpA patients (8,12). A possible reason for the strong correlation between MSK-HQ-BASDAI, MSK-HQ-BASFI, and MSK-HQ-ASQoL is that MSK-HQ includes measures of disease-related daily living activities, social functioning, self-efficacy, and psychological well-being. In addition, as some studies have shown, worsening of inflammatory lumbar pain and disease activity, loss in physical capacity may influence musculoskeletal health and the perception of welfare (19-21). However, spinal mobility as measured by BASMI is not associated with MSK-HQ, which indicates that patients may not perceive mobility restriction as a problem in their daily lives.

We hypothesized that radiographic status and use of biologics may affect musculoskeletal health, disease activity, functionality, and HRQoL before the study. However, according to our results, radiographic status and use of biologics do not play a role in musculoskeletal health, disease activity, functionality, or HRQoL. On the other hand, we found that radiographic status may negatively affect spinal mobility. Previous studies have shown that radiographic axSpA patients have more restricted spinal mobility than non-radiographic axSpA patients (22-25). A recent study reported that the formation of syndesmophytes in axSpA patients is mostly limited to patients with structural damage to their sacroiliac joints (26). We believe that the longer symptom duration of radiographic axSpA patients may negatively affect spinal mobility. The previously mentioned structural damage in the sacroiliac joints and syndesmophyte formation are associated with the function and mobility of the spine, which explains the spinal mobility limitation in radiographic axSpA patients, consistent with our results (26).

Study Limitations

The subjectivity of questionnaires used to evaluate the patient's condition and most of the patients were female, which may be considered study limitations. While radiographic axSpA is a predominantly male disease, non-radiographic axSpA is a predominantly female disease. We determined female-dominated patient groups for the study. Because there were more female patients in our study population.

CONCLUSION

Deterioration of musculoskeletal health in patients with axSpA was mainly related to disease activity, worsening of functionality,

and HRQoL. Radiographic status and use of biologics do not seem to influence disease activity, functionality and HRQoL. However, radiographic status may negatively affect spinal mobility. These results revealed that clinicians should be aware of the possible deterioration of musculoskeletal health, disease activity, functionality and HRQoL.

Ethics

Ethics Committee Approval: This study, which was planned as an observational, cross-sectional, and single-center, was approved by the Necmettin Erbakan University Ethics Committee (decision no: 2021/3185, date: 02.04.2021).

Informed Consent: A written consent form was obtained from the patients.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.K., Concept: Y.M., T.D., A.K., Design: Y.M., T.D., A.K., Data Collection or Processing: Y.M., Analysis or Interpretation: Y.M., T.D., A.K., Literature Search: Y.M., Writing: Y.M.

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