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Original article

Sleep quality in patients with ankylosing spondylitis



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ABSTRACT

Introduction: Ankylosing spondylitis (AS) is a chronic, inflammatory rheumatic disease characterized by the inflammation of the pelvis and spine that results in a restriction in the mobility of the spine. Due to the altered posture and nocturnal inflammatory pain, sleep disturbances are likely to occur in patients with AS.

Objective: This cross-sectional study aimed at determining the differences between the patients with AS and healthy controls in sleep quality, as well as assessing the relationship between the sleep quality and disease activity.

Method: In order to assess sleep quality, fifty-five patients with AS (40 men, 15 women; mean age, 43 ± 1 years) who fulfilled the modified New York criteria and fifty-five comparable controls (40 men, 15 women; mean age, 42 ± 9 years) completed the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The disease activity was assessed by the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI).

Results: Ankylosing spondylitis was associated with a significantly impaired sleep quality according to the total PSQI scores ($p = 0.001$). Significant differences were found between the patients with AS and healthy controls in PSQI domains, including “subjective sleep quality” ($p = 0.010$), “sleep duration” ($p = 0.011$), “habitual sleep efficiency” ($p = 0.034$), “sleep disturbances” ($p = 0.003$) and “daytime dysfunction” ($p = 0.009$) but not in “sleep latency”, “use of sleep medication”. There was a significant positive correlation between the BASDAI and PSQI scores ($r = 0.612$, $p = 0.001$).

Conclusion: In the current study, we found that the sleep disturbances were significantly higher in patients with AS in comparison to controls. Patients with active disease had worse sleep quality. In addition, disease activity was correlated with the scores of most of the PSQI subscales. Sleep quality assessment should be a tool for evaluating patients with AS.

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Qualidade do sono em pacientes com espondilite anquilosante

R E S U M O

Palavras-chave:

Espondilite anquilosante
Atividade da doença
Índice de Qualidade do Sono de
Pittsburgh
Qualidade do sono

Introdução: A espondilite anquilosante (EA) é uma doença reumática inflamatória crônica caracterizada pela inflamação da pelve e da coluna vertebral, que resulta em uma restrição na mobilidade da coluna vertebral. Em decorrência da postura alterada e da dor inflamatória noturna, os distúrbios do sono são passíveis de ocorrer em pacientes com EA.

Objetivo: Determinar as diferenças entre os pacientes com EA e controles saudáveis na qualidade do sono, bem como avaliar a relação entre a qualidade do sono e a atividade da doença.

Método: Para avaliar a qualidade do sono, 55 pacientes com EA (40 homens, 15 mulheres, idade média 43 ± 1 anos) que preencheram os critérios modificados de Nova York e 55 controles comparáveis (40 homens, 15 mulheres, idade média 42 ± 9 anos) preencheram o questionário Índice de Qualidade do Sono de Pittsburgh (PSQI). A atividade da doença foi avaliada pelo Bath Ankylosing Spondylitis Disease Activity Index (BASDAI).

Resultados: A espondilite anquilosante se correlacionou significativamente com a qualidade de sono prejudicada de acordo com os escores totais do PSQI ($p = 0,001$). Foram encontradas diferenças significativas entre os pacientes com EA e controles saudáveis nos domínios do PSQI, incluindo “qualidade subjetiva do sono” ($p = 0,010$), “duração do sono” ($p = 0,011$), “eficiência do sono habitual” ($p = 0,034$), “distúrbios do sono” ($p = 0,003$) e “disfunção diurna” ($p = 0,009$), mas não na “latência do sono” e no “uso de medicação para dormir”. Houve uma correlação positiva entre as pontuações do BASDAI e do PSQI ($r = 0,612$, $p = 0,001$).

Conclusão: Verificou-se que os distúrbios do sono foram significativamente maiores em pacientes com EA em comparação com os controles. Os pacientes com doença ativa apresentaram pior qualidade de sono. Além disso, a atividade da doença esteve correlacionada com a pontuação da maior parte das subescalas do PSQI. A investigação da qualidade do sono deve ser uma ferramenta usada na avaliação de pacientes com EA.

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Introduction

Ankylosing spondylitis (AS) is a chronic, inflammatory rheumatic disease characterized by the inflammation of the pelvis and spine, that results in a restriction in the mobility of the spine. The prevalence of sleep disorders in AS patients varies in a range of 54% to 64%, according to the recent articles.¹⁻³ AS patients report problems with their sleep including difficulty in initiating sleep, nighttime pain, morning stiffness and poor sleep quality.⁴ Consequently, sleeping problem has a negative impact on daily life by increasing fatigue, pain and impairing psychological health on the affected patients.^{2,5,6}

Altered sleep quality seems to be multi-factorial in patients with AS. Pro-inflammatory cytokines, such as TNF- α and IL-1, are known to interfere with the physiological sleep pattern.⁷⁻⁹ Furthermore, inflammatory pain which is the characteristic of the disease, is typically worse at nighttime and affects the quality of sleep. In addition, spinal deformities that emerge with the progression of the disease interfere with finding a comfortable sleep position. Another possible explanation for sleep disturbances might be increased pain, depression and fatigue in patients with AS.^{1,10} These are common complaints that can influence sleep and vice versa. Restricted respiratory functions are also common in AS and might have an additional negative impact on the sleep quality.¹¹

There has been an increasing understanding of the importance of sleep disturbances in patients with rheumatic diseases.^{1,12-15} As for AS, more than half of the patients report sleep disturbances. From the point of patients' quality of life, it is necessary to understand the disrupted components of sleep and their relationship with disease flares.

In addition, sleep problems were suggested to be of higher priority for the improvement of the patients with AS than the patients with other rheumatoid diseases.¹⁶ However, there is not any specific questionnaire being used as an assessment tool. Understanding the affected components of sleep in AS would help us to develop new instruments.

There are a few documented data about sleeping problems in AS. These data are mostly from the prevalence studies in which the sleep quality assessment was not a primary endpoint. Moreover, there is a lack of evidence concerning any difference between AS patients and healthy people in terms of sleep quality.

The objective of this study was to evaluate the effects of AS on sleep quality. The following questions were specifically addressed: (1) Is there any difference between AS patients and healthy individuals in terms of sleep quality? (2) If so, which components of sleep are affected in AS? (3) Is there any relationship between disease activity and sleep disturbances?

Methods

This study protocol was in a cross-sectional design. Fifty-five patients, who met the Modified New York Criteria for AS and fifty-five healthy subjects were included in the study. Exclusion criterion was any co-existing disease or medication that may interfere with sleep. Demographic data, disease duration, treatment regimens, smoking status and exercise habit were documented for each patient. The presence of spinal kyphosis on visual inspection and serum C-reactive protein (CRP) levels were also recorded.

Sleep disturbance

All subjects completed the Pittsburgh Sleep Quality Index (PSQI) questionnaire for the assessment of sleep quality. PSQI is a self-report questionnaire that evaluates sleep quality over one month.¹⁷ It consists of nineteen questions which finally generate seven component scores: "subjective sleep quality", "sleep latency", "sleep duration", "habitual sleep efficiency", "sleep disturbances", "use of sleep medication" and "daytime dysfunction". These nineteen items are used for scoring. A total score above 5 is associated with a poor sleep quality. In various diseases, the PSQI has been used as an assessment tool to detect sleep disturbances.¹⁸

Disease activity

The level of disease activity was determined in each patient using the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI). BASDAI is a self-rated questionnaire that consists of 6 questions (Q) pertaining to the five major symptoms of AS: fatigue (Q1); spinal pain (Q2); joint pain/swelling (Q3); enthesitis (Q4); the duration of morning stiffness (Q5) and the severity of morning stiffness (Q5).^{19,20}

Functional status

Bath Ankylosing Spondylitis Functional Index (BASFI) was used to determine functional status. The BASFI is a self-administered inventory consisting of 10 questions. The first 8 questions assess the functional limitations related to anatomical limitations and the last 2 questions analyze the patients' ability to perform daily tasks.^{21,22}

Statistical analysis

The Kolmogorov-Smirnov test was used to assess the normality of numeric variables. The independent sample t test was used to compare normally distributed numerical variables between two groups and the results were expressed as mean \pm standard deviation. The comparison of the scores and numerical variables that were non-normally distributed between two groups was made by the Mann-Whitney U-test and the results were expressed as median (25–75 percentiles). The chi-square test was used for nominal variables. The Spearman test was used for correlation analysis. Values of $p < 0.05$ were considered statistically significant.

Table 1 – Demographic characteristics of patients with ankylosing spondylitis.

	n (%)
Disease duration (years)	15 \pm 9.8
Family history	10 (18.9%)
Sleeping partner	43 (81.1%)
Regular exercise habit	14 (26.4%)
Smoking habit	16 (30.2%)
Medication	
None	5 (9.3%)
NSAIDs	16 (29.6%)
DMARDs	22 (40.7%)
TNF- α blockers	11 (20.4%)
NSAID, non-steroidal anti-inflammatory drug; DMARD, disease modifying drug; TNF- α , tumor necrosis factor- α .	

Results

The basic characteristics of patients who enrolled in the study are shown in Table 1. There was not any significant difference between the patient and control groups (43 ± 10 years vs 42 ± 9 years, $p = 0.604$) in age. There were 40 male and 15 female participants in each group ($p = 1.000$).

Ankylosing spondylitis was associated with a significantly impaired sleep quality according to the total PSQI scores ($p = 0.001$). There were significant differences between the patients with AS and healthy controls in "subjective sleep quality" ($p = 0.010$), "sleep duration" ($p = 0.011$), "habitual sleep efficiency" ($p = 0.034$), "sleep disturbances" ($p = 0.003$) and "daytime dysfunction" ($p = 0.009$) subscale scores but not in the "sleep latency", "use of sleep medication" scores (Table 2). Significant positive correlations were found between BASDAI scores and the "subjective sleep quality" ($r = 0.475$, $p < 0.001$), "sleep latency" ($r = 0.419$, $p = 0.002$), "sleep duration" ($r = 0.354$, $p = 0.009$), "habitual sleep efficiency" ($r = 0.444$, $p = 0.001$), "sleep disturbances" ($r = 0.426$, $p = 0.001$), "daytime dysfunction" ($r = 0.445$, $p = 0.001$) and the total PSQI scores ($r = 0.612$, $p < 0.001$) of AS patients (Fig. 1). In addition, BASDAI scores that suggested active disease (≥ 4) were significantly associated with higher PSQI scores ($p < 0.001$). The median PSQI score was 4 (3–6) in patients with inactive disease and 8 (6.8–12) in patients with active disease. The detailed analysis of each BASDAI question revealed that all questions correlated with PSQI scores ($r = 0.453$, $p = 0.001$ for Q1; $r = 0.516$, $p < 0.001$ for Q2; $r = 0.431$, $p = 0.001$ for Q3; $r = 0.378$, $p = 0.005$ for Q4; $r = 0.457$, $p = 0.001$ for Q5 and $r = 0.442$, $p = 0.001$ for Q6). In addition, serum CRP levels of AS patients ($n = 43$) correlated with the sleep duration ($r = 0.367$, $p = 0.014$) and total Pittsburgh scores ($r = 0.333$, $p = 0.029$).

There was a significant correlation between the level of fatigue measured using the first item of BASDAI and the "subjective sleep quality" ($r = 0.275$, $p = 0.044$), "sleep duration" ($r = 0.404$, $p = 0.002$), "sleep disturbances" ($r = 0.276$, $p = 0.043$), "daytime dysfunction" ($r = 0.400$, $p = 0.003$), and total Pittsburgh scores ($r = 0.453$, $p = 0.001$).

A significant correlation was found between the functional status of the patients ($n = 44$) and the "subjective sleep quality" ($r = 0.367$, $p = 0.014$), "habitual sleep efficiency" ($r = 0.360$,

Table 2 – Comparison of two groups in regards of Pittsburgh Sleep Quality Index (PSQI) scores.

	Ankylosing spondylitis (n = 55)	Control (n = 55)	p
Age (years)	43 ± 10	42 ± 9	0.604
Gender (male/female)	40/15	40/15	1.000
Subjective Sleep Quality	1 (1–2) ^a	1 (0–1) ^a	0.010
Sleep Latency	1 (0–2) ^a	1 (0–2) ^a	0.181
Sleep Duration	1 (0–1) ^a	0 (0–1) ^a	0.011
Habitual Sleep Efficiency	0 (0–2) ^a	0 (0–0) ^a	0.034
Sleep Disturbances	2 (1–2) ^a	1 (1–2) ^a	0.003
Use of Sleep Medication	0 (0–0) ^a	0 (0–0) ^a	0.096
Daytime Dysfunction	1 (0–2) ^a	0 (0–1) ^a	0.009
Total PSQI score	7 (4–9) ^a	5 (2–7) ^a	0.001

p values show the difference between ankylosing spondylitis and control groups.

^a Data are presented as median (25–75 percentiles).

$p=0.017$), “sleep disturbances” ($r=0.494$, $p=0.001$), “daytime dysfunction” ($r=0.376$, $p=0.012$), and total Pittsburgh scores ($r=0.483$, $p=0.001$).

There was no statistically significant correlation between the sleep quality and age, gender, disease duration, exercise habit, smoking behavior of the patients or spinal kyphosis ($p>0.05$). There was no significant relationship between the drugs used and sleep disturbances.

Discussion

In this cross-sectional controlled study, our findings suggest that patients with AS were significantly more affected by sleep disturbances than the healthy individuals. In addition, there was a significant relationship between the sleep problem and disease activity and inflammatory state. The total PSQI scores increased with increasing scores of BASDAI and serum CRP levels in patients with AS.

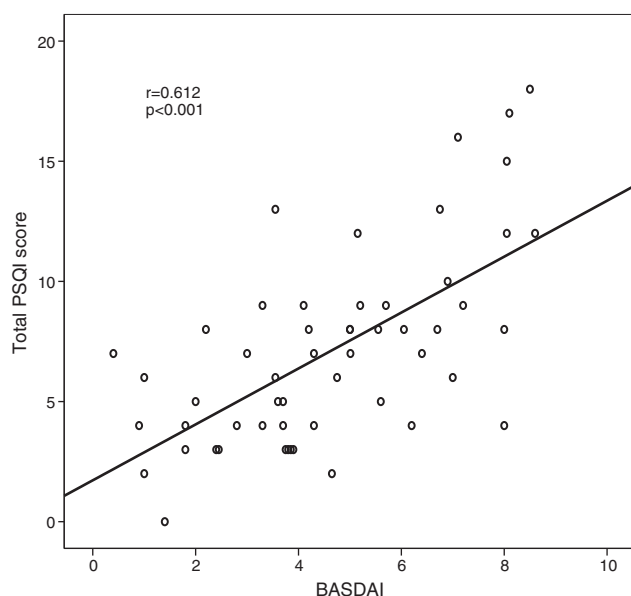


Fig. 1 – Correlation of total BASDAI scores with total PSQI scores.

The first question addressed in this study was whether the patients with AS had a worse sleep quality than healthy people. In our study, the median value of PSQI scores was greater in AS patients than that of the healthy subjects (7 and 5, respectively). Since a total score above 5 is associated with poor sleep quality, we concluded that patients with AS has poor sleep quality. Similar to our study, a previous study involving 62 AS patients also indicated a poor sleep quality in AS patients, since the mean score of PSQI was found as 5.8.³ In another study involving 11 subjects with AS and 11 healthy volunteers, the sleep pattern was found worse in AS patients.⁶

In our study, the incidence of poor sleep quality among the AS patients was found as 58.1%. The incidence of altered sleep pattern among the individuals with AS, has been reported as 64.5% by Hakkou et al., 54% by Ward et al. and 54.8% by Günaydin et al.^{1–3} Similarly, Da Costa et al. found the incidence of sleep problems as 69% in patients with spondyloarthritis.¹³ Consistently with the current literature, our results emphasize that a poor sleep quality might be expected in more than half of the patients with AS.

The second question addressed in this study was which components of sleep quality have been affected in AS. PSQI assesses seven components of sleep. In patients with AS, five of these components were found to be significantly worse compared to normal individuals. The “Subjective sleep quality”, “sleep duration”, “sleeps disturbances”, “habitual sleep efficiency” and “daytime dysfunction” were significantly impaired. In addition, all PSQI components, except “sleep medication” were found to be correlated with disease activity. Possible explanations for the reduced sleep duration and increased sleep disturbances might be the nocturnal increases in the inflammation, pain and stiffness. In a recent survey, people with rheumatic diseases reported a sleep duration less than 6 h per night.²³ Although there are considerable individual differences in sleep duration, healthy adults sleep an average of 7–8 h per day.²⁴ Insufficient sleep, nighttime awakenings and loss of sleep efficiency enhance depression, fatigue and life satisfaction in these patients.^{2,5,10} In a longitudinal survey including 175 subjects with AS, 54% of the patients defined poor sleep quality as the most important quality of life concern.² In another survey involving 295 AS patients, 41% of the subjects complaining of fatigue were experiencing more than three episodes of awakening every night. In

the light of foregoing data, daytime dysfunction detected by our study should not be surprising. As the symptoms of AS usually appear in early adulthood, daytime dysfunction due to sleep problems may have socioeconomic consequences for individual patients and for society.

In respect of sleep latency, there was no significant difference between the groups, whereas the disease activity scores correlated with sleep latency. According to a previous study, pain in AS was found to be correlated with the difficulty in getting to sleep.⁶ In view of our findings, the preserved sleep latency in AS patients might be explained by the character of inflammatory pain that worsen after middle of the night. According to our data, we concluded that the main problem was due to maintaining sleep, not initiating it.

Third question addressed in this study was whether there was a relationship between the disease-specific variables and sleep quality. It is a clinically relevant question because the proper management of the disease could improve sleep quality and health-related quality of life. We found a positive correlation between the disease activity and sleep disturbances. According to their BASDAI scores and CRP levels, the patients with active disease had worse sleep quality. In detailed analysis, each question of BASDAI reflecting fatigue, spinal pain, joint pain/swelling, enthesitis, the duration and severity of morning stiffness revealed a positive correlation with the PSQI scores.

Although pain and stiffness are the major symptoms of the disease, more than half of the AS patients report fatigue.^{5,25} The relationship between fatigue and sleep quality in AS patients was reported previously.^{3,26,27} Similarly, in the present study, patients reporting high levels of fatigue had higher PSQI scores as well. Improving sleep quality may help to decrease fatigue and pain, which in turn may improve the functionality and overall quality of life. Our results indicated that the patients with higher BASFI scores had worse sleep quality according to PSQI. Sleep was assessed by the fourth item of the Hamilton Anxiety Rating Scale in a previous study and similarly to our results, it was reported that the pain intensity, disease activity and functional status had impacts on the sleep quality.¹

The results of this study also suggest that the evaluation of the sleep quality should be a part of outcome assessment in AS. In a study of 2138 subjects with inflammatory arthropathies, patients were asked to rank health problems, including pain, morning stiffness, physical functioning, fatigue, sleep, social function and emotional well-being. The rate of the patients who described priority for the improvement in sleep problems was significantly higher among AS patients in comparison to the other rheumatic disorder groups.¹⁶ These data emphasize the importance of the assessment of sleep problems in AS. Ankylosing Spondylitis Quality of Life (ASQOL) questionnaire has a general question about sleep, but this is a yes/no question and insufficient to understand the real impact.²⁸ By the way, we can conclude that the instruments that assess the impact of AS on sleep quality and its influence to daily life are generally lacking.

Certainly, our study has some limitations. The sample size was small and the study design was cross-sectional. Therefore, the results of this study need a confirmation by a study in a longitudinal observational design with a larger sample

size. In addition, we did not assess the anatomical impairments objectively, in order to find out their relationship with sleep quality. A physical examination consisting of thoracic expansion and Bath Ankylosing Spondylitis Metrology Index, could give valuable data.²⁹ However, in this context, we tried to define a relationship between spinal kyphosis, disease duration and PSQI scores, but there was no significant relationship. Moreover, smoking behavior was asked only to the patient group. It was a yes/no question which was not asking the amount of consumption and former addiction. Further researches concerning the effect of smoking habit on sleep, should be conducted. Finally, we did not use any tool to assess neither the quality of life nor mental health status.

Future studies could be designed to find out how sleep problems interact daily life, such as quality of life or mental health status in patients with AS. Evaluation of spinal mobility and radiological changes by means of Bath Ankylosing Spondylitis Metrology Index and Bath Ankylosing Spondylitis Radiology Index as well as the analysis of real inflammatory state, by using magnetic resonance imaging should be included in these studies.^{29,30} Long term studies investigating how different therapy regimens impact sleep quality and the polysomnography studies could provide valuable data.

Conclusion

In the current study, we found that sleep disturbances were significantly higher in patients with AS. Patients with active disease had worse sleep quality. In addition, disease activity was correlated with most of the PSQI subscale scores. It seems that the disease activity has a greater impact on sleep quality than the anatomical impairments. Proper management of the disease can improve sleep quality and health related quality of life. Furthermore, the assessment of sleep quality should be used routinely in patients with AS.

Conflicts of interest

The authors declare no conflicts of interest.

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