# Lifestyle of patients with ankylosing spondylitis and Sjogren's syndrome: A multi-center and case-control study


## Abstract

**Aim:** Limited information regarding lifestyles of Ankylosing spondylitis (AS) and Sjogren's syndrome (SS) has been reported. This study aimed to compare lifestyle factors in AS and SS patients with healthy matched control.

**Methods:** This study was conducted on two case-control studies: a case group with AS (n=33) and a control group (n=100) and a case group with SS (n=120) and a control group (n=120). Data were collected regarding lifestyle including having physical activity, living place, sleeping, being cigarettes and tobacco smoker, and having stress in daily life. The data were analyzed through SPSS version 24 using Chi-square test.

**Findings:** AS was more common in males and SS in females. The mean ages of the AS and SS groups were 32.03 and 46.33 years, respectively. Compared with the control group, AS patients had higher education levels, healthier BMI, and greater smoking and alcohol use. SS patients had higher education levels, were more often overweight, and reported lower tobacco and alcohol consumption. They also had shorter sleep duration, less sunlight exposure, and higher stress levels at home and work compared to controls ($P<0.05$).

**Conclusion:** Distinct lifestyle patterns were observed among AS and SS patients. AS patients showed healthier BMI but higher smoking and alcohol use, while SS patients experienced shorter sleep, less sunlight, and greater stress. Addressing these modifiable factors through lifestyle counseling, stress management, and sleep improvement programs may enhance patient well-being. Future research should explore how such interventions influence disease outcomes.



**Keywords:** Ankylosing spondylitis, Sjogren's syndrome, lifestyles, sleep, smoking


## Introduction

Ankylosing spondylitis (AS) as a chronic autoimmune and inflammatory disease affects the spine joints and their adjacent soft tissues such as tendons and ligaments. Inflammation leads to spinal fibrosis and calcification. Therefore, the spine loses its flexibility and spine fusion can occur [1]. These changes lead to clinical manifestation such as back pain, and rigidity in the shoulders, hips, fingers, and toes in these patients [1, 2].

Sjogren's syndrome (SS) is another chronic autoimmune disease. The patients have manifestation such as dry mouth and eyes. Patients experience some systematic complications such as pulmonary and kidney diseases and lymphoma [3]. Moreover, the risk of heart failure and other adverse cardiovascular complications can occur in SS patients [4]. It was reported that a family history of autoimmune disease, stressful life events, and infection might be the risk factor of SS [5].

Epidemiological studies on the prevalence of AS indicated that it varied from 0.03% to 1.8% [6]. Moreover, a systematic and meta-analysis study showed that SS prevalence was 6.92 per 100 000 person-years [7]. Other studies on the demographic characteristics of AS and SS showed that the male-female ratio of AS were reported as 2.17 [8]. However, SS was more common in females and a female-male ratio was reported as 4.88:1 [9]. The mean age of the AS and SS were reported as 35.0 [10] and 53.1 years [11], respectively, showing that AS was common in the youth, and SS more commonly seen in the middle age group.

AS and SS complications affect the patients' lifestyle. Lifestyle includes the level of physical activity, body mass index (BMI), stress in life, drinking, smoking, sleeping, etc. Few studies have been published with regard to AS and SS patient's lifestyle. A study indicated that physical activity in SS patients was lower than the healthy control group [12]. Another study showed that negative stressful life events were most commonly observed in SS patients [13]. Studies also noted that approximately one third of AS [14, 15] and one fifth of SS patients [16] were cigarettes smoker. Moreover, another study revealed that one fourth of SS patients used alcohol. Researchers also believed that AS patients, compared to the healthy control group, had more sleep problems, which negatively effected their quality of life [17]. Two systematic and meta-analysis reviews showed 35-90% of AS patients had poor sleep quality [18] and more serious sleep disorder [19]. It was reported that half of SS patients experienced poor sleep quality [20]. Poor sleep quality was associated with poor quality of life, pain, disease activity, anxiety, depression, and dry and ocular surface disease in SS patients [20].

In Press

As mentioned above, there are few studies which investigated the prevalence of AS and SS and their lifestyles. Moreover, each lifestyle variable has been determined in separate studies, and there was no study that fully examined AS and SS lifestyle such as the level of physical activity, BMI, stress in their life, drinking, smoking, sleeping, etc., in one study. Moreover, knowledge regarding the AS and SS patients' demographic characteristics is scarce. In addition, lifestyle of these patients is obvious and there is a need to compare them to healthy control people. Therefore, further studies are needed to be conducted on the AS and SS patients. To improve evidence-based practice and generalizability of these present studies, this study was conducted with the following aims:

1. Determining the demographic characteristics of AS and SS patients
2. Comparing the lifestyle factors in AS and SS patients with healthy matched control

**Materials & Methods**

**Design and sample**

These are case-control studies. The first study was on a case group with AS (n=33) and a healthy matched control group (n=100). The AS and control groups were matched on age and gender, and the AS and control groups were 1:3. The second case-control study was on a case group with SS (n=120) and a healthy matched control (n=120). The SS and control groups were matched for age and gender and the SS and control groups were = 1:1. Due to the matching of each of the control groups with its own case, the subjects in the control groups were different.

The case groups of both studies were selected from multi-rheumatology clinics. Moreover, the controls were selected among visitors of patients from general surgery clinics in Motahari and Imam Reza centers affiliated to SUMS.

The case groups included patients diagnosed with AS or SS by a rheumatology physician. Inclusion criteria of the subjects in the control groups included not having rheumatoid diseases or other autoimmune diseases, being at the same age, and having the same gender as the case groups.

Data were collected using convenience sampling for both case and control groups during the same period to minimize seasonal effects. A researcher assistant helped the data collection. A rheumatologist researcher introduced the study in the clinics and obtained informed consent from eligible participants. Questionnaires were distributed in the waiting hall, where participants completed them prior to their appointments. The research assistant was present to clarify questions or, if participants were unable to respond independently, to read the items aloud and record answers accurately. The control group followed the same procedure, completing questionnaires in the waiting area with support from research assistants as needed, ensuring consistency across groups.

Instruments

The questionnaire consisted of some information about gender, age, BMI, educational level, comorbidities conditions, and kind of family history of rheumatoid diseases. Moreover, some information regarding lifestyle including physical activity level, living place, residence in mold and damp home, cigarettes and tobacco smoker, emotional stress in daily life, night sleep, midday naps and alcohol consumption were assessed. The face and content validities of the questionnaire were approved by ten faculty members of SUMS (five nursing faculty members, one epidemiologist, two internists, and two rheumatologists). The test-retest reliability of the questionnaire on 10 days was 0.90.

Ethical considerations

This study was approved by ethics committee of SUMS (Code number: IR.SUMS.REC.1399.1018). Written informed consent forms were signed by all of the participants. In the form, some information about the aim and purpose of the study was given. They were aware that participation was voluntary, and they could withdraw from the study at any time and place. Moreover, it was revealed that the result would be published in groups.

Data analysis

Data were analyzed using SPSS version 20. The case and control groups were compared using Chi-square test. P-value less than .05 was considered as statistically significant.

**Findings**

AS

The mean age of the AS patients was 32.03 (SD=8.60) with a range of 16 to 53 years old. Moreover, 66.7% of the AS patients were men, and it was twice as common in men as in women.

As Table 1 shows, 83.9% of the patients developed the first symptoms of AS when they were younger than 30 years old. Based on the subjects' report, 15.7%, 23.1%, and 15.4% of them had heart diseases,

In Press

gastritis, and osteoporosis, respectively. Moreover, 75.8% of AS patients had a family history of rheumatoid diseases; among them, the majority of AS patients had a family history of rheumatoid arthritis.

As Table 2 shows, approximately half of AS patients had primary, secondary and high school education. BMI of the AS patients was 23.06 (SD=3.50) ranging from 17.99 to 30.48. Among the subjects, as Table 2 displays, 59.3% had healthy weight and approximately one third of them were in the overweight and obese range of BMI. As Table 2 shows, a significant difference was observed between AS patients and matched control regarding educational levels and BMI. Comparison of the case and control groups showed, a higher percentage of people in the AS group had academic education and a higher percentage of them had a normal BMI.

AS patients did physical activity 3.91 (SD=2.98) hours per day with a range of 1 to 8 hours per day. As Table 2 shows, approximately half of the AS patients had moderate level of physical activity, and most of them lived in urban areas. Twenty-eight (84.8%) patients avoided living in mold and damp home. Daily physical activity levels, living place, and living in mold and damp home were similar in AS patients and control groups (P>0.05).

As shown in Table 2, 17 (56.7%) AS patients reported emotional stress in their daily life. The AS patients' mean scores of stress in their home and work place were 4.60 (SD=3.13) ranging from zero to 10, and 4.84 (SD=3.44) ranged from zero to 10, respectively. The control group reported the mean score of stress in their home and workplace as 5.08 (SD=2.93) and 4.38 (SD=2.93), respectively. Both groups were similar regarding emotional stress in their daily life and stress in their home and workplace (P>0.05).

This study indicated that night sleep duration in AS patients and control group was 6.53 (SD=2.27) and 6.82 (SD=1.61) hours, respectively. Moreover, duration of midday naps in AS patients and control group were 91.52 (SD=49.66) and 91.31 (SD=54.19) minutes, respectively. No significant difference was found between AS patients and control group with regard to sleep duration (t=0.77, P=0.44) and midday naps (t=-0.03, P=0.97).

Our study showed that duration of sunlight exposure in AS patients and control group was 121.03 (SD=118.28) and 94.15 (SD=101.92) minutes, respectively. No significant difference was observed between AS patients and control group with regard to duration of sunlight exposure (t=-1.19, P=0.23).

This study showed that five (17.2%) AS patients were cigarettes smokers and smoked 8.20 (SD=7.29) cigarettes per day. As Table 2 shows, the percentage of cigarette smoking per day was higher in AS patients compared to the control group.

This study indicated that four (14.3%) subjects used tobacco for 6.33 (SD=3.21) years. As Table 2 shows, both groups were similar regarding using tobacco smoke (P>0.05). In addition, seven (24.1%) of the AS patients had drunk alcohol for 2.57 (SD = 0.53) years. Among alcoholics, three (42.9%) and four (57.1%) had drunk alcohol since they were 15-24, and 25-34 years old, respectively. As Table 2 shows, the percentage of drinking alcohol was higher in AS patients group compared to the control group (P=0.001).

Sjogren's syndrome (SS)

The mean age of SS patients was 46.33 (SD=10.45) ranging from 28 to 65 years old. The mean age of the onset of disease was 38.21 (SD=9.88). Two thirds of SS patients (74.1%) developed the first symptoms when they were 30 to 60 years old. The majority of SS patients were female (81.2%), and it was 5-fold as common in women as in men. Approximately half of the SS patients had a family history of rheumatic disease, and one third had a family history of rheumatoid arthritis. The most common diseases among the SS patients were heart or thyroid diseases and osteoporosis.

As Table 2 shows, approximately half of the subjects with SS were educated in primary, secondary, and high school. BMI of the subjects with SS was 25.66 (SD=3.51) ranging from 18.52 to 34.05. Among the participants with SS, 57.1% were overweight. As Table 2 indicates, SS and control groups were difference regarding educational and BMI levels (P<0.05). Patients with SS had a higher level of education compared to the control group. In addition, a higher percentage of patients in the SS group were overweight compared to the control group.

This study showed that night sleep duration in SS patients and control group was 6.14 (SD=1.78) and 6.91 (SD=1.66) hours, respectively. A significant difference was found between SS patients and control group as to sleep duration (t=3.30, P=0.001). On the other hand, duration of midday napping in SS patients and control group was 71.30 (SD=38.96) and 82.50 (SD=57.39) minutes, respectively.

In Press

No significant difference was found between SS patients and control group as to midday napping (t=1.49, P=0.13).
Our study indicated that duration of sunlight exposure in SS patients and control group was 62.96 (SD=87.12) and 94.63 (SD=116.53) minutes, respectively. A significant difference was observed between SS patients and control group with regard to sunlight exposure duration (t=2.15, P=0.03).
This study indicated that approximately half of the patients with SS had moderate level of physical activity. They did physical activity 6.60 (SD=2.97) hours per day ranging from 1 to 9 hours per day.
In this study, 68 (66.7%) patients with SS reported emotional stress in their daily life. The mean scores of stress in their home for the SS group was 6.21 (SD=1.92) with a range of 2 to 10, and 4.17 (SD=2.24) for the control group. Moreover, the mean scores of stress in their workplace for the SS group was 5.37 (SD=3.80), and 3.86 (SD=2.54). A significant difference was observed between SS patients and control group with regard to stress in their home (t=-7.27, P<0.001) and workplace (t=-2.93, P=0.004). Ninety percentages of the patients with SS avoided living in mold and damp home. Both groups were similar regarding physical activity, living in mold and damp home, and having emotional stress in daily life (P>0.05). On the other hand, a significant difference was observed between the groups regarding living place in urban, rural, and suburban areas (P=0.006) (Table 2).
In this study, 11 (9.9%) SS patients were cigarettes smoker for 20 years and smoked 5.00 cigarettes per day. Moreover, six (6.5%) subjects with SS used tobacco for 11.50 (SD = 12.02) years. Moreover, none of the patients with SS had drunk alcohol during their life. As Table 2 shows, the percentage of smoking tobacco and consuming alcohol were higher in the control group compared to the SS patients. On the other hand, both groups were similar regarding cigarettes smoking (P>0.05).

**Discussion**

This study found AS to be more common in males, with a male–female ratio of 2:1, similar to ratios of 2.17 and 1.57 reported previously (8,14). SS was more prevalent in females, with a female–male ratio of 4.28:1, aligning with findings that 92.8% and 83% of SS patients were female [21, 9]. Overall, AS predominated in males, whereas SS was more frequent in females [22].
The mean age of the AS was 32.03 years, and 83.9% of the patients reported that the age of the disease onset was ≤30 years old. In other studies, the mean age of their AS patients was 43.92 [14] and 35 years [10]. Consistent with our study, Koko et al. reported that the mean age of the onset of AS was 29.7 years [23]. As to the mean age of SS patients, our study showed that it was 46.33 years old, and the mean age at the onset of SS in these patients was 38.21 years. In a study on SS, 54% of SS patients were under 54 years of age [24]. Another study also showed the age at the onset of symptoms and SS diagnosis was 40.0 and 43.0 in African patients and 52.0 and 56 in Caucasian patients, respectively [25].
In our study, 57.6% of AS and 59.0% of SS patients had high school and lower level of education. Similarly, a study showed 64.1% of SS patients had high school and lower education [13]. However, a study on AS patients revealed that 93.6% of their subjects had an education of ≤ 12 years [23].
Two thirds of AS patients and approximately half of the SS patients had family history of rheumatic diseases. In a systematic review and meta-analysis study, a family history of autoimmune disease in first-degree relatives might be a risk factor of SS [5].
This study found heart disease in 15.7% of AS patients and 24.0% of SS patients. Wright et al. reported a 10-year cardiovascular disease incidence of 15.8% in AS patients [15]. Other studies showed higher heart failure rates in SS patients than in the general population [4] and a clear SS–cardiovascular disease association [26].
Our study found that AS patients had a mean BMI of 23.06 (17.99–30.48), with about one-third classified as overweight or obese. Sariyildiz et al. (2023) reported a higher mean BMI of 27.02 in AS patients [14]. Among SS participants, the mean BMI was 25.66, with 57.1% overweight and 6.2% obese. Another study reported a BMI of 27.9 in SS patients, with 32% classified as obese [9].
This study found that SS patients had significantly shorter nighttime sleep than healthy controls. Previous research similarly noted more sleep problems among AS patients compared with controls [17]. Qualitative findings also showed that SS patients frequently experienced sleep disturbances [27], and their overall sleep quality was reported to be poorer than that of healthy individuals in comparative studies [28].
In our study, AS patients reported 3.91 hours of daily physical activity, with about half showing a moderate activity level. Prior research found a functional impairment score of 3.8 in AS patients and noted that greater physical activity was associated with improved quality of life [14,10]. Among SS patients, approximately half had moderate activity levels and engaged in 6.60 hours of daily activity,

In Press

with no significant difference from controls. However, other studies documented reduced moderate-to-vigorous activity and overall lower physical activity in SS patients compared with healthy individuals [29, 12].

In our study, 56.7% of AS patients and 66.7% of SS patients reported daily emotional stress. Among SS patients, mean stress scores at home and work were 6.21 and 5.37 (0–10), and their overall stress levels were higher than controls. A previous study found that 86.56% of SS patients experienced negative stressful life events, with an average of 2.81 events, and family-related stressors occurred more frequently than work-related ones [13].

This study found that 17.2% of AS patients were cigarette smokers, averaging 8.20 cigarettes daily, whereas earlier studies reported higher smoking rates of 35.2% and 33%—nearly double our findings [14,15]. Among SS patients, 9.9% smoked cigarettes and 6.5% used tobacco, consistent with reported rates of 6.0%, 13.0%, and 20% in previous research [9,13,16]. SS patients also showed lower smoking rates and no alcohol use compared with controls. Mofors et al. similarly noted normal population–like smoking patterns but higher cessation tendencies in SS patients [24]. Since smoking increases AS activity and hip involvement [30,31], reduced smoking may reflect disease-related behavioral changes.

Our findings showed that 24.1% of AS patients consumed alcohol for an average of 2.57 years, whereas none of the SS patients reported alcohol use. AS patients also used alcohol more frequently than their control group. Previous studies similarly noted alcohol consumption in 21.3% of AS patients [14] and 25% of SS patients [13].

**Implication in practice**

This study provided information regarding the AS and SS epidemiological findings. This would be a guide for researchers and policymakers regarding these diseases. This study provided information about lifestyle of the AS and SS patients such as interest and behavior of physical activity, living place, sleeping, stress in daily life, tobacco and cigarette smoking, and alcohol consumption. This information was implication of this study. Therefore, to improve health of these patients, we recommend modifications in their lifestyle.

**Conclusion:**

The findings indicate distinct demographic and lifestyle patterns among patients with AS and SS. AS was more prevalent in males, while SS was more frequent in females, with differing age distributions and lifestyle characteristics. AS patients demonstrated healthier BMI yet higher rates of smoking and alcohol consumption, whereas SS patients exhibited shorter sleep duration, reduced sunlight exposure, and higher stress levels. These results highlight the need for comprehensive patient management that goes beyond disease-specific treatment. Lifestyle factors—such as sleep quality, stress reduction, and balanced exposure to sunlight—should be addressed as part of routine care, particularly for SS patients. For AS patients, smoking and alcohol cessation programs may improve overall health outcomes. Further longitudinal studies are recommended to explore the causal relationships between these lifestyle factors and disease progression. Interventional studies focusing on stress management, sleep hygiene, and lifestyle modification could help determine their potential role in improving quality of life and disease outcomes in both AS and SS patients.

In Press