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## Concise Report

# The prevalence of obstructive sleep apnoea syndrome in ankylosing spondylitis patients

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**Objective.** To assess the prevalence of obstructive sleep apnoea syndrome (OSAS) in AS patients.
**Methods.** Thirty-one patients with AS were included in the study. The demographic data, spinal mobility measures and Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) scores were recorded for each patient. All participants underwent one night of sleep recording, which was performed using a polysomnography (PSG). Pulmonary function test (PFT) was performed for all subjects and symptoms of OSAS were questioned.
**Results.** Seven (22.6%) of 31 AS patients had OSAS according to PSG assessments. The mean BMI, disease duration, BASDAI score, neck circumference and occiput–wall distance were higher in patients with OSAS, but the differences were not significant. The mean ages of patients with OSAS were significantly higher than the patients without OSAS. The prevalence of OSAS in patients under the age of 35 years was found to be 6.3%, whereas the prevalence of OSAS in patients at the age of 35 years or over was 40.0% ($P = 0.037$). The prevalence of OSAS in AS patients with a disease duration $<5$ years was 11.8% and its prevalence in AS patients with a disease duration of $\geqslant 5$ years was 35.7% ($P = 0.198$). PFT was restrictive in 16 (53.3%) patients and obstructive in none.
**Conclusions.** The prevalence of OSAS in AS patients is higher than reported in the general population. The diagnosis of OSAS should be kept in mind and OSAS symptoms should be considered especially in AS patients at the age of $\geqslant 35$ years and in AS patients with a disease duration of $\geqslant 5$ years.

**Key words:** Ankylosing spondylitis, Obstructive sleep apnoea syndrome, Prevalence, Polysomnography.

## Introduction

Obstructive sleep apnoea syndrome (OSAS), a condition characterized by frequent episodes of upper airway collapse and repeated episodes of apnoea and hypopnoea during sleep, can lead to excessive daytime sleepiness. OSAS is associated with car crashes involving drivers who fall asleep [1], systemic hypertension [2], cardiovascular disease [3] and abnormalities in glucose metabolism [4]. Therefore, it is increasingly recognized as an important cause of morbidity and mortality.

It was suggested that AS could predispose subjects to SAS through several mechanisms including: restriction of the oropharyngeal airway from temporomandibular joint involvement or cervical spine disease causing pharyngeal and tracheal compression; cervical spine disease causing compression of the respiratory centres in the medulla resulting in central depression of respiration; or restrictive pulmonary disease [5]. A higher prevalence of OSAS in patients with AS (12%) than has been found in the general population (1–4%) was reported and it was proposed that OSAS could be a contributing factor to fatigue in AS [5].

In the literature, there are studies investigating sleep disturbances in AS patients [6, 7], but we could find only one observational study reporting the prevalence of OSAS using polysomnography (PSG) in AS patients [5]. Therefore, we aimed to assess the prevalence of OSAS in AS patients.

## Patients and methods

Thirty-one patients with AS, who met Modified New York Criteria, were included in the study. All patients' informed signed consent was obtained according to the Declaration of Helsinki. The study was approved by our institutional research ethics committee. The age, sex, height, weight, disease duration, neck circumference, occiput–wall distance, Schöber's test and chest expansion of each patient was recorded.

The Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) was calculated [8]. Epworth Sleepiness Scale (ESS) was used to assess daytime sleepiness. A score of $\leqslant 10$ is considered as normal [9].

All participants underwent one night of sleep recording, which was performed using an E-Series PSG system (Compumedics, Melbourne, Australia) with integrated digitalized video. PSG monitored the following variables: two electroencephalogram channels; two electro-oculograms; bipolar surface electromyograms; body position and movements. Sleep stages were visually scored in 30-s epochs according to the standard criteria of Rechtschaffen and Kales [10]. Apnoeas were defined as complete cessation of airflow for at least 10 s. Hypopnoea was defined as $\geqslant 50\%$ reduction in airflow accompanied by $>3\%$ desaturation in the preceding 30 s and a reduction in chest wall movement. EEG arousals were not required to make the diagnosis of a respiratory event. Data were expressed as the apnoea–hypopnoea index (AHI) based on the number of apnoeas and hypopnoeas per hour slept. An AHI of five or more events per hour confirmed a positive OSA diagnosis [11].

Spirometry was performed by a chest physician according to the 1994 American Thoracic Society (ATS) recommendations [12], using the same type of spirometer ZAN 300 (ZAN Messgerate GmbH, Oberthulba, Germany) for all subjects. Several measures of lung function were used: the forced expiratory volume in 1 s ($FEV_1$), the forced vital capacity (FVC) and the $FEV_1/FVC$ ratio. If $FEV_1/FVC < 70\%$, the patients were classified as having

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TABLE 1. Demographic data, spinal mobility, BASDAI, ESS scores and PSG findings of AS patients with OSAS and without OSAS

| | No OSAS ($n=24$) | OSAS ($n=7$) | Total group ($n=31$) | *P*-value |
|---|---|---|---|---|
| Age, mean ± S.D., years | 33.2 ± 10.6 | 43.4 ± 5.7 | 35.5 ± 10.6 | **0.026** |
| BMI, mean ± S.D. | 24.5 ± 4.3 | 28.2 ± 6.6 | 25.4 ± 5.0 | 0.137 |
| Disease duration, mean ± S.D., months | 70.0 ± 83.5 | 102.3 ± 108.1 | 77.3 ± 88.7 | 0.367 |
| BASDAI, mean ± S.D. | 3.9 ± 1.7 | 4.4 ± 1.2 | 4.0 ± 1.6 | 0.523 |
| Neck circumference, mean ± S.D., cm | 36.3 ± 3.1 | 38.8 ± 2.8 | 36.9 ± 3.2 | 0.070 |
| Occiput wall, mean ± S.D., cm | 4.0 ± 6.2 | 7.6 ± 7.4 | 4.8 ± 6.5 | 0.178 |
| Schobers, mean ± S.D., cm | 3.0 ± 1.6 | 2.5 ± 1.3 | 2.9 ± 1.6 | 0.441 |
| Chest expansion, mean ± S.D., cm | 4.1 ± 1.8 | 3.7 ± 1.5 | 4.0 ± 1.7 | 0.632 |
| ESS, mean ± S.D. | 5.2 ± 2.7 | 4.7 ± 3.7 | 5.1 ± 2.9 | 0.886 |
| Stage 1, mean ± S.D., % | 7.0 ± 6.5 | 11.9 ± 8.7 | 8.1 ± 7.2 | **0.038** |
| Stage 2, mean ± S.D., % | 56.7 ± 11.3 | 50.9 ± 12.6 | 55.4 ± 11.7 | 0.277 |
| Stage 3, mean ± S.D., % | 14.8 ± 7.4 | 16.1 ± 8.2 | 15.1 ± 7.5 | 0.653 |
| Stage 4, mean ± S.D., % | 6.7 ± 8.3 | 6.1 ± 7.5 | 6.6 ± 8.0 | 0.848 |
| Stage REM, mean ± S.D., % | 14.7 ± 8.1 | 14.9 ± 5.7 | 14.8 ± 7.6 | 0.688 |
| Total sleep time, mean ± S.D., min | 251.4 ± 126.9 | 229.6 ± 111.6 | 246.4 ± 122.2 | 0.257 |
| Sleep efficiency, mean ± S.D., % | 77.3 ± 16.6 | 68.1 ± 12.1 | 75.3 ± 16.0 | 0.098 |
| REM latency, mean ± S.D. | 146.9 ± 77.4 | 170.5 ± 107.2 | 152.2 ± 83.6 | 0.723 |
| Mean $SaO_2$, mean ± S.D., % | 94.2 ± 1.5 | 92.0 ± 1.6 | 93.7 ± 1.8 | **0.008** |

Bold values represent statistically significant values.

obstructive disorder, and if $FEV_1/FVC$ was normal and $FVC < 80\%$, the patients were classified as having restrictive disorder [13].

Among symptoms of OSAS, snoring, witnessed apnoea, daytime sleepiness, daytime fatigue, waking up with headache in the mornings and stuffiness were asked. All patients underwent otorhinolaryngologic examination by the same physician. Modified Mallampati Score of Friedman [14] was evaluated to assess tongue size.

## Results

Seven (22.6%) of 31 AS patients had OSAS according to PSG assessments. The prevalence of OSAS in the general population was found to be 3% [15] and the difference was statistically significant ($P < 0.001$). Among AS patients with OSAS, three (42.9%) of them were women and four (57.1%) of them were men. Among AS patients without OSAS, 4 (16.7%) of them were women and 20 (83.3%) of them were men. The patients with OSAS and without OSAS were comparable according to sex ($P = 0.302$).

The mean ages of patients with OSAS were significantly higher than the patients without OSAS (Table 1). In AS patients, there was significant positive correlation between age and AHI score ($r = 0.392$, $P = 0.029$). The prevalence of OSAS in patients <35 years of age was found to be 6.3%, whereas the prevalence of OSAS in patients at the age of ⩾35 years was 40.0% ($P = 0.037$).

There was no significant correlation between disease duration and AHI scores ($r = 0.104$, $P = 0.579$). The prevalence of OSAS in AS patients with a disease duration <5 years was 11.8% and its prevalence in AS patients with a disease duration of ⩾5 years was 35.7% ($P = 0.198$).

The mean BMI, disease duration, BASDAI score, neck circumference and occiput–wall distance were higher in patients with OSAS, but the differences were not statistically significant. The mean Schöber's test measures, chest expansion and ESS scores were lower in patients with OSAS, but there was not significant difference between two groups (Table 1).

According to PSG assessments, Stage 1 was significantly higher in patients with OSAS. There were no differences in other stages of sleep between the patients with OSAS and without OSAS. Mean $SaO_2$ was found to be significantly lower in patients with OSAS compared with patients without OSAS (Table 1).

Pulmonary function test (PFT) was restrictive in 16 (53.3%) patients and obstructive in none of them. There was no difference between the patients with OSAS and without OSAS in respect to restrictive disorder (Table 2).

TABLE 2. Symptoms of OSAS and PFT results in AS patients

| | No OSAS ($n=24$) | OSAS ($n=7$) | Total group ($n=31$) | *P*-value |
|---|---|---|---|---|
| Symptoms of OSAS, % | | | | |
| Snoring | 41.7 | 71.4 | 48.4 | 0.220 |
| Witnessed apnoea | 12.5 | 42.9 | 19.4 | 0.110 |
| Daytime sleepiness | 37.5 | 42.9 | 38.7 | 1.000 |
| Daytime fatigue | 41.7 | 71.4 | 48.4 | 0.220 |
| Waking up with headache in the mornings | 33.3 | 42.9 | 35.5 | 0.676 |
| Stuffiness | 20.8 | 71.4 | 32.3 | **0.012** |
| PFT, % | | | | |
| Restrictive | 50.0 | 66.7 | 53.3 | 0.657 |
| Obstructive | 0.0 | 0.0 | 0.0 | |
| Smoker, % | 41.7 | 14.3 | | 0.372 |
| Alcohol intake, % | 12.5 | 14.3 | | 1.000 |

Bold values represent statistically significant values.

The rates of the smokers and alcohol intake were not different between the two groups (Table 2).

Most commonly observed symptoms in AS patients were snoring, daytime fatigue, daytime sleepiness, waking up with headache in the mornings and stuffiness. The rates of these symptoms were higher in patients with OSAS. Only the rate of stuffiness was significantly higher in patients with OSAS, but the differences of other symptoms were not significant between two groups (Table 2).

There were no differences between patients with OSAS and without OSAS in respect to modified Mallampati scores ($P = 0.591$).

## Discussion

We report a higher prevalence of OSAS in patients with AS (22.6%) than in the general population. The prevalence of OSA is reported to be ~3–7% for adult men and 2–5% for adult women in the general population [16]. Erb *et al.* [5] have also reported the prevalence of OSAS in AS patients as 12% and this was higher than the general population. We found OSAS prevalence in AS patients to be approximately two times higher than that reported in Erb *et al.*'s study.

AS patients with OSAS were significantly older than the AS patients without OSAS, and a positive correlation was found between age and AHI score. The prevalence of OSAS in AS patients <35 years of age was found to be 6.3%, whereas the prevalence of OSAS in AS patients at the age of ⩾35 years was 40.0%. Actually, the prevalence of sleep apnoea increases with

advancing age. In men, OSA was found in 3.2, 11.3 and 18.1% of the 20–44, 45–64 and 65–100 year age groups, respectively [17]. In a separate analysis of women, the prevalence of OSA was reported to be 0.6, 2.0 and 7.0 for the 20–44-, 45–64- and 65–100-year age groups, respectively [18] Nevertheless, we found the prevalence of OSAS in AS patients higher than in the general population at the same age group.

We found the prevalence of OSAS in patients with disease duration of $\geqslant 5$ years three times higher than the prevalence in patients with disease duration $<5$ years. Actually, as the disease duration gets longer, the changes caused by AS underlying in the etiology of OSAS may increase.

In general, in the healthy young adult non-rapid eye movement sleep accounts for 75–90% of sleep time (3–5% Stage I, 50–60% Stage II and 10–20% Stages III and IV) [19]. We observed increased Stage 1 sleep (8%) in AS patients when compared with the general population. Jamieson *et al*. [20] reported that increased pain was associated with increased Stage 1 sleep in AS patients.

According to pulmonary functioning testing, we observed restrictive disorder in 53.3% of AS patients and obstructive disorder in none of them. Erb *et al*. [5] found restrictive disorder in 47% of AS patients and obstructive in none. Our findings were consistent with this result.

Among OSAS symptoms, daytime fatigue and snoring were the most frequently observed ones in AS patients in our study. It was reported that fatigue and sleep problems were important concerns in AS patients [6, 7, 21]. We observed daytime fatigue and snoring in 48.4% of AS patients. The rates of these symptoms were higher in AS patients with OSAS than in AS patients without OSAS. Erb *et al*. [5] suggested that OSAS could be a contributing factor to fatigue in AS and detection and treatment of OSAS could lead to improvement in fatigue symptoms in these patients. Our findings support this study.

Increased tongue size results in a higher Mallampati classification. Higher Mallampati scores correlate with higher prevalence and severity of OSAS. Therefore, increased fat deposition in the tongue increases tongue volume, thereby increasing the Mallampati score and contributing to OSAS. However, we observed no difference between the AS patients with OSAS and without OSAS in respect to Mallampati scores. This finding suggests that OSAS in AS patients could have any other underlying etiology caused by AS itself other than tongue hyperthrophy.

AS patients with OSAS and AHI $>15$ were treated with nasal (continuous positive airway pressure) CPAP at home. AS patients with OSAS and AHI $<15$ were recommended to lose weight and avoid cigarettes and alcohol.

To conclude, the prevalence of OSAS in AS patients is higher than that reported in the general population, but it is not easy to identify without detailed testing. The diagnosis of OSAS should be kept in mind and OSAS symptoms should be considered especially in AS patients at the age of $\geqslant 35$ years and in AS patients with a disease duration of $\geqslant 5$ years. OSAS can be one of the causes of fatigue in AS patients. If OSAS can be detected and treated properly, symptoms of fatigue can improve in these patients.

## Rheumatology key messages

- The prevalence of OSAS in AS patients is higher than reported in the general population.
- The diagnosis of OSAS is not easy to identify without detailed testing.
- The diagnosis of OSAS should be kept in mind and OSAS symptoms should be considered in AS patients.

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