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Original Research

The analysis of the pulmonary domain involvement in Sjögren's disease

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Abstract

Background: The EULAR Sjögren's syndrome (SS) disease activity index (ESSDAI) pulmonary domain is used to assess the activity of respiratory system involvement in Sjögren's disease (SjD). The most unfavorable form of respiratory involvement in SjD, after lymphomas, is interstitial lung disease (ILD).

Objectives: The aim of the study was to assess the involvement of the respiratory system in SjD patients and the occurrence of ILD in high-resolution computed tomography (HRCT), depending on immunological markers, the influence of cigarette smoking, and the age of the patients.

Design: Single-center, registry, cohort study.

Methods: Among all SjD patients, a group with involvement in the pulmonary domain was distinguished. This group was later subjected to a detailed analysis of immunological and serological markers and chest imaging tests.

Results: In all, 64 patients out of 299 with SjD had involvement in the pulmonary domain defined according to the ESSDAI definition. The most frequently reported clinical symptoms of respiratory system involvement included dryness and chronic cough (over 80% of patients), followed by shortness of breath. Nine percent of patients with changes in lungs were asymptomatic. Patients with pulmonary involvement were older (54 vs 48 years, $p < 0.05$). In the subpopulation of patients with SjD and pulmonary involvement, the presence of rheumatoid factor (73% vs 60%, $p < 0.05$), and hematological domain involvement according to ESSDAI (54% vs 37%, $p < 0.05$) were more common. In the group of 64 patients with a positive pulmonary domain, 34 (53%) had ILD on HRCT. A higher incidence of comorbidities was found in the population of patients with ILD. No correlation was found between the type of lung involvement and the immunological profile, inflammatory markers, age, and smoking habit.

Conclusion: Involvement of the pulmonary domain is common in patients with SjD. However, the clinical picture is very heterogeneous, which determines the subsequent personalization of treatment.

Keywords: ESSDAI, interstitial lung disease, pulmonary domain, Sjögren syndrome

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Introduction

Sjögren's disease (SjD) may involve various parts of the respiratory system, such as the upper airway, lung parenchyma, pleura, and other structures, in both the upper and lower respiratory tract or a combination thereof. The most common clinical presentation is upper respiratory tract involvement,[1] such as dry trachea syndrome. The most unfavorable form of respiratory involvement in SjD, after lymphomas, is interstitial lung disease (ILD).

Respiratory system involvement may impair not only the quality of life but is also a risk factor for shorter survival[2] and is associated with a fourfold increase in the risk of death after 10 years of

disease duration.[3] In the case of ILD, the cumulative 5-year mortality rate increases up to 16%.[2]

ILD is a collection of approximately 200 disease entities with a similar radiological pattern, leading to fibrosis of the lung parenchyma. However, these entities differ in risk factors, treatment, and prognosis.[4] SjD-related ILD is the most common form of pulmonary involvement in SjD, and its most common radiological patterns are nonspecific interstitial pneumonia (NSIP), usual interstitial pneumonia (UIP), lymphocytic interstitial pneumonia (LIP), and organizing pneumonia (OP). ILD can lead to life-threatening complications, including respiratory failure and secondary pulmonary hypertension,[5–7] which confer a poor prognosis in terms of survival and quality of life.[8–10] Therefore, early detection of ILD is crucial in patients with SjD. However, it remains controversial whether all patients with SjD should be systematically tested for pulmonary involvement.

This study aimed to assess the involvement of the respiratory system in SjD patients and the occurrence of ILD in HRCT, depending on immunological markers, the influence of cigarette smoking, and the age of the patients.

Patients and methods

The study included patients with SjD under the care of the Outpatient Clinic and Clinic of Rheumatology and Internal Diseases, Medical University of Wrocław, in the years 01/2010–08/2023 (based on patient register in the hospital). The inclusion criterion for the study was the diagnosis of SjD based on the 2002 classification criteria[11] (retrospectively, all patients also met the 2016 ACR/EULAR classification criteria[12]) and age over $\geqslant$18 years.

The assessment of the activity of respiratory involvement was done according to the EULAR Sjögren's syndrome (SS) disease activity index (ESSDAI).[13] All patients underwent chest X-ray and/or high-resolution computed tomography (HRCT) at the time of diagnosis and during the follow-up visit. The average follow-up period was 5 years (minimum 6 months).

HRCT was ordered in the event of symptoms suggesting the possibility of lung involvement (chronic cough, shortness of breath, decreased values in pulmonary function tests, auscultatory changes). ILD type designation was based on HRCT evaluation. In patients without ILD, changes in lung imaging studies were found that did not correspond to changes of the fibrosis type fulfilling the criteria for ILD, for example, bronchial wall thickening in HRCT or a high percentage of lymphocytes in bronchoscopic examination (single patients, data not shown) in patients with persistent dry cough.

The degree of activity of the respiratory system was as follows:

- 5 points = activity level, low—persistent cough due to bronchial involvement with no radiographic abnormalities on radiography or radiological or HRCT evidence of ILD with no breathlessness and normal lung function test.
- 10 points = activity level, moderate—moderately active pulmonary involvement, such as ILD shown by HRCT with shortness of breath on exercise (NHYA II) or abnormal lung function tests restricted to 70% > DLCO $\geqslant$ 40% or 80% > FVC $\geqslant$ 60%.
- 15 points = activity level, high—highly active pulmonary involvement, such as ILD shown by HRCT with shortness of breath at rest (NHYA III, IV) or with abnormal lung function tests: The diffusing capacity of the lungs for carbon monoxide (DLCO) < 40% or forced vital capacity (FVC) < 60%.

Exclusion criteria included the coexistence of another systemic connective tissue disease, pulmonary disease not related to SjD (any other chronic lung disease, including chronic obstructive pulmonary disease, asthma, emphysema, allergic alveolitis, and a history of tuberculosis), or active infectious disease included symptoms or confirmation of any viral/bacterial/fungal infection or tuberculosis.

In addition, focus score of labial salivary gland biopsy and laboratory tests were retrospectively analyzed in each patient (rheumatoid factor (RF), complete blood count, C3 and C4 complement components, immunoglobulin concentration, protein electrophoresis in serum, a panel of antibodies (anti-SSA/SSB/Ro52/AMA M2/centromere B/PM Scl/Sm/RNP/PCNA/Jo1/histone), and inflammatory markers as C-reactive protein (CRP) and the erythrocyte sedimentation rate (ESR)).

We further divided the group of patients with SjD into those who had involvement in the pulmonary domain and those who did not meet the ESSDAI criteria for this domain. In addition, in the group of patients with involvement in the pulmonary domain, we distinguished a group of patients with ILD confirmed by imaging (chest HRCT) and a group of patients with a positive history of cigarette smoking.

Finally, for statistical analysis, patients with positive scores in the pulmonary domain were divided into three groups according to the time of diagnosis of SjD: the first when pulmonary domain involvement was noted before the diagnosis of SjD; group 2, when the diagnosis of pulmonary domain involvement was made simultaneously with SjD; and the third group, when pulmonary domain involvement was noted at least 1 month after the diagnosis of SjD.

The reporting of this study conforms to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[14]

Statistical methods

Statistical analysis was conducted using STATISTICA 12.0 software. All tests (for normality, homogeneity of variance, equivalence of means, and ranked tests) were conducted at the significance level of $\alpha = 0.05$. Statistical analysis included Fisher's exact test for binary variables. A comparison of variables, the distribution of which was not normal according to the Shapiro–Wilk test, was conducted using the ranked Mann–Whitney *U* test.

This study received approval from the institutional ethics committee (Nr KB-836/2020) and fulfilled the ethical guidelines of the Declaration of Helsinki.

Results

Group characteristics and presence of the pulmonary domain in ESSDAI

Among the entire analyzed group of patients diagnosed with SjD ($n = 299$), 64 patients had involvement in the pulmonary domain defined according to the ESSDAI definition. In this population, respiratory involvement was observed only in women ($n = 64$). There were 4% men in the study (10 patients out of 299 patients), none of whom had pulmonary domain involvement. Patients with pulmonary involvement were older (54 vs 48 years, $p < 0.05$). In the subpopulation of patients with SjD and pulmonary involvement, the presence of RF (73% vs 60%, $p < 0.05$), C4 hypocomplementemia (15% vs 3%, $p < 0.05$), and hematologic domain involvement (54% vs 37%, $p < 0.05$) were more common. Statistically, lympho- and neutropenia were more common in patients with pulmonary involvement ($p < 0.05$) and were noted from the beginning of SjD diagnosis. Moreover, no differences were found in terms of the clinical picture of the SjD, focus score, inflammatory parameters (ESR, CRP), or the immunological profile (in addition to the presence of RF) between the subjects with pulmonary involvement and those without changes in the respiratory system (Table 1).

Occurrence of ILD

All SjD patients had a chest X-ray. HRCT was ordered in the event of symptoms suggesting the possibility of lung involvement (201 patients) as chronic cough, shortness of breath, decreased values in pulmonary function tests, and auscultatory changes.

In the group of 64 patients with a positive pulmonary domain, 34 (53%) had ILD on HRCT. The ILD pattern was as follows: NSIP observed in 28 subjects, lymphocytic interstitial pneumonia (LIP) in 4 patients, UIP in 1 patient, and probable UIP in 1 patient.

Taking into account clinical symptoms, shortness of breath was more common in patients with ILD in HRCT scans (62% vs 17%, $p < 0.05$), while dry cough was more common in patients with lung involvement without ILD (97% vs 76%, $p = 0.02$). There was no relationship between the occurrence (ILD vs non-ILD in HRCT), inflammatory markers, and age. Moreover, no correlation was found between the type of lung involvement (ILD vs non-ILD) and the immunological profile. The clinical course of lung involvement in both analyzed subgroups of patients was similar (Table 2).

Analyzing two subpopulations: SjD with ILD and SjD with lung involvement without ILD, a higher incidence of comorbidities was found in the population of patients with ILD (hypertension 30% in the group without ILD vs 56% in the group with ILD, hypothyroidism 13% in the group

Table 1. Characteristics of the study group of patients with Sjögren's disease.

Variable	Patients with involvement in the pulmonary domain	Patients without involvement in the pulmonary domain	*p*-Value
Number of patients	64	235	
Sex			
Women, *n* (%)	64 (100%)	225 (96%)	
Men, *n* (%)	0	10 (4%)	
Mean age (years)	54	48	0.0035
Autoantibodies			
Anti-SSA, *n* (%)	53 (82%)	202 (86%)	0.5519
Anti-SSB, *n* (%)	43 (67%)	136 (58%)	0.1974
Ro52, *n* (%)	48 (75%)	176 (73%)	1
Increased			
Rheumatoid factor	48 (75%) NA 3 (5%)	142 (60%) NA 3 (1%)	0.0107
C-reactive protein	11 (17%)	30 (13%)	0.4119
ESR	30 (47%)	89 (38%)	0.1983
Focus score ⩾1	45 (70%) NA 6 (10%)	176 (74%) NA 19 (8%)	0.5743
Hypocomplementemia			
C3	11 (17%)	26 (11%)	0.1944
C4	10 (15%) NA 2 (3%)	6 (3%) NA 2 (0.7%)	0.0002
Involvement in domain, *n* (%)			
Constitutional	9 (14%)	19 (8%)	0.1512
Lymphadenopathy	10 (15%)	46 (20%)	0.5884
Glandular	25 (39%)	78 (33%)	0.3782
Articular	32 (50%)	137 (58%)	0.2569
Cutaneous	8 (12%)	35 (15%)	0.6933
Renal	2 (3%)	4 (2%)	0.6119
Muscular	1 (1%)	1 (0.4%)	0.3828
PNS	2 (3%)	3 (1%)	0.2912
CNS	0	2 (0.7%)	1
Hematology	37 (57%)	88 (37%)	0.0042
Biological	30 (47%)	111 (47%)	1
Clinical symptoms reported by patients at the time of diagnosis of pulmonary involvement			
Cough	55 (86%)		
Dyspnea	26 (41%)		
Asymptomatic	6 (9%)		
Mean age at last visit	59.5	52.9	

CNS, central nervous system; ESR, erythrocyte sedimentation rate; *n*, number of patients; NA, not available; nv, normal range of value; PNS, peripheral nervous system; %, percent of patients.

Table 2. Characteristics of patients with Sjögren's disease and involvement of the pulmonary domain depending on the presence of interstitial lung disease in HRCT scans.

Variable	ILD present in HRCT	ILD absent in HRCT	*p*-Value
Number of patients (%) (women 100%)	34 (53%)	30 (47%)	0.6
Mean age at onset of pulmonary domain (years)	56.6	51.9	0.08
ESSDAI 5 points, *n* (%)	13 (38%)	29 (97%)	<0.00001
ESSDAI 10 points, *n* (%)	18 (53%)	1 (3%)	<0.00001
ESSDAI 15 points, *n* (%)	3 (8.8%)	0	0.2411
Comorbidities	27 (79%)	11 (37%)	0.0008
Hypertension	19 (56%)	9 (30%)	
Hypothyroidism	6 (18%)	4 (13%)	
Thyroid nodules in euthyroidism	2 (6%)	0	
Osteoporosis	6 (18%)	0	
Lipid disorders	3 (9%)	3 (10%)	
Previous STEMI/NSTEMI	4 (12%)	0	
Pulmonary arterial hypertension	2 (6%)	0	
Increased			
Rheumatoid factor	25 (73%)	23 (77%)	1
C-reactive protein	6 (18%)	5 (17%)	1
ESR	18 (53%)	12 (40%)	0.3271
Hypocomplementemia			
C3	5 (15%)	6 (20%)	0.7423
C4	4 (12%)	6 (20%)	0.4949
Autoantibodies other than anti-SSA or anti-SSB			
AMA M2	3 (9%)	3 (10%)	1
Centromere B	4 (12%)	0	0.1161
PM Scl	2 (6%)	1 (3%)	1
Sm/RNP	1 (3%)	1 (3%)	1
PCNA	1 (3%)	0	1
Sm	1 (3%)	0	1
Jo1	2 (6%)	0	0.494
Histone	1 (3%)	0	1

(Continued)

Table 2. (Continued)

Variable	ILD present in HRCT	ILD absent in HRCT	*p*-Value
Clinical symptoms	28 (82%)	30 (100%)	0.0259
Dyspnea	21 (62%)	5 (17%)	0.0003
Dry cough	26 (76%)	29 (97%)	0.0294
Course of the disease (pulmonary domain)			
Progression	2 (6%)	1 (4%)	1
Improvement	5 (15%)	4 (13%)	0.117
Stable	27 (79%)	25 (83%)	0.7568

ESR, erythrocyte sedimentation rate; ESSDAI, The EULAR Sjögren's syndrome (SS) disease activity index; HRCT, high-resolution computed tomography; ILD, interstitial lung diseases; *n*, number of patients; NSTEMI, No ST Elevation Myocardial Infarction; STEMI, ST Elevation Myocardial Infarction; %, percent of patients.

without ILD vs 18% in the ILD group, euthyroid thyroid nodules 0 in the no-ILD group vs 6% in the ILD group, osteoporosis 0 in the no-ILD group vs 18% in the ILD group, lipid disorders 10% in the no-ILD group vs 9% in the group with ILD, medical history of STEMI/NSTEMI 0 in the group without ILD vs 12% in the group with ILD, pulmonary arterial hypertension 0 in the group without ILD vs 6% in the group with ILD). The division of patients with involvement of the pulmonary domain in SjD depending on the occurrence of ILD is presented in Table 2.

Pulmonary domain according to time of SjD diagnosis

We also analyzed the time of the appearance of the pulmonary domain among patients diagnosed with SjD, dividing them into three different groups. The first patient suffering from a pulmonary disease met the pulmonary domain ESSDAI criteria preceding the diagnosis of the SjD ($n=2$). The second one is patients with active pulmonary domain concomitant with the SjD diagnosis ($n=48$). Finally, patients with pulmonary symptoms were included in the pulmonary domain ESSDAI criteria after the onset of the SjD ($n=14$). We found no statistically relevant correlation between these three groups and the following variables: medium age of the patients, smoking (active or in the past), presence of ILD or its pattern, concomitant diseases as well as the prevalence of autoantibodies enlisted in Table 3.

Smoking habit and ILD

The study group included non-smokers ($n=40$) and active or former smokers ($n=24$). Both populations were assessed for the occurrence of ILD depending on the age of ILD onset and the presence of specific antibodies. The obtained statistical data indicate that the age in years at which pulmonary involvement was diagnosed is similar in both groups (smokers vs non-smokers ($p=0.1$)). There was no impact of comorbidities on the occurrence of ILD in this subgroup (Table 4).

Pulmonary symptoms appeared in the fifth decade of life, regardless of the age at which SjD was diagnosed and regardless of smoking ($p=0.1$) (Table 4). No increased incidence of ILD was observed regardless of the duration of smoking or the time since cessation of smoking. In both compared groups, ILD affected approximately half of the patients. It occurred with comparable frequency among smokers and non-smokers ($p=0.9$). By far the most common specific antibodies among the studied population were anti-Ro52, anti-SSA, and anti-SSB antibodies. Their frequency was comparable among smokers and non-smokers ($p>0.05$). Anti-Jo antibodies were detected with comparable frequency, but very rarely in both groups ($p>0.05$) not related to the smoking habit. Antimitochondrial antibodies were detected slightly more often in the non-smoking group ($p=0.2$). No statistical differences were found in the frequency of occurrence of other extractable nuclear antigen (ENA)

Table 3. Pulmonary domain involvement depends on the time of diagnosis of Sjögren disease.

Variable	Pulmonary domain before SjD diagnosis, *n* (%)	Pulmonary domain after SjD diagnosis, *n* (%)	Pulmonary domain diagnosed at the same time as SjD, *n* (%)	*p*-Value
Number of patients (%)	2 (3%)	14 (22%)	48 (75%)	
Mean age of patients (years)	59	56.3	53.3	>0.05
Smoker	1 (50%)	4 (28%)	19 (39%)	0.7
Non-smoker	1 (50%)	10 (72%)	29 (61%)	
ILD pattern				
NSIP	2 (100%)	8 (57%)	17 (35%)	0.1
LIP	0	1 (7%)	3 (6%)	0.9
UIP	0	0	1 (2%)	–
Probable UIP	0	0	1 (2%)	–
Pulmonary domain without ILD	0	5 (36%)	26 (54%)	0.2
Comorbidities	2 (100%)	12 (86%)	25 (52%)	0.05
Autoantibodies other than anti-SSA or anti-SSB				
Centromere B	0	1 (7%)	3 (6%)	Not statistical significant
PM Scl	0	2 (14%)	1 (2%)	
AMA M2	0	2 (14%)	4 (8%)	
SM	0	1 (7%)	0	
Jo1	0	1 (7%)	1 (2%)	
PCNA	0	0	1 (2%)	
Sm/RNP	0	0	2 (4%)	
Histone	0	0	1 (2%)	

ILD, interstitial lung disease; LIP, lymphoid interstitial pneumonia; *n*, number of patients; NSIP, nonspecific interstitial pneumonia; SjD, Sjögren disease; UIP, usual interstitial pneumonia; %, percent of patients.

antibodies, such as centromere B, anti-Sm/PCNA/RNP/PM Scl/histone. In the group of smokers, C3 hypocomplementemia was statistically observed more often than in non-smokers (24% vs 12% of patients).

Discussion

Results of our study show that half of the patients with SjD and respiratory involvement according to the ESSDAI have ILD. ILD was commonly diagnosed concurrently with SjD. Our results are similar to previous publications. The lung involvement is observed in up to 20% of patients with SjD.[15,16] Available data indicate differentiation regarding the period of occurrence of ILD-type lesions, which may appear later in the disease, constitute its first manifestation, or precede the appearance of the first symptoms of dryness characteristic for SjD.[17]

Numerous studies have shown a relationship between age (advanced age) and the risk of developing ILD pulmonary lesions.[9,18,19] It seems that

Table 4. Involvement of the pulmonary domain depends on smoking habits.

Variable	Current or former smoker (*n* = 24)	Non-smoker (*n* = 40)	*p*-Value
Mean age (years) at diagnosis of pulmonary domain involvement	57.6	52.15	0.1
Comorbidities	16 (67%)	21 (52%)	0.3056
ILD pattern in HRCT			
NSIP	10 (42%)	17 (42%)	1
LIP	1 (4%)	4 (10%)	0.6424
Probable UIP	1 (4%)	0	0.375
UIP	0	1 (2.5%)	1
Without ILD in HRCT	12 (50%)	18 (45%)	0.7978
Increase rheumatoid factor	18 (75%)	30 (75%)	1.0
Hypocomplementemia			
C3	6 (25%)	5 (12%)	0.0047
C4	3 (12%)	7 (17%)	0.7307
Autoantibodies other than anti-SSA or anti-SSB			
Centromere B	1 (4%)	3 (7%)	0.6204
AMA M2	1 (4%)	5 (12%)	0.21
Sm	1 (4%)	0	0.375
J01	1 (4%)	1 (2.5%)	1
PCNA	0	1 (2.5%)	1
Sm/RNP	0	2 (5%)	0.5238
PM Scl	0	3 (7%)	0.2857
Histone	0	1 (2.5%)	1

HRCT, high-resolution computed tomography; ILD, interstitial lung disease; LIP, lymphoid interstitial pneumonia; *n*, number of patients; NSIP, nonspecific interstitial pneumonia; UIP, usual interstitial pneumonia; %, percent of patients.

age, along with other factors such as the duration of the disease or the presence of specific biomarkers in the blood serum (including Krebs von den Lungen-6 (KL-6), TNFα, CRP), may be one of the main discriminating factors related to the risk of occurrence of ILD in the course of SjD.[18] The results of the presented study showed that patients with pulmonary domain involvement in the course of SjD were older at the time of diagnosis of the underlying disease, but on the contrary, we did not demonstrate such a relationship in the case of ILD lung.

Similar to previous observations, our study indicates that the most common type of interstitial lesions in SjD patients is NSIP, followed by UIP.[10,13,20] LIP changes, the most typical of SjD pattern, are found less frequently (in the population we analyzed, 11.7% of patients).

We did not demonstrate a relationship between the presence of ILD in HRCT and the immunological profile of the disease and inflammatory markers. The RF reaction was detected more frequently in patients with positive pulmonary

domain in ESSDAI, but not exactly ILD, similar to other publications.[5,9,18,21–24] Unlike other studies, we did not demonstrate any association between ILD-type changes and the presence of ENA antibodies.[5,9,18,21–24] With respect to histology, no significant differences were found in focus score (FS) and pulmonary domain just like in La Rocca group study.[25]

The second typical pulmonary manifestation in SjD patients, apart from ILD, is a tracheobronchial disease.[21] This duality of the clinical picture may be reflected in the presented clinical symptoms. In our study, patients with ILD in HRCT statistically more often reported shortness of breath. In the subpopulation with lung involvement without ILD, the chronic cough was significantly more frequently observed, which may be a typical symptom of the trachea and bronchial involvement associated with the presence of bronchiectasis, hyperreactivity, bronchitis, and bronchiolitis. On the other hand, the chronic cough (especially dry cough) may also be a symptom of ILD, it is necessary to extend the diagnostics by HRCT examination to verify the nature of pulmonary lesions. However, it should be remembered that some patients with ILD may be asymptomatic or have minimal symptoms, which should be taken into account in the initial assessment of a patient with SjD.

There is little to no data about patients suffering from a pulmonary disease meeting the pulmonary domain ESSDAI criteria preceding the diagnosis of SjD. In our group of patients, this situation was very rare, only in 3% of patients. The study we could correlate with is a French cohort study[26] of ILD among patients with SjD, where ILD was diagnosed in 25% of patients before SjD onset.[26] Nonetheless, some publications estimate that up to 65% of asymptomatic SjD patients will have abnormal pulmonary imaging.[27]

In our cohort, about 20% of patients had active pulmonary involvement in SjD, with 75% of these cases being active at diagnosis. This aligns with other studies: 15% in a Spanish cohort,[28] 11.6% in South Australia,[29] 10%–15% in the Netherlands,[30] and 21.5% in Greece.[31] Overall, pulmonary involvement in SjD ranges from 9% to 24%, with some reports suggesting it may vary between 9% and 75%.[22,26] These discrepancies may result from changes in classification criteria, different diagnostic methods, and cohort characteristics. Notably, older patients (>70 years) tend to have a higher pulmonary activity score compared to younger ones.[28,32,33]

In our study, 22% of patients had active pulmonary involvement after SjD onset. Follow-up studies indicate that pulmonary involvement becomes increasingly prevalent over time, contributing to lower quality of life and higher mortality risk in SjD patients.[22,29,34,35] We recommend assessing pulmonary symptoms even before SjD diagnosis to ensure appropriate treatment.

The risk of SjD is higher in former smokers compared to current smokers and never-smokers.[36] Studies show that active smokers have a lower risk of SjD and Ro52 antibodies,[37] but pulmonary involvement is more common in SjD patients who smoke.[9,21]

Our study found no increased incidence of ILD in patients with a history of smoking, with ILD affecting about half of patients in both groups. This contradicts some literature suggesting a higher prevalence of pulmonary involvement in smokers.[9,21]

The most common specific antibodies in our population were anti-SSA antibodies and found at similar frequencies in smokers and non-smokers. Karabulut et al.[38] reported a higher incidence of ANA in smokers but did not differentiate between specific antibodies. Anti-mitochondrial AMA antibodies were slightly more common in non-smokers, though not statistically significant, unlike findings by Huang et al.,[39] who identified AMA M2 and anti-Smith antibodies as ILD risk factors in SjD patients. Huang et al. also noted diabetes as a risk factor for ILD, which we did not observe in our analysis.

The limitation of our work was the lack of analysis of functional tests, lung ultrasound, serum albumin level, and the determination of cryoglobulins as one of the important markers of SjD activity.

Conclusion

Involvement of the pulmonary domain is common in patients with SjD. However, the clinical picture is very heterogeneous, which determines the subsequent personalization of treatment. A diagnostic algorithm is also needed to identify patients with pulmonary domain involvement. It seems that the most reasonable approach would

be to perform an HRCT scan and/or lung function test on each patient diagnosed with SjD.

Declarations

Ethics approval and consent to participate

Written informed consent was obtained from all participants according to the Declaration of Helsinki and the study was approved by the Wroclaw Medical University (Nr KB-836/2020).

Consent for publication

Not applicable.

Author contributions

Marta Madej: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Writing – original draft; Writing – review & editing.

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Piotr Wawryka: Investigation; Writing – original draft.

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Piotr Wiland: Writing – review & editing.

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Competing interests

The authors declare that there is no conflict of interest.

Availability of data and materials

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