Quality of life in SSc-ILD patients: Understanding the impact of the ILD and the needs of the SSc-ILD patients and their need for caregivers in France

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Abstract

Objectives: The objectives of this study were to describe the impact of systemic sclerosis associated interstitial lung disease, on quality of life, to estimate the correlation between quality of life and severity of lung disease and to assess the impact of interstitial lung disease on caregivers.

Methods: Seven investigators included systemic sclerosis associated interstitial lung disease patients from December 2019 to April 2020. Sociodemographics and clinical data were collected. Patients reported outcomes and questionnaires were used with 1 generic patients reported outcome (EQ-5D-5L), 1 specific PRO (Brief Interstitial Lung Disease) and 2 self-reported questionnaires on impact of SSc complications and impact on caregivers. The correlation between forced vital capacity and EQ-5D-5L score was estimated with a multivariate linear regression model adjusted on several covariates.

Results: In all, 89 patients were included. 26.4% were males, mean age was 58.2 ± 14.5 years. Mean EQ-5D-5L score = 0.79 ± 0.22 (median = 0.85). Mean EQ-5D-5L visual analog scale score = 60.8 ± 20.4 (median = 61.5). Mean King's Brief Interstitial Lung Disease score = 58.4 ± 12.7 (median = 58.0). After adjustment on covariates, a significant correlation between forced vital capacity and EQ-5D-5L score was found with an increase of 0.003 of the EQ-5D-5L score for a 1% increase of FVC ($p = 0.0096$). No significant correlation between forced vital capacity and the EQ-VAS and King's Brief Interstitial Lung Disease score were found. The impact of SSc on other organs was significantly correlated with EQ- 5D-5L score, respectively, for the impact scores on the lung system ($p = 0.0003$), heart system ($p = 0.0182$), Raynaud's syndrome ($p = 0.0015$), digestive system ($p = 0.0032$), joints/muscles ($p = 0.0003$), skin ($p < 0.0001$), kidney ($p = 0.0052$) and gastro-oesophageal reflux ($p = 0.0063$). Significant correlations between King's Brief Interstitial Lung Disease score and lung system ($p < 0.0001$), heart system ($p < 0.0001$), digital ulcers ($p = 0.058$), digestive system ($p < 0.0001$), kidney ($p = 0.0004$), skin ($p = 0.0499$) and gastro-oesophageal reflux ($p = 0.0033$) scores were found 68.5% of patients reported their need for a caregiver to help them in their daily life activities.

Conclusion: Our study highlighted the strong burden of systemic sclerosis associated interstitial lung disease` for patients, especially with an impact on quality of life, on other organs manifestations and need for caregivers in their daily life.

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Introduction

Systemic sclerosis (SSc) is a rare and heterogenous autoimmune disease characterized by endothelial dysfunction, immune dysregulation, microvascular damage, and subsequent fibrosis.[1] SSc is classified in two forms based on the extent of the skin involvement: limited cutaneous SSc (LsSSc) on the hands, arms, and face; and diffuse cutaneous SSc (DsSSc) with extensive skin thickening and visceral involvement.[2]

The worldwide prevalence of SSc varies geographically and was estimated between 3 and 24 per 100,000 population with higher prevalence in North America and Australia compared to Europe and Japan.[3] Women are more affected by the disease with an incidence ratio of 3:1 compared to men.[3] In France, 158.3 cases of SSc per million adults were reported in a multi-ethnic area in 2001 whereas another study reported 132.2 cases per million adults in 2006.[4] Over the past three decades, there has been an apparent increase in the incidence of SSc to approximately 20 per million, possibly due to improved diagnosis.[5]

SSc constitutes a major clinical challenge for health care providers and patients due to the disease heterogeneity and early complications. In addition to skin involvement, multiple organs can be affected by SSc including the lungs. Interstitial lung disease (ILD) is a common manifestation of SSc associated with dyspnea, inspiratory dry cough, and difficulties in performing daily activities. ILD occurs at an early stage in disease progression[6] and is a leading cause of death associated with poor survival in patients with SSc, with a prevalence of up to 30% and a 10-year mortality of up to 40%.[7,8] ILD is more common among African Americans and in people with the diffuse cutaneous form of SSc or anti-topoisomerase 1 antibodies.

Some patient characteristics are thought to be associated with a higher risk of ILD development such as diffuse cutaneous SSc, anti-topoisomerase antibodies, sex, and ethnicity.[9–12] Despite the higher prevalence of SSc in women, ILD is more likely to occur in men with SSc compared to women with SSc.[7] Furthermore, Afro-Caribbeans with SSc are more likely to develop ILD than European-descent white patients.[8] ILD progression rates vary considerably among patients with SSc.[13]

Previous studies have evaluated the economic burden of SSc and impact on the quality of life in terms of employment status and disability.[14–16] However, few studies have focused on the impact of SSc-ILD on the health-related quality of life (HRQoL) from a patient perspective in the overall management of the disease.[17] Therefore, to raise awareness of the repercussions of this disease for patients and their need for caregivers, we aimed to describe the HRQoL of patients with SSc-ILD, determine the association between ILD severity and HRQoL, and describe ILD impact on patients' need for caregivers in France.

Methods

Design

Patients with SSc-ILD were recruited in seven expert centres in France between 1 December 2019 and 20 April 2020. All participants received detailed information about the study and were not requested to provide consent as stipulated in the Reference Methodology 004 (MR-004). The MR-004 is a procedure developed by the French Data Protection Authority (CNIL) to simplify health data processing without the need to obtain patient consent for every study. An agreement was signed to ensure compliance with the CNIL's policy on patient consent.

Adult patients with SSc–ILD presenting to the investigating centres were included in the study. Patients participating in SENSCIS and SENSCIS-ON studies or those treated with anti-fibrotic therapy were excluded from the study.[18] Patients, who chose to fill out the questionnaire on paper, were provided a pre-paid envelope to return the questionnaire once completed. All patients were given a form with their clinical information to be documented in the first section of the questionnaire. Data were reported anonymously by patients in the questionnaire which was divided into the 4 following sections: demographics, disease duration, HRQoL, impact of nine type of organ involvement on HRQoL and perception of symptoms severity, and their need for caregivers. The investigators reported forced vital capacity (FVC) %, type of SSc, and presence of autoantibodies.

Data on HRQoL were collected through the five-level EQ-5D and the King's Brief Interstitial Lung Disease (K-BILD) self-assessment questionnaires. The EQ-5D[19] is a validated questionnaire recommended in patients with SSc and consists of the EQ-5D-5L descriptive system and the visual analogue scale (VAS). It is validated in many countries, including France and has been widely used in population health surveys, clinical studies and economic evaluations. EQ-5D-5L is the utility standard questionnaire requested by the French Health Technology Assessment (Haute Autorité de Santé) for medico-economic evaluation of drugs and devices.[20] The descriptive system assesses five dimensions including mobility,

self-care, daily activities, pain/discomfort, and anxiety/depression. Each of these dimensions has five response levels: no problems, slight problems, moderate problems, severe problems, and unable to/extreme problems. The EQ-5D-5L score increases with a better QoL and ranges from 1 (maximum value) to -0.525. The VAS reports the patient's self-rated health from 0 'the worst health you can imagine' to 100 'the best health you can imagine'. The K-BILD was established to measure the impact of lung fibrosis on the patient's wellbeing and daily life.[21] The K-BILD is a 15-item brief questionnaire that covers three domains (breathlessness and activity, chest symptoms, and psychological impact) with a total score ranging from 0 to 100, where higher values indicate better health. Scores of EQ-5D-5L and K-BILD were considered only for patients with complete answers to all items of the questionnaires.

The impact of organs involvement and symptoms severity on HRQoL was collected using the impact questionnaire,[22] which was developed by a group of experts and being used in SSc-ILD patients. The impact questionnaire consists of 10-point numeric rating scale ranging from 0 (no impact) to 10 (extremely severe impact). The nine types of organ involvement assessed for the impact on HRQoL included the kidneys, heart, digital ulcers, digestive system, gastroesophageal reflux (GERD), skin, articulations and muscles, lungs, and Raynaud syndrome. The perception of symptoms severity included diarrhoea, nausea/vomiting, infections, fatigue, hair loss, and weight gain.

To describe the disease impact on their daily life, patients had to answer questions on the need for caregivers, relocation of their home because of the SSc and needs related to SSc on a scale of 1 to 10.

Statistical analysis

A descriptive analysis was conducted using frequencies and percentages for qualitative variables and mean and standard deviation for quantitative variables. FVC was used to assess the severity of the lung disease as a continuous and dichotomic variables (FVC $< 80\%$ / $\geqslant 80\%$). A univariate analysis and multivariate linear regression with Pearson correlation were conducted to determine the association between SSc-ILD severity and HRQoL. The dependent variables were HRQoL scores (EQ-5D-5L and K-BILD), and two regression analyses were conducted for each score. In ordrer to adjust the results on potential confounding factors, the following covariates were forced into the model as independent variables: age, gender, disease duration, cutaneous form of SSc (diffuse vs limited), and presence of anti-topoisomerase autoantibodies. p values $<$ 0.05 were considered significant in the comparison between groups. Analyses were performed with SAS software, version 9.4 (North Carolina, USA).

Based on previous similar studies, we planned to include 150 patients in this study.[14]

Table 1. Baseline characteristics of patients with SSc-ILD.

Variables (number of respondants)	Population N = 89
Gender, (N = 87) n (%)	
Male	23 (26.4%)
Female	64 (73.6%)
Age (years), (N = 87) mean (SD)	58.2 (14.5)
SSc duration (years), (N = 86) mean (SD)	11.2 (9.5)
SSc classification, (N = 86) n (%)	
Diffuse cutaneous	52 (60.5%)
Limited cutaneous	34 (39.5%)
FVC %, (N = 85) mean (SD)	86.8 (24.9)
FVC % in diffuse cutaneous SSc	83.9 (23.5)
FVC % in limited cutaneous SSc	91.6 (27.0)
Anti-centromere antibodies positive, (N = 81) n (%)	9 (11.1%)
Anti-topoisomerase antibodies positive, (N = 83) n (%)	49 (59.0%)
Anti-RNA antibodies positive, (N = 73) n (%)	4 (5.5%)

BILD: brief interstitial lung disease; SSc-ILD: systemic sclerosis related-interstitial lung disease; FVC: forced vital capacity; SD: standard deviation.

Results

Patient characteristics

A total of 89 patients completed the study. The majority of patients were women (73.6%), mean age at inclusion was 58.2 years, and mean duration of SSc was 11.2 years (Table 1). The most predominant form of the disease was diffuse SSc, present in 60.5% of patients. Anti-topoisomerase antibodies were detected in 59% of patients whereas anti-centromeres and anti-RNA antibodies were observed in 11.1% and 5.5% of patients, respectively. Mean FVC was 86.8% in the overall study population and 62.4% of patients had an FVC $\geqslant 80\%$. Mean FVC was higher in patients with limited cutaneous SSc (91.6 %) compared to that of patients with diffuse cutaneous SSc (83.9%).

HRQoL

The HRQoL scores for EQ-5D-5L and K-BILD were available for 97.8% and 95.5% of patients, respectively. HRQoL data are depicted in Table 2. The mean score of EQ-5D-5L was 0.793 (SD = 0.216) with a score $\geqslant 0.6$ reported in 82.7% of patients. The mean score of VAS was 60.8 (20.4), and 55.8% of patients had a VAS score $\geqslant 60$. The mean K-BILD score was 58.4 (12.7) and only 9.4% of patients had a total score $\geqslant 75$. The mean scores for the three dimensions of the K-BILD were 63.8 (19.6) for the psychological score, 48.5 (21.9) for the breathlessness and activities score and 75.2 (22.2) for the chest symptoms score.

The univariate analysis found a significant lower EQ-5D-5L score (-0.109) for patients with an FVC < 80% compared to patients with FVC ⩾ 80% (p = 0.026). There was no significant association between EQ-5D-5L score and disease duration, age, gender, or anti-topoisomerase. In the multivariate analysis (Table 3), a significant correlation was found between FVC and EQ-5D-5L score with an increase of 0.03 for 10% increase of the FVC (p = 0.009). A significant correlation was also observed between HRQoL and age or SSc cutaneous subset; HRQoL decreased when age increased (p = 0.002) and patients with limited cutaneous SSc had a better HRQoL compared to those with a diffuse form (p = 0.0045). Moreover, patients with FVC < 80% had a worse HRQoL compared to those with FVC ⩾ 80% (p = 0.004). There were no significant correlations between gender, disease duration or presence of anti-topoisomerase antibodies and EQ-5D-5L score.

The K-BILD score was not associated to FVC nor was it correlated to gender, SSc form, or anti-topoisomerase in the multivariate analysis (Table 3). However, a significant association was found between the K-BILD score and age (p = 0.033) in the subset of FVC < 80 vs ⩾ 80%. The K-BILD score decreased by 0.24 point when age increased by 1 year.

Table 2. HRQoL scores for patients with SSc-ILD.

HRQoL scores	Total population (N = 89)
Total EQ-5D-5L score	
n (%)	87 (97.8%)
Mean (SD)	0.793 (0.216)
EQ-5D-5L score distribution	
<0.3	4 (4.6%)
(0.3–0.6)	11 (12.6%)
(0.6–0.9)	37 (42.5%)
>0.9	35 (40.2%)
VAS	
n (%)	86 (96.6%)
Mean (SD)	60.8 (20.4)
K-BILD score	
n (%)	85 (95.5%)
Mean (SD)	58.4 (12.7)
K-BILD score distribution	
[25–50]	21 (24.7%)
[50–75]	56 (65.9%)
[75–100]	8 (9.4%)

BILD: brief interstitial lung disease; SD: standard deviation; VAS: visual analogue scale.

Organ involvement

The impact of organ involvement on HRQoL (Figure 1(a) and (b)) were ranked as follows from the highest to the lowest impact: Raynaud syndrome (mean score: 5.6 ± 2.9), articulations and muscles (mean score: 4.4 ± 2.8), lungs (mean score: 3.9 ± 3.0), skin (mean score: 3.8 ± 3.4), GERD (mean score: 3.7 ± 3.2), digestive system (mean score: 3.4 ± 3.1), digital ulcers (mean score: 2.6 ± 3.0), heart (mean score: 1.8 ± 2.4), and kidneys (mean score: 1.1 ± 2.2).

In the multivariate analysis (Table 4), significant correlations were found between organ involvement and the EQ-5D-5L and K-BILD scores.

Overall, an increase of the organ score was associated with a decrease of EQ-5D-5L score. The more the organ was damaged, the greater was the impact on EQ-5D-5L score:: lungs (p = 0.0003, β coefficient: -0.03), heart (p = 0.018, β coefficient: -0.026), Raynaud syndrome (p = 0.0015, β coefficient: -0.028), digestive system (p = 0.003, β coefficient: -0.025), Articulations and muscles (p = 0.0003,

Table 3. Multivariate analysis- Severity of SSc-ILD and HRQoL scores.

	EQ-5D-5L score		K-BILD score	
	β coefficient	p-value	β coefficient	p-value
FVC	0.003	0.009	0.003	0.9
Age	−0.064	0.002	−0.16	0.17
Gender: female vs male	−0.06	0.2	−0.18	0.3
Disease duration	0.003	0.2	−3.6	0.3
Diffuse SSc vs limited SSc	−0.14	0.0045	−1.21	0.7
Anti-topoisomerase: negative vs positive	−0.004	0.9	−0.95	0.7
FVC (<80 vs ⩾80%)	−0.158	0.004	−5.67	0.079
Age	−0.006	0.003	−0.24	0.033
Gender: female vs male	−0.059	0.3	−0.13	0.4
Disease duration	0.004	0.18	−3.36	0.3
Diffuse SSc vs limited SSc	−0.123	0.014	−0.6	0.8
Anti-topoisomerase: negative vs positive	−0.009	0.9	0.4	0.9

BILD: brief interstitial lung disease; SSc-ILD: systemic sclerosis related-interstitial lung disease; FVC: forced vital capacity.

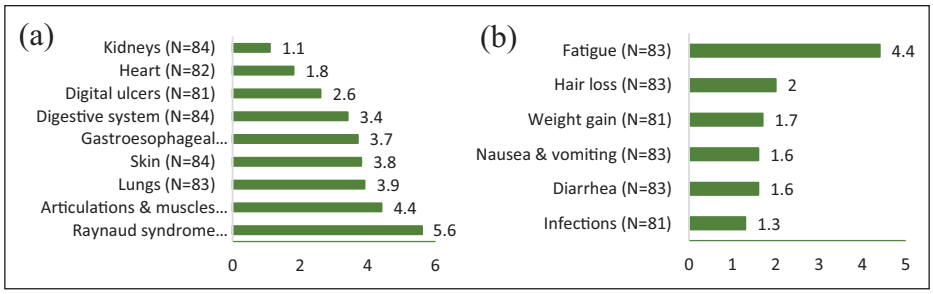

Figure 1. (a) Mean score of organ involvement. (b) Mean score of symptoms severity.

Table 4. Multivariate analysis- Organ involvement and HRQoL scores.

	EQ-5D-5L score		K-BILD score	
	β coefficient	p-value	β coefficient	p-value
Lung	−0.03	0.0003	−3.03	<0.0001
Heart	−0.026	0.0182	−2.43	<0.0001
Raynaud syndrome	−0.028	0.0015	−1.02	0.051
Digital ulcers	0.0013	0.1143	−0.92	0.058
Digestive system	−0.025	0.0032	−1.88	<0.0001
Articulations and muscles	−0.031	0.0003	−0.85	0.0957
Kidney	−0.032	0.0052	−2.24	0.0004
Skin	−0.032	<0.0001	−0.91	0.0499
Gastroesophageal reflux	−0.022	0.0063	−1.32	0.0033
Other	0.028	0.3344	2.48	0.676

KBILD: King's brief interstitial lung disease.

β coefficient: -0.031), kidney ($p = 0.005$, β coefficient: -0.032), skin ($p < 0.0001$, β coefficient: -0.032), and GERD ($p = 0.006$, β coefficient: -0.022). However, there was no correlation with digital ulcers and EQ-5D-5L score.

The impact of organ involvement on HRQoL with the K-BILD score was observed with the following: lungs ($p < 0.0001$, β coefficient: -3.03), heart ($p < 0.0001$, β coefficient: -2.43), digestive system ($p < 0.0001$, β coefficient: -1.88), kidney ($p = 0.0004$, β coefficient: -2.24), skin ($p = 0.0499$, β coefficient: -0.91), and GERD ($p = 0.003$, β coefficient: -1.32). No correlation was found between K-BILD score and Raynaud syndrome, digital ulcers, or articulations and muscles.

Symptoms severity

The symptoms were ranked from the most severe to the least severe as follows: fatigue (mean score: 4.4 ± 3.1), hair loss (mean score: 2.0 ± 2.8), weight gain (mean score: 1.7 ± 2.7), nausea and vomiting (mean score: 1.6 ± 2.5), diarrhoea (mean score: 1.6 ± 2.3), and infections (mean score: 1.3 ± 2.2).

In the multivariate analysis, a significant correlation was observed between the EQ-5D-5L score and nausea/vomiting ($p = 0.0021$, β coefficient: -0.035), fatigue ($p = 0.0037$, β coefficient: -0.025), and hair loss ($p = 0.011$, β coefficient: -0.025). The multivariate analysis found a significant correlation between the K-BILD score and diarrhoea ($p = 0.028$, β coefficient: -1.46), nausea/vomiting ($p < 0.0001$, β coefficient: -2.49), infections ($p < 0.0001$, β coefficient: -2.96), fatigue ($p < 0.0001$, β coefficient: -2.39), and hair loss ($p = 0.003$, β coefficient: -1.57). However, there was no association between the K-BILD score and weight gain.

Caregivers and patients. A total of 61 patients (68.5%) declared having a caregiver to help them. The caregiver was more frequently a family member assisting the patient either alone or with another non-professional caregiver, observed for 54 patients. Among the 39 patients who were being helped by a caregiver, 4 (10.5%) of these caregivers had an impact of SSc-ILD on their professional activity. The main needs for patients were information about the progression of their disease with a score of 6.2 ± 3.3, information on type of help available and how to access it (score: 5.6 ± 3.7), and advice on diet and hygiene (5.0 ± 3.7).

Discussion

This study conducted in patients with SSc-ILD in France brings new insights on an association between ILD severity and HRQoL. The main limitation of this study is the

lack of representativity since the inclusion of patients was limited to seven expert centres. As this study was conducted in a real-world setting, the relation between EQ-5D-5L/KBILD scores and FVC can be biased by confounding factors. Therefore, adjustment for main confounding factors including age, gender, disease duration, form of SSc and presence of autoantibodies were performed in multivariate analyses. Furthermore, although we had planned to include 150 patients, we stopped the inclusions at the 89th included patients because of the hospital overload due to the COVID pandemic. However, the results of our study are similar to those of previous similar studies. Another limitation is that we did not collect smoking and the presence of lung co-morbidities in addition to ILD and we could not adjust for the confounders in the multivariate analysis.

Age and diffuse cutaneous subset of SSc were significantly associated with impaired QoL in SSc-ILD patients measured by the EQ-5D-5L score. However, the K-BILD score was associated with age only when considering FVC < 80 vs $\geqslant 80\%$.

Some studies have reported the impact of SSc in HRQoL using different questionnaires. Hudson et al.[23] had conducted a systemic review of 12 studies in 1127 SSc patients using the Medical Outcomes Trust Short Form 36 (SF-36) and found a significant impairment in the HRQoL. Although physical and mental health were both affected, the highest impairment was observed with physical health compared to that of the general population. Moreover, patients with a diffuse cutaneous subset of the disease had a poorer physical health compared to that of those with a limited form, while mental health was impaired at the same level in both forms of the disease. Hudson et al. also reported that increasing age was associated with better QoL and that patients with a diffuse form of SSc had a worse QoL. However, our study shows a decrease in HRQoL correlated with an increase of age whereas the association between HRQoL and diffuse SSc was consistent with that of Hudson et al.

In the herein study, the mean score of EQ-5D-5L and K-BILD was 0.793 ± 0.216 and 63.8 ± 19.6, respectively, which was higher than that of Chevreul et al.,[14] who reported an EQ-5D-5L score of 0.49 ± 0.25 in a cross-sectional study in France. This discrepancy can be explained by the method of calculation used for this score. In fact, Chevreul et al.,[14] used the mapping values of the EQ-5D-5L scores from the three-level EQ-5D value since a value set of utility scores for the EQ-5D-5 was not available in France at the time their study was conducted.[24] It was shown that the difference of these 2 modes of calculation lead to a large increase in the results with the French value set.[25] Chevreul et al.,[14] also found a significant lower EQ-5D-5L score for patients with the lowest functional level ($p < 0.0001$), but no association was reported between HRQoL and age, gender, or disease duration.[14] Other studies reported EQ-5D-5L scores among SSc that were similar to ours.[26,27]

The duration of SSc in our study was similar to that of Nihtyanova et al.,[28] who conducted a study in patients with SSc including 654 with clinically significant pulmonary fibrosis. The proportion of women was higher in that study (82.9%) compared to ours (73.6%) as well as the presence of anti-centromeres antibodies in 21.3% of patients. Our findings on the demographic description of included SSc patients are consistent with those of the EUSTAR cohort which included 3778 adult patients with SSc-ILD. However, the proportion of patients with diffuse SSc was slightly lower in the EUSTAR study (44.4%) compared to ours.

The difference between $< 80\%$ and $>= 80\%$ is a 5.67 improvement in the mean score but the difference is not significant ($p = 0.079$). However, included patients had a high FVC (86.8) and thus a low impact of ILD on lung function according to this parameter. The variation of the FVC between patient may have been too low and below a threshold to see an impact on the K-Bild score. Other studies showed a significant correlation between the K-Bild score and the FVC, however they have included patients with Idiopathic pulmonary fibrosis who had a much lower FVC.[29] In the INBUILD trial a significant improvement was reached for FVC but K-BILD score was not significantly different in the treated and control group.[30] In our study, the EQ-5D-5L score increased significantly by 0.03 for 10% increase of the FVC. This finding is consistent with that of Ciaffi et al.,[31] who had performed a retrospective study in 378 patients with SSc including 156 patients with ILD and pulmonary arterial hypertension. They reported that changes in lung function have a significant impact on HRQoL using the EQ-5D score in both its utility score ($p = 0.003$) and VAS ($p < 0.001$) over time. For 1% increase of the FVC, patients were expected to have a 0.001 higher EQ-5D utility score and a 0.188 higher VAS.

Our study found that patients with FVC $< 80\%$ had a worse QoL compared to those with FVC $\geqslant 80\%$. It is well established that low FVC is associated with comorbidities including obesity, cardiovascular diseases, pulmonary diseases, and metabolic syndrome, which may further impact QoL.[32,33] We have observed that QoL score increased by 0.03 points for 10% increase in FVC. This is particularly important to consider in the management of patients with SSc in order to improve their QoL. Interestingly, there were no significant associations found between gender, disease duration or anti-topoisomerase and QoL scores in our study. However, Park et al.[34] reported a poorer HRQoL in SSc patients compared to those with other systemic rheumatic diseases after adjustment for disease duration, age, sex, comorbidities, and disease activity state. Furthermore, SSc patients were more likely to report impaired mental health and poor perception of general

health than those with rheumatoid arthritis and systemic lupus erythematosus. In addition, the extent of skin involvement was correlated with a low physical and mental HRQoL scores in SSc patients.

EQ-5D-5L scores were significantly correlated with the following organ involvement scores: lungs, heart, Raynaud syndrome, digestive system, kidneys, skin, or GERD. Similar results were observed regarding K-BILD except for Raynaud syndrome. Moreover, Frantz et al.,[22] carried out a study on 1902 patients over 60 countries and reported that Raynaud's phenomenon and gastrointestinal complications had the main impact on QoL. It is well established that Raynaud's phenomenon is the most prevalent manifestation of SSc[6,35] and affects approximately 96% of patients. It is most often the earliest clinical manifestation of SSc and appears years before additional symptoms emerge. Our findings suggest that health care providers should pay attention to the types of organ involvement in SSc patients when targeting QoL improvement as part of disease management.

In the herein study, we assessed patients' perception on the severity of symptoms to better understand how SSc-ILD patients perceive and respond to their condition. Indeed, patients' perception has been increasingly measured in other chronic diseases in recent years. However, very few studies have assessed patients' perception in SSc-ILD. This is an important aspect to take into account since illness perception is believed to influence self-management behaviour, functional disability, and distress among others.[36,37] Arat et al.[38] determined that illness perception was a greater contributor to physical and mental health in SSc patients compared to general disease activity or skin score. Furthermore, Richards et al.[39] concluded that patients' beliefs and emotional response were associated with their own meaning related to the disease rather than the clinical severity. These results support that patients' perception of SSc is an important point to consider in the management of the disease.

Conclusion

This study has identified factors associated with QoL and illness severity from patients' perception using the EQ-5D-5L and K-BILD self-questionnaires. The significant impact of SSc-ILD on HRQoL and the burden of the symptoms expressed by patients are the main results of this study. Identification of these factors will help guide the overall management of the disease while improving quality of life in SSc-ILD patients.

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