Asociación Colombiana de Reumatología

Revista Colombiana de REUMATOLOGÍA

www.elsevier.es/rcreuma

Review article

Measurement of health-related quality of life in patients with interstitial lung disease and autoimmune diseases

Claudia Mora[a,*], *Alirio Rodrigo Bastidas Goyes*[a,b], *Lina Paola Fajardo Muriel*[c], *Cristian Felipe Rodríguez Yasno*[c]

[a] *Department of Internal Medicine, Faculty of Medicine, Universidad de La Sabana, Chía, Colombia*
[b] *Research Department, Faculty of Medicine, University of La Sabana, Chia, Colombia*
[c] *Internal Medicine Residency, Faculty of Medicine, Universidad de La Sabana, Chía, Colombia*

ARTICLE INFO

Article history:
Received 11 April 2023
Accepted 24 August 2023

Keywords:
Autoimmune disease
Interstitial lung disease
Health-related quality of life

ABSTRACT

Autoimmune diseases comprise a wide and diverse group of diseases, each with its own specific complications, and with common complications such as pulmonary involvement. Lung involvement is extensive and one of its complications is interstitial lung disease, which varies widely within each of the autoimmune diseases. Health-related quality of life is defined as all those aspects that reflect the impact of the disease and the perception of disability and daily functionality of the patient. Even though this concept is subjective, health researchers have sought to define it to serve as a tool in the evaluation of interventions in subjects with different types of pathologies, so much so that it has become a main outcome in program evaluation and clinical research. To date, we are not aware of tools designed with the objective of measuring quality of life specifically in lung involvement due to interstitial lung disease related to autoimmune diseases. The objective of this review will be to further explore the available information on the measurement of quality of life in these patients.

Medición de calidad de vida relacionada con la salud en pacientes con enfermedad pulmonar intersticial y enfermedades autoinmunes

Palabras clave:
Enfermedad autoinmune
Enfermedad pulmonar intersticial
Calidad de vida relacionada con la salud

RESUMEN

Las enfermedades autoinmunes comprenden un amplio y diverso grupo de enfermedades, cada una de ellas con complicaciones propias de cada entidad y con otras comunes, como el compromiso pulmonar. El compromiso pulmonar es amplio, y una de sus complicaciones es la enfermedad pulmonar intersticial, con presentación variable dentro de cada una de las enfermedades autoinmunes. La calidad de vida relacionada con la salud se define como todos aquellos aspectos que reflejan el impacto de la enfermedad y la percepción en discapacidad y funcionalidad diaria del paciente. A pesar de que este concepto es subjetivo, los

* *Corresponding author.*
E-mail address: claudia.mora@unisabana.edu.co (C. Mora).

investigadores de salud han buscado su objetivación para que sirva como una herramienta en la evaluación de las intervenciones en sujetos con diferentes tipos de patologías; tanto es así, que se ha convertido en un desenlace principal en la evaluación de programas y en investigación clínica. Hasta la fecha no conocemos herramientas diseñadas con el objetivo de medir la calidad de vida específicamente en el compromiso pulmonar por enfermedad pulmonar intersticial relacionada con enfermedades autoinmunes. El objetivo de esta revisión es el de profundizar en la información disponible sobre la medición de la calidad de vida en estos pacientes.

Introduction

Health-related quality of life (HRQoL) encompasses the physical, mental, and social impact of a disease, as well as the perception of disability and daily functioning in individuals. It includes physical function, such as self-care tasks (bathing, dressing, walking), work-related tasks (paid or unpaid), and social functionality (ability to interact with family and friends). The mental domain relates to well-being perception (happiness, sadness, depression, anxiety), pain, and fatigue.[1]

Despite its subjective nature, researchers in health care field have strived to standardize HRQoL assessment as a valuable tool for evaluating interventions across different pathologies. In fact, it has emerged as a primary outcome measure in program evaluation and clinical research.[2] Patients with autoimmune-related interstitial lung disease experience impaired functionality and a substantial symptom burden, significantly impacting their quality of life.[3]

The evaluation of HRQoL can be accomplished using generic or specific instruments.[2] This review aims to describe the HRQoL scales used in patients with autoimmune-related interstitial lung disease and summarize the reported findings regarding HRQoL measurement in this population.

Methodology

A comprehensive literature search was conducted across multiple databases, including PubMed, Embase, LILACS, and Scopus, focusing on the topic of health-related quality of life (HRQoL) in patients with interstitial lung disease and autoimmune diseases. The search strategy involved the combination of key terms, including “autoimmune disease,” “interstitial lung disease,” and “health-related quality of life”. Additionally, specific searches were performed for individual diseases using the following terms: “interstitial lung disease” AND “health-related quality of life” AND “rheumatoid arthritis”; “interstitial lung disease” AND “health-related quality of life” AND “systemic lupus erythematosus”; “interstitial lung disease” AND “health-related quality of life” AND “polymyositis dermatomyositis”; “interstitial lung disease” AND “health-related quality of life” AND “Sjogren’s Syndrome”; “interstitial lung disease” AND “health-related quality of life” AND “scleroderma”; and “interstitial lung disease” AND “health-related quality of life” AND “vasculitis.”

Results

A total of 3861 articles were retrieved through the literature search. Titles were screened for relevance to the research topic, and redundant titles were removed. Abstracts were reviewed, and articles deemed relevant to the review were included, while others were excluded. Furthermore, additional articles were identified through the bibliographic references of the retrieved articles. Following this selection process, a total of 37 articles were included in the narrative review.

HRQoL evaluation in interstitial lung disease

Interstitial lung diseases (ILD) encompass a heterogeneous group of pathologies characterized by parenchymal inflammation and fibrosis. Various diseases, including connective tissue diseases (CTD), can result in interstitial lung involvement. Systemic sclerosis (SSc), rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), inflammatory myopathies (IM), Sjögren’s syndrome (SS), and mixed connective tissue disease (MCTD) may present with interstitial lung involvement at different stages of their clinical course, with reported prevalence ranging from 13% for SLE to 91% in SSc.[4]

The presentation and clinical course of ILD vary depending on the underlying rheumatologic disease. Fatigue, cough, and dyspnea are the most common symptoms, significantly impacting the quality of life of affected patients. Within the spectrum of interstitial lung disease, pulmonary fibrosis (PF) and dyspnea, specifically, impose a substantial disease burden and disability on patients.[4]

In assessing health-related quality of life (HRQoL) in ILD, various instruments have been employed. These include generic instruments designed to evaluate quality of life in chronic diseases (not exclusively rheumatologic or pulmonary), instruments intended for quality of life measurement in other pulmonary diseases distinct from interstitial lung disease, specific instruments developed for assessing quality of life in interstitial lung disease patients, and instruments targeting specific domains or symptoms affecting quality of life without necessarily measuring HRQoL as a construct.[2]

Among the questionnaires used in HRQoL assessment in ILD, the most used are the St. George’s Respiratory Questionnaire (SGRQ), Short Form 36 (SF-36), King’s Brief ILD

Table 1 – Primary measurement scales for health-related quality of life in interstitial lung disease and their characteristics.

Instrument	Original design	Validated in ILD	Characteristics	Observations	Studies in rheumatic disease
SGRQ	Asthma and Chronic Obstructive Pulmonary Disease	Yes	Self-administered 50 items Scale 0–100, with 100 indicating worse HRQoL Domains: frequency and severity of symptoms, activities limited by dyspnea, impact on social and psychological functioning.	Translated into more than 77 languages. Extensive length, complex algorithm for final calculation which makes it difficult to apply in daily clinical practice.	SSc[1,35]
SGRQ-I	Specific version of SGRQ for idiopathic pulmonary fibrosis (IPF)	Yes	It contains 34 items to measure HRQOL of the original SGRQ that are more specific to IPF.	Translation to different languages and clinical experience still limited.	No
CAT	Chronic Obstructive Pulmonary Disease	Yes	Self-administered Scale 0–40, 40 indicating worse impairment. 8 items related to respiratory symptoms and their impact: cough, phlegm, chest tightness, shortness of breath, activities, confidence, sleep, and energy.	Good correlation with SGRQ in IPF and in ILD associated with CTD. Short and simple.	SLE, MCTD, RA, SSc, IIM, SSc[36]
K-BILD	Designed for ILD	NA	Self-administered 15 items Scale 0–100, 100 represents better health status. 3 domains: psychological, dyspnea and activities, chest symptoms.	Broad transcultural adaptation Brief	SSc[28]
ATAQ-IPF	Designed for ILD	NA	86 items, 14 domains. Cough (7 items), dyspnea (7 items), planning (6 items), sleep (6 items), mortality (6 items), energy (6 items), mental health (7 items), spirituality (6 items), social activities (6 items), finances (6 items), independence (6 items), sexuality (5 items), treatment (6 items).	Extensive	No
Living with IPF questionnaire (L-IPF)	Designed for ILD	NA	Self-administered 44 items, 2 domains: symptoms (23 items) and impact (21 items) of the disease.		RA, SSc, IIM, SSc[37]
SF-36	Generic, designed for the general population and population with disease	Yes	Self-administered 36 items Domains: Physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health.	It is one of the most widely used and evaluated generic HRQL questionnaires.	RA, SLE, SS, SSc, vasculitis[6,7,9,13,22,31]
EQ-5D5L	Generic, designed to measure disease burden	Yes	Two components, descriptive systems (utilities in mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) and a visual analog scale (VAS)	Validated in multiple countries and in studies involving healthy populations, clinical trials, and economic evaluations.	SLE, SSc[9,27]

ATAQ-IPF: A Tool to Assess Quality of life in Idiopathic Pulmonary Fibrosis, CAT: COPD Assessment Test, HRQoL: Health-related Quality of Life, ILD: interstitial lung disease, MCTD: Mixed Connective Tissue Disease, EQ-5D-5L: EuroQol-5 Dimensions 5-Level, IPF: Idiopathic Pulmonary Fibrosis, K-BILD: King's Brief Interstitial Lung Disease, SGRQ: Saint George's Respiratory Questionnaire, SGRQ-I: St George's Respiratory Questionnaire for Idiopathic Pulmonary Fibrosis, SF-36: Short Form-36 Health Survey, RA: rheumatoid arthritis, SSc: systemic sclerosis, SLE: systemic lupus erythematosus, SS: Sjögren syndrome.

questionnaire (K-BILD), and EuroQoL (EQ-5D).[5] Among these, SF-36 and EQ-5D are generic instruments, SGRQ was designed for evaluation in obstructive disease, and K-BILD is the only specific instrument for interstitial lung disease. Table 1 summarizes the diverse instruments employed for measuring HRQoL in ILD, along with their primary characteristics and their application in rheumatologic-related interstitial involvement.

Regarding symptom assessment in ILD, various tools have been employed. These include the University of California San

Diego-Shortness of Breath Questionnaire (UCSD-SOBQ), the modified Medical Research Council dyspnea scale (mMRC), the Baseline Dyspnea Index-Transition Dyspnea Index (BDI-TDI), and the dyspnea-12 (D12) for evaluating dyspnea severity. For assessing cough severity, frequency, and impact in ILD, the Leicester Cough Questionnaire (LCQ) and the Cough Quality of Life Questionnaire (CQLQ) have been used.[2]

HRQoL evaluation in ILD and rheumatologic disease

Pulmonary involvement in rheumatoid arthritis (RA) not only serves as an indicator of disease activity but also significantly impacts the patient's quality of life. The spectrum of pulmonary manifestations in RA ranges from pleural effusion and bronchiectasis to severe interstitial involvement, leading to notable functional and physical limitations in affected individuals.[6] When approaching these patients, both RA disease activity and respiratory functionality, along with their impact on quality of life, should be assessed.[7]

Patients with RA have been found to have lower quality of life scores compared to the general population, with even worse scores observed among those with pulmonary involvement secondary to RA. Among the commonly used generic instruments, the SF-36 has shown reliability and validity for assessing quality of life in RA. Poorer quality of life scores are associated with higher disease activity measured by disease activity scales such as the Clinical Disease Activity Index (CDAI). Specifically, as arthritis activity levels increase, quality of life levels notably decrease.[7]

A cohort study conducted in San Francisco compared the quality of life in patients with interstitial lung disease related to RA and idiopathic pulmonary fibrosis using the SF-36. The study demonstrated that patients with pulmonary involvement related to RA had poorer scores, particularly in the physical domain and the categories of bodily pain and general health.[6]

Although there is a significant decrease in HRQoL among patients with RA compared to the general population, patients in clinical remission of RA exhibit similar scores to the general population.[7] Measurement of quality of life should always be considered and included as a therapeutic goal in patients with rheumatoid arthritis to achieve a level of quality of life comparable to that of the general population.

For patients with interstitial lung disease related to RA, lung transplantation is a therapeutic option. Evidence suggests that quality of life improves following lung transplantation in these patients.[8]

In the follow-up of patients with systemic lupus erythematosus (SLE), three domains should be addressed: disease activity, accumulated damage, and quality of life.[9] Quality of life is significantly affected in SLE patients compared to the general population. However, within the SLE patient population, there is considerable variation depending on the extent of organ damage, with even further reductions in quality of life observed in patients with pulmonary involvement. Additionally, it is recognized that despite achieving clinical remission of the disease, aspects such as HRQoL and fatigue are not adequately controlled, and studies indicate a lack of agreement between physician assessment of disease activity and damage and the measurement of quality of life.[10]

Validated scales for measuring HRQoL in SLE patients and in SLE patients with interstitial lung disease have been applied in various cohort studies.[11] These include SF-36, EQ-5D-5L, HAQ, GHS (generic), and LupusPRO, LupusQoL (specific).[9] EQ-5D-5L, HAQ, GHS, and LupusPRO have a higher correlation with disease activity compared to SF-36, suggesting the use of LupusPRO as a specific tool and EQ-5D-5L as a generic tool for assessing and monitoring HRQoL in patients with SLE.[9,12]

Regarding inflammatory myopathies (IM), there is limited evidence regarding HRQoL and pulmonary involvement is scarce, and no specific scale for its measurement has been found. Generic scales such as SF-36 are commonly used in these patients. It has been observed that all domains assessed by the SF-36 are compromised in the short and medium term, both during disease activity and remission stages. The impairment of quality of life is associated with disease activity and treatment. Unfortunately, the impact on quality of life in patients with interstitial lung disease and IM has not been extensively studied.[13]

Interstitial lung disease is the most common complication of Sjögren syndrome, with a prevalence ranging from 8% to 39.1%.[14,15] Individuals with interstitial lung disease experience respiratory symptoms and impaired lung function, leading to a decreased quality of life.[16] The impact of interstitial lung disease in patients with Sjögren syndrome has been evaluated in various aspects, such as dry symptoms using the xerostomia scale (SXI),[17] dyspnea (mMRC),[18] anxiety and depression using the Hospital Anxiety and Depression Scale,[19] sleep quality using the Pittsburgh Sleep Quality Index (PSQI),[20] and fatigue using the Fatigue Severity Scale (FSS).[21] However, no statistically significant difference has been found between patients with and without interstitial lung disease ($p > 0.05$).[15]

When measuring quality of life using the SF-36 scale, it has been observed that patients with Sjögren syndrome and ILD have lower scores compared to patients without ILD,[22] particularly in the physical dimension with statistically significant differences in physical functioning (p 0.009), role limitations due to physical problems (p 0.004), and role limitations due to emotional problems (p 0.015).[15] These scores progressively correlate with worsening symptoms, decreased lung function, decreased quality of life, and potentially, mortality.[15]

Systemic sclerosis (SSc) can affect various organs, including the lungs, with interstitial lung disease being the primary manifestation.[23] Interstitial lung disease occurs in the early stages of progression and is a major cause of mortality, with a prevalence of 30% and a 10-year mortality rate of up to 40%.[24] Factors associated with the development of interstitial lung disease in systemic sclerosis include the presence of anti-topoisomerase antibodies, Afro-Caribbean ethnicity, and the diffuse cutaneous variant.[25,26]

In terms of HRQoL measurement in patients with interstitial lung disease secondary to systemic sclerosis, generic questionnaires such as the five-level EQ-5D-5L[27] and the King's Brief Interstitial Lung Disease (K-BILD)[28] have been used, along with pulmonary function tests. It has been found that patients with forced vital capacity (FVC) < 80% have lower EQ-5D-5L scores (−0.109) compared to those with FVC ≥ 80% ($p = 0.026$). Interestingly, a 10% increase in FVC is associated with a 0.03 increase in the EQ-5D-5L score ($p = 0.009$).[29] Another study with 378 patients demonstrated that improvement in the percent-

age of FVC was significantly associated with increased utility score (0.001; 95% CI: 0.000–0.002; $p = 0.003$) and visual analog scale (VAS) over time (0.188; 95% CI: 0.111–0.264; $p < 0.001$). Improvement in the percentage of DLCO was associated with an increase in the utility score (0.001; 95% CI: 0.000–0.002; p 0.038), while VAS results were not significant (0.020; 95% CI: −0.079 to 0.120; p 0.690). Furthermore, it was found that quality of life decreased with increasing age (p 0.002), and patients with limited cutaneous systemic sclerosis had better quality of life compared to those with the diffuse form (p 0.0045).[29,30]

In the application of K-BILD, a worse score was associated with age (p 0.033), with a decrease of 0.24 points for every 1-year increase in age, and there was no difference in pulmonary function tests.[29]

It has been demonstrated that increased organ involvement is associated with lower quality of life scores, with a greater impact observed as organ involvement increases. The most affected organs include the lungs ($p = 0.0003$), heart ($p = 0.018$), Raynaud's phenomenon ($p = 0.0015$), digestive system ($p = 0.003$), joints and muscles ($p = 0.0003$), kidney ($p = 0.005$), skin ($p < 0.0001$), and gastroesophageal reflux disease (GERD) ($p = 0.006$) for the EQ-5D-5L scale, and the lungs ($p < 0.0001$), heart ($p < 0.0001$), kidney ($p = 0.0004$), skin ($p = 0.0499$), and GERD ($p = 0.003$) for the K-BILD scale.[29]

Regarding the severity of symptoms, a significant correlation has been found with the impairment of HRQoL scales, with fatigue being of interest in our patients (p 0.0037) in the EQ-5D-5L score and ($p < 0.0001$) in the K-BILD score.[29]

In the application of SF-36 in systemic sclerosis, scores higher than one standard deviation below the general population have been observed, but there is no data available specifically for the subgroup of patients with interstitial lung disease.[31]

Pulmonary involvement in vasculitis is frequently observed in ANCA-associated vasculitis, with the reported prevalence of interstitial lung disease being 45% in microscopic polyangiitis and 23% in granulomatosis with polyangiitis. Anti-MPO antibodies are the main subtype of ANCA associated with interstitial lung disease, present in approximately 46–71% of cases, while anti-PR3 antibodies are reported in 0–29% of patients. It has been shown that vasculitis and interstitial lung disease are associated with reduced survival, with a mortality rate 2–4 times higher in patients with vasculitis and interstitial lung disease.[32]

Regarding the measurement of quality of life scales in patients with vasculitis, the SF-36 is one of the most commonly used scales, and it consistently shows scores below those of the normal population,[33,34] with improvement in domain scores following the initiation of treatment. While an association between vasculitis and interstitial lung disease is known, with an influence on prognosis and presumed impact on HRQoL, the reviewed articles did not provide information on quality-of-life scales specifically applied to the subgroup of patients with interstitial lung disease.[34]

Discussion

Interstitial lung involvement is common in inflammatory rheumatological diseases and is a factor that negatively affects morbidity and mortality rates in affected patients. In the past decade, the therapeutic approach in rheumatology has been guided by the treat-to-target (T2T) strategy, which aims for specific therapeutic goals, such as disease remission or low disease activity in certain contexts. Early diagnosis strategies and the development of more effective and less toxic pharmacological measures have also been reinforced, resulting in improved survival rates but increased burden of chronic disease. In fact, patients often report inadequate disease control despite physicians documenting disease remission. Therefore, a comprehensive evaluation of patients' health status should include not only disease activity or organ damage but also aspects related to health-related quality of life.

Assessing HRQoL in patients with ILD secondary to autoimmune diseases reveals lower scores in patients with pulmonary involvement compared to those without lung involvement. For systemic sclerosis, scales like EQ-5D-5L demonstrate a relationship between quality of life and pulmonary function test results.

Generic tools, such as the SF-36, are widely used to measure quality of life and have been applied in various conditions. SF-36, frequently utilized in the reviewed articles, assesses different domains (physical and mental) and provides a global approximation of patients' quality of life. There is a direct relationship between pulmonary involvement and lower SF-36 scores. Although SF-36 is not specific to this patient group, it offers valuable information for generating interventions and monitoring patients.

However, no specific scales were found for the specific patient group in focus, and not all scales have been consistently applied across different autoimmune diseases, limiting result comparability. Hence, further studies are needed to develop specific tools for patients with ILD and different autoimmune diseases, aiming to provide reliable and consistent results. Such tools would enable tailored interventions, improved functionality, symptom management, and reduced mortality rates.

While quality of life measurement scales exist for individual autoimmune diseases, there is a lack of research or reviews addressing their application specifically in the subgroup of patients with ILD secondary to vasculitis, SLE and IM. Therefore, further research is warranted to examine the impact on quality of life within this patient group.

Conclusion

Interstitial lung disease (ILD) that occurs secondary to autoimmune diseases has a significant impact on both mortality and quality of life. However, there is currently a lack of specific scales that can be universally applied to each autoimmune disease within this patient group. The most commonly used scale, the SF-36, is a generic tool, but its results vary across different diseases. Therefore, further studies or the development of new scales that can be applied to all patients with ILD, regardless of their specific autoimmune disease, are needed to better assess and understand the impact on quality of life. Such efforts would contribute to improving patient care and outcomes in this population.

Funding

Universidad de La Sabana, MEDEsp-102-2023.

Conflict of interests

The authors declare that they have no conflict of interest.

Appendix A. Supplementary material

The Spanish translation of this article is available as supplementary material at doi:10.1016/j.rcreu.2023.08.005.

REFERENCES

1. Karimi M, Brazier J. Health, health-related quality of life, and quality of life: what is the difference? Pharmacoeconomics. 2016;34:645–9, http://dx.doi.org/10.1007/s40273-016-0389-9.
2. Aronson KI, Suzuki A. Health related quality of life in interstitial lung disease: can we use the same concepts around the world? Front Med (Lausanne). 2021;8. Available from: https://doi.org/10.3389/fmed.2021.745908 [cited 4.7.23].
3. Phua G, Tan GP, Phua HP, Lim WY, Neo HY, Chai GT. Health-related quality of life in a multiracial Asian interstitial lung disease cohort. J Thorac Dis. 2022;14:4713–24, http://dx.doi.org/10.21037/jtd-22-906.
4. Jeganathan N, Sathananthan M. Connective tissue disease-related interstitial lung disease: prevalence, patterns, predictors, prognosis, and treatment. Lung. 2020;198:735–59, http://dx.doi.org/10.1007/s00408-020-00383-w.
5. Cox IA, Arriagada NB, De Graaff B, Corte TJ, Glaspole I, Lartey S, et al. Health-related quality of life of patients with idiopathic pulmonary fibrosis: a systematic review and meta-analysis. Eur Respir Rev. 2020;29:1–22, http://dx.doi.org/10.1183/16000617.0154-2020.
6. Natalini JG, Swigris JJ, Morisset J, Elicker BM, Jones KD, Fischer A, et al. Understanding the determinants of health-related quality of life in rheumatoid arthritis-associated interstitial lung disease. Respir Med. 2017;127:1–6, http://dx.doi.org/10.1016/j.rmed.2017.04.002.
7. Matcham F, Scott IC, Rayner L, Hotopf M, Kingsley GH, Norton S, et al. The impact of rheumatoid arthritis on quality-of-life assessed using the SF-36: a systematic review and meta-analysis. Semin Arthritis Rheum. 2014;44:123–30, http://dx.doi.org/10.1016/j.semarthrit.2014.05.001.
8. Yazdani A, Singer LG, Strand V, Gelber AC, Williams L, Mittoo S. Survival and quality of life in rheumatoid arthritis-associated interstitial lung disease after lung transplantation. J. Heart Lung Transplant. 2014;33:514–20, http://dx.doi.org/10.1016/j.healun.2014.01.858.
9. Grau García E, Fragío Gil JJ, Ivorra Cortes J, Ortiz Sanjuan FM, Chalmeta Verdejo I, Román Ivorra JA. The impact of disease activity on health-related quality of life in patients with systemic lupus erythematosus. Med Clin (Barc). 2023;160:428–33, http://dx.doi.org/10.1016/j.medcli.2022.11.019.
10. Kernder A, Elefante E, Chehab G, Tani C, Mosca M, Schneider M. The patient's perspective: are quality of life and disease burden a possible treatment target in systemic lupus erythematosus? Rheumatology. 2020;59 Suppl. 5:v63–8, http://dx.doi.org/10.1093/rheumatology/keaa427.
11. Trentin F, Zucchi D, Signorini V, Elefante E, Bortoluzzi A, Tani C. One year in review 2021: systemic lupus erythematosus. Clin Exp Rheumatol. 2021;39:231–41, http://dx.doi.org/10.55563/clinexprheumatol/7gzsxp.
12. Shi Y, Li M, Liu L, Wang Z, Wang Y, Zhao J, et al. Relationship between disease activity, organ damage and health-related quality of life in patients with systemic lupus erythematosus: a systemic review and meta-analysis. Autoimmun Rev. 2021;20:102691, http://dx.doi.org/10.1016/j.autrev.2020.102691.
13. Ponyi A, Borgulya G, Constantin T, Va'ncsava'ncsa A, Gergely L, Danko K. Functional outcome and quality of life in adult patients with idiopathic inflammatory myositis. Rheumatology. 2005;44:83–8, http://dx.doi.org/10.1093/rheumatology/keh404.
14. Manfredi A, Sebastiani M, Cerri S, Cassone G, Bellini P, Casa G, et al. Prevalence and characterization of non-sicca onset primary Sjögren syndrome with interstitial lung involvement. Clin Rheumatol. 2017;36:1261–8, http://dx.doi.org/10.1007/s10067-017-3601-1.
15. Zhao R, Wang Y, Zhou W, Guo J, He M, Li P, et al. Associated factors with interstitial lung disease and health-related quality of life in Chinese patients with primary Sjögren's syndrome. Clin Rheumatol. 2020;39:483–9, http://dx.doi.org/10.1007/s10067-019-04753-5.
16. Palm Ø, Garen T, Enger TB, Jensen JL, Lund MB, AalØkken TM, et al. Clinical pulmonary involvement in primary Sjögren's syndrome: prevalence, quality of life and mortality-a retrospective study based on registry data. Rheumatology. 2013;52:173–9, http://dx.doi.org/10.1093/rheumatology/kes311.
17. He SL, Wang JH, Li M. Validation of the Chinese version of the Summated Xerostomia Inventory (SXI). Qual Life Res. 2013;22:2843–7, http://dx.doi.org/10.1007/s11136-013-0420-y.
18. Bollmeier SG, Seaton TL, Prosser TR, Chou YT, Reckenberg K, Hahn B, et al. Assessment of symptom burden and adherence to respiratory medications in individuals self-reporting a diagnosis of COPD within a community pharmacy setting. J Am Pharm Assoc (2003). 2019;59:479–88.e1, http://dx.doi.org/10.1016/j.japh.2019.04.017.
19. Cui Y, Xia L, li L, Zhao Q, Chen S, Gu Z. Anxiety and depression in primary Sjögren's syndrome: a cross-sectional study. BMC Psychiatry. 2018;18:131, http://dx.doi.org/10.1186/s12888-018-1715-x.
20. Priori R, Minniti A, Antonazzo B, Fusconi M, Valesini G, Curcio G. Sleep quality in patients with primary Sjögren's syndrome. Clin Exp Rheumatol. 2016;34:373–9. Available from: https://www.clinexprheumatol.org/abstract.asp?a=9329 [cited 29.3.23].
21. Haldorsen K, Bjelland I, Bolstad AI, Jonsson R, Brun JG. A five-year prospective study of fatigue in primary Sjögren's syndrome. Arthritis Res Ther. 2011;13, http://dx.doi.org/10.1186/ar3487.
22. Miyamoto ST, Valim V, Fisher BA. Health-related quality of life and costs in Sjögren's syndrome. Rheumatology (Oxford). 2019;60:2588–601, http://dx.doi.org/10.1093/rheumatology/key370.
23. Jaeger VK, Wirz EG, Allanore Y, Rossbach P, Riemekasten G, Hachulla E, et al. Incidences and risk factors of organ manifestations in the early course of systemic sclerosis: a longitudinal EUSTAR study. PLOS ONE. 2016;11:e0163894, http://dx.doi.org/10.1371/journal.pone.0163894.
24. Perelas A, Silver RM, Arrossi AV, Highland KB. Systemic sclerosis-associated interstitial lung disease. Lancet Respir Med. 2020;8:304–20, http://dx.doi.org/10.1016/S2213-2600(19)30480-1.
25. Walker UA, Tyndall A, Czirják L, Denton C, Farge-Bancel D, Kowal-Bielecka O, et al. Clinical risk assessment of organ manifestations in systemic sclerosis: a report from the EULAR

Scleroderma Trials And Research group database. Ann Rheum Dis. 2007;66:754, http://dx.doi.org/10.1136/ard.2006.062901.
26. Steelandt A, Benmostefa N, Avouac J, Mouthon L, Allanore Y. Ethnic influence on the phenotype of French patients with systemic sclerosis. Joint Bone Spine. 2021;88:105081, http://dx.doi.org/10.1016/j.jbspin.2020.09.013.
27. Herdman M, Gudex C, Lloyd A, Janssen M, Kind P, Parkin D, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). Qual Life Res. 2011;20:1727–36, http://dx.doi.org/10.1007/s11136-011-9903-x.
28. Patel AS, Siegert RJ, Brignall K, Gordon P, Steer S, Desai SR, et al. The development and validation of the King's Brief Interstitial Lung Disease (K-BILD) health status questionnaire. Thorax. 2012;67:804–10, http://dx.doi.org/10.1136/thoraxjnl-2012-201581.
29. Allanore Y, Constans J, Godard D, de Pouvourville G, Bouee S, Jeanbat V, et al. 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. J Scleroderma Relat Disord. 2022;7:49–56, http://dx.doi.org/10.1177/23971983211013979.
30. Ciaffi J, van Leeuwen NM, Liem SIE, Ninaber MK, Huizinga TWJ, de Vries-Bouwstra JK. Lung function is associated with minimal EQ-5D changes over time in patients with systemic sclerosis. Clin Rheumatol. 2020;39:1543–9, http://dx.doi.org/10.1007/s10067-020-04951-6.
31. Hudson M, Thombs BD, Steele R, Panopalis P, Newton E, Baron M, et al. Health-related quality of life in systemic sclerosis: a systematic review. Arthritis Rheum. 2009;61:1112–20, http://dx.doi.org/10.1002/art.24676.
32. Sebastiani M, Manfredi A, Vacchi C, Cassone G, Faverio P, Cavazza A, et al. Epidemiology and management of interstitial lung disease in ANCA-associated vasculitis. Clin Exp Rheumatol. 2020;38:221–31. https://www.clinexprheumatol.org/abstract.asp?a=15448 [cited 30.3.23].
33. Carpenter DM, Thorpe CT, Lewis M, Devellis RF, Hogan SL. Health-related quality of life for patients with vasculitis and their spouses. Arthritis Rheum. 2009;61:259–65, http://dx.doi.org/10.1002/art.24235.
34. Tomasson G, Boers M, Walsh M, LaValley M, Cuthbertson D, Carette S, et al. Assessment of health-related quality of life as an outcome measure in granulomatosis with polyangiitis (Wegener's). Arthritis Care Res (Hoboken). 2012;64:273–9, http://dx.doi.org/10.1002/acr.20649.
35. Wallace B, Kafaja S, Furst DE, Berrocal VJ, Merkel PA, Seibold JR, et al. Reliability, validity and responsiveness to change of the Saint George's Respiratory Questionnaire in early diffuse cutaneous systemic sclerosis. Rheumatology (Oxford). 2015;54:1369–79, http://dx.doi.org/10.1093/rheumatology/keu456.
36. Suzuki A, Kondoh Y, Swigris JJ, Matsuda T, Kimura T, Kataoka K, et al. Performance of the COPD Assessment Test in patients with connective tissue disease-associated interstitial lung disease. Respir Med. 2019;150:15–20, http://dx.doi.org/10.1016/j.rmed.201901.017.
37. Swigris J, Cutts K, Male N, Baldwin M, Rohr KB, Bushnell DM. The living with pulmonary fibrosis questionnaire in progressive fibrosing interstitial lung disease. ERJ Open Res. 2021;7:00145–2020, http://dx.doi.org/10.1183/23120541.00145-2020.