# Systemic Sclerosis and Associated Interstitial Lung Disease in Ontario, Canada: An Examination of Prevalence and Survival Over 10 Years

Pope JE[1], Quansah K[2], Kolb M[3], Flavin J[2], Hassan S[4], Seung SJ[4],

[1]Schulich School of Medicine and Dentistry, Western University, St. Joseph's Health Care [2]Boehringer Ingelheim (Canada) Limited [3]Dept of Respiratory Medicine, Pathology and Molecular Medicine, McMaster University [4]HOPE Research Centre, Sunnybrook Research Institute

## INTRODUCTION

- Systemic sclerosis (SSc) is an autoimmune disease characterized by skin thickening, vascular lesions and fibrotic changes in various organs, mainly the lungs, heart, intestinal tract, kidneys, muscles and joints.
- Estimates of the prevalence of SSc vary greatly depending on the methodology used, as diagnosis of SSc can be difficult due to clinical heterogeneity and variety of organ manifestations (1,2).
- Pulmonary complications of SSc are one of the leading causes of morbidity and mortality.
- Interstitial lung disease (ILD) is among the most common forms of lung disease associated with SSc (3).
- Global estimates of SSc-ILD vary greatly (3-6). A recent systematic review by Bergmasco et al. suggest that prevalence estimates of SSc-ILD in Europe are between 1.7 to 4.2 per 100,000 persons (4).
- To date, no recently published study has generated population-based estimates of prevalence and incidence of SSc-ILD in Canada.

## OBJECTIVE

- The objective of this study was to develop prevalence and survival estimates of SSc and SSc-ILD in Ontario using administrative data.

## METHODS

- A non-interventional, retrospective cohort study was conducted using administrative data from Ontario, Canada. Ontario, Canada has a population of ~ 14 million people.

**Inclusion Criteria**

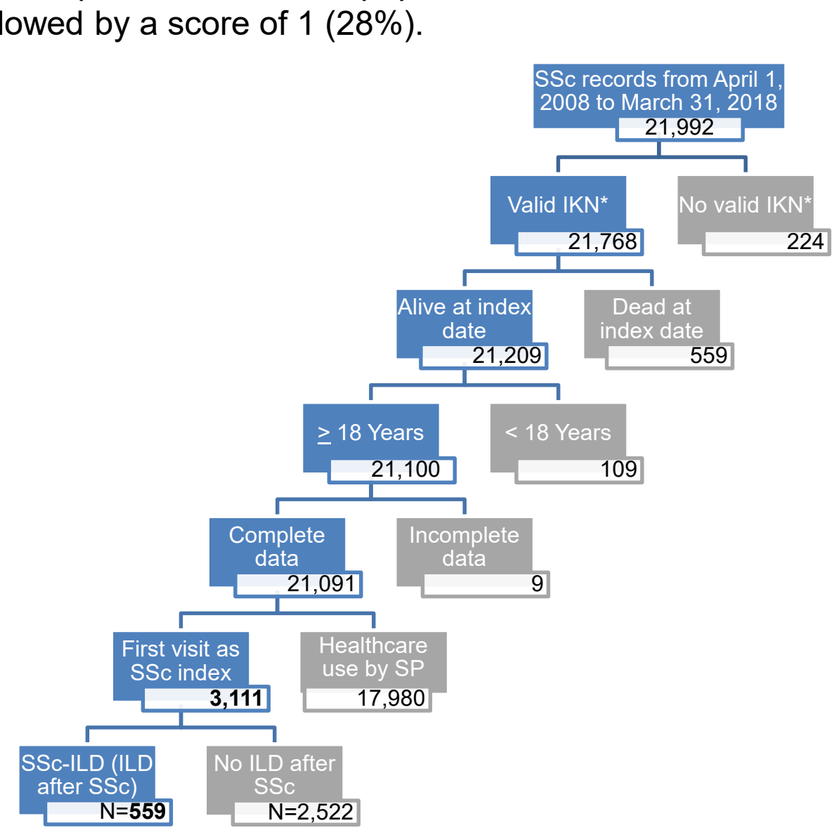
- Record diagnosis of SSc or SSc-ILD (ILD after SSc) in the National Ambulatory Care Reporting System (NACRS) and Discharge Abstract Database (DAD) from April 1, 2008 to March 31, 2018)
- NACRS reports emergency department visits and DAD reports all inpatient and outpatient health services in Ontario hospitals
- Adult patients (≥ 18 years of age)
- **SSc patients-** from the NACRS and DAD identified by presence of M34 ICD-10 CA codes at index date (M34.0, M34.1, M34.2, M34.8, M34.9).
- **SSc-ILD patients -**were identified if an additional one of J84.1, J84.8, J84.9 or J99.1 codes for lung disease occurred after the SSc diagnosis from DAD or NACRS.
- Prevalence estimates were generated for both SSc and SSc-ILD, based on the population of all eligible Ontario adults (e.g. alive, complete data and valid health card)

**Outcomes**

- Primary Outcome: Crude prevalence of SSc and SSc-ILD
- Secondary Outcomes: Survival, Demographics, and Comorbidities

## RESULTS

- Over the 10-year study period, 2,522 SSc and 559 SSc-ILD patients were identified (Figure 1).
- At the start of 2017-18, there were 2,114 prevalent cases of SSc, and 257 prevalent cases of SSc-ILD were identified (Table 1). Cases we defined as patient alive at the start of the year with the diagnosis of interest.
- The mean age of patients with SSc was 57.4 years compared to 57.9 years of age for SSc-ILD patients. For both SSc and SSc-ILD patients the majority of patients were female, 84.2% versus 80.2%, respectively (Table 2).
- 54% of the prevalent SSc population had a Charlson score of 0, followed by a score of 1 (27% in 2017-18).
- For the prevalent SSc-ILD population, 50% had a Charlson score of 0, followed by a score of 1 (28%).




* IKN= ICES Key Number. Each person is assigned a unique identifier which is used to link information in the data sets available.

**Figure 1: SSc and SSc-ILD cohort definitions**

**Table 1: Prevalent SSc and SSC-ILD cases**

| Fiscal Year | Prevalent SSc cases of by diagnosis year | Prevalent SSc cases * | Prevalent SSc-ILD cases by diagnosis year | Prevalent SSc-ILD cases* |
|---|---|---|---|---|
| **2008- 9** | 497 | 497 | 118 | 118 |
| **2009-10** | 381 | 823 | 75 | 178 |
| **2010-11** | 334 | 1,073 | 70 | 227 |
| **2011-12** | 281 | 1,239 | 62 | 262 |
| **2012-13** | 290 | 1,435 | 50 | 282 |
| **2013-14** | 267 | 1,590 | 44 | 288 |
| **2014-15** | 271 | 1,749 | 39 | 289 |
| **2015-16** | 272 | 1,909 | 43 | 296 |
| **2016-17** | 257 | 2,007 | 38 | 281 |
| **2017-18** | 261 | 2,114 | 20 | 257 |

***Prevalence is the sum of patients that are alive with the indication at the start of that year who are recorded that year and were diagnosed in any of the eligible cohort years.**

**Table 2: Baseline characteristics of patients with SSc and SSC-ILD (at fiscal year 2017-18)**

| Variable | SSc (N=2,114) | SSc-ILD (N=257) |
|---|---|---|
| **Time to ILD after SSc diagnosis (days)** | | |
| Mean ± SD | N/A | 732.22 ± 840.11 |
| Median (IQR) | N/A | 390 (68 - 1129) |
| **Age at index date** | | |
| Mean±SD | 57.36±14.31 | 57.89±12.23 |
| Median (IQR) | 58(48 - 67) | 59(50 - 66) |
| **Age group, n (%)** | | |
| 18-29 | 72(3.41%) | 0(0.00%) |
| 30-50 | 555(26.25%) | 65(25.29%) |
| 51-64 | 799(37.8%) | 117(45.53%) |
| 65+ | 688(32.54%) | 75(29.18%) |
| **Sex** | | |
| Female | 1,780 (84.20%) | 206(80.16%) |
| Male | 334(15.80%) | 51(19.84%) |
| **Charlson score group, n (%)** | | |
| 0 | 1,140 (53.93%) | 129(50.19%) |
| 1 | 572(27.06%) | 73(28.4%) |
| 2 | 199(9.41%) | 30(11.67%) |
| 3+ | 203(9.6%) | 25(9.73%) |

- The prevalence rates at the start of fiscal 2017-18 for SSc and SSc-ILD were 19.1 and 2.3 per 100,000 persons, respectively (Table 3).
- Females had a higher overall prevalence (SSc= 31.2 and SSc-ILD= 3.6 per 100,000 persons).
- The prevalence of SSc and SSc-ILD was highest for patients over 50 years of age and followed by patients 65 years of age and above.

**Table 3: Overall prevalence of SSc and SSc-ILD patients (per 100,000 persons)**

| Fiscal Year 2017/ 2018 | SSc (N=2,114) | SSc-ILD (N=257) | % of SSc with ILD |
|---|---|---|---|
| **Overall** | 19.1 | 2.3 | 12.0 |
| **Age group** | | | |
| 18-29 | 3.6 | 0.0 | --- |
| 30-50 | 14.1 | 1.7 | 12.1 |
| 51-64 | 28.8 | 4.2 | 14.6 |
| 65+ | 29.4 | 3.2 | 10.9 |
| **Sex** | | | |
| Female | 31.2 | 3.6 | 11.5 |
| Male | 6.2 | 1.0 | 16.1 |

**Survival**

- For SSc patients, there were 1,150 deaths (37.0%) in the population over the duration of the 10-year study period, and survival rates at 1, 5 and 10 years after diagnosis were 85.0%, 64.5% and 44.9%, respectively (Figure 2a).
- For SSc-ILD patients, 336 patients (63.7%) died over the study period, and survival rates 1, 5 and 10 years after diagnosis were 77.1%, 44.4% and 22.0%, respectively (Figure 2b).

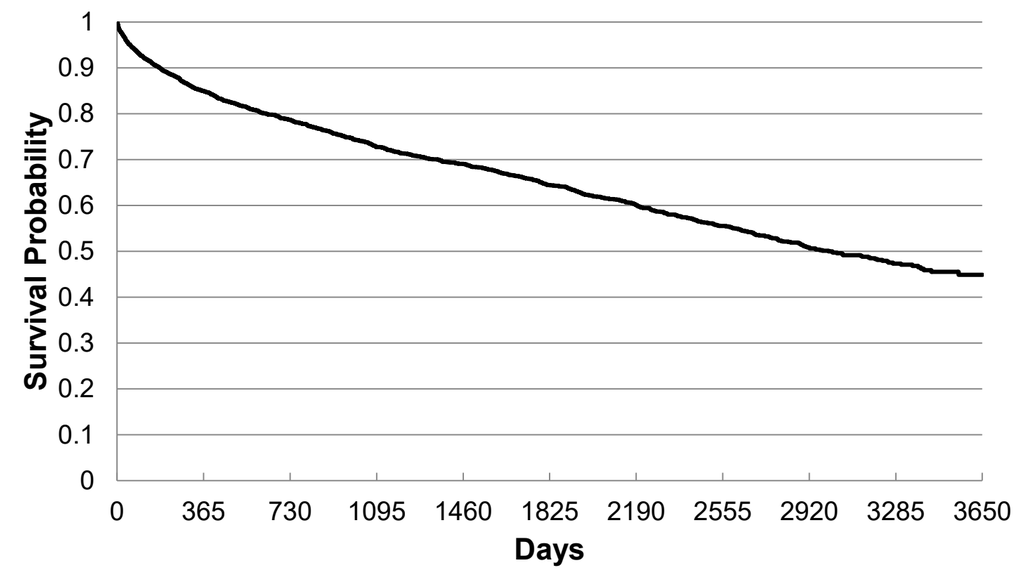



**Figure 2a: Survival of SSc Patients**

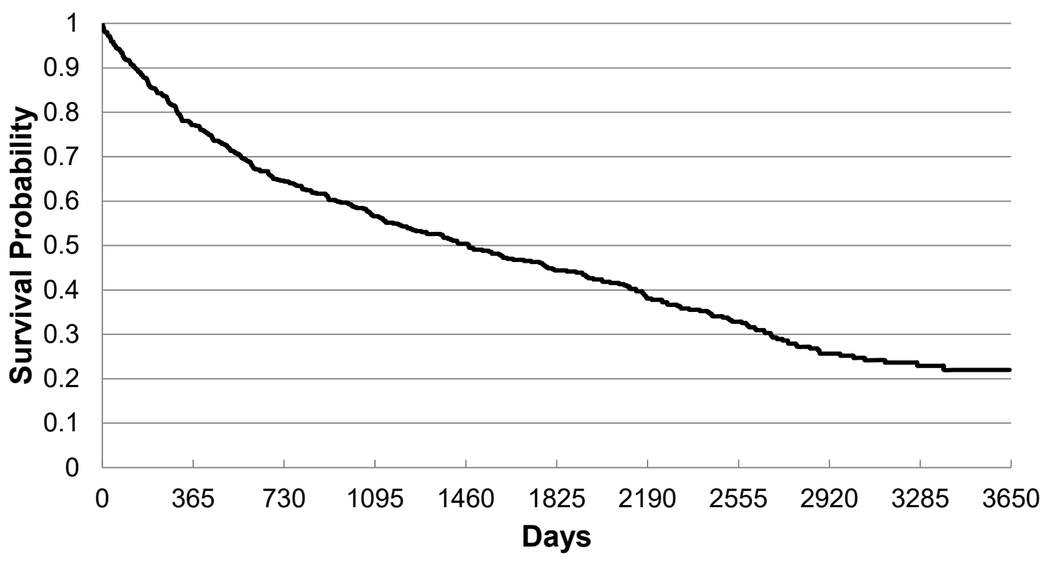



**Figure 2b: Survival of SSc-ILD Patients**

## CONCLUSIONS AND DISCUSSION

- Results confirm that the prevalence estimates of SSc-ILD may fall within the Canadian threshold of 'other' rare disease prevalence > 1 and ≤ 50 patients per 100,000 persons (7).
- It also demonstrates the poor survival in SSc especially when ILD is also present.

## DISCLOSURE

- This study was funded by Boehringer-Ingelheim. The authors meet criteria for authorship as recommended by the International Committee of Medical Journal Editors (ICMJE). The authors received no direct compensation related to the development of the poster. Writing, editorial support and/ formatting assistance was provided by Health Outcomes and PharmacoEconomics Research Centre of the Sunnybrook Research Institute, which was contracted and funded by Boehringer Ingelheim Canada Limited (BICL). BI was given the opportunity to review the manuscript for medical and scientific accuracy as well as intellectual property considerations.

## REFERENCES

1. Ranque B, Mouthon L. Geoepidemiology of systemic sclerosis. Autoimmun. 2010: Rev 9, A311 - A318.
2. Kowal-Bielecka O, Fransen J, Avouac J EUSTAR Coauthors, et al. Update of EULAR recommendations for the treatment of systemic sclerosis. Ann Rheum Dis. 2017;76:1327-1339.
3. Bauer PR, Schiavo DN, Osborn TG et al. Influence of interstitial lung disease on outcome in systemic sclerosis: a population-based historical cohort study. Chest. 2013:144(2):571 – 577.
4.Bergamasco A, Hartmann N, Wallace L, Verpillat P. Epidemiology of systemic sclerosis and systemic sclerosis-associated interstitial lung disease. Clin Epi 2019:11 257–273
5. Vonk MC, Broers B, Heijdra YF et al. Systemic sclerosis and its pulmonary complications in the Netherlands: an epidemiological study. Ann Rheum Dis.2009; 68(6), 961 – 965.
6. Mulla E, Shaffu S, Hassan W. A comparative study of the difference in clinical manifestations and disease outcomes between South Asian and Caucasian patients with systemic sclerosis in a large NHS trust, within the United Kingdom. EULAR 2015, 16th Ann Eur Cong of Rheumatology, Rome, 10 - 13 Jun 2015. Ann Rheum Dis 74 (Suppl 2). 2015; 1128 Abstr AB0689.
7.Richter T, Janoudi G, Amegatse W, Nester-Parr S. Characteristics of drugs for ultra-rare diseases versus drugs for other rare diseases in HTA submissions made to the CADTH CDR. Orphanet J Rare Dis. 2018; 13(15): 1-9.