

Clinical Profile of Interstitial Lung Disease at a Tertiary Care Centre, India**Dhruv S Patel¹, Brijesh A Chauhan², Manisha Yadav³, Komal Bharti Singla^{4*}**¹Senior Resident, Department of Respiratory Medicine, Ananya College of Medicine and Research, Kalol, Gujarat, India²Assistant Professor, Department of Respiratory Medicine, Banas Medical College and Research Institute, Palanpur, Gujarat, India³Medical Officer, Rural Hospital, Umrane, Nasik, Maharashtra, India⁴Professor, Department of General Medicine, Kiran Medical College, Surat, Gujarat, India

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Abstract:**Introduction:** Interstitial Lung Disease (ILDs), which account for around 10% to 15% of respiratory diseases, often get misdiagnosed as TB in countries like India. This study aims to analyze the clinical characteristics, radiographic findings, and lung function measurements in ILD patients.**Materials and Methods:** In this cross-sectional study, we enrolled 60 ILD patients. We collected data using a structured case proforma that included patient details, clinical history, radiological findings, lung function tests, and physical examinations of eligible patients.**Results:** ILD patients presented at the age of 55.2 ± 14.6 years. The male-to-female ratio was 33:27. Around 35.0% of patients were smokers. The majority had Idiopathic Pulmonary Fibrosis (41.7%), followed by Connective Tissue Disease-associated ILD (15.0%) and Nonspecific Interstitial Pneumonia (11.7%). Most patients (35.0%) had mMRC grade 3. Approximately 63.3% had a restrictive pattern, while 6.7% had an obstructive pattern. About 11.7% had a 6MWT distance of less than 150 meters. The average DLCO% in ILD patients was $44.2 \pm 15.4\%$.**Conclusion:** Idiopathic Pulmonary Fibrosis (IPF) is indeed the most common ILD. By utilizing spirometry and 6MWT and O₂ saturation healthcare professionals can achieve early diagnosis and treatment for ILD patients.**Keywords:** Diffusion capacity for carbon monoxide (DLCO), Idiopathic pulmonary fibrosis, Interstitial Lung Disease, Restrictive, Spirometry

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Introduction

Interstitial Lung Disease (ILD) refers to fibrotic and inflammatory alterations in the alveolar walls and septa that impact the alveolar and capillary lining of the lung. [1] After injury to the gas exchange units, interstitial fibrosis takes place, resulting in irregularities in the air gaps and interstitial change. ILDs include a range of illnesses that injury the lung parenchyma which cause symptoms such as exertional dyspnea and a dry cough. Diffuse bilateral infiltrates are frequently observed radiographically. Tests for pulmonary function, such as measurement of diffusion capacity of the lungs for carbon monoxide (DLCO), frequently reveal restricted patterns and poor diffusion. [2] ILDs account for about 10% to 15% of respiratory disease cases and can be challenging to treat. In countries like India with high tuberculosis (TB) prevalence, ILDs are sometimes misdiagnosed as TB initially.

ILDs are complex conditions with various causes. Two-thirds of cases have unknown causes, ILDs are complex conditions with various causes. Two-thirds of cases have unknown causes,[3] while the remaining one-third is linked to connective tissue disease (CTD) or environmental/occupational exposures such as including inhalation of asbestos or other inorganic particles, inhalation of inorganic agents, certain drugs and radiation therapy. [4,5] Sarcoidosis and idiopathic pulmonary fibrosis (IPF) are frequently observed ILDs. A combined approach of radiographic findings, pulmonary function tests, particularly DLCO, and clinical examination are used in the diagnosis process. High-resolution computed tomography (HRCT) and video-assisted thoracoscopic lung biopsy have improved our diagnostic methods, even though lung biopsy is still the gold standard for diagnosis. Although further research is needed for bronchoalveolar lavage and gallium lung scanning which appear promising as indicators of disease activity.[6]

Aim and Objectives: This study aimed to assess the clinical characteristics, radiographic findings, and lung function measurements in patients with ILDs.

Materials and Methods: With approval from the Institutional Ethical Committee, the present cross-sectional study was conducted at the pulmonary medicine department of a tertiary health care hospital in Gujarat. We included a total of 60 ILD patients who voluntarily consented to participate.

Data collection involved using a structured case proforma to record patient details, clinical history, radiological findings (chest X-ray and HRCT scan), lung function tests (spirometry and DLCO), and physical examination of patients who met the inclusion criteria.

Inclusion criteria: a) Adult patients who are 18 years of age or older; b) Patients suspected of having ILD who have long-lasting, ineffective coughing and dyspnea, either with or without coughing. b) Consent from the patients for the study.

Exclusion criteria: a) Patients suffering from concomitant pulmonary diseases such as tuberculosis, bronchial asthma, bronchiectasis, chronic obstructive pulmonary disease, etc. b) Individuals who have experienced a recent cardiac event, such as left ventricular failure,

accelerated hypertension, or acute coronary syndrome (ACS) etc.

ILD patients with an FEV1/FVC% of 70% or higher and an FVC% less than 80% were categorized into different levels of restriction: mild (FVC% 70-79), moderate (FVC% 61-70), moderate to severe (FVC% 51-60), severe (FVC% 34-50), and very severe (FVC% <34).

Statistical Analysis: Data was entered and analysed in Microsoft Excel software Version 2016. Quantitative data, such as clinical and laboratory parameters, were presented with mean, range, and standard deviation. Qualitative data, on the other hand, was presented with frequency and percentage (%).

Results

The present study involved 60 participants suffering from ILD. Patients presented with an average age of 55.2 ± 14.6 years, ranging from 20 to 81 years. The ratio of male to female was 33:27. Twenty-one patients (35.0%) were smokers. PAH (31.7%) was the most prevalent comorbidity, followed by IHD (6.7%), DM (18.3%), and HTN (25.0%). (Table 1)

Table 1: Baseline characteristics of study population

Characteristics	Frequency (%)
Age (Mean \pm SD, Range)	55.2 \pm 14.6 (20-81)
Gender	
– Male	33 (55.0%)
– Female	27 (45.0%)
Smoker	21 (35%)
Co-morbidities	
– Arterial Hypertension (HTN)	15 (25.0%)
– Pulmonary Arterial Hypertension (PAH)	19 (31.7%)
– Diabetes Mellitus (DM)	11 (18.3%)
– Ischemic Heart Disease (IHD)	4 (6.7%)

Of 60 patients, 25 patients (41.7%) were suffering from usual Idiopathic pulmonary fibrosis (IPF). Rest were 9 (15.0%) of CTD associated ILD, 7 (11.7%) of NSIP, 6 (10.0%) of COP, 5 (8.3%) of HSP, 2 (3.3%) of DIP, 2 (3.3%) of LAM, 2 (3.3%) of Sarcoidosis and 2 (3.3%) of Occupational related ILD (Figure 1).

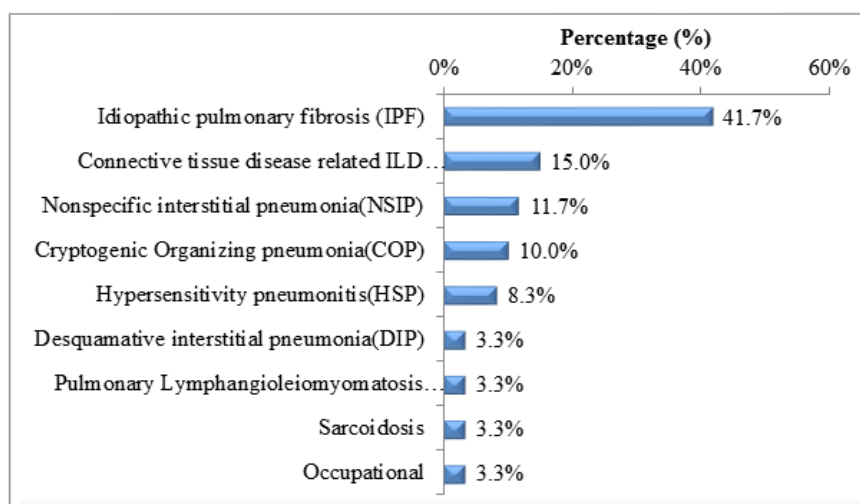


Figure 1: Subtype of ILDs

All ILDs had symptoms for an average of 1.88 ± 0.68 years. The most frequent symptoms were dry cough (52, 86.7%), bilateral end-inspiratory crepitation (48, 80.0%), dyspnoea on exertion (43, 71.7%) and clubbing (35, 58.3%). Among all ILD patients, the average respiration rate was 24 ± 4.5 per minute, with a range of 14–42. A mMRC grade 3 was present in the majority of patients (21, 35.0%),

followed by grades 0 (16, 26.7%), grade 2 (12, 20.0%), grade 1 (7, 11.7%), and grade 4 (4, 8.3%). Out of 60 ILD patients, 15 (25.0%) patients had developed arterial hypertension, 19 (31.7%) had pulmonary hypertension, 11 (18.3%) had diabetes mellitus, 4 (6.7%) had ischemic heart disease. (Table 2)

Table 2: Clinical presentation of ILD patients

Clinical parameters	Frequency (%)
– Dry cough	52 (86.7%)
– Bilateral end-inspiratory crepitation	48 (80%)
– Dyspnoea on exertion	43 (71.7%)
– Clubbing	35 (58.3%)
– Extrapulmonary manifestations	7 (11.7%)
– Joint Pain	7 (11.7%)
– Mean duration of symptoms (years)	1.88 ± 0.68
– Average respiratory rate (range)	24 ± 4.5 (14-42)
mMRC Dyspnoea Scale	
– 0	16 (26.7%)
– 1	7 (11.7%)
– 2	12 (20.0%)
– 3	21 (35.0%)
– 4	4 (8.3%)

Table 3: Radiological presentation of ILD patients

Radiological prevalent zone in Chest X-Ray	Frequency (%)
– No Involvement	26 (43.3%)
– Upper Zone	2 (3.3%)
– Mid Zone	1 (1.7%)
– Lower Zone	18 (30.0%)
– Diffuse involvement	13 (21.7%)
Missed ILD in Chest X ray	26 (43.3%)
HRCT Features	
– Reticular	20 (33.3%)
– Nodular	1 (1.7%)
– Reticulonodular	19 (31.7%)
– Ground glass opacity (GGO)	21 (35.0%)
– Honeycombing	19 (31.7%)

Chest X-Ray was normal in 26 (43.3%) ILD patients, 2 (3.3%) patients had upper zone involvement, 1 (1.7%) had mid zone involvement, 18 (30.0%) had lower zone involvement and 13 (21.7%) had diffuse involvement. Missed ILD in Chest X-Ray were seen in 26 (43.3%) patients. Ground glass opacity (21, 35.0%), reticular (20, 33.3%) and honeycombing (19, 31.7%) were common pattern in HRCT. (Table 3)

Table 4: Pulmonary function test of ILD patients

Spirometry findings (n-60)	Frequency (%)
- Normal	10 (16.7%)
- Restrictive	38 (63.3%)
- Obstructive	4 (6.7%)
- Mixed	8 (13.3%)
Severity of restriction according to FVC% of predicted (n-38)*	
- Mild Restriction (70-79%)	0 (0%)
- Moderate Restriction (61-70%)	3 (7.9%)
- Moderate to Severe Restriction (51-60%)	9 (23.7%)
- Severe Restriction (34-50%)	20 (52.6%)
- Very Severe Restriction (<34%)	6 (15.8%)
Po2	
- < 55	3 (5.0%)
- 55-65	17 (28.3%)
- > 65	40 (66.7%)
SPo2	
- <85	4 (6.7%)
- 85 -90	6 (10.0%)
- >90	50 (83.3%)
6 minute walk test (6MWT) distance (in meters) (n-60)	
- <150 m	7 (11.7%)
- 150-249 m	17 (28.3%)
- 250-349 m	32 (53.3%)
- >350 m	4 (6.7%)
- Mean \pm SD	320.7 \pm 51.3
Post Exertion Oxygen Desaturation	
- Average Spo2 at rest	93
- Average Spo2 post exertional	89
- >4% Desaturation	31 (52.0%)
Diffusion capacity of lungs for carbon monoxide (%)	
- DLCO <40%	35 (58.3%)
- DLCO 40-60%	9 (15.0%)
- DLCO >60%	16 (26.7%)
- Mean \pm SD (range)	44.2 \pm 15.4 (22-69)

*Restrictive Disease (FEV1/FVC% \geq 70% and FVC% <80%)

About 10 (16.7%) patients had normal, 38 (63.3%) patients had restrictive, 4 (6.7%) patients had obstructive and 8 (13.3%) patients had mixed pattern in pulmonary function test (PFT). Out of 38 ILD patients with restrictive diseases, total 3 (7.9%) had moderate, 9 (23.7%) had moderate to severe, 20 (52.6%) had severe and 6 (15.8%) had very severe restriction. Total 3 patients (5.0%) and 4 patients (6.7%) had P02<55 and SPo2 < 85 respectively. (Table 4)

Total 7 (11.7%) patients had 6MWT distance <150 meters, 17 (28.3%) patients had 6MWT distance 150-249 meters, 32 (53.3%) patients had 6MWT distance 250-349 meters and 4 (6.7%) patients had

6MWT distance >350 meters. Post exertion oxygen desaturation more than 4% was present in 31(52.0%) of total ILD patients. Average DLCO% in ILD patients was 44.2 \pm 15.4% with range of 22-69%. Majority 35 (58.3%) patients had DLCO <40%. (Table 4)

Discussion

Our study aimed to examine the clinical and radiological profile of patients with ILDs, diverse group of diseases with various presentations.[7,8] Due to misdiagnosis and underdiagnosis, it has been noted that ILD patients are occasionally treated with anti-tuberculosis therapy. Therefore, it is crucial to increase awareness about ILD among

physicians and the general public. We also noted the paucity of research on ILD, especially in India. This highlights the need for further research about this topic. [9–11]

Baseline Characteristics

In our study, we found that the majority of ILD patients were in their 60s (55.2 ± 14.6 years), which is consistent with other studies that have also reported the most common age group for ILD to be between 50 and 60 years. [12–14] However, there was one study that reported a lower mean age of 40–43 years. [15]

Regarding gender distribution, we observed a slight male predominance (55.0%), similar to the findings of Das V et al. [9] (54.0%), Hyldgaard C et al. [19] (56.0%), and Jankowich et al. [16] (67.0%). However, studies by Kumar et al. [15], Jindal et al. [14], and Subhash et al. [13] showed a higher proportion of females compared to our study.

In our study, we found that approximately 35.0% of the patients were smokers, which is similar to the findings of Das V et al. [9] (22.1%). Smoking is a known risk factor for many ILDs such as IPF, RBILD, DIP, and CPFE.

Subtype of ILD

In our study, we found that 42% of cases were IPF, 15% were CTD ILD, 12% were NSIP, 10% were COP, 9% were HSP, 2% were sarcoidosis, and 2% were occupational-related ILD. Rai D et al. [10] from Bihar reported similar findings, with IPF was found to be the most common ILD (24.1%), followed by CTD-ILD (22.1%), NSIP (17.2%), HP (15.6%), sarcoidosis (7.6%), COP (4.2%), and occupational lung disease (2.7%). Similar ILD subtypes were reported in the study of Das V et al. [9] IPF was the most common subtype (29.3%) followed by NSIP (27.1%), CTD associated ILD (15.7%), sarcoidosis (8.6%) and HP (8.6%). However, contrary to our study, Singh et al. [17] and Sreekala et al. [12] revealed that CTD-related ILD was the most prevalent, and Kumar et al. [15] reported that HSP was the most prevalent ILD. The incidence of HSP varies across regions due to different types of exposure. Estimating the actual figure is challenging unless patients have a classical HRCT pattern, exposure history, and pathological diagnosis. [10]

Presenting Symptoms

The primary features of ILD are dry cough and dyspnea that worsens over time. In our study, the most common symptoms were dry cough (86.7%) and dyspnea on exertion (71.7%). Examination findings included bilateral end-inspiratory crepitation (80.0%) and clubbing (58.3%). Rai D et al. [10] reported dyspnea in 95.8% of patients, dry cough in 69.5% of patients, clubbing in 48.1% of

patients, and fine end-inspiratory Velcro crepitation in 83.2% of patients. Post-exercise desaturation (more than 4% desaturation) was observed in 52.0%, which was lower compared to the study by Das V et al. [9] (90%).

Radiological Findings

To diagnose and categorise ILDs, a multidisciplinary approach incorporating radiological and clinical correlation is essential. Radiology plays a vital role, and newer imaging techniques have made surgical lung biopsies less necessary. In our study, the most important HRCT findings were ground glass opacity (35.0%), reticular pattern (33.3%), and honeycombing (31.7%). Das V et al. [9] also reported similar findings, such as interlobular and intralobular septal thickening (79.8%), honeycombing (40.0%), and ground glass opacities (15.0%). It's fascinating to see how different studies align on these findings. A study by Venkata Ramana et al. [18] showed septal thickening in 42%, honeycombing in 38%, and ground glass opacities in 20%. According to a research by Balas ZC et al. [11], reticular patterns were the most common on chest X-rays, accounting for 48% of cases, and reticulonodular patterns for 14%. Ground glass opacities were the most common finding on HRCT, occurring in 66% of patients; septal thickness was found in 56% of patients, and subpleural opacities were found in 44% of patients. In addition, 40% of patients had honeycombing, 34% had reticulonodular opacities, and 32% had fibrosis.

Spirometry Findings

The most common spirometry abnormality in ILD is a restrictive abnormality with decreased DLCO. Spirometry is easily available and can be helpful in diagnosing, predicting outcomes, and evaluating treatment response. In our study, approximately two-thirds of patients (38, 63.3%) had restrictive ILD. Severe and very severe restriction were observed in 20 (52.6%) and 6 (15.8%) patients, respectively. The average FVC%, 6MWT distance, and DLCO% were $56 \pm 10\%$, 320.7 ± 51.3 meters, and $44 \pm 15\%$, respectively.

In the study by Das V et al. [9], all patients had a restrictive abnormality, with an average FVC of 53% liters and an average DLCO percentage of 52.3% predicted. Rai D et al. [10] reported an average FVC% of $56.6 \pm 18.6\%$, a 6MWT distance of 245.8 ± 122.1 meters, and a DLCO% of $47.7 \pm 24.0\%$. Hyldgaard C et al. [19] found average FVC% and DLCO% to be 71 ± 22 and $48.5 \pm 19.2\%$, respectively. Balas ZC et al. [11] observed that among 50 ILD patients, 14.0%, 40.0%, and 30.0% had mild, moderate, and severe restrictive patterns, respectively, while 0.5% had a severe obstructive pattern. The mean FVC% was $60.76 \pm 25.45\%$.

Comorbidities

ILDs are a type of chronic, progressive lung disease that have a substantial negative influence on a patient's quality of life due to their numerous comorbidities. In our study, PAH (31.7%) was the most prevalent comorbidity, followed by HTN (25.0%), DM (18.3%), and IHD (6.7%). These rates were higher compared to the study by Hyldgaard C et al. [19] (HTN in 18%, PAH in 21%, DM in 17%, IHD in 18%). Rai D et al.[10] found that gastroesophageal reflux disease (37.4%) was the most common comorbidity, followed by hypothyroidism (16.0%).

Conclusion

It's important to consider ILD in people with specific appearance, symptoms, and occupational exposure history. The most common ILD is idiopathic pulmonary fibrosis. Spirometry and 6MWT O₂ saturation should be used as screening tests for individuals who have a persistent cough and dyspnea, followed by HRCT chest and biopsy for confirmation of diagnosis.

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