Original Research Paper

Volume - 15 | Issue - 08 | August - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Respiratory Medicine

CLINICO-RADIOLOGICAL PROFILE AND DISEASE PROGRESSION IN INTERSTITIAL LUNG DISEASE: AN OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTRE IN RAJASTHAN.

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ABSTRACT Interstitial Lung Disease (ILD) encompasses a spectrum of pulmonary disorders marked by inflammation and fibrosis. This study evaluates the clinical, radiological, and functional parameters of ILD patients in a tertiary center in Rajasthan. Among 33 patients followed for a year, Idiopathic Pulmonary Fibrosis (IPF) was most prevalent. Functional decline was significant, particularly in IPF and Pleuroparenchymal Fibroelastosis (PPFE). Type 2 diabetes mellitus was the most frequent comorbidity. **Methods:** A cross-sectional study was conducted at Government Medical College, Kota, from November 2023 to November 2024, including 33 patients diagnosed with ILD. Exclusions were children, pregnant females, and active respiratory infections. Data were collected through clinical examination, spirometry, 6-minute walk test (6MWT), HRCT, and laboratory tests. Follow-up was at 6 and 12 months. **Results:** Among 33 ILD patients, the mean age varied by subtype—highest in IPF , lowest in PPFE. Pulmonary function showed variable decline. Mean FVC was lowest in Undifferentiated ILD (43%) and highest in drug-induced ILD (75%). Significant (>10%) FVC decline after one year was most common in IPF (66.6%) and PPFE (50%). Exercise-induced desaturation (<85% SpO_2) occurred universally in PPFE, Undifferentiated, and drug-induced ILD. IPF (77%) and CT-ILD (57%) also showed high rates. Worsening 6MWT (>5% desaturation or >50 m fall) was seen in all IPF, PPFE, and Undifferentiated ILD cases. Diabetes (45%) was the most common comorbidity. HRCT findings correlated with ILD types: IPF showed lower lobe honeycombing; NSIP had diffuse ground-glass opacities; CT-ILD revealed patchy, basal-predominant changes; CHP showed mixed fibrosis and air-trapping; PPFE and drug-induced ILD exhibited pan-lobar reticulonodular patterns. **Conclusion:** ILDs remain underdiagnosed and functionally debilitating. This study emphasizes the importance of early diagnosis using HRCT and pulmonary function tests. Tailored therapy, including corticosteroids, immunomodulators, and antifibrotics, is vital.

KEYWORDS :

INTRODUCTION

Interstitial lung diseases (ILDs), also referred to as diffuse parenchymal lung diseases, comprise a diverse group of over 100 pulmonary disorders that share common clinical, radiographic, and pathological features [1]. Despite their heterogeneity, ILDs are grouped under a common umbrella due to overlapping pathogenic mechanisms and imaging characteristics. The classification and approach to ILDs have evolved significantly over the past decade, with newer systems now distinguishing between fibrosing and non-fibrosing phenotypes [2–4].

Traditionally, diagnosis relied heavily on histopathological confirmation, but there has been a paradigm shift towards a multidisciplinary approach involving pulmonologists, radiologists, and pathologists to improve diagnostic accuracy [5]. This shift has been instrumental in redefining management strategies, particularly with the advent of anti-fibrotic agents that have shown efficacy in slowing the decline of forced vital capacity (FVC) not only in idiopathic pulmonary fibrosis (IPF) but also in other progressive fibrotic ILDs [6,7].

India, like other parts of the world, has witnessed a growing recognition and understanding of ILDs, reflected in the recent release of national guidelines for ILD management [8,9]. However, the epidemiology of ILDs remains variable and poorly characterized in the Indian context. Factors such as genetics, environmental exposures, occupational hazards, smoking habits, and regional practices contribute to this variability [3,8,9]. The actual incidence and prevalence of ILDs in India are difficult to ascertain due to limited multicentric data and underreporting.

Recent Indian studies have reported hypersensitivity pneumonitis as the most common ILD subtype, which contrasts with findings from international studies where sarcoidosis and connective tissue disease-associated ILDs (CTD-ILDs) are more prevalent [5,10–12]. These discrepancies highlight the need for regional epidemiological studies to better understand the ILD spectrum in different populations.

Given this background, the present study was conducted to evaluate the clinical and radiological profiles of ILD patients presenting to a tertiary care center in India.

MATERIALS AND METHODS

This cross-sectional study was carried out at Government Medical College, Kota, over a period of one year, from November 2023 to November 2024. A total of 33 patients with a confirmed diagnosis of interstitial lung disease (ILD) were enrolled. The study excluded pediatric patients, pregnant women, and individuals with active respiratory infections.

Comprehensive data collection included detailed clinical evaluations, pulmonary function testing using spirometry, six-minute walk test (6MWT), high-resolution computed tomography (HRCT) of the chest, and relevant laboratory investigations. Patients were monitored and assessed at baseline, with follow-up evaluations conducted at 6 months and 12 months.

DISCUSSION

IPF (28%) was the most common ILD subtype, followed by NSIP (24%) and CTD-ILD (21%). A male predominance (54%) was observed. The average age ranged between 45–54 years, except for PPFE. Significant functional decline was found in IPF, NSIP, and CTD-ILD. Diabetes mellitus was the leading comorbidity. Post-exertional desaturation and worsening 6MWT were pronounced in fibrotic subtypes.

RESULTS

In the present study comprising 33 patients diagnosed with interstitial lung diseases (ILDs), the most common subtype was Idiopathic Pulmonary Fibrosis (IPF), observed in 9 patients (27%). This was

followed by Non-Specific Interstitial Pneumonia (NSIP), which accounted for 8 patients (24%), and Connective Tissue Disease-associated ILD (CTD-ILD), seen in 7 patients (21%). Chronic Hypersensitivity Pneumonitis (CHP) was identified in 4 patients (12%). Less frequent subtypes included Pleuroparenchymal Fibroelastosis (PPFE) and Undifferentiated ILD, each found in 2 patients (6%). Drug-induced ILD was noted in 1 patient (3%).

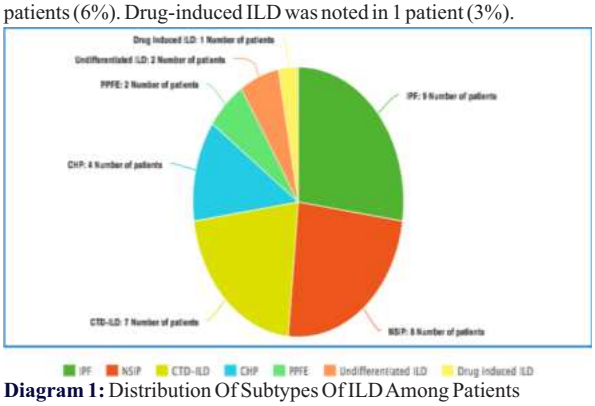

Diagram 1: Distribution Of Subtypes Of ILD Among Patients

Table 1: Mean Age At Presentation

Subtype	Mean Age (Years)
IPF (n=9)	65 ± 9
NSIP (n=8)	54 ± 8
CT-ILD (n=7)	45 ± 10
CHP (n=4)	53 ± 8
PPFE (n=2)	19 ± 1
Undifferentiated ILD	36 ± 23
Drug-induced ILD	60

The study included 33 patients with various ILD subtypes. The mean age at presentation varied significantly across groups, with Idiopathic Pulmonary Fibrosis (IPF) patients presenting at a mean age of 65 years, Non-Specific Interstitial Pneumonia (NSIP) at 54 years, and Connective Tissue Disease-associated ILD (CT-ILD) at 45 years. Pleuroparenchymal Fibroelastosis (PPFE) patients were the youngest, with a mean age of 19 years. (Table 1)

Table 2: FVC At Recruitment And One Year Decline

Subtype	Mean FVC %	>10% Fall After 1 Year (%)
IPF (n=9)	53	66.6
NSIP (n=8)	66	37.5
CT-ILD (n=7)	56	42.8
CHP (n=4)	53	25
PPFE (n=2)	50	50
Undifferentiated ILD	43	0
Drug-induced ILD	75	0

At recruitment, Forced Vital Capacity (FVC) was lowest in Undifferentiated ILD (43%) and highest in drug-induced ILD (75%). Over one year, a significant decline in FVC (>10%) was observed in 66.6% of IPF and 50% of PPFE patients, while NSIP and CT-ILD showed intermediate deterioration (37.5% and 42.8% respectively). No decline was noted in drug-induced or undifferentiated ILD. (Table 2)

Table 3: Post-Exertional Desaturation (<85%)

Subtype	Desaturation (%)
IPF	77
NSIP	25
CT-ILD	57
CHP	50
PPFE	100
Undifferentiated ILD	100
Drug-induced ILD	100

Post-exertional desaturation (SpO_2 <85%) was most prevalent in PPFE, Undifferentiated ILD, and drug-induced ILD groups (100% each). IPF and CT-ILD also showed high desaturation rates (77% and 57%, respectively), whereas NSIP demonstrated a lower prevalence (25%). (Table 3)

Table 4: Worsening In 6MWT

Subtype	Worsening >5% or >50m (%)
IPF	100
NSIP	37.5
CT-ILD	42.8
CHP	50
PPFE	100
Undifferentiated ILD	100
Drug-induced ILD	0

Worsening in 6-minute walk test (6MWT)—defined as a >5% fall in saturation or >50 m decrease in distance—was noted in 100% of IPF, PPFE, and Undifferentiated ILD cases, while NSIP and CT-ILD showed 37.5% and 42.8% worsening, respectively. Drug-induced ILD patients did not exhibit deterioration in 6MWT. (Table 4)

Table 5: Comorbidities In ILD Patients

Comorbidity	Percentage (%)
Diabetes Mellitus	45
Pulmonary Arterial Hypertension	24
Systemic Hypertension	21
COPD	9
Rheumatoid Arthritis	9
Malignancy	3
Hypothyroidism	1

Diabetes mellitus was the most common comorbidity (45%), followed by pulmonary arterial hypertension (24%) and systemic hypertension (21%). Other notable conditions included COPD and rheumatoid arthritis (9% each), malignancy (3%), and hypothyroidism (1%). (Table 5)

High-Resolution Computed Tomography (HRCT) Findings

Idiopathic Pulmonary Fibrosis (IPF): Characterized by bilateral lower lobe predominance with classical honeycombing and a reticulonodular pattern, consistent with a usual interstitial pneumonia (UIP) pattern.**Non-Specific Interstitial Pneumonia (NSIP):** Demonstrated diffuse lung involvement, predominantly marked by ground-glass opacities, reflecting a more uniform inflammatory process.**Connective Tissue Disease-Associated ILD (CT-ILD):** Showed lower lobe predominance with patchy distribution and occasional mosaic attenuation, indicating heterogeneous lung involvement.**Chronic Hypersensitivity Pneumonitis (CHP):** Exhibited a mixed lobar distribution, with findings suggestive of both fibrosis and air trapping, consistent with the chronic fibrotic form.**Pleuroparenchymal Fibroelastosis (PPFE) and Drug-Induced ILD:** Displayed pan-lobar reticulonodular shadows, reflecting widespread interstitial involvement often associated with upper lobe fibrosis in PPFE or diffuse injury patterns in drug toxicity.

DISCUSSION

In the present study, there were 27% cases of IPF, 24% of NSIP, 21% of CTD-ILD, 6% each of PPFE and undifferentiated ILD, and 3% cases of drug induced ILD. The results were comparable to the Dhooria S et al. (Indian study) and also more to the Hyldgaard C et al. (foreign study). But they were quite different as compared to the ILD India registry which showed 47.3% CHP patients, unlike any other Indian or international study on ILD. In the present study, the male gender is predominant in ILD(54%) similar to Hyldgaard et al study (55%) and relatively comparable to Indian studies which show round about 50% male gender distribution. Male% in the present study for IPF, NSIP and CHP is comparable to the ILD India registry, Dhooria S et al study and Hyldgaard C et al study. Variation was found in gender distribution of CTD-ILD where other Indian studies show a lesser male% as compared to the present study (43%) and the Hyldgaard C et al study (41%).The present study shows a lower average age of presentation in ILD as compared to all other studies, which is due to the inclusion of PPFE subtype of ILD which has a younger age predominance.Mean age of presentation for IPF, NSIP, CTD-ILD, and CHP are comparable in the present study, ILD India registry, Dhooria S et al study and Hyldgaard C et al study.A variation was noted in the average age of presentation of undifferentiated ILD patients in Hyldgaard C et al study (59.3 plus/minus 14.5) as compared to the present study (36 plus/minus 23) , the cause of this is due to the small sample size in the present study leading to bias.

CONCLUSION

This study highlights the diverse clinical and radiological spectrum of interstitial lung diseases (ILD) in a tertiary care setting. IPF was the most common subtype, followed by NSIP and CTD-ILD, with findings broadly consistent with other Indian (Dhooria *et al.*) and international (Hyldgaard *et al.*) studies. However, significant variation was noted

when compared to the ILD India Registry, particularly in the low prevalence of CHP.Male predominance was observed across most ILD subtypes, in line with existing literature, though CTD-ILD showed a relatively higher male percentage in this cohort. The average age at presentation was generally lower than other studies, largely due to the inclusion of younger patients with PPFE. Subtype-specific age patterns were otherwise comparable, with the exception of undifferentiated ILD, where small sample size may have introduced bias.

Overall, the study reinforces known ILD patterns while also emphasizing regional variations and the importance of local epidemiological data in understanding disease behavior. Larger, multicentric studies are warranted to validate these findings and guide region-specific ILD management strategies.

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