ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

Original Research Article

RADIOLOGICAL AND CLINICAL CHARACTERIZATION OF INTERSTITIAL LUNG DISEASE: A PROSPECTIVE ANALYSIS

Dr Yogesh Umraniya[1], Dr Govinddas G Akbari[2], Dr Pravin Jivabhai Lakum [3], Dr Rajesh Pimpaldara[4*]

[1]Assistant Professor, Department of Anatomy, GMERS Medical College, Gandhinagar, Gujarat, India

[2]Associate Professor, Department of Anatomy, GMERS Medical College, Morbi, Gujarat, India

[3]Assiatnt Professor, Department of Radiodiagnosis, C U Shah Medical College & Hospital, Surendranagar, Gujarat, India

[4]Associate Professor, Department of TB & Chest, GMERS Medical College, Vadnagar, Gujarat, India

***Corresponding Author:** Dr Rajesh Pimpaldara

Email: rs83804@gmail.com

ABSTRACT

Background and Objectives: Despite advancements, the epidemiology of interstitial lung disease (ILD) remains relatively understudied. This study aimed to comprehend the Clinical, Radiological, and functional Profile of ILD patients seeking care at a tertiary center in India.

Methods: A prospective observational study was carried out at an Indian Medical College, Hospital, and Research Center. 67 known ILD patients aged 20 and above, attending the OPD clinic, and consenting to participate were recruited. Data collected included age, gender, smoking history, co-morbidities, ILD symptoms, auscultatory findings, area involvement on auscultation, X-ray, CT scan, and spirometer results. Statistical analysis utilized mean, standard deviation, frequencies, and percentages.

Results: Among the 67 ILD patients, males dominated. The average age was 57.13 ± 15.89 years. The most common symptoms were cough and dyspnea. Reticular and nodular patterns were the most common radiological findings. None of the patients tested sputum positive for AFB. Infra-axillary and interscapular area involvement was observed in majority of patients. A restrictive pattern was predominant in spirometry. CT scans revealed a honeycombing pattern in majority of patients. The diagnosis identified usual interstitial pneumonia (UIP) in majoirty of cases. UIP primarily affected the lower lobes.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

Conclusion: This study sheds light on the profile of ILD patients from India. However, larger epidemiological studies are warranted to comprehensively assess the burden of ILD in this population.

Keywords: Interstitial lung disease, pulmonary fibrosis, India, hypersensitivity pneumonia

INTRODUCTION

Interstitial lung disease (ILD) comprises a vast array of over 100 distinct conditions, necessitating a multidisciplinary team involving clinicians, radiologists, and pulmonologists for accurate diagnosis. The global incidence of ILD ranges from 1 to 31.5 per 100,000 person-years, with prevalence varying from 6.3 to 71 per 100,000 individuals. Despite this, comprehensive epidemiological studies on the global burden of ILD remain scarce, with geographical variations noted. Data from developing countries regarding ILD are notably limited and inconsistent, highlighting a research gap in understanding the incidence and prevalence of ILDs in such regions [1-3].

A recent study by Sahajal Dhooria shed light on ILD epidemiology in northern India, reporting estimated crude annual incidence and prevalence rates of 10.1–20.2 and 49.0–98.1 per 100,000 populations, respectively [4]. ILDs encompass a diverse range of acute and chronic diffuse lung diseases, presenting challenges in patient classification [5-6]. The clinical profile of ILDs in India remains underexplored, with indications of under-reporting possibly due to inadequate facilities and disease recognition [5,7]. Singh et al. emphasized the necessity of a prospective registry for new-onset ILDs, despite acknowledging limitations such as selection bias and underrepresentation of geographic areas. Hypersensitivity pneumonitis emerged as the most prevalent ILD in India, often linked to domestic environmental factors [4,5,8].

The diagnostic complexities of ILDs in India are compounded by ecological and cultural factors, resource constraints, and a lack of standardized diagnostic protocols. Patients' apprehensions, especially concerning surgical lung biopsy, often lead to reliance on individual clinician judgment [8]. Diagnosing ILDs typically involves medical tests such as Computerized Tomography (CT) scans for assessing lung damage extent, pulmonary function tests like spirometry or diffusion capacity to gauge lung function, and in certain cases, lung tissue biopsy for definitive diagnosis, particularly in pulmonary fibrosis cases [9]. Limited studies in India have explored spirometry testing, revealing a prevalent restrictive pattern among ILD patients [10].

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

Given the complexity and research gaps surrounding ILDs, comprehensive single-center studies can significantly contribute to the scientific understanding of the disease. Thus, there is a need to delve into the clinical, radiological, and functional profiles of ILD patients attending tertiary care centers in India, as the disease's profile remains understudied in many parts of the country.

MATERIALS AND METHODS

This observational prospective single-center study was conducted at Indian Medical College, Hospital, and Research Center. A total of 67 ILD patients were included.

The criteria for selecting participants for the study were meticulously established to ensure a homogenous study population. Eligible patients included those newly presenting with progressive dyspnea absent of significant constitutional or endobronchial symptoms, individuals with a prior diagnosis of ILD, and those exhibiting pulmonary function abnormalities indicative of restrictive lung disease and compromised gas exchange. We delineated clear exclusion criteria to mitigate potential confounding factors. These criteria included individuals incapable of undergoing pulmonary function testing, those with contraindications to undergoing spirometry, patients currently experiencing an acute exacerbation of their pulmonary condition, individuals with severe concurrent illnesses, patients testing positive for HIV, and those who were not willing to provide consent to participate in the research. These measures were adopted to ensure the integrity of the study outcomes by carefully defining the participant pool.

Data collection involved demographics (age, gender), co-morbidities (hypertension, diabetes, and TB), smoking and tobacco-chewing habits, symptoms, signs, auscultatory findings, sputum status, X-ray and CT scan results, spirometry test results, and a 6-minute walk test (6MWT) to assess exercise capacity. Additionally, arterial blood gas (ABG) tests were conducted to evaluate oxygen and carbon dioxide levels in the blood. Hypersensitivity pneumonitis (HP) was diagnosed based on a history of organic dust exposure, radiological features, and available histological evidence.

Statistical tests employed included basic statistics like mean, standard deviation, frequency, and percentages, along with the paired t-test to assess significant reductions in carbon monoxide diffusion capacity and oxygen saturation after the 6MWT among ILD patients.

RESULTS

A total of 67 subjects were enrolled in the study, with a noticeable male predominance observed within the cohort. Cough emerged as the most prevalent symptom among the study

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

sample, being present in all 50 (100%) patients. Dyspnea followed as the second most common symptom. The most frequently observed sign among patients with interstitial lung disease (ILD) was clubbing, followed by pallor and pedal edema. Cyanosis and lymphadenopathy were only noted in a few patients. Auscultatory examinations primarily revealed crepitations, and infra-axillary area involvement was frequently observed. Notably, none of the patients had sputum positive for AFB. Additionally, C-reactive protein levels were elevated in three patients (Table 1).

X-ray findings outlined in Table 2 indicated that the most common patterns observed on the PA view of the chest X-ray were reticular and nodular. Additionally, some patients displayed inhomogeneous opacities and cystic changes.

CT scan findings detailed in Table 3 highlighted lobe involvement in CT scans, which are crucial in diagnosing ILD. Around 50% of patients with usual interstitial pneumonia (UIP) had left lower lobe involvement, while approximately 48% had involvement of the right lower lobe. This suggests that UIP predominantly affects the lower lobes of the lungs.

Spirometry showed restrictive pattern in 49% subjects. The diffusing capacity was measured both directly (DLCO) and predicted based on standard calculations (DLCO Predicted). The mean DLCO as found to be 19.25 ± 1.25 ml/min/mmHg. The mean DLCO Predicted was 25 ± 0.3 ml/min/mmHg. The p-value indicated significant differences between the measured DLCO and the predicted DLCO.

ABG parameters were reported as follows: pH 7.48 ± 0.071, pO2 72.80 ± 24.60 mmHg, pCO2 37.20 ± 5.80 mmHg, Bicarbonate 24.40 ± 4.40 mmol/L, and Sulphate 91.50 ± 7.50 mmol/L, with mean ± SD values indicating different aspects of blood gas and metabolic status.

Table 1: Clinical characteristics of ILD patients

Variables	n	%
Age in years; Mean ± SD	57.13 ± 15.89	
Males	39	58.21
Females	28	41.79
Smoking-Yes	12	17.91
Smoking-No	55	82.09
Tobacco chewing-Yes	15	22.39
Tobacco chewing-No	52	77.61
Co-morbidities		

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

Diabetes Mellitus	8	11.94
Hypertension	12	17.91
Tuberculosis	9	13.43
Symptoms		
Cough	67	100.00
Dyspnoea	63	94.03
Loss of Appetite	44	65.67
Wheezing	40	59.70
Fever	31	46.27
Weight Loss	31	46.27
Chest Pain	20	29.85
Joint Pain	11	16.42
Orthopnoea	4	5.97
Palpitation	4	5.97
PND	3	4.48
Signs		
Clubbing	28	41.79
Cyanosis	3	4.48
Lymphadenopathy	3	4.48
Pallor	13	19.40
Pedal edema	11	16.42
Auscultatory		
Normal vesicular breath sounds	4	5.97
Reduced breath sounds	7	10.45
Wheezing	12	17.91
Crepitations	63	94.03
Area involved in Auscultatory		
SSA (Superior side area)	17	25.37
ISA (Inferior side area)	42	62.69
IFSA (Inferior and front side area)	55	82.09
IAA (Inferior anterior area)	56	83.58
Sputum status		

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AFB Negative	67	100.00
CRP Positive	3	4.48
RF Positive	1	1.49
CRP Negative	64	95.52
RF Negative	66	98.51

Table 2: Radiographic findings in ILD patients

X Ray Finding	n	%
CP Blunting	4	5.97
Cystic changes	8	11.94
Fibrosis	4	5.97
Infiltrate	3	4.48
Inhomogenous	19	28.36
Nodular	35	52.24
Normal	4	5.97
Reticular	36	53.73

Table 3: Lung involvement in CT scan in ILD patients

CT scan finding	n	%
Right Upper Lobe	51	76.12
Right Middle Lobe	54	80.60
Left Upper Lobe	55	82.09
Right Lower Lobe	64	95.52
Left Lower Lobe	66	98.51

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

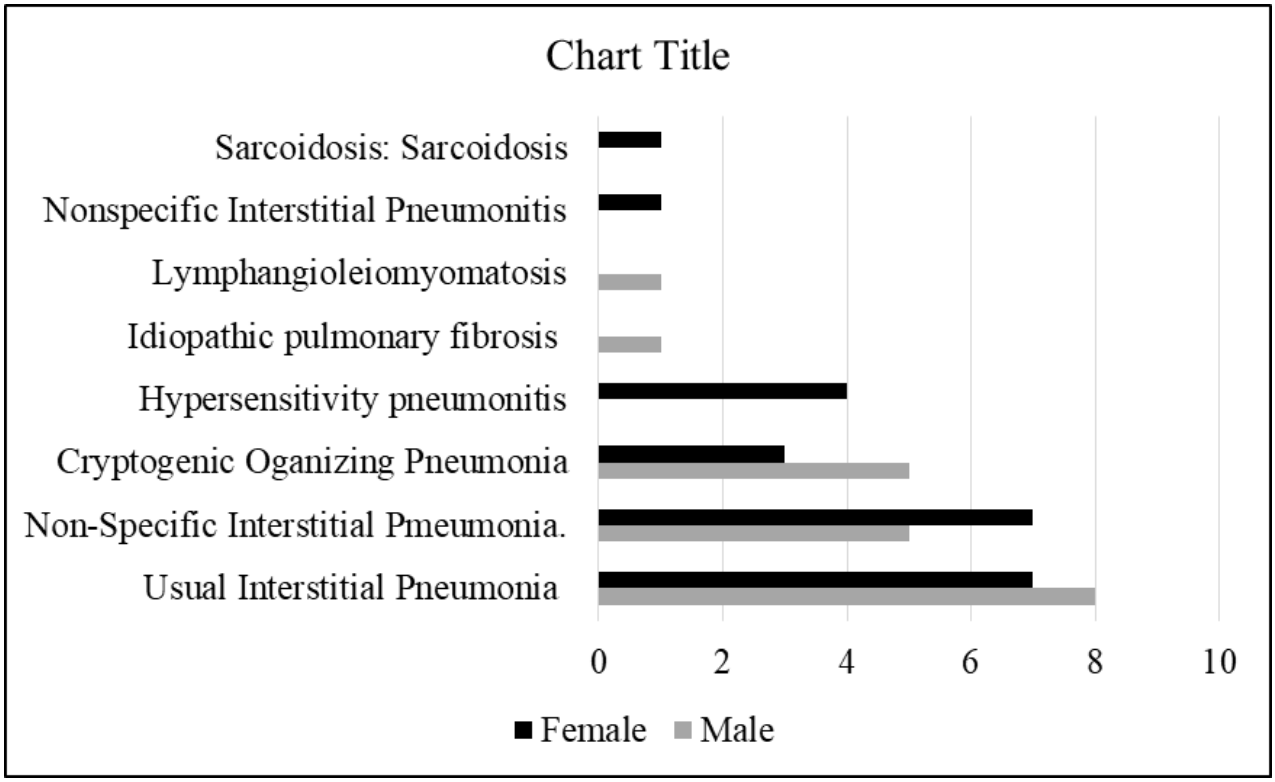

Figure 1: Gender wise diagnosis of ILD patients

DISCUSSION

The findings from this single-center study conducted in India revealed that Usual Interstitial Pneumonia (UIP) was the most prevalent diagnosis among patients with Interstitial Lung Disease (ILD). The study's results were compared with findings from other studies.

The mean age of the study sample was 57.13 ± 15.89 years, consistent with ILD typically manifesting after the age of 50, as reported in various studies [4,5,11]. However, some studies have noted ILD occurrence in individuals under 50 years as well [10,12]. There was a male predominance among ILD patients in this study, aligning with ILD registries from certain European countries but differing from findings in studies from other regions such as Saudi Arabia and Sri Lanka, where female predominance was observed [13].

Among the symptoms reported, cough and dyspnea were the most common, consistent with findings in other studies [7,13,15,16]. Clubbing was the most frequent sign observed in this study, differing from findings in studies where inspiratory Velcro snap or crepitations were more prevalent [16].

Radiological assessments revealed a recurrent nodular pattern on X-ray chest PA view and honeycombing on CT scan, which was in line with findings from previous studies [10, 12].

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

Ground glass opacity (GGO) appearance was also observed, particularly in Non-Specific Interstitial Pneumonia (NSIP) patients [7, 14-17].

Spirometry showed a restrictive pattern in 49% of subjects, with a mixed (obstructive + restrictive) pattern in 41% [17]. There was a significant decline in diffusion capacity of carbon monoxide and O2 saturation in the 6-minute walk test among the subjects [12].

The study identified Usual Interstitial Pneumonia (UIP) as the most common diagnosis, followed by Non-Specific Interstitial Pneumonia (NSIP) in approximately 22% of patients [8]. However, the study noted limitations such as a small sample size and being a single-center study.

In summary, the study provides valuable insights into the clinical, radiological, and functional profiles of ILD patients in India, highlighting the diversity of ILD presentations and the challenges associated with diagnosis and management.

CONCLUSION

ILD represents a critical health concern characterized by a dire prognosis. Given the extensive diversity within India, the epidemiological understanding of ILD remains limited. Therefore, it is imperative to emphasize enhanced awareness and screening initiatives moving forward. Such measures are crucial for gaining a more comprehensive insight into the geographical distribution of ILD prevalence as well as for the identification of specific clusters of ILD subtypes. This approach will significantly contribute to the body of knowledge surrounding ILD and aid in tailoring more effective management strategies for this condition.

REFERENCES

1. Kaul B, Cottin V, Collard H, Velenzuela C. Variability in Global Prevalence of Interstitial Lung Disease. Frontiers in Medicine. 2021.
2. Dhooria S, et al. Spectrum of interstitial lung diseases at a tertiary center in a developing country: A study of 803 subjects. PLoS ONE. 2018;13(2):e0191938.
3. Rivera-Ortega P, Molina-Molina M. Interstitial Lung Diseases in Developing Countries. Annals of Global Health. 2019;85(1):4.
4. Dhooria S. Incidence, prevalence, and national burden of interstitial lung diseases in India: Estimates from two studies of 3089 subjects. PLoS ONE. 2022;17(7):e0271665.
5. Singh S, Collins BF, Sharma BB, Joshi JM, Talwar D, Katiyar S, et al. Interstitial Lung Disease in India. Results of a Prospective Registry. Am J Respir Crit Care Med. 2017;195(6):801-813.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 4, 2024

6. European IPF Registry (eurIPFreg). Clinical and Functional Characteristics of Patients with Unclassifiable Interstitial Lung Disease (uILD): Long-Term Follow-Up Data. J Clin Med. 2020;9(8):2499.
7. Sen T. Retrospective study of interstitial lung disease in a tertiary care centre in India. Indian Journal of Chest Diseases and Allied Sciences. 2010;52(4):207-11.
8. Raghu G, Mehta S. Interstitial lung disease (ILD) in India: Insights and lessons from the prospective, landmark ILD-India registry. Lung India. 2016;33(6):589–591.
9. Mayo Clinic. Interstitial Lung Disease. URL: https://www.mayoclinic.org/diseases-conditions/interstitial-lung-disease/diagnosis-treatment/drc-20353113
10. Gagiya A. Spirometry and X-Ray Findings in Cases of Interstitial Lung Diseases. National Journal of Community Medicine. 2012;3(4):700-2.
11. Alhamad EH. Interstitial Lung Diseases in Saudi Arabia: A Single-Center Study. Ann Thorac Med. 2013;8(1):33-37.
12. Kumar R, Gupta N. Spectrum of interstitial lung disease at a tertiary care center in India. Pneumonol Alergol Pol. 2014;82(3):218–26.
13. Thomeer MJ, Costabel U, Rizzato G, Poletti V, Demedts M. Comparison of registries of interstitial lung diseases in three European countries. Eur Respir J. 2001;18:114s-118s.
14. V. Das, Unnati Desai, Jyotsna Joshi. Clinical profile of interstitial lung disease at a tertiary care center in India. Pneumon. 2017;30(1):17-23.
15. Bhattacharyya P, Dasgupta S, Paul M, Saha D, Sengupta S, et al. High-resolution computerized tomography changes in diffuse parenchymal lung disease from chronic hypersensitivity pneumonitis related to bird antigen. Lung India. 2018;35(3):215-219.
16. Devi HJG, Halappa S, Davis D, Jain A. Interstitial Lung Disease: A Tertiary Care Center Experience. IOSR Journal of Dental and Medical Sciences. 2016;15(1):5-8.
17. Ramana KV. A Clinical and Radiological Profile of Interstitial Lung Diseases. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). 2015;14(4):32-33.