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Clinical and radiological spectrum of interstitial lung disease in a north Indian state: A single centre study

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Abstract
Background: The present study was carried out with an aim of understanding the types of Interstitial lung disease (ILD) and their radiological patterns in the north Indian state of Jammu and Kashmir.
Methods: The present study was a prospective observational study conducted over a period of 2 years in Sher-i-Kashmir Institute of Medical Sciences- Medical College, Bemina, Srinagar. All consecutive patients referred to the department for High Resolution CT scan (HRCT) of the chest with suspected diagnosis of ILD based on clinical features, spirometry and chest X-ray findings, who gave consent for the study were included. Clinical, biochemical, serological and radiological parameters were assessed and the diagnosis of various ILDs was made based on standard international criteria.
Results: A total 122 patients of ILD were enrolled over a period of 2 years in the present study. Mean age of the patients was 63.4 ± 19.7 years and majority (59.8%) were males. 41.8% patients were current or previous smokers. Mean symptom duration before diagnosis was 3.1 ± 1.7 years. Exertional breathlessness (98.4%) and cough (94.3%) were the most common symptoms. Hypertension (70.5%) and gastroesophageal reflux disease (62.3%) were the most frequent comorbidities. On HRCT thorax ground glass opacities (52.5%) were the most common finding, followed by interlobular (39.3%) and intralobular (34.4%) septal thickening. Diffuse pattern of lung involvement was seen in 41.8% and predominant upper/middle lobe involvement in 33.6%. Idiopathic pulmonary fibrosis (29.5%) was the most common form of ILD, followed by Nonspecific interstitial pneumonia (23.8%) and hypersensitivity pneumonitis (15.6%). Gujjar lung, a unique form of ILD in Kashmir, was diagnosed in 2.5% patients.
Conclusion: The present study is the first from the state of Jammu and Kashmir assessing the radiological spectrum and types of ILD in this part of country. It provides a useful insight into the clinical and radiological patterns of ILD in our population and highlights the need for larger prospective multicentre registries to assess the true incidence and prevalence of ILD in the country.

Keywords: Interstitial lung disease, idiopathic pulmonary fibrosis, high resolution computerized tomography, radiological spectrum

1. Introduction
Interstitial lung disease (ILD) refers to a heterogeneous group of disorders with diverse etiologies that involve the alveolar structures, pulmonary interstitium and small airways [1]. The term ILD encompasses more than 200 different individual disease entities characterised by acute or chronic involvement of lung parenchyma with variable degree of inflammation and fibrosis [2]. The spectrum of ILD ranges from common disorders with known etiology to rare diseases with unknown etiology. The clinical course of the diseases included in this group varies from benign and self-limiting to chronic relentless progression with fatal outcome [3,4]. Given the fact that these disorders are often not limited to pulmonary interstitium and have variable involvement of small airways and pulmonary vasculature, some experts prefer to describe them as diffuse parenchymal lung diseases (DPLD).
Most of the epidemiological data regarding ILD comes from the western countries [5, 8]. The epidemiology of ILD shows high ethnic and geographic variability with incidence rates ranging from 3.62 per 100,000 person-years in southern Spain to 31.5 per 100,000 person-years females in New Mexico, USA [5, 6]. Studies from India are limited with conflicting results [9-13]. Jammu and Kashmir is the northernmost state of India which differs from the rest of the country in terms of climate, environment, culture, ethnicity and occupational patterns. In the single largest Indian ILD registry data published in 2016,

representation from the state of Jammu and Kashmir is miniscule [14]. The present study was carried out with an aim of understanding the types of ILD and their radiological patterns in this state.

2. Patients and Methods

The present study was a prospective observational study conducted in the Department of Radiodiagnosis, Sher-i-Kashmir Institute of Medical Sciences- Medical College, Bemina, Srinagar between March 2018 and February 2020. All consecutive patients referred to the department for High Resolution CT scan of the chest with suspected diagnosis of ILD based on clinical features, spirometry and chest X-ray findings, who gave consent for the study were included in the study. Patients with recent or active infection, known tuberculosis, neoplastic disease and those who refused to participate in the study were excluded.

A detailed record of the medical history with focus on presenting symptoms, prior and coexisting medical comorbidities, occupational history, environmental exposures, family history, and medications was obtained from all patients. Investigations such as haemogram, chest radiograph, sputum smear examination for acid-fast bacilli (AFB), Mantoux test and pulmonary function test (PFT) were recorded. All serological investigations such as serum anti-nuclear antibody (ANA), serum calcium, serum angiotensin converting enzyme (ACE) levels, cytoplasmic antineutrophil cytoplasmic antibodies (c-ANCA), perinuclear anti-neutrophil cytoplasmic antibodies (p-ANCA), anti-topoisomerase I antibody (Scl-70), rheumatoid factor (RA), anti-cyclic citrullinated peptide antibodies (anti-CCP), anti-double-stranded DNA (anti-dsDNA), along with other relevant investigations such as 24-hour urinary calcium records, were obtained. Histopathological investigations including bronchoalveolar lavage, transbronchial needle aspiration, endobronchial biopsy, transbronchial lung biopsy (TBLB), surgical lung biopsy, fine needle aspiration, biopsy of any other involved site such as skin, were performed as indicated.

For the diagnosis of idiopathic pulmonary fibrosis (IPF), the ATS/ERS/Japanese Respiratory Society/Latin American Thoracic Association guidelines were followed [15]. For the diagnosis of other idiopathic interstitial pneumonias (IIPs), the ATS/ERS Multidisciplinary Consensus Classification of the IIPs was followed [3, 4]. A diagnosis of sarcoidosis was made on the basis of consistent clinical and radiological findings, and the presence of granulomatous inflammation in tissue specimens, in the absence of other known causes such as tuberculosis [16-18]. A diagnosis of hypersensitivity pneumonitis (HP) was made based on a history of exposure to organic dusts, HRCT findings, along with histological findings of HP on lung biopsy. A diagnosis of a connective tissue disorder related interstitial lung disease (CTD-ILD) was made in the presence of a CTD based on standard criteria and the presence of ILD on HRCT of the chest [19, 20].

3. Statistical analysis

Statistical analysis was performed by SPSS software package (version 20.0, SPSS Inc, Chicago, Illinois, USA). All continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were reported as frequency and percentages.

4. Results

A total 122 patients of ILD were enrolled over a period of 2 years in the present study. Demographic and clinical profile of the patients is presented in Table 1.Mean age of the patients was 63.4 ± 19.7 years, ranging from 18 to 83 years. Majority of the patients belonged to the age group 50-69 years. Majority of the patients were males (59.8%) while females comprised 40.2% of the study participants. 51 patients had current or previous history of smoking, while 71 patients had never smoked. 8.3% patients had remote history of tuberculosis or intake of anti-tubercular therapy (ATT). Mean duration of symptoms before diagnosis was 3.1 ± 1.7 years. Most common presenting symptom was breathlessness (98.4%) followed by cough (94.3%). Major medical comorbidities included hypertension (70.5%), gastroesophageal reflux disease (62.3%), Obstructive Sleep Apnoea (30.3%), Diabetes mellitus (22.1%), and obesity (19.7%), The HRCT thorax findings of the patients are depicted in Table 2. Most common HRCT findings included ground glass opacities (52.5%), interlobular (39.3%) and intralobular septal thickening (34.4%), honeycombing (28.7%) and mediastinal adenopathy (32.8%). Random nodules were observed in 20.5%, while peribronchovascular septal thickening was also present in 20.5% patients. Traction bronchiectasis was noted in 26.3% patients, while centrilobular emphysema was seen in 9.8% patients (mostly IPF). Diffuse pattern of lung involvement was most prevalent (41.8%), followed by predominant upper/middle lobe involvement (33.6%) and predominant lower lobe involvement (24.6%) as depicted in Table 3. The final diagnosis of the study patients is demonstrated in Table 4. Most of the patients were diagnosed with IPF (29.5%). The second most common group was Non IPF Idiopathic interstitial pneumonia (23.8%). Amongst this group most patients had Nonspecific interstitial pneumonia (16.4%), while cryptogenic organizing pneumonia and respiratory bronchiolitis associated ILD were observed in 2.5% and 3.3% patients respectively. HP was the third most common diagnosis (15.6%), followed by CTD-ILD (10.7%). Sarcoidosis was diagnosed in 8.2% patients while occupational lung disease was present in 4.1% patients. Gujjar lung was diagnosed in 2.5% of the study patients. 2 patients were diagnosed with drug induced ILD, one due to bleomycin therapy and one due to methotrexate therapy. Rare disorders including Langarhan cell histiocytosis and Lymphangioleiomyomatosis were seen in one patient each, while 3 patients had unclassified ILD.

Table 1: Demographic and clinical profile of the patients

Characteristic	N (%)
Age group	
18-29 years	7 (5.7)
30-49 years	25 (20.5)
50-69 years	68 (55.7)
70-90 years	22 (18.0)
Gender	
Male	73 (59.8)
Female	49 (40.2)
Current or Previous smokers	51 (41.8)

Clinical Symptoms	
Exertional Breathlessness	120 (98.4)
Cough	115 (94.3)
Chest pain	27 (22.1)
Weight loss	33 (27.0)
Arthralgia	25 (20.5)
Lower extremity edema	17 (13.9)
Fever	4 (3.3)
Skin Rash	3 (2.5)
Comorbidities	
Hypertension	86 (70.5)
Gastroesophageal reflux disease	76 (62.3)
Obstructive sleep apnoea	37 (30.3)
Diabetes Mellitus	27 (22.1)
Obesity	24 (19.7)
Osteoarthritis	21 (17.2)
Chronic Kidney Disease	15 (12.3)
Ischemic Heart Disease	12 (9.8)
Hypothyroidism	9 (7.4)

Table 2: Radiological Abnormalities on HRCT thorax of the study patients

Finding	N (%)
Ground glass opacities	64(52.5)
Interlobular Septal Thickening	48(39.3)
Intralobular Septal Thickening	42 (34.4)
Peribronchovascular Septal Thickening	25(20.5)
Honeycombing	35(28.7)
Centrilobular nodules	6(4.9)
Mediastinal adenopathy	40(32.8)
Centrilobular Emphysema	12(9.8)
Random nodules	25(20.5)
Mosaic attenuation	5(4.1)
Traction Bronchiectasis	32(26.3)
Consolidation	7(5.7)
Cysts	4(3.3)

Table 3: Distribution of Radiological abnormalities on HRCT thorax

Distribution of Abnormalities	N (%)
Predominant upper/middle lobe	41 (33.6)
Predominant lower lobe	30 (24.6)
Diffuse	51 (41.8)

Table 4: Final Diagnosis of the study patients

Diagnosis	N (%)
Idiopathic Pulmonary Fibrosis	36(29.5)
Non-IPF Idiopathic Interstitial Pneumonia	29(23.8)
Nonspecific Interstitial Pneumonia	20(16.4)
Acute Interstitial Pneumonia	1 (0.8)
Cryptogenic Organizing Pneumonia	3(2.5)
Respiratory Bronchiolitis-ILD	4(3.3)
Desquamative Interstitial pneumonia	1(0.8)
Hypersensitivity Pneumonitis	19(15.6)
Connective Tissue Disease associated ILD	13(10.7)
Sarcoidosis	10(8.2)
Occupational Lung disease	5(4.1)
Gujjar Lung	3(2.5)
Drug Induced ILD	2(1.6)
Langarhan cell Histiocytosis	1(0.8)
Lymphangioleiomyomatosis	1(0.8)
Unclassified ILD	3(2.5)

5. Discussion

The present study is the first study from the state of Jammu and Kashmir, India where we have evaluated the radiological spectrum of various ILDs in the state. Epidemiological data regarding ILD in India is limited with few sporadic studies published in literature [9-13]. The data from these studies is sparse and sometimes conflicting. The single largest prospective ILD registry data published in 2016 has a minute representation from our state [14]. Jammu and Kashmir is the northernmost state of India which differs from the rest of the country in terms of climate, environment, culture, ethnicity and occupational patterns. This provided us the impetus to carry out the present study to find out the various types of ILD prevalent in our state and to study their radiological patterns.

The mean age of our study patients was 63.4 ± 19.7 years, ranging from 18 to 83 years. This was considerably more than what has been reported in previous Indian studies [19, 23]. In the ILD India registry, the mean age at the time of presentation was 55.3 years [14]. Similarly, in studies carried out by Dhooria S *et al*., Das V *et al*., and Kumar R *et al*., mean age of the patients was 50.6 years, 53.99 years, and 44.24 years respectively [21, 23]. Thus our population presented almost a decade or more later than previously reported studies. One of the plausible reasons could be late onset of the disease due to intrinsically different population studied, as already mentioned. Also, IPF represented the most common group of ILD in our study, and these patients were older (mean age 69.3 ± 13.6 years) than other subgroups of ILD, which has consistently been observed in previous studies too [5-8, 11-14, 21-23]. Males comprised the majority (59.8%) of our study patients. Previous studies have reported nearly equal sex distribution or slight female preponderance in patients with ILD [5-14]. Among IPF subgroup, which was most prevalent in our study, 83.3% patients were males. Male dominance in IPF has been demonstrated in other studies also [5-8, 11-14, 21-23]. Poor medical attention seeking behaviour among female population in our society could also be a contributing factor to this observation. Smoking is one of the important environmental risk factors for ILD. 41.8% patients in our study had current or previous history of smoking. Among IPF patients 61.1% patients were current or previous smokers. The prevalence of smoking was more than double of what has been reported in previous studies [21-23]. This strikingly high prevalence of smoking could in part be attributed high levels of stress in our population due to the long standing political turmoil going on in this part of the

country. Mean duration of symptoms before diagnosis was 3.1 years in the present study. Kumar R *et al*. also reported mean symptom duration of 3.07 years in their study [21]. This was considerably shorter that reported in ILD India registry (4.1 years) and another large study by Dhooria S *et al*. (6 years) [14-23]. This finding could be attributed to differences in the types and patterns of ILD observed in these studies, due to earlier referral of our patients to higher centres for thorough diagnostic evaluation, or due to more rapid symptomatic progression of ILD in our population. In terms of clinical presentation, exertional breathlessness (98.4%) and cough (94.3%) were the most common presenting symptoms. These were followed by weight loss, chest pain and arthralgia seen in 27%, 22.1% and 20.5% patients respectively. Fever and skin rash were uncommon and observed in 3.3% and 2.5% patients respectively. Clinical symptomatology of our patients was in consistency with that observed in previous studies [5-14, 21-23]. Comorbidities have an important bearing on the clinical course and long term prognosis of ILD patients. In the present study, the most frequently observed comorbidities were hypertension (70.5%) and gastroesophageal reflux disease (62.3%). Obstructive sleep apnoea was observed in 30.3% and diabetes mellitus in 22.1% patients. Other comorbidities included obesity (19.7%), osteoarthritis (17.2%), chronic kidney disease (12.3%), ischemic heart disease (9.8%) and hypothyroidism (7.4%). Again these associations were similar to previously reported studies [5-14, 21-23]. History of tuberculosis or intake of antitubercular therapy was observed in 8.3% patients. This frequency was almost half of that reported in previous Indian studies [21-23]. In the ILD India Registry 15.5% patients had a prior history of tuberculosis [14]. Similarly, Kumar R. *et al*. reported history of antitubercular therapy intake in 14.9% patients and Dhooria S *et al*. reported a history of tuberculosis in 18.4% patients diagnosed with ILD in tertiary care hospitals of India [21, 23]. The reasons for lower prevalence of tuberculosis in our study could be either due to overall lower prevalence of tuberculosis in our population or due to higher physician threshold for prescribing antitubercular therapy. Similar to previous observations, history of ATT intake was most frequently among patients diagnosed with sarcoidosis and Gujjar lung (4.8% and 1.7% respectively) [21-26]. The similarities in clinical and radiological presentation of tuberculosis vis a vis sarcoidosis and Gujjar lung (discussed subsequently), often leads to misdiagnosis of these conditions and unnecessary prescription of ATT to these patients.

In the present study, most common HRCT findings included ground glass opacities (52.5%), interlobular (39.3%) and intralobular septal thickening (34.4%), honeycombing (28.7%) and mediastinal adenopathy (32.8%). Random nodules were observed in 20.5%, while peribronchovascular septal thickening was also present in 20.5% patients. Traction bronchiectasis was noted in 26.3% patients, while centrilobular emphysema was seen in 9.8% patients (mostly IPF). Diffuse pattern of lung involvement was most prevalent (41.8%), followed by predominant upper/middle lobe involvement (33.6%) and predominant lower lobe involvement (24.6%). In comparison to previously reported studies, ground glass opacities and diffuse pattern of lung involvement were more frequently observed in our study [9-13, 21-23].

The most common ILD observed in this study was Idiopathic pulmonary fibrosis (29.5%). The second most common group was Non IPF Idiopathic interstitial pneumonia (23.8%). Amongst this group most patients had Nonspecific interstitial pneumonia (16.4%), while cryptogenic organizing pneumonia and respiratory bronchiolitis associated ILD were observed in 2.5% and 3.3% patients respectively. Hypersensitivity pneumonitis was the third most common diagnosis (15.6%), followed by connective tissue disease associated ILD (10.7%). Sarcoidosis was diagnosed in 8.2% patients while occupational lung disease was present in 4.1% patients. Various Indian studies in the past have reported different prevalence of various subtypes of ILD, some of them being in sharp contrast with others' results [9-14, 21-23]. In a study including 803 subjects, Dhooria S. *et al*. found that sarcoidosis was the most common (42.2%) ILD, followed by IPF (21.2%). CTD-ILDs, HP, and non-IPF IIPs were diagnosed in 12.7%, 10.7%, and 9.2% of the subjects respectively [23]. Similarly, in another study conducted by Kumar R. *et al*, sarcoidosis (37.3%) was found to be the most common form of ILD, followed by IPF (27.6%) and NSIP (25.6%) [21]. In contrast to these studies, the multicentre ILD India registry including 1084 patients from 27 centres in India, reported hypersensitivity pneumonitis as the most common (47.3%) form of ILD. 13.9% patients had CTD-ILD, 13.7% had IPF, 8.5% had idiopathic nonspecific interstitial pneumonia (iNSIP), 7.8% were diagnosed with sarcoidosis, 3% had pneumoconiosis, and 5.7% were found to have other ILDs [14]. The strikingly high prevalence of hypersensitivity pneumonitis found in this study has been subject to severe criticism, as the study was fraught with several limitations. First, the study was subject to significant selection bias, as the patient enrolment was non-consecutive and from various small hospitals and scattered clinics in the country. Second, histopathological diagnosis was available in only 7.5% patients who underwent lung biopsy in this study. Lastly, a diagnosis of aircooler-induced HP was made casually in high proportion (48.1%) of patients, without establishing a cause and effect relationship. In another study conducted by Das V. *et al*., IPF was found to be the most prevalent subtype of ILD constituting 29.29% cases, followed by NSIP (27.14%) and CTD-ILD (15.71%). Sarcoidosis and hypersensitivity pneumonitis constituted 8.57% cases each [22]. These findings were more or less similar to our results. The divergent results of various Indian studies could partly be attributed to diverse groups of patients studied, given the fact that India is a vast country with populations in different parts having dissimilar social, cultural, occupational and environmental attributes apart from variable availability and access to health care facilities. Furthermore, different studies have utilized variable data collection protocols, diagnostic criteria and categorization strategies in their methodology.

An uncommon but unique form of ILD existent in our part of country is Gujjar lung, which is an environmental interstitial lung disease caused due to the indoor air pollution with pinewood smoke, occurring predominantly in members of the Gujjar community (a cattle rearing socio-ethnic group residing at high altitude hilly regions of the Indian sub-continent) [24-26]. The entity Gujjar lung was first introduced in 1991 by Dhar and Pathania from Kashmir when they noticed miliary mottling and reticulonodular pattern in the chest radiographs of patients belonging to Gujjar community, which did not respond to empirical ATT

[24]. Lung biopsy in these patients revealed the findings of anthracotic nodules, carbon laden macrophages and fibrosis. The authors attributed it to the indoor air pollution with smoke from biomass combustion, mainly pine wood. These findings were subsequently validated by multiple studies [25-26]. In the present study Gujjar lung was found in 2.5% ILD patients.

6. Study limitations

The present study had some important limitations. First, it was a single centre study with limited number of patients. Therefore, selection bias cannot be ruled out and extrapolation of the results to larger population needs further validation by larger multi-centric studies. Second, histopathological investigations were performed in a limited number of patients due to financial and logistic constraints and this could have a significant bearing on the study results. Third, pulmonary function tests were not a part of this study and their correlation with the HRCT findings was not assessed. Lastly, serology for hypersensitivity pneumonitis was not available and the diagnosis was based purely on clinical grounds.

7. Conclusion

The present study is the first from the state of Jammu and Kashmir assessing the radiological spectrum and types of ILD in this part of country. Although, it is a single centre study with limited number of patients, it provides a useful insight into the clinical and radiological patterns of ILD in our population. The fact that the results were divergent from some previous studies calls for larger prospective multicentre registries with more robust multidisciplinary diagnosis algorithms and histopathological correlation to assess the true incidence and prevalence of ILD in the country.

8. References

1. Raghu G. Interstitial lung disease. In: Goldman L, Schafer AI, editors Cecil Medicine; 24th edition. Philadelphia: W.B. Saunders, 2011, 556-66.
2. Demedts M, Wells AU, Anto JM, Costabel U, Hubbard R, Cullinan P *et al*. Interstitial lung diseases: an epidemiological overview. European Respiratory Journal. 2001; 18(32):2s-16s.
3. European RS, American Thoracic Society. American Thoracic Society/European Respiratory Society international multidisciplinary consensus classification of the idiopathic interstitial pneumonias. This joint statement of the American Thoracic Society (ATS), and the European Respiratory Society (ERS) was adopted by the ATS board of directors, June 2001 and by the ERS executive committee, June 2001. American Journal of Respiratory and Critical Care Medicine. 2002; 165(2):277.
4. Travis WD, Costabel U, Hansell DM, King Jr TE, Lynch DA *et al*. An official American Thoracic Society/European Respiratory Society statement: update of the international multidisciplinary classification of the idiopathic interstitial pneumonias. American journal of respiratory and critical care medicine. 2013; 188(6):733-48.
5. López-Campos JL, Rodríguez-Becerra E, Neumosur Task Group of the Registry of Interstitial Lung Diseases (RENIA). Incidence of interstitial lung diseases in the south of Spain 1998-2000: the RENIA study. European journal of epidemiology, 2004, 155-61.
6. Coultas DB, Zumwalt RE, Black WC, Sobonya RE. The epidemiology of interstitial lung diseases. American journal of respiratory and critical care medicine. 1994; 150(4):967-72.
7. Behr J, Hoeper MM, Kreuter M, Klotsche J, Wirtz H, Pittrow D. Investigating significant health trends in idiopathic pulmonary fibrosis (INSIGHTS-IPF): rationale, aims and design of a nationwide prospective registry. BMJ Open Respiratory Research, 2014, 1(1).
8. Samet JM, Coultas D, Raghu G. Idiopathic pulmonary fibrosis: tracking the true occurrence is challenging. European Respiratory Journal 2015; 46:604-606.
9. Jindal SK, Malik SK, Deodhar SD, Sharma BK. Fibrosing alveolitis: a report of 61 cases seen over the past five years. The Indian journal of chest diseases & allied sciences. 1979; 21(4):174.
10. Mahashur AA, Dave KM, Kinare SG, Kamat SR, Shetye VM, Kolhatkar VP. Diffuse fibrosing alveolitis-an Indian experience. Lung India. 1983; 1(5):171.
11. Subhash HS, Ashwin I, Solomon SK, David T, Cherian AM, Thomas K. A comparative study on idiopathic pulmonary fibrosis and secondary diffuse parenchymal lung disease. Indian Journal of Medical Science. 2004; 58:185-190.
12. Sen T, Udwadia ZF. Retrospective study of interstitial lung disease in a tertiary care centre in India. The Indian journal of chest diseases & allied sciences. 2010; 52(4):207.
13. Kundu S, Mitra S, Ganguly J, Mukherjee S, Ray S, Mitra R. Spectrum of diffuse parenchymal lung diseases with special reference to idiopathic pulmonary fibrosis and connective tissue disease: An eastern India experience. Lung India: Official Organ of Indian Chest Society. 2014; 31(4):354.
14. Singh S, Collins BF, Sharma BB, Joshi JM, Talwar D, Katiyar S *et al*. Interstitial lung disease in India. Results of a prospective registry. American journal of respiratory and critical care medicine. 2017; 195(6):801-13.
15. Raghu G, Collard HR, Egan JJ, Martinez FJ, Behr J, Brown KK *et al*. An official ATS/ERS/JRS/ALAT statement: idiopathic pulmonary fibrosis: evidence-based guidelines for diagnosis and management. American journal of respiratory and critical care medicine. 2011; 183(6):788-824.
16. Statement on Sarcoidosis. Joint Statement of the American Thoracic Society (ATS), the European Respiratory Society (ERS) and the World Association of Sarcoidosis and Other Granulomatous Disorders (WASOG) adopted by the ATS Board of Directors and by the ERS Executive Committee, February 1999. Am J Respir Crit Care Med. 1999; 160(2):736-55.
17. Dhooria S, Agarwal R, Aggarwal AN, Bal A, Gupta N, Gupta D. Differentiating tuberculosis from sarcoidosis by sonographic characteristics of lymph nodes on endobronchial ultrasonography: a study of 165 patients. The Journal of thoracic and cardiovascular surgery. 2014; 148(2):662-7.
18. Dhooria S, Gupta N, Bal A, Sehgal IS, Aggarwal AN, Sethi S *et al*. Role of Xpert MTB/RIF in differentiating tuberculosis from sarcoidosis in patients with mediastinal lymphadenopathy undergoing EBUS-

TBNA: a study of 147 patients. Sarcoidosis Vasc Diffuse Lung Dis. 2016; 33(3):258-66.
19. Fischer A, Du Bois R. Interstitial lung disease in connective tissue disorders. The lancet. 2012; 380(9842):689-98.
20. Fischer A, Antoniou KM, Brown KK, Cadranel J, Corte TJ, Du Bois RM, *et al*. An official European Respiratory Society/American Thoracic Society research statement: interstitial pneumonia with autoimmune features. European Respiratory Journal. 2015; 46(4):976-87.
21. Kumar R, Gupta N, Goel N. Spectrum of interstitial lung disease at a tertiary care centre in India. Advances in Respiratory Medicine. 2014; 82(3):218-26.
22. Das V, Desai U, Joshi JM. Clinical profile of interstitial lung disease at a tertiary care centre, India. Pneumon. 2017; 30(1):17-23.
23. Dhooria S, Agarwal R, Sehgal IS, Prasad KT, Garg M, Bal A. Spectrum of interstitial lung diseases at a tertiary center in a developing country: A study of 803 subjects. PloS one. 2018; 13(2):e0191938.
24. Dhar SN, Pathania AGS. Bronchitis due to biomass fuel burning in North India: "Gujjar Lung" an extreme effect. Seminars Resp Med. 1991; 12(2):69-74.
25. Raison A, Andeejani AM, Mobiereek A, Al-Rikabi AC. High resolution computed tomography findings in a pathologically proven case of Gujjar Lung. Clinical radiology. 2000; 55(2):155-6.
26. Hassan G, Qureshi W, Kadri SM, Khan GQ. Gujjar lung: A disease mimicking miliary tuberculosis. International Journal of Health Sciences. 2008; 2(1):105.