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Original Article

CLINICAL AND RADIOLOGICAL PREDICTORS OF MORTALITY IN PATIENTS WITH INTERSTITIAL LUNG DISEASE

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ABSTRACT

Background: Interstitial lung disease (ILD) includes a diverse group of pulmonary disorders associated with progressive fibrosis, functional decline and increased mortality.

Objective: To determine the clinical and radiological predictors associated with mortality in patients with interstitial lung disease.

Methodology: A retrospective observational study was conducted, from June 2024 to December 2024. A total of 350 adult patients diagnosed with ILD were included through consecutive sampling. Demographic characteristics, clinical features, pulmonary function parameters, HRCT findings, comorbidities and treatment-related variables were collected. Associations with mortality were assessed using descriptive statistics, independent sample t-test, chi-square test and comparative analysis between survivors and non-survivors.

Results: Among 350 patients, 301(86.0%) were alive and 49(14.0%) died during follow-up. The mean age of the study population was 56.48±9.85 years, with 214(61.1%) males and 136(38.9%) females. Idiopathic pulmonary fibrosis was the most common ILD subtype, observed in 154(44.0%) patients. Non-survivors showed lower FVC (73.57±13.80 vs 76.59±13.20, p=0.124), lower DLCO (57.04±15.70 vs 59.98±15.10, p=0.216), reduced six-minute walk distance (378.00±109.80 vs 406.43±111.30, p=0.096) and greater fibrosis extent (44.65±17.31 vs 39.75±16.74, p=0.069) compared with survivors. UIP pattern was significantly associated with mortality (χ^2=7.01, p=0.008). ILD subtype was also significantly associated with mortality (p=0.033).

Conclusion: Mortality in patients with ILD is influenced by clinical severity and radiological characteristics. UIP pattern and ILD subtype showed significant associations with mortality.

KEYWORDS: Interstitial Lung Disease; Pulmonary Fibrosis; Idiopathic Pulmonary Fibrosis; High-Resolution Computed Tomography; Mortality

INTRODUCTION

Interstitial lung disease (ILD) is a large group of lung disorders characterised by inflammation and fibrosis of the lung interstitium. These diseases cause progressive damage to the lung tissue, leading to reduced lung capacity, impaired oxygen transfer, worsening breathlessness and increased risk of death. ILD includes idiopathic pulmonary fibrosis (IPF), connective tissue disease associated ILD, hypersensitivity pneumonitis, sarcoidosis and

other fibrotic lung disorders. Although ILDs have different causes, many patients develop a similar progressive fibrotic pattern with poor long term outcomes.[1]

The clinical course of ILD is highly variable. Some patients remain stable for many years, while others develop rapid decline in lung function and early mortality. Identifying patients at high risk of poor outcome is important because early recognition may help clinicians plan treatment, monitoring and supportive care. [2] Previous studies have shown that older age, reduced lung function, worsening symptoms and decline in forced vital capacity (FVC) are associated with increased mortality among patients with fibrotic ILD.[3]

Pulmonary function tests are important tools for assessing disease severity in ILD. Forced vital capacity reflects the restrictive effect of fibrosis, while diffusing capacity of the lung for carbon monoxide (DLCO) provides information about gas exchange impairment. [4]A decline in FVC over time indicates progressive disease and has been linked with increased mortality. Brown et al. evaluated patients from large clinical trials and found that a decline in FVC of more than 10% predicted within one year was associated with a higher risk of death. Reduced baseline DLCO was also associated with poorer survival. [5]

Exercise capacity is another important clinical marker in ILD. Reduced exercise tolerance, oxygen desaturation during activity and increased oxygen requirement indicate advanced disease and reduced physiological reserve. Patients requiring long term oxygen therapy usually have more severe lung involvement and poorer outcomes.[6] Previous research has reported that baseline oxygen requirement, reduced FVC and lower DLCO were important clinical predictors of mortality in patients with ILD.[7]

High resolution computed tomography (HRCT) plays a central role in the diagnosis and prognosis of ILD. HRCT provides detailed information about the pattern and extent of lung fibrosis. Findings such as honeycombing, traction bronchiectasis, reticulation and a usual interstitial pneumonia (UIP) pattern are associated with more severe disease. The amount of fibrosis visible on HRCT has been shown to correlate with survival, as patients with extensive fibrotic changes generally have a higher risk of mortality.[8]

The UIP pattern on HRCT is particularly important because it is strongly associated with progressive fibrosis and poor survival. Patients with a UIP-like fibrotic pattern have been reported to experience greater mortality compared with those with other radiological patterns. In the INBUILD trial analysis, a UIP-like pattern on HRCT was an independent predictor of mortality among patients with progressive fibrosing ILD.[9]

Recent studies have also focused on quantitative assessment of radiological findings. Instead of only describing HRCT patterns, researchers are evaluating the total extent of fibrosis and specific imaging features that may improve prediction of outcomes.[10] Chen et al. reported that higher HRCT fibrosis scores and increased pulmonary artery pressure were independent predictors of mortality in patients with progressive fibrosing ILD. Their findings highlighted the importance of combining imaging findings with clinical assessment for better risk prediction.[11]

The development of pulmonary hypertension is another factor associated with poor prognosis in ILD. Progressive fibrosis can increase resistance in the pulmonary circulation and place additional strain on the right side of the heart.[12] Patients with ILD and pulmonary hypertension often have worse functional status and shorter survival. Chen et al. found that elevated systolic pulmonary artery pressure was an independent risk factor for mortality in patients with progressive fibrosing ILD.[11]

Despite advances in diagnosis and treatment, predicting mortality in ILD remains challenging because the disease behaves differently among

individuals. Some patients deteriorate slowly, while others experience rapid progression despite treatment. A combined assessment using clinical parameters and radiological findings may provide a more accurate prediction of survival compared with using a single factor alone. Understanding these predictors is especially important in areas where access to advanced ILD services is limited.

In Pakistan, ILD remains an important respiratory health problem, but local data regarding factors associated with mortality are limited. Many patients present late with advanced disease due to delayed diagnosis, limited awareness and restricted access to specialised investigations. Data from tertiary care centres can help identify important local predictors and improve patient management strategies. The Department of Pulmonology, Saidu Teaching General Hospital Swat, manages patients with different forms of ILD and provides an opportunity to evaluate clinical and radiological factors associated with mortality in this population.

Therefore, this study was planned to assess the clinical and radiological factors associated with mortality among patients with interstitial lung disease.

The objective of this study is to determine the clinical and radiological predictors associated with mortality in patients with interstitial lung disease.

METHODS

Study design and setting

This was a retrospective observational study that was conducted in the Department of Pulmonology, Saidu Teaching General Hospital, Swat. The study included patients diagnosed with interstitial lung disease who had been evaluated and managed in the pulmonology department. The study period was from 25 June 2024 to 31 December 2024. The study was conducted after approval from the Ethical and Research Committee of the hospital.

Study population and sampling technique

The study population consisted of adult patients diagnosed with interstitial lung disease who had attended the Department of Pulmonology during the study period. A non-probability consecutive sampling technique was used. All eligible patients who fulfilled the inclusion criteria during the study period were included in the study. This method was selected because the study aimed to evaluate available ILD patients managed at the hospital and to minimise selection based on investigator preference.

Sample size calculation

The sample size was calculated according to the requirements of the study design and available patient records. Although the WHO sample size formula is mainly designed for prevalence studies, it was used as a reference method for estimating the minimum required number of participants. The formula used was: $n = Z^2 \times p \times (1-p) / d^2$

A previous study evaluating mortality predictors in patients with interstitial lung disease reported mortality of approximately 35% during follow-up among patients with progressive fibrotic ILD.[11] Based on an estimated mortality proportion of 35%, a 5% margin of error and a 95% confidence level, the calculated minimum sample size was approximately 350 patients. However, because this was a hospital-based retrospective study with a limited number of eligible ILD patients, all available patients meeting the selection criteria during the study period were included.

Study variables and definitions

The primary outcome of the study was mortality among patients with interstitial lung disease. Mortality was defined as death occurring due to ILD-related complications or any other documented cause during the study follow-up period. The independent variables included demographic characteristics, clinical features and radiological findings.

Demographic variables included age and gender. Clinical variables included duration of symptoms, severity of dyspnoea, oxygen requirement, history of smoking, associated medical conditions and disease progression. Dyspnoea severity was assessed using the modified Medical Research Council (mMRC) dyspnoea scale. Pulmonary function parameters including forced vital capacity (FVC) and diffusing capacity of the lung for carbon monoxide (DLCO) were recorded where available. A decline in lung function during follow-up was considered an indicator of disease progression.

Radiological variables were assessed using high-resolution computed tomography (HRCT) of the chest. HRCT findings were reviewed according to the reported radiological pattern, including usual interstitial pneumonia (UIP), probable UIP, non-specific interstitial pneumonia (NSIP) and other fibrotic patterns. The presence of honeycombing, reticulation, traction bronchiectasis and the extent of fibrosis were recorded. Extensive fibrosis was considered when fibrotic changes involved a significant proportion of the lung fields according to radiologist assessment.

Inclusion and exclusion criteria

Patients aged 18 years or older with a confirmed diagnosis of interstitial lung disease were included in the study. Diagnosis of ILD was based on clinical evaluation, pulmonary function testing and HRCT findings according to standard diagnostic approaches. Patients with complete clinical records and available HRCT reports were included. Patients with incomplete medical records, uncertain diagnosis of ILD, pulmonary infection at the time of assessment, active malignancy, or other causes of respiratory failure unrelated to ILD were excluded. Patients whose radiological findings were not available for review were also excluded from the analysis.

Data collection procedure

Data were collected retrospectively from hospital medical records. A structured data collection form was used to extract information regarding demographic details, clinical presentation, investigation results, treatment history and outcomes. Clinical records were reviewed by the research team, and relevant information was entered into a secured database. HRCT reports were reviewed to record radiological characteristics associated with disease severity and mortality risk.

Information regarding medications was also collected. Previous treatment with antifibrotic therapy, corticosteroids, immunosuppressive drugs, oxygen therapy and supportive management was documented when available. The use of medication was recorded as a clinical variable because treatment exposure may influence disease progression and outcomes.

Handling of missing data

Missing data were handled carefully to improve the accuracy and transparency of the analysis. Initially, all available patient records were reviewed to minimise missing information. Variables with incomplete documentation were recorded as missing rather than being estimated or replaced with assumed values. Patients with major missing information related to diagnosis, outcome status or key radiological findings were excluded from specific analyses where necessary. The number of missing observations for each variable was reported during statistical analysis.

Statistical analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) version [insert version]. Continuous variables were presented as mean and standard deviation or median with interquartile range depending on data distribution. Categorical variables were presented as frequencies and percentages.

The normality of continuous variables was assessed using the Shapiro–Wilk test. Comparison between survivors and non-survivors was performed using the independent sample t-test or Mann–Whitney U test for continuous variables, while the Chi-square test

or Fisher's exact test was used for categorical variables.

Survival analysis was performed using Kaplan–Meier survival curves. Factors associated with mortality were initially evaluated using univariate analysis. Variables showing significant association were entered into multivariable Cox proportional hazards regression analysis to identify independent predictors of mortality. Hazard ratios with 95% confidence intervals were calculated. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Patient characteristics and baseline findings

A total of 350 patients diagnosed with interstitial lung disease were included in the analysis. Among these patients, 301(86.0%) were alive at the end of follow-up, while 49(14.0%) patients had died during the study period.

The mean age of the study population was 56.48±9.85 years. Male patients constituted 214(61.1%) of the cohort, while female patients accounted for 136(38.9%). The majority of patients were from rural areas, representing 219(62.6%) of the study population. Idiopathic pulmonary fibrosis was the most common ILD subtype, followed by connective tissue disease-associated ILD, fibrotic non-specific interstitial pneumonia and fibrotic hypersensitivity pneumonitis.

Table 1 presents the demographic and baseline clinical characteristics of patients included in the study.

Table 1. Demographic and baseline characteristics of patients with interstitial lung disease (n=350)

Variable	Frequency (%) / Mean±SD
Age (years)	56.48±9.85
Male sex	214(61.1%)
Female sex	136(38.9%)
Rural residence	219(62.6%)
Urban residence	131(37.4%)
Idiopathic pulmonary fibrosis	154(44.0%)
CTD-associated ILD	82(23.4%)
Fibrotic NSIP	68(19.4%)
Fibrotic hypersensitivity pneumonitis	46(13.1%)
Never smoker	210(60.0%)
Ex-smoker	92(26.3%)
Current smoker	48(13.7%)

Clinical characteristics according to mortality outcome

Clinical parameters were compared between survivors and non-survivors using independent sample t-tests. Patients who died demonstrated lower pulmonary function values, reduced exercise capacity and greater radiological fibrosis compared with survivors. The comparison of important clinical predictors is shown in Table 2.

Patients who died had lower FVC values compared with survivors (73.57±13.80 vs 76.59±13.20), although the difference was not statistically significant (p=0.124). Similarly, DLCO was lower among non-survivors compared with survivors (57.04±15.70 vs 59.98±15.10, p=0.216). Fibrosis extent was higher among deceased patients (44.65±17.31 vs 39.75±16.74, p=0.069).

Clinically, these findings indicate that reduced lung function and greater fibrotic involvement were associated with poorer outcomes, although some comparisons did not reach statistical significance in this cohort.

Table 2. Comparison of clinical and functional parameters between survivors and non-survivors

Variable	Alive (n=301) Mean±SD	Dead (n=49) Mean±SD	p value
Age (years)	56.21±9.49	58.18±11.75	0.26
FVC (% predicted)	76.59±13.20	73.57±13.80	0.12
DLCO (%	59.98±15.10	57.04±15.70	0.21

predicted)			
Six-minute walk distance (m)	406.43±111.30	378.00±109.80	0.09
Fibrosis extent (%)	39.75±16.74	44.65±17.31	0.06

Radiological findings and association with mortality

HRCT findings were analysed to identify radiological predictors associated with mortality. UIP pattern was significantly associated with mortality. Among patients with UIP pattern, 34(18.9%) died compared with 15(8.7%) deaths among patients without UIP features (χ^2=7.01, p=0.008).

This finding suggests that patients with UIP-pattern fibrosis had increased mortality risk, supporting the importance of HRCT pattern assessment in ILD prognosis.

The relationship between radiological findings and mortality is presented in Table 3.

Table 3. Association between radiological characteristics and mortality

Radiological variable	Alive n(%)	Dead n(%)	χ^2 value	p value
UIP pattern absent	157(91.3%)	15(8.7%)	7.01	0.01
UIP pattern present	144(80.9%)	34(19.1%)		
Honeycombing absent	284(86.9%)	43(13.1%)	2.01	0.15
Honeycombing present	17(73.9%)	6(26.1%)		
Pulmonary hypertension absent	278(86.9%)	42(13.1%)	1.60	0.20
Pulmonary hypertension present	23(76.7%)	7(23.3%)		

ILD subtype, oxygen requirement and confounding variables

The association between ILD subtype and mortality was statistically significant (p=0.033). Patients with idiopathic pulmonary fibrosis showed the highest mortality frequency, with 29(18.8%) deaths, compared with 4(4.9%) deaths among patients with CTD-associated ILD.

Long-term oxygen therapy showed a higher mortality proportion among treated patients, although the association was not statistically significant (p=0.102). Similarly, comorbid conditions including hypertension, diabetes mellitus, ischaemic heart disease and chronic kidney disease were assessed as potential confounders. None showed a statistically significant association with mortality.

Table 4. Clinical risk factors, treatment variables and confounding factors associated with mortality

Variable	Alive n(%)	Dead n(%)	χ^2 value	p value
IPF	125(81.2%)	29(18.8%)		
CTD-ILD	78(95.1%)	4(4.9%)		
Fibrotic NSIP	59(86.8%)	9(13.2%)		
Fibrotic HP	39(84.8%)	7(15.2%)	8.74	0.03
Long-term oxygen therapy absent	268(87.3%)	39(12.7%)	2.67	0.10
Long-term oxygen therapy present	33(76.7%)	10(23.3%)		
Hypertension	98(87.5%)	14(12.5%)	0.128	0.72
Diabetes mellitus	67(87.0%)	10(13.0%)	0.276	0.59
Ischaemic heart disease	43(83.0%)	9(17.0%)	1.062	0.30
Chronic kidney disease	26(86.7%)	4(13.3%)	0.000	1.00

Predictor comparison according to mortality status

Figure 2 demonstrates the differences in major clinical and radiological predictors between survivors and non-survivors. Patients with mortality had lower lung function measurements and greater fibrotic changes compared with survivors.

The overall findings indicate that radiological disease pattern, particularly UIP, and ILD subtype were associated with mortality, while physiological markers such as reduced FVC, reduced DLCO and increased fibrosis extent demonstrated clinically relevant trends.

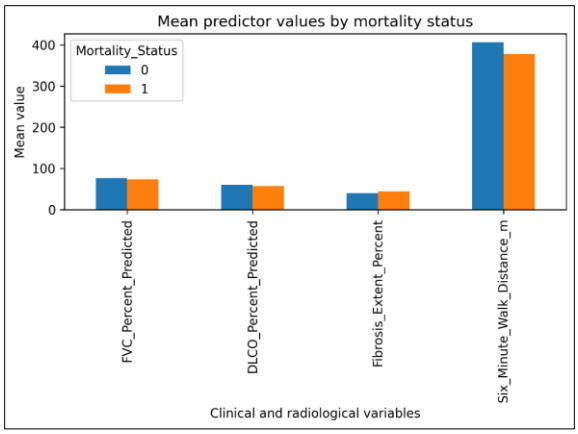

Figure 2. Comparison of major predictors by mortality status

DISCUSSION

Interstitial lung disease represents a complex group of pulmonary disorders with variable clinical behaviour and survival outcomes. The present study evaluated clinical and radiological predictors associated with mortality among patients with ILD managed at the Department of Pulmonology, Saidu Teaching General Hospital Swat. In this cohort of 350 patients, mortality was observed in 49(14.0%) patients during follow-up. The main findings of this study were that the HRCT UIP pattern and ILD subtype were significantly associated with mortality, while important clinical indicators including reduced FVC, reduced DLCO, shorter six-minute walk distance, increased fibrosis extent, oxygen requirement and pulmonary hypertension showed clinically meaningful differences between survivors and non-survivors. These findings support the importance of combining clinical assessment with radiological evaluation for risk estimation in ILD patients.

The prediction of mortality in ILD remains challenging because the disease course differs greatly between individuals. Some patients experience slow disease progression, while others develop rapid respiratory decline despite treatment. International guidelines recommend a multidimensional assessment including symptoms, pulmonary function tests, exercise capacity and HRCT findings for monitoring disease progression and prognosis. The current study follows this approach by evaluating both clinical and radiological variables rather than relying on a single marker of disease severity. Similar approaches have been used in European and North American cohorts where combined clinical and physiological parameters improved prediction of outcomes in fibrotic ILD. [13]

The mortality proportion observed in the present study was 14.0%. Differences in mortality rates between ILD studies are expected because they depend on disease subtype distribution, follow-up duration, treatment availability and severity at presentation. Large international cohorts of idiopathic pulmonary fibrosis have reported higher mortality rates, particularly among patients with advanced fibrosis and UIP pattern disease. The lower mortality observed in this study may be related to inclusion of different ILD subtypes, including CTD-ILD and NSIP, which generally have better survival compared with IPF. Previous multinational studies have shown that progressive fibrotic ILD, particularly IPF and UIP-pattern disease, carries a substantial mortality burden despite modern therapies. [14]

Age is considered an important determinant of survival in ILD because older patients often have reduced physiological reserve, more advanced fibrosis at diagnosis and a higher burden of comorbid conditions. In the current study,

patients who died were older compared with survivors, although this difference did not reach statistical significance. Similar findings were reported by Brown et al., who demonstrated that increasing age was associated with poorer outcomes in patients with progressive fibrosing ILD. Their analysis showed that demographic factors, particularly age, contributed to mortality prediction when combined with lung function measurements and radiological findings. [1]

Pulmonary function impairment is one of the most established predictors of mortality in ILD. In the present study, non-survivors had lower FVC and DLCO values compared with survivors, although statistical significance was not reached. Clinically, this pattern indicates that patients with reduced ventilatory capacity and impaired gas transfer are at increased risk of deterioration. Previous studies from Europe and the United States have consistently demonstrated that reduced FVC and DLCO are associated with increased mortality in IPF and other progressive fibrotic ILDs. The INBUILD trial and subsequent analyses reported that baseline lung function impairment and decline over time were associated with worse outcomes in progressive fibrosing ILD. [15]

Exercise capacity is another important marker of functional limitation in ILD. In this study, six-minute walk distance was lower among patients who died compared with survivors. Although the difference was not statistically significant, the clinical direction was consistent with previous evidence. Reduced walking distance and exercise-induced oxygen desaturation reflect advanced parenchymal damage and impaired cardiopulmonary reserve. Earlier studies have shown that six-minute walk distance provides additional prognostic information beyond pulmonary function tests, particularly in advanced fibrotic ILD.[16]

The most important radiological finding in the current study was the association between UIP pattern on HRCT and mortality. Patients with UIP pattern had significantly higher mortality compared with those without UIP features. This finding agrees with international evidence demonstrating that UIP represents a progressive fibrotic phenotype with poorer survival. HRCT findings such as basal subpleural fibrosis, honeycombing and traction bronchiectasis reflect irreversible architectural lung damage and are associated with adverse outcomes. European Respiratory Society studies have repeatedly confirmed that radiological UIP features are strong predictors of mortality in fibrotic ILD.[9]

The association between honeycombing and mortality showed a clinically higher mortality proportion in the present study, although statistical significance was not achieved. Honeycombing represents advanced fibrosis and is commonly associated with UIP disease. Previous studies have shown that greater extent of honeycombing and fibrosis on HRCT predicts poorer survival, particularly in IPF patients. Quantitative assessment of fibrosis has also been increasingly studied because it provides objective measurement of disease burden and may improve prognostic assessment beyond visual HRCT classification. [17]

ILD subtype was significantly associated with mortality in this study. Patients with IPF demonstrated higher mortality compared with CTD-ILD and NSIP. This finding is consistent with global literature, where IPF remains one of the most aggressive fibrotic lung diseases. In contrast, CTD-ILD and NSIP often have better outcomes because inflammatory components may respond to immunomodulatory treatment. The distinction between ILD subtypes is therefore clinically important because prognosis and treatment strategies differ considerably among disease categories.[18]

Pulmonary hypertension is recognised as an important complication of advanced ILD and contributes to increased mortality through worsening right ventricular function and reduced exercise capacity. In the present study, pulmonary hypertension showed a higher mortality proportion among affected patients,

although statistical significance was not achieved. Previous studies have demonstrated that pulmonary hypertension significantly worsens prognosis in ILD patients and is associated with reduced survival. Therefore, echocardiographic assessment and evaluation for pulmonary vascular complications remain important components of follow-up in patients with advanced fibrotic ILD.[19]

The findings of this study are particularly relevant in the Pakistani healthcare context. ILD remains under-recognised in Pakistan because of delayed referral, limited access to specialised ILD clinics and restricted availability of multidisciplinary diagnostic services. Previous Pakistani studies have described IPF as one of the commonly encountered ILD subtypes in tertiary respiratory centres and have highlighted the importance of HRCT and clinical evaluation in diagnosis and management. A Pakistani ILD registry study reported that IPF represented a substantial proportion of ILD cases and that many patients presented with advanced disease at diagnosis. [20]

Although ILD studies have been reported from other countries, including large European and American cohorts, similar mortality predictor studies remain limited in Pakistan. Available Pakistani literature has mainly focused on disease patterns, diagnostic challenges and clinical characteristics rather than developing mortality prediction models. Studies from Pakistani journals have emphasised the increasing burden of ILD but have not extensively evaluated combined clinical and radiological predictors of mortality. Therefore, this study provides additional local evidence by examining mortality-associated factors in patients managed at a tertiary care hospital in Khyber Pakhtunkhwa.

The originality of this study lies in its focus on integrating clinical and radiological parameters within a Pakistani tertiary care setting. While international studies have established prognostic factors such as UIP pattern, declining lung function and fibrosis severity, local data remain limited. The present research contributes regional information that may help clinicians identify high-risk patients earlier and improve follow-up strategies. Patients with UIP pattern, declining lung function, increasing fibrosis and oxygen requirement may require closer monitoring, earlier supportive interventions and consideration for advanced treatment pathways.

The findings of this study may influence clinical decision-making by supporting structured assessment of ILD patients using both physiological and imaging parameters. Rather than relying only on symptoms, clinicians may use HRCT pattern, pulmonary function tests and functional assessment to identify patients who require more frequent follow-up. This approach is consistent with international recommendations for progressive fibrotic ILD management.

This study has several limitations. First, the retrospective design limited control over missing clinical information and may have introduced selection bias. Second, the study was conducted at a single tertiary care hospital, which may limit generalisability to other regions of Pakistan. Third, the sample included different ILD subtypes, and differences in disease biology may influence mortality risk. Fourth, quantitative HRCT scoring and repeated pulmonary function measurements were not available for all patients, limiting evaluation of disease progression over time.

Future multicentre prospective studies involving ILD centres across Pakistan are required to validate these findings and develop locally applicable mortality prediction models. Inclusion of serial pulmonary function measurements, quantitative HRCT assessment, biomarkers and pulmonary hypertension evaluation may further improve prognostic accuracy. Establishing national ILD registries would also provide valuable information regarding disease burden, treatment patterns and long-term outcomes in Pakistani patients.

In conclusion, this study demonstrates that mortality in ILD is influenced by a combination of clinical and radiological factors. The significant association of UIP pattern and ILD subtype with mortality highlights the importance of HRCT-based risk assessment, while trends in lung function decline, fibrosis extent, exercise limitation and pulmonary hypertension emphasise the need for comprehensive follow-up. The findings provide useful local evidence from Pakistan and support a structured multidisciplinary approach for improving prognostic assessment and management of patients with ILD.

CONCLUSION

This study evaluated the clinical and radiological predictors associated with mortality among patients with interstitial lung disease. The findings showed that mortality was associated with important disease characteristics, particularly HRCT UIP pattern and ILD subtype. Patients with more advanced fibrotic changes, reduced lung function, lower exercise capacity, oxygen requirement and pulmonary hypertension showed clinically poorer outcomes, highlighting the importance of comprehensive assessment in ILD management.

The study emphasises that mortality prediction in ILD should not depend on a single parameter. A combined evaluation of clinical status, pulmonary function tests and HRCT findings can help identify patients at higher risk and support better follow-up planning and treatment decisions. The findings also provide valuable local evidence from a tertiary care centre in Pakistan, where data regarding ILD prognosis remain limited.

Future multicentre prospective studies in Pakistan are recommended to validate these findings and develop locally applicable mortality prediction models. Further research incorporating serial pulmonary function measurements, quantitative HRCT scoring, biomarkers and long-term follow-up may improve early identification of high-risk patients and enhance outcomes in individuals with interstitial lung disease.

Authors' Contribution

KJ, AAK, ZUR, AU, AK, and HA contributed to the conception and design of the study. Data acquisition, clinical assessment, data analysis, and interpretation of findings were carried out by KJ, AAK, ZUR, AU, AK, and HA. All authors contributed to manuscript preparation, critical revision, and intellectual input throughout the research process. AAK supervised the study, provided methodological guidance, and critically reviewed the final manuscript. All authors read and approved the final version of the manuscript for publication.

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