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CLINICAL AND SOCIODEMOGRAPHIC CORRELATES OF UIP AND NSIP DIAGNOSED BY HIGH-RESOLUTION CT

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Abstract

Introduction: Usual Interstitial Pneumonia (UIP) and Nonspecific Interstitial Pneumonia (NSIP) are major subtypes of idiopathic interstitial pneumonias, distinguishable by high-resolution computed tomography (HRCT) and associated clinical and sociodemographic characteristics.

Aim of study: To evaluate clinical and sociodemographic features of patients with UIP and NSIP and investigate associations with HRCT-diagnosed disease type.

Material and Methods: A retrospective study included 70 patients with UIP and NSIP attending the University Clinic of Pulmonology and Allergology, Skopje, between 2022 and 2024. HRCT was performed using a 128-slice PHILIPS INCISIVE CT scanner with a thoracic protocol. Sociodemographic and clinical data were recorded.

Results: NSIP patients were younger than UIP patients (61.1 ± 14.1 vs. 66.8 ± 8.5 years; $p = 0.039$). Female predominance was observed in both groups, likely due to inclusion of connective tissue disease-associated ILD. Former smoking was more common in UIP (67.5% vs. 36.7%; $p = 0.01$), while current smoking and cumulative exposure were similar. Time since smoking cessation was longer in NSIP patients (14.0 ± 9.2 vs. 7.6 ± 10.8 years; $p = 0.029$). Cough and dyspnea were frequent in both groups, with no significant differences in MRC dyspnea scores ($p = 0.24$). Comorbidities were present in 66.7% of NSIP and 70% of UIP patients ($p = 0.77$).

Conclusion: HRCT with clinical and sociodemographic data is essential for differentiating UIP from NSIP, with age and former smoking as key distinguishing factors, while symptoms and comorbidities were similar.

Keywords: UIP, NSIP ,HRCT, Sociodemographic characteristics.

Introduction

Usual Interstitial Pneumonia (UIP) and Nonspecific Interstitial Pneumonia (NSIP) are recognized subtypes of idiopathic interstitial pneumonias (IIPs), a group of diffuse parenchymal lung diseases characterized by varying degrees of inflammation and fibrosis. UIP is the histopathologic pattern most often associated with idiopathic pulmonary fibrosis (IPF), a progressive fibrotic lung disease with a poor prognosis; it typically affects older adults, particularly males with a history of smoking, and is often identified by its distinctive features on high-resolution computed tomography (HRCT) (e.g., basal and peripheral predominant reticular abnormalities and honeycombing) that can be highly specific for UIP in the appropriate clinical context.[1]

In contrast, NSIP tends to occur in a relatively younger population and is more common in women. NSIP often presents with nonspecific symptoms such as cough and dyspnea, and its radiological appearance on HRCT is characterized by bilateral ground-glass opacities with fine reticulation and relative subpleural sparing, with honeycombing being uncommon or absent in early disease.[2]

Although both UIP and NSIP may share overlapping clinical features and can present similarly with progressive respiratory symptoms, HRCT plays a pivotal role in their differentiation. NSIP frequently demonstrates more uniform and diffuse ground-glass changes, whereas UIP more commonly shows patchy fibrosis and honeycombing.

As a result, HRCT findings combined with clinical and sociodemographic information—such as age, sex, and smoking history—enhance diagnostic confidence and help guide management decisions.[3]

Understanding these patterns and their associated demographic characteristics is essential for accurate diagnosis, prognostication, and therapeutic strategy planning in patients with interstitial lung disease.

The aim of the study is to evaluate the clinical and sociodemographic characteristics of patients diagnosed with Usual Interstitial Pneumonia (UIP) and Non-Specific Interstitial Pneumonia (NSIP) using high-resolution computed tomography (HRCT), and to investigate potential associations between these characteristics and the type of interstitial lung disease.

Material and methods

All patients voluntarily participated in the study after providing written informed consent. The study protocol was approved by the Ethics Committee of the Faculty of Medicine in Skopje and was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki of the World Medical Association for research involving human subjects.

A total of 70 participants were included in the study from 2022-2024, comprising 30 patients with Nonspecific Interstitial Pneumonia (NSIP) and 40 patients with Usual Interstitial Pneumonia (UIP), who presented to the University Clinic of Pulmonology and Allergology in Skopje. High-resolution computed tomography (HRCT) was performed using a 128-slice CT scanner (Philips INCISIVE) with a slice thickness of 1 mm and a dedicated thoracic imaging protocol.

Results

The statistical analysis of the data obtained from the study was performed using the statistical software SPSS, version 23.0. The Kolmogorov–Smirnov and Shapiro–Wilk tests were applied to assess the normality of data distribution. The results are presented in tables and figures.

Categorical (attribute) variables are presented as absolute and relative frequencies, while numerical (quantitative) variables are expressed as mean, standard deviation, and minimum and maximum values. Comparisons between the two groups for qualitative variables were performed using the Chi-square test and Fisher's exact test, whereas comparisons for quantitative variables were conducted using the Student's t-test and the Mann–Whitney U test.

Statistical significance was defined at a p-value < 0.05.

A total of 70 participants were included in the study, comprising 30 patients with nonspecific interstitial pneumonia (NSIP) and 40 patients with usual interstitial pneumonia (UIP). The sex distribution between the two groups was homogeneous, with no statistically significant difference (p = 0.48). Female patients were more frequently represented in both groups, accounting for 63.33% in the NSIP group and 55% in the UIP group (Table 1).

The two study groups differed significantly in terms of age (p = 0.039). Patients with NSIP were significantly younger than those with UIP (61.1 ± 14.1 vs. 66.8 ± 8.5 years, respectively) (Table 1, Figure 1).

All patients with NSIP and 92.5% of patients with UIP resided in urban areas, with no statistically significant difference between the groups regarding place of residence (p = 0.12) (Table 1).

Table. 1 Sociodemographic characteristics of patients with UIP and NSIP.

	groups			
	n	**NSIP**	**UIP**	**p-level**
Sex n (%)				
female	41	19 (63.33)	22 (55)	X^2=0.5
male	29	11 (36.67)	18 (45)	p=0.48
Age				
mean ± SD		61.1 ± 14.1	66.8 ± 8.5	t=2.11
min- max		31 – 84	52 – 82	*p=0.039
Place of living				
City	67	30 (100)	37 (92.5)	X^2=2.3 p=0.12

NSIP –(non specific interstitial pneumonia)

UIP-(usual interstitial pneumonia), X^2(Chi-square test); t (Student t-test),*sig p<0.05

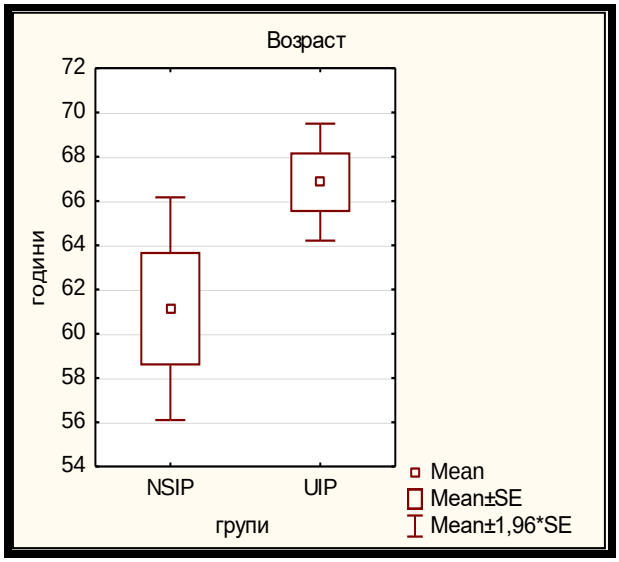

Figure 1. Graphical presentation of the mean age of UIP and NSIP.

Current smokers comprised 10% of the NSIP group and 20% of the UIP group; this difference was not statistically significant (p = 0.25) (Table 2).

Former smoking status was significantly more prevalent among patients with UIP compared with those with NSIP (67.5% vs. 36.7%, p = 0.01) (Table 2, Figure 2).

No significant difference was observed between groups in the duration of smoking exposure (p = 0.82). Mean smoking duration was 28.6 ± 3.9 years in the NSIP group and 29.4 ± 6.8 years in the UIP group (Table 2).

The time since smoking cessation differed significantly between groups (p = 0.029). Patients with NSIP had quit smoking earlier than those with UIP (14.0 ± 9.2 vs. 7.6 ± 10.8 years, respectively). Median time since cessation exceeded 14 years in NSIP patients and 5 years in UIP patients (Table 2, Figure 2a)

Table 2. Characteristics of smoking status in patients with NSIP and UIP.

	groups			p-level
	n	**NSIP** n(%)	**UIP** n(%)	
Do you smoke?				
yes	11	3 (10)	8 (20)	X^2=1.3
no	59	27 (90)	32 (80)	p=0.25
Have you been smoking?				
yes	38	11 (36.67)	27 (67.5)	X^2=6.6
no	32	19 (63.33)	13 (32.5)	*p=0.01
How many years have you been smoking?				
n		11	26	t=0.22
mean ± SD		28.6 ± 3.9	29.4 ± 6.8	p=0.82
min- max		25 – 35	7 – 50	
How many years ago did you stop smoking?				
n		9	18	Z=2.2
mean ± SD		14.0 ± 9.2	7.6 ± 10.8	*p=0.029
min- max		5 – 26	1 – 47	
median (IQR)		14(5-25)	5(1.5-10)	

NSIP –(non specific interstitial pneumonia)

UIP-(usual interstitial pneumonia)

X^2(Chi-square test); t (Student t-test); Z(Mann-Whtney test),*sig p<0.05

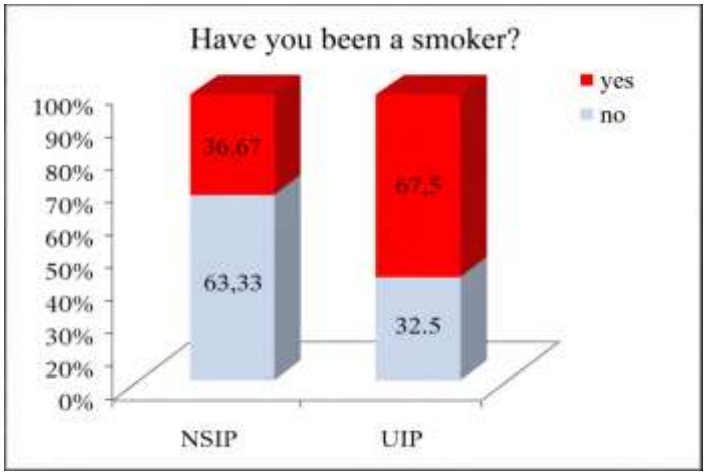

Figure 2. Graphical presentation of smoking status in UIP and NSIP.

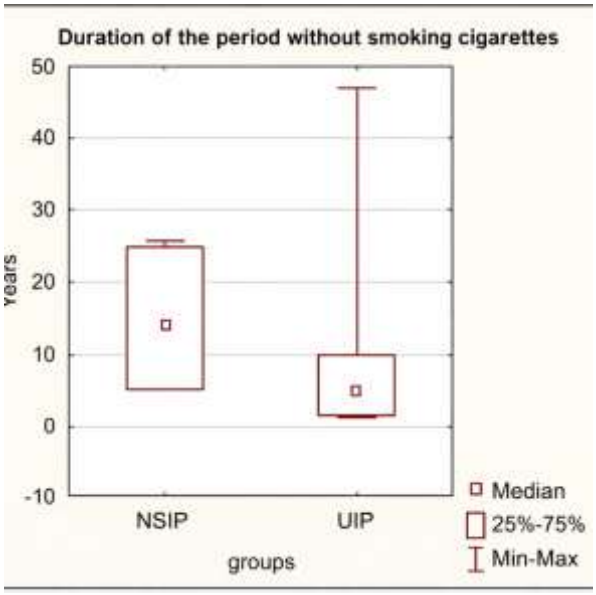

Figure 2a. Graphical presentation of the median duration of the period without smoking cigarettes (years) in UIP and NSIPA similar proportion of patients with NSIP and UIP had been hospitalized due to pulmonary disease (16.7% vs. 17.5%, respectively; Chi-square = 0.01, p = 0.93) (Table 3).

No statistically significant difference was observed in the distribution of patients with no hospitalizations or with one, two, or three hospitalizations related to pulmonary disease between the two groups (p = 0.93). In both groups, three hospitalizations were the most frequently observed category, occurring in 13.3% of patients with NSIP and 10% of patients with UIP (Table 3).

Table 3. Number of previous hospitalizations due to pulmonary disease in patients with NSIP and UIP

Number of previous hospitalizations due to pulmonary disease	**groups**			
	n	**NSIP** n(%)	**UIP** n(%)	**p-level**
0	58	25 (83.33)	33 (82.5)	Fisher's exact test p=0.93
1	3	1 (3.33)	2 (5)	
2	1	0	1 (2.5)	
3	8	4 (13.33)	4 (10)	

NSIP –(non specific interstitial pneumonia), UIP-(usual interstitial pneumonia)

All patients in the NSIP group had a negative history of familial pulmonary disease, compared with 10% of patients in the UIP group (Table 4).

The difference in the distribution of patients with and without a familial history of pulmonary disease between the two groups did not reach statistical significance (p = 0.07) (Table 4).

Table 4. Family history of pulmonary disease in patients with NSIP and UIP.

Family history of pulmonary disease	**groups**			
	n	**NSIP** n(%)	**UIP** n(%)	**p-level**
yes	4	0	4 (10)	X^2=3.2
no	66	30 (100)	36 (90)	p=0.07

NSIP –(non specific interstitial pneumonia)

UIP-(usual interstitial pneumonia)

X^2(Chi-square test)

In both groups, 80% of patients reported cough as a presenting symptom (Table 5).

Regarding cough intensity, patients with NSIP more frequently reported mild cough (37.5% vs. 15.6%), whereas patients with UIP more commonly experienced moderate and severe cough (71.9% vs. 62.5% and 12.5% vs. 0%, respectively). However, these differences in cough intensity between the two groups did not reach statistical significance (p = 0.069) (Table 5).

With respect to cough character, dry cough was more common among patients with NSIP (33.3% vs. 12.5%), while productive cough was more frequently observed in patients with UIP (87.5% vs. 66.7%). The difference in the distribution of dry and productive cough between the two groups was not statistically significant (p = 0.06) (Figure 5).

Table 5. Characteristics of cough in patients with NSIP and UIP.

	групи			
	n	**NSIP** n(%)	**UIP** n(%)	**p-level**
Do you cough?				
yes	56	24 (80)	32 (80)	
no	14	6 (20)	8 (20)	
Intensity of cough				
mild	14	9 (37.5)	5 (15.62)	Fisher's exact test
moderate	38	15 (62.5)	23 (71.88)	p=0.069
severe	4	0	4 (12.5)	
Type of cough				
dry	12	8 (33.33)	4 (12.5)	X^2=3.5
purulent	44	16 (66.67)	28 (87.5)	p=0.06

NSIP –(non specific interstitial pneumonia)

UIP-(usual interstitial pneumonia)X^2(Chi-square test)

Dyspnea was the predominant symptom in both groups, reported by 96.7% of patients with NSIP and 91.9% of patients with UIP. The difference in the distribution of patients with and without dyspnea between the two groups was not statistically significant (p = 0.41) (Table 6, Figure 3).

Table 6. Breathing difficulties in patients with NSIP and UIP.

Dyspnea	**групи**			
	n	**NSIP** n(%)	**UIP** n(%)	**p-level**
yes	63	29 (96.67)	34 (91.89)	X^2=0.7
no	4	1 (3.33)	3 (8.11)	p=0.41

NSIP-НСИП (неспецифична интерстициелна пневмонија)

UIP-УИП (вообичаена интерстициелна пневмонија)

X^2(Chi-square test)

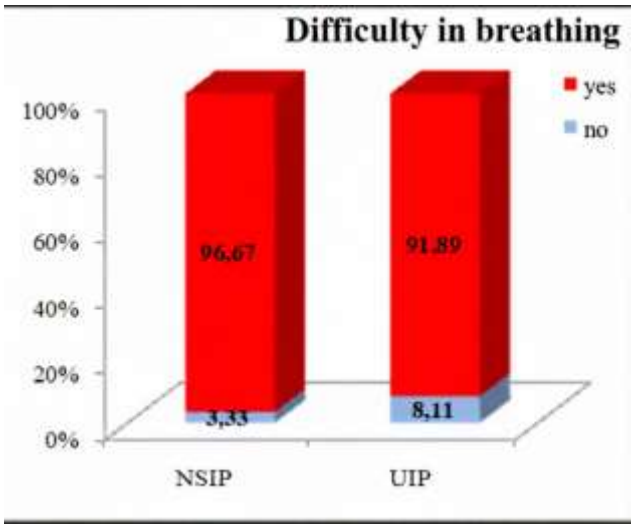

Figure 3. Graphical presentation of the frequency of breathing difficulties

According to the Medical Research Council (MRC) dyspnea scale, patients with NSIP more frequently reported breathlessness when walking slowly on level ground (13.3% vs. 7.5%) and dyspnea after walking for a few minutes on level ground (36.7% vs. 17.5%). In contrast, patients with UIP more often reported dyspnea when walking fast on level ground (45% vs. 33.3%), walking slower than people of the same age (25% vs. 16.7%), and severe breathlessness during dressing (5% vs. 0%) (Table 7).

Overall comparison of MRC dyspnea scores between the NSIP and UIP groups did not reveal a statistically significant difference ($p = 0.24$). Furthermore, differences in the distribution of patients across individual MRC scale categories were not statistically significant (all $p > 0.05$) (Table 7, Figure 4).

Table 7. MRC scale in patients with NSIP and UIP.

MRC scale	**groups**			**p-level**	**difference tests**
	n	**NSIP** n(%)	**UIP** n(%)		
Breathing difficulties	7	4 (13.33)	3 (7.5)	Fisher's exact test p=0.24	p=0.43
Dyspnea when walking fast on level ground	28	10 (33.33)	18 (45)		p=0.32
Walks slower than other people of the same age	15	5 (16.67)	10 (25)		p=0.4
Dyspnea when walking on level ground for several minutes	18	11 (36.67)	7 (17.5)		p=0.069
Severe shortness of breath and difficulty breathing while dressing	2	0	2 (5)		p=0.21

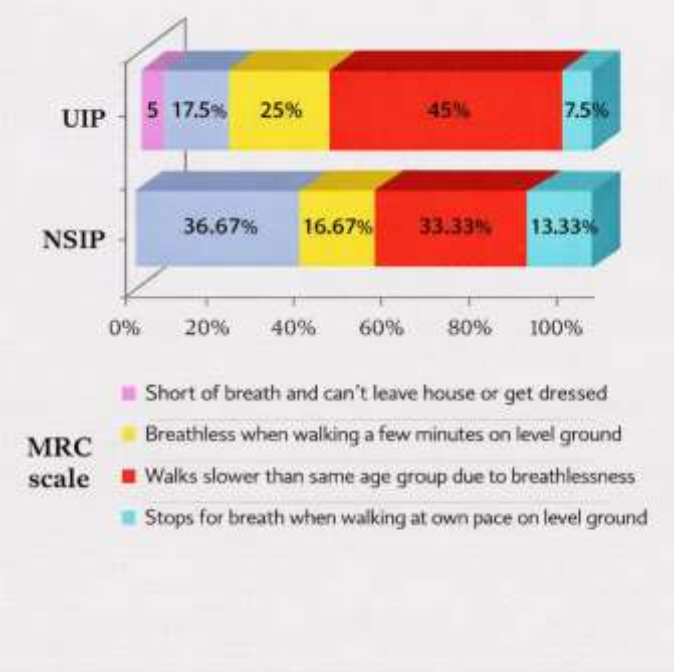

Figure 4. Graphical presentation of MRC scale frequency in UIP and NSIP

A history of comorbidities was present in 66.7% of patients with NSIP and 70% of patients with UIP, with no statistically significant difference between the two groups (p = 0.77) (Table 8).

Table 8. Frequency of comorbidities in patients with NSIP and UIP.

Comorbidities	**groups**			
	n	**NSIP** n(%)	**UIP** n(%)	**p-level**
yes	48	20 (66.67)	28 (70)	X^2=0.9
no	22	10 (33.33)	12 (30)	p=0.77

NSIP –(non specific interstitial pneumonia)
UIP-(usual interstitial pneumonia), X^2(Chi-square test)

Discussion

In this study, we compared clinical characteristics, smoking history, hospitalization frequency, familial pulmonary disease, respiratory symptoms, and comorbidities between patients with nonspecific interstitial pneumonia (NSIP) and usual interstitial pneumonia (UIP). Understanding these features is crucial for differentiating ILD subtypes, guiding management, and predicting prognosis.

The sex distribution in our cohort was similar between the two groups, with a slight female predominance. This differs from classic idiopathic UIP, which typically shows a male predominance, and can be explained by the inclusion of interstitial lung disease associated with connective tissue diseases (CTD-ILD) in our UIP subgroup.

Autoimmune conditions such as systemic sclerosis, rheumatoid arthritis, Sjögren's syndrome, and systemic lupus erythematosus are known to disproportionately affect women, often leading to NSIP or UIP patterns on HRCT. [4] The higher proportion of females in our cohort therefore likely reflects the epidemiology of CTD rather than the ILD subtype itself, consistent with previous reports showing that CTD-associated ILD cohorts are predominantly female.

Age differences were statistically significant, with NSIP patients being younger than UIP patients (61.1 ± 14.1 vs. 66.8 ± 8.5 years, p = 0.039). This aligns with prior studies demonstrating that NSIP generally affects middle-aged adults, whereas UIP more commonly presents in older populations [5,13].

The observed age trend also mirrors findings in meta-analyses and large ILD registries, emphasizing the importance of age as a distinguishing demographic characteristic. No significant differences were observed regarding urban versus rural residence, suggesting that environmental exposure based on living location did not substantially influence disease presentation in our cohort.

Smoking history showed distinct patterns between the groups. Current smoking was slightly more common in UIP, although the difference was not statistically significant. However, former smoking was significantly more prevalent in UIP patients, whereas NSIP patients had a significantly longer time since smoking cessation. Both groups exhibited similar cumulative smoking exposure. These findings support the notion that smoking may contribute more strongly to the development of UIP than NSIP and that cessation may impact disease course [6,7].

Smoking, therefore, remains a key demographic and environmental factor influencing ILD phenotype, potentially more than age or sex alone.

Hospitalization rates due to pulmonary disease were comparable between NSIP and UIP patients, with no differences in the number of hospitalizations or the severity of exacerbations, suggesting a similar clinical burden at presentation. Similarly, familial pulmonary disease was rare in both groups, indicating that hereditary factors do not appear to significantly differentiate these ILD subtypes in our cohort.

Regarding respiratory symptoms, cough and dyspnea were highly prevalent in both NSIP and UIP. NSIP patients more frequently reported mild and dry cough, whereas UIP patients more commonly had moderate to severe and productive cough, although differences were not statistically significant. Dyspnea was the dominant symptom in both groups, and MRC scale analysis revealed overlapping patterns of exertional breathlessness, reflecting similar functional impairment across both ILD subtypes. These findings are consistent with previous literature, highlighting the difficulty of differentiating UIP from NSIP based solely on symptoms [8,9,10].

Comorbidities were present in approximately two-thirds of patients in both groups, with no significant differences, reflecting the expected burden of chronic diseases in ILD populations. This is consistent with prior studies demonstrating that comorbid conditions such as cardiovascular disease, diabetes, or gastroesophageal reflux disease are prevalent across ILD subtypes and do not significantly distinguish between UIP and NSIP [2,7].

Recent research on ILD associated with autoimmune conditions, such as ANCA-associated vasculitis or systemic sclerosis, suggests that UIP and NSIP subtypes differ in both demographic and clinical characteristics. UIP patterns are more frequent in older patients and are associated with worse prognosis compared with NSIP patterns, whereas NSIP generally shows a more favorable clinical course [2,4,5].

Imaging findings further support these distinctions: HRCT features such as honeycombing, subpleural fibrosis, and patchy distribution are more characteristic of UIP, whereas NSIP often demonstrates more uniform ground-glass opacities and subpleural sparing. Lung ultrasound studies have also shown stronger correlations with HRCT severity in UIP than NSIP, reflecting underlying pathophysiologic differences between subtypes.[11]

Taken together, our results demonstrate both overlapping and subtle differences in clinical presentation between NSIP and UIP.

Age and former smoking status were the main variables distinguishing the two groups, whereas most other characteristics—including sex, residence, hospitalizations, familial history, respiratory symptoms, and comorbidities—were similar. These findings emphasize the challenge of relying on clinical history alone to differentiate NSIP from UIP and reinforce the critical role of HRCT and, when needed, histopathologic confirmation for accurate diagnosis.

Limitations of our study include the modest sample size and single-center design, which may limit the generalizability of findings. Larger multicenter cohorts would help to better elucidate demographic and clinical predictors of ILD subtypes, assess longitudinal outcomes, and evaluate treatment response and survival, particularly given that NSIP generally has a more favorable prognosis than UIP [12].

Conclusion

Patients with NSIP and UIP share many overlapping clinical features, including respiratory symptoms, hospitalization rates, and comorbidity burden. However, NSIP patients were significantly younger and more often former smokers with a longer duration since smoking cessation, whereas UIP patients were older and more frequently had a history of former smoking.

Despite subtle trends in symptom intensity and cough characteristics, no statistically significant differences were observed in most clinical variables.

These findings highlight the challenges of differentiating NSIP from UIP based solely on clinical presentation and underscore the importance of high-resolution imaging and in specific cases histopathological evaluation for accurate diagnosis and appropriate management.

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