

SUPPLEMENTARY MATERIAL

Prevalence and patterns of inhalational exposures in patients with interstitial lung diseases: a cross-sectional study

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Supplementary Table 1. Association between gender and inhalational exposures among interstitial lung disease patients.

Exposure	Male (n = 47)	Female (n=92)	OR (95% CI) (male vs. female)	P ^a
Any exposure	36 (76.6)	71 (77.2)	0.97 (0.42 to 2.22)	0.934
Hay/Grain	14 (29.8)	22 (23.9)	1.33 (0.60 to 2.93)	0.478
Mold	8 (17)	18 (19.6)	0.84 (0.34 to 2.11)	0.714
Animal hair	1 (2.1)	13 (14.1)	0.13 (0.02 to 1.06)	0.056
Biomass	4 (8.5)	51 (55.4)	0.07 (0.02 to 0.21)	<0.001
Tobacco smoke	21 (44.7)	13 (14.1)	4.85 (2.13 to 11.05)	<0.001
Avian particles	6 (12.8)	25 (27.2)	0.40 (0.15 to 1.08)	0.071
Multiple exposure	22 (46.8)	45 (48.9)	0.92 (0.45 to 1.86)	0.817
Occupational	22 (46.8)	33 (35.9)	1.63 (0.79 to 3.35)	0.184
Environmental/Domestic	11 (23.4)	63 (68.5)	0.13 (0.06 to 0.30)	<0.001
Organic	33 (70.2)	67 (72.8)	0.87 (0.4 to 1.89)	0.721
Inorganic	32 (68.1)	25 (27.2)	5.80 (2.68 to 12.5)	<0.001
Mixed	29 (61.7)	21 (22.8)	5.45 (2.53 to 11.7)	<0.001

Values are n (%). ^aAdjusted for age

Supplementary Table 2. Association between the occupational nature and inhalational exposures.

Exposure	Blue-collar workers (n = 99)	White-collar workers (n = 40)	OR (95% CI) (blue-collar vs white-collar)	P ^a
Any exposure	81 (81.8)	26 (65)	2.95 (1.15 to 7.55)	0.024
Hay/Grain	34 (34.3)	2 (5)	19.7 (3.94 to 98.5)	<0.001
Mold	20 (20.2)	6 (15)	1.41 (0.47 to 4.19)	0.536
Animal hair	10 (10.1)	4 (10)	0.47 (0.12 to 1.81)	0.273
Biomass	49 (49.5)	6 (15)	2.82 (0.98 to 8.14)	0.055
Tobacco smoke	18 (18.2)	16 (40)	0.58 (0.23 to 1.45)	0.241
Avian particles	22 (22.2)	9 (22.5)	0.64 (0.23 to 1.76)	0.384
Multiple exposure	55 (55.6)	12 (30)	3.58 (1.47 to 8.67)	0.005
Occupational	46 (46.5)	9 (22.5)	5.83 (2.08 to 16.3)	<0.001
Environmental/Domestic	61 (61.6)	13 (32.5)	1.71 (0.70 to 4.18)	0.236
Organic	77 (77.8)	23 (57.5)	3 (1.23 to 7.31)	0.016
Inorganic	37 (37.4)	20 (50)	1.39 (0.55 to 3.48)	0.485
Mixed	33 (33.3)	17(42.5)	1.63 (0.63 to 4.17)	0.310

Values are n (%). ^aAdjusted for age and sex.

Supplementary Table 3. Distribution of inhalational exposures across different interstitial lung disease subtypes.

Exposure	HP (n=21)	IPF (n=14)	Autoimmune- related ILD (n=62)	Sarcoidosis (n=14)	Other ILD (n=28)	P ^a
Any exposure	18 (85.7)	13 (92.9)	48 (77.4)	7 (50)	21(75)	0.089
Hay/Grain	4 (19)	5 (35.7)	19 (30.6)	1 (7.1)	7(25)	0.351
Mold	6 (28.6)	1 (7.1)	14 (22.6)	2 (14.3)	3(10.7)	0.388
Animal hair	5 (23.8)	0 (0)	6 (9.7)	1 (7.1)	2(7.1)	0.248
Biomass	10 (47.6)	2 (14.3)	32 (51.6)	1 (7.1)	10(35.7)	0.005
Avian particles	8 (38.1)	1 (7.1)	14 (22.6)	3 (21.4)	5(17.9)	0.308
Multiple exposure	10 (47.6)	7 (50.0)	34 (54.8)	6 (42.9)	10(35.7)	0.542

Values are n (%). ^ap-values were calculated using Fisher's exact test. Exposure categories are not mutually exclusive. HP, hypersensitivity pneumonitis; IPF, idiopathic pulmonary fibrosis.

Supplementary Table 4. Association of exposure burden with high-resolution computed tomography features.

Exposure burden		Honeycombing		GGO		Consolidation		Mosaic attenuation	
		n (%)	P ^a	n (%)	P ^a	n (%)	P ^a	n (%)	P ^a
Any exposure	Yes (n=107)	45 (42.1)	0.118	59 (55.1)	0.472	15 (14)	0.74	22 (20.6)	0.765
	No (n=32)	9 (28.1)		21 (65.6)		4 (12.5)		6 (18.8)	
Multiple exposure	Yes (n=67)	29 (43.3)	0.217	36 (53.7)	0.512	8 (11.9)	0.609	13 (19.4)	0.855
	No (n=72)	25 (34.7)		44 (61.1)		11 (15.3)		15 (20.8)	

Values are n (%). ^aAdjusted for age, sex, and smoking status. GGO, ground-glass opacity.

Supplementary Table 5. Exposure characteristics in hypersensitivity pneumonitis (HP) vs. non-HP interstitial lung disease.

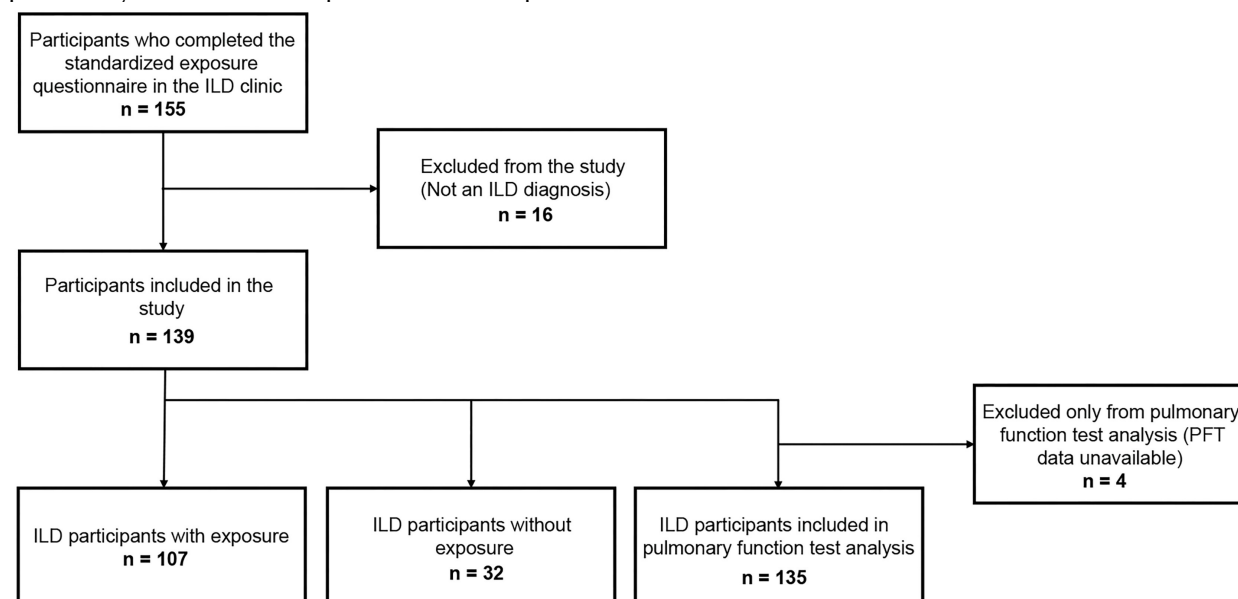
Exposure Characteristics	OR (95% CI) (HP vs non-HP)	P ^a
Exposure duration >10 years	1.32 (0.49 to 3.52)	0.574
Daily frequency for large periods	1.1 (0.43 to 2.79)	0.841

^aUnadjusted logistic regression analysis. HP, hypersensitivity pneumonitis.

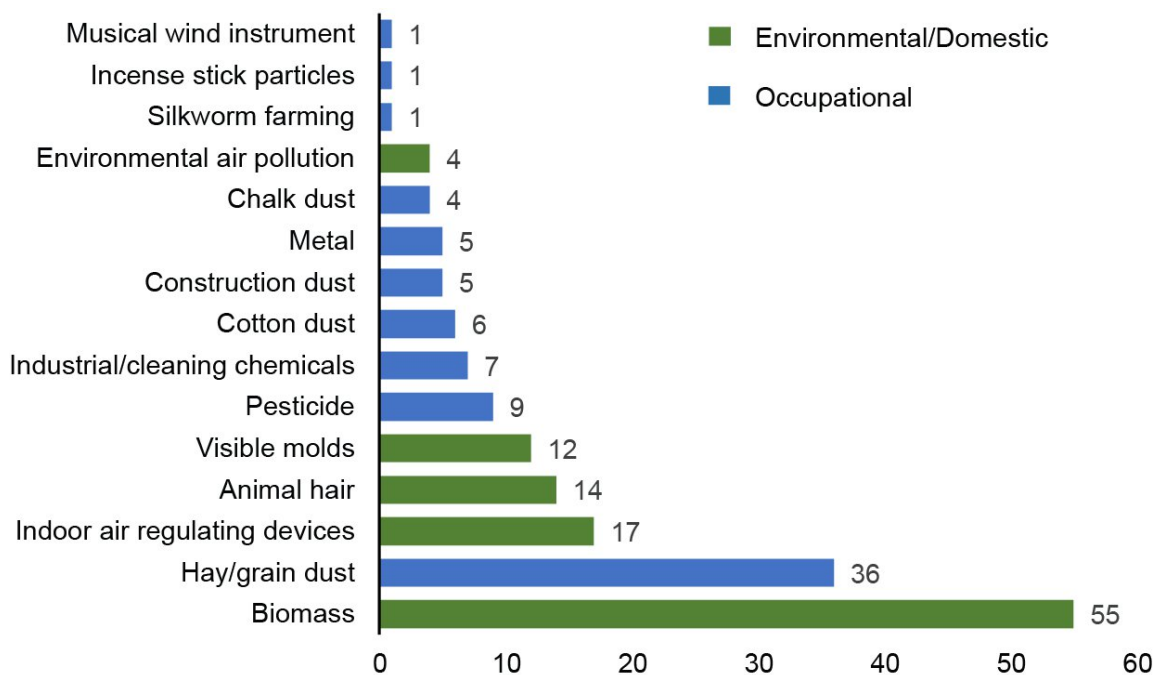
Supplementary Table 6. Time since last exposure among different interstitial lung disease subtypes.

Time since last exposed	> 5 years	Last 5 years	Last year	Last month	Last week
HP	22.2%	27.8%	16.7%	5.6%	27.8%
IPF	46.2%	23.1%	0.0%	23.1%	7.7%
Other IIP	31.3%	6.3%	18.8%	6.3%	37.5%
Autoimmune-related	14.6%	25.0%	4.2%	6.3%	50.0%
Sarcoidosis	0.0%	28.6%	0.0%	14.3%	57.1%

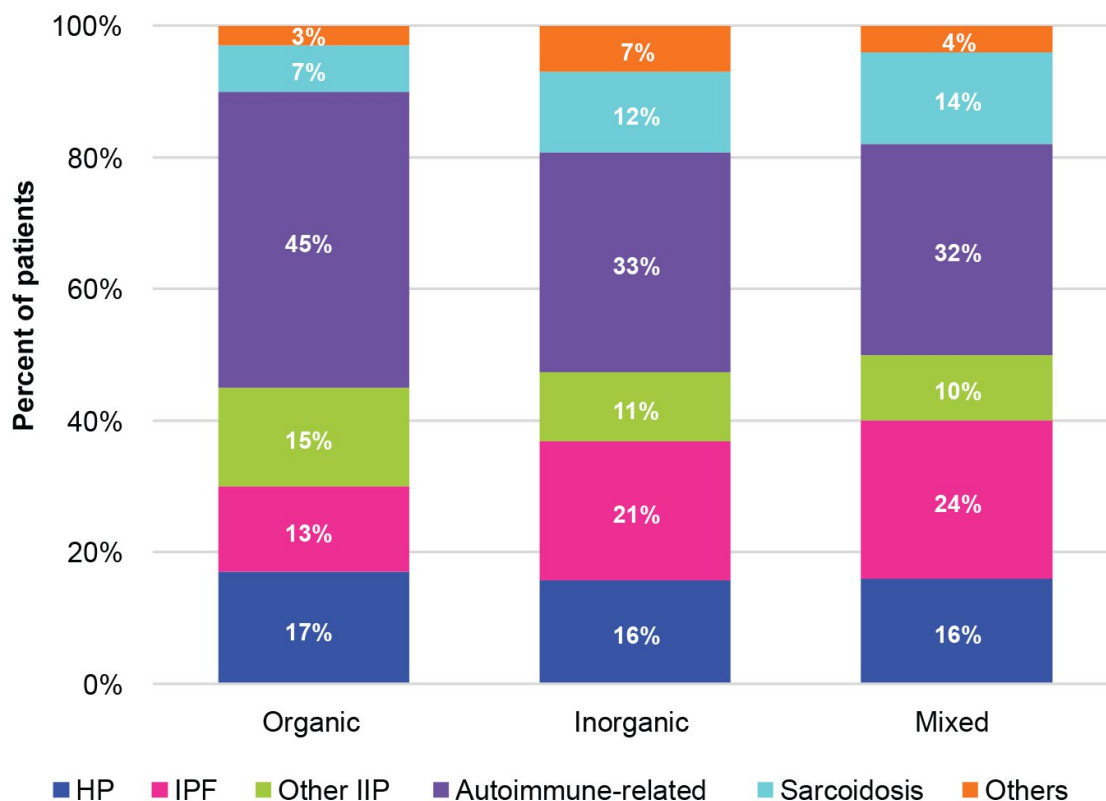
Values are percentages of reported exposures within each ILD subtype. HP, hypersensitivity pneumonitis; IPF, idiopathic pulmonary fibrosis; IIP, idiopathic interstitial pneumonia.



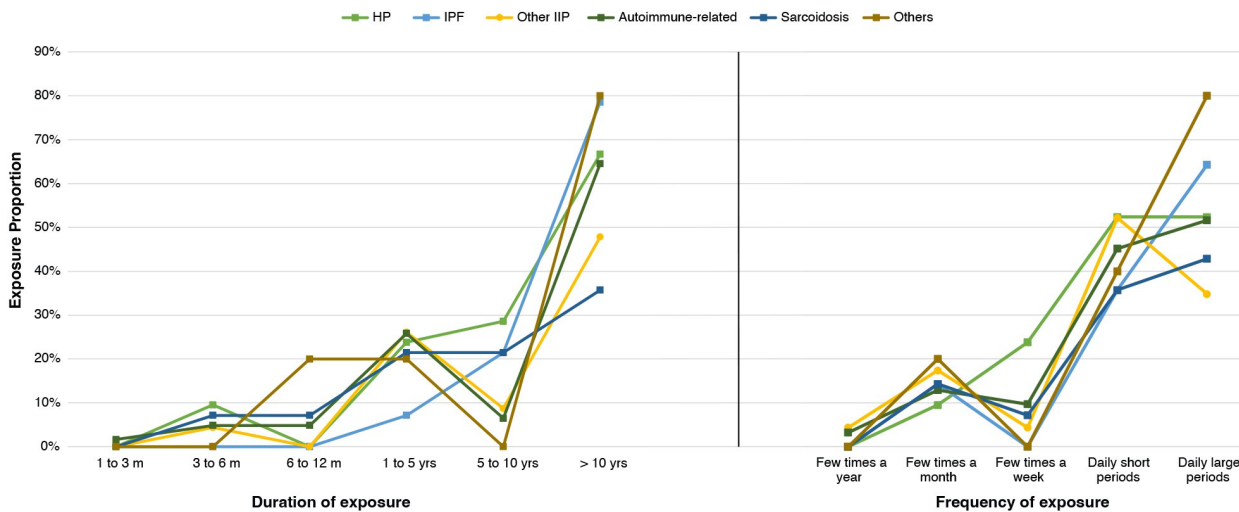
Supplementary Figure 1. Flowchart of participant enrollment, and exclusions. ILD, interstitial lung disease; PFT, pulmonary function test.



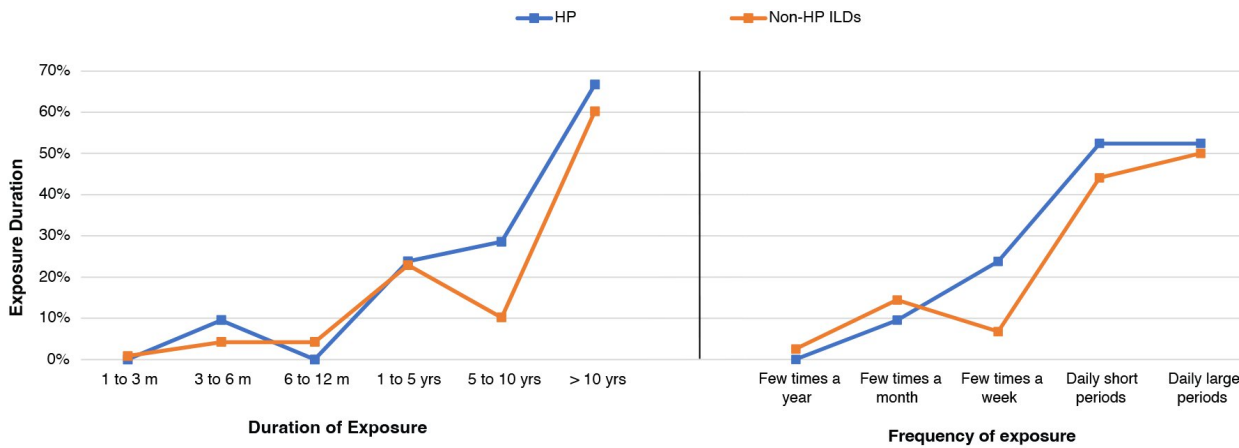
Supplementary Figure 2. Distribution of occupational and environmental/domestic inhalational exposures among interstitial lung disease patients.



Supplementary Figure 3. Proportion of interstitial lung disease subtypes among different exposure compositions. HP, hypersensitivity pneumonitis; IPF, idiopathic pulmonary fibrosis; IIP, idiopathic interstitial pneumonia.



Supplementary Figure 4. Distribution of duration and frequency of exposures across different interstitial lung disease subtypes. HP, hypersensitivity pneumonitis; IPF, idiopathic pulmonary fibrosis; IIP, idiopathic interstitial pneumonia.



Supplementary Figure 5. Distribution of duration and frequency of exposures in hypersensitivity pneumonitis (HP) vs. non-HP interstitial lung disease. HP, hypersensitivity pneumonitis; IPF, idiopathic pulmonary fibrosis; IIP, idiopathic interstitial pneumonia.

Supplementary Appendix 1. Inhalational exposure questionnaire.

Section 1: Basic Information

1. Name: _____
2. Age: _____
3. Sex: ☐ Male ☐ Female
4. Location: _____
5. Occupation: _____
6. Date of collection: _____

Section 2: Exposure screening

Below is a list of environmental exposures that have been known to cause lung disease in some people. Exposures generally occur in the home, workplace, and other places where you commonly spend time. Thinking about the places where you have commonly spent time, either now or in the past, select those exposures that have occurred on a regular basis.

Do you have any of the following inhalational exposures?

- 🍏 Smoking tobacco, including secondhand smoke (type, number per day, duration in years)
- 🍏 Household air pollution - Biomass (wood, dung, kerosene, coal for cooking)
- 🍏 Visible or significant mold/mildew or persistent musty odour
- 🍏 Stagnant water exposure, plumbing work, swimming pools, or water-damaged environments
- 🍏 Humidifiers, swamp coolers, or air conditioners with water reservoirs
- 🍏 Bird exposure: droppings or feathers (e.g., pigeons, geese), and down or feather products (comforters, pillows, clothing)
- 🍏 Animal hair exposure (dogs, cats), including occupations such as pet grooming
- 🍏 Food manufacturing and processing (e.g., cheese production, seafood processing)
- 🍏 Farming activities (paddy cultivation, mushroom growing, onion sorting, corn farming), hay, or silage exposure, livestock
- 🍏 Cotton exposure (cotton farming or textile industry work)
- 🍏 Gardening, compost, mulch, or similar organic material exposure
- 🍏 Wood cutting, wood dust, or moldy wood exposure (e.g., carpentry)
- 🍏 Mining and mineral work (coal mining, mica work, cement manufacturing)
- 🍏 Talc exposure (paints, lubricants, insecticides, roofing products, asphalt, ceramics, rubber industry, jewellery manufacture)
- 🍏 Metalworking fluid exposure (e.g., coolants, lubricants, machining operations)
- 🍏 Automotive industry exposure (brake linings, gaskets, clutch plates)
- 🍏 Isocyanate exposure (e.g., paint spraying, polyurethane foam, varnishing)
- 🍏 Significant vapour, gas, or fume exposure (chemical manufacturing, industrial or household cleaning agents)
- 🍏 Silica, quartz, or slate exposure (sandblasting, well boring, construction sites, railroads, road building, glassmaking, ceramic industry)
- 🍏 Musical wind instrument use (e.g., shehnai, flute, nadaswaram, shankh)

Have you been exposed to anything else which you think is important? _____

Section 3: Exposure Description (Repeated for each exposure)

1. Name of exposure: _____
2. Date of onset of symptoms (month/year): _____
3. When were you first exposed (month/year)? _____
4. Duration of exposure (How long is the time from when you were first exposed to when you were last exposed?) (If there is more than 1 period of exposure, add them together)

- ☐ < 1 month
 - ☐ 1–3 months
 - ☐ 3–6 months
 - ☐ 6–12 months
 - ☐ 1–5 years
 - ☐ > 5 years
5. Frequency of exposure (In the period of exposure, which of these best matches the number of times you were exposed?)
- ☐ Daily, for large parts of the day
 - ☐ Daily, for short periods
 - ☐ A few times a week
 - ☐ A few times a month
 - ☐ A few times a year
6. How long ago is it since you were last exposed?
- ☐ In the last week
 - ☐ In the last month
 - ☐ In the last year
 - ☐ In the last 5 years
 - ☐ More than 5 years ago
7. What is/was the location of your exposure?
- ☐ Work
 - ☐ Home
 - ☐ Other (Please specify): _____
8. When did your symptoms start (month/year)? _____
9. Do any of your symptoms improve when you are away from the exposure?
- ☐ Yes
 - ☐ No

Supplementary Appendix 2. Visual aids.

Images were used solely as visual prompts to assist participants in recognising common exposure. Images were not used to suggest or imply exposure and were presented only when participants required clarification or had difficulty identifying specific exposure types, and only after open-ended questioning. The images primarily depict common Indian occupational and domestic exposures that are part of everyday life and were not intended to be exhaustive. All images were obtained from a public domain source, Wikimedia Commons [1], and are licensed for reuse.

Combustion of kerosene, wood, and cow dung cake for fuel



Swamp coolers/Air conditioners



Common forms of tobacco smoking in India (beedi, smoking hookah, smoking pipe)



Agricultural Farming



Bird Exposure (Pigeon/Poultry)



Cotton exposure



Other common occupational exposures in India (carpentry, food processing)



Common occupational exposures in India (painting, construction site work, automobile repairs)



Common musical wind instruments (shehnai, nadaswaram, shankh)



Reference:

1. Wikimedia Commons [Internet]. [cited 2025 Feb 2]. Available from: https://commons.wikimedia.org/wiki/Main_Page