**Occupational Burden of Idiopathic Pulmonary Fibrosis (250 word edition)**

Idiopathic pulmonary fibrosis (IPF) is a diagnosis of exclusion. It is made in the presence of a usual interstitial pneumonitis (UIP) pattern on high resolution CT scan or biopsy. The diagnosis requires that known causes of interstitial lung disease (such as drug toxicity, connective tissue disease, domestic, and occupational or environmental exposures) be excluded.[1]

We identified four review articles covering occupational exposures in IPF [2-5] by searching for articles that cited relevant case-control studies. One review performs a meta-analysis of six case-control studies and reports population attributable risk percentages for agriculture and farming (20.8%), livestock (4.1%), wood dust (5%), metal dust (3.4%), stone/sand/silica (3.5%), and smoking (49.1%). [4]

We found (as of May 2017) 14 case-control studies looking at occupational exposures in IPF (table 1); the most recent review article covers only eight of them. Associations with metal, wood, and agricultural dust are most commonly reported. [6-19]

Two investigators independently reviewed and abstracted data for four exposure categories

common to the identified case-control studies: “any dust,” “metal dust,” “wood dust,” and “agricultural dust”. We calculated PAF as follows: PAF=pc(RR – 1)/RR, where pc is the proportion of cases exposed and RR is the risk estimate. We calculated pooled OR and pooled PAF for occupational exposures using Stata. 32 risk estimates from 12 publications ( 1949 IPF patients in total) were used. Each exposure category was assessed with 6-10 risk estimates. Pooled ORs were significantly elevated for each category; the pooled PAF estimates by category ranged from 4-13% (Table 2).

Table 1: Summary of IPF case-control studies investigating occupational exposures.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reference  Author year  (n cases) | OR; 95% CI | | | | PAF | | | | | IPF Case Definition Criteria | | Exposure Measure |
|  | vgdf\* | metal | wood | ag | | vgdf\* | metal | wood | ag | |  |  |
| Scott 1990  (40)\* | 1.3; 0.8, 2.0 | 11.0; 2.3, 52 | 2.9; 0.9, 9.9 | 10.9; 1.2, 96 | | 17 | 12 | 10 | 12 | | clinical assessment, CXR, pulmonary function | questionnaire |
| Iwai 1994  (86) |  | 1.3;  1.1,  1.6 |  | 3.0;  1.3,  7.4 | |  |  |  |  | | clinical assessment, CXR or CT, pulmonary function | questionnaire |
| Iwai 1994  (615) | 2.0; 1.2, 3.1 |  |  |  | |  |  |  |  | | autopsy | job group |
| Hubbard 1996  (218) |  | 1.7;  1.1,  2.7 | 1.7;  1.0,  2.9 |  | |  | 10 | 6 |  | | clinical assessment, CXR or CT, pulmonary function | questionnaire and telephone interview |
| Mullen 1998  (15) | 2.4;  0.7,8.4 |  | 3.3;  0.4,  25.8 |  | | 23 |  | 7 |  | | clinical assessment, lung biopsy or CT | questionnaire |
| Baumgartner 2000  (248) |  | 2.0;  1.0,  4.0 | 1.6;  0.8,  3.3 | 1.6;  1.0,  2.5 | |  | 5 | 3 | 7 | | clinical assessment, lung biopsy or BAL, CT | telephone interview |
| Hubbard 2000  (22) |  | 1.1;  0.4,  2.7 |  |  | |  | 5 |  |  | | death certificate diagnosis | job group |
| Miyake 2005  (102) |  | 9.6;  1.7,  181.1 | 6.0;  0.3,  112.4 |  | | 26 | 11 | 4 |  | | clinical assessment, lung biopsy or BAL, CT | questionnaire |
| Gustafson 2007  (140) | 1.1;  0.7,  1.7 | 0.9;  0.5,  1.6 | 1.2;  0.7,  2.2 |  | | 6 |  | 3 |  | | pulmonary fibrosis of unknown aetiology + requiring LTOT | questionnaire |
| Garcia-Sancho Figueroa 2010  (97) | 1.2;  0.8,  1.9 |  |  |  | | 9 |  |  |  | | clinical assessment, CT +/- lung biopsy | questionnaire |
| Garcia-Sancho 2011  (100) | 2.8;  1.5,  5.5 |  |  |  | | 5 |  |  |  | | clinical assessment, CT +/- lung biopsy | questionnaire |
| Awadalla 2012  (201) |  | 1.6;  0.7,  3.6 | 2.7;  1.1  6.8 | 1.3;  0.7,  2. | |  | 6 | 7 | 7 | | clinical assessment, CT, pulmonary function | questionnaire |
| Paolocci 2013 (abstract only)  (65) |  | 2.8;  1.1,  7.2 |  |  | |  | 9 | 2 |  | | clinical assessment and CT | questionnaire |
| Koo 2017  (78) | 2.7;  0.7,  10.9 | 5.0;  1.4,  18.2 | 2.5;  0.5,  12.3 |  | | 35 | 22 | 5 |  | | clinical assessment, CT +/- lung biopsy | interview |

\*vapors, gases, dust, fumes.

Table 2: Pooled estimates of occupational contributions to IPF. CI = confidence

interval; OR = odds ratio; PAF% = population attributable fraction, expressed as a

percentage.

|  |  |  |  |
| --- | --- | --- | --- |
| Exposure | Risk estimates (n) | Pooled OR (95% CI) | Pooled PAF (95% CI) |
| VGDF\* | 8 | 1.6 (1.3-1.9) | 14 (12-17) |
| Metal dust | 10 | 1.4 (1.3-1.7) | 8 (6-10) |
| Wood dust | 11 | 1.7 (1.3-2.2) | 4 (3-5) |
| Agricultural dust | 6 | 1.7 (1.2-2.3) | 9 (6-12) |

\*vapors, gases, dust, fumes.

**References:**

1. William D. Travis, Ulrich Costabel, David M. Hansell, Talmadge E King, Jr,

David A. Lynch, Andrew G. Nicholson, Christopher J. Ryerson, Jay H. Ryu,

Moisés Selman, Athol U. Wells, Jurgen Behr, Demosthenes Bouros, Kevin K.

Brown, Thomas V. Colby, Harold R. Collard, Carlos Robalo Cordeiro, Vincent

Cottin, Bruno Crestani, Marjolein Drent, Rosalind F. Dudden, Jim Egan, Kevin

Flaherty, Cory Hogaboam, Yoshikazu Inoue, Takeshi Johkoh, Dong Soon

Kim, Masanori Kitaichi, James Loyd, Fernando J. Martinez, Jeffrey Myers,

Shandra Protzko, Ganesh Raghu, Luca Richeldi, Nicola Sverzellati, Jeffrey

Swigris, Dominique Valeyre, and A. T. S/E. R. S Committee on Idiopathic In-

terstitial Pneumonias . An official american thoracic society/european respi-

ratory society statement: Update of the international multidisciplinary clas-

sification of the idiopathic interstitial pneumonias. Am J Respir Crit Care

Med, 188(6):733–748, Sep 2013. doi: 10.1164/rccm.201308-1483ST . URL

http://dx.doi.org/10.1164/rccm.201308-1483ST

2. M Turner-Warwick. In search of a cause of cryptogenic fibrosing alveolitis

(cfa): one initiating factor or many? Thorax, 53 Suppl 2:S3–S9, August 1998.

ISSN 0040-6376.

3. R Hubbard. Occupational dust exposure and the aetiology of cryptogenic

fibrosing alveolitis. Eur. Respir. J., 18(32 suppl):119s–121s, 2001.

4. Varsha S Taskar and David B Coultas. Is idiopathic pulmonary fibrosis an

environmental disease? Proc. Am. Thorac. Soc., 3(4):293–298, 2006.

5. Mridu Gulati and Carrie A Redlich. Asbestosis and environmental causes of

usual interstitial pneumonia. Current opinion in pulmonary medicine, 21:193–

200, March 2015. ISSN 1531-6971. doi: 10.1097/MCP.0000000000000144 .

6. Jonathan Scott, Ian Johnston, and John Britton. What causes cryptogenic

fibrosing alveolitis? a case-control study of environmental exposure to dust.

BMJ, 301(6759):1015, 1990.

7. K. Iwai, T. Mori, N. Yamada, M. Yamaguchi, and Y. Hosoda. Idiopathic pul-

monary fibrosis. epidemiologic approaches to occupational exposure. Am. J.

Respir. Crit. Care Med., 150(3):670–675, Sep 1994. doi: 10.1164/ajrccm.150.

3.8087336 . URL http://dx.doi.org/10.1164/ajrccm.150.3.8087336

8. Richard Hubbard, Ian Johnston, David B Coultas, and John Britton. Mortality

rates from cryptogenic fibrosing alveolitis in seven countries. Thorax, 51(7):

711–716, 1996.

9. J. Mullen, M. J. Hodgson, C. A. DeGraff, and T. Godar. Case-control study of

idiopathic pulmonary fibrosis and environmental exposures. J. Occup. Envi-

ron. Med., 40(4):363–367, Apr 1998.

10. K. B. Baumgartner, J. M. Samet, D. B. Coultas, C. A. Stidley, W. C. Hunt, T. V.

Colby, and J. A. Waldron. Occupational and environmental risk factors for

idiopathic pulmonary fibrosis: a multicenter case-control study. collaborating

centers. Am. J. Epidemiol., 152(4):307–315, Aug 2000.

11. Richard Hubbard, Marie Cooper, Marilyn Antoniak, Andrea Venn, Sayeed

Khan, Ian Johnston, Sarah Lewis, and John Britton. Risk of cryptogenic fi-

brosing alveolitis in metal workers. The Lancet, 355(9202):466–467, 2000.

12. Yoshihiro Miyake, Satoshi Sasaki, Tetsuji Yokoyama, Kingo Chida, Arata

Azuma, Takafumi Suda, Shoji Kudoh, Naomasa Sakamoto, Kazushi

Okamoto, Gen Kobashi, et al. Occupational and environmental factors andidiopathic pulmonary fibrosis in japan. Ann. Occup. Hyg., 49(3):259–265,

2005.

13. Torbjörn Gustafson, Anna Dahlman-Höglund, Kenneth Nilsson, Kerstin

Ström, Göran Tornling, and Kjell Torén. Occupational exposure and severe

pulmonary fibrosis. Respir. Med., 101(10):2207–2212, 2007.

14. Germania A Pinheiro, Vinicius C Antao, John M Wood, and James T Was-

sell. Occupational risks for idiopathic pulmonary fibrosis mortality in the united

states. Int. J. Occup. Environ. Health, 14(2):117–123, 2008.

15. Ma Cecilia Garcı́a-Sancho Figueroa, Guillermo Carrillo, Rogelio Pérez-

Padilla, Ma Rosario Fernández-Plata, Ivette Buendı́a-Roldán, Mario H Var-

gas, and Moisés Selman. Risk factors for idiopathic pulmonary fibrosis in

a mexican population. a case-control study. Respir. Med., 104(2):305–309,

2010.

16. Cecilia Garca-Sancho, Ivette Buenda-Roldn, Ma Rosario Fernndez-Plata,

Carmen Navarro, Rogelio Prez-Padilla, Mario H Vargas, James E Loyd, and

Moiss Selman. Familial pulmonary fibrosis is the strongest risk factor for idio-

pathic pulmonary fibrosis. Respiratory medicine, 105:1902–1907, December

2011. ISSN 1532-3064. doi: 10.1016/j.rmed.2011.08.022 .

17. N. J. Awadalla, A. Hegazy, R. A. Elmetwally, and I. Wahby. Occupational

and environmental risk factors for idiopathic pulmonary fibrosis in egypt: a

multicenter case-control study. Int J Occup Environ Med, 3(3):107–116, Jul

2012.

18. Magnus Ekstrom, Torbjorn Gustafson, Kurt Boman, Kenneth Nilsson, Goran

Tornling, Nicola Murgia, and Kjell Toren. Effects of smoking, gender and oc-

cupational exposure on the risk of severe pulmonary fibrosis: a population-

based case-control study. BMJ open, 4(1):e004018, 2014.

19. J-W Koo, J-P Myong, H-K Yoon, C K Rhee, Y Kim, J S Kim, B S Jo, Y Cho,

J Byun, M Choi, H-R Kim, and E-A Kim. Occupational exposure and idio-

pathic pulmonary fibrosis: a multicentre case-control study in korea. The

international journal of tuberculosis and lung disease : the official journal of

the International Union against Tuberculosis and Lung Disease, 21:107–112,

January 2017. ISSN 1815-7920. doi: 10.5588/ijtld.16.0167 .