Chronic obstructive pulmonary disease among residents of an historically industrialised area: Online Supplement

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SUPPLEMENTAL METHODS

Population-Based Sampling

The size of the initial sampling frame was determined by an *a priori* power calculation. The location was chosen as previous work had suggested a high level of COPD in this area,[1] and also because of the historic presence of industry, including high levels of metalworking trades.

Questionnaire Content and Other Variables

The questionnaire sent to each identified potential participant included demographics, smoking status, respiratory symptoms, and self-reported “doctor made” diagnoses of chronic respiratory illnesses (asthma, COPD, emphysema and chronic bronchitis). In addition, detailed questions were asked related to previous and current occupational history, with particular focus on exposure to vapours, gas, dust or fume (VGDF). A set of specific workplace exposures were also recorded, (for example, cadmium, diesel exhaust) largely replicating items elicited in a similar US-based telephone study of COPD and occupation.[14] A marker of socio-economic deprivation was available for the majority of individuals within the sampling frame, represented as the percentage of households in each postal code (average 15 [range up to 100] addresses / delivery points per code) claiming any form of Income Support, subsequently referred to as %IS.

Recruitment Time Frame

Questionnaires were sent out over a 12-month period, with equal numbers mailed each month and with each mailing being stratified by %IS, to ensure that all residential areas were approached equally with each mail out. In order to maximise response rate, at the end of the initial period, all study non-respondents were sent a further single questionnaire, after updating the sample details to adjust for those who had died or were no longer available for recruitment.

Diagnostic Definitions

Following the initial phase, respondents were categorised into three groups in order to stratify for subsequent lung function testing, defined as follows:
(i) **Probable** case of airways disease, either:

- a self-reported doctor diagnosis of COPD, emphysema, chronic bronchitis or asthma noted in the questionnaire response, or
- Medical Research Council (MRC) grade 3 shortness of breath **and** at least one reported respiratory symptom (wheeze, chest tightness, winter morning cough, or winter morning phlegm production).

(ii) **Possible** case of airways disease, either:

- MRC grade 3 shortness of breath, or
- at least one reported respiratory symptom
- but no self-reported doctor diagnosis of a COPD condition.

(iii) No airway disease: individuals with no reported doctor diagnosis and no shortness of breath or respiratory symptoms.

**Lung Function Assessment**

Following diagnostic classification, respondents in groups (i) and (iii), but not (ii), were approached for a home based follow up study carried out by a single researcher, including assessment of respiratory physiology and a quality of life estimate. Asthma was included in the criteria for spirometry selection, due to the potential diagnostic overlap between chronic asthma and COPD.[3]

The vast majority of the community sample invited to have respiratory function testing underwent this at home, although a minority elected to undergo this in our hospital-based physiology laboratory. This was done using a standard, verified, rotameter-based portable spirometer (Microlab, MicroMedical, Rochester, UK). The same spirometer machine and individual physiologist were used to complete all the home study recordings. Spirometry was performed according to current ATS/ERS standards.[4] Bronchodilators were not given, avoiding drug administration outside of a hospital setting, however regular users of medication were not advised to abstain prior to testing.
Occupational Exposure Classification

Previous and current inhaled occupational exposures were defined in multiple ways. First, self-reported exposures were queried using a general exposure probe (VGDF), followed by a checklist of 18 more exposures specifically enquired about on the questionnaire. The exposures were later grouped into four categories: (i) steel industry work [2 specific items (non-steel other metal work was separately queried)], (ii) organic dusts [4 items], (iii) inorganic dusts and fumes [7 items] and (iv) combustion by-products [5 items]. Blank responses were treated as negative for the 18 specific exposures.

Second, the respondent's reported longest held job was coded into a job exposure matrix (JEM) with categories determined a priori for no exposure, intermediate, and high likelihood of exposure to dusts carrying potential risk for COPD. This JEM was adapted from that used in previous US-based studies of COPD.[2,5] The JEM coding was carried out independently by two respiratory physicians with occupational training, and manually crosschecked. Where disagreement occurred, an expert consensus panel, consisting of two senior occupational respiratory physicians with JEM attribution experience, made a final coding decision blinded to clinical data.

Supplemental COPD Cases to Enrich Sample

A further study population (n=209) was identified specifically to enrich our study group with additional cases of COPD. This sample was identified from the physiology department at our base hospital, including both patients with a likely diagnosis of chronic airways disease on clinical grounds or patients attending specific COPD clinics. All those participating from this targeted group completed the same questionnaires and lung function assessment as those from the random population sample. For this group, lung function was carried out in the hospital physiology department using an identical standardised and verified machine.

Statistical Methods

For the purposes of analysis, several COPD definitions were used. Principal analyses employed a broad definition to include a reported doctor’s diagnosis of COPD or emphysema or chronic bronchitis. Concomitant asthma could be present,
but not without one of these former diagnoses as well. Key analyses were repeated with those reporting COPD or emphysema, but excluding those who reported chronic bronchitis alone. For the subgroup with lung function data, COPD was defined according to the GOLD staging system.[6]

Descriptive statistics were generated using SPSS v.14.0, with chi-squared testing used for comparison of categorical variables, and independent t-tests and one-way ANOVA for comparison of means. Normality of data was tested using prior to the application of a parametric test, and 5% statistical significance was taken as standard unless otherwise stated. Logistic regression analysis was used to test the association between smoking, occupational exposures and the various definitions of COPD by calculating crude unadjusted and adjusted OR, the latter corrected for age, sex and smoking.

To assess the contribution of various occupational exposures and smoking to the overall burden of COPD, PAR% estimates were derived from corrected ORs, using the standard formula: PAR = (OR-1/OR) x % of cases exposed.[18] In addition, Stata/SE v.11 software was used to derive confidence limits for the calculated central PAR% estimates.

Individuals with key missing data were excluded from relevant analyses, resulting in slightly varying study numbers contributing to certain sub-analyses.
REFERENCES FOR SUPPLEMENT


