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Ambient air pollution and respiratory health effects in mail carriers

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ABSTRACT

Mail carriers represent an occupational group suffering from respiratory symptoms and lung function impairment. Although environmental conditions may play role, information on the effects of air pollution exposure in this population is lacking.

The present study was conducted in Athens, Greece, in order to investigate the adverse effects of long-term air pollution exposure on respiratory outcomes in mail carriers.

A total of 226 mail carriers and 73 office employees were enroled. Information on respiratory symptoms, medical, occupational, residential and smoking history was obtained through a questionnaire. Flow-volume curves were performed in the workplace using a portable spirometer. Individualised personal exposure assessment has been applied based on long-term residential and occupational subject history linked with geographical air pollution distribution. Furthermore, personal measurements were obtained for forty-one mail carriers using NO_2 and O_3 passive samplers, assuming that current air pollution exposure is sufficiently representative of long-term, previous exposure to make a plausible link with current health status.

The analysis based on exposures estimated on the basis of residential and work addresses showed that the most exposed to PM_{10} postal workers have rhinitis at a higher rate (OR=1.67, 95% CI: 1.01–2.75). In mail carriers there is indication that those exposed to higher concentrations of O_3 or PM_{10} have a greater possibility to present rhinitis (OR=1.63, 95% CI: 0.93–2.88 and OR=1.70, 95% CI: 0.96–3.03, respectively). The effect of O_3 on rhinitis became even more apparent in the analysis based on exposures assessed by personal measurements (OR=6.74, 95% CI: 1.24–36.55). Exposure to NO_2 was significantly associated with decrements in lung function. For office employees the exposure to air pollutants was not associated to any adverse respiratory outcome.

Our findings suggest that air pollution is a contributing factor for the occurrence of rhinitis and lung function impairment in mail carriers.

1. Introduction

Air pollution is a well-recognised public health problem associated with a range of adverse health outcomes ranging from premature mortality to subtle sub clinical respiratory symptoms (Samet and Krewski, 2007; Katsouyanni, 2003; Brunekreef and Holgate, 2002; Katsouyanni et al., 2001). The identification of subpopulations that are at increased risk is of particular interest for air pollution policy decisions since it will determine how health risks at current ambient levels are distributed in the population.

Athens is one of the most polluted European capital cities. Although during the last decades SO_2 levels have considerably declined this is not the case with O_3, NO_2 and particulate matter (PM) (Grivas et al., 2008; Hellenic Ministry for the Environment, Physical Planning and Public Works, 2008; Economopoulou and Economopoulos, 2002). Several previous studies have consistently shown air pollution effects on the total as well as on respiratory mortality and morbidity in the Greater Athens area (Karakatsani et al., 2003; Pantazopoulou et al., 1995; Katsouyanni et al., 1990; Hatzakis et al., 1986). However, there is a lack of information on long-term consequences of chronic exposure to air pollution for occupational groups highly exposed.

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Mail carriers usually spend most of their working time outdoors, walking along streets or riding a vehicle, delivering mail. From a previous study there is evidence that they represent an occupational group at high risk to develop respiratory symptoms or lung function impairment (Zuskin et al., 2000). Furthermore, some years later a panel study demonstrated acute effects on mail carriers' lung function after exposure to ozone concentrations below current ambient air quality standards and occupational exposure limits (Chan and Wu, 2005). Because information on the effects of long-term air pollution exposure in this population is lacking, we conducted this study in the Athens area in order to investigate the adverse effects of long-term air pollution exposure on respiratory outcomes in mail carriers.

2. Materials and methods

The study protocol was approved by the Hellenic Data Protection Authority.

2.1. Study subjects

This study was conducted from February 2004 until April 2005. In February 2004 468 postal workers (78 office employees and 390 mail carriers) working in fourteen postal zones dispersed throughout the Athens basin (Fig. 1) were asked to participate in the study. Finally, 339 (72.4%) postal workers, 266 (68.2%) mail carriers and 73 (93.6%) office employees gave their informed consent and were included in the study.

Among mail carriers 53.4% delivered mail via motor vehicle while 46.6% delivered mail on foot. It is estimated that both groups spent 60% of their working days outdoors, exposed to different atmospheric air pollutants and adverse meteorological conditions.

2.2. Questionnaire

Participants were asked to complete a self-administered detailed questionnaire that was based upon questionnaires used in previous studies such as the ECRHS I (http://www.ecrhs.org/Quests.htm). Questions on the subjects' demographic data, biometry, smoking habits, exposure to environmental tobacco smoke at workplace and at home, occupational and medical history, occurrence of respiratory symptoms and medication use were included. One of the authors (KF) was present during the completion of the questionnaire to clarify any questions.

The following definitions were used:

Chronic cough: cough during the day or the night for a minimum of 3 months per year.

Chronic phlegm: phlegm during the day or the night for a minimum of 3 months per year.

Chronic bronchitis: cough during the day or the night and phlegm for a minimum of 3 months per year for 2 consecutive years.

Asthma: medical history records of asthma or wheezing or whistling in the chest with recurring attacks of dyspnoea during the day or the night or at rest while not having common cold.

Rhinitis: nasal catarrh or congestion without common cold or all these nasal problems accompanied by eye irritation and being in tears.

2.3. Spirometry

Flow volume curves were performed for all participants in their workplace, at the beginning of their morning shift, using the same portable spirometer (microlab v 1.900, Micro Medical Ltd., Rochester, UK). Lung function measures were performed in a standardized manner, according to the American Thoracic Society's guidelines (American Thoracic Society, 1995), with the subjects seated and wearing a nose clip. Subjects were instructed to abstain from inhaled bronchodilator use for 4 h before testing. All manoeuvres deemed technically satisfactory (American Thoracic Society, 1995) were recorded and, if less than three the participant was allowed up to five further attempts. If after eight attempts three technically satisfactory manoeuvres had not been made, lung function testing was abandoned. We used the best FEV_1 and FVC value out of three technically acceptable curves whereas MMEF and PEF values were taken from the test effort

Fig. 1. Map of Greater Athens area.