Ambient air pollution and depressive symptoms

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Abstract

Background. Depression is among the most common mental health problems. Depression interferes with daily functioning and quality of life. Many factors can contribute to depression and air pollution can initiate or intensify symptoms of depression.

Methods. Case-crossover method was used to study associations between emergency department (ED) visits for depression and ambient air pollution. The statistical analysis was applied for patients of different ages.

Results. Positive and statistically significant results, (communicated as odds ratios), were obtained for exposure to ambient carbon monoxide and ED visits for depression.

Discussion. The presented results support the hypothesis that recent exposures to ambient levels of air pollutants can contribute clinically significant worsening in depression symptoms leading to ED visits. As the results suggest the associations are age dependent.

INTRODUCTION

Wang et al. (2014) investigated the association between ambient and traffic related air pollution, and depressive symptoms among older adults. They studied the presence of depressive symptoms among 732 Boston-area adults older than 64 years of age in relation to exposure. As a main outcome they found no evidence of a positive association between depressive symptoms and long-term or short-term exposure to the considered air pollutants (among them carbon monoxide, black carbon and fine particulate matter). In our opinion there are at least two important factors related to the results, comorbidity and age of study subjects, which should be addressed as confounders in this study.

First, a recent publication in the domain (Cho et al., 2014) showed positive associations between air pollution and depression for individuals with other health conditions (cardiovascular disease, diabetes mellitus, or asthma). In our studies of the associations between ambient air pollution and depression we also have suggested that we may be seeing relationships between air pollution effects and other disease states, comorbid with depression (Szyszkowicz, 2007; Szyszkowicz et al., 2009; Szyszkowicz et al., 2010; Lim et al., 2013; Szyszkowicz et al., 2013; Thomson et al., 2013; Bhat et al., 2014, Calderón-Garcidueñas et al., 2014; Costa et al. 2014). Interestingly, our studies of the associations between air pollution and depression have not shown correlations with anxiety. It might suggest that anxiety disorders are less interconnected with the effects of air pollution exposure.

Second, we would like to emphasise the contribution of age to the association between depression and air pollution. In our study as health data we used emergency department visits for depression.

MATERIALS AND METHODS

In this work we investigate the contribution of age to the association between depression and ambient air pollution exposure. The health data were obtained from five emergency departments (ED) in Edmonton, Canada for the period April 1992 – March 2002. The diagnosed cases were retrieved by using the ICD-9 code 311, (Szyszkowicz, 2007). We used case-crossover (CC) approach (Maclure, 1991) to estimate the odds ratios (OR) values and their 95% confidence intervals (CI) in relation to air pollution exposure. Time-stratified design was applied to define controls in the applied CC method (Janes et al., 2005). This technique results in three or four controls for each health event, i.e. here ED visit for depression. The statistical models were realized using a conditional logistic regression procedure (PHREG procedure in SAS, v. 9.3). Ambient temperature and relative humidity were added in the statistical models in the form of natural splines with three degrees of freedom.

RESULTS

The results are demonstrated on one figure. Figure 1 shows ORs and their corresponding 95% CIs. The presented ORs are estimated for a series of age groups [A, A+19], where age A changes from 0 to 66. The values (OR and 95% CI) were calculated and are illustrated for each A separately. This technique allows to see changes in the associations by the age of the patients. The ORs were estimated for ED visits for depression in the warm season (April-September) and exposure to ambient carbon monoxide (CO) lagged by one day (lag 1). The results are reported for a change in CO levels equivalent to one interquartile range (IQR = 0.4 ppm).

In addition, Figure 1 also presents the total number of ED visits for depression (In total: all = 7,802, male = 3,217, and female = 4,585) for each of the considered age intervals; [A, A+19].

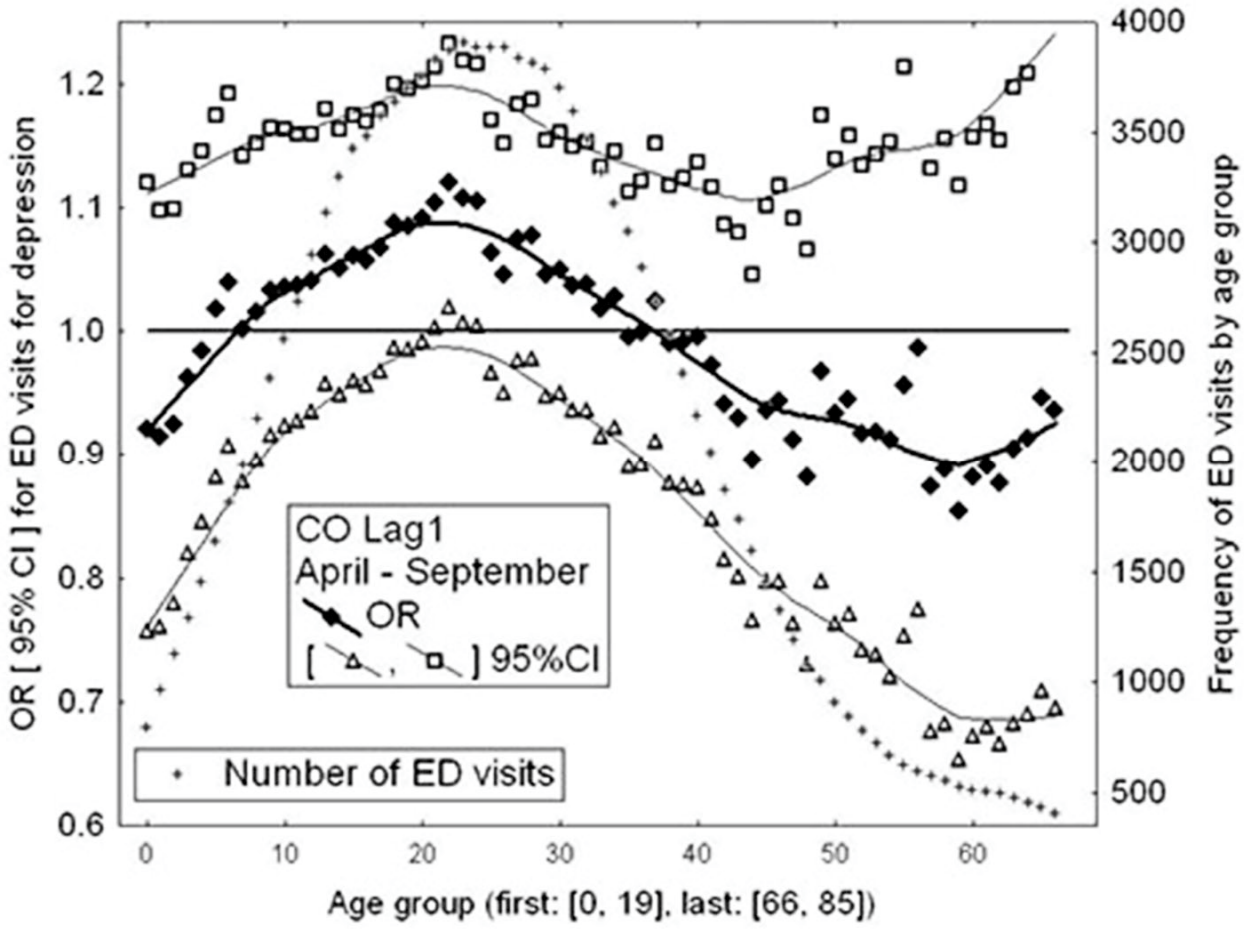

Figure 1. Odds ratios (OR) and their 95% confidence intervals (95%CI). The ORs are estimated for a series of age groups [A, A+19], where A changes from 0 to 66

DISCUSSION

The obtained results suggest that the association between carbon monoxide levels and depression is stronger for young and middle aged patients. Similar results were observed for other ambient air pollutants. The estimated ORs are positive and statistically significant for some age groups for which we also observe maximum of the number of ED visits for depression. Here acute health events measured by ED visits are considered in contrast to the work of Wang et al. (2014). Taken together, these results seem to suggest that for persons 65 years of age and older the association of

depression with air pollution is weaker, and may include a contribution from co-morbid conditions, as it was observed by (Cho et al., 2014).

These findings support the hypothesis that recent exposures to ambient levels of air pollutants can contribute clinically significant worsening in depression symptoms leading to ED visits.

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