Air pollution and general practice consultations for respiratory illnesses

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SHORT REPORT

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Associations between air pollution and hospital admissions and mortalities have been demonstrated in many studies.[1] By contrast, few studies have reported the relation between air pollution and respiratory morbidity in general practice (GP). In these studies, associations have been reported between air pollution and GP consultations for asthma, lower respiratory tract infections, and allergic rhinitis.[2 3] To further explore these associations, we prospectively collected daily numbers of GP consultations from seven clinics in various districts of Hong Kong and performed a time series analysis to examine their relations with daily concentrations of PM_{10}, NO_2 , SO_2, and O_3 measured in stations within or nearest to each district.

PARTICIPANTS, METHODS, AND RESULTS

Seven GP clinics located in different districts in Hong Kong were recruited to provide data on daily patient consultations throughout the year 2000 using a standard format that captured information on age, gender, and diagnosis. The diagnosis was coded in accordance with the *International Classification of Primary Care* 2nd edition. New cases of illnesses were distinguished from follow up visits. Only new cases of respiratory illnesses were used for statistical analysis. All patients' data were checked and validated.

The generalised additive model[4] using Poisson distribution with log-link function was adopted to construct a core model that regressed the daily numbers of GP visits in each clinic on the time variable (day), daily mean temperature and humidity, a holiday indicator, and the day of the week. Smoothers were used to control for long term seasonal patterns of GP visits. The core models were chosen so that the predicted daily numbers of GP consultation best fitted the observed numbers. The quasi-likelihood method was used to correct for overdispersion. When significant autocorrelation was detected, it was adjusted by adding autoregressive terms (GP consultations in the previous day, up to three days) to the model. Residual analyses were performed and no uncontrolled trends were observed. After the confounding effects of seasonality, days of the week, and climatic variables have been controlled, daily concentrations of PM_{10}, NO_2 , SO_2, and O_3, obtained from the monitoring station in/nearest to the district, were then added to each core model to determine the relative risk (RR) of GP consultations for a 10 μg/m^3 increase in these pollutants. The RRs obtained from different clinics were combined using a random effect model.[5] All calculations were performed with the software S-plus 3.3.

A total of 51 822 consultations for new cases of illnesses were recorded from the seven clinics. Of these, 36 112 (69.7%) were respiratory illnesses and 31 303 (60.4%) were upper respiratory tract infections (URTI). A total of 2094 cases of influenza (5.8%) were diagnosed. The mean daily concentrations (in μg/m^3) for PM_{10}, NO_2, O_3, and SO_2 were 47.2, 58.2, 28.3, and 15.9 respectively. For PM_{10}, the combined RRs (per 10 μg/m^3 increase) of consultations for all respiratory illnesses and URTI were 1.033 (95% confidence intervals 1.025 to 1.041) and 1.030 (95% confidence intervals 1.016 to 1.045) respectively. RRs for O_3, NO_2, and SO_2 (at 1.017, 1.013, and 0.992 respectively) were statistically insignificant (see table 1).

COMMENT

This study adds further evidence that particulates have a significant impact on respiratory morbidity in GP, and is the first report of a positive association between PM_{10} and URTI using prospectively collected data. Despite the small number of clinics studied, they were geographically diverse, each with a reliable and complete dataset and matching, district specific air pollution data. The high correlation between PM_{10} and total suspended particulates (predominantly larger particles that might cause irritation and inflammation of the upper respiratory tract) makes the association with URTI biologically plausible. GP consultations for respiratory illnesses in general, and URTI in particular, represent a larger proportion of community morbidity. Hence, the impact of air pollution on public health extends far beyond the increase in hospital admissions and mortalities.

Contributors

TWW had the original study idea, planned the study, wrote the paper and is guarantor of the study. YTW recruited and coordinated the GPs and validated the data. TSY and CMW contributed to the planning of the study. CMW and AHSW gave useful comments. WT analysed the data.

Authors' affiliations

T W Wong, Y T Wun, T S Yu, W Tam, A H S Wong, Department of Community and Family Medicine, The Chinese University of Hong Kong

Table 1 Combined risk estimates for consultations for upper respiratory tract infections (URTI) and all respiratory diseases and mean daily concentrations of pollutants

Pollutants*	Mean (SD) daily concentration (μg/m^3)	URTI RR (95% CI)	All respiratory RR (95% CI)
NO_2	59.50 (21.81)	1.0125 (0.9906 to 1.0349)	1.0342 (0.9938 to 1.0763)
PM_{10}	49.63 (24.84)	1.0301 (1.0154 to 1.0450)	1.0328 (1.0252 to 1.0405)
O_3	27.52 (17.18)	1.0174 (0.9933 to 1.0420)	1.0150 (0.9882 to 1.0426)
SO_2	16.57 (12.68)	0.9923 (0.9487 to 1.0378)	1.0068 (0.9697 to 1.0454)

*NO_2, nitrogen dioxide; PM_{10}, particulates with an aerodynamic diameter less than 10 μm; O_3, ozone; SO_2, sulphur dioxide.

C M Wong, Department of Community Medicine, The University of Hong Kong

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Correspondence to: Professor T W Wong, Department of Community and Family Medicine, The Chinese University of Hong Kong, 4/F, School of Public Health, Prince of Wales Hospital Shatin, NT, Hong Kong; twwong@cuhk.edu.hk

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