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A Randomised Controlled Trial Investigating The Effects Of Nitrogen Dioxide In Classrooms On The Respiratory Health Of Asthmatic Primary School Children.

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Submitted as a PhD thesis at the University of Adelaide during November 2002

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Abstract

A Randomised Controlled Trial Investigating The Effects Of Nitrogen Dioxide On Asthmatic Children In Primary School Classrooms

(356 words)

The aim of this study was to determine the effects of a randomised controlled trial of unflued gas heater replacement on asthma in children.

18 schools (134 classrooms) using unflued gas heaters in winter were randomly allocated an intervention of heater replacement with either flued gas heaters (4), or electric heating (4), or remained unflued (10). The main eligibility criteria were (i) doctor diagnosed asthma with (ii) no unflued gas sources at home (a priori sample). The sample was extended to asthmatic children with home gas cooking (extended sample). Participants kept a daily diary of symptoms for 12 weeks in order to establish symptom rates in the intervention and control groups. Lung function and bronchial hyper-responsiveness (BHR) tests were performed at the beginning and end of the study period. Indoor NO_2 was monitored in classrooms and homes during the study period.

Mean NO_2 exposure was significantly lower in intervention schools (15. 5 ppb SD:6.6) compared to control schools (47.0 ppb SD:26.8). Mean kitchen NO_2 levels were significantly lower in the a priori sample compared to the extended sample (14.3 ppb CI:10.3-18.3 vs 28.7 ppb CI: 24.1-33.3; $p<0.001$).

In the a priori sample there were 45 and 73 children in the intervention and control groups respectively, and 43 in each group in the extended sample.

In the a priori sample, difficulty breathing (RR: 0.32; CI: 0.14-0.69), chest tightness (RR: 0.45; CI:0.25-0.81), and asthma attack (RR: 0.39; CI:0.17-0.93) rates were significantly decreased in the intervention group compared to the control group. In the extended group, symptom rates were not significantly different. Mean %predicted FEV_1% and BHR were similar between intervention and control groups.

Significantly reduced NO_2 levels in classrooms were accompanied by more than a 50% reduction in some asthmatic symptoms in the intervention a priori group. This was not found in the extended sample, likely due to misclassification of exposure associated with home exposure from gas cooking.

Nitrogen dioxide is associated with increased asthma symptoms in children, and replacement of unflued gas heating in schools should become a public health priority for school authorities. Furthermore, the result may implicate unflued gas appliances in environments other than classrooms.