

The Association of Residential Environmental Exposure and Occurrence of Adulthood Asthma

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During the last quarter century, evidence has accumulated that the prevalence and incidence of asthma among adults has increased in many countries. The changing pattern of disease has not been fully explained, in part because of an incomplete understanding of its pathogenesis. The changes have been too rapid to be accounted for by changes in gene frequencies. It is also unlikely that they can be totally accounted for by changes in either diagnostic patterns or in reporting attitude of asthmatic symptoms by the general population. They do suggest a role for environmental exposure in the etiology of this evolving epidemic.

Our knowledge about the influence of residential environments on respiratory symptoms has improved. Up to the present, the literature is rather consistent regarding its importance in childhood asthma, but there is sparse information on the situation in adults. The role of environmental factors in adult-onset asthma is also less clear than in child-onset asthma. Both genetic and environmental factors are believed to contribute to adulthood asthma. Epidemiological evidence concerning the relative contributions of environmental stimuli and genetic propensity to adult-onset asthma warrants investigation.

Between March and October 2004, we conducted a questionnaire survey among 26- to 50-year-old adults in Southern Taiwan. After excluding unqualified questionnaires, data from 24,784 subjects were left for analysis. Those who reported an onset of typical respiratory symptoms within five years (new-onset asthma) was reported for 0.83% of males (80/9,662) and 1.36% of females (206/15,122). In the year 2002 in Taiwan, the populations were approximately 4.66 million males and 4.54 million females between 26 and 50 years old, so these prevalences correspond to about 100,400 cases of new-onset asthma. After adjustment for host factors such as sex, age, education level, family income, and the smoking status, subjects who had ever avoided ETS and pets were 1.60 and 3.21 times, respectively, more likely to develop asthma in the preceding five years. Visible mold on walls at home was



independently associated with the occurrence of asthma symptoms in adulthood (OR = 1.49, 95% CI = 1.09-2.01, PAR = 7.74%) (Table). Population attributable risk (PAR) represents cases that would be prevented if the subjects were not exposed to specific risk factors.

While mutually adjusted models were applied, we found a statistically significant association between residential exposure and new-onset adulthood asthma (OR = 1.80, 95% CI = 1.08-3.23) (Table). Of the estimated 100,400 cases of new-onset adulthood asthma in 26- to 50-year-old Taiwanese residents, we estimated that residential environmental factors accounted for around 28,200 excess cases, which was consistent with 5,640 excess cases annually occurring in Taiwan. The effect of eliminating these factors, if they are indeed causal, would have a profound impact on hospitalization rates, clinic and emergency department visits, or even some non-medical costs such as work loss and early retirement in adults.

Our study also demonstrated that parental atopy and residential environmental exposure approximately contributed equally, with PAR 28.04% for residential exposures and 31.38% for parental atopy. In a twin-family study from Finland, 87% of the variation in liability to childhood asthma was explained by genetic factors, which suggested that a family history of asthma was stronger than other risk factors. The present data was also inconsistent with our previous finding on childhood asthma that parental atopy plays the most important role rather than other environmental factors. Different pathogenetic mechanism should be considered between child-onset and adult-onset asthma. Further studies are warranted to identify the relative contributions of environmental stimuli and genetic propensity in various types of asthma.

Table. Odds ratios with 95% confidence intervals, and population attributable risks for parental atopy and residential environmental factors associated with new-onset adulthood asthma

Risk factors	Prevalence (%)	OR	95% CI	PAR(%)	aOR	95% CI	PAR(%)
Parental atopy							
Asthma in father	2.44	2.63*	(1.55-4.24)	3.39			
Asthma in mother	2.20	11.61*	(8.07-16.42)	15.97			
AR/AE in father	6.94	2.41*	(1.67-3.39)	8.55			
AR/AE in mother	6.24	2.02*	(1.36-2.90)	5.77			
Any parental atopy	15.43	4.55	(3.54-5.85)	34.09	4.47	(3.47-5.75)	31.38
Residential environments							
Cockroaches	82.84	1.23†	(0.85-1.84)	15.99			
Visible mold	17.33	1.49†	(1.09-2.01)	7.74			
Dog	19.72	1.26†	(0.90-1.72)	4.87			
ETS avoidance	6.66	1.60†	(1.03-2.47)	3.61			
Pet avoidance	8.47	3.21†	(2.13-4.73)	14.98			
Any environmental factor	89.56	2.02	(1.23-3.65)	47.25	1.80	(1.08-3.23)	28.04

All ORs are adjusted for sex, age, education, family income, and smoking status.

* Adjusted for other parental atopic factors.

† Adjusted for other residential environmental factors.

aOR: mutually adjusted odds ratio; PAR: population attributable risk; ETS: environmental tobacco smoke; AR/AE: allergic rhinitis or atopic eczema.