



Preconceptional, prenatal and postnatal exposure to outdoor and indoor environmental factors on allergic diseases/symptoms in preschool children



Qihong Deng^{a, b, c, *}, Chan Lu^a, Cuiyun Ou^a, Lv Chen^b, Hong Yuan^{c, d}

^a School of Energy Science and Engineering, Central South University, Changsha, Hunan, China

^b School of Public Health, Central South University, Changsha, Hunan, China

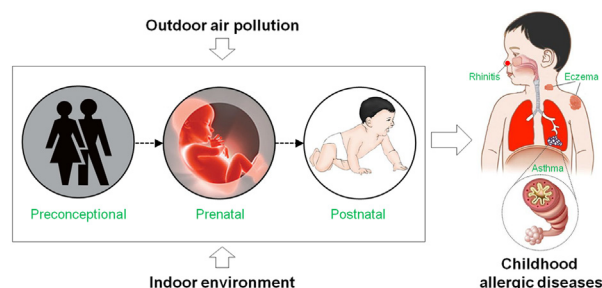
^c Institute of Environmental Health, Central South University, Changsha, Hunan, China

^d The Third Xiangya Hospital, Central South University, Changsha, Hunan, China

HIGHLIGHTS

- We studied allergy risk of some environmental factors during children's whole life exposure.
- Both outdoor air pollution and indoor environment can be associated with childhood allergy.
- The risk of environmental factor is determined by its timing of exposure.
- Early life exposure before birth can play an important role in the incidence of allergic diseases.
- Allergic symptoms are associated with indoor environment only.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 12 January 2016

Received in revised form

28 February 2016

Accepted 8 March 2016

Available online 19 March 2016

Handling Editor: A. Gies

Keywords:

Allergic rhinitis

Asthma

Eczema

Indoor mold and dampness

Indoor renovation

Outdoor air pollution

ABSTRACT

Background: Environmental factors have been found to be associated with allergic diseases, but it is unclear which environmental factor during which exposure window causes what kind of allergic diseases.

Objectives: We investigated association between exposure to some predominant outdoor and indoor environmental factors during preconceptional, prenatal, and postnatal periods and allergic diseases/symptoms in 2598 children in China.

Methods: Children's lifetime incidence of allergic diseases and current prevalence of allergic symptoms and exposure to indoor new furniture/redecoration and mold/dampness was surveyed by a questionnaire. Exposure to outdoor air pollutants was estimated by the concentrations measured at air quality monitoring stations. Multiple logistic regression model was used to evaluate the associations between outdoor air pollutants and indoor environmental factors and allergic diseases (asthma, allergic rhinitis, and eczema) and symptoms (wheezing, night cough, and rhinitis-like).

Results: We found that preconceptional, prenatal, and postnatal exposure to outdoor industrial and traffic air pollutants were significantly associated with increase in the risk of childhood asthma, and also positively associated with allergic rhinitis and eczema. However, we cannot distinguish the effect of outdoor air pollutants and exposure windows because of their high correlations. New furniture was associated with eczema and allergic rhinitis during postnatal exposure, but redecoration associated with asthma and eczema during prenatal exposure. Indoor visible mold/damp stains was significant for

* Corresponding author. School of Energy Science and Engineering, Central South University, Changsha, 410083, Hunan, China.

E-mail address: qh deng@csu.edu.cn (Q. Deng).

eczema during prenatal exposure and asthma during postnatal exposure respectively, but window condensation was significant for all childhood allergic diseases during both prenatal and postnatal exposures. Allergic symptoms in children were found to be associated with exposure to indoor factors only. *Conclusions:* Associations between outdoor air pollutants and indoor environmental factors and childhood allergic diseases/symptoms were divergent and related to the timing of exposure.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Asthma and allergy have become the most common chronic disease in children and the leading cause of pediatric hospitalization worldwide (Eder et al., 2006). The prevalence of childhood asthma and allergic diseases has been found to be increasingly rapidly, especially in developing countries such as China (Asher et al., 2006; Eder et al., 2006; Zhang et al., 2013). Apart from well known genetic factors, environmental factors have been found to be important contributors to the manifestations of allergic diseases (London, 2007). However, some fundamental issues about the role of environmental factors in the etiology of allergic diseases are still unclear:

- Outdoor or indoor? Although outdoor air pollution has long been suggested as a trigger for asthma or allergic diseases in children (Brauer et al., 2007), concern has arisen in recent years about indoor environment as a risk factor for the increased incidence of allergic disease because people spend more than 80% of their time indoors globally (Heinrich, 2011; Mendell, 2007).
- Which environmental risk factor? An array of environmental risk factors have been investigated, such as outdoor air pollutants and indoor environmental tobacco smoke (ETS), mold and dampness, allergens, and “new” chemicals (von Mutius, 2000; Bornehag et al., 2001, 2003, 2004; Kasznia-Kocot et al., 2010; Kim et al., 2013; Guarnieri and Balmes, 2014). However, which environmental factors is the main cause for the increase in prevalence of allergic disease is not well understood.
- Which timing of exposure: early life or late life? Adult or childhood chronic disease development proposes the importance of exposures throughout life or late life exposure (Gunnell et al., 1999; Yazdanbakhsh et al., 2002). However, there is recently increasing evidence pointing to the influence of prenatal and early life exposures on the development of allergic disease (Gluckman et al., 2008; Duijts, 2012). It remains largely unclear whether a time window exists within which the organism may be especially sensitive to the specific environmental influences.
- What kind of allergic disease and symptom? So far, there is a large difference and lack of consistency in the association between allergic diseases and symptoms and outdoor and indoor environmental factors (Penard-Morand et al., 2005; Heinrich, 2011), maybe due to different exposure level and metrics.

To address these issues, we aim to investigate the relation of asthma and allergy to some predominant outdoor and indoor environmental factors in China that, includes: (1) Serious outdoor Outdoor air pollution. With the rapid economic development, China is now facing one of the world worst industrial air pollution and also the worsening traffic air pollution due to the rapidly growing number of motor vehicles in the urban (Kan et al., 2012);

(2) Compelling indoor Indoor new furniture and redecoration. Due to the rapid urbanization progress, a huge number of people, especially the new couples and expected parents, migrated into new buildings in urban areas during the past decade. New building materials, and decoration materials, and new furniture caused high indoor level chemicals, such as volatile and semi volatile organ compounds (VOCs and SVOCs) (Bornehag et al., 2004; Schlink et al., 2010); (3) Mold and dampness in the home. Due to lack of central air conditioning and heating systems, mold and dampness in dwellings is very serious in the southern China with subtropical climate (Mendell et al., 2011).

We hypothesized that different developmental stages of environmental exposure can result in dissimilar impact on childhood allergic diseases and symptoms. We divided the child's whole life exposure into preconceptional, prenatal, and postnatal stages, and then evaluated the risk of exposure to outdoor air pollutants and indoor environmental factors during these stages on childhood allergic diseases/symptoms. Although the importance of exposure timing and how this affects the children's health outcomes were observed (Selevan et al., 2000), no one has systematically compiled the preconceptional, prenatal, postnatal developmental exposures and childhood allergy.

2. Materials and methods

2.1. Study population

Our work is a part of nationwide cross-sectional China-Children-Homes-Health (CCHH) epidemiology study (Zhang et al., 2013). Between September 2011 and January 2012, we conducted a survey for respiratory disease and symptoms in children in the kindergartens in Changsha, the capital city of Hunan Province in south-central China, having a population of 7.22 million inhabitants and covering an area of 1909 km². The study protocol were reviewed and approved by the Ethics Committee of the Central South University and also by the health department and school board of each kindergarten.

We used a self-administered Chinese questionnaire that combined the standard questionnaire designed by the International Study of Asthma and Allergies in Childhood (ISAAC) (Asher et al., 2006) and a Swedish questionnaire about dampness in buildings and health (DBH) (Bornehag et al., 2004) to collect information on health status, possible exposures to chemical substances in the immediate environment, and lifestyles of the children and their family members. A total of 4988 questionnaires were distributed to the children at 36 randomly chosen kindergartens throughout the city. Children were instructed to have the questionnaire completed by parents and to return it to kindergartens within one week.

We received 3897 completed questionnaires with the overall response rate 78%. We first excluded 745 children from kindergartens having response rate lower than 50%. These excluded kindergartens were basically distributed in the outer suburbs where the children are mainly from the far rural areas and their parents are mainly rural migrant workers. For these children, the early life

Download English Version:

<https://daneshyari.com/en/article/6306984>

Download Persian Version:

<https://daneshyari.com/article/6306984>

[Daneshyari.com](https://daneshyari.com)