

ASSOCIATION BETWEEN AEROALLERGEN SENSITIZATION AND THE SEVERITY OF ASTHMA IN PEDIATRIC PATIENTS

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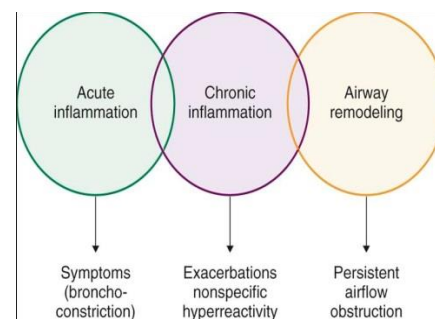
INTRODUCTION

Asthma is one of the most common chronic diseases in childhood, with increasing prevalence in the past 3 decades (Nievas et al, 2013). The prevalence of asthma in the world is approximately 7.2% (6% adults and 10% children).

There are variations in the prevalence and mortality of asthma. WHO estimates that there are currently 250,000 deaths due to asthma. It is leading cause of childhood hospitalization and school absenteeism. Asthma is more prevalent in boys in the first years of life, but in adolescents it predominates among female subjects. Asthma affects minority and low-income groups disproportionately (Herzog et al, 2011; Rahajoe, 2013).

In Indonesia, Asthma is the top ten causes of morbidity and mortality. The study data of household health survey in 1986 in various provinces in Indonesia showed asthma ranks 5th of 10th causes of morbidity. In 1992 Household Health Survey, asthma, chronic bronchitis and emphysema as 4th cause of death in Indonesia (5.6%). In 1995, the prevalence of asthma in Indonesia approximately 13/1000, compared with chronic bronchitis is 11/1000 and pulmonary obstruction is 2/1000 (Guidelines for Diagnosis and Management of Asthma In Indonesia, 2013)

Asthma is a heterogeneous disorder in children that is characterized by recurrent airway obstruction, bronchial hyper-responsiveness, and airway inflammation. (Herzo et al, 2011).



The pathophysiologic basis of asthma is not well understood. It appears to have a complex, multifactorial etiology which results from an interplay of many hereditary factors and a number of environmental factors. Bronchial biopsies from patients with even mild asthma have evidence of chronic inflammation, and cytokines and other mediators of inflammation are found in bronchial washings from asthma patients. Some families are more prone to development of allergies, and there is a well-known association between allergies and asthma. This suggests a genetic predisposition, but it appears that a number of genes are involved.

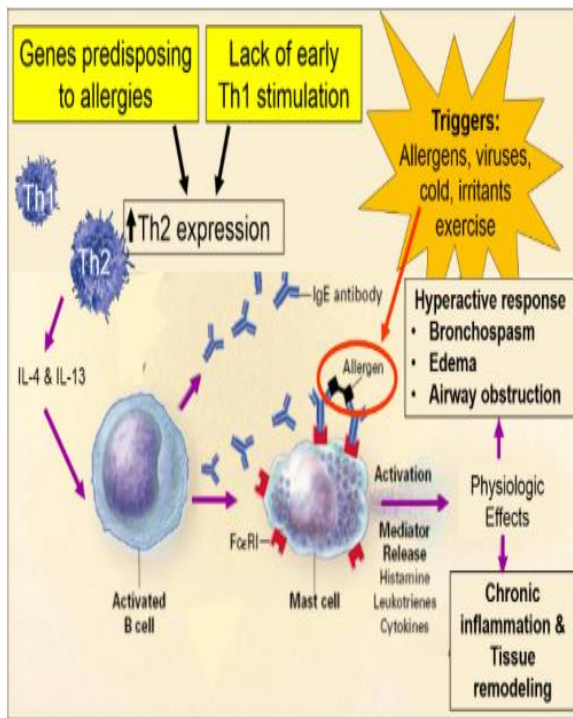


Figure 1. Pathophysiology of asthma

Source: Busse W. & Lemanske R: N. Engl. J. Med. 2001;344(5):350-362

Asthma attacks vary from mild to severe and life threatening. The various factors which can trigger asthma attacks, such as exercise, allergens, infections, sudden changes in air temperature, or exposure to respiratory irritants such as cigarette smoke and others. (Rahajoe, 2013)

Aeroallergen sensitization is a risk factor in the development of childhood asthma. Aeroallergen sensitization occurs in most patients with asthma and is noted in a high percentage of patients with mild and moderate asthma. The percentage of those that are atopic with severe asthma appears less, but still approximates the percent seen in patients with mild and moderate asthma. The most commonly implicated allergens are house dust mite (HDM), cockroach, and furred animals. Aeroallergen sensitization can be evaluated using skin testing. (Raj et al, 2013)

House dust mites are arachnids that are microscopic in size (~0.33mm long). They are found in dust and products with woven material or stuffing such as mattresses, pillows, stuffed animals, and bedding. Their life cycle from egg to adult takes 3 to 4 weeks and they live for 6 to 8 weeks. Females produce 40 to 80 eggs during this time.

It has been shown that dust mite exposure in early childhood is an important determinant in asthma development. Sporik et al. showed that 16 of 17 children with asthma were sensitized to dust mite. Further, the higher the level of dust mite exposure at 1 year old, the earlier the first episode of wheezing occurred. The relative risk of asthma was almost 5-times greater in the subjects who were exposed to

high levels of dust mite allergen (>10 µg/g) (Baxi et al, 2010)

They demonstrated that early exposure to house dust mite was associated with an increased risk of asthma and late onset wheezing. They followed a group of 440 children from birth to 7 years and found that children exposed to high levels of dust mite allergen in their bed at 2 to 3 months old had a 3-fold increase in the odds of asthma at age 7 years old compared with those exposed to low level dust mite allergen (Baxi et al, 2010)

Skin prick testing (SPT) is an easy, cost-effective and convenient approach to identify sensitization to allergens. SPT detects the presence of allergen specific IgE bound to mast cells by eliciting mast cell degranulation to the specific allergen being tested (Raj et al, 2013).

The purpose of this study was to determine the association of aeroallergen sensitization and the severity of asthma in pediatric patients.

METHODS

Study design

The study design was cross sectional. The participants were all asthma patients (n=221) who were treated at Pediatric Outpatient Clinic of Saiful Anwar Hospital Malang, Indonesia since January 2014 to December 2015. The severity of asthma (intermittent and persistent asthma) was based on GINA'S criteria. The Aeroallergen sensitization was based on skinprick test result relevant to house dust mite allergy. Inclusion criteria was The participants are children age less than 18 year old with asthma and house dust mite sensitization, proven by skin prick test and exclusion criteria was pediatric asthma patient with others sensitization.

Statistical analysis

In this study, severity of asthma was variable dependent and aeroallergen sensitization was variable independent. Data was taken from medical record of pediatric asthma patients. The participants were 221 asthma patients. Data were analysed with the SPSS (version 17.0) statistical programme packages. Summary statistics such as means, proportions and measures of dispersion were computed using standard parametric methods. Analysis of variance, and differences in proportions use the chi-square test.

RESULTS

From the 221 participant. The majority of the study population were man. There were 147 participant with allergent sensitization. Incidence of aeroinhalant sensitization in intermittent group was 81 participants meanwhile there were 66 participants in persistent group. There was no significant association between aeroallergen sensitization and the severity of asthma (P=0.233).

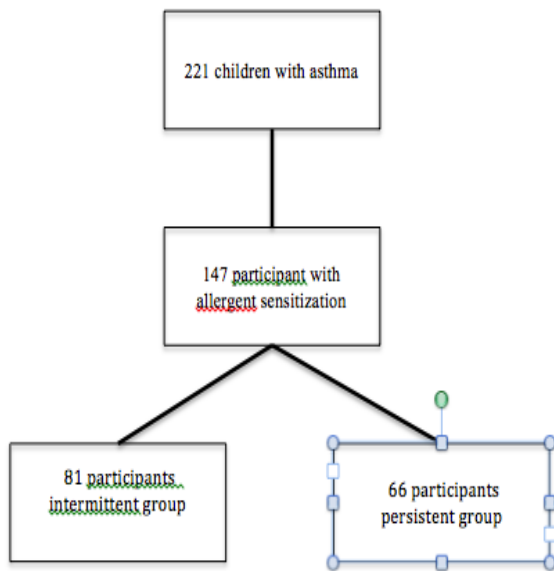


Table 4. Gender Frequency Distribution

| | Frequency | Percent |
|-------|-----------|---------|
| Boy | 146 | 66,1 |
| Girl | 75 | 33,9 |
| Total | 221 | 100 |

Table 2. Crosstabulation of Aeroallergen sensitization and severity asthma

| | No Aeroallergen sensitization | Aeroallergen sensitization |
|---------------------|-------------------------------|----------------------------|
| Intermittent asthma | 47 | 81 |
| Persistent asthma | 27 | 66 |
| Total | 74 | 147 |

DISCUSSIONS

The basis for an allergen’s role in asthma is that increased exposure can lead to sensitization and re-exposure to the allergens in a sensitized individual will increase the risk of asthma development and other allergic diseases. However, allergen avoidance or desensitization will improve symptoms.

The classification of severity is slightly modified in our study in comparison with the classification for patients on asthma treatment used in GINA guidelines. Using our classification, two-thirds of the patients had moderate or severe asthma.

In this study, incident of asthma is higher in boy participants. Based on the study, Until age 13–14 years, the incidence and prevalence of asthma are greater among boys than among girls. Studies through puberty have shown a greater incidence of asthma among adolescent and young adult females

and a greater proportion of males with remission of asthma. Before age 12, boys have more severe asthma than girls, with higher rates of admission to hospital. In contrast, adult females have more severe asthma than males, with more hospital admissions, slower improvement, longer hospital stays and higher rates of readmission. Most authors have attributed these changes in prevalence and severity to events of puberty, although mechanisms for differences between the sexes have not been established (Subbarao et al, 2009)

The Global Initiative for Asthma (GINA) recommends that cases of asthma be classified into four levels of clinical severity, based on symptom frequency (dyspnea with wheezing and/or cough) and pulmonary function (foerced expiratory volume in the first second, FEV1): intermittent and mild, moderate, or persistent asthma. Around 60% of cases are estimated to meet criteria for intermittent or mild persistent asthma, 25 to 30% as moderate asthma, and 5 to 10% are severe. Patients with severe asthma are a minority, but they account for the majority of utilization of health services, morbidity and mortality, and healthcare costs (Simoes et al, 2010).

Table 3. Symptom-based classification of asthma severity according to modified Global Initiative for Asthma (GINA) criteria

| | Symptoms |
|---------------------|---|
| Intermittent | 1-3 exacerbations over past 12 months Symptoms ≤ 1 time a week Waking at night < 2 times a month No limitation of activities |
| Mild Persistent | 4-12 exacerbations over past 12 months Symptoms several times a week, no more than 1 attack per day Waking at night ≥ 2 times a month Sometimes affects activities of daily living |
| Moderate persistent | >12 Daily symptoms, with occasional improvement exacerbations over past 12 months Waking at night 1–2 times a week ometimes affects activities of daily living |
| Severe persistent | >12 exacerbations over past 12 months Continuous symptoms (daily, no improvement) Waking at night > 2 times a week Always affects activities of daily living |

In this study, the severity of asthma was divided into 2 groups, based on GINA’S criteria : intermittent and persistent asthma. We were not divided the persistent criteria because the count of moderate

and severe persistent participant was less than 5 persons.

Sensitization to house dust mite was observed in 147 childrens from 221 participants in our study (66%). Similarly a study from Mysore in children and adults with allergic rhinitis and/or asthma found dust mite allergy in 65-70%. Sensitization to house dust mite has been incriminated in the development of asthma, and has been observed in over 50% children and adolescents. A whole population birth cohort study identified house dust mite as the most common allergen. Dust mite allergy has also been associated with increased asthma morbidity and severity. Platts-Mills et al reported that exposure to house dust mites is associated with development of bronchial asthma. There

is a threshold of HDM exposure to induce symptoms of asthma. Exposure to low levels of mite allergens (0.02- 2.0 µg/g dust) was found to be a significant risk factor for sensitization.

In our study sensitization to house dust mite was not associated with increasing severity of asthma. The results of our study because of others aeroallergen or others allergen like viral respiratory tract infections, exercise, non steroidal anti inflammatory drugs, GERD and psychosocial factors may trigger asthma exacerbation.

CONCLUSION

Asthma is one of the most common chronic diseases in childhood. There are variations in the prevalence and mortality of asthma. The basis for an allergen's role in asthma is that increased exposure can lead to sensitization and re-exposure to the allergens in a sensitized individual will increase the risk of asthma development and other allergic diseases. The classification of severity is slightly modified in our study in comparison with the classification for patients on asthma treatment used in GINA guidelines.

Sensitization to house dust mite has been incriminated in the development of asthma, and has been observed in over 50% children and adolescents. A whole population birth cohort study identified house dust mite as the most common allergen. Dust mite allergy has also been associated with increased asthma morbidity and severity.

In this cross sectional study, sensitization to house dust mite was not associated with increasing severity of asthma. The results of our study because of others aeroallergen or others allergen like viral respiratory tract infections, exercise, non steroidal anti inflammatory drugs, GERD and psychosocial factors may trigger asthma exacerbation.

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