Correlation between open burning habit and asthma symptoms in children

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Abstract. Asthma is a non-infectious disease which is commonly occurred in children and its prevalence highly varies in the world. It is known that ambient air in environment can worsen asthma. Generally, children prefer to play around their houses means that air quality around the household great influence on children health status, especially concerning in asthma. The method used in this research was cross-sectional. Data were collected from parents by filling out modified ISAAC questionnaire. Chi-square was applied as well to analyse the correlation of variables examined. This study was conducted in Surabaya, Indonesia, with 65 children around 6-7 years old as sample group. The result indicated that there was correlation between asthma symptoms in children and family history of asthma (P=0.024), and correlation between asthma symptoms and children with family history of asthma who lived with family or neighbour that actively doing open burning habit (P=0.036). The conclusion was open burning habit was potentially associated with asthma symptoms in children, without abandoning other external factors such as family history of asthma.

1. Introduction

Asthma is a chronic respiratory disease that affects about 235 million people. In 2015, around 383,000 people were suspected to have died from asthma [1]. Asthma also affects the population morbidity and mortality in both developed and developing countries. Asthma is more common occurred in children and the main cause of children being hospitalized which can burden family and poor folks economically [2].

Asthma is influenced by two main factors, genetic predisposition and environmental exposure. These two factors can complement each other to worsen the patient. The most influential environmental factor is air pollution which can trigger an allergic reaction or irritate the respiratory tract. Many researchers have identified a brief correlation between air exposure and asthma patients but the results were proven inconsistent. This inconsistency can be caused by different regions, pollution characteristics and vulnerability [3].

Open burning is the combustion of all types of combustible materials in open areas where smoke and emissions are released directly into ambient air [4]. In Indonesia, this habit is still widely practiced. In fact, open burning can affect human negatively if the smoke enters respiratory tract. Pollutants in ambient air can cause asthma, respiratory disease, nervous system damage, kidney damage as well as liver malfunction [5]. Children, parents, pregnant woman and people with heart disease and asthma are highly at risk of being exposed to open burning.
Air pollution can trigger an allergic reaction and irritate the respiratory tract. There is still no coherent knowledge about the type of pollutants and particles that can lead to asthma [6]. This study aimed to analyze correlation between open burning habit and asthma symptoms in children.

2. Methods
This study was conducted from July to August 2015 in Surabaya, Indonesia using 65 children aged between 6-7 years old as a research sample, consisting of 41.54% females and 58.46% males. Data was collected by filling ISAAC (International Study of Asthma and Allergies in Childhood) modified questionnaire based on parents’ assessment about the characteristics, behaviour and health of their children, and was analyzed afterwards. This research used cross-sectional method.

Data were analyzed using chi-square test to identify correlation between independent variable and dependent variable. Independent variable consists of open burning habit that was carried out by family and neighbours. As for dependent variable were asthma symptoms which were wheezing and night coughing in the last 12 months.

This research had passed ethical clearance test held by public health faculty of Airlangga University, Surabaya. The sample group had received a brief explanation. Furthermore, parents also signed informed consents to clarify that they were willing to participate in this research.

3. Results and discussion
65 children were sampled in this study. Twenty-seven (41.54%) were women and the rest (58.46%) were men. The results from the questionnaire can be seen in Table 1.

Table 1. Open burning habit from family and neighbour, history of asthma

| No | Variable                        | n  | %    | n  | %    | Total |
|----|---------------------------------|----|------|----|------|-------|
| 1  | Family open burning habit       | 27 | 41.54| 38 | 58.46| 65 (100%) |
| 2  | Neighbour open burning habit    | 27 | 41.54| 38 | 58.46| 65 (100%) |
| 3  | Family asthma history           | 8  | 12.31| 57 | 87.69| 65 (100%) |
| 4  | Asthma symptom                  | 17 | 26.15| 48 | 73.85| 65 (100%) |

41.54% of sample group indicate the number of children who had family or neighbour with open burning habit. 12.31% of children had family asthma history and 26.15% experienced symptoms of asthma. Asthma symptoms in this study were based on the ISAAC questionnaire, which consisted of wheezing and coughing in the last 12 months. The result showed that 3 children (4.61%) experienced wheezing and 17 children (26.15%) had a night cough. All children who experienced wheezing were coughing as well at night during the last 12 months’ time periods.

Table 2. Crosstabulation of family with open burning habit and asthma symptoms.

|                        | Asthma Symptom | Total |
|------------------------|----------------|-------|
|                        | Yes | No  |     |
| Open burning habit     |     |     |     |
| Yes                    | 7   | 20  | 27  |
| No                     | 10  | 28  | 38  |
| Total                  | 17  | 48  | 65  |

P=1.000
Table 3. Crosstabulation of neighbour open burning habit

| Neighbour burning habit | Yes | No | Total |
|-------------------------|-----|----|-------|
| Yes                     | 12  | 15 | 27    |
| No                      | 5   | 33 | 38    |
| Total                   | 17  | 48 | 65    |

P=0.011

Table 2 showed that there was no correlation between open burning habit in family and asthma symptoms in children. Meanwhile, Table 3 showed that there was a correlation between open burning habits in neighbours with asthma symptoms in children. This was highly intriguing since families usually throw their household trash next to the house thus it would not affect them but result indicated that open burning habit, which was carried out by neighbours, was associated with asthma symptoms in children. Although there were several external factors which acted as modifying factors. According to Manggali in 2015, these factors were:

1. Direction and strength of wind: the direction and strength of the wind can help deliver smoke to children.
2. Location and extent of ventilation: Ventilation is the main entrance for the smoke to enter the house.
3. Open burning frequency: The risk of children exposed by smoke is getting higher in each increasing frequency of open burning activity.
4. Open burning time: Burning trash when children are around can lead to a high risk of children being exposed to smoke.
5. Type of burnt trash: More types of waste equals more danger.
6. The distance of the open burning place from house: the closer combustion occurred, the higher its exposure to children.
7. Children immunity level: every child has a different level of immunity. High level of immunity to combustion smoke will reduce the risk of asthma in children.

The main mechanism for air pollutants triggered asthma was oxidation of the respiratory tract which could cause inflammation and an increased risk of sensitivity. Furthermore, the difference in external conditions such as environment and weather could also lead to different effects [7].

Table 4. Crosstabulation of family or neighbour habit of open burning with asthma symptoms in children.

| Family or neighbour doing open burning | Yes | No | Total |
|---------------------------------------|-----|----|-------|
| Yes                                   | 13  | 25 | 38    |
| No                                    | 4   | 23 | 27    |
| Total                                 | 17  | 48 | 65    |

P=0.142

Table 4 showed that there was no correlation between smoke from open burning practiced by family or neighbour with asthma symptoms in children (0.142). 11 children with the family habit of open burning, 11 children with neighbour habit and the rest of 16 children with open burning habit of family and neighbour.
Table 5. Crosstabulation of family asthma history and asthma symptoms

| Family asthma history | Asthma Symptoms | Total |
|-----------------------|----------------|-------|
| Yes                   | 5              | 8     |
| No                    | 12             | 57    |
| Total                 | 17             | 65    |

Based on the analysis, it was known that asthma symptoms in children had a correlation with a family history of asthma. The result of this study supported previous researches which showed that parents with asthma had 30% chance of passing down asthma to their children. If both parents had asthma, the transmission rate increased to 50% [8]

Table 6. Crosstabulation of children with a family history of asthma who had family or neighbour practising open burning activity, and asthma symptoms

| children with family history of asthma who had family or neighbour practising open burning activity | Asthma Symptoms | Total |
|-----------------------------------------------------------------------------------------------|----------------|-------|
| Yes                                                                                          | 4              | 6     |
| No                                                                                           | 13             | 57    |
| Total                                                                                         | 17             | 65    |

Chi-square analysis in Table 6 was conducted to identify whether there was a correlation between children with family history of asthma who had family or neighbour practising open burning activity, with asthma symptoms in children. It showed that there was a correlation between those variables. Thus, family history of asthma was a modifying factor that can change the association between family and neighbour habit of open burning with asthma symptoms in children, from previously holding no correlation to be related.

4. Conclusion
This research showed that there was no correlation between open burning activity conducted by family or neighbour and asthma symptoms in children. The said symptoms were wheezing and coughing in the last 12 months. No correlation was due to some other external factors, which were the direction of wind during the burning process and family history of asthma. The result showed that family asthma history was a modifying factor for the correlation between family or neighbour habit of open burning and asthma symptoms in children, which was initially not related to associated.
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