

# Risk Factors for Pneumonia in Children

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## ABSTRACT

Pneumonia has been known to be the leading cause of death in children under five years old. Children are a vulnerable group so pneumonia is a serious problem that needs to be addressed. Pneumonia is a disease that can be prevented and treated. Prevention of pneumonia can be done by knowing several risk factors that influence the incidence of pneumonia in children. Several risk factors have been known to be the cause of an individual's susceptibility to infection with pneumonia, including factors from the individual and the environment.

**Keywords:** [Pneumonia, Risk factor]

## INTRODUCTION

Pneumonia is a serious infectious disease in children and one of the acute respiratory infections (ARI) which is the biggest cause of death in children worldwide. Every year, pneumonia kills more than 2 million children under five in developing countries or it can be said that one in five children under five dies from pneumonia.[1] The United Nations International Children's Emergency Fund (UNICEF) declared pneumonia as "The Forgotten Killer of Children" or the most important child killer that is forgotten because there is so little attention given to this disease.[2] According to the Pneumonia & Diarrhea Progress Report 2018, Indonesia is also one of the 15 countries with the highest death rate due to pneumonia in the world in 2017.[3] Pneumonia is transmitted through droplets in the air when the patient coughs or sneezes and through objects that have been exposed

to respiratory tract secretions that are infected with the germs that cause pneumonia. In someone with a weak immune system, such as children aged less than 2 years, the elderly, and people with immunological disorders, the infection will occur more quickly.[4-5]

Children are individuals who are vulnerable and easily infected with disease because their organ systems are still developing so that cases of pneumonia in children need serious attention, both from the government and from the family circle. It is important to know the risk factors that affect the incidence of pneumonia so that prevention can be done to reduce the incidence of pneumonia in children. Risk factors for pneumonia can be divided into individual risk factors and external or environmental factors. This literature review aims to analyze the risk factors for pneumonia in children based on a review of several articles.

## RISK FACTORS

### Individual Factors

#### 1. Gender

In several studies on pneumonia sufferers, boys were found to be sufferers more than girls.[6-8] This is associated with boys who often play outside the home so that the risk of being infected with germs that cause pneumonia from the environment becomes higher. In general, the size of the respiratory tract for boys is also shorter than for girls which can increase the frequency of respiratory diseases in boys.[6]

## 2. Exclusive breastfeeding

Exclusive breastfeeding is the main food for babies and breast milk contains immune substances that can protect babies from infection. IgA and IgG antibodies found in breast milk play a role in maintaining the integrity of the respiratory tract mucosa so that they can protect the body from respiratory diseases.[1] Therefore, children who are exclusively breastfed are more resistant to germs that cause pneumonia, on the other hand children who are not exclusively breastfed have weaker immune systems. This is in line with several studies which state that there is a significant relationship between exclusive breastfeeding and the incidence of pneumonia in children.[6,8-10] Children who are not given exclusive breastfeeding are also said to be 2,1 times more likely to experience pneumonia than those who get exclusive breastfeeding.[10] In Fikri's (2017) study, it was found that children who did not receive exclusive breastfeeding had a 7,407 times the risk of getting pneumonia compared to those who received exclusive breastfeeding.[1]

## 3. Immunization History

Immunization can prevent some infectious diseases and reduce the spread of infection. Immunization stimulates the formation of specific antibodies in infants and the formation of memory cells so that they can protect against recurrent infections. Several studies have shown that children with incomplete immunization are more likely to suffer from pneumonia than children who are fully immunized.[7,9,11,12] Pneumonia is a disease that can be prevented by immunization and pneumonia which is the most common complication of measles can be prevented by immunization against measles.[9] DPT-HB-HIB combined immunization can protect children from *Haemophilus influenzae type B* bacterial infection which is also the germ that causes pneumonia in children.[7]

## 4. Nutritional status

Almost all defense mechanisms will deteriorate in a state of malnutrition.[9] Poor nutritional status results in decreased immunity against infection through impaired humoral immunity caused by decreased protein complement and decreased activity of white blood cells to kill germs. In addition, in children with malnutrition there is a decrease in the production and function of IgA in the mucous fluid of the airways, thereby reducing the defense of the respiratory organs.[7] In children who suffer from malnutrition, the respiratory muscles will also weaken so that they are susceptible to pneumonia.[11] Children with poor nutritional status are 9,1 times more at risk of suffering from pneumonia than children with good nutrition.[13] In another study, nutritional status was found to be associated with the incidence of pneumonia in children.[6,11,13]

## 5. Dosage of vitamin A

In several studies, giving vitamin A to children has a relationship with the incidence of pneumonia and children who are not given vitamin A have a 2,09 times the risk of developing pneumonia compared to those who are given vitamin A.[10,11] Vitamin A is described as an anti-infective vitamin because of its role in regulating human immune function.[11] Giving vitamin A to children can improve the immune system so that it can prevent infectious diseases. In children who are given a dose of vitamin A twice a year, it can prevent ARI by 50%.[10]

## 6. Underlying diseases

Children who have a history of asthma are found to have a 3,9 times chance of experiencing pneumonia compared to children who do not have a history of asthma.[14] In a literature study, several cardiopulmonary diseases, such as congenital heart disease, bronchopulmonary dysplasia and chronic lung disease, diabetes mellitus, cystic fibrosis, and asthma are also

mentioned as risk factors for pneumonia in children.[15]

### **Environmental Factors**

#### **1. Residential density**

The risk of a children being infected with pneumonia will increase if they live in a house with a dense occupancy rate. Children also inhale more air than adults during breathing and have more physical activity which will increase the need for ventilation.[16] Lung development that has not fully matured in children, which is supported by high exposure to infectious pathogens in the air, will increase the risk of children being infected with pneumonia. In addition, the spread of infectious diseases in the house with dense occupants will be faster. Children living in crowded house are said to be at risk of suffering from pneumonia by 2,94 times greater than children living in house with good residential density.[17]

#### **2. Smokers in the house**

Increased exposure to cigarette smoke in the home is a risk factor for respiratory problems in children which can indirectly cause a children's immune system to weaken.[1] When the immune system is weak, children will be susceptible to pathogenic infections that cause pneumonia. Not only that, children can get recurrent pneumonia which occurs due to exposure to toxins found in cigarette smoke, especially nicotine and free radicals.[7] In one study, children who were exposed to cigarette smoke had a 8,9 times the risk of developing pneumonia compared to those who were not exposed to cigarette smoke.[10] Other studies have also found that exposure to cigarette smoke is associated with the incidence of pneumonia in children.[7,10,12,17,18] In one meta-analysis study, the smoking behavior of family members has the highest risk as a cause of pneumonia in children.[1]

#### **3. House ventilation**

Children living in the house with poor ventilation have a 7,7 times chance of getting pneumonia compared to children living in the house with adequate ventilation.[14] This is because ventilation has a function as an exchange of air in the house so that dirty air can come out and clean air can enter the house. Children who spend more time at home will more often breathe dirty air if the house's ventilation does not meet standards, making them more susceptible to respiratory tract diseases. Not only as an exchange of air, ventilation also has a function as the entry of sunlight into the house.

#### **4. Pollution in the house**

Pollution that often occurs in the house includes CO<sub>2</sub> (carbon dioxide), NH<sub>3</sub> (ammonia), and H<sub>2</sub>S (hydrogen sulfide) which within a certain threshold can cause irritation of the respiratory tract.[7] The use of wood or charcoal as cooking fuel and the use of burnt mosquito repellents were also found to be significantly associated with the incidence of acute respiratory infections (ARI) in children.[18] In addition, using only cement or earth as a floor for a house can also increase the risk of ARI in children because during the dry season the floor will produce a lot of dust which can interfere the respiratory system.[18] House walls made of wood and woven bamboo also make it easier for dust to stick and children who live in the house with non-permanent walls are found to be more at risk of suffering from pneumonia.[19]

### **CONCLUSION**

Based on the results of the identification and review of several articles, several risk factors that influence the incidence of pneumonia in children come from intrinsic and extrinsic factors. By knowing the risk factors for pneumonia in children, it is hoped that pneumonia in children can be prevented so that it can reduce child mortality due to pneumonia.

**Declaration by Authors**

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