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# SECONDHAND SMOKE AS A TRIGGER FOR ASTHMA EXACERBATION

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## ABSTRACT

**Background**: Smoking is a major cause of death and chronic disease worldwide. In Indonesia, nearly 60% of adults are exposed to cigarette smoke, including secondhand smoke at work, home, and public places, which worsens asthma, especially in adolescents and children. **Aim**: To conduct a review by collecting results from studies on the effect of secondhand smoke as a trigger for asthma exacerbation. **Methods**: The study used a narrative review method, with journal searches through the electronic database, PubMed, using the keywords "Secondhand Smoke," "Asthma Risk Factors," and "Asthma". **Results**: Secondhand smoke has a negative impact on health, including asthma exacerbations. Exposure to secondhand smoke can occur at home, work, school, and public places. Another study stated that the percentage of asthma attacks due to secondhand smoke indoors was 14.1%, in cars 11.5% and outdoors and cars 19.6%. Also, secondhand smoke with the type of Heated Tobacco Product cigarettes is also a contributor to asthma attacks of 11% of the 39.5% incidence of asthma. **Conclusion**: Secondhand smoke can cause asthma exacerbations, which can occur at home, in the workplace, and in public spaces. **Suggestion:** Future studies should conduct systematic reviews or meta-analyses to strengthen conclusions on secondhand smoke and asthma. Research should also examine long-term effects, emerging tobacco products, and demographic factors to better understand asthma variability.

**Keywords**: Secondhand Smoke, Asthma Risk Factors, Asthma

## A. BACKGROUND

Globally, smoking causes death and causes diseases that arise due to smoking or as a trigger. According to the World Health Organization (WHO) in the WHO Global report on trends in prevalence of tobacco use 2000-2025, states that in 2019, more than 8 million people related to tobacco-related diseases died. This incidence will continue to increase even if tobacco use is reduced due to the residual use of tobacco and the like (Commar et al., 2021). Smokers in the continental United States are 34.3 million people and kill about 0.48 million Americans per year (Bhalerao et al., 2019). According to The Global Adult Tobacco Survey (GATS) as a standard for evaluating cigarette use in adults, that in Indonesia the use of tobacco or electronic cigarettes reaches 70.2 million people (for Disease Control, 2021). Interest in cigarette use is based on sensory perceptions of cigarette smoke, the dependence or addiction of tobacco flavors that increase the desire to smoke. For example, in menthol-flavored cigarettes that make people more willing to smoke related to taste and smell. At a milder and less irritating level of flavor when smoking, people use cigarettes with ventilation filters (Pennings et al., 2023).

Pollutants are classified into gaseous pollutants and Particulate Matter (PM). Gaseous pollutants include inorganic compounds, heavy metals, and Volatile Organic Compounds (VOCs), some of which are directly emitted, while others form through chemical reactions in the atmosphere. PM is one of the most harmful air pollutants affecting human health and serves as a key indicator of air quality. Traffic-related air pollution (TRAP), which contains high levels of PM, has particularly adverse effects on lung function (Tiotiu et al.,

2020). $PM_{10}$, with a diameter of 10 micrometers, can be inhaled into the lungs, posing significant respiratory risks. In addition, cigarette smoke contains toxic substances and particulate matter, which further contribute to air pollution and respiratory diseases. Cigarettes produce tobacco smoke containing 7000 chemicals among which there are 69 chemicals that are carcinogenic. Smokers are divided into active smokers, passive smokers or Secondhand Smoke (SHS) and exposure to residual cigarette smoke in the environment of smokers and / or someone who comes into contact with smokers or called Thirdhand Smoke (THS). Passive smokers or SHS are people who are not smokers but are directly exposed to cigarette smoke. SHS is the most important concern for public health. SHS can cause lung cancer and is a risk factor for asthma (Arfaeinia et al., 2023). An estimated 600,000 people are passive smokers out of 5 million people who smoke (Lima et al., 2020).

Passive smoking or SHS has a negative impact on adolescent health, especially in causing asthma exacerbations. Asthma is characterized by airway obstruction, bronchial hyperresponsiveness, and recurrent symptoms such as coughing and wheezing in response to cigarette smoke exposure. Asthma is the most important disease in cases that occur in the Emergency Department. A previous study stated that almost 30% of adolescents with asthma lived with smokers (Merianos et al., 2019). The results of exposure can exacerbate the incidence of damage to the respiratory system (Lima et al., 2020). From the report of The Global Adult Tobacco Survey (GATS), the use of secondhand smoke still reaches 44.8% of adults exposed to cigarette smoke in enclosed workplaces, 59.3% of adults exposed to cigarette smoke at home, and 74.2% exposed to cigarette smoke in public places (for Disease Control, 2021). This is a concern that needs to be considered in the health impact for passive smokers who are exposed and the occurrence of asthma exacerbations or worsening of asthma disease conditions.

## B. METHODS

The researcher reviewed this article using the narrative review method. The author searched for journals using the electronic database, PubMed. The search used the English keywords "Secondhand Smoke", "Asthma Risk Factors" and "Asthma". The selected reference sources are within the last 5 years. The results of the journal search on PubMed obtained 409 journals, then reviewed the publications, filtered based on journal duplication, selection of titles and abstracts and complete journals. So that 6 journals were obtained from the filtered publication results.

## C. ASTHMA DEFINITION

Asthma is a chronic airway disease generally characterized by variable expiratory airflow obstruction (Bellou et al., 2022). Asthma is a heterogeneous disease, usually characterized by chronic inflammation of the airways. It is defined by a history of respiratory symptoms, such as wheezing, shortness of breath, chest tightness, coughing, which vary over time and in intensity, together with variable expiratory airflow limitation (GINA, 2024).

## D. CLINICAL CHARACTERISTICS OF ASTHMA

The characteristics of asthma are related to its cause, here are some clinical characteristics of asthma (Kawamatawong et al., 2022) :

1. Asthma caused by allergies, this can be seen from the history of the family and the history of allergies from the patient. Sputum examination will show eosinophilic. Patients with a history of allergies may respond to corticosteroid therapy (Chung et al., 2022)
2. Non-allergic asthma, which is characterized by airway inflammation. Asthma without allergies usually responds to corticosteroids in the short term.
3. Adults who have asthmatic disease, commonly found in women and associated with work. Responding to high-dose corticosteroids.
4. Permanent airway obstruction, this may change the shape of the airway.
5. Obesity can cause asthma, due to airway inflammation.

## E. ASTHMA RISK FACTORS

There are several risk factors for asthma such as gender where males often occur in childhood, and females will occur in adulthood. Obesity based on socioeconomic status, in low-income socioeconomics with a percentage of 7.3% and middle and upper income socioeconomics which is 7.7%. Exposure to air in the outside environment as a factor of asthma. Asthma factors caused by air in enclosed spaces such as secondhand smoke, sweeping activities and allergies. Depression and anxiety can cause worsening of asthma. Diet can also be a risk factor for asthma (Wong et al., 2022).

## F. SECONDHAND SMOKE OUTCOMES IN ASTHMA EXACERBATIONS

In research Tiotiu et al., 2020, Seconhand Smoke (SHS) is very important for the development of asthma. There is a correlation between $PM_{10}$ exposure and maternal smoking habits with genetic factors that can contribute to asthma in children. Pregnant mothers who smoke can have an impact on children's asthma in the first year of life. Although the mechanism is unclear, epigenetics plays a role in asthma. Exposure to cigarette smoke from the father can have an unfavorable health impact, one of which is asthma. In research Lima et al., 2020, 2020) Smoking and exposure to cigarette smoke are frequently reported causes of severe asthma. The incidence of one third of asthma patients with mild or moderate and severe symptoms, exposure to cigarette smoke at home, work, school and or public places. The most common exposure to cigarette smoke was in public places, which was almost 72% for severe asthma. For mild or moderate asthma, the most common exposure was in public places which was almost 85%. In research Booalayan et al., 2020, There is an increase in asthma in adolescence due to exposure to cigarette smoke in the home environment. In Middle Eastern countries including Kuwait, the prevalence of exposure to cigarette smoke in the home environment was 54%. In research Satybaldiyeva et al., 2024, for school children with a history of asthma, they were exposed to cigarette smoke with results close to 13.5% and close to 20%, the incidence of exposure in closed rooms and car vehicles. In research Agache et al., 2024, exposure to environmental tobacco smoke can increase asthma exacerbation symptoms. In research Imura & Tabuchi, 2021, exposure to cigarette smoke in the form of Heated Tobacco Product can increase the incidence of asthma attacks by almost 11% from 39.5%.

## G. DISCUSSION

Secondhand smoke can cause asthma exacerbations in children (Wang et al., 2015) and in adolescents (Merianos et al., 2019). Asthma exacerbation is the worsening of asthma symptoms such as night cough and increased cough frequency, wheezing, shortness of breath and chest tightness (Patel et al., 2024). Research results from Tiotiu et al., 2020 and Agache et al., 2024 stated that there was an increase in the incidence of asthma exacerbations in children, adolescents and adults associated with Secondhand Smoke. This is assessed to be related to the content of cigarette smoke which can produce several dangerous gas and particle mixtures. Substances produced from cigarette smoke make the epithelium in the respiratory tract produce a lot of mucus, making lung clearance difficult, and making people with asthma more susceptible to respiratory infections (Hasina et al., 2022). In line with the above, research Lima et al., 2020and Booalayan et al., 2020 also reported that exposure to cigarette smoke has a significant effect on improving asthma disease and patient quality of life. Cigarette smoke exposure in asthma patients can occur at home, school, and public spaces. Cigarette smoke can cause severity for people with asthma (Chung et al., 2022). The presence of secondhand smoke (passive smoking) is one of the factors that contribute to the development of asthma (Bellou et al., 2022). Other results in the study Satybaldiyeva et al., 2024 stated that the percentage of asthma attacks due to

Secondhand smoke indoors was 14.1%, inside the car 11.5% and outside the room and car by 19.6%. Research (Imura & Tabuchi, 2021) also wrote that Secondhand Smoke with Heated Tobacco Product cigarettes also contributed to asthma attacks by 11% of the 39.5% asthma incidence rate.

## H. THERAPY

### 1. Pharmacological

The goal of asthma treatment is to control current symptoms and prevent future risk of recurrence. The principles of pharmacologic therapy in asthma are: asthma patients should be treated according to the severity of asthma; control and relief therapy is given to all asthma patients; low-dose inhaled corticosteroid-containing therapy is the main treatment to control asthma, if it is not effective with low-dose inhaled corticosteroids, the dose is increased or a long-acting B2 agonist, LABA, or leukotriene receptor antagonist is given; corticosteroids/LABA with formoterol content can be given as control and relief therapy in asthma; The dosage of controller and reliever medications in previously treated asthma patients should be adjusted upward within 1–3 months if asthma remains poorly controlled, Step-down therapy may be considered after achieving good asthma control for 3–6 months; and in patients with severe asthma that is not controlled despite high-dose corticosteroid and LABA therapy, it can be referred to a specialist (Kawamatawong et al., 2022).

### 2. Non-Pharmacological

Non-pharmacologic therapy for asthma is: Quit smoking, which is done every visit smokers must be given therapy so that smokers can stop. Exercise or exercise can be educated to asthma patients, the recommended exercise is swimming, running, cycling or Tai Chi. Breathing exercises are recommended in asthma patients with symptoms of dyspnea or shortness of breath or poor quality of life. Environmental control, weight reduction, vaccination, and bronchial thermoplasty (Kawamatawong et al., 2022).

## I. CONCLUSION

Asthma is a chronic airway disease generally characterized by variable expiratory airflow obstruction. Symptoms include wheezing, shortness of breath, coughing and other respiratory symptoms. One of the risk factors in asthma is exposure to cigarette smoke which can cause an increase in asthma symptoms. This can be seen from the studies analyzed by the author. Although these results are not significant enough to conclude the level of worsening of asthma exacerbations in cigarette smoke exposure due to the limitations of the journals analyzed. For the development of further writing, it is expected to summarize more information or meaningful research results to be analyzed.

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