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Asthma

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Asthma

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Introduction

Asthma is a condition that causes swelling of the airways and increased mucous production. Understanding the potential risk factors and how asthma develops can help decrease further incidence in our society. There is no cure for asthma.

- Approximately 25 million people worldwide have asthma (Centers for Disease Control and Prevention, 2020).
- 12 million people have experienced an asthma attack (CDC, 2020).
- Asthma is the leading cause of chronic illness in children (Asthma and Allergy Foundation of America, 2020)
- 1/10 children are diagnosed with asthma (CDC, 2020)
- Asthma is the 3rd leading cause for hospitalizations (AAFA, 2020)
- Annual economic cost of asthma is \$81.9 billion (AAFA, 2020)

Signs and Symptoms

Asthma is a chronic inflammatory disease that has symptoms of airway hyper-responsiveness, leading to intermittent, repeated periods of wheezing and difficulty breathing (Sullivan, et al., 2016)

- Wheezing
- Coughing
- Shortness of breath
- Chest Tightness
- Possible death from airway constriction (AAFA, 2020)

Pathophysiology

Underlying Pathophysiology

Incidence is caused by environmental and genetic factors. These factors cause inflammatory mechanisms in the airway leading to structural changes to the airway wall and airway epithelium (King, 2018).

- Persistent environmental exposures cause airway wall hypertrophy and hyperplasia to increase force generation due to airflow obstruction (King, 2018)
- Exposure to IL-13 induces mucous metaplasia and mucous hypersecretion (King, 2018).
- Inflammation causes thickening of the airways walls and increased mucosal glands, further increasing airway resistance (King, 2018)
- Increased tissue mass and altered composition alter airway wall mechanics and contribute to airway narrowing (King, 2018)
- Thickening of the airway wall decreases the elastic pull of the lung (King, 2018)

Immune System and Asthma

The immune system plays a large role in asthma

- Increased amounts of immunoglobulin IgE, allergic mediators from mast cells, and movement of eosinophils into the lungs cause airway inflammation (Toskala & Kennedy, 2015)
- Mast cells are activated when IgE antibodies attach to an allergen, releasing histamine (King, 2018)
- Triggers such as infection, aeroallergens, pollutants, drugs and physical stimuli can cause an immune response (Sullivan, et al., 2016).
- Allergens are environmental antigens and produce specific IgE antibodies (Froidure, 2015)
- Respiratory infections during childhood have shown to cause an increase in asthma (Benedictis & Attansi, 2016).
- Severe asthma is related to an interaction between inflammation caused by both the adaptive and innate immune system (King, 2018)

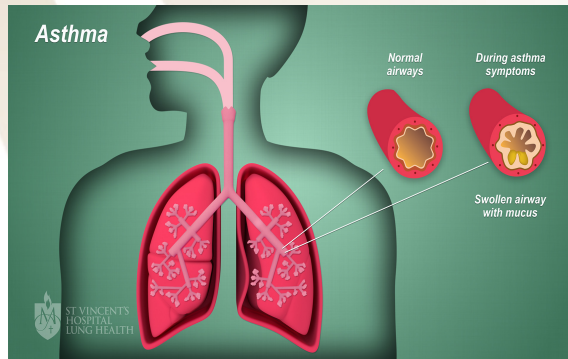


Figure A (St Vincent's Hospital, n.d.)

Significance

The immune system reacts against the environmental factors, which causes airway inflammation. Understanding the potential for asthma development from environmental factors is crucial for implementing preventative measures. The relationship between respiratory infections and environmental irritants creating an immune response and change of airway epithelium is a large factor in asthma occurrence (King, 2018).

Although asthma is usually recognized through the acute episodes of asthma attacks, including wheezing and sometimes irreversible declines in lung function, the understanding that asthma has an important immune system component is critical for the disease development (Toskala & Kennedy, 2015).

- Viral infections show an increased incidence of wheezing and onset of asthma (Benedictis & Attansi, 2016)
- Microbes in the airway can induce an immune response causing inflammation in asthma (Sullivan, 2016)
- Respiratory infections may induce reactivity of IgE which further perpetuates asthma (Froidure, 2015)

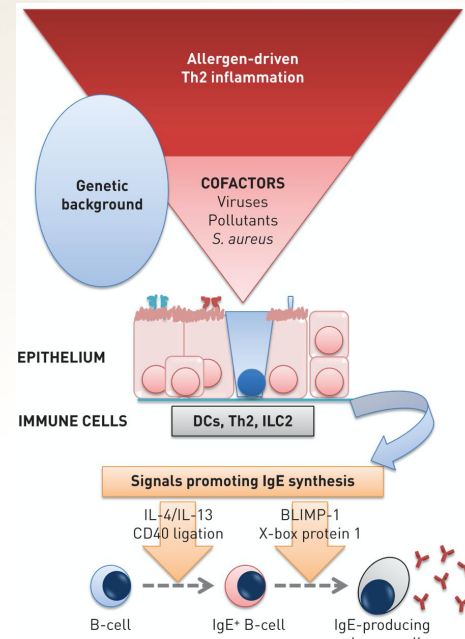


Figure B (Froidure, 2015)

Implications for Nursing Care

Prevention of risk factors is crucial for decreasing the development of asthma and reoccurrence of exacerbations. Asthma exacerbations from environmental stimuli are a major factor in the morbidity of asthma.

- Attention to the causes of asthma exacerbations is critical for prevention
- Respiratory tract infections, environmental allergens, pollutants and stress are the major factors (Benedictis & Attansi, 2016)
- Asthma incidence is increased with obesity and poor nutrition (Toskala & Kennedy, 2015)
- Much of the prevalence of asthma is linked to having specific allergies ((Toskala & Kennedy, 2015)
- A number of studies have shown a clear association between smoking and developing asthma (Toskala & Kennedy, 2015)
- Work environment exposures increase risk of asthma, and should be kept as a careful consideration in a patient with chronic cough, allergies, and asthma (Toskala & Kennedy, 2015)
- Reducing indoor and outdoor pollutants improve asthma symptoms (Toskala & Kennedy, 2015)
- The use of anti-inflammatory drugs and antibiotics can significantly alter lung microbiome. A change in the microbiome in the lung increases risk of asthma (Sullivan, et al., 2016).

Conclusions

The number of cases of asthma are growing each year, and there is a higher demand to provide quality treatment for those individuals to prevent complications. The understanding of the mechanisms for this disease process can help provide education of this growing disease and help identify potential triggers for specific individuals.

The relationship between the immune system and inflammatory mechanisms is still not well understood due to the many different reactions individuals with asthma have. The importance of quality research in the pathophysiology of this disease is crucial in decreasing the number of incidences. The different factors that cause an increased exacerbation of asthma is important for clinical practice due to the increased prevalence of this disease.

The relationship between both the immune system and the environmental factors that people are commonly exposed to potentially explains the relationship between the increased incidence of asthma. Infections and changes in the lung environment play a large role in the risk of development asthma.

References

