

## **LEVEL 5 ASSESSMENT SPECIFICATION**

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## **Introduction:**

Asthma is a highly widespread chronic lung disorder in numerous young adults and teenagers. It is caused by inflammation of the airways, blockage of air that comes by in waves and the lungs responding significantly with triggers. According to the Global Initiative against Asthma (GINA, 2023), asthma is a mixed disease, which typically entails inflammation in the lungs and a history of breathing symptoms including wheezing, dyspnea, chest tightness and cough that progress in the course of time and intensity. Asthma is present in the form of episodes, and this distinguishes it among other chronic lung diseases. This explains why we must understand the triggers of asthma in a person and the way the disease is modified. The adolescent period is a dangerous period for asthmatic individuals. Symptoms may change not only in puberty, but lifestyle changes, increasing independence, peer influence, and increased exposure to irritants may exacerbate asthma. According to Jackson et al. (2019), teenagers usually begin smoking, vaping, or attending significant events where they contract respiratory diseases, and all these can complicate the process of dealing with asthma.

The risk factors in asthma are numerous and include genetic factors, environment and behavior. One of the most promising hints is a family history of asthma or allergies, and being exposed to allergens, cigarette smoke, viruses and air pollution increases the likelihood of developing asthma (Papi et al., 2018). Vaping is a trend of concern lately, particularly among teens who believe that vaping is less harmful than smoking, despite research indicating that it damages airway inflammation and lung performance. The causes and consequences of asthma are further complicated by obesity, lack of exercise and stress, which demonstrates that asthma is a disease that resides in a complicated sequence consisting of body, mind and social determinants. Due to the existence of numerous risk factors that are preventable, education, early assistance and providing young individuals with clear facts regarding their lungs are crucial. In this report, the researcher will examine the mechanism of building the breathing system, the way we breathe, the way irritants ruin the lungs and the importance of having regular lung checks in asthma. We will also provide evidence-based lifestyle recommendations to assist the teens in enhancing the health of their lungs, as well as reducing the number of exacerbations.

## **Mechanical Respiration and the Structure of the Respiratory System**

The breathing system in human beings is a complex arrangement of organs that combine efforts to ensure the air flows and the exchange of gases. We tend to separate it into a higher part - the nose, nasal cavity, throat and voice box - and a lower part - the windpipe, main tubes, smaller tubes and lungs. According to Tortora and Derrickson (2017), the system is designed in a way that cleans, warms, and maintains the air at the appropriate temperature and then forces the air into the tiny lungs. Air enters through the nose, and it must pass through cells containing tiny hairs and mucus, which warm and filter this air before it reaches the throat and voice box to the windpipe. The windpipe is divided into right and left main tubes, which then further divide into even smaller tubes and many air sacs known as the alveoli and have short walls with numerous capillary networks surrounding them. Alveoli provides a massive area in which the gas can move, and their structure is vital to breathing well.

Physical movement that introduces air in the lungs and releases it is known as mechanical breathing, and it consists of two phases, which include the intake and the release of air. As one inhales, the diaphragm muscle is pulled down, and the outer chest muscles push the ribs up, resulting in a larger chest cavity and lowering the pressure in the chest cavity. This allows air to pass into the lungs due to the difference in pressure (West, 2012). As the person breathes out, the diaphragm loosens and the chest muscles return to their usual size and pressure increases, forcing the air out. Normal individuals normally breathe in through passive exhalation; however, in severe exercise or asthma attacks, additional muscles can assist. Asthma alters the normal breathing pattern due to inflammation, airway and mucus narrowing, which provide resistance and difficulty in breathing in and out. The constriction of airways during asthma entraps air, inflates the lungs, and complicates the breathing process, which is often scary to the teens who may not know the science behind the process.

## **Gas Exchange in the Lungs:**

The primary mode of oxygen uptake and the elimination of carbon dioxide in the body is through gas exchange. It occurs at the alveoli, where the air meets the blood at the alveolar-capillary interface. The flow of oxygen to the blood is not caused by the air

pressure being high in the alveoli. since the oxygen level in the air is higher than in the deoxygenated blood. The carbon dioxide the body produces as waste passes in the other direction as it is more in the blood, leaving the body to be expelled into the alveoli so that we can breathe out (West, 2012). The effectiveness of gas exchange is determined by the thinness of the membrane, the vast aggregate of the alveoli, good breathing, as well as good blood flow in the lung capillaries.

Asthma, Inflammation and mucus may block airways and restrict breathing of portions of the lung, which leads to the lack of conformity between blood flow and ventilation. This incompatibility reduces the efficiency of gaseous flow, resulting in reduced oxygen and increased carbon dioxide in a worse-case scenario. According to Fahy (2015), Type 2 pathways in asthma inflammation attract eosinophils, over-produce mucus, and destroy the airway lining. These alterations disrupt the usual environment of proper transfer of gases. The constriction of the airway aggravates the mismatch and results in low oxygen levels in case it is not promptly managed in the context of flare-ups. Information on the mechanism of gas exchange would make asthmatics understand why minimal inflammation can cause significant alteration to their breathing.

### **Irritation, Inflammation and their effects on breathing:**

When there is exposure to the irritants, a cascade of swelling and immune responses in the lungs begins and may worsen asthma. Cigarette smoke, smoking vapors, air pollution, cold air, fumes and viral infections are some of the irritants. Once these substances enter the breathing tract, they inflame the inner lining and activate immune cells releasing inflammatory chemicals including histamine, leukotrienes and cytokines. This makes the airways narrow, the blood vessels leak, and inflammatory cells enter the airways walls (Fahy, 2015). The enlargement of the lung tissue and the constriction of the airways complicate breathing, and therefore, the lungs have to strain more to push the air in and out. Teenagers are particularly vulnerable since their lungs are yet to develop fully. According to Hancox et al. (2015), both smoking and vaping may cause sustained irritation, impairment in lung functioning and a decrease in bronchodilator drug response.

One of the primary causes of asthma flare-ups is respiratory infections, which teenagers usually contract at school and in social settings. According to Mikhail et al. (2023), viruses like rhinovirus cause damage to the airway lining and make it sensitive to various factors, which further worsens the tightening of the airways that are already severe. More mucus and swelling, which block airflow, are also caused by infection. On dealing with irritants and infections at the same time, the symptoms of asthma become aggravated and the probability of a severe attack increase. Hence, asthmatics need to know the mechanisms of airway inflammation. Being aware of what causes their symptoms to occur can make them have an easier time coping and minimize the possibility of hospital treatment.

### **The Significance of Measuring and Monitoring Respiratory Functions:**

One of the essential components of self-management of asthma is monitoring breathing capability. Following the data allows individuals to monitor the development of their condition and take urgent actions. The speed at which air can be expelled in the lungs is measured as the peak expiratory flow (PEF) and indicates whether the airways are contracting. According to the National Asthma Education and Prevention Program (2020), peak flow is particularly beneficial in people with moderate to severe asthma since it can identify the onset of early worsening before it manifests. The early detection enables individuals to change their medication or behaviors, which include using a preventer inhaler more often or avoiding known triggers.

Trends are another way people can track data over time and identify triggers as well as evaluate the level of success in their plan. According to Schatz et al. (2014), a combination of the symptom notes with peak flow readings provides a complete picture of asthma control and offers doctors to make more appropriate decisions. The visualization of personal data by teenagers is especially beneficial as it makes them responsible and interested in their well-being. It is possible to record peak flow values, symptoms, and exposures using smartphone applications, written diaries or pre-developed action plans. The daily data also comes in handy on visiting the doctor, as it enables the health professionals to customize treatment based on objective numbers, instead of what the patient says. Also, measuring peak flow will provide teenagers with

confidence and awareness of early warning signs that could be addressed in the medical facility. This gives them the capability to control safely and with confidence, reducing the risk of emergency flare-ups.

### **Evidence-Based Lifestyle Advice for better Management of Asthma:**

A change in lifestyle contributes significantly towards having asthma under good control, particularly among teens who may engage in certain habits that deteriorate the condition.

The best thing to do is to quit smoking and be vaping. The literature indicates that tobacco smoke irritates the airways, causes more inflammation, and damages the operation of the lungs (Hancox et al., 2015). Generally, vaping is trendy among adolescents, yet e-cig vapors include minute particles, flavored chemicals and nicotine, all of which initiate airway swelling and reduce the well-being of breathing. Tobacco and vaping should be stopped to avoid exacerbation and protect lung function in the long term.

It is also important to reduce exposure to respiratory infections. Viruses usually enter teens in places of high density, such as school, clubs and other events. The diseases are strongly connected to asthma attacks as they affect the airway lining and increase sensitivity (Mikhail et al., 2023). Hand washing is good practice, avoiding sick people, maintaining up-to-date immunization, letting the body rest after infection, and all this reduces asthma attacks in relation to infections.

The other factor is physical activity. Although exercise may also cause asthma symptoms at times, routine moderate exercise strengthens breathing muscles, improves the health of the heart, and enhances the overall size of lung capacity. According to Cordova-Rivera et al., (2018), when pre-exercise medication and medical care are provided correctly, asthmatic patients can safely exercise and even become better at controlling in the long run. Alternatively, an inactive lifestyle may deteriorate the performance of the lungs and render the body less capable of responding to other precipitants.

It is important to maintain a healthy weight. More apparent symptoms of asthma and less effective reactions to inhaled steroids are associated with obesity. Forno and Celedón (2017) discovered that adolescents who lose excess weight can have better lung-related performance, reduce inflammation, and are more responsive to medications. Healthy eating and a balanced diet thus have a significant role to play in breathing well.

Finally, good control is based on adherence to asthma medication and proper utilization of the inhaler. Inhaled steroids not only decrease airway inflammation and prevent exacerbation, but also it is required that they should be used regularly and properly. The teaching and checking of inhaler technique will enhance outcomes and reduce unnecessary symptoms (GINA, 2023). The integration of drug compliance and healthcare lifestyle modifications will help to build a setting in which adolescents can manage asthma to the maximum.

### **Conclusion:**

Asthma is a chronic inflammatory condition that requires long-term treatment, particularly in adolescence, when the decisions in life and environmental exposure may lead to the escalation of the risk of flare-ups. Knowing the anatomy and physiology of the respiratory system helps people comprehend how gas exchange and mechanical respiration work, as well as how asthma flare-ups interfere with these processes. Irritants such as smoke, vape aerosols and viral infections trigger inflammatory responses that narrow the airways, restrict airflow and reduce the efficiency of gas exchange. People can identify early indicators of decline, assess triggers, and keep more control over their health by continuously monitoring respiratory data, including peak flow measurements. Adolescents can improve their respiratory health and prevent severe exacerbations by following evidence-based lifestyle recommendations, which include abstaining from smoking and vaping, limiting exposure to infections, exercising regularly, maintaining a healthy body weight, and taking prescription drugs as directed. People with asthma can improve long-term results, lessen the burden of their symptoms, and maintain a safe, efficient method of self-management through education, monitoring, and proactive lifestyle choices.

## **References**

- Cordova-Rivera et al. (2018). Physical activity and exercise capacity in severe asthma: key clinical associations. *Journal of Allergy and Clinical Immunology*.
- Fahy. (2015). Type 2 inflammation in asthma — present in most, absent in many. *Nature Reviews Immunology*.
- Forno and Celedón. (2017). The effect of obesity, weight gain, and weight loss on asthma'. *Annals of the American Thoracic Society*.
- GINA. (2023). Global Strategy for Asthma Management and Prevention. *Global Initiative for Asthma*.
- Hancox et al. (2015). The relationship between vaping, smoking and lung function in young adults. *The Lancet Respiratory Medicine*.
- Jackson et al. (2019). Role of viral infections in asthma exacerbations. *The Lancet*.
- Mikhail et al. (2023). Viral infections and exacerbations of asthma in children and adolescents. *Pediatric Pulmonology*.
- National Asthma Education and Prevention Program. (2020). Guidelines for the Diagnosis and Management of Asthma. U.S. *Department of Health and Human Services*.
- Papi et al. (2018). 'Asthma'. *The Lancet*.
- Schatz et al. (2014). Asthma control test and peak flow monitoring in asthma management. *Journal of Allergy and Clinical Immunology*.
- Tortora and Derrickson. (2017). Principles of Anatomy and Physiology. *15th edn. Wiley*.
- West. (2012). Respiratory Physiology: The Essentials. . *9th edn. Lippincott Williams & Wilkins*.