

## CONSEQUENCES OF E-CIGARETTE USE ON RESPIRATORY DISEASES IN ADOLESCENTS: A LITERATURE REVIEW

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## **INTRODUCTION**

The WHO (World Health Organization) declares smoking a serious global public health problem, being one of the main causes of preventable death in the world. In Brazil, about 220,000 people die each year due to tobacco use. In this scenario, electronic cigarettes (EC) emerged as nicotine substitutes (KNORST et al., 2014).

The electronic cigarette entered the market, initially as a therapeutic option to combat the use of traditional cigarettes based on tobacco, nicotine and other substances, with attractive designs and devices with different flavors to exhale flavored smoke without causing bad breath or spreading ash. The initial strategy of large companies was to appeal to young people, in many cases encouraging dual consumption, both of traditional cigarettes and electronic cigarettes (BARRADAS et al., 2021).

In addition to the more attractive appearance, the use of the device benefits from a variety of flavors, greater social acceptance than traditional cigarettes, the concept of helping to stop smoking, advertising and promotion that encourages use and sales on social networks, due to the lack of knowledge of their harms. Therefore, electronic cigarettes tend to attract adolescents and young adults due to their pleasant and variable aroma, as well as the ease of concealment (BARROS et al., 2021).

This way, the use of electronic cigarettes exposes the body to various chemical products, such as those added by the device itself (metallic nanoparticles), which are produced during heating or vaporization. Some products contained in electronic cigarette vapor include carcinogenic substances that can cause lung diseases (BARUFALDI et al., 2021).

Long-term use of e-cigarettes and tobacco cigarettes weakens the respiratory system and immune response, so smokers and e-cigarette

users are more susceptible to respiratory infections, including colds, flu, bacterial pneumonia, tuberculosis, and infections caused by COVID-19. In addition, sharing equipment is common among users of electronic cigarettes, an attitude that favors the spread of the disease through respiratory droplets (DE ALENCAR et al., 2022).

E-cigarette users must be educated on smoking cessation strategies. These recommendations can help patients quit smoking before further complications develop. Most patients require critical care interventions including: non-invasive positive airway pressure, inotropic compression, and intubation or mechanical ventilation. In addition, aggressive empiric corticosteroids, antimicrobials, and antiviral therapy have been shown to help treat this disorder and may be necessary in patients with severe disease.

Therefore, it is important to point out that the implications of using electronic cigarettes present a series of gaps that need to be elucidated in view of the use and the target audience. Thus, the present study aims to evaluate the consequences of electronic cigarette use in the development of respiratory diseases in adolescents.

## **THEORETICAL REFERENCE OPERATION OF THE ELECTRONIC CIGARETTE AND ITS COMPONENTS.**

One of the reasons that helped popularize the use of electronic cigarettes is related to its compact structure, in the form of capsules, similar to some USB devices. Thus, it is worth noting that the device has the following components: structural designs that differ, a reservoir or cartridge that stores the liquid, a coil or atomizer, made up of metallic elements, a battery that can be rechargeable or not, a sensor, inputs and air outlets and a liquid based on nicotine and other compounds for

its dilution (D'ALMEIDA, et al., 2020).

The vaporization of the liquid contained inside the reservoir happens due to the electrical conduction coming from the battery, which is activated by the sensor next to the coil. Thus, there is a loss of energy in the form of heat in the coil, which heats the liquid and promotes vaporization, which can be taken to the user's mouth by means of the air flow from the device. This way, the individual feels the effect of nicotine on the body according to the concentration contained in the liquid inside the device's reservoir (BARUFALDI, et al., 2021).

## **MAIN GROUPS SUSCEPTIBLE TO USE (STUDENTS/ADOLESCENTS).**

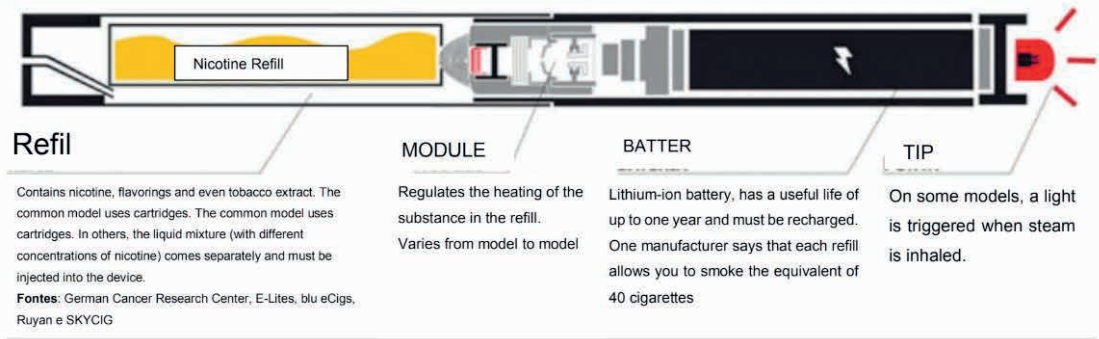
At first, the use of electronic cigarettes was well regarded, due to the idea that it would help reduce or stop the use of conventional cigarettes, leading users to a more technological and beneficial way. However, because the EC is built in a more modern and technological setting, it ends up drawing more attention from adolescents and adults, leaving these groups more susceptible to having their first contact with this form of smoking, to later switch to traditional cigarettes (BARRADAS, A. et al, 2021).

In the current scenario, electronic cigarette companies make incisive use of this modern context, selling the idea of smoking not only as a product that will last longer than the traditional cigarette, but also to offer the user a variety of flavors that disguise the taste of burnt tobacco, being more attractive to young people, mobilizing the millionaire market and making it even more difficult for the user to break free from addiction (VARELLA, D., 2020).

According to the report by Covitel (Telephone Survey of Risk Factors for Chronic Noncommunicable Diseases in Times of Pandemic) an estimate can be reached on the

## HOW IT WORKS

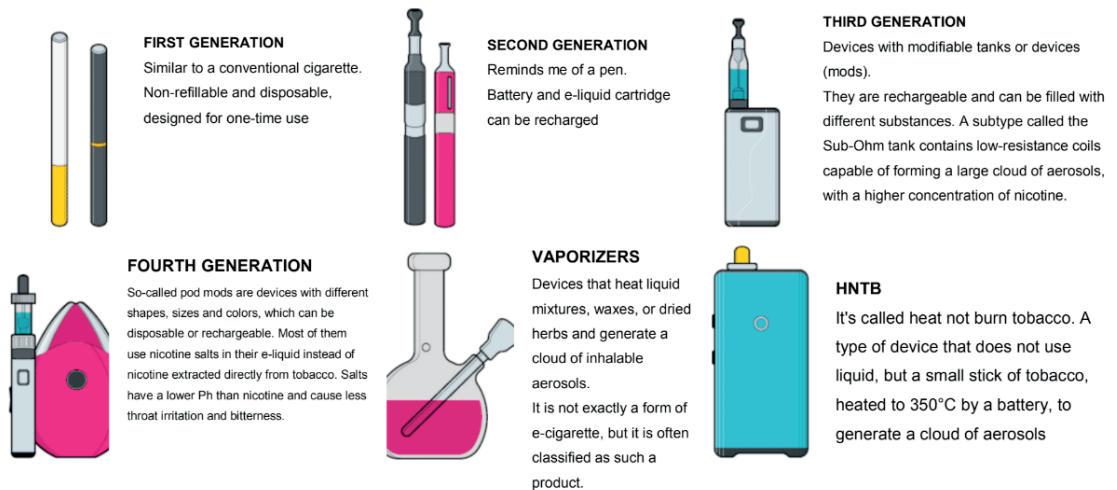
What it contains and how the device is realized; there are different brands and



**Figure 1:** Operation and components of the common electronic cigarette.

**Source:** German Cancer Research Center, E-Lites, blu and eCigs, and Ruyan and SKYCIG.

## THE DIFFERENT SHAPES OF DEVICES

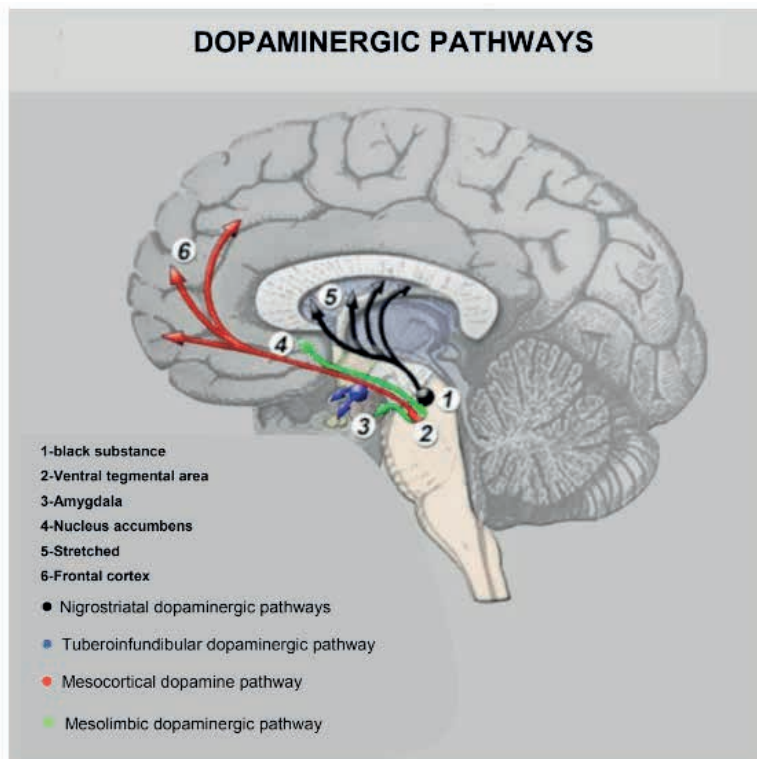


**Figure 2:** Different types of electronic cigarettes.

**Source:** United States Centers for Disease Control and Prevention (CDC)



**Figure 3:** The tobacco industry and youth-oriented technologies  
 Source: ACT - Health Promotion



**Figure 4:** Mesolimbic dopamine pathways.  
 Source: <http://i.imgur.com/fu8gx78.jpg>

use of electronic cigarettes. The data showed that 20% of young people aged 18 to 24 years use this electronic device, it was still possible to observe a higher prevalence among men in all age groups, being 10.1% in men, while in women this value reaches to be 4.8%, with the Midwest region having the most users (COVITEL, 2022).

## NICOTINE DEPENDENCE

As for conventional and electronic cigarettes, products with a nicotine-based mechanism, it is important to understand the main withdrawal symptoms. It is necessary to remember that these symptoms start between 24 and 48 hours, lasting about 4 weeks, which can be an aggravating factor in the process of getting rid of this addiction. Some of the main symptoms are: bradycardia, difficulty concentrating, increased appetite, headache, insomnia, irritability, restlessness, among others (REBOUÇAS, C., 2018)

There are also criteria that assess dependence on psychoactive substances, such as nicotine. Among them, the use of the product for a longer period than desired, attempts to cease use, spending time to obtain the substance, continuing to use the device even after knowing the physical and psychological harm they cause to the body (AMADERA, 2022).

Nicotine is classified as a psychoactive substance, stimulating the Central Nervous System (CNS), and may have two mechanisms of action, indirect and direct. In the indirect pathway, nicotine binds to the neurotransmitters of nicotinic acetylcholinergic receptors (nAChRs), promoting the release of the neurotransmitter glutamate, which has an excitatory function, which, in turn, promotes the release of dopamine in the Reward System. The direct pathway of nicotine acts by inhibiting the gamma-aminobutyric acid system (GABA),

which has an inhibitory function in the CNS, inactivating several systems, including the reward system. Therefore, by inhibiting the GABAergic system, there is a stimulating effect on the Mesolimbic System (VOIGT, L. et al., 2021).

Nicotine abstinence triggers emotional discomfort due to the decrease in the dopaminergic pathway, thus, in a scenario where you cannot have a cigarette, as in abstinence, the Limbic System activates the Reward System, which makes the body look for sources of easier dopamine, one of these mechanisms being the increased desire to eat foods rich in fats and sugars (Tobacco Control Alliance, 2021).

## PATHOPHYSIOLOGY OF LUNG INJURY CAUSED BY ELECTRONIC CIGARETTES

Studies on the causes of lung diseases triggered by the use of electronic cigarettes are still very recent. However, there are physiological mechanisms that facilitate airway homeostasis, such as mucociliary clearance, particle phagocytosis, pulmonary surfactants (FUENTES, 2019).

In the lung, there are some types of cells, such as pneumocytes I and II, alveolar macrophages, granulocytes, among others, responsible for airway immunity that establishes physiological functions that correspond to the contact of the aerosol that the electronic cigarette emits. Alveolar macrophages are responsible for the degradation of aspirated vapors, apoptotic cells and pathogens through phagocytosis, which decrease the inflammatory response of injured tissues. Therefore, this cleaning work done by macrophages is impaired when they are exposed to inhaled vapors, causing a phenotypic change (CHAND, 2020).

Therefore, it is important to understand the pathophysiology of some diseases that

## E-cigarette withdrawal symptoms:

- ⌘ Dizziness;
- ⌘ Headache;
- ⌘ Tremors
- ⌘ Irritability;
- ⌘ Difficulty concentrating;
- ⌘ Fissure
- ⌘ Sleep alteration;
- ⌘ Aggressiveness



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Figure 5: Cigarette withdrawal symptoms

Source: Ceará State Government

## Here's what happens if you stop smoking now:

- ⊗ **After 20 minutes**  
Blood pressure and pulse rate return to normal.
- ⊗ **After 2 hours**  
There is no more nicotine circulating in the blood.
- ⊗ **After 8 hours**  
The level of oxygen in the blood normalizes.
- ⊗ **After 12 to 24 hours**  
The lungs already work better.
- ⊗ **After 2 days**  
The smell already perceives the smells better and the palate already tastes the food better.
- ⊗ **After 3 weeks**  
Breathing becomes easier and circulation improves
- ⊗ **After 1 year**  
The risk of death from myocardial infarction is reduced by half.
- ⊗ **After 10 years**  
The risk of suffering a heart attack will be the same as that of people who have never smoked.

**The sooner you stop smoking, the lower your risk of getting sick.**

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Dr. Carlos Alberto Soares Gomes

GOVERNO DO ESTADO DO CEARÁ  
Secretaria de Saúde

Figure 6: Short- and long-term improvements from quitting smoking.

Source: Ceará State Government

have their condition worsened or the cause such as the e-cigarette.

### **PATHOPHYSIOLOGY OF EVALI**

From studies on the composition of CE materials, it was possible to observe the presence of toxic components such as tetrahydrocannabinol (THC) and vitamin E acetate, the former being a psychoactive substance derived from the plant of the Cannabis genus (BLOUNT, 2020). Vitamin E acetate, on the other hand, acts as a thickener and is related to the pathophysiology of EVALI, since its action prevents the physiological mechanisms of secretion of pulmonary surfactant, which has the function of increasing surface tension in the alveolar area, causing inflammatory processes and dyspnea (WINNICKA; SHENOY, 2020).

Microscopic studies have shown chemical substances contained in electronic cigarette vapor that cause biomolecular alterations, such as in nuclear DNA, increase in cytokines, inflammatory interleukins and loss of antioxidant substances. In addition, it is possible to find in its composition silica, flavorings and components that give flavor to the steam, such as benzaldehyde, propylene glycol and diacetyl, which initiate inflammatory processes and cause more serious lung injuries (WINNICKA; SHENOY, 2020).

### **PATHOPHYSIOLOGY OF PULMONARY EMPHYSEMA**

Pulmonary emphysema (PE) is characterized as a COPD condition. Its hallmark features are increased lung air space distally to the terminal bronchioles. (JUNIOR, R., 2019). In this pathology there is the development of a chronic inflammatory process in the airways and in the vascular system of the lungs. Therefore, there is an increase in several cells in the region:

macrophages, T lymphocytes, neutrophils, among others. (ROBBINS, COTRAN, 2016).

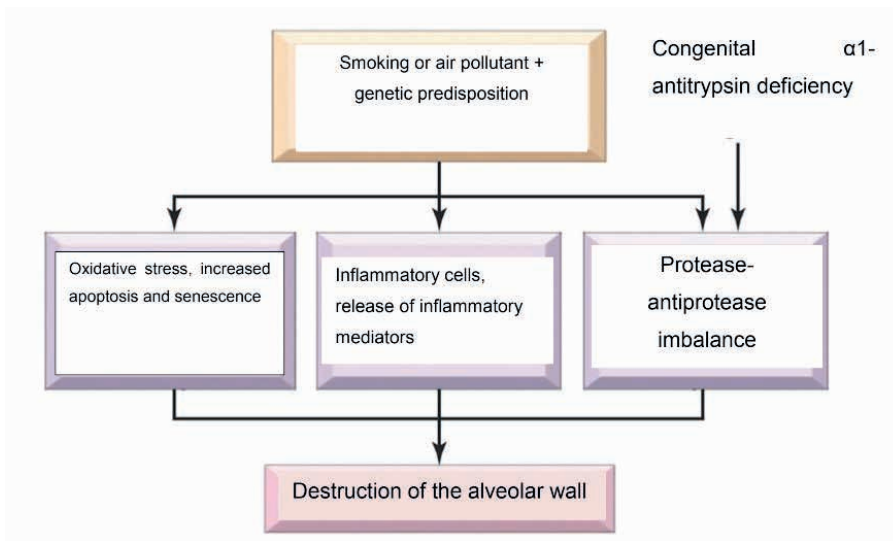
Furthermore, the exacerbated release of inflammatory mediators such as interleukins 8 (IL-8), tumor necrosis factor (TNF) and leukotriene B4 is notorious, causing serious damage to the walls of the vessels of the lungs, such as the alveolar walls. The most accepted assumption to try to justify the damage to the walls of the alveoli is precisely the protease-antiprotease mechanism, which is stimulated by the imbalance between oxidant and antioxidant substances in the body, which leads to the state of oxidative stress, which may be influenced by genetics or smoking. (ROBBINS, COTRAN, 2016).

### **PATHOPHYSIOLOGY OF ASTHMA**

Asthma is associated with a number of events in the body that can cause vasoconstriction, airway swelling and inflammation, airway hyperreactivity, and airway remodeling. (CIOBANU, A., et al., 2018). In this pathology, several cells, such as Th2, CD4 T lymphocytes, eosinophils, macrophages, mast cells and others, participate in the inflammatory process of the epithelium and smooth muscles of the airways, which can cause subepithelial fibrosis, smooth muscle hypertrophy or desquamation (RODRIGUES, 2021).

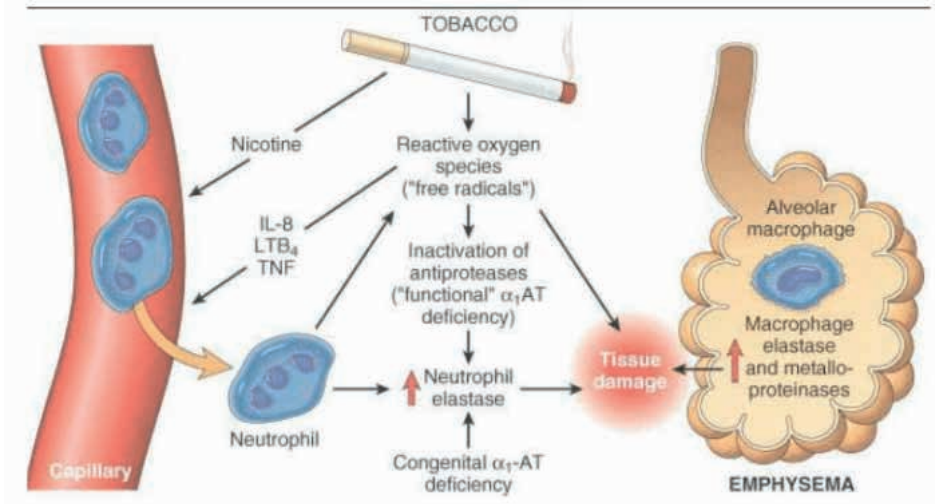
Bronchial asthma can be characterized by an inflammatory process in the high-caliber airways, promoting as a reaction mucus hypersecretion, smooth muscle spasms, edema, among others, which may cause airway blockage (BARBOSA, F., et al., 2021). Studies have shown that tobacco consumption is not safe for patients with bronchial asthma, and may lead to the worsening of this condition (SOCIEDADE BRASILEIRA DE PNEUMOLOGIA E TISIOLOGIA, 2019).





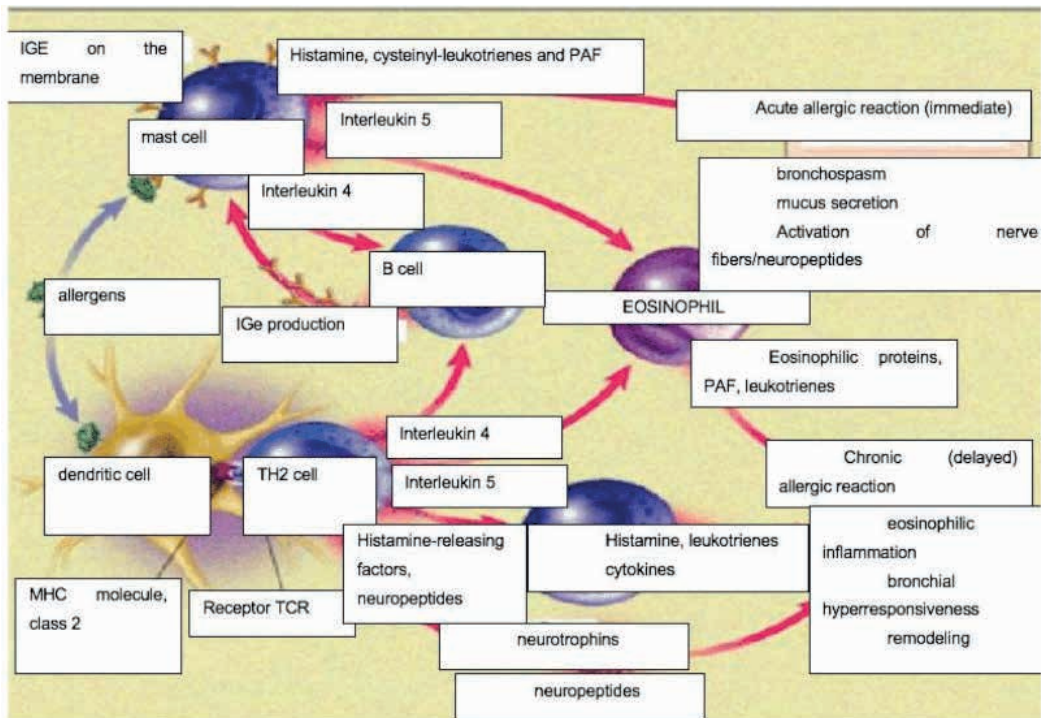
**Figure 7:** Relationship of Smoking, Air Pollutants and Genetic Predisposition and their pulmonary influences for the involvement of the alveolar wall.

**Source:** Robbins & Cotran - Pathology - Pathological Bases of Diseases



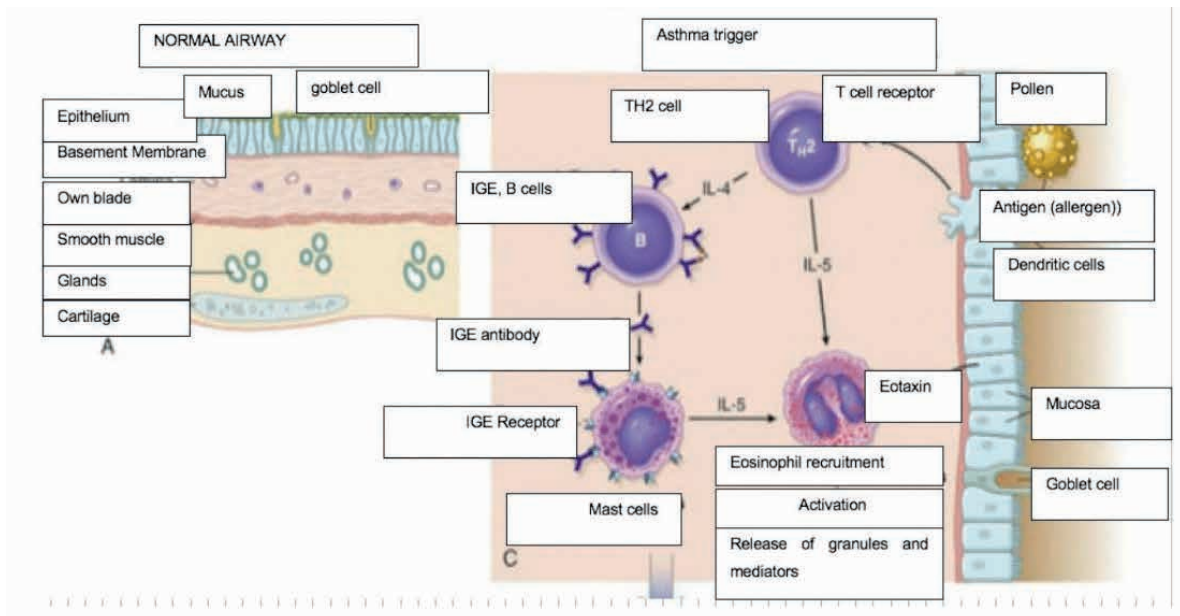
**Figure 8:** Pathogenesis of Emphysema

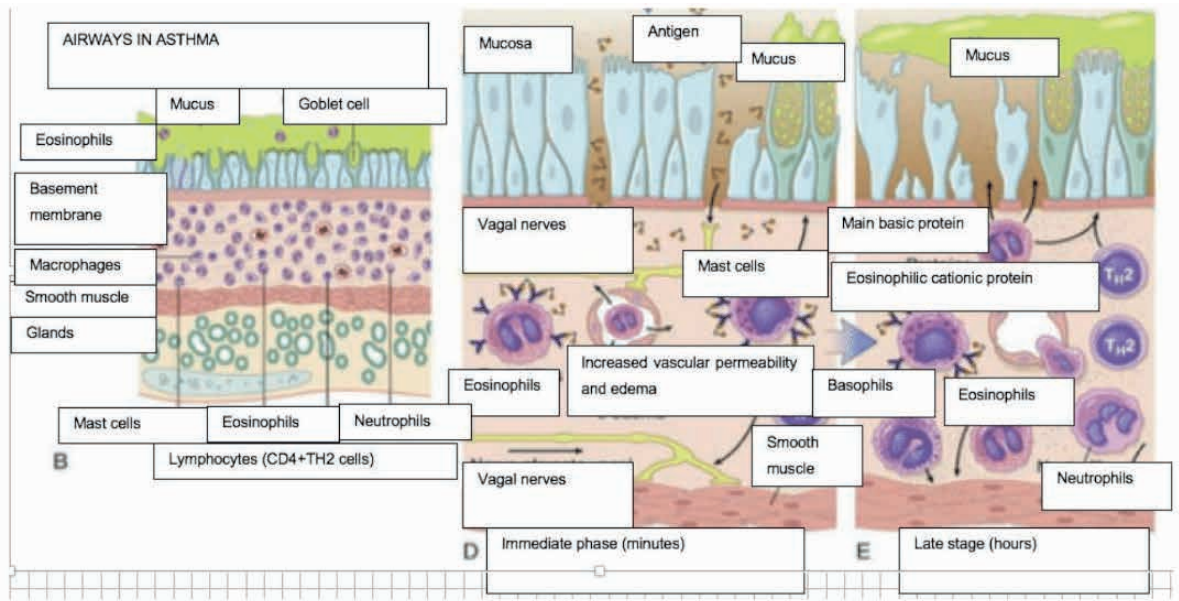
**Source:** Robbins & Cotran - Pathology - Pathological Bases of Diseases



**Figure 9:** Phases and cells of the IgE-mediated response

Source: New Eng J Med (adapted)





**Figure 10:** A and B, Comparison of a normal airway and an airway involved in asthma. The asthmatic airway is marked by the accumulation of mucus in the bronchial lumen followed by an increase in the number of mucus-secreting goblet cells and hypertrophy of the submucosal glands, intense chronic inflammation due to the recruitment of eosinophils, macrophages and other inflammatory cells, membrane thickening baseline and hypertrophy and hyperplasia of smooth muscle cells. C, Inhaled allergens (antigens) elicit a TH2-dominated response, favoring IgE production and eosinophil recruitment. Upon reexposure to antigen (Ag), the immediate reaction is triggered by Ag-induced cross-linking of IgE bound to mast cell Fc receptors. These cells release preformed mediators that induce bronchospasm directly or through neurons, increase vascular permeability, mucus production, and leukocyte recruitment. And, leukocytes recruited at this reaction site (neutrophils, eosinophils, and basophils; lymphocytes and monocytes) release additional mediators that initiate the late phase of asthma. Various factors released from eosinophils (eg, major basic protein, eosinophilic cationic protein) also damage the epithelium.

**Source:** Robbins & Cotran - Pathology - Pathological Bases of Diseases

## **PATHOPHYSIOLOGY OF LUNG CANCER**

First, in the year 2014, the number of cancer patients who tried e-cigarettes as an alternative to traditional tobacco increased from 10.6% to 38.5%. (BORDERUD, 2014). In addition, scientific evidence has shown the relationship between lung cancer and particles contained in the liquids used in electronic cigarettes, as these contain carcinogenic substances (RING, MADSEN et al., 2016).

Although the mechanisms by which e-cigarettes act on the loss of lung function are still poorly understood, there is scientific evidence that these devices are behind the increase in inflammation and airway resistance. (MCCONNELL et al., 2017; SCHWEITZER et al., 2017).

Thus, the use of EC can cause DNA damage and inhibition of mutation processes in lung cells, and this is a risk for the development of tumors in these organs, as well as the appearance of cancers. (MRAVEC, B., 2020).

## **DIAGNOSIS**

### **EVALI**

It is a lung disease caused by electronic devices composed of nicotine-based liquids, causing symptoms such as chest pain, cough, dyspnea, fever, among others, with the possibility of hypoxemic respiratory failure, focusing on the use of mechanical ventilation in cases very serious (LAYDEN et al., 2020).

Furthermore, studies agree that after applying exclusion criteria among possible etiologies, EVALI must be considered as a differential diagnosis in patients who have vaped in the last 90 days and have a suggestive physical examination, clinical history, and laboratory results. Therefore, many authors admit that no laboratory study can be considered diagnostic, however, several patients tend to present a decrease in the production of leukocytes, mainly neutrophils,

in addition to the continuous increase of elevated inflammatory markers such as Erythrocyte Sedimentation Rate (ESR), C-reactive protein (PCR) and Prolactin (AGOSTINI, L. V., et al., 2022).

In addition to the aforementioned results, other complementary exams are available for detailing the clinical case, such as x-ray, computed tomography of the chest, bronchoscopy with bronchoalveolar lavage, sputum sample culture, transbronchial biopsy, serological tests and blood culture (MUKHOPADHYAY, et al., 2020; CHERIAN, KUMAR, 2020).

That said, the most common clinical pattern found in this pathology is ground glass bilaterally in the lower lobes, in addition to the presence of subpleural opacities, with a reduced incidence of pleural effusions, diffuse and irregular consolidated opacities, ground glass in the upper lobe with air retention (MUKHOPADHYAY, et al., 2020; CHERIAN, KUMAR, 2020; XANTUS, 2020; BALMES, 2019).

In this bias, in biopsies performed in patients with EVALI, lesions such as diffuse alveolar damage, presence of lipoid pneumonia and fibrous pneumonia were observed, while in the cytopathological evaluation the presence of foamy macrophages and vacuolated pneumocytes was observed (CHERIAN; KUMAR; ESTRADA- Y-MARTIN, 2020).

### **ASTHMA**

The diagnosis of this pathology is clinical and can be made from the age of 2 years and, congruently with the treatment, follows the Global Initiative for Asthma (GINA) guidelines. In this diagnosis, it is objectively explained how the approach, classification and medical intervention must be carried out according to the risk classification and the etiology presented by each patient. From this perspective, to be able to diagnose asthma,

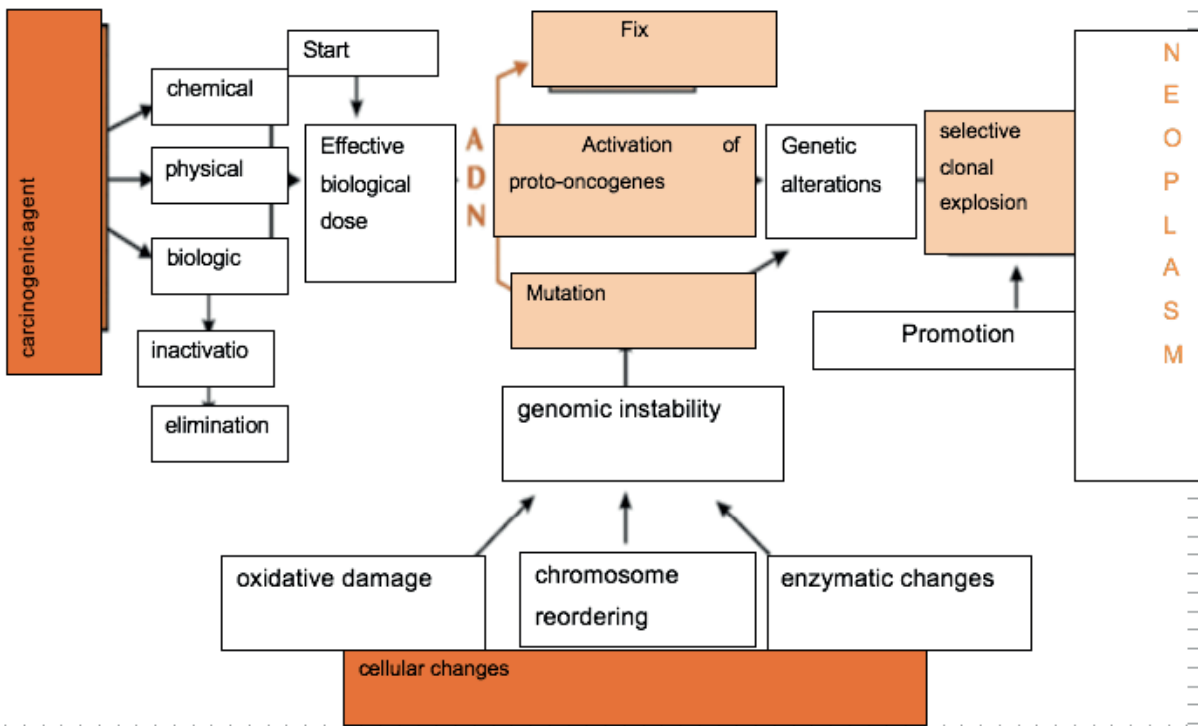


Figure 11: The stages of carcinogenesis.

Source: INCA

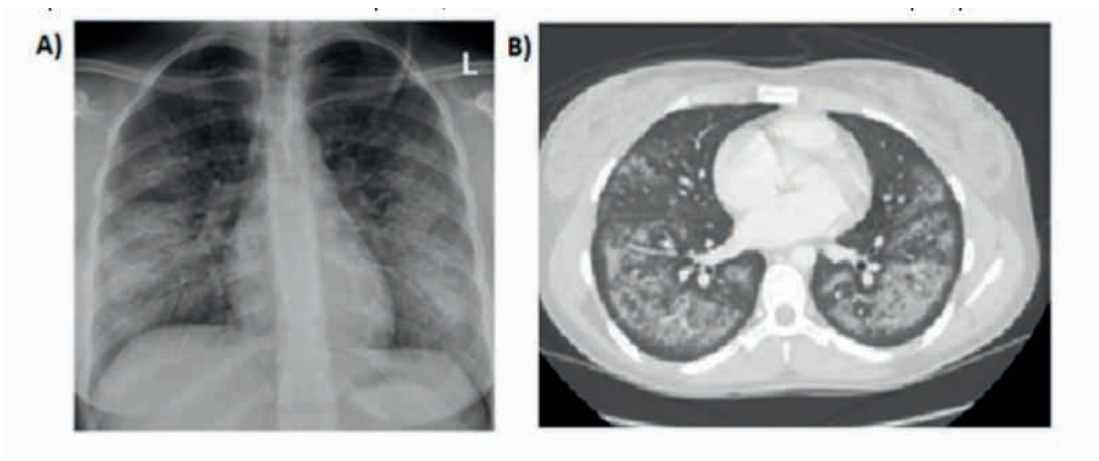
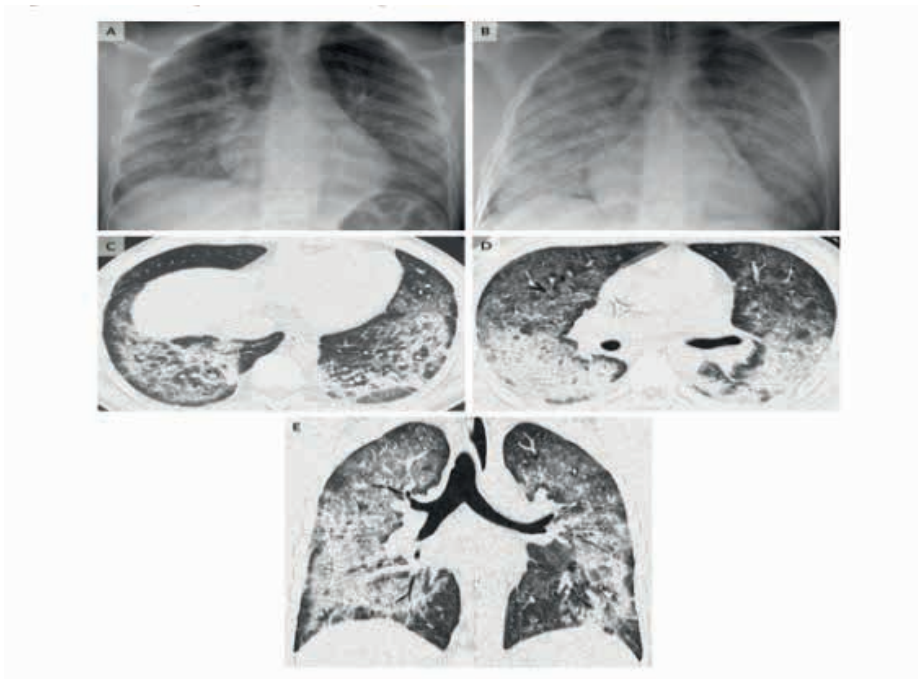


Figure 12: Chest X-rays showed ground-glass opacity, and consolidation was seen elsewhere. In CT scans, in addition to expressing this opacity with the same aspect, cases of subpleural sparing were also observed.

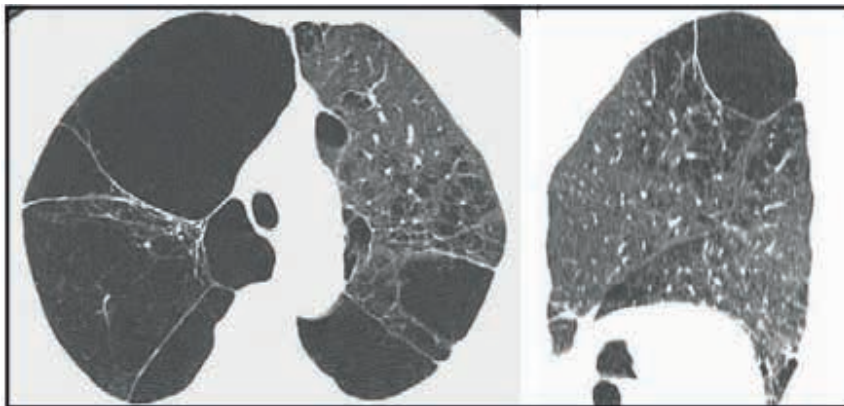
**Subtitle:** (A) It consists of an X-ray of an e-cigarette user, where in addition to the evident lung injury, it also shows the existence of lung opacity. (B) Tomography of continuous electronic cigarette user, which also demonstrates an opaque area in the lung.

Source: Modified from Cherian, Kumar and Estrada-Y-Martin (2020).



**Figure 13:** Radiological images of lesions caused by EVALI

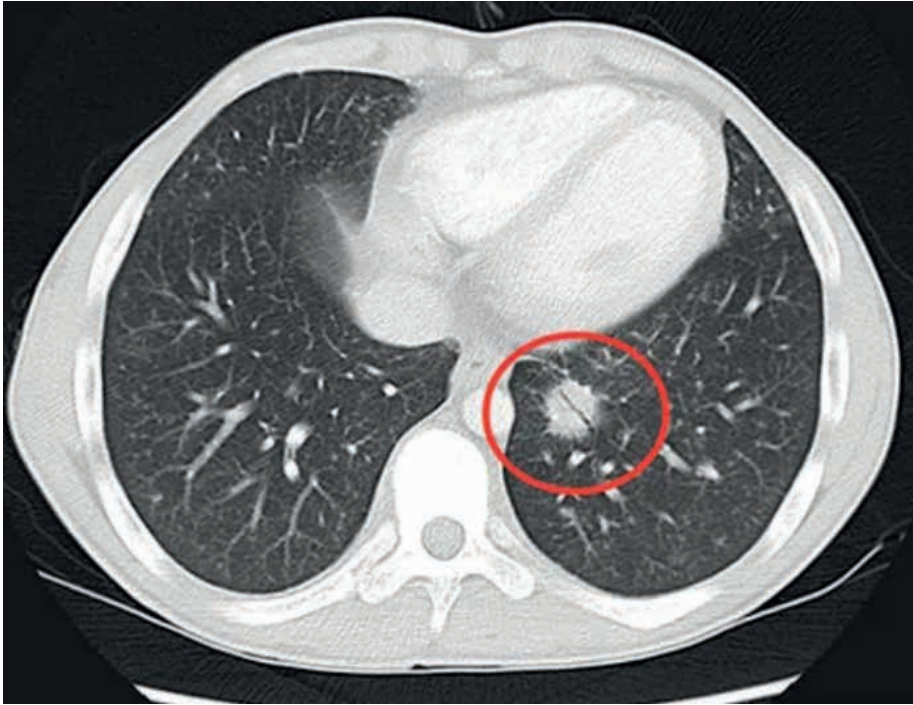
**Source:** Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Final Report 2020



**Figure 14:** Axial section in parenchyma window showing bullous and centroacinar emphysema (right).

Sagittal reformatting showing bullous emphysema at the lung apex associated with centrilobular emphysema (left). Centroacinar emphysema, shown in the image above, results from the destruction of the walls of the centroacinar alveoli associated with the dilation or destruction of the respiratory bronchioles, the most common form being associated with cigarette use, occurring predominantly at the apex of the lungs.

**Source:** Machado D., Camilo G., Noronha A. et al. Radiological diagnosis of COPD.



**Figure 15:** Diagnosis of lung cancer using computed tomography  
**Source:** Tesla - Diagnostic Imaging - 2019.

one must pay attention to the patient's clinical history and use spirometry, these clinical features being essential for the exclusion of other diseases that cause dyspnea or other similar symptomatology (BOULET L., et al., 2019).

In the medical follow-up, the presence of constant episodes of shortness of breath and wheezing is asked, if the patient has already used or is using an oral or inhaled bronchodilator to alleviate the symptoms of the condition, if there is continuous cough, with worsening in the period at night and at dawn, if the patient wakes up during the night with dyspnea or apnea. In addition, it is also possible to notice symptoms after exposure to mold, dust, cigarette smoke, perfumes, animals, among others, which may be caused by allergens (BRAZIL, 2022).

In order to obtain differentiated results in spirometry in asthma and COPD, it is important for the medical team to be attentive when performing and analyzing the test. When comparing changes in response to bronchodilators through spirometry in patients with asthma or COPD, international medical organizations are used to arrive at an accurate diagnosis. In asthma, there is an increase in the forced expiratory volume in the first second (FEV1) after the use of the bronchodilator device (MORSCH, 2018).

## **COPD**

The presentation of signs and symptoms such as cough, dyspnea, wheezing, expectoration may indicate the development of inflammatory processes, being a clinical condition that requires measures to arrive at an accurate diagnosis of COPD (VINIOL C, VOGELMEIER C., 2018). Regarding the diagnosis, spirometry must be performed to validate the hypothesis, demonstrating airway blockage that is seen by the FEV1/FVC function (forced expiratory volume in one

second/forced vital capacity), giving less than or equal to 0.7. (BRAZIL, 2019).

## **LUNG CANCER**

In Brazil, the diagnosis of lung cancer (LC) takes time, as patients only begin to show signs and symptoms in very advanced stages of the disease, and there are also no alternatives for lung cancer screening for the general population (BADE, D., 2020). Therefore, screening and early diagnosis of PC is extremely relevant, since the survival rate related to lung tumors and cancers is directly related to the time of diagnosis (MATHIAS, et al., 2020).

The diagnosis of this pathology is made through chest X-ray, which is considered an accessible and low-cost exam, however, there are other means of arriving at the diagnosis, which is through the use of computed tomography (CT), considered the best test to detect pulmonary nodules (GONG, et al., 2019).

## **TREATMENT**

### **EVALI**

As it is a current treatment, EVALI underwent clinical guidelines so that an appropriate treatment is necessary for the patient. In addition to discontinuing vaping, antimicrobial and antiviral treatment is required, which must be administered in accordance with microbiological guidelines and resistance standards for bacterial pneumonia. (JATLAOUI, M., et al., 2019).

In September 2019, a series of suspected cases of EVALI allowed authors to develop a clinical management of this issue. This treatment would be focused on the empirical administration of antibiotics, administration of systemic corticosteroids, starting with the use of 40 mg methylprednisolone every 8 hours, improving, switching to VO prednisone, reducing the dose over the next



two weeks (KALININSKIY, A, et al., 2019).

Studies point to the usefulness of corticotrophs in the treatment of EVALI, since with their use, certain patients who had the disease obtained a more expressive improvement than those who did not use corticotrophs. However, as this is a recent issue, caution is required, considering that there were patients who only withholding the use of vape also had an improvement in the disease (JATLAOUI, M. et al., 2019).

## **ASTHMA**

As for the treatment of bronchial asthma, studies were carried out on the drugs prescribed for the treatment of patients with this disease, and it was concluded that in the domestic market, the most used drug is the dry powder inhaler in capsule form, followed by Ellipta and Turbuhaler, following criteria such as their availability by the Unified Health System (SUS), as well as ease of use (CANÇADO, J., 2019).

Drugs with the active ingredient benralizumab, which began to be approved in 2018 by ANVISA, are now considered suitable for use in the additional treatment of severe eosinophilic asthma, in addition, inhaled corticosteroids are used together with this substance. Studies have shown that the active ingredient benralizumab reduces the number of eosinophils in the blood, which may improve breathing difficulties, however, this drug is not yet foreseen in the SUS (OLIVEIRA, F., 2019).

## **COPD**

In the drug treatment of chronic obstructive pulmonary disease, inhaled bronchodilators are used, which are effective in symptomatic patients, and these drugs are used only when symptoms occur. In critically ill patients, one or two different medications must be used to improve lung function and increase exercise

capacity (WISE, 2020).

On the other hand, there are non-drug treatments for COPD, which mainly consist of identifying and reducing the patient's exposure to risk factors, but also assessing their nutritional and musculoskeletal status and whether they are physically active (BRASIL, 2013).

Patients with pulmonary emphysema can benefit from pharmacological clinical treatment, smoking cessation and pulmonary rehabilitation to improve their quality of life. However, these treatments do not stop the disease from progressing. When the condition reaches its terminal stage, lung transplantation and lung volume reduction surgery (LPRS) remain the only treatment alternatives to improve breathing capacity and increase the patient's chances of survival. (BRANDÃO D, 2014).

However, the main reason reduction surgery is not recommended is the very high mortality rate associated with this procedure. This way, the same results can be achieved with Endoscopic Volume Reduction (ERV). The technique is based on the principle of reducing the residual volume and improving the mechanics of the respiratory system, introducing valves or blockers in the bronchi of each segment to be treated (BRANDÃO D, 2014).

## **LUNG CANCER**

Before determining the course of action, it is essential that the physician understands the type and classification of the tumor that affects the patient. For resectable and resectable non-small cell lung cancer (NSCLC) in stages I and II, surgery is the recommended treatment, providing better chances of survival. Those with unresectable stage II tumors require a combination of radiotherapy and surgery followed by chemotherapy. Treatment options for stage IIIA tumors require surgery

and then chemotherapy or chemotherapy followed by surgery. Sequential or combined chemoradiation treatments are recommended for those with unresectable tumors at this stage. Chemotherapy alone can be selected for stage IIIB and palliative external beam radiotherapy, combination chemotherapy, and targeted therapy for stage IV. Curative surgery is only considered for stage I cases (LEMJABBAR, et al., 2015).

## **PREVENTION**

To prevent respiratory diseases like EVALI, educating and guiding young people about the risks of using electronic cigarettes is essential. In addition to providing practical ways to stop smoking, studies suggest that e-cigarette users, young and old, must be counseled to taper off use gradually to avoid chronic disease. Specialized services, including therapy and psychology, are recommended for this group to help modify their behavioral patterns (JATLAOUI, M. D., et al., 2019).

Furthermore, despite including warnings and instructions on cigarette packages and in advertising campaigns aimed at instilling healthy habits and inducing fear, these efforts did not achieve the desired result among a specific group of smokers. Therefore, anti-vaping awareness campaigns must be tailored to suit your target audience. An advertisement that discourages electronic cigarettes for non-smokers has a different weight than one aimed at regular smokers (DIAS, et al., 2021).

## **CHALLENGES FACED IN ADOLESCENCE AND SUSCEPTIBILITY TO ALCOHOL, DRUGS AND ELECTRONIC CIGARETTES**

According to the World Health Organization (WHO), adolescence comprises the period from 10 to 19 years old, subdivided into phases, with 10 to 14 being the initial

phase and 15 to 19 being the final phase. Adolescence is a phase of human development of major metabolic changes, which can range from hormonal, emotional, physical, social and behavioral changes.

Adolescent health indicators may vary depending on the different characteristics of the sub-phases of this period of intense change. In early adolescence, the first changes identified are related to biological problems, that is, increased activity, physical growth and body composition, hormonal disruption and cognitive and sexual maturation. (Keating, 2004; Smetana et al., 2006).

With the development of these skills, adolescent health indicators must be mainly related to learning conditions and habits, hygiene, nutrition, physical activity and sleep. (Jenkins, 2007). Currently, these health practices are highly influenced by people's circumstances and the immediate health needs of adolescents rather than the possible consequences they may have in the long term. (Michaud, Chossis, & Suris, 2006).

Young people's sexual and reproductive health occupies an important place in public policy, as puberty is coming earlier and therefore sex is earlier, with pregnancy rates among girls aged 10-14 rising. Complications of pregnancy and childbirth are the leading cause of death for women in this age group worldwide. (Gonçalves & Garcia, 2007; UNICEF, 2011).

The use of alcohol and drugs is one of the main public health problems in Brazil because of the effects they have on users, leading to expenses and social ills for the Government (MALTA, D. C, et al., 2014). The last National School Health Survey (PeNSE) carried out in 2019, with students aged 13 to 17 years, showed that 63.3% of students had already tried alcoholic beverages, it also showed that 22.64% had already tried tobacco, in addition to 13.04% who tried other illicit

drugs, representing an increase compared to the results of the last survey, carried out in 2015 (Brazilian Institute of Geography and Statistics, 2021).

There are several reasons why adolescents start drinking alcohol and drugs at an early age, and may be linked to friendships, the place where the individual spends more time, it depends on the family factor, since many families can naturalize the use of some substances, school, in addition to the proximity of bars to student environments (NEVES. J. V. V., et al., 2021; PARK E. A., et al., 2022).

With regard to the family context, families that tend to have daily conflicts and that do not adequately supervise their children tend to have a higher prevalence of alcohol and drug use (SILVA S. Z., et al., 2021). In this sense, it is important to emphasize that it is at this stage of life that adolescents begin to develop their skills and discover themselves, in addition to starting to have an emotional evolution, becoming more mature (CRESWELL K. G., et al., 2022).

In view of the above, a survey carried out in 2018 by Oliveira et al, among university students, showed that the younger they are, the greater the chances of learning about electronic cigarettes, and this phase is justified by the phase of discoveries experienced by adolescents, with many vulnerable, being attracted by the new, which can be alcoholic beverages, drugs, conventional and electronic cigarettes, even in the face of knowledge about the risks and harm they can present to the organism (SILVA; PACHÚ, 2021).

## CONCLUSION

In view of the facts presented and studied, in a review of the most current literature, adolescents/young adults have a greater tendency to come into contact with electronic cigarettes. This fact presents itself in the face

of a change in life and the search for self-knowledge provided during this phase of life, which often, when faced with problems, these groups tend to flee the monotony in search of new sensations.

In this sense, when evaluating the consequences of using e-cigarettes on the appearance of respiratory diseases, it was possible to observe that this product brings a new form of smoking to the younger public, which, in view of all the technology presented by the electronic cigarette industry, has this habit ingrained in the population.

Today, it is known that “vape”, as it is popularly known, has harmful effects on users, which can cause the emergence of diseases such as EVALI, pulmonary emphysema, chronic obstructive pulmonary disease (COPD), lung cancer and even aggravate conditions asthmatics.

Therefore, it is important that young people, in particular, are aware of the harmful effects of e-cigarettes, so that there are no doubts about the risks to the respiratory system, both in the short and long term, so as not to be deceived by the electronic cigarette industry and new cultural habits.

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