EPIDEMIOLOGICAL ANALYSIS OF LUNG CANCER IN BRAZIL AS A FUNCTION OF THE INCREASE IN THE USE OF ELECTRONIC CIGARETTES IN THE YEARS 2017 TO 2022

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João Victor Barros Araújo[1], Guilherme de Moura Batz [2], Janaína Tavares Marins[3], Marlon Maia da Silva [4], Maycon Maia da Silva [5], Diogo dos Santos Rocha [6], Anelyse Soares Chagas[7], Pedro Henrique Menezes de Freitas[8], Luciano de Castro Resende Araújo Teixeira[9], Pitágoras Farah Magalhães Filho[10], Fabrício Ferreira da Silva[11], Thaís Arce Natividade[12].

ABSTRACT

Introduction: Lung cancer is the leading cause of cancer death in Brazil and the most lethal malignant tumor among men in the world. In recent years, the increase in the use of electronic cigarettes in the country has become a concern, as its relationship with the development of the disease has been increasingly evidenced. **Objective**: To define the epidemiological profile of lung cancer in Brazil in the context of increased use of electronic cigarettes. **Methods**: This is a retrospective horizontal epidemiological profile that uses data from datassus and INCA, using the parameters of temporality about the use of electronic cigarettes in the years 2014 to 2022.**Result**: In 2022, Brazil registered more than 62 thousand cases of lung cancer, with an increase compared to 2017.No same period, the use of electronic cigarettes among young people aged 15 to 24 grew 300% between 2015 3 2019, indicating a possible correlation. **Discussion:** The analysis of the data revealed a direct relationship between the increase in the use of electronic cigarettes among young people and the increase in hospitalizations for lung cancer. The most affected age group was 15 to 24 years, evidencing the impact of electronic cigarettes on the incidence of the

[1] Graduating in Medicine
UNIRG
[2] Graduating in Medicine
UNIRG
[3] Medical Student
Ceuma Empress
[4] Graduating in Medicine
UNIRG
[5] Graduating in Medicine
UNIRG
[6] Graduating in Medicine
UNIRG
[7] Medical Graduate
UNIFACS (Salvador University)
[8] Graduating in Medicine
UNIRG
[9] Graduating in Medicine
UNIRG
[10] Medical Graduate
UNIFACS (Salvador University)
[11] Graduating in Medicine
University of Gurupi (UNIRG)
[12] Medical Student
University of Gurupi (UNIRG)

disease. **Conclusion:** The study highlights the relationship between the increase in lung cancer and the use of electronic cigarettes, especially among young people aged 15 to 24 years, and seeks to encourage public policies and research for prevention and awareness of the risks.

Keywords: Neoplasm. Epidemiology. Brazil.

INTRODUCTION

Electronic cigarettes (e-cigarettes) are the most common type of a product category called electronic nicotine delivery systems. E-cigarettes are relatively new products designed to simulate smoking by heating a solution that typically includes nicotine, flavorings, and a delivery system such as propylene glycol or glycerin, or both. (Orellana - Barrios et al., 2015). These devices were created with the aim of helping to reduce or quit smoking, although there have been studies with conflicting results in this regard. (Dawkins et al., 2012).

An example of this is a study of smoking cancer patients referred to a smoking cessation program in which they reported that e-cigarette users were twice as likely to smoke at follow-up compared to non-users, after adjusting for nicotine dependence, attempts to quit, and cancer diagnosis. In this study, e-cigarette users were more dependent on nicotine. (Borderud et al., 2014).

In this line of reasoning, it is shown that the relationship between smoking and lung cancer is well documented, and the incidence is linked to the duration of exposure to smoke. The increase in the use of electronic cigarettes in recent years has contributed to this persistence. (Bhatta; Glantz, 2019). In general, DATASUS data show a consistent increase in lung cancer diagnoses, the leading cause of cancer mortality in men and women in Brazil. ("Electronic Cigarettes", [n.d.])

Another point to note is that e-cigarettes should not be seen as "safe", as they can cause acute lung diseases, atrial fibrillation and nicotine poisoning. (Orellana-Barrios et al., 2015)

In addition, the use of e-cigarettes by children is increasing in the U.S., but it remains much lower than the use of traditional tobacco products. Recent data notes that e-cigarette use by middle and middle school students has increased, and according to reports, more than a quarter of a million young people who have never smoked tried e-cigarettes by 2013. (Dutra; Glantz, 2014). These data also show that, during the same period, the use of traditional cigarettes decreased in these two groups. It seems that children and young adults are experimenting with e-cigarettes on an experimental basis, with no intention of replacing traditional cigarettes or initiating a pattern of regular use. College students often use e-cigarettes as a substitute for traditional cigarettes, either as a "safer alternative" or for experimentation. (Sutfin et al., 2013)

It is important to note that in mid to late 2019, vaping caused a new disease in the US that quickly reached epidemic levels, called EVALI. Thousands of e-cigarette users,

predominantly men aged 13 to 34, developed respiratory, gastrointestinal, and systemic symptoms after vaping (Smith et al., 2020). The outbreak was widely reported in the media. In the United States, 62% of all e-cigarette news articles published in 2019 mentioned "EVALI," and reporting peaked in September 2019 (East et al., 2022). Articles that mentioned the outbreak were often accompanied by warnings about the health harms caused by vaping, concerns about vaping among young people, and were less likely to mention that vaping is less risky than smoking (East et al., 2022).

More broadly, research and experimental studies have found that information about vaping in the media can change perceptions of vaping harms. Exposure to e-cigarette advertisements has been associated with reductions in the perceived harmfulness of vaping among youth and adults (Zheng et al., 2021).

In this line of reasoning, the Brazilian population that is affected by the use of electronic cigarettes depends on sources of information for the prevention of comorbidities caused by the devices. Therefore, it is recommended to improve health education, communication, and engagement through respected and trusted community members. Anti-vaping campaigns can never be seen as separate from political systems and power relations. (Silva ; Moreira, 2019)

In this context, e-cigarettes are a public health problem, especially in Brazil, due to the environmental and socioeconomic conditions of the country, thus justifying the development of studies dedicated to understanding the epidemiological profile as well as the development of new strategies to combat their use.

For all the above, the article aims to explore the particularities involving inequality in the effects of preventive care on comorbidities related to electronic cigarettes in Brazil, as well as to understand their epidemiology with a view to developing, in the future, new strategies to counteract their use.

METHODOLOGY

The present study is a retrospective, observational, and descriptive epidemiological analysis, evaluating cases of lung cancer in the geographic coverage of Brazil, in the period described between 2017 and 2022.

Annual data were searched for the Information System of the Outpatient Information System of the SUS (Sia/Sus), the Department of Information and Informatics of the SUS (DataSus), obtaining a table where the row was the federation unit, the column was the year, processing and the content was the total value. In addition, the database of the National Cancer Institute (INCA) was consulted. In aid of the theoretical foundation,

scientific articles in Portuguese were used, extracted from the Scielo, PubMed and Scopus platforms.

To better direct the research, the following clinical and diagnostic variables were considered for analysis: age group and total cases in the years 2014 to 2022, temporal and causal correlation in relation to the increase in the use of electronic cigarettes in the period analyzed.

In addition, the variable referring to temporality in relation to the pandemic was also considered, with the years 2014 to 2019 considered as pre-pandemic, 2020 and 2021 as pandemic and 2022 as post-pandemic.

RESULTS

Lung cancer is the malignant tumor with the highest mortality rate worldwide in men and the second in women. About 20% of cases are diagnosed in the early stages and most of the time the diagnosis occurs when the disease is already at a more advanced stage of development, which makes it difficult to treat the patient. (International Agency for Research on Cancer)

Electronic cigarettes have been pointed out by many studies as closely related to the increase in lung cancer rates in the last decade. In this context, Smoking is an important public health problem in the world and is considered by the World Health Organization (WHO, 2024) as one of the main preventable causes of death, in addition to the fact that electronic cigarettes have been gaining ground both because they are used predominantly by young people and by people who want to quit the habit of normal cigarettes.

An increase in the use of electronic cigarettes was observed between 2015 and 2019, from 0.45% to 0.72%, with the main age group of this increase being from 15 to 24 years old (0.92% to 2.38% in the period analyzed) representing an increase of about 300%. (Vigitel; 2019)

In this context, a survey by the Institute for Strategic Research and Consulting (IPEC, 2023), carried out only with Brazilians over 18 years old, showed a continuous trend of growth in smokers, going from 0.3% in 2018 to 1.8% in 2023.

Thus, the increase in the use of electronic cigarettes in the last decade may be closely related, both in the temporal and causal spectrum, in relation to electronic cigarettes, considering that a total of 62 thousand cases of lung cancer were registered in the periods from 2017 to 2022, with the south and southeast regions being the most affected in the period analyzed.

In parallel to this, in the period from 2015 to 2019, a 300% increase in the use of electronic cigarettes was analyzed, mainly in the 15-24 age group, while in relation to the age group that saw a greater increase in the period analyzed in terms of lung cancer cases, the 15 to 29 age group was analyzed, with almost a 30% increase from 2018 to 2022.

Regarding the other age groups analyzed, the most affected was the 50 years and over, followed by the age group from 30 to 49 as the second most affected and, finally, the age group from 15 to 29, and in this period there was an upward trend in the number of cases from 2017 to 2022, data that coincides with the increase in the use of electronic cigarettes in the same period, Especially taking into account that the largest percentage increase among the age groups analyzed was that of the age group from 15 to 29 years old, which saw an increase of almost 30% from 2018 to 2022, also being the age group that consumes the most electronic cigarettes.

The most affected sex was female, which had almost 55% compared to males, which had just over 45% of the total.

Analyzing the year 2019 (pre-pandemic) with the year 2020 and 2021 (pandemic), a decline in the number of cases was observed, with the year 2020 having the lowest number of cases with about 7,786 cases this year, but the year 2022 (post-pandemic) saw a relevant increase with 14,540 cases.

DISCUSSION

From the analysis of the data, it was possible to infer that there is a temporal and causal correlation between the significant increase in the number of electronic cigarette users and the increase in the number of lung cancer cases, especially in the age group of 15 to 24 years. In this sense, a study carried out by (Zheng et al., 2021) demonstrated that there is a close relationship between the media appeal of the use of electronic cigarettes and the damage caused by it in the population of young people and adults, thus highlighting the influence that the excessive use of electronic cigarettes has on population health.

Media plays a crucial role in the use of electronic devices, as shown by the company Vuse, which uses themes attractive to young people, such as creativity, innovation, individuality, arts, technology and alcohol. Vuse was the first e-cigarette brand to obtain marketing authorization from the FDA for its tobacco-flavored pods, highlighting the importance of government control over the use of these products. (Han et al., 2023)

From another perspective, it is relevant to mention the distribution by sex. The numbers reveal a significant disparity, with women presenting just over 1,000 cases diagnosed in the age group analyzed. It is notable that, throughout the entire period

evaluated, men never surpassed women in the number of diagnosed cases. In 2021, this difference reaches its peak, with 162 more cases diagnosed in women, thus showing that there was an inversion of the distribution of the sexes over time. ("Panel-Oncology - Brazil", [n.d.])

Another relevant aspect is the number of cases by geographical area. It is noted that the highest concentration is in the Southeast region, which represents 42.79% of the diagnoses in the period, surpassing the South region, in second place, by 17.86%. On the other hand, the North region has the lowest number of records, with 534 cases, which is equivalent to less than 5% of the total. ("Panel-Oncology - Brazil", [n.d.])

In view of the above, it can be seen that there is a higher number of diagnosed cases of lung cancer in the Southeast (5,081), which has 84.8 million inhabitants, which represents 41.8% of the country's population, which may be correlated with the fact that it is the most populous region in the country and the ease of access to the health system and diagnostic methods. (Datasus, 2024)

The increasing use of e-cigarettes has become a public health concern, especially in relation to the increasing incidence of lung cancer. Although studies on the direct correlation between e-cigarettes and lung cancer are not yet conclusive, there is initial evidence that the devices, which heat liquids containing nicotine and other chemical compounds, can generate potentially toxic substances when vaporized. This process can result in chemical reactions that cause damage to lung cells, favoring the development of neoplasms. The popularization of the use of electronic cigarettes, especially among young people, may be associated with the increase in cases of lung cancer in the younger age group, as observed in data on the disease in patients under 50 years of age. (Sahu et al, 2023)

In addition, the correlation between the use of e-cigarettes and lung cancer is complex and multifactorial, with factors such as exposure to carcinogenic agents, passive smoking, and even nicotine dependence often associated with the development of cancer. The lack of conclusive studies, however, does not allow a direct relationship between the use of electronic cigarettes and the increase in the incidence of the disease. (Bhatta; Glantz, 2019) However, the substantial increase in lung cancer cases in recent years, added to the increasing use of electronic smoking devices, suggests that these products may be another risk factor in the context of public health, especially among younger people. (Chaitanya Thandra et al., 2021). Controlling the use of these devices and raising awareness of their risks should be priorities in public health policies.

A positive point highlighted in this study is the increase in the number of exams performed in 2022, surpassing those of 2020. This growth reflects a greater awareness of

the population about the importance of prevention and health screening. This advance points to the urgent need for effective and personalized management in the control of the use of electronic cigarettes in Brazil, as a lung cancer prevention strategy.

CONCLUSION

The records of diagnosed cases of lung cancer in Brazil, as well as the increase in the use of electronic cigarettes in the same period, demonstrate a need for greater coverage by the public authorities, both from the point of view of raising awareness among the population and prophylaxis in relation to lifestyle habits that can corroborate the development of neoplasms.

In addition, it was possible to observe a relationship between the pandemic period and the registration in the number of cases where there was possibly underreporting in this period that contrasts with other timelines with an upward trend that was maintained in the post-pandemic period.

It is concluded that the possible notifiable aggravations of lung cancer in Brazil are directly linked to the increase in the use of electronic cigarettes in the same period. Therefore, it is essential to review public policies to combat this pathology to address the obstacles that prevent the development of good lifestyle habits avoiding other habits such as alcoholism and smoking , in addition to increasing the dissemination of information about the risks of using electronic cigarettes and how they can be closely linked to the development of malignant neoplasms such as lung cancer, The study in question can inspire future public policies aimed at raising awareness among young people about electronic cigarettes, as well as serve as a basis for other studies related to lung cancer and its aggravating factors.

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