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Dangerous Liaison Between Tobacco Smoking and Asthma

საშიში კავშირი თამბაქოს მოწევასა და ასთმას შორის

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Abstract

Introduction: The interaction between smoking and asthma leads to significant adverse effects on disease symptoms, progression, and treatment outcomes. Smoking worsens asthma by accelerating lung function decline, increasing symptom severity, and reducing treatment efficacy. This study investigates the biological mechanisms of treatment resistance and the harmful impact of smoking on asthma progression. The primary objectives are to understand how smoking exacerbates asthma symptoms, evaluate the challenges of managing asthma in smokers, and explore the implications of tobacco use on treatment resistance and long-term respiratory health. **Methodology:** A comprehensive literature review was conducted, analysing peer-reviewed studies on the relationship between smoking and asthma. **Results:** The findings revealed that smoking impairs airway function, induces chronic inflammation, and alters immune responses, leading to more frequent asthma exacerbations. Second-hand smoke was found to cause similar harmful effects, especially in children and non-smoking adults. Smokers with asthma showed reduced responsiveness to corticosteroids and bronchodilators, highlighting the need for alternative therapeutic strategies. **Discussion:** The study underscores the importance of integrating smoking cessation into asthma management plans. Early intervention, personalized therapies, and public health initiatives targeting smoking reduction can significantly improve patient outcomes. **Conclusion:** Smoking cessation is essential for effective asthma management and long-term respiratory health. A multidisciplinary approach combining medical, behavioural, and psychological interventions can reduce healthcare costs and promote a healthier, smoke-free lifestyle for individuals with asthma.

Keywords: Smoking, Asthma, Smoking cessation, Lung function decline, Chronic inflammation, Immune response alteration, Asthma exacerbations, Second-hand smoke

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აბსტრაქტი

შესავალი: თამბაქოს მოხმარებასა და ასთმას შორის ურთიერთქმედება მნიშვნელოვან უარყოფით გავლენას ახდენს დაავადების სიმპტომებზე, პროგრესირებასა და მკურნალობის შედეგებზე. მოწევა ასთმას ამძაფრებს ფილტვების ფუნქციის დაქვეითების დაჩქარებით, სიმპტომების გამწვავებითა და მკურნალობის ეფექტურობის შემცირებით. კვლევა მიზნად ისახავს გაარკვიოს, როგორ აძლიერებს მოწევა ასთმის სიმპტომებს, შეაფასოს ასთმის მართვის გამოწვევები მწეველ პაციენტებში და შეისწავლოს თამბაქოს მოხმარების გავლენა მკურნალობის რეზისტენტობასა და სასუნთქი სისტემის ჯანმრთელობაზე. **მეთოდოლოგია:** ჩატარდა ყოვლისმომცველი ლიტერატურის მიმოხილვა, რომელიც ეფუძნებოდა რეცენზირებულ კვლევებს მოწევისა და ასთმის ურთიერთობის შესახებ. **შედეგები:** კვლევამ აჩვენა, რომ მოწევა იწვევს სასუნთქი გზების ფუნქციის დაზიანებას, ქრონიკულ ანთებასა და იმუნური რეაქციის ცვლილებას, რაც ასთმის უფრო ხშირ გამწვავებას განაპირობებს. მეორადმა მოწევამაც კი მსგავსი მავნე გავლენა იქონია, განსაკუთრებით ბავშვებსა და არამწეველ მოზრდილებში. ასთმით დაავადებულმა მწეველებმა აჩვენეს კორტიკოსტეროიდების და ბრონქოდილატატორებისადმი შემცირებული რეაგირება, რაც ალტერნატიული თერაპიული მიდგომების აუცილებლობაზე მიუთითებს. **დისკუსია:** კვლევა ხაზს უსვამს მოწევის შეწყვეტის აუცილებლობას ასთმის მართვის პროცესში. ადრეული ჩარევა, პერსონალიზებული თერაპიები და საზოგადოებრივი ჯანდაცვის ინიციატივები, რომლებიც მოწევის შემცირებას ისახავს მიზნად, შესაძლოა მნიშვნელოვნად გააუმჯობესოს პაციენტთა მდგომარეობა. **დასკვნა:** მოწევის შეწყვეტა გადამწყვეტია ასთმის ეფექტური მართვისა და გრძელვადიანი რესპირატორული ჯანმრთელობისთვის. მულტიდისციპლინური მიდგომა, რომელიც მოიცავს სამედიცინო, ქცევით და ფსიქოლოგიურ ინტერვენციებს, ხელს შეუწყობს ჯანდაცვის ხარჯების შემცირებასა და პაციენტების ცხოვრების ხარისხის გაუმჯობესებას.

საკვანძო სიტყვები: თამბაქოს მოხმარება, ასთმა, თამბაქოს მოხმარების შეწყვეტა, ფილტვების ფუნქციის დაქვეითება, იმუნური პასუხის ცვლილება, ასთმის გამწვავება, მეორადი მოწევა

ციტატა: ამირ სუჰაილ კორაკკა კოტილი. საშიში კავშირი თამბაქოს მოწევასა და ასთმას შორის. ჯანდაცვის პოლიტიკა, ეკონომიკა და სოციოლოგია, 2024; 8 (2). https://doi.org/10.52340/healthecosoc.2024.08.02.12

Introduction

Smoking tobacco continues to be the world's greatest preventable cause of premature death, contributing to a number of serious ailments, including lung cancer, heart disease, strokes, chronic respiratory disorders, and other types of cancer. Asthma sufferers continue to smoke in large numbers despite the established health dangers. This behavior could be explained by the fact that nicotine is addictive and that asthma symptoms, particularly in milder forms, are sporadic. Studies reveal that about 25% of persons with asthma in affluent nations smoke regularly, a proportion comparable to that of the overall population. Smoking aggravates asthma symptoms, speeds up lung function decline, and decreases the efficiency of common asthma therapies like corticosteroids, making the coexistence of smoking with asthma a special health concern.

Tobacco usage has a substantial negative impact on health, with at least one in four adults smoking cigarettes in many high-income countries. The symptoms of asthma, a long-term respiratory disease, include inflammation, increased airway sensitivity, and recurrent airway blockage. The 2019 Global Burden of Disease report projected that asthma affects 262 million people globally. Smokers experience more severe and enduring symptoms, which makes managing their disease more difficult and raises their chance of developing long-term respiratory issues.

Tobacco consumption poses profound risks to respiratory health, particularly for individuals afflicted with asthma. Individuals with asthma who smoke are more likely to be susceptible to accelerated decline in pulmonary function and exhibit a heightened susceptibility to developing COPD. Moreover, smoking induces complex alterations in the inflammatory pathways of the airways, culminating in a diminished pharmacological response to corticosteroids, the cornerstone of asthma management. This corticosteroid resistance significantly complicates clinical management, necessitating more intensive, individualized therapeutic regimens. Despite the well-documented benefits of smoking cessation—such as enhanced pulmonary capacity and improved asthma symptom control—cessation rates among asthmatic smokers remain discouragingly low. This underscores the critical need for more effective cessation interventions and innovative management strategies targeting this vulnerable population.

This thesis investigates, relationship between smoking and asthma, with a focus on biological mechanisms underlying treatment resistance and its harmful impact on lung function. Exploring link between asthma and smoking is critical due to the substantial health repercussions of this combination. Understanding how smoking exacerbates asthma symptoms and contributes to treatment resistance can aid in developing more effective management options. Addressing this issue is critical for increasing patients' quality of life, lowering healthcare expenditures, and improving treatment outcomes. The study's findings could provide useful insights into creating targeted interventions aimed at lowering smoking among asthma patients and enhancing their clinical care.

Many people with asthma still smoke in spite of the known harm that smoking does to. asthma management. This conduct increases the severity of asthma, decreases the efficacy of treatment, and increases the use of healthcare services. There is still a lack of knowledge regarding the causes of this persistent smoking behavior, the biological processes underlying treatment resistance, and the poor efficacy of the available cessation regimens. Improving smokers' asthma management requires filling in these knowledge gaps.

Examining how smoking affects asthma control, response to therapy, and general health. outcomes are crucial given the rising prevalence of smoking and asthma worldwide. In order to better manage asthma in this high-risk population, this study is required to investigate the underlying mechanisms of corticosteroid resistance in smokers with asthma and to pinpoint viable approaches. Comprehending these dynamics can help medical professionals create clinical procedures and public health initiatives that are more successful.

Research Questions:

- How does cigarette smoking influence asthma severity and progression?
- How effective are current asthma management strategies for smokers compared to nonsmokers?
- What interventions can be developed to reduce smoking rates among individuals with asthma?

Despite extensive research on the adverse effects of smoking on asthma, critical gaps persist in understanding the precise biological mechanisms contributing to treatment resistance and accelerated lung function decline among asthmatic smokers. Existing studies often focus on either asthma or COPD in isolation, overlooking the overlapping characteristics and diagnostic challenges in patients with combined asthma-COPD features. Additionally, while the harmful impact of ETS on children with asthma is well-documented, fewer studies explore its long-term effects on adults with pre-existing asthma. There is also limited evidence on the effectiveness of integrated smoking cessation strategies tailored specifically for asthmatic populations, especially among vulnerable groups such as adolescents, pregnant women, and individuals with severe asthma phenotypes.

Methodology

A literature search was done through PubMed, Scopus, and Web of Science databases, and data were extracted according to inclusion criteria. The search strategy utilized a combination of Medical Subject Headings (MeSH) terms and relevant keywords, such as "Asthma ", "Smoking cessation", "Lung function decline", "Asthma exacerbations". The search was limited to peer-reviewed articles and reviews published in English between January 2000 and April 2024 to ensure the inclusion of recent and relevant studies.

Literature review

Chronic airway inflammation is the hallmark of asthma, a respiratory disease that causes symptoms including coughing, chest tightness, wheezing, and dyspnea that vary in intensity and frequency because of fluctuating airflow restriction. Up to 18 percent of people worldwide are thought to be affected by its prevalence. Asthma management's key goals are to minimize treatment adverse effects, maintain ideal symptom control, and lower the risk of asthma-related consequences like exacerbations, death, and long-term airflow limitation. It is noteworthy that 20% of people with asthma smoke regularly, which is similar to the incidence in the general population.

Almost one billion people worldwide are reported to smoke, rendering tobacco use a grave global health hazard. The true value of smokers is predicted to remain significant due to ongoing population increase, even if estimates suggest a drop in smoking prevalence over the next ten years. Globally, it proved that men smoked substantially more than women in 2020. Likewise, among teenagers with asthma, smoking rates are either the same as or higher than those of their peers without the condition.

Higher risks of asthma and COPD exacerbations, worsened lung function, and elevated respiratory symptoms are all closely associated with smoking. People with long-term respiratory conditions like asthma or COPD who smoke had worse treatment results, more frequent hospital stays, and more severe symptoms. From the standpoint of public health, smoking is acknowledged as one of the world's major preventable causes of sickness and mortality. Its extensive effects on world health emphasize the critical need for ongoing tobacco control initiatives and focused interventions, especially for vulnerable groups like people with COPD and asthma.

Impact of Tobacco Exposure on Asthma Development and Respiratory Health

A multitude risk factors and environmental exposures may either boost or lower the likelihood of developing asthma at different times. A history of infections, developmental impacts like preterm birth and delivery style, and demographic characteristics like age and sex are a handful of of these determinants. In addition to dietary practices, medicine use, and exposure to inhaled chemicals like smoke, air pollutants, and allergens, socioeconomic factors including income level, agricultural livelihood, and childcare attendance also have an impact (Beasley et al., 2015). Notably, smoking was identified as the second most important risk factor (Safiri et al., 2022). Although secondhand smoke has also been connected to an increased risk of asthma, tobacco exposure goes beyond active smoking. Although majority of asthma diagnoses are identified in children, later-life asthma may be exacerbated by active smoking and passive smoke exposure (Papi et al., 2018). Because of the importance of the early years for lung development, prenatal interaction and first few years of life is especially problematic. Wheezing, decreased lung function during adolescence, and increased risks of respiratory infections in children have all been linked to maternal smoking (Gibbs et al., 2016). In people exposed to maternal smoking during early development, longitudinal studies have demonstrated that these respiratory problems can last into adulthood and result in chronic conditions like airflow obstruction, COPD, and idiopathic pulmonary fibrosis (Magnus et al. 2018).

Outcomes in Asthmatic smokers

According to Thomson et al. (2009), studies have repeatedly demonstrated that asthmatic smokers have higher rates of morbidity and mortality than their non-smoking peers. People who smoke have greater vulnerability of experiencing grave symptoms, frequent aggravation, and potentially asthma attacks. Asthma-related mortality is also much greater among heavy smokers than among asthmatics who do not smoke. During pregnancy, smoking increases the risk of fetal development abnormalities and aggravates asthma symptoms, resulting in more frequent and severe flare-ups (Newman et al.). It's noteworthy that the biggest correlation with illness severity has been seen in those who have smoked for more than 20 pack-years. It has been discovered that secondhand smoke exposure has a detrimental effect on asthma control in both adults and children, much like active smoking does. Asthmatic children exposed to smoke have more severe symptoms, require rescue drugs more frequently, visit the hospital more frequently, and experience more potentially fatal asthma attacks. Secondhand smoking lowers lung function, lowers quality of life, makes it harder to manage asthma in adults, and increases dependency on medical services. These results highlight how important it is to implement successful smoking cessation programs and implement public health initiatives to lower tobacco exposure in susceptible groups.

Impact of Smoking on Lung Function Decline in Asthmatic Individuals

People with asthma who already have impaired lung function, smoking has been demonstrated to cause acute bronchoconstriction. Asthma and smoking have a combined effect on the lowering of FEV1, according to research by James et al. This suggests that smoking asthmatics experience a more substantial decline in lung function than either non-smoking asthmatics or healthy smokers. Even while tobacco smoke does not always cause an acute irritating response, it is nevertheless a major cause of respiratory impairment in vulnerable groups.

Deterioration of lung function observed among smokers with asthma is influenced by a multifaceted interplay of factors extending beyond tobacco consumption alone. Genetic susceptibility, environmental influences, and impaired pulmonary development during formative years are critical contributors to this decline. Moreover, those with a history of severe childhood asthma who persist in smoking during adulthood are disproportionately predisposed to chronic airflow obstruction. As highlighted by Thomson et al. (2012), this heightened vulnerability stems from the synergistic effects of early-life respiratory complications compounded by the deleterious impact of sustained tobacco exposure in later years

Differentiating Asthma from COPD: Diagnostic Challenges and the Impact of Smoking on Lung Function

The primary method of diagnosing asthma is by identifying the hallmark symptoms, which usually occur concomitantly comprise dyspnea, coughing, chest tightness, and wheezing. The aforementioned signs exhibit a clear temporal pattern: they are often triggered by environmental variables like tobacco smoke and allergens, they worsen at late hours or at sunrise, and their intensity varies over time (Polosa et al., 2013). Since the clinical signs of asthma and COPD overlap, discerning between two conditions is one of the most difficult diagnostic tasks. According to Papi et al. (2018), COPD is marked by a continuous restriction in airflow brought on by injury to the airways and/or alveoli.

As opposed to asthma, COPD usually manifests later in life and has a more consistent symptom pattern, with dyspnea initially mostly happening during physical activity. However, in asthma, wheezing is a more noticeable symptom in those who have the condition, and symptoms are more likely to be brought on by particular environmental variables, such as allergens or irritants.

Distinguishing between asthma and COPD necessitates consideration of multiple critical factors, including demographic variables such as age and sex, as well as personal and familial medical histories, which may encompass conditions like asthma, allergen sensitization, hay fever, eczema, and allergic rhinitis. Additionally, biomarkers, including eosinophils, immunoglobulin E (IgE), and fractional exhaled

nitric oxide (FeNO) levels, are pivotal in making an accurate distinction. The diagnosis of asthma is typically corroborated through pulmonary function tests, with spirometry revealing expiratory airflow obstruction and marked fluctuations in lung function

Smoking typically begins in adolescence or early adulthood, and when combined with asthma, early and sustained tobacco use significantly accelerates the decline in pulmonary function. Asthmatic individuals who initiate smoking at a young age are especially prone to airway remodeling and progressive lung dysfunction, ultimately culminating in fixed airway obstruction (non-reversible). These observations emphasize the critical importance of early identification and intervention in asthma, particularly for individuals with a smoking history, in order to mitigate long-term respiratory impairment.

Impact of Environmental Tobacco Smoke (ETS) on Asthma Development and Severity

Exposure to ambient tobacco smoke, or ETS, is the term used to describe involuntary smoking, which happens when nonsmokers are exposed to the negative effects of tobacco use by those around them, such as close friends, relatives, or coworkers. This passive exposure correlated with higher probability of developing asthma and bronchial hyper responsiveness, as well as heightened incidence of acute respiratory infections and exacerbation of respiratory diseases, especially in children. ETS also puts children at risk for a gradual deterioration in lung growth and maturation as well as decreased pulmonary function. These people often complain of eye, nose, throat, and respiratory tract irritation when exposed to ETS in enclosed areas, such as homes and public transportation.

Smoking aggravates asthma symptoms in children, according to a significant percentage of parents whose children have the condition, and quitting smoking at home usually improves symptoms. Children of moms with less education (less than 12 years) and who smoke more than 10 cigarettes a day are 2.5 times prone to acquire asthma than children of non-smoking mothers, according to research by Martinez et al. Although many asthmatic patients believe that environmental tobacco smoke (ETS) is a major cause of symptom worsening, outcomes of ETS exposure on adult asthmatics are still not well understood Significance of ETS in exacerbating adult respiratory and nasal allergy reactions has been demonstrated by studies like the one by Wiedemaan et al. Researchers in a Swedish population-based study found that individuals who had been exposed to ETS as children were more likely to acquire asthma than those who had not. Furthermore, the start of asthmatic symptoms has been independently linked to early exposure to both tobacco smoke and ETS, even at low concentrations. In children with an atopic propensity, it is hypothesized that early exposure to ETS, when combined with genetic sensitivity, may cause the early onset of chronic wheeze, whereas its absence may delay but not prevent the onset of wheezing. Children with genetic predispositions who are exposed to ETS also have a higher chance of becoming sensitive to dust mites in the home.

Results

The reviewed literature highlights the significant impact of smoking and ETS on asthma development, severity, and management. Smoking exacerbates asthma symptoms, accelerates lung function decline, and diminishes treatment efficacy due to corticosteroid resistance. Passive smoke exposure in children and adults further worsens respiratory health, contributing to asthma onset and more severe disease outcomes. Smokers with asthma experience heightened morbidity and mortality risks, including frequent exacerbations, fixed airway obstruction, and increased asthma-related hospitalizations. Effective asthma management requires integrating smoking cessation strategies, including pharmacological treatments and behavioral counseling, supported by public health interventions to reduce tobacco exposure and promote smoke-free environments.

Discussion

Reviewing research papers makes it clear that tobacco use is closely related to asthma, a chronic inflammatory illness of the airways that exacerbates the disease's course and makes treatment more difficult. Dynamic airway blockage causes asthma to present as episodic symptoms as coughing, chest tightness, wheezing, and dyspnea (Polosa et al., 2013). Although there have been improvements in asthma medication to reduce symptoms and reduce risk, the fact that 20% of people with asthma continue to smoke presents a serious clinical problem that exacerbates side effects and reduces the effectiveness of treatment (Thomson et al., 2009).

The global burden of tobacco use remains formidable, with nearly one billion smokers reported worldwide (Global Burden of Disease Report). Smoking accelerates respiratory decline, precipitates frequent exacerbations, and heightens mortality risks among individuals with asthma. Prolonged exposure, exceeding 20 pack-years, is particularly associated with severe asthma complications, including irreversible airway remodeling and fixed airflow obstruction (Newman et al.). In pregnant asthmatic women, smoking intensifies asthma-related complications, jeopardizing maternal and fetal health by increasing the likelihood of exacerbations and adverse neonatal outcomes.

Both adult and pediatric asthma populations have a detrimental effect by environmental tobacco smoke (ETS), a crucial yet inevitably disregarded component. Children's pulmonary development is hampered by ETS exposure, which additionally triggers bronchial hyper reactivity and worsens respiratory infections (Martinez et al.). Children who witness their mothers smoking are more prone to experience wheezing, have weaker lungs, and be more vulnerable to allergens such dust mites (Wiedeman et al.). Early-life exposure to ETS interacts with genetic susceptibility to cause persistent asthma symptoms later life and heightened likelihood of developing chronic respiratory conditions, such as idiopathic pulmonary fibrosis and COPD, according to Magnus et al.

Differentiating between asthma and COPD remains diagnostically challenging due to overlapping clinical presentations. While asthma is typified by episodic, trigger-induced symptoms and variable airflow obstruction, COPD manifests with persistent, progressive airway limitation and is often linked to cumulative smoking exposure (Papi et al., 2018). Biomarkers such as eosinophils, IgE and FeNO along with spirometric assessments, are essential in distinguishing between these two disorders.

The reviewed literature underscores the profound impact of smoking and ETS on asthma emphasizing the necessity for aggressive tobacco control measures. Early smoking cessation, targeted public health policies, and the promotion of smoke-free environments are critical strategies to curtail the tobacco-related burden on respiratory health and improve clinical outcomes for individuals with asthma.

Smoking cessation presents substantial health benefits, particularly for individuals with asthma, by improving various aspects of disease control. Research by Fennerty et al. demonstrated that quitting smoking leads to a marked improvement in lung function, with significant increases in peak expiratory flow (PEF) observed within 24 hours of abstinence. Although airway hyperresponsiveness to histamine showed no immediate improvement, significant reduction was noted after seven days. Long-term smoking cessation has been linked to reduced asthma symptoms, less frequent reliance on rescue medications, and enhanced well- being. Additionally, asthma patients who quit smoking often require lower doses of inhaled corticosteroids to maintain symptom control. Despite these advantages, smoking cessation among asthmatics remains challenging due to tobacco's addictive nature, underscoring the need for integrated cessation programs that combine behavioral counseling, pharmacotherapy, and follow-up support. (Chaudhuri et al 2022)

Effective smoking cessation strategies for asthma patients should address both medical and psychological aspects of tobacco dependence. First-line treatments such as nicotine replacement therapy, bupropion, and varenicline have been shown to enhance quit rates. Physicians play a critical role in educating asthma patients about the severe respiratory risks of continued smoking and encouraging

cessation efforts. It is essential to inform patients that asthma symptoms, such as coughing, may temporarily worsen after quitting due to airway clearance processes, necessitating short-term adjustments in asthma medications. Furthermore, protecting children with asthma from secondhand smoke is crucial, emphasizing the need for parents and caregivers to quit smoking. (Hughes et al 2002). Alternative therapies, including dual therapy of inhaled corticosteroids, long-acting β2 agonists, may be considered for patients unable to quit smoking or those experiencing persistent symptoms despite cessation efforts. These combined approaches can significantly improve asthma management and reduce tobacco-related respiratory complications

Conclusion and recommendations

Based on the reviewed literature, it is evident that cigarette smoking significantly exacerbates asthma severity and accelerates disease progression. Smoking contributes to increased airway inflammation, impaired lung function, and heightened asthma symptoms such as wheezing, coughing, and breathlessness. Additionally, smokers with asthma undergo regular instances and severe exacerbations, diminished response to standard asthma therapies, and an elevated chance of COPD. The dual burden of asthma and smoking poses serious health risks, necessitating targeted management strategies.

Current asthma management protocols are less effective for smokers than nonsmokers due to smoking-induced resistance to inhaled corticosteroids and other standard treatments. Smokers often require higher doses of asthma medications and alternative therapeutic approaches, such as dual therapy with inhaled corticosteroids, long-acting β2 agonists and to achieve better symptom control. Despite available treatments, smoking cessation remains the most critical intervention to improve asthma outcomes.

Comprehensive therapies that combine behavioral counseling, medication, and follow-up care are crucial to lowering smoking rates among people with asthma. Patient education regarding the dangers of smoking, particularly its effects on managing asthma and long-term respiratory health, should be the main goal of public health campaigns. Particularly for high-risk populations like adolescents and expectant mothers, doctors must actively participate in smoking cessation programs and provide individualized support. Healthcare professionals can improve asthma management and encourage healthier, smoke-free living by addressing the psychological, social, and physical elements of smoking habit.

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