Minds And Lungs: Unraveling The Association Between Electronic Cigarette Smoking And Asthma With A Focus On Mental Health - A Systematic Exploration

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Abstract

Background: The prevalence of electronic cigarette (e-cigarette) usage, especially among the youth, has raised significant health concerns. This study delves into the historical context of smoking, the emergence of e-cigarettes, and their adverse health effects, particularly on the respiratory system.

Purpose: The primary objective is to comprehensively analyze the impact of e-cigarette smoke on lung health, with a specific focus on asthma, while concurrently exploring the intricate relationship with mental health. The study aims to contribute to

a holistic understanding of the multifaceted consequences associated with e-cigarette consumption.

Method: A systematic literature review was conducted using prominent databases such as Google Scholar, Emerald Insight, Research Gate, PubMed, Medline, Taylor and Francis, and Springer Link. A rigorous selection process, detailed in the PRISMA flow diagram, identified 30 high-quality sources for analysis. The VOSviewer tool was employed for bibliometric assessments, unveiling trends, themes, and authorship patterns**.**

Findings & Results: Analysis revealed a surge in publications related to e-cigarettes and health between 2018 and 2020. Bibliometric assessments highlighted the active contributions of authors and countries, emphasizing the global concern. E-cigarette smoke's detrimental impact on lung health, leading to asthma and mental health issues, was substantiated by the literature. Behavioral, social, and economic consequences were also explored, underscoring the intricate web of challenges associated with e-cigarette usage.

Conclusion: The study provides comprehensive insights into the multifaceted repercussions of e-cigarette consumption on respiratory health and mental well-being. The findings underscore the urgent need for targeted interventions and policies to address the growing public health concerns associated with e-cigarette use, especially among the youth.

Keywords: Electronic cigarettes, E-cigarettes, Vaping, Asthma, Respiratory health, mental health, Literature review, Public health, Youth, Bibliometric analysis.

Introduction

Background

The global issue of smoking has become inevitable and remains a crucial and pressing topic for analysis (Alcántara et al., 2022). The use of combustible cigarettes has a long history, being widely popular in the past (Lippi et al., 2020). Dating back to shamanistic rituals in the Americas around 5000 BC, tobacco cigarettes evolved over centuries, with Europe transforming the structure in the 16th century. The 10th century witnessed the emergence of cigars, and further advancements in combustible cigarettes led to smokeless

and potentially less harmful varieties (Veeresha et al., 2019; Rodríguez Muñoz et al., 2019).

In 2003, Hon Lik introduced a transformative form of tobacco consumption – the electronic cigarette. Originating from the development of aerosols in 1963 by various tobacco companies, electronic cigarettes, also known as e-cigarettes or vapes, were officially introduced to society in 2003 by a Chinese scientist (Kozlowski, 2021). These devices generate nicotine-infused vapors with flavors for inhalation, providing an alternative to traditional pipe cigarettes (Janssen et al., 2020). The availability of flavored tobacco cigarettes has historically contributed to a significant proportion of youth consumption, influencing their psychological, social, and personal aspects of life (Serrano-Alarcón et al., 2019). This has led to concerns about the rebellious nature of youth, prompting campaigns against tobacco and associated substances (Giulietti et al., 2020).

Nicotine serves as a central component in most electronic cigarettes and vapes, often combined with various flavors. However, it is crucial to note that nicotine is a harmful and carcinogenic substance, inflicting significant harm on the lungs and central nervous system (Mixdam et al., 2020). Recognized as the addictive element in both traditional and electronic cigarettes, nicotine exposure leads to the inhalation of heavy metals such as cadmium and lead, influencing the nasal and buccal cavities and subsequently affecting the alveolar structure of the lungs (Thompson et al., 2019).

Tar, coal tar, cadmium, lead, and flavor components are introduced into the nasopharyngeal pathway through the buccal cavity, ultimately depositing into the alveolar ducts via the bronchitis channel. These substances, being heavier than air, do not undergo expulsion through the acceleration process and instead accumulate in the alveolar ducts (Blank & Hoek, 2022). The retention of smoke particles occurs due to the mucous membrane, which binds carbon monoxide, dust, and cadmium particles, eventually supplying them to the bloodstream and distributing them throughout the body (Lee et al., 2022).

These obstructions disrupt proper breathing patterns and lead to chest cavity blockage due to excessive mucus secretion.

Consequently, individuals experience significant breathlessness during routine activities such as sleeping, eating, and communication (Kute et al., 2019). The resulting accelerated breathing and heart rate contribute to confusion, exhaustion, drowsiness, and lethargy in patients, often manifesting as blue lips and fingertips (Prochaska et al., 2020).

These circumstances are intricately tied to thematic issues among smokers (Hulls et al., 2020). The symptoms observed in electronic cigarette smokers are notably comparable to those associated with asthma (Tokle & Pedersen, 2019). The paramount consequence is the discernible decline in health among these individuals, ultimately influencing individual mortality rates (Denlinger-Apte et al., 2022). Furthermore, contemplations about mortality are prevalent among chain smokers, influenced by their health conditions that significantly affect their mental well-being (Stephens, 2019).

It is frequently observed that patients dealing with mental health problems often resort to defense mechanisms (Taylor et al., 2021). These defense mechanisms are closely linked to activities that alleviate stress levels and enhance feelings of pleasure (Loud et al., 2021). Particularly, avoidance behaviors may result in the excessive consumption of tobacco and electronic cigarettes in their daily lives (Richardson et al., 2019). The surge in the use of electronic cigarettes is also associated with modernization perspectives (Lightfoot et al., 2020). Mental health, in this context, extends beyond mere stability of the state of mind; it encompasses the provision of homogeneity, constructivism, and a productive life scenario (Brose et al., 2020).

The literature review manuscript comprehensively examines the effects of electronic cigarette smoke consumption on lung health, particularly its contribution to asthma. It also explores the impact on mental health and its physiological manifestations as consequences of asthma. The study delves into the health issues related to heavy electronic cigarette consumption, including chain-smoking, and its association with increased mortality rates.

Material and method

The current literature review employs a systematic approach, focusing on the mental stages of the research device, with an emphasis on transparency, replicability, and a comprehensive research scope. The objective is to streamline and refine the research by utilizing published and unpublished studies as well as an extensive bibliography. To achieve this, the research question was carefully constructed, and relevant articles were selected for meta-analysis and systematic literature review. This rigorous methodology was operationalized and implemented through a four-step process: data collection, extraction of research papers, screening of abstracts, and screening of full-text articles. The selection process is thoroughly explained using the PRISMA flow diagram.

This research is based on three essential questions concerning the connection between electronic cigarettes, asthma, and mental health well-being. They are as follows:

1. Investigating the correlation between electronic cigarette smoke and asthma.

2. Assessing the impact of electronic cigarette smoke on lung development.

3. Understanding the role of mental health well-being in the link between electronic cigarettes and asthma.

The research engines commonly used for systematic literature review are Google Chrome, Maxton, and Microsoft Edge, which access databases such as Google Scholar, Emerald Insight, Research Gate, PubMed, Medline, Taylor and Francis, and Springer Link. The research methodology involved creating search syntaxes based on specific research parameters, which were then connected using Boolean terms like "or" and "and." The findings of the data search are summarized in a table.

Table 1 Syntax

Variable	Boolean	Relation	Syntax
	And	“e-cigarette smoke” and “Asthma”	Syntax 1
E-cigarette smoke		“e-cigarette smoke” and “mental health role”	Syntax 2

Asthma Mental health role	Or	“Asthma” and “mental health role”	Syntax 3
		“e-cigarette smoke” or “Asthma”	Syntax 4
		“e-cigarette smoke” or “mental health role”	Syntax 5
		“Asthma” or “mental health role”	Syntax 6
	and	“e-cigarette smoke” “Asthma” and “mental health role”	Syntax 7

The fundamental concept of the study is to comprehensively comprehend the harmful impact of electronic cigarette smoke on health, particularly its role in causing asthma, with a focus on the influence of mental health. This study encompasses a cross-sectional population, including individuals of various age groups, from young to adult, emphasizing the relevance and inclusivity of the literature review.

Table 2 indicates the raw data

Databases	Year	Syntax	Total number
Google Scholar	2019 – 2022	Syntax 1	3,650
		Syntax 2	9,900
		Syntax 3	24,800
		Syntax 4	3,650
		Syntax 5	10,000
		Syntax 6	28,100
		Syntax 7	2,070
Emerald Insight,		Syntax 1	12,01
		Syntax 2	1,105
		Syntax 3	678
		Syntax 4	1,203
		Syntax 5	809
		Syntax 6	915
		Syntax 7	791
Research Gate,		Syntax 1	801
		Syntax 2	975
		Syntax 3	670
		Syntax 4	759
		Syntax 5	984

	Syntax 6	768
	Syntax 7	597
	Syntax 1	720
	Syntax 2	831
	Syntax 3	761
PubMed,	Syntax 4	791
	Syntax 5	489
	Syntax 6	871
	Syntax 7	673
	Syntax 1	365
	Syntax 2	301
	Syntax 3	291
Medline	Syntax 4	261
	Syntax 5	271
	Syntax 6	267
	Syntax 7	255
	Syntax 1	372
	Syntax 2	381
	Syntax 3	381
Taylor and	Syntax 4	229
Francis,	Syntax 5	291
	Syntax 6	261
	Syntax 7	247
	Syntax 1	301
	Syntax 2	381
	Syntax 3	349
Springer link	Syntax 4	299
	Syntax 5	264
	Syntax 6	295
	Syntax 7	238

The table presents data from various databases spanning the years 2019 to 2022, along with corresponding syntax types and total numbers of entries. Google Scholar, during this period, utilized seven different syntax types, ranging from Syntax 1 with 3,650 entries to Syntax 7 with 2,070 entries. Emerald Insight employed seven syntax types as well, with Syntax 1 having 12, 01 entries and Syntax 7 with 791 entries. Research Gate also utilized seven syntax types, ranging from Syntax 1 with 801 entries to Syntax 7 with 597 entries.

PubMed's data, within the specified years, encompassed seven syntax types, with Syntax 1 having 720 entries and Syntax 7 with 673 entries. Medline utilized seven syntax types, with Syntax 1 having 365 entries and Syntax 7 with 255 entries. Taylor and Francis employed seven syntax types, ranging from Syntax 1 with 372 entries to Syntax 7 with 247 entries. Lastly, Springer Link utilized seven syntax types, with Syntax 1 having 301 entries and Syntax 7 with 238 entries. This comprehensive overview provides insight into the varied utilization of different syntax types across multiple databases during the specified timeframe.

The selection process limitations are tied to the exclusion of research not utilized in the study, including non-peer-reviewed and non-scientific literature and journals, as well as articles not written in English. The focus is on understanding the potential relationship of electronic cigarette smoke on customer progression and the role of mental health. A flowchart describing the extraction of articles from the data resources to the final selected articles is presented.

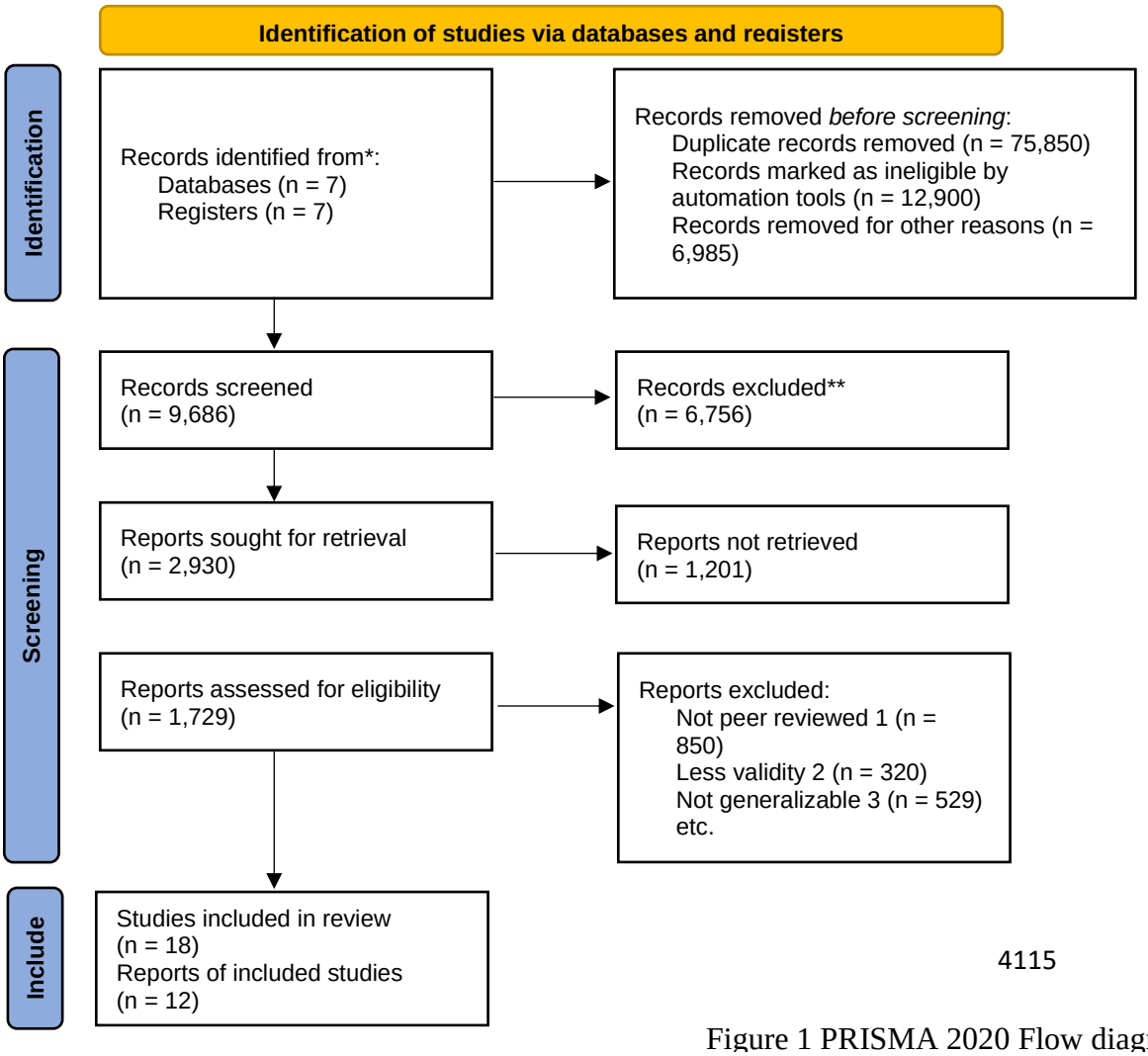


Figure 1 PRISMA 2020 Flow diagram

The results from the PRISMA diagram reveal a staggering 105,421 articles identified across the 7 databases. However, before screening, we meticulously removed duplicates amounting to 75,850 records, as well as 12,900 records that were deemed ineligible to be included in the study based on our automatic tool. Additionally, we eliminated 6,985 pieces of data from other resources.

During the screening process, 9,686 records were reviewed, with 6,756 being excluded. The records sought for retrieval numbered 2,930, and 1,201 data points were not retrieved. For the assessment of eligibility, 1,729 reports were considered, out of which 850 were excluded based on gray material, 320 due to weak validity, and 529 due to generalizability. This left 30 literature sources for the present review, focusing on quality, reliability, generalizability, validity, and other psychometric properties.

The VOSviewer tool plays a critical role in visually illustrating the linkage between the major categories and corresponding keywords, as well as the trends, authorship, and country-based identification within the network of literature. This graphical tool is designed to create a visual map for exploring and understanding the related concerns of the literature review. It is vital not to overlook the valuable insights provided by VOSviewer. The segregation of certain items not belonging to the collection within the map also warrants attention.

Results

Literature analysis: trends and themes

The analysis of themes and trends is conducted by examining peer-reviewed publications relevant to the topic of interest from January 2018 to November 2022. This period encompasses a vast range of scholarly documents that provide valuable insights. Notably, there is significant variability in the contributions related to a specific topic, with certain periods standing out as particularly prolific. The trends reveal that between 2018 and 2020, there was a substantial surge in the publication of articles centered on this

topic, generating a palpable and widespread interest among researchers in the field.

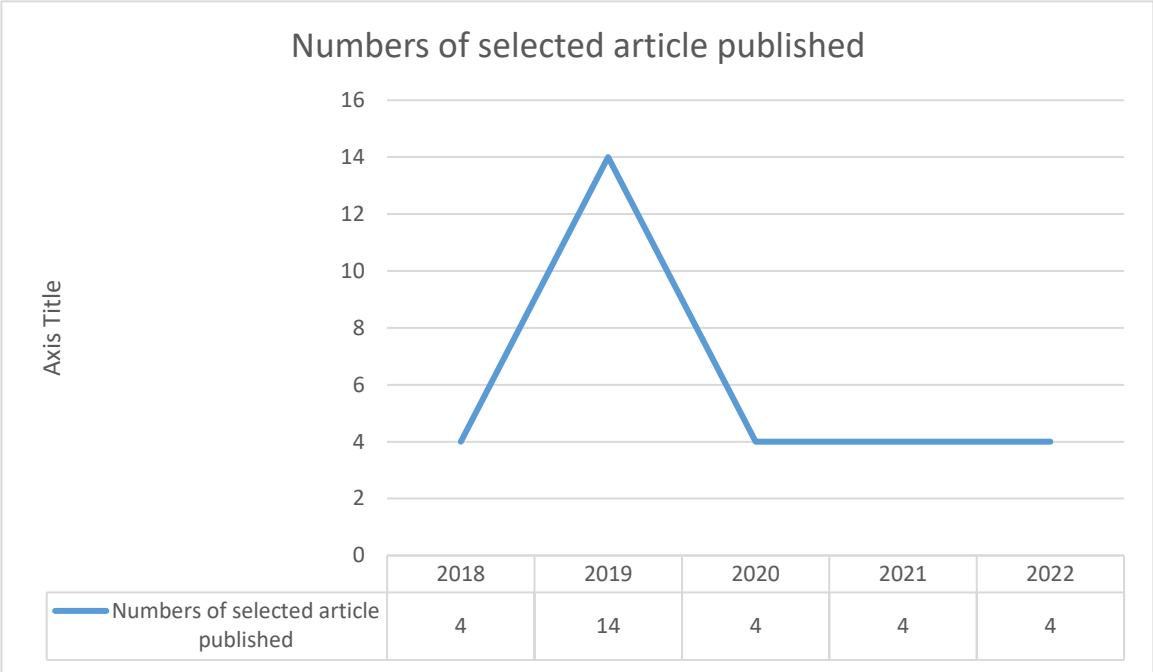


Figure 2 Numbers of selected Published articles

Analyzing the research was particularly by the authors depicted that approximately 132 authors write about the topic of interest electronic cigarette smoke, asthma, and mental health. The writers have published an article on this topic presented in the figure.

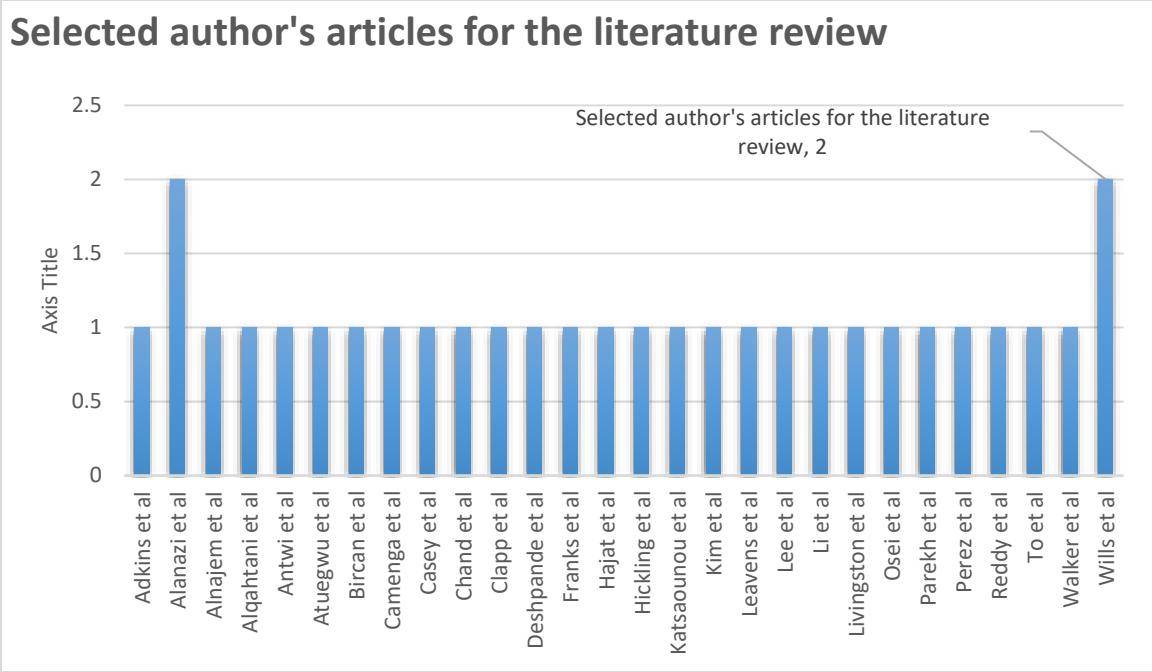
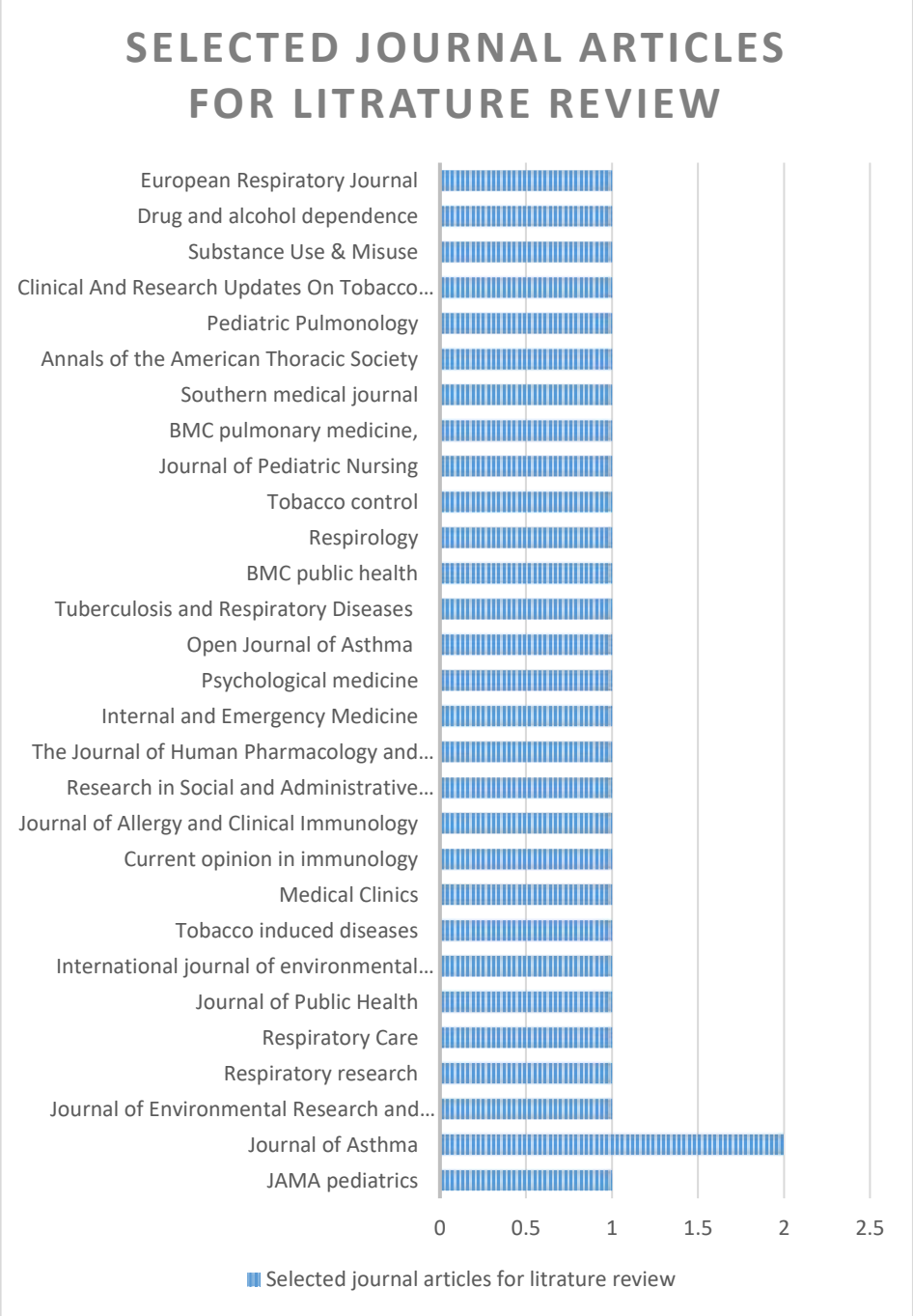


Figure 3 Selected authors articles for literature review

Based on the journal data, the majority of the research work on the topic primarily focused on two articles. The first article delved into the significance of preventing medicine, while the second article explored the American Journal of Respiratory Diseases. However, it is worth noting that several other articles also hold significant importance in this field. These articles shed light on various perspectives encompassing electronic cigarette smoke, asthma, and the role of mental health.



Based on country-specific analysis, three standout countries, the United States, Australia, and China, have demonstrated exceptional dedication to addressing electronic cigarette smoke, customer well-being, and mental health. This commitment is also echoed in the efforts of other nations such as the Kingdom of Saudi Arabia, Italy, Japan, Hungary, Poland, Canada, and Germany, among others.

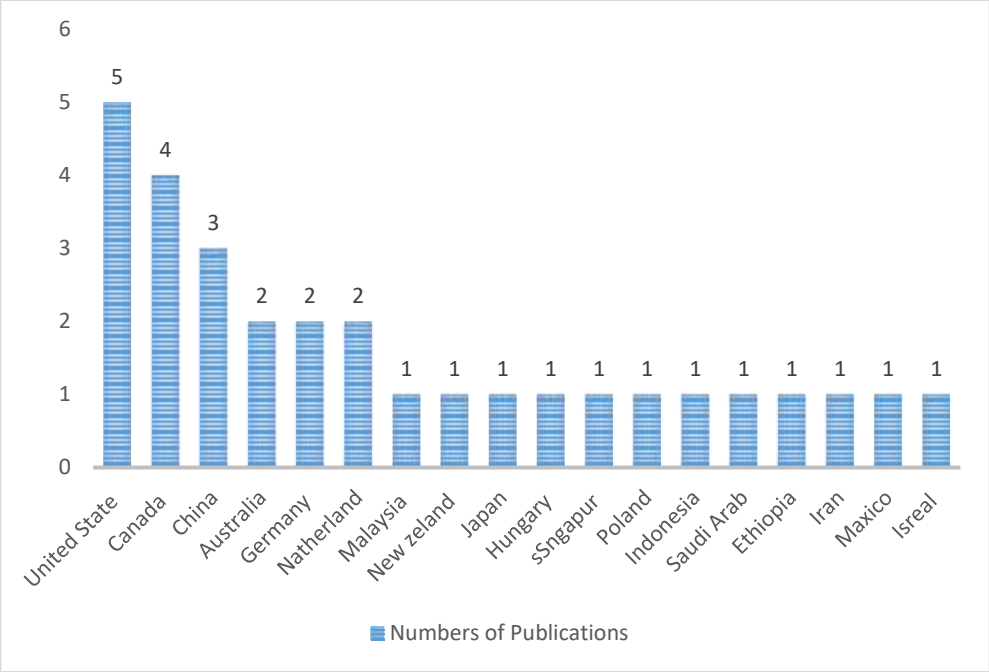
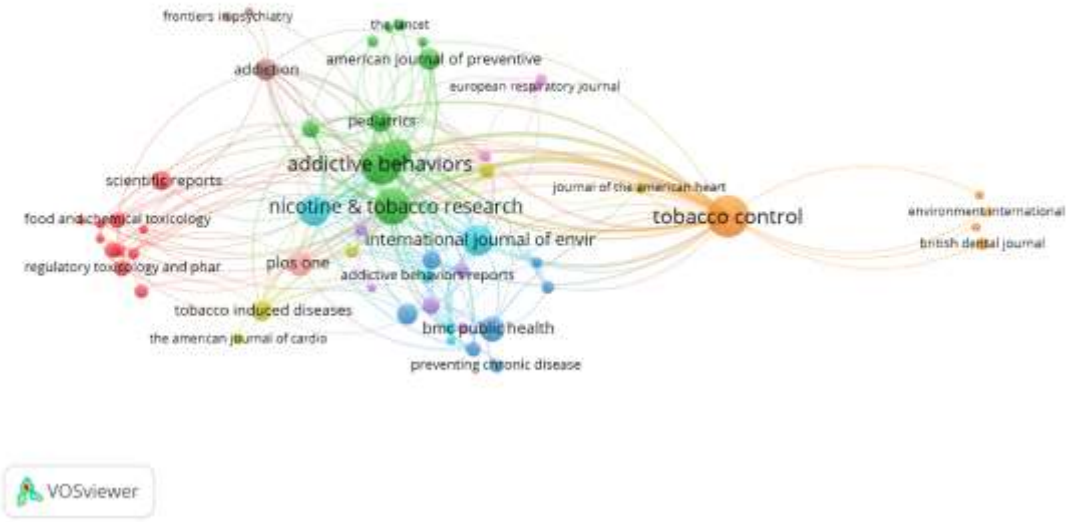


Figure 5 Numbers of publication of each author

According to a bibliometric study conducted by Yu et al. (2020), the use of the VOSviewer software has proven to be objective in identifying the primary research keywords in various studies related to electronic cigarette smoke, asthma, and mental health, as indicated by Shah et al. (2019). The primary keyword of this paper appears frequently, more than 5 times, in the WOS core that is analyzed using VOSviewer, as mentioned by Xie et al. (2020). Some of the most significant keywords found include Tobacco, tobacco control, respiratory disorder, asthma, bronchitis and asthma, mental health, psychiatry, and depression, among others. The nodes in the visualization represent the frequency and strength of these keywords in the publications, as explained by Huang et al. (2020). The curvature structure between the nodes indicates the co-occurrence of keywords within the same and different research studies, based on their publication characteristics, as highlighted by Nandiyanto and Al Husaeni (2021). The distance between the nodes reveals the extent of co-

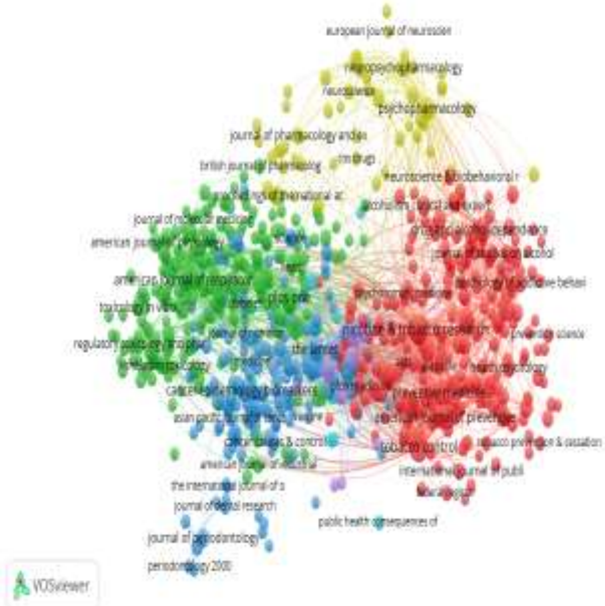
occurrence between the two words and can indicate any confounding variables among these keywords.



The VOSviewer bibliometric assessment allows for a comprehensive analysis of scientific publications, specifically focusing on the country-based research execution and participation. The main objective is to examine the quality papers being submitted by different countries to various journals, all while considering the specific research objectives and goals.

In the case of the journal base identification, the VOSviewer bibliometric assessment reveals that a significant number of regionally based journals are actively contributing to the scientific discussion on the impact of electronic cigarette smoke on mental health. This assessment provides a deeper understanding of this important topic and its implications for both researchers and customers alike.

The VOSviewer bibliometric assessment identifies the potential authors contributing to the fields of addiction, breathing disorders, and mental health. It reveals significant trends and variations in research focus within these domains.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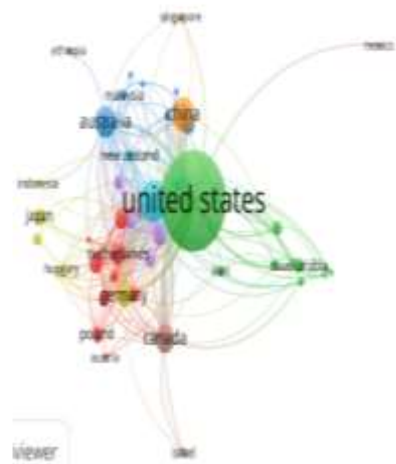
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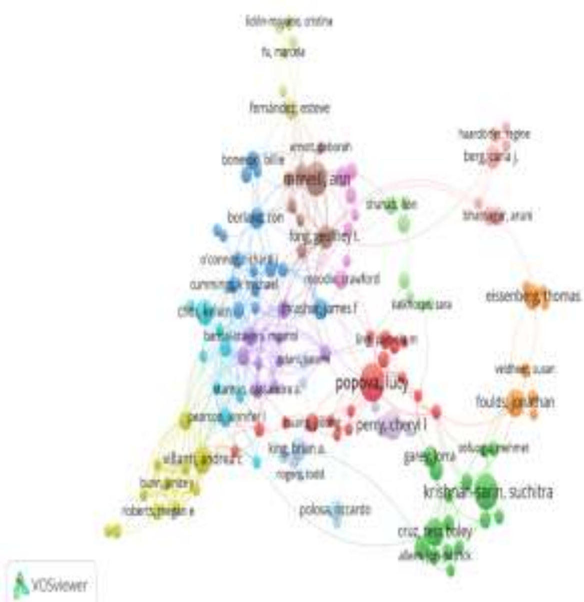
popova, lucy
eissenberg, thomas
krishnan-sarin, suchitra
VOSviewer

Discussion

Previous literature (Osei et al., 2019) has provided insights on the connection between electronic cigarette smoke and asthma, as well as the influence of mental health on this relationship (Brett et al., 2021). Additionally, literature identifies five key dimensions related to the associated health problems and consequences of electronic cigarettes, including its impact on young adolescents, pulmonary and lung injuries, mental health consequences, behavioral issues, and social problems among users (Wills et al., 2019; Fu et al., 2021).

Electronic cigarettes and asthma

Electronic cigarette frames consist of a variety of materials, such as ultrafine nicotine particles and acetyl components, which deeply penetrate the structure of bronchitis and bronchioles (Lee et al., 2021). This penetration of the bronchioles leads to severe internal bleeding and rupturing of the internal structure (Alanazi et al., 2022). As a result, the exchange of gases is hindered, causing blockage and disturbance in the breathing rate (Bircan et al., 2021). Over time, this can lead to a heavy buildup of mucous lining in the bronchitis, leading to severe health issues (Osei et al., 2019). Electronic cigarettes are a major contributor to pulmonary health problems, including a higher risk of alveolar cancer, breakage, and deterioration (Reddy et al., 2019).

The examination conducted by Livingston et al. (2022) focuses on the automated analysis of patient results obtained from inhaling viscous substances in the form of refined liquid, which leads to the blockage of arterial structures. This condition is frequently associated with chronic diseases that subsequently influence various other parts of the body and disrupt logical coordination, as noted by Leavens et al. (2020). Moreover, the impact of nicotine inhalation goes beyond the lungs and pulmonary system, as it is often found to be comorbid with various other health conditions, as highlighted by Adkins et al. (2020).

Role of Mental Health

Health encompasses various aspects of life, including cognitive and mental well-being, which relies on neurotransmitters and hormones. Smoking has detrimental effects on overall health,

especially for habitual smokers. Mental health is heavily influenced by excessive smoking. Furthermore, smoking is associated with health problems related to the nasopharynx. (To et al., 2021; Antwi et al., 2022; Li et al., 2020; Wills et al., 2019).

Recognizing the vital connection between mental health and the excessive smoking of cigarettes among individuals with asthma is of utmost importance (Franks et al., 2018). Well-being encompasses not only mere existence but also the profound feelings of joy, happiness, and tranquility in life (Parekh et al., 2020). Moreover, mental health significantly impacts an individual's behavior and interactions within society (Casey et al., 2020). Therefore, it is imperative to give due attention to the mental well-being of patients concerning their excessive cigarette use and the associated respiratory issues it may cause (Deshpande et al., 2020).

Electronic cigarettes among adolescence

Adolescents are increasingly gravitating towards electronic cigarettes, driven by rebelliousness, peer pressure, and the pervasive influence of social media (Alanazi et al., 2020; Kotoulas et al., 2021; Kim et al., 2020). This concerning trend is fueling ethical transgressions and a surge in risky behavior among young people. The rising use of electronic cigarettes among adolescents is fueled by the perception that it signifies maturity and adulthood (Alnajem et al., 2020). However, this pattern has led to a proliferation of dehumanizing behavior and a susceptibility to criminal activities among youth, pushing them towards unethical conduct and criminal inclinations (Adkins et al., 2020).

Lung injuries

According to Casey et al. (2020), the fumes from electronic cigarettes enter the lungs through the windpipe and been exposed to the walls of the alveoli. This macromolecule then penetrates the mucous membrane of the alveoli and is absorbed by the epithelial and endothelial surfaces that are in contact with the blood vessels, as reported by Deshpande et al. (2020). These blood vessels carry the absorbent molecule to the deeper part of the lungs, resulting in the formation of a black lining in the alveolar ducts, as discussed by Alqahtani et al. (2021). This stage is particularly harmful to the alveoli and leads to bleeding and pus discharge into the alveolar

ducts. Consequently, electronic cigarette smokers are at risk of developing acute asthma, as described by Perez et al. (2019).

The dense fumes from electronic cigarette smoke can engulf the healthy cells of the alveoli, converting them into damaged ones, which have been noted by Alnajem et al. (2020) and Noshili et al. (2022). Excessive consumption of electronic cigarette smoke has been associated with mental health issues among patients, as highlighted by Atuegwu et al. (2021). The relationship between electronic cigarette smoke and well-being is complex, as they affect each other in a direct or indirect manner.

Mental health consequences

The importance of mental health cannot be understated when it comes to leading a fulfilling and stable life. Ongoing research on the use of electronic cigarettes has shown significant implications for asthma and various psychological disorders (Camenga & Tindle, 2018; Shahbal et al., 2022). It has become increasingly clear that there is a mutually influential relationship between electronic cigarette use and mental health, leading to a deep-seated impact on both aspects (Chand & Hosseinzadeh, 2020). The prevalence of electronic cigarettes has been closely linked to the development of conditions such as eczema, depression, loneliness, anxiety, and despair, ultimately contributing to suicidal thoughts as individuals struggle to cope with overwhelming stress (Wills et al., 2021; Katsaounou et al., 2019).

Behavioral issues

The use of electronic cigarettes can lead to a wide range of behavioral issues, stemming from the inhalation of liquid-purified nicotine in the form of vape smoke (Hajat et al., 2021). The consumer's behavior gradually deviates from the norm, leading to various psychological disorders such as depression, affective disorder, and bipolar disorder over time (Hickling et al., 2019). One prominent effect is a decrease in impulse control, resulting in increased impulsivity, aggression, and feelings of disgust (Walker & Christian, 2020). These behavioral changes are common signs of addiction, which can have detrimental effects on healthcare practices (Clapp et al., 2020; Shahbal et al., 2022; Batool et al., 2022).

Social issues

This perspective examines a range of social issues, such as economic issues, public health issues, social inequality, and work-related issues (Kim et al., 2021). Among young teenagers, vaping is often seen as a symbol of social prestige and fashion, as well as a means of self-satisfaction (Adkins et al., 2020). One prominent aspect of social issues is their connection to mental health disabilities. The prevalence of social issues in societies is closely linked to how these societies are constructed, formed, and managed (Khan et al., 2020; Kwon & Park, 2020).

Limitation

The operationalization of constrained resources from online databases poses threats to external validity and generalizability. Obtaining additional data from diverse sources is crucial for gaining a more comprehensive understanding of generalized phenomena related to the topic of interest.

Future Directions:

Future research should focus on acquiring data concerning the relational dynamics between the construction of electronic cigarettes and asthma, considering the influential role of mental health in this relationship. Exploring additional core-found variables would contribute to a more nuanced analysis within the context of the literature review.

Gap Filling and Major Contribution to the Saudi Context:

This study significantly contributes to the Saudi context by addressing a crucial gap in the current literature regarding the impact of e-cigarette usage on respiratory health and mental well-being. The research provides a comprehensive analysis of the global discourse while emphasizing the unique socio-cultural and health-related aspects relevant to Saudi Arabia. By shedding light on the specific challenges and implications within the Saudi context, this study aids in developing tailored strategies for public health interventions and regulatory frameworks to mitigate the escalating concerns associated with e-cigarette consumption in the Kingdom.

Conclusion

The widespread use of electronic cigarettes among young people is not only a health concern but also affects various aspects of their lives, including physical, mental, and social well-being. Research suggests that e-cigarette use can affect the respiratory system, leading to increased mucus production and potential mental health issues. Understanding the link between mental health and e-cigarette use is crucial in addressing the issue and its potential effects on conditions such as asthma.

Conflict of interest: Authors have no conflict of interest.

References

Adkins, S. H., Anderson, K. N., Goodman, A. B., Twentyman, E., Danielson, M. L., Kimball, A., ... & Wiltz, J. L. (2020). Demographics, substance use behaviors, and clinical characteristics of adolescents with e-cigarette, or vaping, product use–associated lung injury (EVALI) in the United States in 2019. JAMA pediatrics, 174(7), e200756-e200756.

Alanazi, A. M., Alqahtani, M. M., Lein, D. H., & Ford, E. W. (2022). The relationship between asthma diagnosis and E-Cigarette use among youth and young adults: The mediation effects of anxiety, depression, and impulsivity and the moderation effects of substance use. Journal of Asthma, 59(4), 682-690.

Alanazi, A. M., Alqahtani, M. M., Pavela, G., Ford, E. W., Leventhal, A. M., & Hendricks, P. S. (2020). Mental health and the association between asthma and E-cigarette use among young adults in the United States: a mediation analysis. International Journal of Environmental Research and Public Health, 17(23), 8799.

Alcántara, M. S. N., Rivas, L. M., Espartero, M. E. G., Rubio-Rivas, M., García, B. A., Martinez, F. M., ... & Lumbreras-Bermejo, C. (2022). Influence of smoking history on the evolution of hospitalized in COVID-19 positive patients: results from the SEMI-COVID-19 registry. Medicina Clínica (English Edition), 159(5), 214-223.

Alnajem, A., Redha, A., Alroumi, D., Alshammasi, A., Ali, M., Alhussaini, M., ... & Ziyab, A. H. (2020). Use of electronic cigarettes and secondhand exposure to their aerosols are associated with asthma symptoms among adolescents: a cross-sectional study. Respiratory research, 21(1), 1-9.

Alqahtani, M. M., Alanazi, A. M., Pavela, G., Dransfield, M. T., Wells, J. M., Lein, D. H., & Hendricks, P. S. (2021). Binge drinking moderates the association between chronic lung disease and e-cigarette use. Respiratory Care, 66(6), 936-942.

Antwi, G. O., & Rhodes, D. L. (2022). Association between E-cigarette use and chronic obstructive pulmonary disease in non-asthmatic adults in the USA. Journal of Public Health, 44(1), 158-164.

Atuegwu, N. C., Litt, M. D., Krishnan-Sarin, S., Laubenbacher, R. C., Perez, M. F., & Mortensen, E. M. (2021). E-Cigarette Use in Young Adult Never Cigarette Smokers with Disabilities: Results from the Behavioral Risk Factor Surveillance System Survey. International journal of environmental research and public health, 18(10), 5476.

Batool, R., Khan, A., Shahbal, S., Noshili, A. I., Hamdi, A. M., Almutairi, H. K., ... & Alanazi, M. M. (2022). Relationship among Locus of Control, Personality Type, and Subjective Happiness among Conversion Patients and Healthy individuals. Clinical Schizophrenia & Related Psychoses.

Bircan, E., Bezirhan, U., Porter, A., Fagan, P., & Orloff, M. S. (2021). Electronic cigarette use and its association with asthma, chronic obstructive pulmonary disease (COPD) and asthma-COPD overlap syndrome among never cigarette smokers. Tobacco induced diseases, 19.

Blank, M. L., & Hoek, J. (2022). Navigating social interactions and constructing vaping social identities: A qualitative exploration with New Zealand young adults who smoke. Drug and Alcohol Review.

Brett, E. I., Miloslavich, K., Vena, A., Didier, N., & King, A. C. (2021). Effects of Visual Exposure to IQOS Use on Smoking Urge and Behavior. Tobacco regulatory science, 7(1), 31-45.

Brose, L. S., Brown, J., & McNeill, A. (2020). Mental health and smoking cessation—a population survey in England. BMC medicine, 18(1), 1-13.

Camenga, D. R., & Tindle, H. A. (2018). Weighing the risks and benefits of electronic cigarette use in high-risk populations. Medical Clinics, 102(4), 765-779.

Casey, A. M., Muise, E. D., & Alexander, L. E. C. (2020). Vaping and e-cigarette use. Mysterious lung manifestations and an epidemic. Current opinion in immunology, 66, 143-150.

Chand, B. R., & Hosseinzadeh, H. (2022). Association between e-cigarette use and asthma: a systematic review and meta-analysis. Journal of Asthma, 59(9), 1722-1731.

Cheng, K. W., Chaloupka, F. J., Shang, C., Ngo, A., Fong, G. T., Borland, R., ... & Cummings, K. M. (2019). Prices, use restrictions and electronic cigarette use—evidence from wave 1 (2016) US data of the ITC four country smoking and Vaping survey. Addiction, 114, 115-122.

Clapp, P. W., Peden, D. B., & Jaspers, I. (2020). E-cigarettes, vaping-related pulmonary illnesses, and asthma: A perspective from inhalation

toxicologists. Journal of Allergy and Clinical Immunology, 145(1), 97-99.

Denlinger-Apte, R., Suerken, C. K., Ross, J. C., Reboussin, B. A., Spangler, J., Wagoner, K. G., & Sutfin, E. L. (2022). Decreases in smoking and vaping during COVID-19 stay-at-home orders among a cohort of young adults in the United States. Preventive Medicine, 156, 106992.

Deshpande, M., Bromann, S., & Arnoldi, J. (2020). Electronic cigarette use among adults with asthma: 2014-2017 National Health Interview Survey. Research in Social and Administrative Pharmacy, 16(2), 202-207.

Franks, A. S., Sando, K., & McBane, S. (2018). Do electronic cigarettes have a role in tobacco cessation?. Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy, 38(5), 555-568.

Fu, R., Mitsakakis, N., & Chaiton, M. (2021). A machine learning approach to identify correlates of current e-cigarette use in Canada. Explor Med, 2, 74-85.

Giulietti, F., Filipponi, A., Rosettani, G., Giordano, P., Iacoacci, C., Spannella, F., & Sarzani, R. (2020). Pharmacological approach to smoking cessation: an updated review for daily clinical practice. High Blood Pressure & Cardiovascular Prevention, 27(5), 349-362.

Hajat, C., Stein, E., Shantikumar, S., Niaura, R., Ferrara, P., & Polosa, R. (2021). A scoping review of studies on the health impact of electronic nicotine delivery systems. Internal and Emergency Medicine, 1-28.

Hickling, L. M., Perez-Iglesias, R., McNeill, A., Dawkins, L., Moxham, J., Ruffell, T., ... & McGuire, P. (2019). A pre-post pilot study of electronic cigarettes to reduce smoking in people with severe mental illness. Psychological medicine, 49(6), 1033-1040.

Huang, T., Wu, H., Yang, S., Su, B., Tang, K., Quan, Z., ... & Luo, X. (2020). Global trends of researches on sacral fracture surgery: a bibliometric study based on VOSviewer. Spine, 45(12), E721-E728.

Hulls, P., Stone, C. J., de Vocht, F., Munafo, M., Richmond, R., Martin, R. M., & Skinner, A. (2020). Feasibility of using stopWatch smartwatch system for passive detection of cigarette smoking in the workplace.

Janssen, E., Le Nézet, O., Shah, J., Chyderiotis, S., Brissot, A., Philippon, A., ... & Spilka, S. (2020). Increasing socioeconomic disparities in tobacco smoking decline among French adolescents (2000–2017). Journal of Public Health, 42(4), e449-e457.

Katsaounou, P., Ioannou, M., Hyland, M. E., Odemyr, M., Spranger, O., Lindberg, A., ... & Kasujee, I. (2019). Smoking asthmatics, a neglected large phenotype of asthmatic patients. Open Journal of Asthma, 3(1), 001-008.

Khan, A., Khan, R. U. A., Ehsan, N., Khan, M. N., & Khan, A. U. (2020). UDERSTANDING THE RELATIONSHIP OF SOCIAL MEDIA USE WITH SOCIAL COMPARISON, LIFE SATISFACTION AND EMOTIONAL INTELLIGENCE AMONG YOUNG ADULTS. Ilkogretim Online, 19(3), 2964-2974.

Kim, C. W., Jeong, S. C., Kim, J. Y., Lee, J. S., Lee, J. H., Jo, S. H., & Kim, S. H. (2020). Associated factors for depression, suicidal ideation, and suicide attempt among asthmatic adolescents with experience of electronic cigarette use. Tobacco induced diseases, 18.

Kim, J. Y., Kang, H. S., Jung, J. W., Jung, S. Y., Park, H. J., Park, J. S., ... & Choi, H. S. (2021). Nicotine dependence and stress susceptibility in E-cigarette smokers: The Korea national health and nutrition examination survey 2013–2017. Tuberculosis and Respiratory Diseases, 84(2), 159.

Kotoulas, S. C., Katsaounou, P., Riha, R., Grigoriou, I., Papakosta, D., Spyratos, D., ... & Pataka, A. (2021). Electronic Cigarettes and Asthma: What Do We Know So Far?. Journal of Personalized Medicine, 11(8), 723.

Kozlowski, L. T. (2021). Nicotine addiction, Maurice Seevers, and the first surgeon general report on cigarette smoking and health: conflicting terms and interests. Journal of Studies on Alcohol and Drugs, 82(4), 536-543.

Kute, P. K., Muddeshwar, M. G., & Sonare, A. R. (2019). Pro-Oxidants and Anti-Oxidant Status in Patients of Psoriasis with Relation to Smoking and Alcoholism. Journal of Evolution of Medical and Dental Sciences, 8(34), 2677-2681.

Kwon, M., & Park, E. (2020). Perceptions and sentiments about electronic cigarettes on social media platforms: Systematic review. JMIR public health and surveillance, 6(1), e13673.

Leavens, E. L., Ford, B. R., Ojo-Fati, O., Winkelman, T. N., Vickery, K. D., Japuntich, S. J., & Busch, A. M. (2020). Electronic cigarette use patterns and chronic health conditions among people experiencing homelessness in MN: a statewide survey. BMC public health, 20(1), 1-8.

Lee, D., Lee, K. S., Kim, H., Lee, Y., Lee, M. J., Lee, H. K., ... & Lee, J. (2022). Awareness and needs of smoking cessation services for female emotional laborers, parcel delivery workers, transportation workers, and construction workers in Korea.

Lee, W. K., Smith, C. L., Gao, C. X., Borg, B. M., Nilsen, K., Brown, D., ... & Abramson, M. J. (2021). Are e-cigarette use and vaping associated with increased respiratory symptoms and poorer lung function in a population exposed to smoke from a coal mine fire?. Respirology, 26(10), 974-981.

Li, D., Sundar, I. K., McIntosh, S., Ossip, D. J., Goniewicz, M. L., O'Connor, R. J., & Rahman, I. (2020). Association of smoking and electronic

cigarette use with wheezing and related respiratory symptoms in adults: cross-sectional results from the Population Assessment of Tobacco and Health (PATH) study, wave 2. Tobacco control, 29(2), 140-147.

Lightfoot, K., Panagiotaki, G., & Nobes, G. (2020). Effectiveness of psychological interventions for smoking cessation in adults with mental health problems: A systematic review. British Journal of Health Psychology, 25(3), 615-638.

Lippi, G., Sanchis-Gomar, F., & Henry, B. M. (2020). Active smoking and COVID-19: a double-edged sword. European journal of internal medicine, 77, 123.

Livingston, J. A., Chen, C. H., Kwon, M., & Park, E. (2022). Physical and mental health outcomes associated with adolescent E-cigarette use. Journal of Pediatric Nursing, 64, 1-17.

Loud, E. E., Gallegos-Carrillo, K., Barrientos-Gutiérrez, I., Arillo-Santillán, E., Lambert, V. C., Zavala-Arciniega, L., & Thrasher, J. F. (2021). Smoking Behaviors, Mental Health, and Risk Perceptions during the Beginning of the COVID-19 Pandemic among Mexican Adult Smokers. International Journal of Environmental Research and Public Health, 18(20), 10905.

Mixdam, C. B. S., Slamet, Y., & Supriyadi, S. N. (2020). SOCIAL CONSTRUCTION AND THE MEANING OF THE USE OF ELECTRIC CIGARETTES IN FEMALE ELECTRIC CIGARETTE USERS. Advance Journal of Education and Social Sciences, 5(2).

Nandiyanto, A. B. D., & Al Husaeni, D. F. (2021). A bibliometric analysis of materials research in Indonesian journal using VOSviewer. Journal of Engineering Research.

Noshili, A. I., Batool, R., Najmi, A. A., Najmi, M. A., Abiri, H. M. A., Khubrani, F. Y. G., ... & Hamzi, J. M. (2022). Relationship Between Personality Trait, And Mental Health Well-Being, The Mediating Role Of Emotional Intelligence Among Healthcare Workers In Jizan, KSA. Journal of Positive School Psychology, 6(10), 1833-1851.

Osei, A. D., Mirbolouk, M., Orimoloye, O. A., Dzaye, O., Uddin, S. M., Dardari, Z. A., ... & Blaha, M. J. (2019). The association between e-cigarette use and asthma among never combustible cigarette smokers: behavioral risk factor surveillance system (BRFSS) 2016 & 2017. BMC pulmonary medicine, 19(1), 1-6.

Parekh, T., Owens, C., Fay, K., Phillips, J., & Kitsantas, P. (2020). Use of e-Cigarettes and Development of Respiratory Conditions in Women of Childbearing Age. Southern medical journal, 113(10), 488-494.

Perez, M. F., Atuegwu, N. C., Oncken, C., Mead, E. L., & Mortensen, E. M. (2019). Association between electronic cigarette use and asthma in never-smokers. Annals of the American Thoracic Society, 16(11), 1453-1456.

Prochaska, J. J., Watts, M. H., Zellers, L., Huang, D., Daza, E. J., Rigdon, J., ... & Henriksen, L. (2020). Inequity in California's smokefree workplace laws: a legal epidemiologic analysis of loophole closures. American journal of preventive medicine, 58(3), e71-e78.

Reddy, A., Jenssen, B. P., Chidambaram, A., Yehya, N., & Lindell, R. B. (2021). Characterizing e-cigarette vaping-associated lung injury in the pediatric intensive care unit. Pediatric Pulmonology, 56(1), 162-170.

Richardson, S., McNeill, A., & Brose, L. S. (2019). Smoking and quitting behaviours by mental health conditions in Great Britain (1993–2014). Addictive behaviors, 90, 14-19.

RODRÍGUEZ MUÑOZ, P. E. D. R. O., CARMONA TORRES, J. U. A. N., Hidalgo Lopezosa, P., Cobo Cuenca, A. I., & Rodríguez Borrego, M. A. (2019). Evolution of alcohol and tobacco consumption in young people in Spain, after the law 42/2010 against smoking: 2011-2014. Adicciones, 31(4).

Serrano-Alarcón, M., Kunst, A. E., Bosdriesz, J. R., & Perelman, J. (2019). Tobacco control policies and smoking among older adults: a longitudinal analysis of 10 European countries. Addiction, 114(6), 1076-1085.

Shah, S. H. H., Lei, S., Ali, M., Doronin, D., & Hussain, S. T. (2019). Prosumption: bibliometric analysis using HistCite and VOSviewer. Kybernetes.

Shahbal, S., Tahir, M., Khan, A., Noshili, A. I., Aljohani, T. A., Zammar, A. M. A., ... & Batool, R. (2022). Technology Addiction, Sleep Disturbance and Physical Inactivity Among Psychiatric Patients. International Journal of Clinical Skills, 16(3), 231.

Stephens, K. (2019). AJR Reviews Imaging Findings of Vaping-Associated Lung Injury. AXIS Imaging News.

Taylor, G. M., Lindson, N., Farley, A., Leinberger-Jabari, A., Sawyer, K., te Water Naudé, R., ... & Aveyard, P. (2021). Smoking cessation for improving mental health. Cochrane Database of Systematic Reviews, (3).

Thompson, M. E., Fong, G. T., Boudreau, C., Driezen, P., Li, G., Gravely, S., ... & Quah, A. C. (2019). Methods of the ITC four country smoking and Vaping survey, wave 1 (2016). Addiction, 114, 6-14.

To, T., Zhang, K., Terebessy, E., Fong, I., Zhu, J., Vozoris, N., ... & Schwartz, R. (2021). Does Vaping Increase the Odds of Asthma?: A Canadian Community Health Survey Study. In TP16. TP016 Clinical And Research Updates On Tobacco Cessation, Vaping, And E-Cigarettes (pp. A1645-A1645). American Thoracic Society.

Tokle, R., & Pedersen, W. (2019). “Cloud chasers” and “substitutes”: e-cigarettes, vaping subcultures, and vaper identities. Sociology of health & illness, 41(5), 917-932.

Veeresha, P., Prakasha, D. G., & Baskonus, H. M. (2019). Solving smoking epidemic model of fractional order using a modified homotopy analysis transform method. Mathematical Sciences, 13(2), 115-128.

Walker, C. J., & Christian, W. J. (2020). Estimating the Population Attributable Fraction of Asthma Due to Electronic Cigarette Use and Other Risk Factors Using Kentucky Behavioral Risk Factor Survey Data, 2016–2017. Substance Use & Misuse, 56(3), 353-358.

Wills, T. A., Pagano, I., Williams, R. J., & Tam, E. K. (2019). E-cigarette use and respiratory disorder in an adult sample. Drug and alcohol dependence, 194, 363-370.

Wills, T. A., Soneji, S. S., Choi, K., Jaspers, I., & Tam, E. K. (2021). E-cigarette use and respiratory disorders: an integrative review of converging evidence from epidemiological and laboratory studies. European Respiratory Journal, 57(1).

Xie, L., Chen, Z., Wang, H., Zheng, C., & Jiang, J. (2020). Bibliometric and visualized analysis of scientific publications on atlantoaxial spine surgery based on Web of Science and VOSviewer. World neurosurgery, 137, 435-442.

Yu, Y., Li, Y., Zhang, Z., Gu, Z., Zhong, H., Zha, Q., ... & Chen, E. (2020). A bibliometric analysis using VOSviewer of publications on COVID-19. Annals of translational medicine, 8(13).