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THE IMPACT OF VAPING ON PATIENTS UNDERGOING GENERAL ANESTHESIA: A LITERATURE REVIEW

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ABSTRACT

Background: *Particularly among adolescents and young adults vaping or electronic cigarettes has become more popular in recent years. In Indonesia, e-cigarette use increased significantly from 0.3% in 2011 to 3% in 2021.General anesthesia requires maintaining hemodynamic stability to avoid complications. Vaping has been linked to pulmonary and cardiovascular issues, which may complicate anesthesia management and increase risks during anesthesia. This study aims to assess patients' vaping history during preoperative evaluations.*
Method: *This research used a literature review method with the PICO framework to analyze secondary data from databases like Google Scholar, PubMed, and ScienceDirect. The search strategy involved adjusting keywords to match Medical Subject Headings (MeSH) and using Boolean operators (AND, OR) and quotation marks for precision. Keywords selected for the study were "Vaping," "Undergoing," and "General Anesthesia." Articles published between 2020 and 2025 in English or Indonesian, from reputable journals, and classified as original research, were included. Relevant studies were identified, critically appraised using the JBI tools, and synthesized into PICO tables for presentation.*
Result: *From a total of 1,965,989 articles identified through database searches, three studies met the inclusion criteria and were included in the review. The findings from these studies demonstrated that vaping is associated with several respiratory complications during general anesthesia, such as increased airway reactivity, bronchospasm, and impaired gas exchange. One case series highlighted the occurrence of hypoxia and increased oxygen requirements in patients with vaping-associated lung injury (EVALI). Another large-scale retrospective cohort study reported a slightly higher incidence of pulmonary complications among vapers compared to non-vapers; however, the difference was not statistically significant.*
Conclusion: *Vaping may increase the risk of perioperative and intraoperative respiratory complications, particularly in patients undergoing general anesthesia. The presence of harmful chemicals in e-cigarette aerosols, such as nicotine and volatile organic compounds, can exacerbate pre-existing respiratory conditions or contribute to new ones. These risks highlight the importance of including vaping history in preoperative assessments. Anesthesia providers should be vigilant in monitoring and managing airway function in patients with a history of vaping to ensure safe and effective anesthetic care.*

Keywords: *Vaping; Undergoing; General Anesthesia*

INTRODUCTION

Vaping or using of electronic cigarettes (e-cigarettes) has been linked to various chronic health outcomes (Steinert et al., 2022). However, using of electronic cigarettes has more recently gained popularity, especially among adolescents and young adults. According to the Indonesian Global Adult Tobacco Survey (GATS) Indonesia Report 2021 highlights that using of electronic cigarettes in Indonesia increased tenfold over a decade—from 0.3% in 2011 to 3% in 2021. It also notes that 34.5% of Indonesian adults use tobacco products (WHO, 2024).

General anesthesia is a cornerstone of modern surgical practice, ensuring patient safety and comfort during procedures. Maintaining hemodynamic stability throughout anesthesia is essential for optimizing patient outcomes, minimizing complications, and facilitating smooth recovery. Disruptions in cardiovascular and respiratory stability during anesthesia can lead to adverse events such as hypotension, arrhythmias, and respiratory depression, which may increase perioperative morbidity and mortality rates (Scott et al., 2024).

The rising popularity of vaping introduces new challenges in perioperative care. Vaping use has been associated with various pulmonary effects, including airway hyperreactivity, impaired gas exchange, increased susceptibility to respiratory infections, and cardiovascular diseases These effects may complicate anesthesia management, as patients who vape could be at higher risk (Novelli et al., 2022; Steinert et al., 2022).

Given the potential perioperative risks associated with e-cigarette use, it is imperative for nurse anesthetist or anesthesia provider to assess patients' vaping history during preoperative evaluations. Based on this background, the study aims to identify potential anesthesia risks in patients with a history of vaping who undergo general anesthesia.

METHODS

This research employed a literature review method using the PICO framework. Secondary data are obtained from data bases such as Google Scholar, PubMed, ScienceDirect. Search strategies includes adjusting keywords to align with Medical Subject Headings (MeSH) and combining them with Boolean operators (AND, OR), along with the use of quotation marks to enhance search precision.

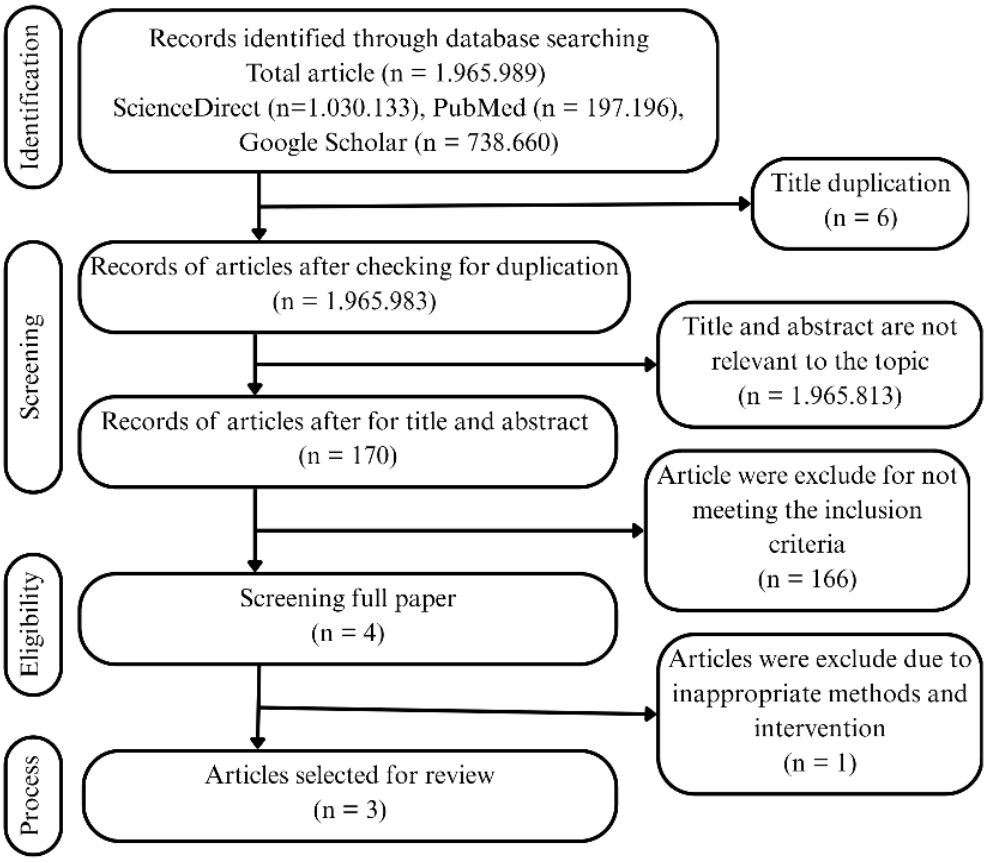

Figure 1. PRISMA Diagram Article Search

The selected keywords for this evidence-based research are “Vaping”, “Undergoing”, and “General Anesthesia”. Inclusion criteria consist of articles published between 2020 and 2025, written in either English or Indonesian, sourced from reputable national or international journals, and categorized as original research articles. The relevant studies were searched and selected, and a review was conducted along with a critical appraisal using the JBI tools instrument. Then synthesized and presented using PICO tables.

Table 1. PICO Table

PICO	Inclusion	Exclusion
Population	Patients undergoing general anesthesia (with a history of vaping/e-cigarette use)	Patients undergoing regional anesthesia
Intervention	Exposure to vaping (prior to surgery/anesthesia)	None
Comparation	None	None
Outcome	Risk of anesthesia	None

Literature searches were conducted using the PRISMA flowchart. The search process identified a total of 1,965,989 articles sourced from various databases, including 1,030,133 from Science Direct, 197,196 from PubMed, and 738,660 from Google Scholar. After removing 6 duplicate titles, 1,965,983 articles remained for screening. During the screening of titles and abstracts, 1,965,813 articles were excluded for being irrelevant to the topic, leaving 170 articles for further evaluation. There were 166 articles were excluded for not meeting the inclusion criteria, and 4 articles underwent full-text review. From this stage, 1 article was excluded due to inappropriate methods and intervention. Ultimately, 3 articles were selected and included for review and analysis.

RESULTS AND DISCUSSION

According to the reviewed studies, vaping has been found to have adverse impacts during general anesthesia. The detailed results of the review are presented in the synthesis table below:

Table 2. Article Search Result

Title	Purpose	Design	Sample	Result
Perioperative Implications of Vaping (Krishna et al., 2020)	To explore the respiratory complications associated with vaping and their implications for anesthetic care in a clinical setting.	Case report	n= 1	The study presented a case of a 16-year-old female patient who experienced respiratory complications linked to vaping, which necessitated bronchoscopy and bronchoalveolar lavage. The findings indicated that vaping can lead to significant respiratory issues, including airway reactivity and increased risk of postoperative complications, similar to those seen with traditional tobacco use. This underscores the importance of recognizing vaping as a potential risk factor in patients undergoing anesthesia.
E-cigarette, or Vaping, Product Use-Associated Lung Injury—Lessons Learned: A Case Series (Saab et al., 2024)	The study aimed to highlight the challenges and outcomes of providing anesthesia to patients with vaping-associated lung injury (EVALI) undergoing diagnostic procedures like bronchoscopy.	Case report	n = 4	The study found that patients with EVALI experienced increased airway reactivity and hypoxia during anesthesia, leading to higher oxygen requirements and complications. It emphasized the need for careful anesthesia management in these patients and the importance of vaping cessation to prevent further health issues.
The association of	The study purposes to investigate the	Retrospective cohort study of	n = 110.940	Study on noncardiothoracic surgery patients found no

Title	Purpose	Design	Sample	Result
vaping and electronic cigarette use with postoperative hypoxemia and respiratory complication: a retrospective cohort analysis (Helm et al., 2020)	association of vaping/e-cigarette use with postoperative hypoxemia and respiratory complications in adults undergoing noncardiothoracic surgeries.	110.940 patients; 1.941 were vapers.		significant link between vaping and immediate postoperative hypoxemia or pulmonary complications. However, the incidence of pulmonary complications was slightly higher in the vaping group compared to the non-vaping group, but the difference was not statistically significant, as indicated by an odds ratio of 1.04 (P = 0.84). Despite the lack of strong short-term effects, anesthesiologists should remain vigilant and further research is needed to clarify vaping's long-term impact.

Patients who use electronic cigarettes (e-cigarettes) are at risk for various perioperative and postoperative complications when undergoing general anesthesia. Among the most concerning are respiratory complications, including increased airway reactivity, bronchospasm, and impaired gas exchange, which are primarily due to inflammation and irritation of the airway mucosa. These physiological alterations pose significant challenges in maintaining adequate ventilation and oxygenation during and after surgical procedures (Cutts & O'Donnell, 2021; Krishna et al., 2020).

The inhalation of nicotine and various chemical substances contained in e-cigarettes can trigger inflammatory responses in the airways, leading to bronchoconstriction and increased airway resistance. These effects are mediated by stimulation of afferent pathways in the bronchial mucosa, which activate parasympathetic cholinergic pathways and result in bronchospasm. Furthermore, volatile organic compounds and other irritants present in e-cigarette aerosols can exacerbate airway inflammation, promote excessive mucus production, and increase the risk of airway obstruction. These pathophysiological changes may be amplified during sedation or general anesthesia, potentially leading to impaired gas exchange, reduced oxygen saturation, and a heightened risk of intraoperative bronchospasm (Cutts & O'Donnell, 2021; Kim & et.al, 2022).

Moreover, vaping-induced airway sensitivity poses a critical concern during anesthetic procedures, particularly those involving airway manipulation, such as bronchoscopy or endotracheal intubation. Inflammation and injury of the airway epithelium from e-cigarette exposure heighten the risk of acute bronchospasm and hypoxemic events, as compromised airway function impedes airflow and efficient gas exchange. As a result, patients may require higher concentrations of supplemental oxygen to maintain adequate oxygen saturation levels (Helm et al., 2020).

Emerging clinical evidence supports the link between vaping and perioperative respiratory complications. A recent study noted a slightly higher incidence of pulmonary complications in patients with a history of vaping (1.4%) compared to non-vaping individuals (1.3%), suggesting a potential association with increased anesthetic risk (Saab et al., 2024). Additionally, the presence of harmful substances in vaping products—such as vitamin E acetate and other toxic compounds—may aggravate pre-existing respiratory disorders or lead to new

complications, particularly in the high-risk environment of surgery where patients are already physiologically stressed (Krishna et al., 2020).

Given these risks, it is imperative that nurse anesthetists and anesthesiologists recognize the perioperative implications of e-cigarette use. A thorough preoperative evaluation should include assessment of vaping habits, enabling clinicians to adjust anesthetic plans accordingly and ensure vigilant intraoperative respiratory monitoring. Failure to account for vaping-related respiratory effects may lead to insufficient preparation, increased perioperative complications, and adverse patient outcomes. Therefore, understanding the impact of vaping is essential for optimizing respiratory stability and ensuring safe, effective anesthesia management (Krishna et al., 2020; Scoot, 2024).

CONCLUSION

This study concluded that the use of electronic cigarettes presents significant perioperative and intraoperative respiratory risks, especially in patients undergoing general anesthesia. The chemical components in e-cigarette aerosols can induce airway inflammation, bronchospasm, and impaired gas exchange, all of which compromise respiratory stability during surgical procedures. These effects are particularly concerning due to the heightened vulnerability of anesthetized patients and the physiological stress of surgery. Therefore, recognizing vaping as a critical factor in preoperative assessment is essential for anesthetists to tailor anesthetic management, anticipate complications, and implement appropriate respiratory monitoring strategies to ensure optimal patient safety and outcomes.

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CONFLICT OF INTEREST

Authors declared that there was no conflict of interest.

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