

Knowledge and attitude of adolescents regarding e-cigarettes: A scoping review

SADJ September 2023, Vol. 78 No.8 P383-393

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ABSTRACT

Introduction

The World Health Organization Framework Convention on Tobacco Control has informed countries to ban or regulate electronic cigarettes (e-cigarettes) because of their health adverse effects. Although e-cigarettes are regulated, their popularity has increased among teens.

Objective

To review published articles on the knowledge and attitude of adolescents regarding e-cigarettes and whether their knowledge and attitude influence their use of e-cigarettes.

Methods

Literature published from January 2012-11 March 2022 in the PubMed, Web of Science and PsycINFO databases were systematically reviewed using the SPIDER search strategy. We screened the full texts of 100 qualitative and quantitative studies that met the inclusion criteria. Of these, 68 studies were not eligible for review, leaving 32 articles: 21 quantitative studies and 11 qualitative studies.

Results

Most adolescents believed that e-cigarettes were less harmful than traditional cigarettes. Adolescents used e-cigarettes out of curiosity and the different flavours. Their

source of information came from friends, family and social media. Some adolescents believed that e-cigarettes were perfectly safe, and adolescents were influenced by tobacco companies' marketing campaigns.

Conclusion

Findings indicate that adolescents are aware of e-cigarettes; however, their perceptions of them differ. Some adolescents believe that e-cigarettes are safe, while others believe them to be harmful to health or remain unsure of their effects. Findings also revealed that adolescents' use of e-cigarettes is linked to their perceptions of them.

INTRODUCTION

Electronic cigarettes (e-cigarettes) are battery-operated devices that contain a liquid that emits a vaporised solution when heated. They are sometimes referred to as "vapes", "e-cigs", "vape pens", "e-hookahs" and "electronic nicotine delivery systems". The e-liquid comprises nicotine and flavouring chemicals within a solvent, usually propylene glycol and/or glycerine.¹ E-cigarettes entered the global market in 2004 and were often advertised by tobacco companies as a smoking cessation tool. Since their introduction e-cigarettes have undergone a rapid transformation. E-cigarette products come in the form of disposables, where the device is disposed of after the liquid is finished; open reusable systems that can be refilled with any e-liquid of choice; and closed reusable systems that have removable cartridges that can be replaced when the e-liquid is finished.²

Over the past decade, the popularity of e-cigarettes among teenagers has soared. Globally, the uptake of e-cigarettes among adolescents has increased steadily, especially in high-income countries.³ E-cigarettes are the most commonly used tobacco product among the youth with 19.6% of high school students in the United States of America (US) using these devices.⁴ Data from the 2020 National Youth Tobacco Survey in the US revealed that 550,000 middle school students and 3.02 million high school students have reported using e-cigarettes.⁴ The increased e-cigarette use among the youth over the past decade caused the Food and Drug Administration (FDA) and the US Surgeon General to declare it as an epidemic in 2018.^{5,6} In the United Kingdom (UK), the regular use of e-cigarettes by adolescents is low, with only 11.2% of 11- to 17-year-olds having tried an e-cigarette in 2021.⁷ In Australia, 14% of adolescents between the ages of 12 and 17 years old have experimented with e-cigarettes.⁸ Although these studies report a low prevalence of use, they may be subject to self-report bias. Morean et al.⁹ found that teens indicated "no" when asked if they had ever used an e-cigarette but would then report "yes" when asked about a specific electronic cigarette brand. This research suggests that the prevalence of e-cigarette use among the youth may be understated.

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Declarations

Ethics approval

Ethical approval for this study was waived by the Queen Mary Ethics of Research committee.

All authors have contributed significantly, and all authors are in agreement with the manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Authors' contributions

- | | |
|---|-----|
| 1. Dr Rutendo Kudenga (primary researcher) | 70% |
| 2. Prof Martin Vorster (scientific writing) | 20% |
| 3. Justin Yang (scientific writing) | 10% |

Acknowledgements

Dr Cheryl Tosh (University of Pretoria) for editing

Table 1. SPIDER framework used to structure the review question

S	PI	D	E	R
Sample	Phenomenon of Interest	Design	Evaluation	Research Type
12- to 17-year-old adolescents in high income countries	E-cigarette use	All study designs	Knowledge, beliefs, attitude	Qualitative, quantitative or mixed-method studies

Although studies have shown that e-cigarettes may be an effective smoking cessation tool, they have caused more harm than good, especially among adolescents.⁴ The appeal of e-cigarettes has attracted more teenagers, who would never have started smoking, to start vaping.¹⁰ E-cigarettes have also led to more teenagers who currently smoke traditional cigarettes compared to the number of teenagers who would have smoked in the absence of e-cigarettes.^{10, 11} The Theory of Planned Behaviour (TPB) has been linked to e-cigarette use. The TPB proposes that a person's subjective norms, attitudes and perceived behavioural control towards a specific behaviour are connected to their intention to carry out the behaviour.¹² For example, Hershberger et al.¹³ revealed that people who have a positive attitude toward e-cigarettes were more likely to use them. The TPB can be used to explain the rising popularity of e-cigarettes among teenagers.

Adolescents are exposed to e-cigarette advertising through social media platforms such as Tik Tok, Instagram and Facebook. Wang et al.¹⁴ concluded that adolescents who were exposed to low-impact e-cigarette advertising were more susceptible to e-cigarette use; even those who had never used cigarettes or e-cigarettes. E-cigarette advertising and promotion increases awareness and knowledge and might be a potential factor facilitating the use of e-cigarettes. In 2019, the World Health Organization Framework Convention on Tobacco Control issued a policy recommending the ban or regulation of e-cigarettes.¹⁵ These regulations should aim to prevent adolescents from using e-cigarettes.

To date, there is little data on the long-term health effects of e-cigarette use, and research investigating the adverse effects e-cigarettes is ongoing. The National Academies of Science, Engineering and Medicine released a report reviewing more than 800 studies on the health consequences of e-cigarettes.¹⁶ The report concluded that e-cigarettes have their own health risks, and although the level of known toxicants is lower than combustible cigarettes, the toxicants still cause adverse health effects.¹⁶ E-cigarette toxicants have acute effects on the immune system, the cardiovascular system and the pulmonary system.¹⁷ As of February 2020, there have been 2,807 cases of e-cigarette or vaping product use-associated lung injury (EVALI) hospitalisations and 68 deaths.¹⁸ There are many unknowns regarding e-cigarette use, but there is substantial evidence showing that e-cigarettes are potentially detrimental to your health. The purpose of this scope is to examine existing literature on adolescents' knowledge and belief of e-cigarettes and whether their perceptions are associated with the use of e-cigarettes.

METHODS

Search strategy

From 2-7 March 2022, a search was conducted on the PubMed, Web of Science and PsycINFO electronic databases. The SPIDER search strategy was used to

conduct the systemic review¹⁹ (Table 1). The sample included adolescents aged 12-17 years in high-income countries. The phenomenon of interest was e-cigarette use. The knowledge and attitude of adolescents were evaluated, and the research type included qualitative, quantitative and mixed study designs. Literature reviews, systematic reviews, meta-analyses and editorials were excluded. The search strategy used was (E-cigarettes or e-cigarettes or vaping or electronic nicotine delivery system (ENDS)) AND (adolescent or youth or teenager) AND (knowledge or perception or beliefs or attitude or opinion). The term "high-income country" was not used in the search strategy because it gave limited results. The research focused on articles published between January 2012 and 11 March 2022. The search strategy results are presented in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram²² (Figure 1).

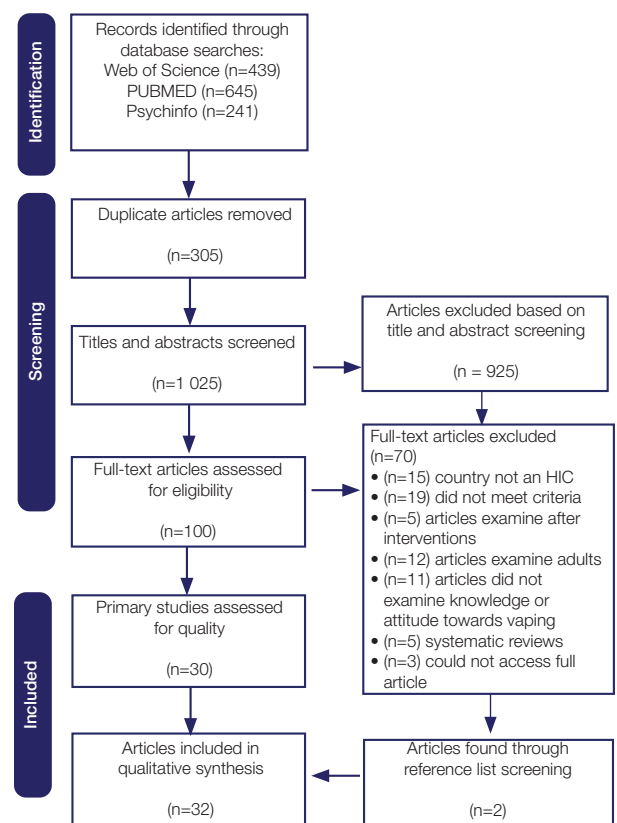


Figure 1. PRISMA flow chart to show the study selection process. Flowchart adapted from the PRISMA template.²⁰ HIC: high-income countries

Eligibility criteria and study selection

Eligible articles included peer reviewed primary research studies (quantitative, qualitative and mixed studies) published between January 2012 and March 2022. The World Bank defines high-income economies as those with a gross national income per capita of \$12,696 or more.²¹ Only primary research from the countries listed by the World

Bank as countries with high-income economies was eligible. We included studies that included participants who ranged in age from 12 to 17 years. These studies were included only if they reported results in an age stratified manner. Most countries legally view 18-year-olds as adults, and 18-year-old people can legally purchase e-cigarettes which biases their perceptions. Articles that reported on the knowledge and attitude of adolescents towards the use of e-cigarettes after interventions were excluded.

Data extraction

Data from the 32 articles were extracted and captured in a table in an Excel (Microsoft USA) spreadsheet. Information on the year of study, authors, country of study, type of

research, study design, participants, sample size, sampling methods, recruitment, response rate, results and limitations were extracted from the articles.

Study selection and results

Thirty articles were included in the study. Two additional articles were identified from bibliographies.^{22, 23} Studies were conducted in the US (n=20), UK (n=5), Finland (n=2), Hong Kong (n=1), Germany (n=1), France (n=1), Canada (n=1) and Ireland (n=1) (Table 2). Of the 32 studies, 19 were cross-sectional,^{22, 24-41} 10 were qualitative studies,^{23, 42-50} two were randomised control studies^{51, 52} and three were longitudinal studies.^{32, 43, 53}

Table 2. List of published articles included in this review (n=32)

Author	Year	Country	Title
Alexander et al ⁴²	2018	USA	Youth who use e-cigarettes regularly: A qualitative study of behaviour, attitudes, and familial norms
Ambrose et al ²⁴	2014	USA	Perceptions of the relative harm of cigarettes and e-cigarettes among US youth
Amrock et al ²⁵	2015	USA	Perception of e-cigarette harm and its correlation with use among US adolescents
Bernat et al ²⁶	2018	USA	Electronic cigarette harm and benefit perceptions and use among youth
Bold et al ⁴³	2016	USA	Reasons for trying e-cigarettes and risk of continued use
Brossier et al ⁵⁰	2020	France	Are French adolescents ready to adopt the electronic cigarette? A qualitative study of their knowledge and representations
Chaffee et al ⁵³	2018	USA	Tobacco product initiation is correlated with cross-product changes in tobacco harm perception and susceptibility: Longitudinal analysis of the Population Assessment of Tobacco and Health youth cohort
de Andrade et al ⁴⁴	2015	UK	Teenage perceptions of E-cigarettes in Scottish tobacco-education school interventions: co-production and innovative engagement through a pop-up radio project
East et al ²⁷	2018	UK	Harm perceptions of E-cigarettes and nicotine: A nationally representative cross-sectional survey of young people in Great Britain
Ebrahimi et al ²⁸	2020	USA	The road to vaping: E-cigarette susceptibility and curiosity among US adolescents susceptible and non-susceptible to cigarette smoking
El-Amin et al ⁴¹	2022	Finland	Adolescents' perceptions of harmfulness of tobacco and tobacco-like products in Finland
Fairman et al ⁴⁵	2021	USA	"You have to vape to make it through": E-cigarette outcome expectancies among youth and parents
Farrelly et al ⁵¹	2015	USA	A randomized trial of the effect of e-cigarette TV advertisements on intentions to use e-cigarettes
Ford et al ²⁹	2016	UK	Adolescents' responses to the promotion and flavouring of e-cigarettes
Giovacchini et al ³⁰	2017	USA	Use and perceived risk of e-cigarettes among North Carolina middle and high school students
Gorukanti et al ³¹	2017	USA	Adolescents' attitudes towards e-cigarette ingredients, safety, addictive properties, social norms, and regulation
Hammal et al ⁴⁶	2016	Canada	Exploring attitudes of children 12-17 years of age toward e-cigarettes
Hansen et al ³⁸	2018	Germany	Electronic cigarette marketing and smoking behaviour in adolescence: a cross-sectional study
Hanafin et al ³²	2021	Ireland	Friends and family matter most: a trend analysis of increasing e-cigarette use among Irish teenagers and socio-demographic, personal, peer and familial associations
Hilton et al ⁴⁷	2016	UK	E-cigarettes, a safer alternative for teenagers? A UK focus group study of teenagers' views
Jiang et al ³⁹	2016	Hong Kong	Electronic cigarette use among adolescents: a cross-sectional study in Hong Kong
Johnson et al ⁴⁸	2017	USA	A qualitative study of adolescent perceptions of e-cigarettes and their marketing: Implications for prevention and policy
Kinnunen et al ⁴⁰	2015	Finland	Awareness and determinants of electronic cigarette use among Finnish adolescents in 2013: a population-based study

Kwon et al ³³	2018	USA	Predictors of youth e-cigarette use susceptibility in a US nationally representative sample
Less et al ⁴⁹	2021	USA	"If someone has it, I'm gonna hit it": Lessons learned from Minnesota teens about vaping
Padon et al ⁵²	2018	USA	A randomized trial of the effect of youth appealing e-cigarette advertising on susceptibility to use e-cigarettes among youth
Park et al ²³	2019	USA	Listening to adolescents: Their perceptions and information sources about e-cigarettes
Pepper et al ³⁴	2018	USA	Adolescents' understanding and use of nicotine in e-cigarettes
Pepper et al ²²	2016	USA	Adolescents' interest in trying flavored e-cigarettes
Rohde et al ³⁵	2018	USA	The role of knowledge and risk beliefs in adolescent e-cigarette use: A pilot study
Tackett et al ³⁶	2021	USA	Adolescent susceptibility to e-cigarettes: An update from the 2018 National Youth Tobacco Survey
Weishaar et al ³⁷	2016	UK	'Maybe they should regulate them quite strictly until they know the true dangers': a focus group study exploring UK adolescents' views on e-cigarette regulation

A thematical analysis was carried out to identify patterns in the research articles. Five themes emerged from the articles (Figure 2):

1. Source of e-cigarette information
2. Perceived harmfulness of e-cigarettes versus traditional cigarettes
3. E-cigarette initiation
4. Determinants of e-cigarette use
5. E-cigarette knowledge and beliefs

Source of information

Five studies discussed the source of e-cigarette information.^{27,39,40,42,44} The studies reported that adolescents got their information from family and/or friends. The information either resulted in a positive or negative attitude toward e-cigarettes. The studies also reported that social media applications such as Facebook, YouTube and Twitter influenced their perception. Some adolescents reported seeing music videos with rappers doing vape tricks and

it was appealing.⁵⁰ Other sources of information included e-cigarette advertisement billboards, posters and television.

Determinants of e-cigarette use

The environment surrounding adolescents determines whether they are susceptible to e-cigarette use. Adolescents who were surrounded by friends who vape have a higher chance of joining than adolescents who were not surrounded by people who vape. When participants were asked what would help them to stop using e-cigarettes, they responded that they would stop vaping if they were "not being around friends who use them".⁴² Second-hand smoke exposure, even in public spaces, is also associated with increased susceptibility to e-cigarette use.³³ In the US, 8 million adolescents were exposed to e-cigarette use in 2018. In another study participants reported that they used e-cigarettes because they were cheaper and easier to hide from their parents.⁴³ Similarly, Scottish adolescents also reported that e-cigarettes were more accessible and cheaper than traditional cigarettes.⁴⁴ Participants

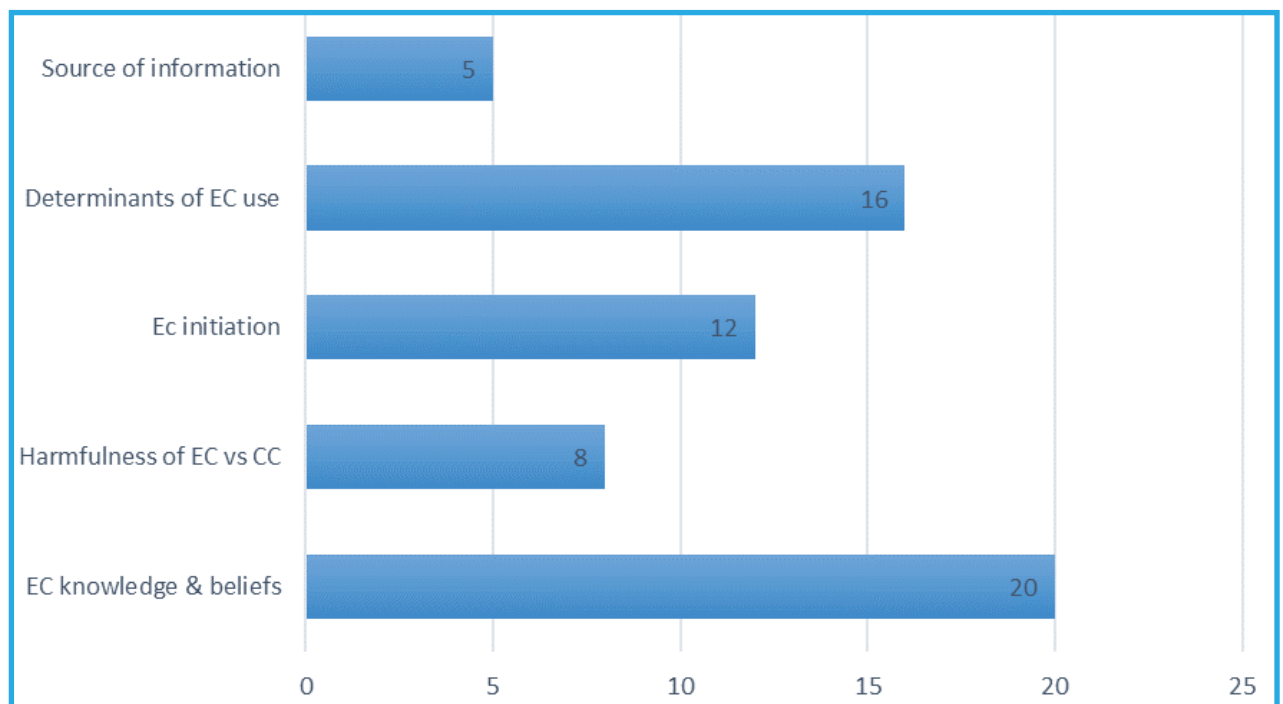


Figure 2. Number of articles that reported on the different themes. EC, e-cigarette; CC, conventional cigarette

in a qualitative study reported that advertisements conveyed that e-cigarettes were “cool” and gave the impression that e-cigarettes were “safer” or “better” than combustible cigarettes.⁴⁸ A randomised trial reported that e-cigarette advertising was persuasive and engaged adolescents effectively.⁵¹ The experiment showed that being exposed to four e-cigarette advertisements changed non-user adolescents’ attitudes to be more positive and more favourable, and resulted in intentions to try them in the future. In a qualitative study conducted in France, one participant reported that advertising specifically targeted young people and motivated them to start using e-cigarettes.⁵⁰

E-cigarette initiation

Twelve studies explored the reason for initiating e-cigarettes.^{22, 23, 28, 29, 32, 34, 42-45, 50, 53} Adolescents initiated e-cigarettes because they were curious, and there is a vast array of flavours. They viewed the device as something cool and fun to use because of its sleek design. The different flavours and colours of the e-liquid were appealing to adolescents. Adolescents were more interested in trying fruity, sweet flavours such as bubble gum and menthol compared to flavours such as alcohol and tobacco. Adolescents also believed that candy flavoured or fruit-flavoured e-liquid were less harmful than tobacco or alcohol flavours.²² Therefore, they were more likely to initiate e-cigarette use due to the perceived harmlessness of the fruity flavours. Friends and family have a big influence on whether adolescents initiate e-cigarette use. When family members or friends use e-cigarettes, adolescents tend to have a more positive attitude. Some participants said that they would try e-cigarettes if a friend gave it to them.³⁹ Adolescents, especially high school students, also took up vaping because they could perform tricks using e-cigarettes.⁴²

Perceived harmfulness of e-cigarettes versus traditional cigarettes
Eight studies reported that adolescents believed e-cigarettes were less harmful compared to traditional cigarettes.^{23-26, 46-48, 51} Some 30% to 80% of adolescents believed that e-cigarettes were less harmful. In the UK, participants believed that e-cigarettes were less toxic because they contained no tar or chemicals, and they associated the smoke with water vapour.⁴⁴ However, in three quantitative studies from the US, between 15% and 22% of participants believed that e-cigarettes were as harmful as traditional cigarettes.²⁴⁻²⁶ A minority (2%-5%) of participants believed that e-cigarettes were more harmful. Between 10% and 50% did not know or were unsure of the harmful extent of e-cigarettes. E-cigarette users (71.8%) were more likely to report that e-cigarettes were less dangerous than traditional cigarettes while 31% of non-users were less likely to report that e-cigarettes were less dangerous.²⁵

E-cigarette knowledge and beliefs

Twenty studies^{22-26, 30-35, 37, 39-42, 44-47, 49, 50} which reported on adolescents’ knowledge of e-cigarettes was high (70%-85%) in all countries except for Canada. Most of the participants from Canada showed very little or no knowledge of e-cigarettes.⁴⁶ The studies revealed an increasing awareness with age, therefore more participants in high school were e-cigarette users. Adolescents believed that e-cigarettes were either perfectly safe, harmful to health or not harmful at all. Risk beliefs seemed to determine e-cigarette use. Susceptible e-cigarette users, adolescents who had tried e-cigarettes (ever users) and electronic regular users believed that e-cigarettes were not harmful. Few adolescents believed that the smoke produced by the e-cigarette was water vapour. In one study, some participants (23%) believed that e-cigarettes were not tobacco products.³¹

Nine studies reported on whether participants were aware of the

nicotine content in e-cigarettes,^{22, 27, 34, 39, 40-42, 44, 46} with only one in five adolescents being unsure or not believing that e-cigarettes contained nicotine.²² Adolescents who were unsure of the nicotine level in their devices had been given a device by a family member or a peer. Some participants associated nicotine content with the colour of the e-cigarette liquid believing that the darker the liquid the higher the nicotine content. Other participants associated nicotine content with the physical effects, strong taste and a feeling of light-headedness. Most participants had a misperception about the nicotine in e-cigarettes.²² In one study, half of e-cigarette users who vaped with nicotine and more than half of users who usually vaped without nicotine believed that the nicotine in their devices was artificial or “chemically engineered”.^{34, 42} Some participants believed that nicotine caused little harm.^{27, 44}

Fourteen studies reported on the perceived benefits of e-cigarettes.^{22, 26, 31, 36, 37, 42-50} Some participants said that e-cigarettes could be used as a smoking cessation tool, helping teens who struggle to quit smoking. Other participants described e-cigarettes as a coping mechanism to help reduce anxiety.^{26, 45, 49} One study reported that 31% of adolescents, mostly e-cigarettes users, believed that e-cigarettes reduce stress.²⁶ Participants in two studies believed that second-hand smoke from e-cigarettes was harmless to the public.^{36, 46}

DISCUSSION

It is evident from the reviewed articles that various factors influence e-cigarette use among adolescents. The belief that e-cigarettes are less harmful than traditional cigarettes was associated with e-cigarette use. E-cigarette users are more likely to self-report a positive perspective of e-cigarettes than non-users, this was shown in the studies conducted in the US.^{25, 26, 27} E-cigarette use was associated with a favourable social environment. Adolescents with friends and/or family members who use e-cigarettes were more likely to use them. Their exposure to the devices and e-cigarette advertisements gave them a positive perception towards them and increased their likelihood to use them.³⁸

This review shows that adolescents aged 12-17 in high-income countries have mixed perceptions regarding e-cigarettes. Most adolescents reported that e-cigarettes are less harmful than traditional cigarettes, and some adolescents believed e-cigarettes were not harmful. Adolescents also believed e-cigarettes contained artificial nicotine and were therefore less addictive and safer than traditional cigarettes.^{34, 42} However, one device being less harmful than the other does not mean that it is harmless. The long-term effects of e-cigarettes are not yet fully understood and there is a lack of clear evidence on their health impact.

Currently, public health has not reached consensus about whether e-cigarettes are less harmful than traditional cigarettes. Literature suggests that adolescents are not sure of how harmful e-cigarettes are, which might be due to this lack of public health consensus. More evidence suggests that e-cigarette use is linked to smoking addiction, especially in adolescents.⁵⁴ Supporters of e-cigarettes believe that their devices replace high-risk behaviour, such as smoking traditional cigarettes, with a far less harmful one. In contrast, the opponents of e-cigarettes focus on the risks to adolescents.⁵⁵ There is no conclusive evidence that proves e-cigarettes can be used as a smoking cessation tool.⁵⁶ Despite the lack of evidence, e-cigarettes have been promoted as a smoking cessation tool in England’s Public Health campaign.⁵⁷ In contrast, the FDA has not approved e-cigarettes as a smoking cessation tool due to the lack of concrete evidence.⁵⁸ Further, e-cigarette companies do not encourage smoking cessation; they encourage a long-term swap.^{59, 60} The risk profile of e-cigarettes is still evolving

and it is a work in progress, but countries must consider that e-cigarettes pose a health risk and adolescents need to be informed about these health risks.

E-cigarette advertising conveys misinformation surrounding the safety of e-cigarettes to the public. Advertising companies design appealing content by portraying their devices as being fashionable and “cool” by using celebrities. Although companies state that they do not intend to advertise to the youth, their advertisements are appealing to the youth and impact their perception of devices.⁵¹ The effect of e-cigarette marketing on adolescents shows that there are few regulations, which are not strongly enforced. Adolescents report seeing e-cigarettes on social media although there are restrictions.⁵⁰ E-cigarette company JUUL Labs’ marketing campaign was investigated for two years by 33 states in the US. They discovered that JUUL marketed its e-cigarettes to teens through social media posts and launch parties. JUUL settled lawsuits by paying more than \$440m. JUUL Labs has lawsuits against it from teens who say they have become addicted to its e-cigarette product.⁶¹ E-cigarette advertising plays a major role in the teen vaping epidemic, and they have the potential to “renormalise” smoking in the form of vaping and reverse decades of work that public health campaigns have achieved towards tobacco denormalisation.⁶²

The TPB explains why adolescents use e-cigarettes (Figure 3). According to the TBP, perceptions play an important role on whether adolescents initiate e-cigarette use. Adolescents have a more favourable attitude towards e-cigarettes because of the vast array of flavours, especially sweet flavours. E-cigarettes also have a sleek design and colourful packaging, which influences adolescents’ perceptions. E-cigarettes are easily accessible and are used as a coping method to help teens manage their stress and anxiety. Adolescents who have an unfavourable attitude believe that e-cigarettes are addictive and harmful or that e-cigarettes are a gateway to other risky behaviours. Adolescents are further pressured to start vaping if they are exposed to second-hand smoke and having their family and peers vape around them. E-cigarette marketing, including celebrities using e-cigarettes and doing tricks, also creates social pressure. Most adolescents who

have family members or peers informing them of harmful effects do not initiate vaping. Non-motivational factors such as availability of resources and favourable opportunities to perform the behaviour represent the individual’s control over the behaviour. Adolescents like that they can conceal e-cigarettes from their parents, unlike traditional cigarettes. Adolescents can use e-cigarettes indoors and outdoors. All these factors are determinants that either increase or decrease the intention to use an e-cigarette.

LIMITATIONS

The studies included in this review were conducted in France, Germany, the UK, Finland, Canada, Ireland and Hong Kong. Studies in other high-income countries such as Australia or New Zealand could not be identified. Studies from the US made up two-thirds of the total number of studies. The lack of studies from other countries limits our understanding of adolescents’ knowledge and attitude toward e-cigarettes globally. Global information could help countries to develop interventions to stop e-cigarette use among adolescents. The scope was conducted by a single reviewer. Ideally, studies should be reviewed by two or more reviewers to reduce the risk of bias. Very few studies reported on the source of e-cigarette information. Future studies need to include questions on sources of information.

CONCLUSION

Findings indicate that adolescents are aware of e-cigarettes; however, their perceptions of them differ. Some adolescents believe that e-cigarettes are safe, while others believe them to be harmful to health or remain unsure of their effects. The study reveals that there is an association between adolescents’ perceptions and e-cigarette use. Besides this association the exposure to e-cigarette advertising is significantly associated to e-cigarette use. Governments need to rethink regulations on e-cigarette advertising campaigns to reduce the number of adolescents initiating e-cigarette use. More research is needed to investigate the sources of e-cigarette information. This information will give public health officials an understanding of adolescent e-cigarette use so that misperceptions can be addressed to reduce the prevalence of e-cigarette use.

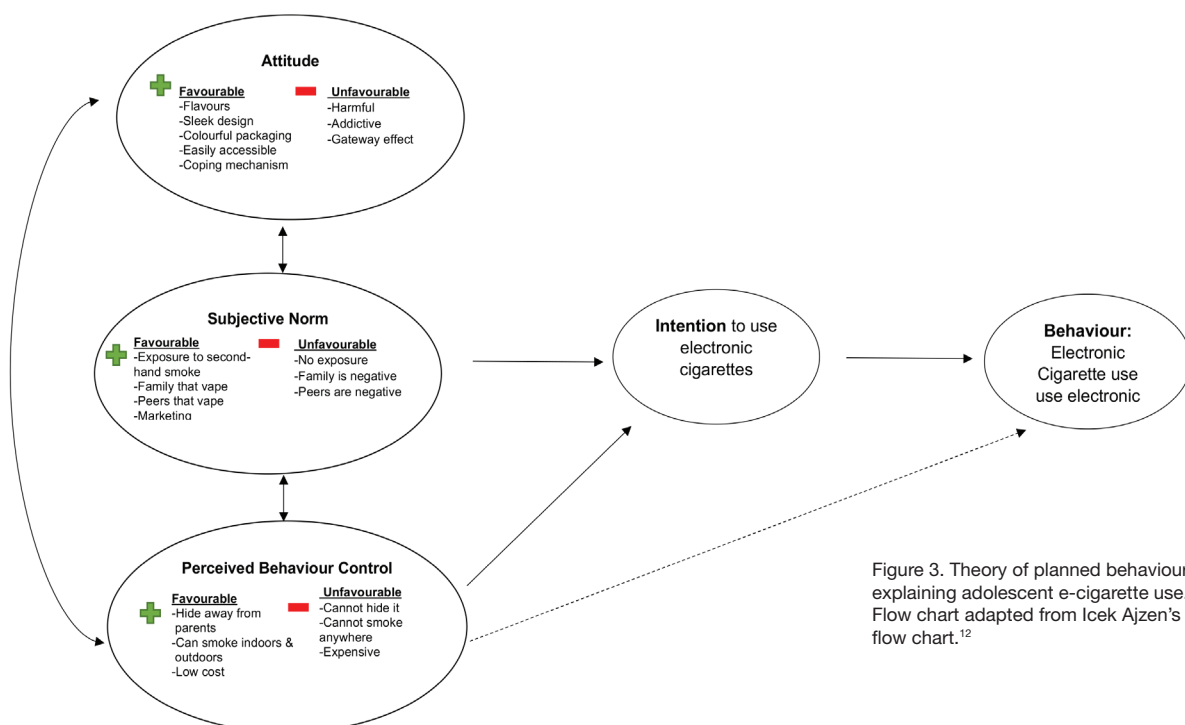


Figure 3. Theory of planned behaviour explaining adolescent e-cigarette use. Flow chart adapted from Icek Ajzen’s flow chart.¹²

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