Title: The risk of adverse pregnancy outcomes compared to lack of e-cigarette smoking exposure: a systematic review

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Abstract

E-cigarette use has been reported to be 7% among pregnant women. Nearly half believe they are less dangerous than regular cigarette smoking, which might encourage individuals to give up or cut back on traditional cigarette use while pregnant. However, studies have found a correlation between using e-cigarettes while pregnant and a higher risk of low birth weight and fetal development limitation. This is an updated systematic analysis of publications from 2019 to 2022 that explored the adverse effects of e-cigarette smoking on pregnancy outcomes compared to no e-cigarette use. Google scholar and PubMed databases were used for systematic literature search using keywords "e-cigarette, pregnancy, adverse effects, exposure to e-cigarettes, and lack of e-cigarette exposure." The inclusion criteria were the original research that detailed the adverse effects of e-cigarette smoking on pregnancy outcomes compared to no e-cigarette smoking and full-text articles. Among 160 articles collected, just 9 met the inclusion requirements. Seventy-six thousand four hundred ninety-seven people were involved in all the studies, six of which were cross-sectional, one prospective, and one qualitative. Few pregnant women believe e-cigarettes are a healthy alternative to conventional smoking. However, half of the participants thought vaping was harmful to both them and their developing fetuses. On the other hand, several studies revealed that infants exposed to cigarette and e-cigarette smoke had significantly more defective reflexes. Their younger age influenced women's use of e-cigarettes, lack of marriage, fewer years of formal education, living with a smoker, long-term smokers, high school education or more, an income of $30,000, being white and not of Hispanic origin.

Keywords: E-cigarette, pregnancy, adverse effects, exposure to e-cigarettes, lack of e-cigarette exposure.
1. Introduction

Over the past ten years, e-cigarettes (EC) have gained increased popularity on a global scale. EC are electronic nicotine delivery systems (ENDS) that aerosolize a liquid mixture of nicotine, propylene glycol, and vegetable glycerin using a battery-powered heating element [1]. Because vaping fluid composition varies, liquids from various brands and users' tastes have different nicotine amounts [2]. The addition of flavours may have boosted EC's popularity, especially among teenagers and expectant mothers. Pregnancy-related changes in taste, cravings, sickness and increased sensitivity to bitter flavours are all significant factors in the favour of flavoured foods for pregnant women [3]. An estimated 7% of pregnant women use e-cigarettes. Nearly half of them believe they're less harmful than regular cigarettes and could even help them stop or cut back on traditional smoking while pregnant. [4]. This approach goes against a US Preventive Services Task Force (USPSTF) statement that there is insufficient evidence to support the use of e-cigarettes as a method for helping smokers, including those who are pregnant and nonpregnant, quit [5]. Current findings on humans have revealed that using e-cigarettes increases the risk of lung damage [6]. Previous animal research has shown that e-cigarette exposure in the mother resulted in offspring with neurodevelopmental abnormalities, decreased lung development, shorter crown-rump length, overweight neonates, and higher oxidative stress and inflammation levels [7]. Recent human epidemiological studies have discovered that using e-cigarettes during pregnancy increases the risk of low birth weight and fetal development restriction [8, 9]. These neurobehavioral anomalies, which include psychomotor, cognitive, and emotional development, have been connected to late infant development [10]. Additionally, low birth weight in children born to smoker moms indicates prenatal development restriction, which is thought to be related to CO exposure reducing the oxygen-carrying capacity of the fetal blood [11]. Some people consider e-cigarettes and nicotine replacement therapy (NRT) to be harm reduction strategies, and literature in pregnancy health guides claims that nicotine on its own is relatively safe [12]. However, there is growing concerned over the safety of nicotine exposure for a developing fetus in light of e-cigarettes' increased popularity [13]. The risks of EC smoking during pregnancy are mostly unknown. However, evidence suggests that even EC aerosols free of nicotine could be detrimental to the developing fetus. To assess the function of placental cells exposed to flavourless EC without nicotine, HTR8/SVneo cells made from human chorionic villi-transfected cells were used. The results showed a significant decrease in trophoblast impairment and angiogenesis functions, which are crucial for placental circulation [14]. These findings indicate that exposure to EC aerosols may cause placental cells to become sensitive even without nicotine [15]. Therefore, our study aims to assess the negative effects of e-cigarette smoking on pregnancy versus no e-cigarette smoking.
2. Method and Search Strategy
This review followed the PRISMA checklist guidelines for systematic reviews and meta-analyses [16]. The PubMed and Google Scholar databases were each searched separately. For example, to find papers on our main subject, "the adverse pregnancy outcomes related to e-cigarette smoking compared to lack of e-cigarette smoking," the two databases were searched. The studies' publications span the years 2019 and 2022. Several keywords, such as "e-cigarette, pregnancy, adverse effects, exposure to e-cigarettes, lack of e-cigarette exposure," were included during the search. Additionally, all pertinent articles were gathered using the relevant keywords. Finally, all titles were revised as a result of this initial investigation.

3. Eligibility Criteria
After carefully examining the titles of the retrieved articles, only studies emphasizing the adverse effects of e-cigarette smoking on pregnancy outcomes, as opposed to the absence of e-cigarette smoking, were included. However, articles highlighting the negative impact of e-cigarette use during pregnancy that were published before 2019 were disregarded. In the second step, only original, English-language studies on the negative effects of e-cigarette smoking on pregnancy outcomes were chosen after carefully reading their abstracts in the remaining articles. However, case reports, editor letters, and review articles were not included. The final stage had original English-language articles that detailed the negative effects of e-cigarette use on pregnancy outcomes compared to no use of e-cigarettes; these articles were further examined to weed out duplicates, non-available full-text articles, and articles with unsatisfactory content, such as articles with overlapped or incomplete data. Figure 1 presents a comprehensive overview of the search approach.
4. Data Reviewing and Analysis

Articles were reviewed for abstracts and the full text to extract the data of interest and transfer data into a pre-designed excel sheet. The selected data were then revised through the excel sheet, and then the data was transferred to one stable to summarize the chosen data to facilitate the analysis of data.
5. Results

For this systematic review, nine studies were eligible [16-24] (Table 1). The included studies were either published in 2019 [24], 2020 [20-23], 2021 [17-19], or 2022 [16]. Six studies were cross-sectional [16 23], while one study was prospective [24], and one qualitative study [21]. The included studies involved 76497 individuals. The study population was pregnant women in eight of the nine studies [16-24], while one study was conducted on infants [22]. The mean age of participants was 18-45 in one study [17], while one study was carried out on infants at one month of age [22]. Three studies were conducted in the US [17, 19, 24], one between May and December 2017 [17], another one between 2016–2017 [19], and the last one between August 2015 and February 2016 [24]. Two studies used telephone surveys [21, 23], while one was done via an online survey [17]. In addition, one study used a postal survey [18], another study used a text messaging program [24], and another study used data from the multi-site Pregnancy Risk Assessment Monitoring System [19]. Four studies evaluated the prevalence of vaping during pregnancy and explored the factors and outcomes associated with vaping in pregnancy [18, 19, 23, and 24]. Two studies compared prenatal e-cigarette exposure to prenatal cigarette exposure [17, 22], while one study [16] examined associations between prenatal e-cigarette use to pregnancy and birth outcomes. Two studies assessed pregnant e-cigarette usage, smoking habits, and women's vaping experiences, specifically how vaping to quit smoking is aided and how challenges are addressed. [20, 21]. The prevalence of vaping in pregnancy was reported in four studies [16, 18, 23, and 24], with 1% in one study [16], 2.8% in another study [18], 4% in another [23], and 17.29% in one previous study [24]. In one study, 27.3% of pregnant women reported conventional cigarette use without e-cigarette use [23], and 3.2% used e-cigarettes and one other tobacco product in another study [16]. The pattern of cigarette smoking in pregnancy was documented in three studies [18, 20, and 23]. In one study [18], 0.3% were never-smokers; 3.3% were ex-smokers; 7.7% were pregnancy-inspired quitters; 9.5% were temporary quitters; and 17.7% were persistent smokers. In a separate study [20], 41% of participants smoked an e-cigarette daily, about eight times a day on average. One pack of cigarettes per day was smoked by 11% of dual users. Still, in another research [23], conventional cigarette use without e-cigarette use was reported by 27.3% of participants. Nine hundred thirty-nine participants (68.8%) reported not using tobacco or nicotine replacement treatment (NRT) products throughout preconception or pregnancy. 74% of female e-cigarette users admitted to also smoking traditional cigarettes.

Two studies [16, 18] found no significant associations between e-cigarettes and adverse pregnancy or birth outcomes. According to one study, using e-cigarettes within the previous 30 days did not increase the risk of a poor pregnancy or birth outcome [16]. However, using tobacco products other than e-cigarettes within the last 30 days did increase the risk of a poor pregnancy outcome in multivariable models but not of a poor live birth outcome. The probability of giving birth or having a healthy pregnancy was not affected by previous 30-day e-cigarette usage during pregnancy compared to prior 30-day cigarette consumption [16]. Another study [18] found no association between vaping and preterm birth, birth weight, or breastfeeding. However, in a different study [22], newborns exposed to cigarettes and e-cigarettes showed a considerably higher frequency of aberrant reflexes.
According to a study [22], birth outcomes, such as birth weight, gestation, and head circumference, did not differ between newborns exposed to e-cigarettes and those not exposed to nicotine during pregnancy. However, infants exposed to e-cigarettes showed somewhat lower self-regulation and slightly lower motor maturity, while infants exposed to cigarettes performed significantly worse on both measures. Another study found that e-cigarette users were more likely to experience depressive symptoms, have a history of severe mental illnesses, drink alcohol during pregnancy, and use marijuana or other drugs before conception. More than half of the participants in one study [20] believed e-cigarettes were bad for women (56%) and harmful to the fetus (53%). In addition, participants who planned to be pregnant reported higher endorsement that combustible smoking cigarettes would cause a miscarriage or increased blood pressure for a child than currently pregnant participants in another study [17]. In contrast, another study found that positive beliefs toward vaping and becoming proficient at it were considered ways to overcome barriers to vaping [21]. Participants reported healthcare providers asked about, advised them not to use, and talked to them about the health effects of smoking combustible cigarettes while pregnant significantly more than e-cigarettes in one study [17]. The factors associated with vaping in pregnancy were reported in two studies [18, 23]. In a study [18], women who were younger, unmarried, had fewer years of formal education, lived with a smoker, and were long-term smokers were more likely to vape. Another study [23] found that women who smoked traditional cigarettes were more likely to be white, non-Hispanic, and to have completed high school or higher. The risk factors for e-cigarette use were reported in two studies [18, 19]. In one study [19], conventional cigarette use was a strong risk factor for e-cigarette smoking and persistent smoking in another [18]. In another study [20], a quarter of women who used e-cigarettes before pregnancy continued to use e-cigarettes during pregnancy. The primary reason for using e-cigarettes during pregnancy was quitting, as indicated in one study [24]. However, the main smoking cessation result was not shown to be associated with baseline e-cigarette use.
6. Discussion

E-cigarettes have become more popular due to advertising that positions them as a healthy alternative to conventional smoking. However, the FDA has not yet authorized e-cigarettes for smoking cessation. Peer and familial influences and the attractiveness of adopting new technology appear to entice girls to the habit more than males, presumably due to females' increased propensity to use social media [25]. E-cigarettes' potential health risks are underreported. Pregnant e-cigarette users have approximately the same risk of preterm delivery as non-users but a higher chance of limited fetal development [26]. According to recent findings, e-cigarettes may cause lung damage. Adolescent nicotine usage can result in negative cognitive repercussions lasting into adulthood [8]. According to recent findings, e-cigarettes may cause lung damage [10]. There is limited data on female e-cigarette consumption in Arab nations. In Saudi Arabia, e-cigarette smoking among health sciences university students was 27.7%, about double the incidence of traditional smoking [27]. The rising popularity might be attributed to various factors, including the ability to provide entertainment, the opportunity to try something new, and a smoking cessation technique. The present systematic review aimed to assess the current studies on the adverse pregnancy outcomes due to e-cigarette smoking compared to the lack of e-cigarette smoking. In the current review, the prevalence of vaping in pregnancy was reported by Cohn et al. (2022), Opondo et al. (2021), Rollins et al. (2020), and Chiang et al. (2019). Cohn et al. reported a prevalence of 1%, while Opondo et al. reported 2.8%. Rollins et al. reported a prevalence of 4%, while Chiang reported 17.29%. Rollins et al. showed that 27.3% of pregnant women reported conventional cigarette use without e-cigarette use, whereas Cohn et al. found that 3.2% used e-cigarettes and one other tobacco product. According to Hawkins et al. (2020), vaping in the last three months of pregnancy ranged from 0.6% in New York City to 4.4% in West Virginia; 0.5% of pregnant women who did not smoke throughout pregnancy used vaping goods [28]. In one major survey by Liu et al. (2019), the prevalence of vaping among pregnant (3.6%) and nonpregnant (3.3%), although the prevalence of smoking was considerably lower among pregnant women (8.0%) than nonpregnant women (14.3%) [4]. The pattern of cigarette smoking in pregnancy was documented by Opondo et al. (2021), McCubbin et al. (2020), and Rollins et al. (2020). According to Opondo et al., 0.3% of participants had never smoked, 3.3% had quit smoking, 7.7% had stopped because of pregnancy, 9.5% had only stopped temporarily, and 17.7% had continued. According to research by McCubbin et al., 41% of e-cigarette users use them on average eight times daily. One pack of cigarettes per day was smoked by 11% of dual users. Contrarily, according to Rollins et al., 74% of women using e-cigarettes also reported using conventional cigarettes, compared to 27.3% of pregnant women who reported using conventional cigarettes but not e-cigarettes and 68.8% who reported using no tobacco or nicotine replacement therapy (NRT) products during the preconception period or pregnancy. A cross-sectional study by Kondracki et al. (2019) showed that smoking was reported by about 9.4% of women before pregnancy and 7.1% during pregnancy, both at high and medium intensity and smoking rates were greater in the first trimester (7.1%) than in the second (6.1%) or third (5.7%) trimesters [29]. Cohn et al. (2022) and Opondo et al. (2021) found no significant associations between e-cigarettes and adverse pregnancy or birth outcomes. According to Cohn et al., in the past 30
days, e-cigarette use during pregnancy was not linked to an elevated risk of unfavourable pregnancy or birth outcomes (2022). Furthermore, Cohn et al. demonstrated that prior 30-day non-e-cigarette tobacco use was linked to an elevated risk of a poor pregnancy outcome but not poor live birth results in multivariable models. The odds of having a baby or having a healthy pregnancy were not any lower for past 30-day e-cigarette usage during pregnancy than for previous 30-day cigarette use. Opondo et al. found no association between vaping and preterm birth, birth weight, or breastfeeding. However, Froggatt et al. (2020) hypothesized that newborns exposed to cigarette and e-cigarette smoke had a markedly higher proportion of faulty reflexes compared to children who weren't exposed to nicotine prenatally, birth outcomes like birth weight, gestation, and head circumference didn't change for newborns exposed to e-cigarettes. A study by Regan et al. (2021) that showed that using electronic cigarettes before becoming pregnant was not connected with worse delivery outcomes supports the earlier findings. Compared to non-users, usage of electronic cigarettes during pregnancy was linked to a higher prevalence of low birth weight [7]. In the present review, McCubbin et al. (2020) reported that more than one-half of participants believed e-cigarettes were harmful to women (56%) and posed harm to the fetus (53%). In addition, participants who planned to be pregnant reported higher endorsement that combustible smoking cigarettes would cause a miscarriage or increased blood pressure for a child than currently pregnant participants, as indicated by Dobbs et al. (2021). In contrast, Bowker et al. (2020) found that positive beliefs toward vaping and becoming proficient at it were considered ways to overcome barriers to vaping. A study by Wagner et al. (2017) found that the majority of women (64.27%) believed that e-cigarettes are safer than conventional cigarettes [30]. Another study by Ford et al. (2021) showed that pregnant smokers who were given e-cigarettes and vaped had favourable opinions about the importance of vaping for smoking cessation that overcame worries about vaping [31]. Furthermore, in the current study, Dobbs et al. (2021) demonstrated that participants reported healthcare providers asked about, advised them not to use, and talked to them about the health effects of smoking combustible cigarettes while pregnant significantly more than e-cigarettes. A study by Gallegos-Carrillo et al. (2020) stated that smokers who also used e-cigarettes (dual users) were more likely to have addressed e-cigarettes with their healthcare provider than exclusive smokers who had recently attempted to quit smoking. In their attempt to quit smoking, e-cigarettes were used by 53.3% of smokers who had talked about them. In addition, compared to exclusive smokers and non-daily smokers, dual users and daily smokers were more likely to report being led by their healthcare provider to use e-cigarettes in the quitting attempt [32]. The current results suggested that the factors associated with vaping in pregnancy were Women who were younger, unmarried, had fewer years of formal education, lived with a smoker, and were long-term smokers were more likely to vape, as indicated by Bowker et al. (2020). At the same time, Rollins et al. (2020) found that high school education or greater, income <$30,000, white race, and non-Hispanic ethnicity than women who used conventional cigarettes were the factors associated with vaping during pregnancy. Kondracki et al. (2019) reported that non-Hispanic White women, women aged 20 to 24, and women with a high school education or less are the most likely to smoke at any stage during pregnancy [29].
Finally, our findings indicated that conventional cigarette use was a strong risk factor for e-cigarette smoking, as shown by Liu et al. (2021), and persistent smoking, as indicated by Oondo et al. (2021). In addition, According to McCubbin et al. (2020), a quarter of pregnant women who had previously smoked e-cigarettes did so again. Regan et al. (2021) findings, which demonstrated that pre-pregnancy smoking was a risk factor connected with e-cigarette use, confirm our findings [7]. The primary reason for using e-cigarettes during pregnancy was quitting, as indicated by Chiang et al. (2019). A previous study by Bowker et al. (2018) showed that e-cigarettes are used to quit smoking by women during pregnancy [33].
6. Conclusion

In conclusion, our investigative analysis shows that, despite being aware of the health concerns associated with cigarette smoking, women continue to smoke throughout pregnancy for various reasons. Few women believe that e-cigarettes are an excellent alternative to conventional smoking. However, half of the participating women considered vaping harmful to them and their fetuses. Confusing evidence about the pregnancy outcomes of smoking women was reported. Some studies showed no association between exposure to smoking and pregnancy and birth outcomes. Contrarily, other research showed that newborns exposed to cigarettes and electronic cigarettes had a considerably higher frequency of faulty reflexes. Factors that affected women's e-cigarette consumption were younger age, unmarried, had fewer years of formal education, living with a smoker, and were long-term smokers, high school education or greater, income <$30,000, white race, and non-Hispanic ethnicity. Healthcare practitioners should focus on providing risk information on the effect of e-cigarettes on pregnancy and birth. Furthermore, additional research is required to understand the safety and efficacy of e-cigarettes during pregnancy so that women may make an educated decision about their smoking habits.

List of abbreviations:

EC E-cigarettes
ENDS Electronic nicotine delivery systems
NRT Nicotine replacement therapy
UPSTF US Preventive Services Task Force

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<table>
<thead>
<tr>
<th>Author and Publication year</th>
<th>Study design</th>
<th>Population, Sample Size, and characterization</th>
<th>Main points</th>
<th>Results and main findings</th>
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<tbody>
<tr>
<td>1. Cohn et al. 2022[16]</td>
<td>Cross-sectional study</td>
<td>The study includes 1037 pregnant women.</td>
<td>To examine associations of prenatal e-cigarette use to pregnancy and birth outcomes.</td>
<td>Approximately 1% of pregnant women reported past 30-day exclusive e-cigarette use, and 3.2% used e-cigarettes and one other tobacco product. Compared to no tobacco use, past 30-day e-cigarette use during pregnancy was not associated with increased odds of an adverse pregnancy or birth outcome in bivariate or multivariable models. Past 30-day non-e-cigarette tobacco use was associated with increased odds of an adverse pregnancy outcome in multivariable models but not an adverse live birth outcome. Compared to past 30-day cigarette use, past 30-day e-cigarette use during pregnancy was not associated with lower odds of a birth or pregnancy outcome.</td>
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<td>2. Dobbs et al. 2021[17]</td>
<td>Cross-sectional study</td>
<td>A convenience sample of gestational women (n = 218; ages 18–45) living in the U.S. completed an online survey between May and December 2017. Participants reported a perceived likelihood of adverse health outcomes among infants/children born to mothers who used cigarettes/e-cigarettes.</td>
<td>To investigate variations in the perceived harm of smoking and using electronic cigarettes (e-cigarettes) while pregnant and healthcare practitioners' communication concerning these</td>
<td>Overall, participants believed adverse health outcomes were significantly more likely caused by maternal use of cigarettes than e-cigarettes. Participants who planned to be pregnant reported higher endorsement than smoking combustible cigarettes would cause a miscarriage (p &lt; .05) or increased blood pressure (p &lt; .05) for a child than currently pregnant participants. Participants indicated that healthcare practitioners inquired about (p.05), counseled them not to use (p.001), and discussed the health risks of smoking combustible cigarettes while pregnant (p.001) much</td>
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<td>3. Opondo et al. 2021 [18]</td>
<td>A cross-sectional postal survey based on maternal and infant health population data from the National Maternity Survey (NMS) 2018.</td>
<td>The prevalence of vaping during pregnancy, as well as to investigate the causes and outcomes correlated with vaping during pregnancy.</td>
<td>The survey received 4,509 responses from women. Vaping was prevalent in 2.8% of pregnant women. This differed according to the smoking pattern in pregnancy: 0.3% in never-smokers, 3.3% in ex-smokers, 7.7% in pregnancy-inspired quitters, 9.5% in temporary quitters, and 17.7% in persistent smokers. Women who were younger, unmarried, had fewer years of formal education, lived with a smoker, and were long-term smokers were more likely to vape. However, after adjusting for the pattern of cigarette smoking and maternal characteristics, persistent smoking was the only risk factor. The study found no association between vaping and preterm birth, birth weight, or breastfeeding.</td>
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<td>4. Liu et al. 2021. [19]</td>
<td>A cross-sectional study using data from the multi-site Pregnancy Risk Assessment Monitoring System in the United States, 2016–2017. All participating mothers with information on e-cigarette use before and during pregnancy were included.</td>
<td>To examine the prevalence and the changing pattern of e-cigarette use from preconception to pregnancy.</td>
<td>This study included 69,508 pregnant women from 38 states in the United States. There were geographical variations in the prevalence of e-cigarette use before and during pregnancy. A quarter of women who used e-cigarettes before pregnancy continued to use e-cigarettes during pregnancy. Conventional cigarette use is a strong risk factor for e-cigarette use before and during pregnancy. Therefore, the prevalence of e-cigarette use needs to be monitored continuously.</td>
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<td>5. McCubbin et al. 2020. [20]</td>
<td>Cross-sectional data from a larger study of pregnant conventional-only</td>
<td>To measure perceptions of</td>
<td>Among 176 pregnant smokers (38% dual users), more than one-half of participants believed e-cigarettes were</td>
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and dual users were analyzed through a brief survey. The analysis included descriptive statistics, bivariate analysis, and logistic and linear regression analysis.

Prenatal e-cigarette use and smoking behaviors. Harmful to women (56%) and posed harm to the fetus (53%). Among dual users, 41% used their e-cigarettes, on average, eight times daily. In addition, 11% of dual users smoked a pack of cigarettes per day, compared with 5% of conventional-only smokers, and dual users scored significantly higher on the Penn State Cigarette Dependence Index. The most common e-cigarette liquid flavor was fruit (64%), and the most frequently reported e-cigarette nicotine concentration was 1–6 mg.

| 6. Bowker et al. 2020 [21] | A Qualitative Study | Semi-structured telephone interviews (n = 15) were done with pregnant or postpartum women who vaped throughout pregnancy, either solely (n = 10) or dual-used (n = 5). (smoked and vaped). Interviews were analyzed by thematic analysis. The research aimed to understand pregnant women's vaping experiences, specifically how vaping to quit smoking is enabled, and challenges to this are addressed. Positive vaping ideas and skill development were considered as solutions to overcome hurdles. The theoretical domain framework guided intervention recommendations to help pregnant smokers who attempted but failed to quit smoking switch to vaping. |

| 7. Froggatt et al. 2020 [22] | 83 infants were involved in the study, either exposed prenatally to cigarettes or e-cigarettes or not. Compare prenatal e-cigarette exposure compares to Both cigarette and e-cigarette-exposed infants had a significantly greater number of abnormal reflexes. However, cigarette-exposed infants performed significantly worse for both self-regulation and motor |
At one month, differences in birth outcomes and scores on the Neonatal Behavioural Assessment Scale (NBAS) were examined. Prenatal cigarette exposure.

Birth outcomes, such as birth weight, gestation, and head circumference, did not change between e-cigarette-exposed newborns and non-prenatally exposed infants. Infants exposed to cigarette smoke had considerably lower birth weights.

8. Rollins et al. 2020 [23]

Cross-sectional study

The study compared sociodemographic characteristics and mental health conditions by performing a telephone survey to determine the prevalence of e-cigarette and conventional cigarette usage during preconceptual or pregnancy in a large sample of racially/ethnically diverse, low-income pregnant women (2015-2018). Prevalence, characteristics, and concurrent mental health conditions

Of the 1365 pregnant women polled, 54 (4.0 %) used e-cigarettes, 372 (27.3 %) used conventional cigarettes without using e-cigarettes, and 939 (68.8 %) used no tobacco or nicotine replacement therapy (NRT) products throughout the preconception period and/or pregnancy. 74% of women who use e-cigarettes also smoke traditional cigarettes. Women who used e-cigarettes were more likely to have a high school diploma or above, a household income of $30,000, to be White, and to be non-Hispanic. Furthermore, women who used e-cigarettes were more likely to report depressive symptoms, a history of severe mental health issues, alcohol use during pregnancy, and marijuana or other substance use before conception.


A prospective study of pregnant smokers from around the nation.

A secondary analysis of a randomized controlled trial using a text-messaging smoking cessation program among a nationwide population of pregnant smokers (n = 1365). The incidence and patterns of e-cigarette usage among pregnant smokers and their infants.

At the start, 74 (17.29 %) pregnant smokers had used e-cigarettes in the previous 30 days, and 36 (8.41 %) had used e-cigarettes in the previous 7 days. The major reason for using e-cigarettes while pregnant was to quit smoking. E-cigarette usage varied between baseline...
The outcomes studied were e-cigarette usage trajectories from baseline to one-month follow-up and the longitudinal correlation between baseline e-cigarette use and smoking cessation at one-month follow-up.

Conclusions
According to a secondary examination of a nationwide sample of pregnant smokers, e-cigarette usage is inconsistent and unrelated to improved smoking cessation results. There is an urgency to investigate the risks and benefits of smoking e-cigarettes, especially when pregnant.

Table 1: Selected Studies