

Original Research

Vaping in pregnancy: a geographically focused assessment of OBGYN provider knowledge regarding the safety and usage of electronic nicotine delivery systems

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Abstract

Background: Electronic nicotine delivery systems (ENDS), or vaping, usage has become increasingly popular and generally has a positive perception by the public. However, ENDS are known to contain harmful chemicals and teratogens that induce numerous health consequences to both the pregnant mother and fetus. Despite this, physician knowledge and discussion of ENDS with their pregnant patients remains limited. The main objective of this study was to assess the knowledge of Obstetrics and Gynecology (OBGYN) providers regarding the safety and usage of ENDS in pregnancy. A secondary objective was to understand providers' practices to increase patient education and awareness of the effects of ENDS on pregnant women and developing fetuses. **Methods:** A 40-question online anonymous survey was developed for this study. The survey aimed at assessing OBGYN providers' understanding of the usage of ENDS and potential harms. The questionnaire was distributed to OBGYN providers in the Midwest and South of the United States of America. **Results:** One Hundred and four respondents completed the survey (95% response rate). While 96% of providers investigated alcohol and tobacco use during prenatal visits, only 44% routinely inquired about ENDS use. Most providers noted that they had received no formal education about ENDS usage and 55% of providers reported an insufficient understanding of vaping. **Conclusions:** These results demonstrate that providers lack the education and knowledge about ENDS usage in pregnancy. This is concerning as ENDS usage is rapidly increasing in the United States of America. It is essential to develop educational resources for providers about the risks of vaping and incorporate questions ENDS usage into the social history, especially in pregnancy.

Keywords: E-cigarette; Electronic nicotine delivery system; Fetus; Counseling; Pregnancy; Vaping; Nicotine; Tobacco use

1. Introduction

Tobacco use in pregnancy has been extensively studied, and standards of practice have been set by the American College of Obstetrics & Gynecology (ACOG) to help guide practitioners in counseling their patients [1]. Specific to pregnancy, it is widely known that there is significant neonatal morbidity and mortality associated with tobacco use, including fetal growth restriction, placental abnormalities, ectopic pregnancy, preterm deliveries, and sudden infant death syndrome [1]. While the widespread use of tobacco in pregnant females has decreased (from 13% in 2006 to 7% in 2016 in the United States), the use of electronic nicotine delivery systems (ENDS), also known as "vaping", has increased in reproductive-aged women [1,2]. Vaping has become increasingly prevalent as advertising campaigns are prolific and often promote ENDS as healthier, less toxic alternatives to conventional cigarette use [3]. This perceived reduction in toxicity has impelled pregnant patients to utilize ENDS as a smoking cessation tool or an alternative [4]. However, ENDS are considered a teratogen

and have numerous health consequences to both the mother and the fetus [5,6].

Previous studies have investigated the potential risks of vaping to both the pregnant patient and fetus. Nicotine is known to have multiple effects on both the pregnant mother and the fetus, such as preterm birth, stillbirth, and sudden infant death syndrome [5]. ENDS has been associated with a higher risk of stillbirth and increased maternal complications, such as eclampsia [4]. These reports show the detrimental effects of ENDS on pregnancy, but much yet remains unknown and understudies.

Data is currently limited on provider knowledge of vaping products, comfort with patient counseling, and impression of vaping use during pregnancy [4,5,7,8]. To better counsel and inform patients, providers must identify knowledge gaps, seek to educate themselves, and apply current evidence-based knowledge to their practice.

The primary objective of this study was to assess the knowledge level of healthcare providers regarding the safety and usage of ENDS. The secondary aim was to understand providers' practices when educating patients on



the effects of ENDS on pregnant women and the developing fetus.

2. Materials and methods

Informed consent was obtained from all participants. The study was approved by the institutional review board of the ProMedica Health System (IRB code 19-059). Obstetrics and Gynecology (OBGYN) providers (physicians, residents, physician assistants, nurse practitioners, and nurse midwives) in the Midwest and Southern regions of the United States of America were included in the study. The survey recipients were part of a group of providers connected through academic links. This was intentionally devised as such due to increased receptivity to the surveys. This was further reinforced through two timed email reminders.

A 40-question close-ended questionnaire was developed for this study. Questions focused on demographics and the providers' familiarity with vaping, and the approach towards vaping in pregnancy. Three reminders were sent to ensure a maximal response rate.

3. Results

Our results can be categorized as demographics of our responders, providers' familiarity with vaping in general, and providers' approach towards vaping in pregnancy. Up to 110 surveys were sent with 104 being completed resulting in a survey response rate of 95%.

3.1 Demographics of responders

The majority of respondents (53%, $n = 55$) were in the range of 30–39 years old. The sample was majority female (81%, $n = 84$). The sample included nurse midwives, nurse practitioners, physician assistants, residents, and attending physicians. Over 88% ($n = 92$) of providers were attending physicians. Most responders had been practicing for <10 years (58%, $n = 60$). The majority (96%, $n = 100$) had never tried vaping themselves. None of the participants endorsed current or past regular ENDS use.

3.2 Familiarity with vaping

The majority of providers (95%, 99/104) believed that ENDS use is currently increasing. While the bulk of providers reported that they routinely ask patients about their consumption of alcohol and tobacco (96%, 100/104 and 99%, 103/104, respectively), only 44% (46/104) of providers attested to asking about ENDS use. When asked if they would consider incorporating questions about vaping into their standard social history questions, up to 36% (37/104) stated that it was “unlikely”. The vast majority (87%, 90/104) of providers reported having patients who have tried vaping, and 81% (84/104) have patients who regularly vape. Additionally, half (52/104) of providers said they would be more likely to ask about ENDS use if their patients stated that they were current cigarette smokers.

Ninety-two percent of providers believed that patients are more likely to try vaping if they are current smokers vs. tobacco naïve patients.

Of the providers who discuss vaping in clinical settings, the majority (63%, 66/104) reported that they actually initiate discussions about vaping with their patients. Additionally, providers reported that certain aspects of a patient's demographics and general appearance, such as an odor of tobacco or visualization of a patient's vaping unit, influence whether or not they ask the patient about ENDS usage (Fig. 1).

About half (45%, 17/104) of providers denied that their patients have ever inquired about vaping, while 13% stated they frequently fielded questions about ENDS. However, only 18% (19/104) of providers felt “very comfortable” answering these questions. When broken down by question subject, such as side effects prevalence of ENDS use, the majority of providers demonstrated that they were most comfortable with explaining known side effects and pros/cons of vaping compared to traditional cigarette use (Fig. 2).

Providers reported a myriad of sources of knowledge and information about ENDS (Fig. 3). Although a limited cohort asked questions about vaping history, the majority recounted obtaining knowledge about the topic from news media (64%, 67/104) and self-sought research (58%, 60/104). Most providers (78%, 81/104) reported turning to scientific literature when undergoing self-directed research about ENDS. Others supplement with less verified sources, such as a Google search (43%, 45/104) and even WebMD (14%, 15/104). About 26% (37/104) of providers studied said that they seek knowledge from other providers for more information about ENDS.

Very few providers (9%, 9/104) reported having formal education in their training program, the workplace, or through online modules. A third of providers (36%, 37/104) disclosed that they received education about ENDS usage passively via word of mouth. Few providers (7%, 7/104) reported a complete lack of knowledge regarding vaping.

The majority of providers (55%, 57/104) reported that they believed that current OBGYNs do not sufficiently understand vaping or its effects. Additionally, none of the providers reported that they subjectively feel that their knowledge base on the topic was sufficient. The majority agreed (61%, 63/104) or strongly agreed (27%, 28/104) that providers should receive formal education on vaping. Also, 96% (100/104) of providers said that they were interested in learning more about the potential health effects of ENDS.

Regarding patient education, the majority of providers believed that direct physician counseling (93%, 97/104) and in-office hand-outs (75%, 78/104) would be the most effective methodologies to use. Few (32%, 33/104) believed that podcasts or online references would be effective methods of patient education on ENDS (Fig. 4).

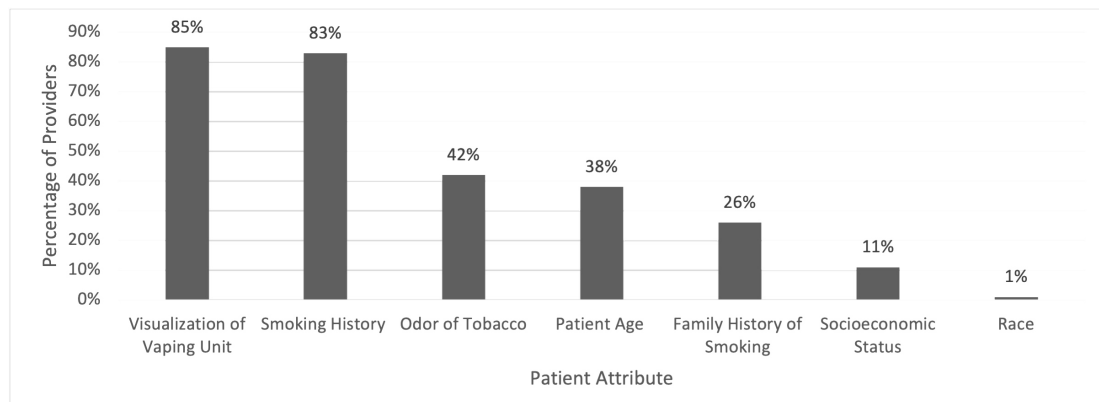


Fig. 1. Patient factors that influence providers asking about vaping.

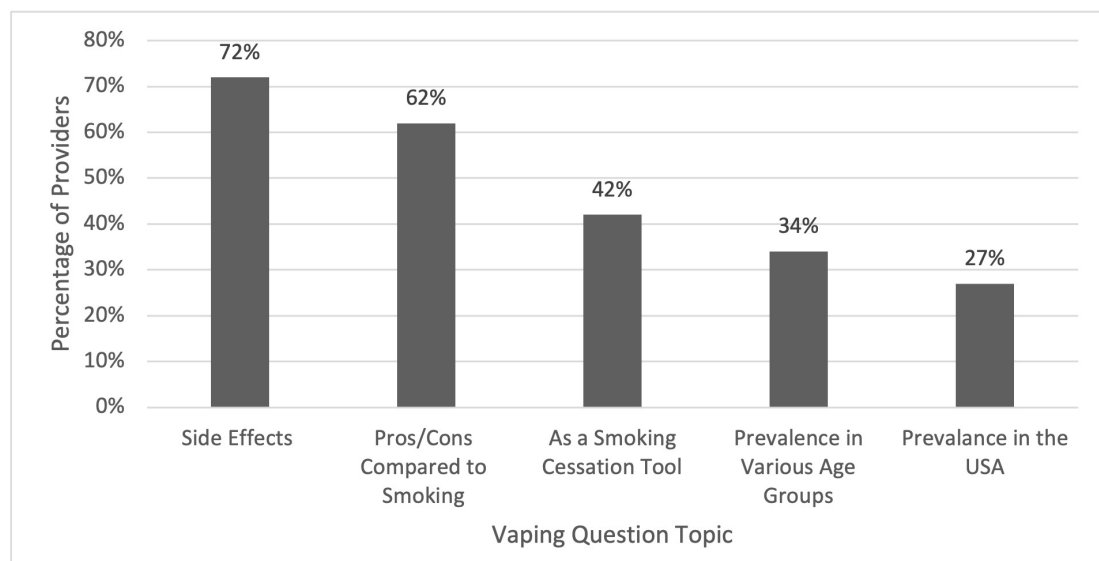


Fig. 2. ENDS question topics and percentage of providers who address these topics.

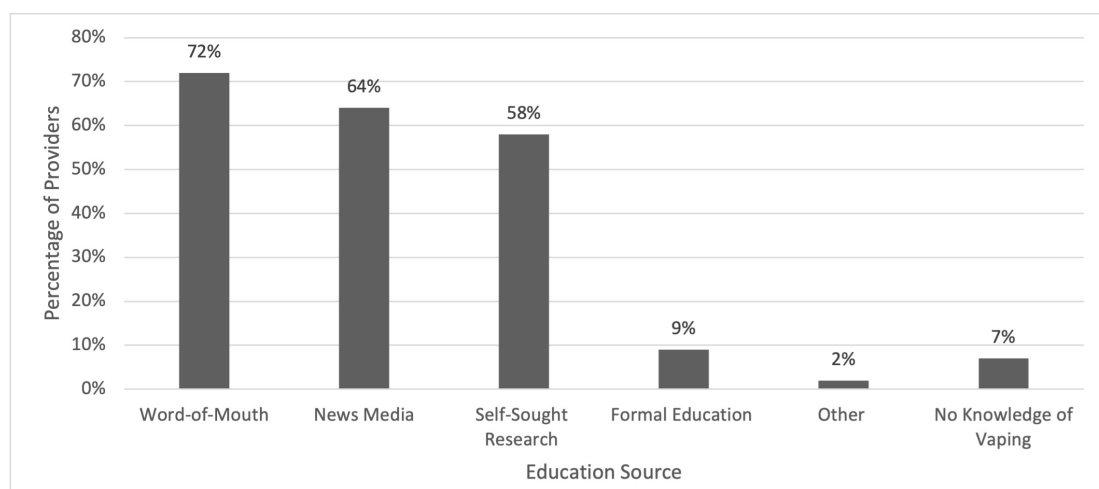


Fig. 3. Provider source of knowledge on vaping/ENDS.

3.3 Vaping in pregnancy

The majority (66%, 69/104) of polled providers reported that they had patients who had used ENDS during

pregnancy. The vast majority of providers reported that most of their pregnant patients did not inquire about smoking during pregnancy. This was reported at similar rates for

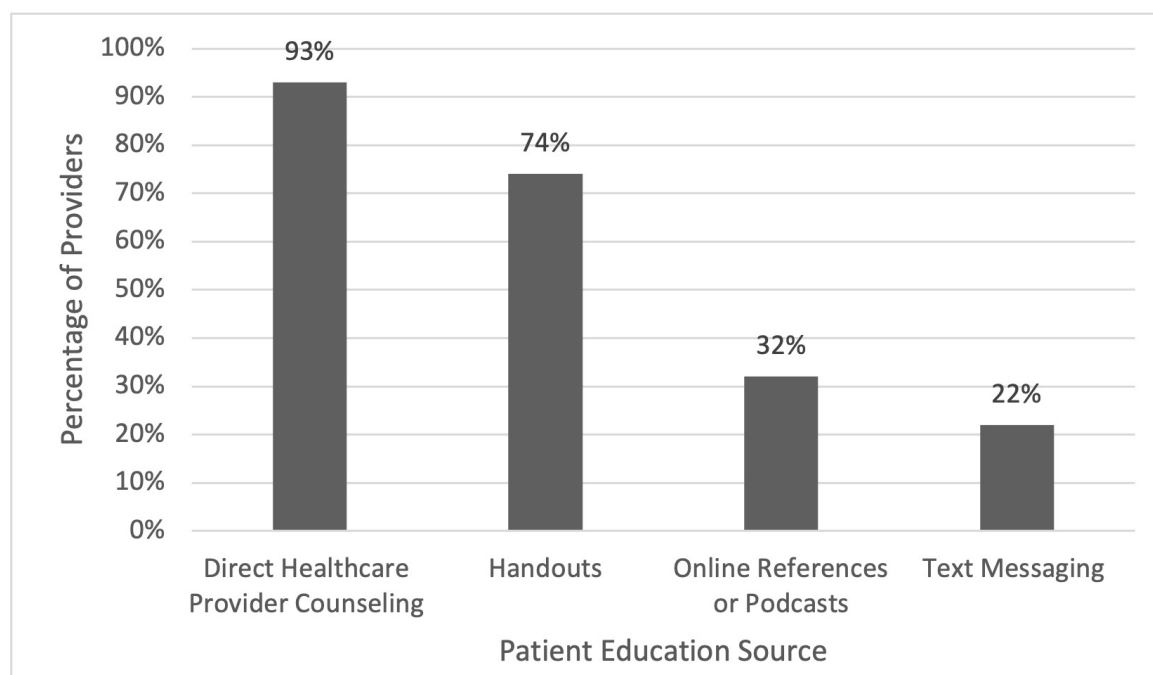


Fig. 4. What form of patient education would your patients be most receptive to?

patients who smoked (97%, 101/104) and patients who did not smoke tobacco products (94%, 98/104).

Providers were polled on their confidence that counseling could impact or alter patients' vaping habits. Only 11% (11/104) believed that their counseling was "very likely" to help pregnant patients stop smoking, while the majority (54%, 56/104) believed that counseling was "somewhat likely" to help patients stop vaping. A large majority of providers (96%, 99/104) believed that there was a stigma for tobacco use in pregnancy, but only 66% (69/104) believed there was a stigma for ENDS use.

When comparing vaping to conventional cigarettes, 16% (17/104) of providers believed that vaping was a healthier option for pregnant patients. The majority (92%, 96/104) of providers said that they would not recommend vaping as a form of smoking cessation to a pregnant patient. Almost all (99%, 103/104) of providers reported that it was "very important" that their pregnant patients cut down on cigarettes/day. Additionally, most (90%, 94/104) of providers reported that they would be equally aggressive in counseling about tobacco cessation or vaping cessation.

Most providers believed that the nicotine (93%, 97/104) contained in vaping oil was harmful to either the mother or fetus when vaping during pregnancy. More than 80% (83/104) of providers believed that vaping affected the developing fetus, yet 97% (101/104) of providers believed that the scientific evidence available currently could not attest to the safety of ENDS, on its own or compared to cigarette smoking, in pregnancy.

4. Discussion

The results of this study highlight the inconsistencies in how providers approach ENDS and conventional cigarette use in pregnancy, the uncertainty surrounding vaping during pregnancy, and the lack of resources for education about vaping.

While the use of ENDS has become increasingly popular, medical literature in obstetrics and gynecology has not focused adequately on this practice, overlooking the importance of communication between physicians and patients regarding potential harmful effects. It is common to screen patients for tobacco, alcohol, and illicit drug use during pregnancy, but it is less common to discern vaping [4,9]. England *et al.* [9] in 2015 found that half of the obstetrician-gynecologists have inconsistent screening methods for ENDS use in pregnancy. Our study found that while 98% of providers believe the use of ENDS is increasing and 87% of providers have patients who report trying vaping, only 44% regularly ask about its use. This is in comparison to the 96–99% who routinely ask about alcohol and tobacco use. Another study found that physicians believed the prevalence of ENDS use was low, only 1–5% in their population, which is in stark contrast to the 81% of our polled providers who have patients with regular ENDS use [10]. This could be justified by widespread behavior variations in communities. However, the prevalence of ENDS users nowadays does seem higher than 5%, as illustrated by an epidemiologic study identifying a 46% increase in ENDS use among young adults, resulting in a prevalence of 8% in 2018 in the United States of America [11]. These results show the importance of standardized screening for

ENDS use during pregnancy, given the increasing rates of this practice.

In addition, discussion of ENDS use and cessation is not as commonly practiced as it is with use of conventional cigarettes. Only 18% of polled providers reported feeling “very comfortable” answering questions about vaping. Additionally, only a few providers (13%) said that they inquired about vaping use in pregnancy. One reason why practitioners might not be assessing ENDS usage is that they might not believe vaping to be a health risk.

Another potential reason why there was limited discussion of ENDS use was that providers felt less confident in their abilities to counsel patients on ENDS usage. Only a minority of providers (45%) were comfortable citing information about ENDS, such as the prevalence of vaping and how ENDS can or cannot be used as a smoking cessation tool. This discomfort likely stems from a lack of education on the topic, as the vast majority (91%) of providers have not received any formal education on ENDS. Also, most providers (86%) indicated that they wished to receive formal training on ENDS usage, especially during pregnancy. This shows the importance of developing new guidelines and educational tools to help mitigate this issue.

Many providers (64%) glean their knowledge of ENDS from commonplace resources, such as news media. Providers may be uncomfortable guiding their patients on ENDS usage as their source of information is not necessarily scientifically validated. This shows the need for further scientific study on the effects of ENDS, especially during pregnancy.

Even if providers do have education about and screen for ENDS usage, the data shows that there is a stark lack of faith in the effectiveness of counseling. Only 11% of polled providers believed that their counseling is “very likely” to help patients decrease ENDS usage. This apprehension shows a significant barrier to effective counseling on vaping. In order to better help patients, it is critical that providers find ways of improving their counseling abilities.

The initial struggle of combating ENDS use in pregnancy starts with the perceived stigma of using ENDS versus conventional cigarettes. Only 65% of providers believed there is a stigma for ENDS use in pregnancy compared to 96% for conventional cigarette use. Additionally, providers were less aggressive in cessation counseling for ENDS usage than cigarette usage, with only 10% of providers reporting that they equally invest in cessation counseling for both nicotine delivery systems. This shows that many providers do not believe that ENDS are as harmful as traditional cigarettes. However, we know that the nicotine contained in both ENDS and cigarettes is a teratogen, and therefore cessation of both of these nicotine delivery systems should be strongly encouraged during pregnancy.

Limitations of this study include being a survey as well as the smaller sample size of respondents. Another substan-

tial limitation is that the study sample consisted of a heterogeneous population of providers randomly selected based on geographical location, although this could help generalize the data across interprofessional OBGYN fields. Despite the smaller sample size, this study demonstrated critical findings regarding provider attitudes towards ENDS in pregnancy. Additionally, the study does not address statistical analyses per se, as the study focused on identifying trends in provider outlooks towards ENDS. Selection bias may also play a role due to recruitment methodology of the providers in the study. As such, the target groups formulation may impact the findings. Strengths of the study included that data was collected from several practices across many states in the Midwest and South of the United States of America. Thus, we believe that the data may coincide with national trends and thus be overall representative and, as such generalizable. Additional strengths include the systematic, detailed questioning and anonymity employed during the assessment.

5. Conclusions

OBGYN providers do not receive enough formal education about ENDS to screen for its use and provide effective counseling to patients. While there is a paucity of research on ENDS in pregnancy, it is essential to note that these systems do contain nicotine, which is a known teratogen with harmful effects on both pregnant women and fetuses. This study clearly demonstrates the need to develop standardized screening tools and educational materials on ENDS usage during pregnancy. By identifying and further studying these voids of knowledge, health care providers will be able to improve patient care for pregnant patients who vape.

Abbreviations

ACOG, American College of Obstetrics & Gynecology; ENDS, electronic nicotine delivery systems.

Author contributions

MC, AT, AC, and DZ focused on manuscript editing and finalization; EJ and RM focused on the survey conception and administration. All the authors read and approved the final version of the manuscript.

Ethics approval and consent to participate

Online informed consents were obtained from all participants. The institutional review board of the ProMedica Health System approved, code 19-059.

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Conflict of interest

The authors declare no conflict of interest.

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