

The Association Between E-cigarettes and Smoking Initiation Among Students at the Hashemite University in Jordan.

Lara M. Al-Natour ^{1*}, Salah Salah ², Lujain Al-Dwaikat ³, Dania Abu Arqoub ⁴, Massa Al-Hababbeh ⁵, Majd Salameh ⁶, Sarah Hababbeh ⁷, Ro'ia Ghanem ⁸, Shahed Abdullah ⁹, Sara Alrawashdeh¹⁰, Basel AbedAlrhman¹¹

^{1*} Department of Pharmacology and Public Health, Faculty of Medicine, The Hashemite University(Zarqa, Jordan), E-mail: laram@hu.edu.jo ,ORCID: <https://orcid.org/1611-1622-1611-1622>

² Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: salahbeyond@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

³ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: Lujain.dwaikat@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

⁴ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: daniaa654@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

⁵ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: Massaghassan.hb@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

⁶ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: mbsalameh@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622X>

⁷ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: habbahbeh@yahoo.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

⁸ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: Roiaghanemm@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

⁹ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: shahedabdullah098@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622X>

¹⁰ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: salrawashdeh206@gmail.com, ORCID: <https://orcid.org/1611-1622-1611-1622>

¹¹ Medical Student, Faculty of Medicine, The Hashemite University, (Zarqa, Jordan), E-mail: baselay23@gmail.com , ORCID: <https://orcid.org/1611-1622-1611-1622>

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ABSTRACT:

Background : Despite the explosive rise of electronic cigarettes being marketed as a healthier, more suitable alternative to traditional tobacco cigarettes, they still pose significant risks. Not only are they proven to contain carcinogenic inhalation byproducts, but they also play a crucial role in initiating tobacco use, even among those who were not smokers at baseline.

Methods. A cross-sectional study was conducted to examine the association between e-cigarette use and the initiation of traditional tobacco smoking among students at The Hashemite University in Jordan, with a sample of 245 participants.

Results : A chi-square test was used to assess associations between categorical variables, including the relationship between e-cigarette use frequency and (a) having friends who smoke traditional tobacco and (b) difficulty quitting e-cigarettes. 70.0% of participants reported starting to use tobacco products after trying e-cigarettes, indicating that most transitioned to traditional cigarettes. Regarding smoking other tobacco products alongside e-cigarettes, 41.3% of participants use traditional cigarettes, while

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40.7% smoke hookah. Regarding the frequency of smoking other tobacco products alongside e-cigarettes, 42.3% of respondents report almost daily use, and 24.5% smoke 1611-1622 days per week. E-cigarette use frequency was a significant predictor ($p=0.013$), with higher frequency increasing the odds of initiating traditional smoking by about 1.6 times ($OR=1.618$, 95% $CI=1.1611-1622.365$). There is also a statistically significant association ($p\text{-value} < 0.05$) between e-cigarette use frequency and having friends who smoke traditional tobacco. Smoking frequency was also tied to difficulty quitting, with a highly significant association ($p\text{-value} < 0.05$) between cigarette use frequency and difficulty quitting, and quitting difficulty was reported by 48.2% of participants.

Conclusion. There is a significant association between initiating e-cigarette use without a prior history of tobacco smoking and transitioning to tobacco smoking. Frequency of e-cigarette use is a significant predictor of whether a person will transition to tobacco smoking, with higher frequencies linked to a greater likelihood of initiation.

Keywords: KElectronic Cigarettes (E-cigarettes); Smoking Initiation; Tobacco Use; University Students; Smoking Behavior; Jordan.

Introduction

Invented in 2003, electronic or E-cigarettes were developed to promote smoking cessation by providing a presumably healthier alternative that contains nicotine and is somewhat more effective than other methods, such as nicotine patches [1]. Although e-cigarettes initially appear useful for helping professionals assist those addicted to smoking in quitting, a recent study has shown that they do contain less harmful aerosols, with most having lower nicotine concentrations [2]. E-cigarettes still contain potent carcinogens and inhaled toxicants, albeit in lower amounts, with a long list of ingredients that require extensive research to fully understand their scope and the severity of inhalation risks [3]. In one meta-analysis, it was demonstrated that in adults, e-cigarettes were not superior; in fact, those who used them intermittently or irregularly did not benefit from them at all [4].

One meta-analysis found that adolescents who started vaping were nearly three times more likely to initiate tobacco smoking [5,6]. All these studies concluded that e-cigarette use at baseline could significantly increase the likelihood of starting cigarette smoking [1611-1622], especially among adolescents. A longitudinal study conducted in

Australia compared the likelihood of beginning cigarette smoking between never-smokers and e-cigarette users, finding that e-cigarette users were about 3.7 times more likely to start smoking traditional cigarettes, which aligns with previous research [8,12,13]. Coinciding with the growing popularity of e-cigarettes, Germany observed a nearly 37% increase in e-cigarette adoption [14]. Similarly, other countries like England and Canada also show an increase in use, rising from 24% to 38% [15]. Globally, the numbers skyrocket to a staggering 10%, revealing the severity of the situation where everyone is affected, especially the youth [17].

Youth adoption of smoking is not a new phenomenon; almost 11% of boys and 6% of girls have reported smoking a cigarette [18]. Sadly, these numbers are not decreasing; uptake of e-cigarettes by new and old users has increased [19]. Among the University population, smoking is quite common, especially among males, with e-cigarettes on the rise among the students [20,21]. Regardless of the reason why they start using e-cigarettes, whether it be to quit smoking or even recreationally, it still requires a great deal of attention with how the students behave using them; many have concerns with initiating traditional tobacco cigarettes [10,11].

Secondhand smoke could also play a role in accepting and initiating traditional cigarettes, where it all boils down to social context and peer pressure [22,23].

Tobacco, one of the leading causes of preventable deaths, where almost 8 million people die each year due to tobacco smoking [1,24], and is often associated with cancer and heart disease, remains a major issue, where simply quitting could reduce the risk of recurrent cardiovascular disease by nearly one third [25]. Tobacco smoke is still considered to be more lethal than e-cigarettes. However, both profoundly affect respiratory function with a great risk to irreversibly injure and risk their cardiovascular health, greatly increasing their likelihood of possible complications [13,26], especially the risk of myocardial infarction [1611-1622].

With the increasing use of e-cigarettes and the decline of traditional cigarettes [31,32], it is important to understand how the public views e-cigarettes. One study found that more than half believe e-cigarettes are less harmful than traditional ones [33], a view supported by another study [34]. Understanding how dangerous e-cigarettes are is crucial; it is a challenge we must address to educate the public about their side effects, common complications, and prevent them from escalating to tobacco smoking.

This study aims to explore whether **e-cigarette use increases acceptance and initiation of traditional smoking** among university students, and to identify the **motivating factors** that lead non-smokers to try e-cigarettes in the first place.

Methodology

A **cross-sectional study** was conducted to investigate the relationship between e-cigarette use and the initiation of traditional tobacco smoking among students at The Hashemite University in Jordan, with a total sample size of 245 participants. A structured, self-administered questionnaire was designed based on previously validated tools for the target population. It consisted of two sections: (1) sociodemographic characteristics (gender, age, academic year, place

of residence, as well as whether participants had friends who smoked traditional tobacco products); (2) e-cigarette use (history of tobacco use, reasons for initiation, frequency and duration of use, and concurrent smoking of other tobacco products).

The questionnaire was distributed among students in the university, where each student was limited to one try to provide information about their history of using e-cigarettes. Participation was **voluntary**, and informed consent was obtained from all participants. No identifying information was collected to maintain **confidentiality**.

Ethical approval was obtained from the **Institutional Review Board (IRB)** of Hashemite University (NO.12/1/2024/2025).

Inclusion and Exclusion Criteria

Inclusion criteria:

1. Undergraduate students currently enrolled at The Hashemite University.
2. Students who reported using e-cigarettes, regardless of frequency.
3. Students who provided informed consent to participate.

Exclusion criteria:

1. Students who have never used e-cigarettes.
2. Incomplete or invalid questionnaires.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics (frequencies, percentages, medians, and ranges) were used to summarize the demographic data and participants' responses regarding e-cigarette and tobacco use. The Chi-square test was employed to assess the association between categorical variables, such as the relationship between frequency of e-cigarette use and (a) having friends who smoke traditional tobacco, and (b) difficulty quitting e-cigarettes. The logistic regression model was used to identify predictors of smoking initiation after e-cigarette

use. A p -value < 0.05 was considered statistically significant.

Results:

The results of the data were analyzed using the Statistical Package for Social Sciences (SPSS,

version 27). Descriptive statistics, such as frequencies and percentages, were used to describe the participants' degree of agreement regarding the use of e-cigarettes and traditional tobacco products. This study consists of 245 participants.

Table 1: demographic characteristics of participants (n=245)

Variables	Frequency (%)
Gender	
Male	157(62.1%)
Female	96(37.9%)
Age	
Median (Min-Max)	21 (1611-1622)
Years level	
First year	29(11.5%)
Second year	18(7.1%)
Third year	75(29.6%)
Fourth year	27(10.7%)
Fifth year	38(15.0%)
Sixth year	66(26.1%)
Place of residency	
Student housing	66(26.1%)
With family	187(73.9%)
Do you have any friends who smoke traditional tobacco products?	
Yes	221(87.4%)
No	32(12.6%)

As shown in Table 1 above, most participants were male (62.1%), while females accounted for 37.9% of the sample. The median age was 21 years. Regarding academic year, 29 (11.5%) participants were in the first year, 18 (7.1%) in the

second year, 75 (29.6%) in the third year, 27 (10.7%) in the fourth year, 38 (15.0%) in the fifth year, and 66 (26.1%) in the sixth year. Most participants, 73.9%, lived with their families, while 26.1% resided in student housing.

Table 2: participants' responses related to tobacco and e-cigarette use

Questions	Frequency(%)
Do you have any friends who smoke traditional tobacco products?	
Yes	221(87.4%)
No	32(12.6%)
Have you started using any tobacco products (i.e., have you become a smoker) after using e-cigarettes?	
Yes	177(70.0%)
No	76(30.0%)
Do you find traditional smoking more acceptable after e-cigarettes?	
Yes	189(74.7%)
No	64(25.3%)

The above in Table 2 shows that most participants (87.5%) have friends who smoke traditional tobacco products, while 12.6% said

they didn't know. Moreover, 70.0% of participants reported starting to use tobacco products after trying e-cigarettes, and 74.7%

indicated that they found traditional smoking more acceptable after using e-cigarettes.

Table 3: frequency and percentage for all responses participants

Questions	Frequency (%)
frequently used electronic cigarettes	
Daily	133(52.6%)
Weekly	74(29.2%)
Monthly	46(18.2%)
How many days per week do you smoke other tobacco products in addition to e-cigarettes?	
Almost daily	107(42.3%)
1611-1622 days	62(24.5%)
Once a week	33(13.0%)
Never	51(20.2%)
Have you ever found it difficult to quit e-cigarettes?	
Yes	122(48.2%)
No	53(20.9%)
I have never tried	78(30.8%)

As shown in Table 3, more than half of the participants, 52.6%, use e-cigarettes daily, 29.2% use them weekly, and 18.2% use them monthly. Additionally, 48.2% of participants find it difficult to quit e-cigarettes. Regarding the frequency of smoking other tobacco products

alongside e-cigarettes, 42.3% of respondents report almost daily use, 24.5% smoke 1611-1622 days per week, 13% smoke once a week, and 20.2% indicate that they never use other tobacco products along with e-cigarettes.

Table 4: Factors influencing participants to try electronic cigarettes despite not being smokers.

Influenced factor	Frequency(%)
Imitating celebrities	12(2.5%)
TV advertisements	14(2.9%)
Many of my peers use them	77(15.9%)
less harmful than regular cigarettes	109(22.5%)
less expensive than regular cigarettes	80(16.5%)
Easier to manage indoor smoking restrictions	66(13.6%)
A wide variety of flavors	126 (26.0%)

As shown in Table 4, the most frequently reported factor was the wide variety of flavors at 26.0%, followed by the perception that e-cigarettes are less harmful than regular cigarettes at 22.5%. Other influencing factors included the belief that e-cigarettes are less expensive than

traditional cigarettes at 16.5%, peer influence at 15.99%, and easier management of indoor smoking restrictions at 13.6%. A smaller proportion reported being influenced by TV advertisements at 2.9% and imitating celebrities at 2.5%.

Table 4: Do you currently smoke any other tobacco products in addition to e-cigarettes?

Answer	Frequency(%)
Traditional cigars	133(41.3%)
Water- pipes	8(2.5%)
Hookahs	131(40.7%)
Currently, you do not smoke any other tobacco products in addition to e-cigarettes	50(15.5%)

As shown in Table 5 above, 41.3% of participants use traditional cigars, while 40.7% smoke hookah. 2.5% and 15.5% represent small

proportions of responses regarding water pipe use and not smoking any other tobacco products besides e-cigarettes.

Table 5: demographic variables associated with e-cigarette use frequency

Gender	Daily	Weekly	monthly	Chi-square	P-value
Male	81(60.9%)	45(60.8%)	31(67.4%)	0.691	0.751
Female	52(39.1%)	29(39.2%)	15(32.6%)		
Year level					
First year	21(15.8%)	5(6.8%)	3(6.5%)	13.936	0.176
Second year	9(6.8%)	5(6.8%)	4(8.7%)		
Third year	30(22.6%)	28(37.8%)	17(22.7%)		
Forth year	11(8.3%)	9(12.2%)	7 (15.2%)		
Fifth year	21 (15.8%)	11(14.9%)	6 (13.0%)		
Sixth year	41(30.8%)	16(21.6%)	9(19.6%)		
Place of residency					
Student housing	45(33.8%)	19(25.7%)	2(4.3%)	15.421	<0.001
With family	88(66.2%)	55(74.3%)	44(95.7%)		
				Kuskal wallis	P-value
Age	133(128.8)	74(120.73)	46(131.83)	0.858	0.651

There is a significant association between place of residency and e-cigarette use frequency, with students living in a family more likely to be daily

or weekly users; gender, year level, and age are not significantly related to usage frequency, with p-values greater than 0.05.

Table 6: Association Between E-cigarette Use and Friends Who Smoke Traditional Tobacco Products and difficulty quitting

	How frequently do you use electronic cigarettes? Cross-tabulation			Chi-square	P-value
	Daily	Weekly	monthly		
Do you have any friends who smoke traditional tobacco products?				8.755	0.013
Yes	109(82.0%)	67(90.5%)	45(97.8%)		
No	24(18.0%)	7(9.5%)	1(2.2%)		
Have you ever found it difficult to quit e-cigarettes?					
Yes	78(58.6%)	34(45.9%)	10(21.7%)	34.586	<0.001
No	15(11.3%)	15(20.3%)	23(50.0%)		
have never	40(30.1%)	25(33.8%)	13(28.3%)		

There is a statistically significant association (p-value < 0.05) between e-cigarette use frequency and having friends who smoke traditional tobacco, and a highly significant association (p-

value < 0.05) between cigarette use frequency and difficulty quitting. The smokers who are daily users experience more difficulty quitting than others. Table 7.

Table 7: Association between gender and difficulty quitting e-cigarettes.

	Have you ever found it difficult to quit e-cigarettes?			Chi-square	P-value
Gender	Yes	No	I have never tried		
Male	64(52.5%)	37(69.8%)	56(71.8%)	9.268	0.009
Female	58(47.5%)	16(30.2%)	22(28.2%)		

A chi-square test was conducted to examine the association between gender and whether individuals found it difficult to quit e-cigarettes. The results, shown in the table above, indicate a statistically significant association between

gender and difficulty in quitting e-cigarettes, $\chi^2(2, 253) = 9.268$, p -value 0.009. Males were more likely than females to have never tried to quit (71.8%) versus (28.2%). Table 8

Table 8: logistic regression between demographic and smoking initiation of e-cigarette use

	B	S.E	Exp(B)	95% CI	Sig.
Gender	0.607	0.317	1.835	0.1611-1622.413	0.055
Age	0.351	0.190	1.421	0.980- 20.060	0.064
Year level	-0.283	0.191	0.753	0.518 - 1.094	0.137
Do you have any friends who smoke traditional tobacco products	0.277	0.452	1.319	0.544- 3.198	0.540
How frequently do you use electronic cigarettes	0.481	0.194	1.618	1.107- 2.365	0.013

The logistic regression model identified predictors of smoking initiation after e-cigarette use. The table above shows that the frequency of e-cigarette use was a significant predictor ($p=0.013$), with higher frequency increasing the

odds of initiating traditional smoking by about 1.6 times ($OR=1.618$, $95\% CI=1.1611-1622.365$). Other variables like gender, age, year of study, and peer smoking were not significant predictors.

Table 9: Influence of Peer Smoking on Reasons for E-Cigarette Initiation Among Non-smokers

Responses	Yes	No
Imitating celebrities	12(5.4%)	0
TV advertisements	12(5.4%)	2(6.3%)
Many of my peers use them	71(32.1%)	6(18.8%)
less harmful than regular cigarettes	91(41.2%)	0
less expensive than regular cigarettes	73(33.0%)	7(21.9%)
Easier to manage indoor smoking restrictions	57(25.8%)	9(28.1%)
A wide variety of flavors	119(94.4%)	7(21.9%)

As shown in the table above, the data indicate that individuals influenced by peer smoking are most likely to start using e-cigarettes because of the wide variety of flavors (94.4%).

Peer beliefs that e-cigarettes are less harmful (41.2%) and less expensive (33.0%) were also common in this group. Interestingly, non-smokers without peer influence were more likely to cite "less harmful than regular cigarettes" (56.3%) as a reason. Overall, peer influence appears to increase the appeal of e-cigarettes,

especially through social exposure and flavored types.

Discussion

Created to help overcome tobacco addiction, e-cigarettes have spread like wildfire around the world, especially among our youth [18]. An average of 9.2% of adolescents have used e-cigarettes [35], and this number has been increasing since the 2010s [36]. While tobacco use worldwide has plummeted to around 32.9% in

2025 [37], e-cigarettes still pose a significant risk of initiating traditional cigarette use, which could hinder progress in combating the devastating effects of tobacco on our health. E-cigarettes are not free from scrutiny regarding their harm to us. Although they are marginally better than traditional forms of smoking [2], they still contain carcinogens [3] and chemicals with unknown adverse reactions. However, this did not translate well to the public.

A substantial percentage of people began using e-cigarettes because they perceived them as a healthier alternative. According to our study, the second leading reason people started, accounting for 22.5%, was the belief that e-cigarettes were safer, which corresponds with a study that explored the prevalence of e-cigarettes among the Arab population, where it was the main reason [38,39]. This was not the case in other regions [15].

Surprisingly, the highest recorded factor that influenced people to begin was the wide variety of flavors e-cigarettes offered. One study looked at addiction levels in people beginning "Traditional Flavors" and "Non-Traditional Flavors" and found no significant difference between them, and that both groups had the same perception of harm regardless [40]. A paper found that flavors influenced quitting and quitting success, where non-traditional flavors like Menthol and mint had higher odds of quitting and overall had more attempts [41]. These non-traditional non-tobacco flavors could increase the appeal of e-cigarettes, but the data on whether they increase the appeal or even help in quitting is inconclusive and limited [42,43].

Recorded to this study, around 70% of people who began smoking electronic cigarettes have started smoking tobacco and tobacco products; e-cigarettes were associated with higher intention to begin smoking rather than to quit [10]. This means that electrical cigarettes are not effective in helping fend off addiction, but they might get those who have never smoked cigarettes to begin. Similarly, other studies have shed light on a possible causal relationship between those who use e-cigarettes and initiation of tobacco

[11,12,44,45]. Results show 48.2% of people find it difficult to quit e-cigarettes, with another study showing that most users consider themselves to be addicted [46].

A study looked at the attempts and the desire to quit e-cigarettes, where only 25% expressed that they wanted to quit, and around half who used e-cigarettes in the past 30 days attempted to quit [15]. Gender also played a role, according to our analysis, where females were more likely to attempt quitting, but this does not seem to correlate with the success of quitting [47].

The greatest indicator for initiating tobacco after e-cigarette use was frequency of use, also frequency played a crucial role in preventing and ruining the chances of successfully quitting, our analysis found that increased frequency had 1.6 times higher odds of beginning tobacco, which is in line with other studies that concluded frequency of use is associated with greater uptake of cigarettes [1611-1622].

Dual use has also become an issue; the majority who engage with e-cigarettes also smoke something in addition to e-cigarettes (84.5%), where traditional Cigars and Hookahs held the bulk of answers. Another Jordanian study found that a third of participants were dual users [20].

Those who started smoking tobacco at first likely began dual use of e-cigarettes, but also baseline e-cigarette smokers had a relatively high chance of experimenting with other forms of tobacco; dual users are more likely to stay dual users at follow-up [51]. Many of the reasons behind dual use are to ease the transition from cigarettes [52,53]; however, it has been reported that dual users are more than likely to consume more nicotine and tobacco than the average single user and show more signs of dependence [54].

The increased inhalation and consumption of both cigarettes and e-cigarettes concurrently is linked to a greater risk of developing serious cardiopulmonary conditions and altered systemic inflammatory states [55,56], where one paper has linked dual use with COPD [57].

Limitations

In this study, we have utilized a cross-sectional structure; thus, we cannot infer or derive any causal relationships between e-cigarette consumption and initiation of traditional tobacco cigarettes, although many other studies have come up to the same conclusion and pinpointed the significant role of e-cigarettes. Secondly, the sample size of 245 fell short of the desired size needed; with the distribution of those 245 being university students of similar age groups, it is not representative of the general Jordanian population at large. Thirdly, the participants gave their own testaments, which could be subjected to bias and scrutiny, so there is very little room to accurately confirm.

Conclusion

There is a significant association between e-cigarette use and the initiation of traditional cigarettes. 70% of e-cigarette smokers began smoking tobacco-based products, where cigarettes ranked first at 41.3% and hookah at a close second. The greatest indicator found to accurately assess whether someone would begin is their frequency of use, daily and more frequent smokers were seen to have an increased odds of initiating by 1.6 times, the findings highly suggest that the environment also plays a role in increasing the frequency of use of e-cigarettes, smokers who live with their families are more likely to have higher frequency of use than those who live without them in student housing. This correlates with how the frequency of use also impacts how difficult it is to quit smoking; other factors, like having friends who smoke and being male, considerably lower the chances of a successful escape.

Our study found that the majority of those who started using e-cigarettes started because of the array of flavors available to them, which seemed appealing, and many took up the habit because they perceived them to be less dangerous and a healthier alternative to tobacco.

Tobacco products, especially cigarettes, are dangerous, toxic, and contain powerful carcinogens that could lead to disastrous conditions, mainly cardiopulmonary. So, it is very important to prevent our youth, and people in general, from consuming them. Sadly, this study gave us insight into how it is accepted in our society to smoke, which allowed it to become prevalent. Further research within this field could help uncover ways to prevent and aid those who are suffering from addiction, educating them about the potential harm of e-cigarettes.

Author Declaration

The authors declare that this manuscript, "The Association Between E-cigarettes and Smoking Initiation Among Students at The Hashemite University in Jordan," is an original work that has not been published previously, either in whole or in part, and is not currently under consideration for publication elsewhere. All authors have made substantial contributions to the study, have reviewed and approved the final version of the manuscript, and agree to its submission for publication. All sources of information have been appropriately acknowledged and cited. State no conflicts of interest

The authors declare that there are no financial, personal, institutional, or professional conflicts of interest that could have influenced the design, conduct, analysis, interpretation, or reporting of this study.

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