

## Prevalence, perception, and attitude regarding electronic cigarettes usage among young adults in Riyadh, Saudi Arabia. *A cross-sectional study*

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### ABSTRACT

**Objectives:** To determine the prevalence of electronic cigarette (e-cigarette) usage among young adults in Riyadh, Saudi Arabia; their perceptions of its harm and legal age, and the reasons and factors influencing their use.

**Methods:** This cross-sectional study was carried out within the general community of Riyadh, Saudi Arabia, between December 2023 and April 2024. Participants aged 18-25 years were included. A self-administered online questionnaire was used to gather demographic data, perceptions, and attitudes toward e-cigarettes and reasons for their use.

**Results:** The majority of the 476 participants were female (n=378, 79.4%) and Saudi nationals (n=451, 94.7%). Current e-cigarette usage was 10.5% (n=50), being more prevalent among males (n=46, 46.9%) and non-Saudis (n=12, 48%). Respondents living alone (n=11, 34.4%) or with friends (n=4, 80%), those who perceived e-cigarettes as safer than cigarettes (n=38, 42.2%), or were unsure of age restrictions demonstrated high usage. Key motivators included flavors available, stress relief, and curiosity.

**Conclusion:** Electronic cigarette use among Riyadh's youth was remarkable, especially among males. Reducing the e-cigarette usage prevalence in Saudi Arabia should be prioritized.

**Keywords:** prevalence, perception, attitude, electronic cigarettes

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Electronic cigarettes (e-cigarettes) are devices that use battery-power to heat liquids for aerosolization. This liquid typically comprises nicotine, flavors, and a base of glycerol or propylene glycol.<sup>1</sup> A study in Saudi Arabia revealed that e-cigarette users were notably more

likely to also smoke tobacco.<sup>2</sup> Lip and oral cavity cancers have the highest prevalence among cancers caused by tobacco smoking as reported in a study in the Gulf Cooperation Council countries.<sup>3</sup>

Research indicates that high smoking rates among Saudi Arabian adolescents aged 11-19 years are linked to having a smoker in the household and parents with lower educational levels.<sup>4</sup> Interestingly, another study involving medical students at a university in Riyadh, discovered that e-cigarette use had more prevalence in this particular group.<sup>5</sup> Currently, data is lacking on the prevalence of and attitudes toward e-cigarette use among young adults in Riyadh, as previous studies have not particularly targeted this demographic. Young adults in Riyadh are the primary targets of antismoking campaigns. Therefore, this study aimed to estimate the prevalence, perceptions, and attitudes of young adults toward e-cigarette use in Riyadh, Saudi Arabia.

**Methods.** This descriptive cross-sectional study was carried out according to the principles of the Helsinki Agreement, it employed convenience sampling and was carried out in a general community setting in Riyadh, Saudi Arabia, between December 2023 and April 2024.

The institutional review board of Princess Nourah Bint Abdulrahman University, Riyadh, Saudi Arabia (research number: 23-0169), gave its approval for this study.

All young adults aged 18-25 residing in Riyadh were invited to participate in the study. They were asked to complete an online, self-administered, closed-ended questionnaire developed via Google Forms. Participants' identities were kept confidential through anonymous questionnaire collection.

Participants aged <18 or >25 years were excluded. As this questionnaire was carried out relying on previous questionnaires which were written in English, it was initially designed in English and then translated into local Arabic using forward and backward translation procedures. Consent was required.

The questionnaire collected socioeconomic data and included questions adapted from validated instruments.<sup>6-8</sup> The first section gathered demographic information and explored e-cigarette usage within the social circles of the participants.

The second section featured 6 multiple-choice questions assessing the perceptions of safety, harm, and

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legal issues associated with e-cigarette use. The third section examined attitudes toward e-cigarette usage.

The sample size was calculated with a 5% acceptable margin of error, 95% confidence level (CI), 50% response distribution, and an estimated population of 2,333,328 based on Data Saudi and the recommended sample size was found to be 385 young adults aged 18-25 years, residing in Riyadh, Saudi Arabia.

**Statistical analysis.** A descriptive analysis was carried out to summarize the demographic characteristics of the participants. This section provided an overview of the study population. Subsequently, inferential analyses, such as the Chi-square test (for >5 observed values in a single cell) and Fisher's exact test (which is more specific and used for <5 observed values in a single cell), were employed to examine the relationship between the prevalence of e-cigarette usage and different sociodemographic features as well as perceptions of e-cigarette usage. Moreover, a binary logistic regression model was employed to identify the predictors of e-cigarette use among the study participants. Statistical significance was established at a *p*-value of  $\leq 0.05$  and a 95% CI. All the quantitative data acquired from the questionnaire underwent the Statistical Package for the Social Sciences statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA).

**Results.** The participants were predominantly female, with 10.5% reporting current usage of e-cigarettes as shown in **Table 1**.

Significant associations were identified between participants' beliefs regarding e-cigarette safety and their actual usage. In **Table 2**, the relationship between the perceptions of participants and their use of e-cigarettes offers intriguing insights.

Participants who believed that e-cigarettes were a safer alternative for quitting smoking ( $n=22$ , 43.1%;  $p<0.001$ ), perceived them as safer than traditional cigarettes ( $n=38$ , 42.2%;  $p<0.001$ ), or were unsure of the legal minimum age for their use ( $n=6$ , 6.7%;  $p<0.001$ ) demonstrated greater prevalence of e-cigarette use. Conversely, those who believed that exposing children to e-cigarette smoke was unsafe ( $n=82$ , 18.7%;  $p=0.023$ ) or that using e-cigarettes indoors could harm nonsmokers ( $n=60$ , 16.7%;  $p=0.001$ ) exhibited a low prevalence of use.

Males and non-Saudis exhibited high e-cigarette usage, potentially due to targeted marketing strategies or social perceptions of acceptability as demonstrated in **Table 3**.

**Table 1** - Demographic factors of the participants.

Variables	n (%)
Age (year), mean $\pm$ SD	21.29 $\pm$ 2.37
<b>Gender</b>	
Male	98 (20.6)
Female	378 (79.4)
<b>Nationality</b>	
Saudi	451 (94.7)
Non-Saudi	25 (5.3)
<b>Monthly income</b>	
<5000 SR	42 (8.8)
5000-10000 SR	102 (21.4)
>10000 SR	237 (49.8)
I do not know	95 (20.0)
<b>Work</b>	
Not working but searching for work	38 (8.0)
Not working and not searching for work	8 (1.7)
Housewife	10 (2.1)
Students	336 (70.6)
Employee	81 (17.0)
In military	3 (0.6)
<b>Marital status</b>	
Single	413 (86.8)
Married	60 (12.6)
Divorced	3 (0.6)
<b>Parent's marital status</b>	
Married	404 (84.9)
Divorced	26 (5.5)
One of them has died	35 (7.4)
Both have died	11 (2.3)
<b>Living with:</b>	
Parents	439 (92.2)
Alone	32 (6.7)
With a friend	5 (1.1)
<b>Current use of e-cigarettes</b>	
Yes, only e-cigarette	38 (8.0)
Yes, in addition to regular cigarette	12 (2.5)
No, but use them once	46 (9.7)
No, and never used them	380 (79.8)
<b>Use of e-cigarette*</b>	
No	380 (79.8)
Yes	96 (20.2)
<b>Do any of your friends or family members use e-cigarettes?</b>	
No	199 (41.8)
Yes	245 (51.5)
I do not know	32 (6.7)
<b>Are there any smokers in your accommodation?</b>	
No	234 (49.2)
Yes	209 (43.9)
Not sure	33 (6.9)

Values are presented as numbers and percentages (%). \*People who have used electronic cigarettes at any time in their lives.

E-cigarette: electronic cigarette, SD: standard deviation, SR: Saudi Riyals

Furthermore, most participants cited attractive flavors as their primary reason for using e-cigarettes ( $n=168$ , 35.30%) followed by using them to manage social issues with family and friends ( $n=162$ , 34.10%).

**Table 2** - Perceptions, practices, and attitudes of participants toward electronic cigarettes.

Variables	n (%)
<i>Perception of participants regarding e-cigarettes</i>	
<i>Do you believe that using e-cigarettes instead of nicotine gum or patches is a safer approach to stop smoking?</i>	
No	338 (71.0)
Yes	51 (10.7)
Not sure	87 (18.3)
<i>Do you think that using e-cigarettes is safer than regular cigarettes (traditional tobacco cigarettes)?</i>	
No	330 (69.3)
Yes	90 (18.9)
Not sure	56 (11.8)
<i>Do you think that the preservatives or flavors used in e-cigarettes are harmless?</i>	
No	388 (81.5)
Yes	40 (8.4)
Not sure	48 (10.1)
<i>Do you think that exposing children to e-cigarette smoke is safe?</i>	
No	438 (92.0)
Yes	14 (2.9)
Not sure	24 (5.0)
<i>Does using e-cigarettes indoors cause harm to nonsmokers in the same space (passive smoking) if exposed to the air emitted by e-cigarettes?</i>	
No	58 (12.2)
Yes	359 (75.4)
Not sure	59 (12.4)
<i>Are you aware of a legal minimum age for using e-cigarettes?</i>	
No minimum age to use e-cigarettes	43 (9.0)
At least 18 years	148 (31.1)
At least 21 years	80 (16.8)
Prohibited for all ages	115 (24.2)
Unsure	90 (18.9)
<i>Practice and attitude of participants toward e-cigarettes</i>	
<i>How frequently do you use e-cigarettes?</i>	
Do not use them	401 (84.2)
Once daily	5 (1.1)
More than once daily	39 (8.2)
1-2 times weekly	11 (2.3)
1-2 times monthly	20 (4.2)
<i>Where do you buy electronic cigarettes?</i>	
Do not use them	395 (83.0)
Shops selling electronic cigarettes	42 (8.8)
Grocery store	8 (1.7)
Tobacco and shisha shops	23 (4.8)
Friends	8 (1.7)
<i>Do you trust the nicotine concentration value written on the product label?</i>	
Do not use e-cigarettes	364 (76.5)
No, I do not trust them	49 (10.3)
Yes, I trust them	40 (8.4)
I use nicotine-free e-cigarettes	4 (0.8)
Unsure	19 (4.0)
<i>Where do you use electronic cigarettes?</i>	
Do not use e-cigarettes	393 (82.6)
In indoor spaces	10 (2.1)
In outdoor spaces	17 (3.6)
Both in- and outdoor spaces	56 (11.8)
<i>Are you ready to quit using e-cigarettes?</i>	
Do not use e-cigarettes	397 (83.4)
No	14 (2.9)
Yes, at the earliest time	29 (6.1)
Yes, in future	30 (6.3)
Not sure	6 (1.3)
<i>What do you think regarding using electronic cigarettes?</i>	
Not harmful	16 (3.4)
Less harmful than normal cigarettes	64 (13.4)
Same harm as normal cigarettes	169 (35.5)
More harmful than normal cigarettes	180 (37.8)
Not sure	47 (9.9)

Values are presented as numbers and percentages (%). E-cigarette: electronic cigarette

Notably, a significant percentage of participants (n=151, 31.80%) reported “out of curiosity” as their reason for use. The least frequently cited reason was a smoking reduction (n=56, 11.80%).

**Discussion.** The findings of this cross-sectional study shed light on the varied perceptions, practices, and attitudes toward e-cigarette use among young adults in Riyadh, Saudi Arabia. The participants were predominantly female, with 10.5% reporting current usage of e-cigarettes. This trend aligns with global concerns regarding the rising popularity of e-cigarettes among young adults.<sup>9</sup>

Compared to other studies carried out in Saudi Arabia, our study reported a low prevalence of current e-cigarette use (10.5%). Abdulelah et al<sup>10</sup> reported that the e-cigarette use prevalence among 5,012 healthcare students in Saudi Arabian universities was 32.36%. Another study reported a 13.5% prevalence of current e-cigarette use among first-year university students in Riyadh.<sup>11</sup>

A study in Jazan, Saudi Arabia, reported that only approximately 13.9% of participants believed that using e-cigarettes helped smokers quit.<sup>12</sup> However, a study by Alzahrani et al<sup>13</sup> involving a Western population demonstrated that 32.1% of participants believed that e-cigarettes were beneficial for ceasing conventional smoking.

Males and non-Saudis exhibited high e-cigarette usage, potentially due to targeted marketing strategies or social perceptions of acceptability. Living arrangements were also influential; individuals living alone or with friends displayed high usage rates suggesting that peer influence plays a crucial role, highlighting the importance of social context in shaping e-cigarette-related behaviors.

The relationship between the perceptions of participants and their use of e-cigarettes offers intriguing insights. Participants who believed that e-cigarettes offered a safe method to quit smoking perceived them as safer than traditional cigarettes or were unsure of the legal minimum age for their use and demonstrated a high prevalence of e-cigarette use. This trend aligns with findings reported in previous studies.<sup>10,14</sup> Public health campaigns aimed to correct misperceptions and raising awareness of the potential risks associated with e-cigarette use could have a great benefit.

Conversely, participants who believed that exposing children to e-cigarette smoke was unsafe or that using e-cigarettes indoors posed risks to nonsmokers had a low prevalence of use.

**Table 3 -** Factors affecting the prevalence of e-cigarette usage.

Variables	Use of e-cigarette		Chi-t test	Fisher's exact	RR	Regression model	
	No	Yes				95% CI	P-values
<i>Gender</i>							
Male	52 (53.1)	46 (46.9)	<0.001*	<0.001*	5.80	3.53-9.53	<0.001*
Female	328 (86.8)	50 (13.2)			Ref.		
<i>Nationality</i>							
Saudi	367 (81.4)	84 (18.6)	<0.001*	0.001*	0.386	0.14-1.03	0.060
Non-Saudi	13 (52.0)	12 (48.0)			Ref.		
<i>Monthly income</i>							
I do not know	79 (83.2)	16 (16.8)	0.805	0.811	Ref.	0.31-2.89	0.926
<5000 SR	33 (78.6)	9 (21.4)			0.94		
5000-10000 SR	82 (80.4)	20 (19.6)			0.69		
>10000 SR	186 (78.5)	51 (21.5)			1.18		
<i>Marital status</i>							
Single	325 (78.7)	88 (21.3)	0.187	0.130	Ref.	0.21-1.11	0.087
Married	53 (88.3)	7 (11.7)			0.487		
Divorced	2 (66.7)	1 (33.3)			1.846		
<i>Marital status of parents</i>							
Married	322 (79.7)	82 (20.3)	0.333	0.390	Ref.	0.733-4.155	0.208
Divorced	18 (69.2)	8 (30.8)			1.745		
One of them has died	30 (85.7)	5 (14.3)			0.654		
Both have died	10 (90.9)	1 (9.1)			0.393		
<i>Living with:</i>							
Parents	358 (81.5)	81 (18.5)	<0.001*	<0.001*	Ref.	1.07-4.99	0.032*
Alone	21 (65.6)	11 (34.4)			2.315		
With a friend	1 (20.0)	4 (80.0)			17.67		
<i>Do any of your friends or family members use e-cigarettes?</i>							
No	186 (93.5)	13 (6.5)	<0.001*	<0.001*	Ref.	3.79-13.16	0.000*
Yes	164 (66.9)	81 (33.1)			7.066		
Not know	30 (93.8)	2 (6.3)			0.954		
<i>Are there any smokers in your accommodation?</i>							
No	199 (85.0)	35 (15.0)	0.003*	0.003*	Ref.	1.33-3.41	0.002*
Yes	152 (72.7)	57 (27.3)			2.13		
Not sure	29 (87.9)	4 (12.1)			0.784		

Values are presented as numbers and percentages (%). CI: confidence interval, RR: relative risk, e-cigarette: electronic cigarettes, Ref.: reference, SR: Saudi Riyals

Prominent reasons for e-cigarette use included the appeal of flavors, coping with problems, and curiosity. These findings are consistent with those reported in previous research that underscore the influence of flavor and psychosocial factors on e-cigarette initiation among young adults.<sup>14</sup> Interventions tailored to address specific motivations, such as imposing flavor restrictions and providing mental health support, could be effective.

Moreover, contextualizing these findings within the broad scope of tobacco control policies in Saudi Arabia is crucial. The high prevalence of e-cigarette use underscores the need for a comprehensive regulatory framework addressing marketing, sales, and public awareness. Therefore, culturally sensitive interventions considering societal norms and values are necessary.

**Study limitations.** Majority of participants were female. Additionally, utilizing a convenience sample and

a self-administered online survey may have generated a response bias, limiting the generalizability of the findings. We recommend carrying out similar studies in other cities of Saudi Arabia to identify variables that may differ regionally and to inform holistic policy implementation.

In conclusion, young Saudi adults cited flavors of e-cigarettes as the primary reason for their use. Furthermore, they believed that e-cigarettes use was a safe alternative to quitting traditional smoking. Electronic cigarettes should be regulated and restricted similarly to traditional cigarettes.

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