Tobacco Induced Diseases

Media influences on university students' e-cigarette risk perceptions and use in Chengdu, China: A qualitative study

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ABSTRACT

INTRODUCTION Media exposure may influence young adults' risk perceptions and vaping behaviors. This study explores how media exposure is associated with university students' perceptions of electronic cigarette risks and use behavior.

METHODS Between January and February 2024, 20 purposively sampled full-time Chinese university students aged 18–25 years with lifetime e-cigarette use participated in semi-structured online interviews of 40–60 minutes, in Chengdu, China. Interviews continued until data saturation was reached. All interviews were conducted by one trained bilingual female researcher. Transcripts were analyzed using inductive qualitative content analysis in NVivo 14, and intercoder agreement was assessed using Cohen's kappa. The study followed Consolidated Criteria for Reporting Qualitative Research guidelines and was reported with reference to the Standards for Reporting Qualitative Research checklist.

RESULTS Four main themes and twelve subthemes were identified: 1) everyday media exposure to e-cigarette-related information (information volume, source credibility, and visible representations of vaping); 2) e-cigarette-related media content (health consequences, aesthetic appeal and behavior-oriented content, and repeated exposure); 3) interpretations of official health information (risk messages, personal relevance, message frequency, and attitudes towards official information); and 4) peer-mediated information and behaviors (peer-reported health consequences of e-cigarette use and peer-shared experiences on social media). Peer narratives and algorithm-driven social media content were perceived as more influential than official messages in shaping risk perceptions and usage.

CONCLUSIONS Participants perceived repeated exposure and peer-driven social media content as contributing to message fatigue, reduced risk salience, and the normalization of e-cigarette use. Official health messages were generally viewed as credible but abstract, repetitive, and less personally relevant than peer narratives.

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INTRODUCTION

E-cigarettes, initially marketed as smoking cessation tools, are increasingly recognized as public health risks and have been associated with vascular dysfunction and cardiovascular complications[1,2]. Globally, >100 million people use e-cigarettes, including at least 15 million adolescents aged 13–15 years[3]. In China, e-cigarette use is particularly common among young adults, with national survey data indicating rapid growth in uptake in recent years[4,5]. The regulatory environment has tightened substantially in recent years[5,6]. By 2024, many countries had banned electronic nicotine delivery systems (ENDS), while many others implemented

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measures restricting youth use[7]. In China, since 2022, e-cigarette products have been incorporated into the national tobacco regulatory framework, with restrictions on flavor products, online sales, and youth access[8-10]. Despite regulations, e-cigarette use has expanded rapidly among young adults.

Concurrently, young adults navigate a complex digital information environment[11]. E-cigarette companies increasingly use social media platforms, influencer marketing, behavior-oriented content, and user-generated promotions to increase product visibility and appeal among young adults[12-14]. Health professionals, government agencies, and commercial actors disseminate competing health information across digital platforms, influencing how young adults evaluate risks and make behavioral decisions[12,15,16]. Source credibility, defined as the perceived expertise and trustworthiness of information, remains a key determinant of risk evaluation and health-related decision-making, particularly when individuals have limited prior knowledge[16,17].

Existing international research has shown that social media and peer-generated e-cigarette-related content can increase product appeal, normalize use, and reduce perceived risks among young adults[12,13,18]. Studies in Western contexts suggest that algorithm-driven exposure and peer communication play a central role in shaping vaping-related attitudes and behaviours[12,19]. Most of this evidence originates from North America, Europe, and Australia[13,18], where digital platforms, regulatory environments, and patterns of trust in institutional information differ substantially from those in China[14]. In China, e-cigarette-related information is primarily encountered through highly platformized ecosystems such as Douyin, RedNote, and WeChat, where algorithmic recommendation systems may intensify repeated exposure and blur distinctions between commercial, social, and informational content[14,20-22]. In addition, stronger peer embeddedness and the simultaneous presence of extensive state-led health communication may shape how young adults evaluate competing information sources[23]. University students represent a particularly important population in this context, as they are intensive users of algorithm-driven social media platforms and are at a developmental stage in which health risk perceptions and behavioral patterns are still forming[19].

However, it remains unclear whether similar mechanisms operate among Chinese university students navigating China's unique media ecosystem[10,24]. Meanwhile, Chengdu provides a strategically important yet underexplored setting for examining these processes in western China[17,24]. Understanding how Chinese university students interpret e-cigarette-related information requires context-specific empirical investigation within China's distinctive cultural, regulatory, and media environment[20]. This research aimed to explore how university students perceived the role of media exposure in shaping their e-cigarette risk perceptions and use-related behaviors in Chengdu, China.

METHODS

Study design, setting, and participants

This qualitative study was conducted among university students in Chengdu, Sichuan Province, China, between January and February 2024. Purposive sampling was used to explore students' experiences and perceptions of e-cigarette use. Eligibility criteria included Chinese citizenship, full-time enrolment at a participating university, ability to speak Chinese, aged 18–25 years, and lifetime e-cigarette use (defined as having taken at least one puff of an e-cigarette in their lifetime). Recruitment information was distributed electronically through university student networks with the assistance of relevant university contacts. Interested students contacted the researcher directly and were screened for eligibility before enrolment. University staff were not informed of individual students' decisions to participate. Recruitment continued until data saturation was achieved, defined as the point at which no new themes emerged from successive interviews. A total of 20 eligible students were enrolled and completed the interviews, with no withdrawals after enrolment. Non-response to the electronic recruitment information was not formally recorded. Reporting was guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist[25] and the Standards for Reporting Qualitative Research (SRQR) (Supplementary file).

Interview guide

A semi-structured interview guide was developed

based on the study objectives, relevant literature, and Bandura's Social Cognitive Theory (SCT), with questions informed by key SCT constructs, including personal factors, behavioral factors, and environmental influences[26]. Participants were asked about how different media, particularly social media, influenced their perceptions and use of e-cigarettes. However, SCT was used as a conceptual guide to inform question development and later interpretation, rather than as a deductive coding framework; data analysis followed an inductive qualitative content analysis approach. The guide was developed to explore participants' experiences and perceptions of e-cigarette use. The guide explored four key domains: 1) Everyday exposure to e-cigarette-related media content; 2) Types of e-cigarette-related information encountered across different media platforms; 3) Interpretation of official health information; and 4) The roles of peers in shaping and disseminating e-cigarette-related information. The interview guide was pilot-tested and refined to ensure clarity and relevance (Table 1).

Data collection

In-depth, semi-structured interviews were conducted online in Chinese via Tencent Meeting. Interviews were scheduled at a time selected by each participant, and participants were asked to join from a private location where possible. Each interview lasted approximately 40–60 minutes and was audio-recorded with participants' consent. Prior to interviews, participants received detailed study information and provided informed consent online. Field notes were taken to capture contextual observations and non-verbal cues where observable in the online setting. All participants were interviewed once, with no follow-up or repeat interviews conducted.

Participant characteristics

Participant characteristics included sex, age in completed years, academic year, duration of e-cigarette use, age at first conventional cigarette use in years, age at first e-cigarette use in years, weekly e-cigarette expenditure, and monthly living expenses. Duration of e-cigarette use was categorized as ≤6 months, 7–24 months, and >2 years. Weekly e-cigarette expenditure (Chinese Renminbi, RMB) was categorized as: <100, 100–199, and ≥200. Monthly living expenses (RMB) were categorized as: <1000, 1000–1999, 2000–2999, and 3000–3999.

Researcher positionality and reflexivity

In accordance with COREQ guidelines, the researcher is acknowledged as the primary analytical instrument[25]. All interviews were conducted by a single bilingual female Chinese researcher with postgraduate training in public health. The interviewer had no prior personal, academic, or supervisory relationship with the participants before recruitment. Before the interviews, participants were informed that the interviewer was a postgraduate public health researcher conducting a study on university students' experiences of e-cigarette-related media information, risk perceptions, and use-

Table 1. Semi-structured interview guide used in a qualitative study of university students with e-cigarette experience in Chengdu, China, January–February 2024

Main topic	*Interview questions*
1. Exposure to e-cigarette-related information in daily life	Can you tell me about the electronic cigarette–related information you have come across in your daily life?
	How would you describe the amount of e-cigarette-related information you are exposed to?
2. Types of e-cigarette-related content encountered	What kinds of e-cigarette-related content have you seen on social media or online platforms?
	Overall, how do you feel different types of e-cigarette-related content shape your understanding of vaping?
3. Experiences with peers and social communication	Have your friends or people around you ever talked about, or shared information related to e-cigarette use?
	Can you describe any experiences or stories you have heard from peers about e-cigarette use?
	How do the views or experiences of peers influence your own thoughts about e-cigarette use?
Closing question	Is there anything else about e-cigarette-related information or your experiences that you think is important, but we have not talked about?

related behaviors. Participants were not informed of any predetermined hypotheses or expected findings. This insider–outsider positionality facilitated rapport and contextual understanding of local language and digital cultures, while the external academic affiliation helped reduce social desirability bias in a context where e-cigarette use is socially and institutionally sensitive. Qualitative content analysis was supported by peer debriefing within the research team to minimize interpretive bias and ensure that findings remained grounded in participants' accounts. Only the participant and the interviewer were present during the interviews. Transcripts were not returned to participants for review, nor did participants provide feedback on the preliminary findings.

Data analysis

All interviews were transcribed verbatim in Chinese and translated into English by one bilingual member of the research team. To ensure accuracy, translations were cross-checked against the original Chinese transcripts. Data were managed and coded using NVivo 14, and qualitative content analysis was conducted following an inductive approach. Initial coding was conducted to identify meaningful data units relevant to the study objectives. Codes with similar concepts were iteratively grouped into categories and subsequently refined into overarching themes, with reference to the literature. Participant characteristics were summarized using frequencies and percentages for categorical variables, and means, standard deviations, and ranges for continuous variables. Descriptive statistics were calculated using IBM SPSS Statistics for Windows, version 29.0 (IBM Corp., Armonk, NY, USA).

To enhance rigor, two experts with >10 years of research experience in psychology and communication independently reviewed the coded units. The scale-level content validity index based on universal agreement (S-CVI/UA) was 0.93, and intercoder agreement assessed using Cohen's kappa was 0.71 ($p<0.001$). Discrepancies were resolved through discussion until consensus was reached, and the coding framework was refined iteratively.

To ensure dependability and an audit trail, data analysis followed an iterative coding process. Initial open coding of five transcripts generated descriptive codes related to media exposure and vaping behaviors. These codes were refined through cross-transcript comparison and team reflexivity into higher-order categories. Discrepancies were resolved through peer debriefing until consensus was reached, ensuring that final themes remained grounded in the data. Representative participant quotations were selected to illustrate and support the themes and subthemes presented in the Results section. Quotations translated from the original Chinese transcripts were labelled with participant codes (P1–P20).

Ethical considerations

The study was conducted in accordance with institutional ethical requirements and the Declaration of Helsinki, as revised in 2013. Ethical approval was obtained from Ya'an Polytechnic College (Approval number: 0001) and Universiti Kebangsaan Malaysia (Approval number: UKM/PPI/111/8/JEP·2022-606). All participants provided electronic informed consent before participation. They were informed about the study and assured that all data would be stored securely, analyzed and reported in a manner that protected participants' confidentiality; no information identifying individual students or participating universities would be disclosed.

RESULTS

Participant characteristics

Twenty in-depth interviews were conducted with university students (15 males, 5 females; mean age 19.40 years (SD=1.22, range 18–22). Participants were from all academic years (academic year 1–4) and had varying e-cigarette use experience (≤6 months: n=7; 7–24 months: n=3; >2 years: n=10). Most reported weekly e-cigarette expenditure (RMB) was <100 (about US$14), and monthly living expenses (RMB) ranged from <1000 to 3000–3999 (Table 2).

Table 3 provides a more detailed individual-level profile of the interview participants. The table summarizes their sex, age, academic year, duration of e-cigarette use, age at first conventional cigarette use and age at first e-cigarette use, weekly e-cigarette expenditure, and monthly living expenses.

Emerging themes

Four overarching themes were identified: everyday media exposure to e-cigarette-related information,

types of e-cigarette content encountered through media, ways of interpreting official health information, and roles of peers in the circulation of e-cigarette information. Table 4 summarizes the themes and subthemes.

Theme 1: Everyday media exposure to e-cigarette-related information

Participants described repeated exposure to warnings and negative information as being associated with reduced attention and emotional responsiveness rather than heightened concern. Three subthemes were identified: 1) perceived volume of e-cigarette-related information; 2) perceptions of the credibility of information sources; and 3) visible representations of vaping in media and everyday contexts.

Subtheme 1: Perceived volume of e-cigarette-related information

Many participants described feeling overwhelmed by the constant flow of e-cigarette-related content in their social media feeds. Frequent exposure to harm warnings initially attracted attention, but participants reported that the perceived impact of these warnings diminished with repeated exposure. The following account captures this trajectory clearly:

> *'Douyin/TikTok keeps pushing me these harm warnings about vaping ... At first, I was kind of worried (about my health) ... it's just the same stuff every time (I open the app), ... it doesn't feel interesting anymore.'* (P9)

Another indicated that a large amount of negative information was seen as meaningless talk:

> *'I searched online about the harms of vaping. Most stuff was super negative, like "duh, of course it's bad" (participants perceived the warnings as unsurprising or repetitive).'* (P6)

Table 2. Group demographic and behavioral characteristics of participants in a qualitative interview study conducted in Chengdu, China, January–February 2024 (N=20)

Characteristics	n (%)
Age (years), mean (SD) [range]	19.40 (1.22) [18–22]
Sex	
Male	15 (75.0)
Female	5 (25.0)
Duration of e-cigarette use	
≤6 months	7 (35.0)
7–24 months	3 (15.0)
>2 years	10 (50.0)
Weekly e-cigarette expenditure (RMB)	
<100	13 (65.0)
100–199	5 (25.0)
≥200	2 (10.0)
Monthly living expenses (RMB)	
<1000	1 (5.0)
1000–1999	10 (50.0)
2000–2999	6 (30.0)
3000–3999	3 (15.0)

SD: standard deviation. RMB: 1000 Chinese Renminbi about US$140 using the average exchange rate during the study period.

Subtheme 2: Perceptions of the credibility of information sources

About one-third of participants (35.0%) reported difficulty distinguishing between authoritative and non-authoritative sources within their feeds. Because content from government accounts, news outlets, commercial brands, influencers, and ordinary users all appeared in the same scroll, students often felt unsure whom to trust. As one put it:

> *'Online information is highly ambiguous and unreliable, but if it's from legit research on e-cigarette harms, I'd trust it 80%. Baidu (China's main search engine)? Maybe 50-50. Like, you never know what's clickbait.'* (P8)

Another participant held a thoroughly skeptical attitude toward these online e-cigarette viewpoints:

> *'Online info's all over the place - most sites say vaping's harmless, but Baidu searches show the health risks ... Don't trust offline sellers (post on social media) either ... They're just pushing products ... Honestly don't believe anything online ... It's all too messy and contradictory.'* (P10)

Subtheme 3: Visible representations of vaping in media and everyday contexts

Seventeen participants (85.0%) suggested that constant exposure to images and videos of people using e-cigarettes in everyday, social, or aesthetically pleasing contexts made vaping appear normal and routine, rather than exceptional or risky. For example,

one participant noted:

'From my friend's social media posts, most of the friends around vape ... everyone vapes, and if I vape or don't vape, it doesn't matter. It just feels like a normal social phenomenon.' (P16)

A participant believed that frequently presented content featured influencers using EC as props to create smoke-blowing effects:

'... Some influencers even use vapes for smoke tricks (manipulating vapor to create visual shapes or effects) in their videos ...' (P7)

Theme 2: Types of e-cigarette content encountered through media

Participants described encountering several types of e-cigarette-related content through digital media environments. In contrast to the relatively passive reception of official health messages, social media platforms were experienced as dynamic systems that appeared to 'learn' from users' behavior and tailor e-cigarette-related content to their perceived interests. Three subthemes were identified: 1) content emphasizing health consequences; 2) aesthetic appeal and behavior-oriented content; and 3) repeatedly promoted e-cigarette-related content.

Subtheme 1: Content emphasizing health consequences

Thirteen participants (65.0%) described a pathway in which algorithms appeared to amplify emotionally charged, often sensationalized health content about e-cigarette use. Participants reported that after they had searched for, clicked on, or lingered over e-cigarette-related posts, their feeds increasingly surfaced short videos or infographics warning about 'serious' or 'life-threatening' consequences. These

Table 3. Individual demographic and behavioral characteristics of participants in a qualitative interview study conducted in Chengdu, China, January–February 2024 (N=20)

Participant	Sex	Academic year	Duration of e-cigarette use	Age at first cigarette use (years)	Age at first e-cigarette use (years)	Weekly e-cigarette expenditure (RMB)	Monthly living expenses (RMB)
P1	Female	1	6 months	17	18	100–199	1000–1999
P2	Male	1	2 years	13	16	100–199	2000–2999
P3	Male	1	2 years	17	18	<100	3000–3999
P4	Female	1	1 year	14	17	100–199	3000–3999
P5	Female	1	1 month	19	19	<100	3000–3999
P6	Male	1	2 years	16	18	<100	<1000
P7	Male	1	3 years	15	16	<100	2000–2999
P8	Male	1	3 years	14	13	<100	1000–1999
P9	Male	1	3 months	17	17	<100	1000–1999
P10	Male	1	2 months	15	16	<100	1000–1999
P11	Female	3	6 months	18	19	<100	1000–1999
P12	Male	1	6 months	16	19	≥200	1000–1999
P13	Male	4	2 years	18	19	<100	1000–1999
P14	Male	1	6 months	17	17	<100	1000–1999
P15	Female	3	5 years	15	17	100–199	1000–1999
P16	Male	2	3 years	16	17	<100	2000–2999
P17	Male	2	1 year	14	16	≥200	2000–2999
P18	Male	2	2 years	17	17	<100	1000–1999
P19	Male	3	5 years	13	15	100–199	2000–2999
P20	Male	2	1 year	19	20	<100	2000–2999

As shown in Table 2, the 20 participants varied in age, year of study, duration of e-cigarette use, and socioeconomic background. RMB: 1000 Chinese Renminbi about US$140 using the average exchange rate during the study period.

clips frequently used dramatic language or striking visuals, and several students questioned their scientific accuracy. However, they also noted that such content left a strong emotional imprint even when they did not fully believe it.

For example, one recalled encountering an exaggerated health claim that continued to echo in his mind despite his skepticism:

> *'On Douyin/TikTok, they said electronic cigarettes are way more harmful than regular ones ... What stuck with me the most was that vaping makes you 10 times more likely to get COVID than smoking cigarettes.'* (P2)

Subtheme 2: Aesthetic appeal and behavior-oriented content

A larger group of participants (85.0%) reported an almost opposite, but equally powerful, algorithmic pathway, in which platforms funneled visually appealing, pro-vaping content. After interacting with e-cigarette-related posts or online shops, students described being 'surrounded' by advertisements, influencer videos, and behavior-oriented 'vlogs' that framed vaping as fashionable, convenient, and socially desirable. Rather than emphasizing health effects, this content highlighted design, flavor variety, and compatibility with particular behavior or subcultures.

A participant admitted being drawn in by this aesthetic and identity-based framing:

> *'E-cigs don't give you that buzz as easily, and they come in all sorts of flavors ... e-cigarettes look good in design ... many colors and looked more like something you'd match with your outfit than a cigarette.'* (P1)

Subtheme 3: Repeatedly promoted e-cigarette-related content

Thirteen participants (65.0%) also described a third, repetitive e-cigarette-related concern. Many recounted that, once the algorithm had 'learned' they were interested in e-cigarettes, their feeds would intermittently push health alerts, regulatory updates, or cautionary stories often in very similar, simplified formats. As one explained:

> *'Even though I knew it was kinda exaggerated, seeing it constantly made me feel like, "Damn, maybe this is worse than I thought". But now? Zero ads (no longer receive any advertisements or e-cigarette-related content on social media apps on my phone). It's weird how the algorithm just ... stopped once I quit.'* (P17)

Theme 3: Ways of interpreting official health information

Although participants frequently encountered e-cigarette-related information from official state

Table 4. Themes and subthemes identified in a qualitative interview study of university students with e-cigarette experience in Chengdu, China, January–February 2024 (N=20)

Theme	Subthemes	n	%
Everyday media exposure to e-cigarette-related information	Perceived volume of e-cigarette-related information	13	65
	Perceptions of the credibility of information sources	7	35
	Visible representations of vaping in media and everyday contexts	17	85
Types of e-cigarette content encountered through media	Content emphasizing health consequences	13	65
	Aesthetic appeal and behavior-oriented content	17	85
	Repeatedly promoted e-cigarette-related content	13	65
Ways of interpreting official health information	'General' or 'empty' health risk statements	7	35
	Disconnections from everyday life	5	25
	Fatigue and reduced attention to repeated information	15	75
	Nominal, surface acceptance of official health claims	10	50
Peer-mediated e-cigarette information and use-related behaviors	Peer-reported health consequences of e-cigarette use	9	45
	Social media circulation of peer-generated e-cigarette content	17	85

Participants could endorse multiple subthemes; therefore, percentages do not sum to 100%, and counts may exceed the total sample size (N=20); n indicates the number of participants who mentioned each subtheme; percentages are calculated as % of participants (N=20).

media and government health agencies, they generally perceived such messages as having weak influence on their day-to-day vaping behavior. Four subthemes were identified under this theme: 1) 'general' or 'empty' health risk statements; 2) disconnections from everyday life; 3) fatigue and reduced attention to repeated information; and 4) nominal, surface acceptance of official health claims.

Subtheme 1: 'General' or 'empty' health risk statements

Seven participants (35.0%) described official warnings as 'too general' or 'empty'. They felt that statements such as 'e-cigarettes are harmful' lacked specific, concrete details that could help them understand the nature or severity of the risk. For example, a participant commented:

> *'I saw some reports on TV, something ... They basically just said e-cigarettes are bad for your health. I don't remember anything specific though. I think they mentioned things like "white lung" and stuff, but honestly, I can't really remember.'* (P13)

Another noted that official sources often provided detailed data but lacked the emotional salience that characterized social media content:

'The official sites hit you with cold hard data, while social media goes full clickbait.' (P20)

Subtheme 2: Disconnection from everyday life

Five participants (25.0%) highlighted a disconnection between official messages and their own lived experiences. Long-term risks were perceived as distant and unlikely to occur 'at this age'. As one explained:

> *'They [the government media] talk about lung cancer and things that might happen many years later. For us it feels very far away. None of my friends have those problems now, so it's hard to really feel it.'* (P10)

Subtheme 3: Fatigue and reduced attention to repeated information

A larger group of participants (75.0%) described official content as repetitive and predictable, which they associated with message fatigue. As was noted:

> *'The information on official websites is general ... A lot of it says the same thing ... if I click on a post about the harms of e-cigarettes, I can usually guess what it's going to say before I even read it.'* (P12)

Subtheme 4: Nominal, surface acceptance of official health claims

Ten participants (50.0%) expressed surface-level acceptance of official messages. A participant summarized this gap:

> *'Of course, I trust the government more than random bloggers. But believing it's harmful and actually stopping are two different things.'* (P7)

Theme 4: Peer-mediated e-cigarette information and use-related behaviors

As summarized in Table 4, the theme highlights the roles of peers in the circulation of e-cigarette information. Participants frequently described relying on narratives from peers rather than official statistics or expert data when discussing e-cigarette risks. These peer narratives were not only transmitted through face-to-face communication, but were also frequently circulated via social media platforms, where experiences, warnings, and discussions about e-cigarette use were shared, reposted, and amplified within digital peer networks. Two subthemes were identified: 1) peer-reported health consequences of e-cigarette use; and 2) social media circulation of peer-generated e-cigarette content.

Subtheme 1: Peer-reported health consequences of e-cigarette use

Nearly half of the participants (45.0%) mentioned that concrete health stories about people around them, such as their friends or classmates (directly experienced or personally known health consequences of e-cigarette use), had an impact on how they viewed e-cigarette risks. Participants frequently described learning about vaping-related health incidents through peer-generated content shared on social media platforms. In these cases, personal experiences became health information that circulated beyond immediate social networks and contributed to broader perceptions of e-cigarette-related risks:

> *'I quit because my friend got lung fibrosis from vaping (information shared on social media within my peer network). Seeing someone close to me suffer like that was much more real than any numbers on a chart.'*

(P5)

A participant described that a friend of a friend's experience with pulmonary fibrosis directly led his friend to quit using e-cigarettes:

'His friend who used e-cigarettes developed some pretty serious lung scarring (which he came to know through social media within his peer group). After that happened, he got scared and quit because of that fear.' (P14)

Subtheme 2: Social media circulation of peer-generated e-cigarette content

The majority of participants (85.0%) reported encountering peer-generated e-cigarette-related content through social media networks, such as Douyin/TikTok, WeChat Moments, or short-video platforms. Unlike top-down official campaigns, these warnings were often embedded in everyday content, including short clips, reposted news, and were therefore perceived as both accessible and credible. One participant described how a combination of online peer content and personal experience eventually pushed him to stop using e-cigarettes:

'In high school ... friends also shared scientific facts they had collected about e-cigarette harms on WeChat [information about the harms of e-cigarettes]. Combined, these made me quit – I threw mine away and never looked back.' (P18)

DISCUSSION

This study identified four main patterns in how university students in Chengdu interpreted e-cigarette-related media information. Participants described frequent exposure to mixed information from official sources, commercial actors, influencers, and peers. Repeated exposure was commonly associated in their accounts with information overload, message fatigue, and reduced attention to health warnings. Peer narratives and algorithmically recommended content were perceived as more personally relevant than official messages, which were generally viewed as credible but abstract and repetitive.

Everyday media exposure and the desensitization of risk information

The findings indicate that students encounter e-cigarette-related information within a dense and continuously updating media environment. Participants described frequent exposure to warnings, news coverage, promotional content, influencer posts, and peer sharing within the same algorithm-curated feeds. Participants' accounts associated prolonged exposure with reduced attention and emotional responsiveness rather than steadily increasing risk awareness[27,28]. Many participants reported gradually paying less attention to e-cigarette-related information and experiencing reduced emotional responses after repeated exposure.

This pattern is consistent with previous research on information overload and emotional blunting. When users encounter a large volume of mixed information in fast-scrolling environments, the cognitive effort required to evaluate each message increases[29]. Under such conditions, users may adopt low-effort coping responses, such as ignoring content or treating warnings as background noise[11]. From a cognitive load perspective, repeated exposure to heterogeneous and competing messages may exceed users' processing capacity and may be associated with selective withdrawal of attention rather than sustained risk elaboration[29]. In this context, repeated risk messages may lose salience rather than reinforce concern.

Another important factor was the coexistence of multiple information sources within the same digital space. Government accounts, commercial brands, influencers, and ordinary users often appeared side by side in the same feed[13]. This may blur the boundaries between authoritative information, marketing content, and personal opinion[13,14,30]. When users perceive the information environment as confusing or inconsistent, they may develop generalized skepticism rather than carefully evaluate each claim[17,26]. To put it another way, consumers' differentiated trust assessments may be weakened by epistemic ambiguity in algorithmically curated feeds and may be associated with a shift from message-level appraisal to source-level disengagement. Under these conditions, health warnings may fail to accumulate into stable risk perceptions.

The widespread visibility of vaping in everyday media contexts was also associated in participants' accounts with perceptions of vaping as normal and routine. Participants frequently encountered vaping in posts portraying vaping in everyday social settings,

social gatherings, or aesthetically framed online content[12-14,31]. Such repeated visual exposure may shape descriptive norms by signaling that vaping is common and socially acceptable[12,13]. Over time, vaping may appear less deviant and more integrated into everyday social life. Together, these patterns suggest that high-density media environments may be associated with reduced responsiveness to repeated risk communication[28]. This pattern may explain participants' reports of continued e-cigarette use even while acknowledging potential health risks[30].

Algorithmic media content and emotional pathways

Beyond general exposure, participants associated different types of algorithmically recommended e-cigarette-related content with different perceptions and emotional responses. Platforms did not simply transmit information; they actively filtered and amplified content based on users' browsing behavior[22,32,33]. Through this process, algorithmic recommendation systems repeatedly exposed users to similar e-cigarette-related material, which may be associated with changes in attention and emotional responses[21,22]. Previous research conceptualizes these technologies as feedback loops that may reinforce prior interaction patterns and limit the diversity of subsequently encountered content[21,30].

Three emotional pathways emerged from participants' descriptions. First, participants described health-consequence content as eliciting fear or concern. Algorithmically promoted videos or images emphasizing severe health outcomes were described as leaving a lasting emotional impression, even when participants questioned the scientific accuracy of the claims[15,34]. Emotionally intense content may attract attention and temporarily heighten perceived risk[15]. However, previous research suggests that emotional arousal may be transient and may not necessarily translate into sustained behavioral intention[34].

Second, aesthetic and behavior-oriented content was described as eliciting responses that contrasted with those associated with health-consequence content. Promotional posts, influencer videos, and product displays frequently framed e-cigarettes as fashionable, convenient, or socially appealing[12,13]. Such content rarely discussed health consequences. Instead, it emphasized design, flavors, and identity cues[12-14]. In participants' accounts, e-cigarette devices were sometimes interpreted less as nicotine products and more as identity-related accessories associated with youth culture and self-expression[13,14,31].

Repeated exposure to similar e-cigarette-related content was associated in participants' accounts with reduced attention and emotional responsiveness[27,28]. Taken together, these findings suggest that algorithmically mediated environments may be associated with heterogeneous responses rather than consistently discouraging or encouraging e-cigarette use[11,21]. Participants described a range of responses, including anxiety, curiosity, and reduced sensitivity to repeated warnings, which are consistent with previous research on emotional risk processing and message fatigue[15,16,27]. Previous research suggests that recommendation systems therefore function not only as channels of information distribution but also as mechanisms that shape how risk messages compete for attention within digital platforms[21,22,29].

Interpretation gaps in official health communication

Although participants frequently encountered e-cigarette-related information from government sources and mainstream media, these messages were often perceived as having limited influence on everyday behavior. Many participants acknowledged the authority of official institutions and verbally agreed that e-cigarette use carries health risks. However, participants described a gap between acknowledging the risks and changing their behavior.

One reason for this gap was that official warnings were often perceived as abstract or vague[35]. Participants described many messages as broad statements about harm that lacked detailed explanations or practical guidance. When risk information remains at the level of general conclusions without explaining mechanisms, probabilities, or concrete behavioral steps, individuals may struggle to translate knowledge into action[34,35].

Another challenge involved the perceived distance between official messages and students' everyday experiences. Public health warnings frequently emphasized long-term health consequences such as cancer or chronic respiratory disease[11,35,36]. For young

adults, these outcomes often felt temporally distant and difficult to verify within their immediate social environment[26]. In participants' accounts, these messages were recognized cognitively but were not experienced as personally urgent or immediately relevant[16].

Repetition was also associated in participants' accounts with message fatigue. Participants reported encountering similar warning formats repeatedly across different platforms. When health messages become predictable, users may begin to ignore them automatically, particularly in fast-scrolling social media environments[27,28]. Participants perceived generalized warnings as less personally relevant than concrete and context-specific information[35,36]. This finding highlights the importance of further examining how message specificity and perceived personal relevance are associated with young adults' engagement with official e-cigarette risk information[16,17,35].

Peer narratives and socially embedded risk perception

While official messages were often perceived as distant, participants frequently described peer narratives as more personally relevant than official messages when discussing their perceptions and decisions about e-cigarette use. Students reported paying close attention to the experiences and advice of friends, classmates, and same-age users online. These narratives often carried greater emotional weight and social relevance than institutional information[12,13]. This is consistent with SCT's observational learning mechanism, where individuals model behaviors and beliefs based on salient social referents[26].

One important form of peer influence involved personal health stories. Accounts of friends experiencing negative health effects from e-cigarette use were often described as particularly persuasive. Such narratives were perceived as making potential risks more immediate and personally relevant because they involved people within participants' own social networks.

Peer communication on social media also played an important role in circulating warnings and behavioral advice[11-13]. Many participants encountered e-cigarette-related information through reposts, short videos, or informal discussions within their online networks. Because these messages were embedded in everyday social interaction, they were perceived as more relatable and trustworthy than distant institutional messages[13,16]. This finding is consistent with SCT's emphasis on observational learning, whereby students' behavioral responses may be related to observed peer experiences and perceived peer norms[26].

At the same time, participants' accounts associated peer narratives with different behavioral responses. Stories about health consequences may encourage quitting or reduction, whereas narratives that normalize vaping may reinforce continued use[31]. Social media platforms may increase the visibility and repetition of peer-generated content[11]. The prominence of peer narratives in participants' accounts indicates a need for further research on how peer-generated communication is associated with the credibility, personal relevance, and interpretation of e-cigarette risk information.

Overall, participants' accounts indicated that media exposure was associated not only with how they understood e-cigarette risks but also with reported behavioral responses, including continued use, reduced attention to repeated health warnings, and the normalization of vaping within peer- and algorithm-mediated environments[11,12,19,27].

Limitations

This study has several limitations. First, participants were purposively recruited from universities in Sichuan Province, and all had experience of e-cigarette use. The findings may therefore not be transferable to university students in other regions, students who have never used e-cigarettes, or young adults outside higher education. Second, the qualitative design was intended to explore participants' experiences and interpretations and cannot establish causal relationships between media exposure, risk perceptions, and e-cigarette use. Third, the findings were based on self-reported accounts and may be affected by recall bias, social desirability bias, and other forms of information bias. Finally, the online interview format may have limited the observation of non-verbal communication, although field notes were recorded where possible.

CONCLUSIONS

University students in Chengdu described encountering

e-cigarette-related information from official, commercial, algorithmically recommended, and peer-generated sources. Repeated and mixed exposure was commonly associated in participants' accounts with message fatigue and reduced attention to health warnings. Peer narratives and socially embedded content were perceived as more immediate and personally relevant than official messages, which were generally viewed as credible but abstract and repetitive. These findings provide context-specific qualitative insight into how university students interpret e-cigarette risk information within China's platformized media environment.

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DATA AVAILABILITY
The data supporting this research are available from the authors on reasonable request.

AUTHORS' CONTRIBUTIONS
All authors: conceptualization, writing of original draft, writing, reviewing and editing of the manuscript. LW and CSS: data curation. LW, NB and CSS: formal analysis. LW: investigation, software. LW, LHW, NB, MIH and CSS: methodology. LHW, NB, MIH and CSS: supervision. All authors read and approved the final version of the manuscript.

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