RESEARCH ARTICLE

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Distressing Reality: Mumbai School Students Show Growing Interest and Familiarity with E-Cigarettes

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Abstract

Introduction: In the ever-evolving landscape of nicotine, electronic cigarettes (e-cigarettes) have gained popularity as devices that deliver nicotine and other chemicals to users in the form of aerosol without the need for combustion. The study examines increasing use of e-cigarettes among under-resourced adolescents in Mumbai's municipal and government schools. **Methods:** We used purposive sampling to recruit 72 students of Grade 8 and 9 from nine Mumbai municipal schools, enrolled in the Salaam Bombay programme, based on their willingness and ability to discuss e-cigarettes. We used thematic analysis to analyse interview data. **Results:** Results reveal that despite financial constraints, curiosity and misconceptions about safety these teens are drawn to e-cigarettes. Peer pressure and strategies to bypass bans exacerbate the trend. While the students are aware of ban on e-cigarettes, their understanding about the regulations remains limited. The 2019 Prohibition of Electronic Cigarette Act (PECA), while not entirely eradicating e-cigarette availability, has had a surprisingly positive impact. Informing the participants about legal consequences outlined in PECA triggered fear and a shift towards discreet consumption. This suggests that the law serves as an effective deterrent in curbing adolescent use. This research emphasizes the significance of PECA in reducing e-cigarette use among adolescents, advocating for its sustained and potentially amplified application. **Conclusion:** The study concludes that PECA alone is insufficient to address this complex issue. It calls for a comprehensive strategy, including targeted interventions that address peer pressure, online influences, and greater involvement of families to protect adolescents from dangers of e-cigarettes. A multi-faceted approach that includes education, legal enforcement, and community engagement is essential to combat this complex public health issue effectively.

Keywords: E-cigarettes- in-depth interviews- adolescents- Prohibition of Electronic Cigarette Act (PECA)

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Introduction

In the ever-evolving landscape of nicotine, electronic cigarettes (e-cigarettes) have gained popularity as devices that deliver nicotine and other chemicals to users in the form of aerosol without the need for combustion. Electronic cigarettes, disguised as sleek and harmless, have infiltrated the Mumbai's government schools, casting a long shadow over the delicate lungs and minds of adolescents. Despite India's proactive 2019 ban, these enticing devices, often perceived as a *"safer"* alternative to traditional cigarettes, continue to find their way into young hands.

While uncertainties shroud the long-term consequences of these "electronic nicotine delivery systems" (ENDS), their rising popularity among Mumbai's youth demands immediate attention. This study, armed with a qualitative lens, seeks to pierce through the haze of speculation and unveil the prevalence, patterns, and motivations behind e-cigarette use among government school children in the city.

India's youth stand at a pivotal juncture, with over 236 million individuals, roughly one-fifth of the population, falling within the vulnerable age group of 10-19 years [1]. Research paints a worrying picture, with 4% of 15–24-year-olds acknowledging awareness of e-cigarettes [2-4]. This awareness results into alarming usage eventually translating into a habit. Our preliminary research suggests sophisticated student-run networks, disguised as "ownership" systems and crowdfunding initiatives that bypass the ban with shocking ease. Furthermore, shadowy figures lurking near school premises, coupled with lax regulations at local shops, provide readily available avenues for purchase, often requiring only trusted references from existing users.

The allure of e-cigarettes, amplified by a kaleidoscope of flavours and aggressive social media marketing, fuels this trend [5]. However, the debate surrounding these devices remains complex. While their potential as harm-reduction tools for adult smokers has been debated [6],

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the hidden dangers, including carcinogenic chemicals and lung-damaging substances, raise concerns [7]. Furthermore, the "safer alternative" label attached to e-cigarettes carries a deceptive weight. Studies have linked their use to an increased risk of smoking initiation among youth [8-11]. The addictive grip of nicotine, coupled with potential respiratory harm, can leave adolescents vulnerable to further dependencies and negatively impact their developing brains, potentially leading to long-term consequences, mood disorders, and impaired impulse control [12].

Recognizing the urgency of this issue, India enacted a national ban on e-cigarettes in 2019, prohibiting their manufacture, sale, storage, and advertisement [13]. However, the effectiveness of this ban hinges on its implementation. While global measures like minimum-age-of-purchase laws and marketing restrictions offer valuable insights [14], understanding the specific context of Mumbai is crucial.

This study delves deeper into the city's underbelly, utilizing focus group discussions (FGDs) with 72 school children from diverse localities. By delving into their perspectives, motivations, access to e-cigarettes, and perceived risks and benefits, we seek to gain a nuanced understanding of the factors driving this hidden epidemic. Our findings aspire to illuminate not only the prevalence and patterns of e-cigarette use but also the complex interplay of social, economic, and psychological factors that contribute to its adoption among school children.

We envision this research contributing significantly to the global dialogue on e-cigarette use among youth and informing the development of targeted prevention and intervention programmes in Mumbai and beyond. By empowering communities, informing policy decisions, and safeguarding the health of future generations, this study hopes to unravel the e-cigarette maze and pave the way for a smoke-free future for children everywhere.

Materials and Methods

Study Setting and Participants

The Municipal Corporation of Greater Mumbai has taken on the responsibility of providing free primary education to all children enrolled in its schools, which it manages and maintains. This primary education system, overseen by the corporation, is the largest urban system of its kind in Asia. More than 485,000 children benefit from these facilities, which offer instruction in eight different mediums, including Marathi, Hindi, Gujarati, Urdu, English, Tamil, Telugu, and Kannada.

We employed purposive sampling to select participants, enlisting 72 self-volunteered adolescents from 8th and 9th grades across nine municipal schools in Mumbai. Students enrolled in the Salaam Bombay Preventive Health Education Program were included based on their willingness to participate and their ability to articulate thoughts and ideas about e-cigarettes in either Hindi or Marathi, their preferred language. The selection of schools was guided by insights from field facilitators, with a focus on schools where higher e-cigarette usage had been reported. Sessions took place in closed rooms within school premises, offering flexible timing to accommodate students during and after school hours for their convenience (Table 1).

Data Collection

In order to delve into the intricate world of e-cigarette use among municipal school children in Mumbai, a qualitative methodology was employed. This approach was not merely a matter of convenience; it was a strategic decision aimed at transcending surface-level data to explore the nuanced perspectives, attitudes, and hidden realities that shape e-cigarette use within this vulnerable population. It enabled us to explore this sensitive topic in greater depth, helping to reveal the true thoughts, emotions, and underlying reasons behind adolescents' use of e-cigarettes.

Focus Group Discussions (FGDs) were utilized as the primary tool for data collection, enabling the researchers to unravel the diverse and often contradictory narratives surrounding e-cigarettes. Nine schools across the city were purposefully selected based on the insights of field facilitators. Seven senior facilitators who shared an excellent rapport with adolescents were trained for qualitative interviewing techniques to conduct FGD sessions with students.

These FGDs, meticulously structured through the integration of literature review findings and research objectives, systematically probed essential domains encompassing awareness, information sources, consumption patterns, comprehension of health risks, and overarching attitudes towards e-cigarettes. This methodological rigor, further enhanced by purposeful sampling techniques and unanticipated interactions within the student cohort, facilitated a comprehensive exploration of concealed factors influencing the landscape of e-cigarette utilization among the students. Interviews were conducted in the school premises, face-to-face, within assigned empty classrooms. Each interview session involved only two facilitators and the participants; no teaching staff or non-participants were permitted. At the outset of each Focus Group Discussion (FGD), the facilitator elucidated the study's objectives in the local

Table 1. Adolescent's Grade, E-cigarette Usage by Gender

	Male (n=52)	Female (n= 20)	Total (n=72)
Grade - 8th	11	8	19
Grade - 9th	41	12	53
Duration of use			
Tried it a few times	21	4	25
Use frequently	2	2	4
Did not disclose	6	2	8
Do not use	25	10	35
Products ever used			
E-cigarette	16	2	18
Vape	6	1	7
Dual (E-cig + Hookah)	2	2	4

languages of Hindi or Marathi, based on the students' preference, and sought consent before proceeding or recording audio. Field notes were diligently taken during the interviews, and a summary of each session was documented later. Remarkably, none of the participants withdrew from the interviews.

Data Analysis

The study sought to investigate the levels of awareness and patterns of e-cigarette usage among adolescents residing in selected slums of Mumbai. In alignment with this central aim, the framework for the Focus Group Discussions (FGD) was meticulously crafted, encompassing critical themes such as the awareness surrounding e-cigarettes and their detrimental health consequences, usage patterns, accessibility and distribution channels, familial influence, economic capacity for purchase, and comprehension of relevant legal regulations.

The notes or audio recordings of the Focus Group Discussions (FGDs), conducted in either Hindi or Marathi, underwent a meticulous process. Initially, they were transcribed and subsequently translated into English to ensure accessibility for analysis. The analysis entailed inductive coding and content analysis, where all FGD transcripts were carefully examined and analysed manually, without relying on software assistance.

The thematic analysis of the FGDs followed a structured, step-by-step approach and began by delving into each transcript to identify key themes, fostering a comprehensive understanding of the data's nuances and intricacies. In alignment with the themes outlined during the formulation of the FGD guidelines, notable patterns and insights were systematically recognized and categorized through initial coding to encapsulate key concepts. For instance, if a participant mentioned learning about e-cigarettes from YouTube, it was coded as "YouTube Influence," which later contributed to the broader theme of "Sources of Information." Similar concepts were grouped together to form sub-themes and overarching themes. For example, within the theme of "Availability and Accessibility," the sub-themes "Widespread Availability" and "Discreet Sales" emerged based on participants' remarks about e-cigarettes being easily available in small shops and sometimes sold covertly. The researchers then reviewed and refined the themes to ensure clarity and relevance. To ensure a thorough analysis, earlier stages were revisited, and new themes were identified as needed, ensuring comprehensive coverage of the data. The final themes were determined not only by how frequently they appeared but also by their relevance to the study, allowing for a deeper and more meaningful interpretation of the findings. Finally, each theme was elaborated upon with supporting quotes from participants to illustrate their perspectives and experiences. This systematic approach helped organize the data in a way that effectively highlights how young people become aware of, access, and perceive e-cigarettes (Table 2).

The transcripts and findings derived from the study were not shared with the participants for corrections or feedback, thereby maintaining the integrity and objectivity of the analysis process.

Results

Our focus group discussions (FGDs) with school children unravelled a multidimensional reality that transcends the oversimplified lens of a mere regulatory ban, transcending beyond the confines of numerical data. While legal dimensions, notably governed by the Prohibition of Electronic Cigarette Act (PECA), surfaced as a salient theme, the intrinsic motives and intricacies underpinning e-cigarette consumption unveil a concealed labyrinth of factors, including accessibility, economic feasibility, and peer influence. This intricate web, shrouded in secrecy and fuelled by a dearth of holistic comprehension, constitutes the crux of e-cigarette dynamics among the studied cohort.

The thematic analysis of the collected data revealed distinctive patterns and trends, culminating in the identification of key themes.

Awareness about e-cigarettes

The results indicate a consistent and widespread acknowledgment of electronic cigarettes (e-cigarettes) within the government school children demographic. The participants exhibited a coherent understanding of diverse e-cigarette types, predominantly sourced from information disseminated by peers, community channels, and online platforms. "This is all vape. Only its size, design, and different companies belong to it. Like the first is Thanos, the second is Yuto, the third is Alphabar, and the fourth is also Thanos."

Students demonstrated a nuanced understanding of e-cigarettes as battery-operated devices. *"It runs on a charger. 1-2 hours of charging is sufficient. Its charge lasts for 3 days."*

"There is no button. If it's charging, it operates directly. If not, just charge for 10 minutes, and it starts. When pulled from the mouth, a blue light on the back side lights up. Pulling it brings out the flavor, indicating whether the device is active."

Table 2. Broad Themes and Sub-Categories of Focus Group Discussion

Broad Themes	Sub-categories
Awareness	Consistent Recognition
	Types, differences, recharge ways, Legal Awareness
Use	Common Usage Patterns
	Peer Influence
Sources of Information	YouTube Influence
	Peer Networks
	Family
Availability and Accessibility	Widespread Availability
	Discreet Sales
Knowledge of health Risks	Varied Understanding
	Perception of Harmlessness

They identified two types: refillable and rechargeable. The refillable variant, often termed *"vape hookahs,"* involves a sponge for flavour absorption. *"First, remove the cap from the top. It contains a firm sponge. A flavor dropper, similar to eye medication bottles, is included. Apply 3-4 drops onto the sponge, then inhale through the mouth" which could last for 7-8 months*, reflecting a practical understanding of e-cigarette operation.

Students possess a vague understanding of the e-cigarette ban and the Prohibition of Electronic Cigarette Act (PECA). Their comprehension of PECA's penalties is limited, with fear of fines emerging post-awareness sessions. *"I don't know. But there is a law; that's why shopkeepers fear being caught."* This highlights the need for targeted sensitization programmes. The secrecy maintained by shopkeepers fosters confusion, hindering students from seeking accurate information on legal and health consequences of e-cigarette use.

"There is a threat of the police. Policemen impose fines."

"The shopkeeper could face a 2-year jail term."

"It's banned, so it is sold stealthily."

Influence and Usage patterns

The e-cigarette variant of choice among users is vape hookahs, indicating a shared cultural or social preference. This choice is associated with factors such as enhanced smoke production and specific flavour preferences, suggesting users have a detailed understanding of sensory and experiential aspects.

"Meaning, it comes with various flavours in its drop bottle, such as sweet, chocolate, strawberry, mint, cumin, anise, orange, apple, watermelon, pineapple, ice, and bubble-gum. It is available in different flavours like these."

E-cigarette use is primarily a social activity, driven by peer groups. *"My friend who studies in the sixth standard uses it. When he gave it to me for charging, I saw it for the first time."* Students overcome financial barriers through crowdfunding models, collectively contributing between Rs 300 and 500 to purchase devices. The main contributor becomes the owner, but the collective experience is the real value. This approach creates a close-knit social environment where access, use, and enjoyment of e-cigarettes are tied to friendship and shared activities. Interestingly, usage patterns often align with times when parents are absent, emphasizing the secretive and socially coordinated nature of their e-cigarette use.

"Our friends told us that they use to bring it to school and use it. That's how we found out, and we've used it a couple of times too."

Sources of Information

YouTube, with its captivating content, emerged as a primary e-cigarette information source. Product reviews and lifestyle vlogs blurred the lines between factual information and advertising, shaping perceptions and curiosity about e-cigarettes.

"After watching YouTube videos, we feel good. Initially, we thought it would only have fruit flavours. During a session on tobacco control organized by the Salam Bombay Foundation, we learned that it also contains nicotine, which is a dangerous chemical present in electronic cigarettes."

Friends shared not just devices, but also knowledge. Casual conversations and shared experiences made peer networks powerful information conduits. Stories of shared purchases and group consumption practices revealed a social understanding of these devices, shaped by collective wisdom.

"In hookah, there is tobacco along with flavor, and in pen hookah, flavors similar to web are added and pulled. The flavors we use in the web can be put in pen hookah and consumed. Madam, search on your mobile, I'll show you."

While not the main source, family influenced students' choices. Some students mentioned relatives using e-cigarettes, subtly influencing their perception of risks and consequences. This quiet acceptance added a layer of normalization to their choices.

Availability and Accessibility

The study reveals that, notwithstanding the official ban, e-cigarettes are alarmingly accessible within the students' communities. These devices are not concealed contraband but are conspicuously available in everyday locales.

"It is available at CSMT, can be used 500 to 2000 times. It is found in Chor Bazaar, in the market, and also in the community. But if they know us, they will give it to us; otherwise, they won't."

This accessibility is not incidental; it represents a calculated strategy to operate subtly, engendering a parallel market beneath the surface of everyday life.

More disconcertingly, agents are found to lurk in the vicinity of school boundaries, capitalizing on the vulnerabilities of young minds by offering free *"samples"* as an insidious lure. This clandestine sales system is not merely about location; it involves inclusion in an exclusive network. Shops function as gatekeepers, with trustworthy customers serving as entry points, vouching for newcomers. This guarded system operates within school boundaries, exposing a disturbing reality: e-cigarette use is not merely a personal vice; it represents a covert society with its own rules and hierarchies, exploiting young vulnerabilities within the very communities that are intended to safeguard them.

Knowledge of health Risks

Students' understanding of e-cigarette risks varied. Some acknowledged dangers like *"It can cause throat pain and may lead to cancer"* while others believed e-cigarettes to be harmless *"Only the flavor remains, and it can cause coughing. Otherwise, there are no health issues."*

This variation in risk perception reflects the interplay of information exposure, individual interpretation, and personal experiences.

Despite potential risks, some students perceived e-cigarette use as harmless. This perception lowers the psychological barriers to regular use, underscoring the need to address factual inaccuracies and dismantle narratives that normalize e-cigarette use.

The shared beliefs among students, while providing insight into their thought processes, also unveiled potential misconceptions. Their claim about annual device changes, while suggestive of a cautious approach, lacks scientific backing. Similarly, their distinction between e-cigarettes and pen hookahs based on tobacco content and intoxication potential ignores the presence of harmful chemicals and addictive nicotine in both. These anecdotal insights, while valuable for understanding student perspectives, underscore the importance of disseminating accurate, evidence-based information to dispel such misconceptions (Table 3).

Discussion

This study uncovers the multifaceted issue of adolescent e-cigarette use among government school children in Mumbai, India. It reveals an intricate network of discreet storefronts, local markets, and peer-driven distribution channels that contribute to this alarming trend. The study emphasizes the need for stricter enforcement measures and targeted crackdowns to dismantle this shadow market.

Building on this, the research also highlights the significant role of peer pressure in underprivileged communities. Shared ownership models and crowdfunding enable under-resourced students to engage in e-cigarette use. Devices like the *"Yuto"* or *"Thanos"* have become symbols of social inclusion, often consumed clandestinely during parental absence. Addressing this complex social dynamic necessitates community-specific interventions.

Despite awareness of the e-cigarette ban, students' understanding remains superficial, indicating the need for accessible educational programmes that clarify the legal implications of PECA and debunk myths surrounding e-cigarettes. Providing access to verified health data is

Table 3. Adolescent's Awareness, Influence, and Access to e-cigarettes: Gender Comparison

	Male (n=52)	Female (n= 20)	Total (n=72)
Awareness about E-cigarettes			
Recognize E-cigarettes	52	20	72
Know brands of E- cigarettes and the range of costs	45	17	62
Know the types of E- cigarettes and its features	35	15	50
Know how to re-construct E- cigarettes	3	0	3
Know how to use/refill/recharge	29	8	37
Know E- cigarettes are ban	2	0	2
Know about PECA	0	0	0
Influence and Usage patterns			
Use it because they like the sweet, cool, and fresh feeling flavors	23	6	29
Use it for fashion or to make smoke rings	5	0	5
Friends/peers encouraged to try and use e-cigarette	22	2	24
Use E-cigs with friends/peers/classmates	23	6	29
Use E-cigs at secluded place with friends	23	0	29
Use E-cigs at home	0	6	6
Parents/ family does not know that I use E-cigs	23	6	29
I am aware of other students in my school or locality who use E-cigarettes.	37	12	49
Sources of Information			
I have heard or seen someone in my locality, school, or community using E-cigarettes	47	16	63
I have heard or seen someone form my family using/promoting E-cigarettes	36	8	44
I have watched YouTube videos or lifestyle vlogs discussing E-cigarettes.	48	18	66
Availability and Accessibility			
I have been denied by the shopkeeper because I had no reference	19	0	19
I have used my pocket money or savings to purchase E-cigarettes or refills.	5	0	5
Is or have been part of crowdfunding groups to use E-cigs	17	0	17
I use my brother / cousin/uncle's E-cigs	15	4	19
I know of shops or locations where E-cigarettes are readily available despite the ban.	50	6	56
Knowledge of Health Risks			
E- cigarettes are better option to traditional Cigarettes	12	0	12
E- cigarettes are harmful	0	0	0
E- cigarettes are harmless	61	4	65
E- cigarettes make me cough	8	3	11

crucial to counter the perception of harmlessness and empower students to make informed choices.

The study, thus, calls for a comprehensive approach involving stakeholders at multiple levels. Policymakers should reconsider current regulations, particularly those related to addictive flavours and online sales, and prioritize youth vulnerability over industry profits. Educators and community leaders play a vital role in crafting educational programmes that resonate with adolescents and dispel myths surrounding e-cigarettes. Partnerships with communities are essential to understand specific social pressures and develop targeted interventions.

The role of researchers and healthcare professionals is pivotal. Their ongoing exploration of the evolving landscape of e-cigarette use and its impact on adolescent health informs the development of culturally relevant tobacco cessation and prevention programmes. Fostering collaboration between research, education and policy is key to bridging gaps and translating knowledge into practical solutions.

Researchers and healthcare professionals must continue their vital work. Exploring the evolving landscape of e-cigarette use and its impact on adolescent health requires ongoing research. This knowledge informs the development of culturally relevant tobacco cessation and prevention programmes specifically geared towards young people. Fostering collaboration between research, policy, and education is critical to bridge the gaps and translate knowledge into tangible solutions.

Finally, parents and guardians also bear a significant responsibility. Open communication and strong family support are essential. They should educate themselves about the dangers of e-cigarettes, remain vigilant about their children's activities, and engage in open conversations about their choices.

As this study concludes, it becomes clear that these findings are not just data points; they are blueprints for effective prevention and intervention strategies. They contribute significantly to the ongoing battle against the e-cigarette epidemic among adolescents, demonstrating the power of research in guiding the way forward. By concurrently addressing accessibility, awareness, policy, and education, we can construct a comprehensive and impactful response to this critical issue, safeguarding the health and well-being of young people now and in the future.

Implications and Future Directions

The critical examination of these findings against existing literature illuminate's avenues for refining intervention strategies.

Implications for Policy and Regulation

Stricter enforcement of PECA is necessary as the study highlights the existence of a shadow market. Policymakers should prioritize stricter enforcement measures, conducting targeted crackdowns on these illegal distribution networks. However, the approach should not solely rely on punitive measures. Instead, policies should aim to educate, empower, and protect young people, prioritizing their health and well-being over industry profits.

Implications for Education and Community Engagement

Public awareness campaigns are crucial to educate people, especially adolescents, about the dangers of e-cigarettes and the legal implications of violating PECA. These campaigns should utilize various media channels to reach a wider audience and emphasize the health risks associated with e-cigarette use. The study also emphasizes the importance of open communication within families. Parents and guardians should educate themselves about the dangers of e-cigarettes and engage in open conversations with their children, creating a safe space for them to express concerns and seek help.

Future Directions for Research

Understanding the long-term consequences of e-cigarette use on adolescent health requires longitudinal studies that track young individuals over time. This will provide valuable insights into the potential addiction patterns and health risks associated with e-cigarette use.

Author Contribution Statement

TB: Conceptualized the study, designed the methodology, planned and guided data analysis and interpretation, revised the manuscript critically for intellectual content. MB: Conceptualized the study, designed the methodology, conducted data analysis and interpretation, drafted the manuscript and revised it critically for intellectual content. KG: Conducted data analysis and interpretation, drafted and revised the manuscript critically for intellectual content. NL: Led and monitored the data collection process, reviewed the manuscript. All authors have reviewed and approved the final version of the manuscript.

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Ethical approval

The study received ethical approval from the Joint Ethical Committee of Narotam Sekhsaria Foundation and Salaam Bombay Foundation.

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