

Electronic Nicotine Delivery Systems (ENDS): Smoking Cessation Tools or Escalating Nicotine Addiction

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ABSTRACT

Introduction: Electronic nicotine delivery systems (ENDS) are used to smoke or 'vape', a flavoured solution containing nicotine, an addictive chemical found in cigarettes and tobacco products. Contrary to popular belief that they are useful as smoking cessation tools, current data does not support this theory. In fact, they cause various deleterious effects in body including death. Their use has seen exponential rise amongst youth. We conducted a study in northern India to assess its prevalent use and awareness amongst youth.

Material and methods: A questionnaire with various questions related to ENDS was circulated amongst higher secondary schools and university students to ascertain their use and awareness amongst students regarding its usage pattern and health effects. After receiving first 200 confirmed responses of use, the data was analysed.

Results: First 200 confirmed users were obtained after 764 responses. 82% were exposed to ENDS at an age of 15-20 years. 38% said vaping was 'COOL' and 32% started it because of nice flavours. 28% believed that ENDS are safe and 47% were either not sure or not aware. 41% were now more open to the idea of regular smoking.

Conclusion: Nicotine is one of the most addictive drug and exposure of youth to ENDS predisposes them to nicotine at an early age. Understanding of the potential harmful effects of ENDS is not fully comprehended by them predisposing them to addiction. Therefore, the ban on ENDS by the government is justified.

Keywords: Electronic Nicotine Delivery Systems, Nicotine, Youth.

INTRODUCTION

Electronic nicotine delivery systems (ENDS) or e-cigarettes are battery-powered devices used to smoke or 'vape' a flavoured solution containing a varying concentration of nicotine, an addictive substance found in cigarettes and other forms of tobacco products.¹ The most common type is an e-cigarette that produces an aerosolized mixture of the flavoured liquids and nicotine in varying concentrations, which is inhaled by the user. The age of first exposure, rapidity at which it is introduced into the body and the dosage taken adds to determine the potential risk of a person being addicted to for life.^{1,2} The liquids are available in more than 7,000 flavours including kid friendly flavor like cherry, bubble gum, chocolate etc add to the allure of these products to the young population.³

Currently, there are more than 460 different e-cigarette brands with varied configuration of nicotine delivery available in the market, for example, cigar likes (first

generation), tank systems (second generation) and personal vaporizers (third generation) and common gadgets such as flash drives, flashlights or pens.¹ This makes collation of data on health effects more difficult for the generation of scientific evidence.⁴

There is an increasing trend for the use of ENDS or e-cigarettes amongst the youth and adolescents in many countries where these products were introduced.⁵ A recent WHO report showed that use of ENDS amongst non-smoking youth and adolescents has increased in USA, some European Union countries and also in various other parts of the world.⁶ Data from longitudinal studies indicate that the use of ENDS by minors doubles their chances of starting to smoke. Therefore, the increasing use of ENDS by youth is a significant public health concern since the extent of potentially harmful effects, beyond the demonstrated nicotine addiction, is still to be fully revealed and remains a cause for concern.^{4,7} They also increase the risk of dual use due to lack of awareness about the harmful effects of ENDS.⁵ There is very limited evidence regarding the impact of ENDS as an tobacco smoking cessation method. The International Association for the Study of Lung Cancer does not recommend the use of e-cigarettes for treating nicotine dependence even in cancer patients, due to the absence of sufficient evidence on their efficacy and safety.⁸ The Indian Medical Association considered ENDS as an unhealthy and disguised form of tobacco addiction, with serious long-term health effects and unfit to be used for tobacco cessation.⁵

Ours was a prospective cross sectional study to determine the prevalence of use of ENDS in school and university students and also to ascertain their habits behavior and knowledge regarding efficacy/harmful effects/limitations of ENDS. To the best of our knowledge presently there is no data available in Indian scenario due to paucity of such cross-sectional studies.

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MATERIAL AND METHODS

This was a prospective cross sectional study conducted in northern part of India from Jul 2019 to Sep 19. A detailed questionnaire (presented below) was prepared regarding prevalence and use of first second and third generation ENDS. It was circulated to students of higher secondary schools and university students. Responses were received, which were then analyzed. The first 200 responses with confirmed use of ENDS exposure, irrespective of their combustible cigarette user status, were then analyzed for various psychosocial parameters and behavioral patterns, and results tabulated.

Questionnaire

Questionnaire on Vaping by ENDS – (Electronic Nicotine delivery Devices)

Name: _____ Age: _____

Ethnicity: _____ Sex _____

Email: _____

Education: Graduate/post graduate/under graduate

Phone number: _____

Confidentiality clause: This study is done only to find out perceptions of Youth regarding ENDS. This data will remain confidential and under no circumstances the particulars of subjects filling up questionnaire will be released in any format or to any agency by authors.

1 Have you ever done Vaping by ENDS (E- cigarettes, E-Hookah, mechanical pod, E-pipe)

- a) Yes regularly
- b) Sometimes
- c) Rarely
- d) Never

2) Do you smoke regular combustible cigarette

- a) Yes regularly
- b) Sometimes
- c) Rarely
- d) Never

3) Do you think ENDS are safer than regular combustible cigarette

- a) Yes
- b) No
- c) May be
- d) Don't know

4) Why do you think ENDS are safer than combustible cigarette

- a) Due to lack of Tar
- b) Due to nicotine in pure form
- c) Due to fact that dose can be regulated
- d) All of the above

5) Why do you think youth are attracted to ENDS

- a) Easy to carry
- b) Nice flavors
- c) Easy to hide from parents/teachers
- d) All of the above

6) Do you think ENDS can be used as means to quit smoking

- a) Yes
- b) NO
- c) May be
- d) Don't know

7) At what age, were you introduced to ENDS

- a) 10-15 yrs
- b) 15-20 yrs
- c) 20-25 yrs
- d) After-25yrs

8) What was the occasion when you first used ENDS

- a) In Restaurant
- b) At Party with friends
- c) In hostel/college/school
- d) Don't remember

9) What is that you liked best about ENDS when you used it first

- a) Flavor was nice
- b) No mouth odor after use
- c) It is safer than combustible cigarette
- d) Effect or kick was better than Combustible cigarette

10) Do you know ENDS can be used medium in which other drugs can be used instead of nicotine

- a) Yes
- b) No
- c) May be but not sure
- d) Don't know

11) Have you ever used ENDS device to use other recreational drugs like marijuana

- a) Yes regularly
- b) Yes occasionally
- c) Yes very rarely
- d) No Never

12) What type of ENDS you first used

- a) Hookah
- b) Hookah Stick
- c) E cigar /E pipe
- d) Mechanical Pod

13) What type of ENDS you regularly use

- a) Hookah
- b) Hookah Stick
- c) E cigar /E pipe
- d) Mechanical Pod

14) Do you think ENDS helped you to quit combustible smoking

- a) Yes
- b) No
- c) Little bit
- d) Not applicable I don't smoke

15) Why do you think ENDS are becoming popular in youth

- a) Because of convenience
- b) Because of better kick

- c) Vaping more cool than smoking
 - d) Because of better flavors.
- 16) How do you procure ENDS
- a) From retail shop
 - b) Online purchase
 - c) Buy from friends
 - d) Never buy
- 17) Do you know ENDS are banned in large number of states in India
- a) Yes
 - b) I think so
 - c) I don't think so
 - d) No they are not banned
- 18) Have u seen any of your friends who started vaping first than started smoking.
- a) Yes always
 - b) Yes some times
 - c) Yes rarely
 - d) Never
- 19) Why do you think vaping is not helpful in quitting smoking
- a) Very expensive
 - b) Vaping and smoking both enforce other each other.
 - c) Psychological need, for gratification of inhaling remains
 - d) Don't know I am not smoker
- 20) Do you think after vaping you become more open to idea of smoking
- a) Yes
 - b) No
 - c) Not sure
 - d) Little bit
- 21) Why did you start Vaping
- a) Recreational
 - b) Peer pressure from friends
 - c) It seem cool and I wanted to experiment
 - d) So that I can quit smoking
- 22) Who gave you advice that vaping can help you quit smoking
- a) Parents and elder family members
 - b) Friends
 - c) Professional counselors
 - d) Doctors
- 23) Where did you first hear about vaping
- a) Friends
 - b) Internet
 - c) Advertisements
 - d) Parents
- 24) Do you know vaping can also cause cancers like smoking
- a) Yes
 - b) No
 - c) May be
 - d) Don't know

- 25) Do you always authenticate that web site selling ENDS is selling it legally
- a) Yes
 - b) No
 - c) Some times
 - d) Rarely

RESULTS

The first 200 affirmative responses came at the end of 764 responses (26.17%). In our study, 64% of respondents were males whereas 36% were females both mostly from urban

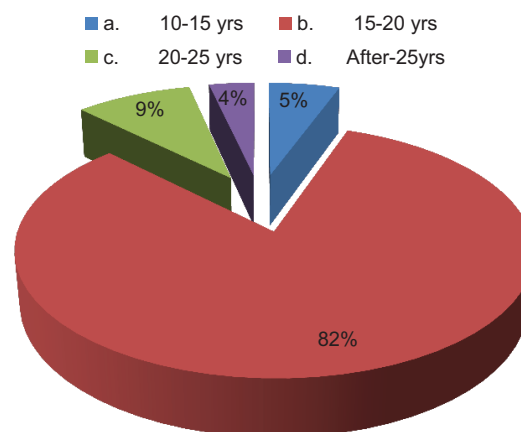


Figure-1: At what age, were you introduced to ENDS -200

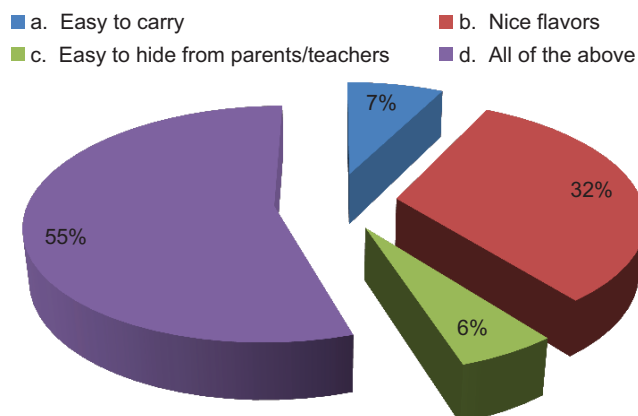


Figure-2: Why do you think youth are attracted to ENDS - 200

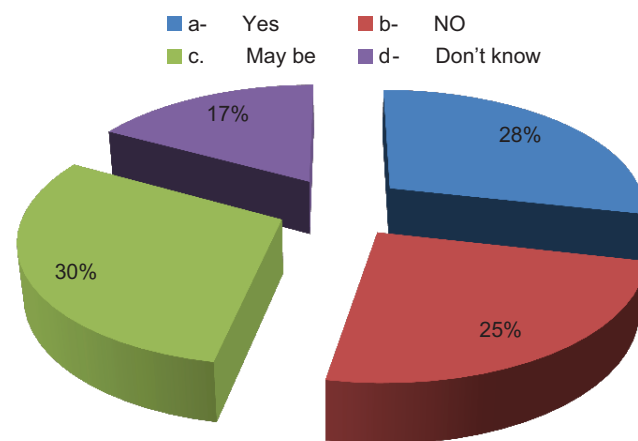


Figure-3: Do you think ENDS are safer than regular combustible cigarette - 200

areas.

Education status analysis revealed that 79% were undergraduates, 15% were graduates and only 6% were post graduates. Age of the respondents varied from 14 years to 27 years. Maximum respondents were in the age group 20 years (30%) followed by 19 years (26%) while the youngest age group was 14 years (2%). On being asked that as to what age they were first introduced to ENDS, 82% said at 15-20 years (fig 1).

On being asked as to what attracted you to start ENDS, 32% said it was because of nice flavours, 7% said it was easy to

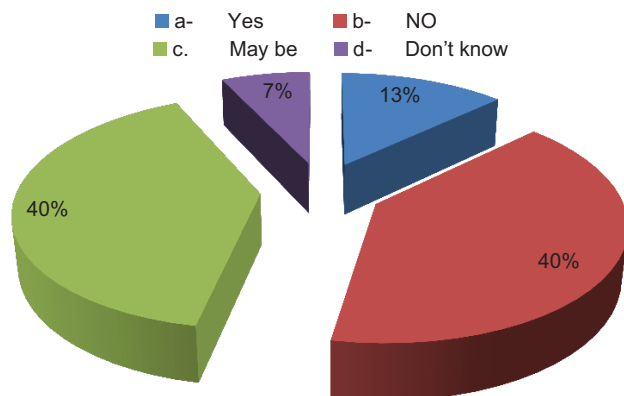


Figure-4: Do you think ENDS can be used as means to quit smoking -200

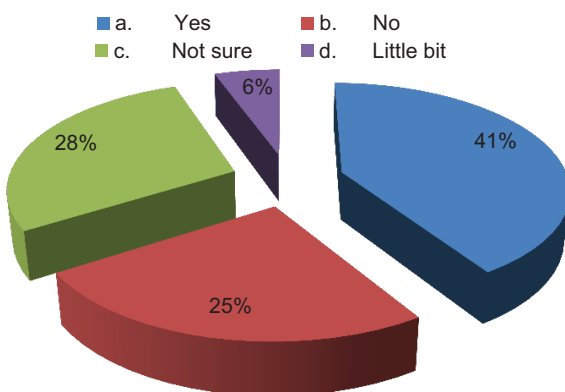


Figure-5: Do you think after vaping you become more open to idea of smoking -200

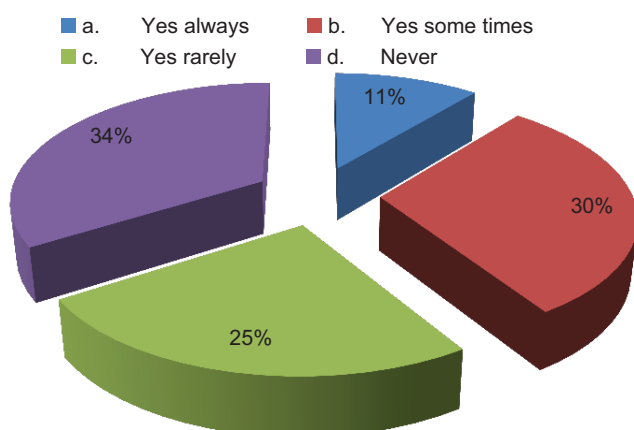


Figure-6: Have you seen any of your friends who started vaping first than started smoking. -200

carry, 6% said that it was easy to hide from parents/teachers and 55% said it was a combination of all the above factors (fig 2). Common ENDS devices which were used were hookah (65%), hookah stick (13%), E-cigarettes (13%) and mechanical pods (9%). On being asked to give the reason for rising popularity of ENDS amongst youth, 24% said it was because of convenience, 9% said it was because of better 'KICK', 38% believed that vaping is more 'COOL' than regular cigarettes and 24% attributed it to nice flavours.

24% of the respondents used combustible cigarettes regularly whereas 21% admitted use of regular cigarettes occasionally. On being asked as to whether ENDS are safer than combustible cigarettes only 25% answered as no. 28% believed that ENDS are safer, 30% were not sure and 17% did not know (fig 3). Those who replied that ENDS are safe, reasons given were that it does not contain tar (26%), due to availability of nicotine in pure form (13%), due to the fact that dose can be regulated (19%) and combination of above three factors (42%).

To the all important question as to whether ENDS can help you to quit smoking, only 5% said yes whereas 49% did not believe that ENDS can help you to quit smoking, 15% said may be whereas 31% were not sure (fig 4). 41% of respondents felt that they were more open to the idea of using regular cigarettes, 25% replied as no 28% said may be whereas 6% said little bit (fig 5). On being asked as to whether any of their friends who started smoking regular cigarettes after vaping, 11% said yes, regularly; 30% said yes, sometimes; 25% said yes but rarely, whereas 34% said never (fig 6).

On being asked as to whether they are aware that ENDS can be used for drugs other than nicotine, 22% said yes, 21% said no, 29% said may be whereas 28% did not know. None of the respondents had regularly used other drugs, 3% had used other drugs occasionally, 7% had used rarely whereas 90% denied having used other drugs with ENDS.

DISCUSSION

Despite extensive efforts, smoking remains a modern-day epidemic with profound health consequences. The first patent for a smokeless tobacco cigarette was filed in 1963 by the inventor Herbert Gilbert but it was not until the early 2000s when Hon Lik, a Chinese pharmacist successfully invented E-cigarettes.⁷ The assumption was that by eliminating the toxic chemicals found in combustible tobacco, these products would have less impact on smokers' health and minimize the health-related consequences.⁹

However there is an increasing trend of ENDS being used at early age.⁶ In our study we found that 82% of the respondents first used ENDS between 15-20 years. Thus, the increasing use of ENDS by youth is a significant and disturbing public health problem as the extent of potential harmful effects, beyond the demonstrated nicotine addiction of ENDS, is still to be fully revealed and remains a cause for concern.^{1,5}

32% respondents in our study started ENDS due to nice flavours. Several studies have shown that experimentation and specific flavors (candy and fruit flavors) were considered

less harmful than other (tobacco) flavors among adult and youth e-cigarette users, adult and youth cigarette smokers, and non-users.^{10,11}

38% of our respondents admitted that vaping is 'COOL' and there are nice flavours. Rising popularity and perceived benefits of ENDS include (expected and actual) positive experiences (such as taste), social acceptance, a cool and fashionable product, avoidance of smoking restrictions and an effective smoking aid.¹⁰ The adolescent and youth today perceived ENDS as safe to use and fashionable and also user benefits revolved around convenience as these can be hidden easily from parents, and authorities due to pen drive like shape which increases attractiveness of the product, health benefits, positive experiences, safety, smoking cessation benefits, and social acceptability.^{12,13}

In our study, 28% believed that ENDS are safer, 30% were not sure and 17% did not know. Current studies suggest that use of ENDS or e-cigarettes adversely affects almost all the human body system with impact across the life course, from the womb to tomb.^{1,5} A typical ENDS cartridge can contain about as much nicotine as a pack of 20 regular cigarettes and can act as a source for nicotine addiction.¹⁴ Studies on these nicotine solvents had shown a varied degree of release of potential carcinogens including formaldehyde, acetaldehyde and acetone. Studies have shown that liquid-vapourizing solutions in ENDS contain toxic metals and chemicals that can cause several adverse health effects, including cancers and diseases of the lungs, heart and brain.^{15,16} For this reason, sale of EC has been completely banned in 25 countries, including Singapore, Norway and Brazil. Market authorization is required in 17 other countries.¹⁷ In USA and England, they are treated as medicines and are strictly regulated for treatment purpose only.¹

Use of ENDS as a tool or aid for stopping regular smoking is also under scrutiny. In our study 51% of the respondents either said no or were not sure. While some research shows ENDS to be useful in quit attempts¹⁸, results from a US national survey conducted of 729 current and former smokers showed that smokers are unsatisfied with the new devices and return to smoking tobacco cigarettes or maintain dual use of ENDS and conventional cigarettes.¹⁹ Three population-based, longitudinal studies have also not shown associations between e-cigarette use and smoking cessation.^{7,20} In a large randomized control study conducted in New Zealand, it was found that recruited smokers who were motivated to quit through newspaper advertisements and found that e-cigarettes were not superior to the patch as a smoking cessation tool.⁹

Most importantly, data from longitudinal studies indicate that the use of ENDS by minors doubles their chances of starting to smoke regular tobacco.^{6,8} In our study, the respondents on being asked whether they or their friends started using regular cigarettes, 11% said yes, regularly; 30% said yes, sometimes; 25% said yes but rarely. Studies have shown that adolescents using ENDS are more likely to use regular cigarettes later as it increases the likelihood to experiment with regular tobacco products, increases intention to cigarette

smoking and also increases the risk of dual use.^{21,22} One more trend seen was increase attraction of teenage girls towards ENDS due to flavors and convenience as percentage of girls in our study was 36% which far more than prevalence of use of combustible cigarette in girls.

The government of India has prohibited production, manufacture, import, export, transport, sale, distribution, storage and advertisement of electronic cigarettes via an ordinance published on 18 Sep 2019.²³

CONCLUSION

Uses of ENDS have risen exponentially in recent years. The current trend of rapidly rising trend of its use in adolescents and adults is a matter of serious health concern. ENDS contain nicotine solution, which is highly addictive and other ingredients such as flavoring agents and vaporizers, rendering these products harmful for health. Their role as smoking cessation aid is controversial and not established. In fact, their harmful effects are now documented. As they are predisposing the youth to nicotine addiction at an early age, their sale and use should be banned as has been done in several countries including India.

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