



E- CIGARETTE: A REVIEW

Dr. Malika Singh¹, Dr. Abhinav Singh² and Dr. K. Singh^{3*}

^{1,2}JR(Surgery Department).

³MD Professor, Department of Physiology, PGIMS, Rohtak-124001.Haryana.

***Corresponding Author: Dr. K. Singh**

MD Professor, Department of Physiology, PGIMS, Rohtak-124001.Haryana.

Article Received on 29/10/2017

Article Revised on 19/11/2017

Article Accepted on 10/12/2017

ABSTRACT

An electronic cigarette (E-cigarette) is handheld electronic device, which vaporizes the flavored liquid called e – liquid, consists of nicotine, propylene glycol, glycerin and flavorings. Person inhales this vapor called Vaping. It is thought that they are less harmful than tobacco, help people to quit smoking. No effect of passive smoking to others. Now a days there is exponential increase in use of E cigarettes. Although it is thought to be safer, but it is dangerous in persons with heart and arteries problem, it may cause battery explosion, skin burn, metal poisoning and electrical waste problem. Ultra filtrate in vapor consists of carcinogens (less than smoke), so E - Cigarette cannot be regarded as simply harmless, but are safer alternative to conventional cigarettes. They act as gateway drug since they contain nicotine. They don't leave smell like tobacco, effective way to help people in quitting of smoking.

KEYWORDS: E – cigarette. Cigarette. Smoking. Nicotine.

E- CIGARETTE: A REVIEW

Tobacco smoking is one of the big public health problems, threatening the world. According to WHO, 7 million deaths are reported annually due to tobacco and number is expecting to rise to 8.3 million in next few years and will be responsible for 10% of all deaths world –wide.^[1] Tobacco is smoked as biddies, cigarette, hookahs, pipes and cigar. Smoke coming out of cigarette contains nicotine (addictive psychoactive drug), carbon monoxide (co), hydrogen cyanide (HCN), phenol, and several carcinogenic products (i.e., benzopyrene, N-nitrosamine-NNK) etc that bind to DNA, cause genetic mutation, which may lead various carcinomas i.e. Mouth, larynx, lungs, and pancreas etc.^[2] It was the US surgeon who first tried to show relationship between smoking and lung cancer.

Nicotine affects many brain systems thus producing psychological and biological effects. Tobacco psychological effects can be shown by the facts that frequency of smoking is increased when person feels boredom or under stress, during driving or drinking alcohol.^[3] When person tries to quit smoking, he cannot be successful and only very strong psychological determinant can quit smoking. Also desire to smoke still remains even if person using the nicotine patch.^[4]

Its biological effects can be shown by the fact that persons do smoking at regular intervals when nicotine level falls after the last cigarette.³ It is observed that

pleasurable feeling is not only related to nicotine level, but also to sensory motor aspect of smoking e.g., taste, smell (some people are very fond of smell of smoking), handling and way of handling of cigarette, thus reinforcing people to take cigarettes, and not quit.^[4]

An electronic cigarette or e- cigarette or e-cigs, EC, electronic nicotine delivery systems (ENDS) or electronic non nicotine delivery systems (ENNDs) or personal vaporizer is handheld electronic device, made to look like conventional cigarette and used in similar way, which vaporizes the flavored liquid called e – liquid, consists of nicotine, propylene glycol, glycerin and flavorings.^[5] Person inhales this vapor called Vaping. Propylene glycol, a syrupy synthetic liquid added to food (in cupcakes, soft drinks and salad dressings), cosmetics (in soap, shampoo, and antiperspirants), and some medicines to absorb water and keep them moist. Propylene glycol is considered safe by GRAS (an official FDA designation) since 1997.^[6] It is thought that constituents of vaping are less harmful than tobacco, help people to quit smoking. There occurs no effect of passive smoking to others.^[7] It is first introduced – by Chinese pharmacist Hon Lik in 2003.^[8] After this there is exponential increase in use of e- cigarettes. They consists of mouth piece, a battery, a heating element, cartridge which holds nicotine, other liquids and flavorings, a microprocessor and LED light on the end. Features and cost vary. Some are disposable; others have rechargeable battery and refillable cartridge. When person pushes a

button or activates a pressor sensor by inhalation, heating element atomizes liquid, reaches a temperature of roughly 100-250 degree C within a chamber to create an aerosolized vapor, he inhales vapor, giving feeling similar to tobacco smoking. As person inhales ends glows, as person exhales, he puffs out a cloud of what looks like smoke.

Since its introduction in 2003, e - cigarette use has increased worldwide. In 2013 there were several million people using it.^[9] Mostly higher group people use e-cigarette.^[10] It is interesting to note that 1% people using e-cigarette do not have nicotine in liquid.^[11]

Types of e-cigarette: Cigalikes- looking like cigarette; e Gos, bigger than cigar likes, mods – assembled from basic parts.

Reasons for using e – cigarette: It is thought that it is used by people, who wants to quit smoking or for recreational purpose.

While some persons think that it is less harmful and also there are no effects of passive smoking on others.^[12] Others believe that it can be used in areas where smoking is banned.^[13] Due to the belief that it is safer, it is widely used by pregnant women.^[14] Young people used it due to curiosity, flavors and anxiety.^[15]

Health effects of e – Cigarette: It causes less exposure to toxicants and these toxicants are fewer than in usual smokes. e- Cigarettes are 95% less harmful than smoking.^[16] It is advised by Public Health England that e- Cigarettes should be tried by those who wants to quit smoking and benefitted by conventional nicotine replacement therapy(NRT) or by those who cannot quit or do not want to quit smoking. So that smoking related diseases will reduce. e- Cigarettes (20%) help in quitting than NRT (10%).

Tobacco harm reduction (THR) is replacement of tobacco cigarette with products which are having less risks to reduce tobacco related diseases.^[17] Tobacco smoke contains 100 known carcinogens and about 900 potentially cancer causing chemicals. So smokers and others are not exposed to these chemicals because these are found in traces in aerosol of e cigarettes.^[18]

As far as safety of e- cigarette is concerned, it is not clear.^[19] According to others, these are much safer than tobacco cigarette.^[20] Their safety in long run is not known.^[21] But improvement in pulmonary functions are shown, when they are shifted to e-cigarettes from tobacco smoking.^[22] Other effects include irritation, cough, bronchitis leading to increased airway resistance, increased heart rate, blood pressure, chest pain, nausea, vomiting all these effects occur due to vaping. Other harmful effects include battery explosions due to overcharging, unsuitable charger, or flaws in design of e-cigarette or skin burn.^[14] It is shown that nicotine in

vapor of e-cigarettes affects the cells of respiratory tract, promotes the proliferation of cancer cells by inhibiting apoptosis, increasing blood supply and placement of these cells at different sites in body. Also transcriptome changes occur (changes in proteins produced from DNA code) in human bronchial epithelial cells.^[23] It affects the lung endothelial barrier function, associated with oxidative stress and inflammation.^[24]

The e-liquid has its own side effects as it has contamination with various chemicals, although toxic chemicals of tobacco smoke are mostly below 1% of the corresponding levels in tobacco smoke.^[24,25] Vapor of e-cigarettes consists of flavors, propylene glycol, glycerin, nicotine, small amounts of toxicants, carcinogens, nanoparticles of metals, which includes tin, nickel, chromium comes from nichrome heating elements of vaporizing device, cadmium, a toxic metal that is also present in cigarette smoke, may lead breathing problem and disease.^[26,27] Due to presence of these ultra fine particles in vapor of e – cigarettes, they cannot said to be safer.^[28] Since they are disposable, they may cause problem of pilling of electrical waste.

It is thought that nicotine in e-liquids after entering in blood stream stimulates adrenal glands to release epinephrine, which affects central nervous system. Also nicotine increases level of chemical messenger called dopamine in brain, affects reward centre, give pleasurable feeling, reduces anxiety, thus motivate people to use nicotine again and again, despite the fact that it is not good for health.^[29]

Traditional tobacco cigarette smoke yields 0.5 to 1.5 mg of nicotine^[30] and it is rapidly absorbed and may lead addiction. While nicotine content of e-cigarette may reach to 36mg/ml.^[31] or 20mg/ml (2%)^[14] and it is slowly absorbed.

Other effects include, since e-cigarettes are mostly used by teens, nicotine may affect brain circuits that control attention and learning, mood disorders, permanent problems with impulse control i.e., failure to fight an urge or impulse that may cause harm to himself or others. Along with nicotine addiction, it may cause dependence on others drugs like cocaine and methamphetamine.^[32]

It is a question whether e-cigarette can help in quitting the smoking or not. According to some persons it may help in quitting the smoking by decreasing nicotine craving, in those people who wants to quit smoking. It is said that use of e-cigarette is safer than traditional tobacco.

Effects seen after stopping the e-Cigarette: It is seen that when person stops using the e-Cigarette, can get withdrawal symptoms like irritability, anger, anxiety, depression, impatience, sleep disturbances, restlessness,

weight gain, difficulty in concentration. It is dangerous for persons with heart and arterial problems.

But again it is not clear whether it is safe or not in long run. So, according to Yeh 2016, subject should be advised e-cigarettes when he himself is strongly determined to quit smoking and whenever urge of smoking occurs or cigarette withdrawal symptoms occur take e-cigarette or non nicotine e-cigarette.^[33] Although it has not been recommended as a medication for smoking cessation by the Food and Drug Administration (FDA), but they are mostly used for smoking cessation particularly by young adults.^[34] People thought that only advantage of it is that it is considered safer alternative as gateway drugs since it contains nicotine, other advantage is that it does not leave smell like tobacco, and effective way to help in quitting of smoking. At this point it is necessary to mention that according to healthcares actually e-cigarettes decrease the chances of quitting the smoking. So, e-cigarettes should not be recommended as effective aid to quit smoking.^[35]

REFERENCES

1. Tobacco. Geneva: World Health Organization; May 2017. p.1. Weblog available from: www.who.int/mediacentre/factsheets/fs339/en/ [Accessed 15th August 2017].
2. Hecht S. Carcinogen-derived biomarkers: applications: applications in studies of human exposure to second hand tobacco smoke. *Tob Control*, 2004; 13(1): 48-56.
3. <http://www.quit-smoking-advisor.com/06-psychology-of-smoking/cigarette-addiction.html>.
4. <http://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-andmaps/psychology-and-smoking-behavior>.
5. WHO. Electronic nicotine delivery system: FCTC/COP/6/10Rev, 1(PDF), Moscow; World Health Organization, Conference of the Parties to the WHO Framework Convention on tobacco control, Sixth Session, 13-18 October 2014.
6. <http://www.scientificamerican.com/article/smoke-screen-are-e-cigarettes-safe/5/30/> 2016; 1-7.
7. McRobbie, Hayden; Bullen, Cheris; Hartmann-Boyce, Jamie; Hajek, Peter; McRobbie, Hayden. Electronic cigarettes for smoking cessation and reduction." *The Cochrane Library* 12; CD010216, DOI10.1002/14651858.CD010216.PUB2.PMID25515689.
8. Barbara Demick "A high technical approach to getting a nicotine fix. *Los Angeles Times*, 2009.
9. Michael Felberbaum "Marlboro Maker To Launch New Electronic Cigarette" *The Huffington Post.*", 2013.
10. Carroll Chapman, SL; Wu, LT 18 March "E cigarette prevalence and correlates of use among adolescents versus adults: A review and comparison." *J Psychiatric Research*, 2014; 54: 43-54.
11. Born H, Persky M, Kraus DH, Peng R, Amin M R, Branski RC. Electronic Cigarettes: A Primer for Clinicians. *Otolaryngology-Head and Neck Surgery*, 2015; 153: 5-14. doi10.1177/0194599815585752. ISSN0194-5998.PMID26002957.
12. Pepper J K, Brewer n t." Electronic Nicotine Delivery System (electronic cigarette) awareness, use, reactions and beliefs: a systemic review". *Tobacco control*, 2013; 23: 375-384. doi:10.1136/Tobacco control-2013-051122.ISSN 0964-4563.PMID 24259045.
13. Siu AL. (22 September 2015). "Behavioral and Pharmacotherapy Interventions for Tobacco Smoking Cessation in adults, including pregnant women: US Preventive Services Task Force Recommendation statement". *Annals of Internal Medicine*, 163: 622-34. doi: 10.7326/M15-2023, PMID26389730.
14. Ebbert Jon O, Agunwamba Amenah A, Rutten Lila J. "Counseling Patients on the use of Electronic cigarettes". *Mayo Clinic Proceedings*, 2015; 90(1). doi: 10.1016/j.mayocp.2014.11.004.ISSN0025-6196. PMID25572196.
15. Kong G, Morean ME, Callo DA, Camenga DR, Krishnan Sarin S. Reasons for Electronic cigarette experimentation AND Discontinuation among adolescents and young adults." *Nicotine and Tobacco Research*, 2014; 17: 847-54. doi: 10.1093/ntr/ntu257. ISSN1462-2203. PMID25481917.
16. McNeill A. SC. "E-cigarettes: an evidence report commissioned by Public Health England" (PDF). GOV.UK: Public Health England.P.76.Retrieved 19 August 2015, 2015.
17. Saitta, Ferro ga, Polosa R. Achieving appropriate regulations for Electronic cigarettes. *Therapeutic Advances in Chronic Disease*, 2014; 5(2): 6. doi:10.1177/2040622314521271.PMC3926346.PMID24587890.
18. Cahn Z, Siegel M. Electronic cigarettes as a harmful Strategy for Tobacco Control: A Step Forward or a Repeat of Past Mistakes? *J of Public Health Policy*, 2011; 32(1): 16-31. Doi: 10.1057/jphp.2010.41 PMID 21150942.10.
19. Harrell PT, Simmons VN; Correa JB, Padhya TA, Brandon TH. "Electronic Nicotine Delivery systems (E-cigarettes): Review of safety smoking cessation Efficacy". *Otolaryngology-head and neck surgery: official journal of American Academy of Otolaryngology-head and neck surgery*, 4 June 2014; 151; 381-393. Of, Doi:10.1177/0194599814536847.PMID 24898072.
20. Bhatager A; Whitsel LP, Ribis KM, Bullen C, Chaloupka F, Piano M R ET AL." Electronic cigarettes; A Policy statement from American Heart Association" *Circulation*, 2014; 130(16): 1418-1436. doi: 10.1161/CIR.000000000000107.PMID 25156991.
21. Orellana-Barrios, Menfil A, Payne, Drew, Mulkey, Zachary, Nugent, Kenneth. "Electronic cigarettes-a narrative review for clinicians". *The Am J Med*. doi: 10.1016/j.amjmed.2015.01.033. ISSN 002-9343. PMID 25731134.

22. Saitta D, Ferro GA, Polosa R (March 2014). Achieving appropriate regulations for electronic cigarettes. *Therapeutic advances in chronic disease*, 2015; 5(2): 50-61. doi: 10.1177/2040622314521271.PMC 3926346. PMID24587890.
23. Shen Y, Wolkowicz MJ, Kotova T, Fan L, Timko MP. Transcriptome sequencing reveals e-cigarette vapor and mainstream smoke from tobacco cigarettes activate different gene expression profile in human bronchial epithelial cells. *Scientific Reports*, 2016; 6.
24. Schweitzer KS, Chen SX, Law S, Van Demark M, Poirier C, Justice MJ et al. Endothelial disruptive proinflammatory effects of nicotine and e-cigarette vapor exposures. *Am J Physiology-Lung Cellular and Molecular Physiology* 2015; 309 (2): L175-L187.
25. Burstyn, Igor, Peering through the mist: systemic review of what the chemistry of contaminants in electronic cigarettes tells us about health risks. *BMC Public Health*, 2014; 14(1): 18. doi: 10.1186/1471-2458-14-18. ISSN 1471-2458.
26. Hess CA, Olmedo P, Navas-Acien A, Goessler W, CohenJE, Rule AM. E- Cigarettes as a source of toxic and potentially carcinogenic metals. *Environ Res*, 2017; 152: 221-225. doi: 10.1016/j.envres.2016.09.026.
27. Hajek P, Etter JF, Benowitz N, Eissenberg T, McRobbie H, Electronic cigarettes: review of use, content, safety, effects on smokers and potential for harm and benefit. *Addiction (Abingdon, England)*, 31 July 2014; 109(11): 1801-10. doi:10.1111/add.12659.PMID 15078252.
28. Pisinger C, Dossing M. (December 2014). A systemic review of health effects of electronic cigarettes. *Preventive Medicine* 69; 248-260. doi: 10.1016/j.ypmed.2014.10.009. PMID 25456810.
29. www.drugabuse.gov. Electronic cigarettes, June 2017; 1-5.
30. Schroeder MJ, Hoffman AC. "Electronic cigarettes and nicotine clinical pharmacology. *Tobacco Control*, 2014; 23(Supplement 2): ii30-ii35. doi: 10.1136/tobaccocontrol-2013-051469./ISSN 0964-4563.PMID 24732160.
31. Britton J, Bogdanovica, I. Electronic cigarettes - A report commissioned by Public Health England. (PDF). Public Health England, 15 May 2014.
32. US Dept. of Health and Human Services, Centres for Disease Control and Prevention, National Centre for Chronic Disease, Prevention and Health Promotion, Office on Smoking and Health. E- Cigarette Use Among Youth and Young Adults: A report of the Surgeon General –Executive Summary; 2016. https://e-cigarette.surgeongeneral.gov/documents/2016_SGR_Exec_Summ_508.pdf. Accessed February 21, 2017.
33. Yeh JS. E-Cigarettes and smoking cessation. *New Eng J M*, 2016; 374: 22.
34. Rutten IJ, Blake KD, Agunwamba AA, ET AL. Use of e-cigarettes among current smokers: Associations among reasons for use, quit intentions, and current tobacco use. *Nicotine Tob Res*, 2015; 17: 1228-34.
35. Kalkhoran S, Glantz SA. E-cigarettes and smoking cessation in real world and clinical settings: a systemic review and Meta –analysis. *Lancet Respir Med*, 2016; 4: 116-28.