




ORIGINAL ARTICLE

Measuring The Concentration of Plasma Trace Elements of Al-Mustaqbal University College Smokers (employees and students)

Qusay Azeez Hasan^{1, }, Sabrean Farhan Jawad^{1, *}, Emam Atiyah Ibadi^{1, },
Aliaa Kareem Abdulla^{1, }, Qassim A. Zigam^{1, }, and Hasanain Kamil Hasan
Owadh^{1, }

¹Department of Pharmacy, Al-Mustaqbal University College, Babylon, Hilla, Iraq.

Corresponding author:

sabrean.f.jawaad@uomus.edu.iq

Department of Pharmacy,
Al-Mustaqbal University College,
Babylon, Hilla, Iraq.

Received: December 25, 2022,
Revised: January 15, 2023,
Accepted: January 30, 2023,

DOI: 10.57238/jbb.2023.5911.1022

OPEN ACCESS



Access this
article online

Abstract

In developed countries, the biggest factor leading to death is cigarette smoking, where smoking causes cancers, congestive heart diseases, pulmonary diseases, and other diseases. This study was conducted at Al-Mustaqbal University College - Hilla - Iraq, to evaluate the effect of smoking types on lipid profile (triglycerides, cholesterol, low-density lipoproteins (LDL), very low-density lipoprotein (VLDL), high-density lipoprotein (HDL), and iron. The study included 24 samples of males and the study targeted three groups: the control group (group 1= 7) without smoking, regular cigarette R.C (group 2= 8) smokers of regular cigarettes, and the last group 3 (electron cigarette E.C) comprised of 9 samples (people who smoke electronic cigarettes). The samples studied were of a similar age group ranging from 19 to 30 years. The levels of triglycerides and cholesterol were observed to increase in group 2 compared to the control group. The level of HDL increased in group R.C. by comparing it with the control group, while the iron level increased in group E.C. in comparison to both the groups (control and R.C).

The results showed that the use of electronic cigarettes E.C. was less severe than regular cigarettes R.C., while both had high marks compared to the control group.

Keywords: Regular cigarettes; Electronic cigarettes; smokers; chemical parameters

Abbreviation

R.C.; regular cigarettes, E.C.; electron cigarette, TG; triglycerides, HDL; high-density lipoprotein, VLDL; Very low-density lipoprotein.

1 Introduction

Tobacco smoking has long been the cause of avoidable morbidity and mortality worldwide, even

though some of its many adverse effects on health were documented decades ago worldwide, there are over one billion tobacco smokers, including smokers of cigarettes and bidis (tobacco rolled loosely in a leaf, smoked widely in India and Bangladesh). Survey data from 14 high-burden countries collected around 2010 in the most recent Global Adult Tobacco Survey (GATS) showed that about 41% of men and 5% of women smoked cigarettes. In high-income countries (Western) tobacco use is declining [1]. In

developed countries, the biggest factor leading to death is cigarette smoking. It is estimated that five of the deaths are caused by smoking, also 30% of all the types of cancers are attributable to smoking in the United States [2], especially laryngeal carcinoma [3]. Cigarette use increased dramatically with the emergence of new lung diseases, while such diseases were extremely rare. Until now, the mechanisms that cause inflammatory diseases due to smoking have not been known. Respiratory bronchiolitis-interstitial lung disease, chronic bacterial infections, acute eosinophilic pneumonia, chronic obstructive pulmonary disease (COPD), chronic rhinosinusitis, pulmonary Langerhans cell, desquamative interstitial pneumonia, histiocytosis inflammation are caused by exposure to secondhand smoke [4]. CS aims for immune responses to boost infection, cancer, and lung disease. A compound and multi-layered immune system keeps the host contra hurtful agents and balances tissue homeostasis. Exposure markedly impacts the immune lines, compromising the capacity of hosts to mount proper inflammatory and immune responses that contribute to smoking-related pathologies. The negative effects may continue for a period even if the exposure ends, as it harms the immune system of smokers and even non-smokers who are exposed to smoke directly [5]. Many previous works studied the impact of smoking on lipid profiles in Iraq and worldwide but to the best of our knowledge, there was no paper comparing lipid profiles between smoking types [6,7].

2 Materials and Methods

2.1 Tested compounds

The data in this study was prepared from information about the students and employees of Al -Mustaqbal University College, Hilla, Iraq. Their ages ranged from (19-30) years. It included their name, age, weight, height, gender, profession, and the number of smoking times for smokers.

2.2 Experimental groups

24 samples were collected and distributed into three groups: group A "control" (without smoking), group B (smokers' regular cigarettes), and group C (Smokers' electronic cigarettes) "Hookah".

2.3 Collected sample

5 ml of intravenous blood was withdrawn with a single-use syringe, then the blood was placed in a clean, sterile (gel tube) and these tubes were left at room temperature until the blood clots. Finally, the

serum was separated using a centrifuge (4000r.p.m) for 5 minutes to ensure obtaining a sufficient amount of serum that is free from traces of red blood cells. The blood is kept in tubes containing an anticoagulant (gel tube) in case of freezing at a temperature (-20 °C) until the tests were carried out.

2.3.1 IRON liquid color procedure

After mixing it well it is incubated for 15 minutes at (20-25°C). The absorbance is measured of the sample (ΔA_{sample}) and the standard (ΔA_{std}) against the reagent blank within 60 minutes.

Wavelength=623nm

Normal values: 59-148 mg/dl

$$C = 100 * \frac{\Delta A_{\text{sample}}}{\Delta A_{\text{std}}} [mg/dl]$$

2.3.2 Triglycerides

Mix and incubate for 10min at (20-25°C) or for 5 min at 37 °C to measure the absorbance of the sample (ΔA_{sample}) and the standard (ΔA_{std}) against the reagent blank within 60 minutes. Wavelength=500nm

Normal values: 150-200 mg/dl

$$C = 200 * \frac{\Delta A_{\text{sample}}}{\Delta A_{\text{std}}} [mg/dl]$$

2.3.3 HDL Cholesterol

Mix well, and incubate for 10 minutes at room temperature. Centrifuge for atleast 2 minutes at 10000 g, alternatively for 10 minutes at 4000 g. After centrifugation separate the clear supernatant from the precipitate within 1 hour and determine the cholesterol concentration using a Cholesterol liquid color reagent.

Wavelength=500nm

Normal values: 150-200 mg/dl

$$C = 150 * \frac{\Delta A_{\text{sample}}}{\Delta A_{\text{std}}} [mg/dl]$$

Semi-micro-Method:

Normal values: 35-55 mg/dl

$$C = 175 * \frac{\Delta A_{\text{sample}}}{\Delta A_{\text{std}}} [mg/dl]$$

2.3.4 Cholesterol

Mix and incubate for 10min. at 20-25 °C or for 5 min at 37 °C and measure the absorbance of the sample (ΔA_{sample}) and the standard (ΔA_{std}) against the reagent blank within 60 minutes.

Wavelength=500nm

Normal values: adults \leq 190 mg/dl

$$C = 200 * \frac{\Delta A_{\text{sample}}}{\Delta A_{\text{std}}} [mg/dl]$$

2.4 Biochemical examination

2.4.1 Determination lipid

Cholesterol, triglyceride levels, and HDL were estimated using the enzymatic method by a special kit with all analyzes supplied by (Human Diagnostics World Wide).

2.4.2 Determination of VLDL-Cholesterol

The following mathematic equation is used to extract a value of (VLDL-Cholesterol)

$$\text{VLDL - Cholesterol}(mg/dL) = \frac{TG}{5}$$

The level of (LDL-Cholesterol) was determined mathematically using the following equation:

$$\text{LDL-Cholesterol} = \text{Total Cholesterol} - (\text{HDL-Cholesterol} + \text{VLDL-Cholesterol})$$

Normal values for LDL- Cholesterol: 150-190 mg/dl

3 Results

The mean age, height, and weight were (24), (168 cm), and (68 kg), respectively. The level of triglyceride, cholesterol, LDL, and VLDL significantly increased in both groups R.C and E.C, when compared with control groups. At the same time, an increase was observed in the R.C groups which were more than in the E.C groups for the same parameters Figure 1.

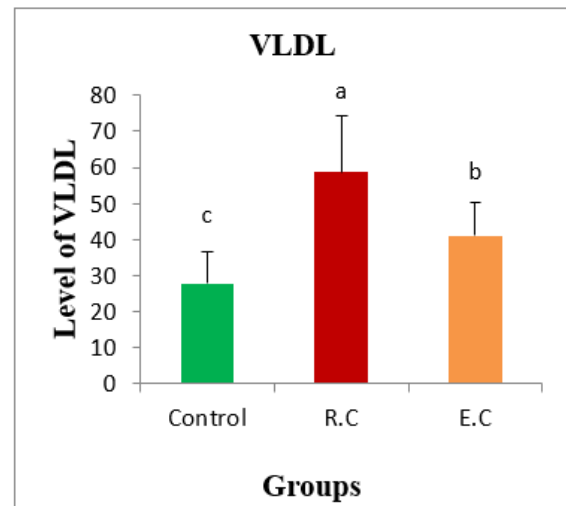
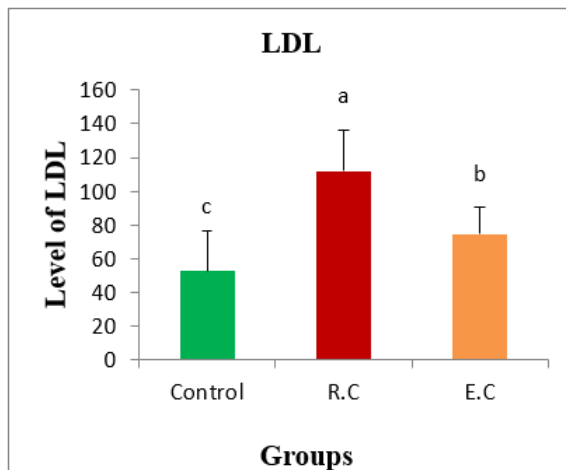
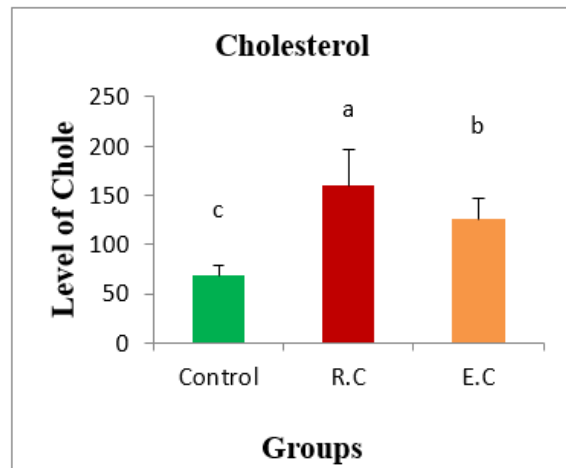
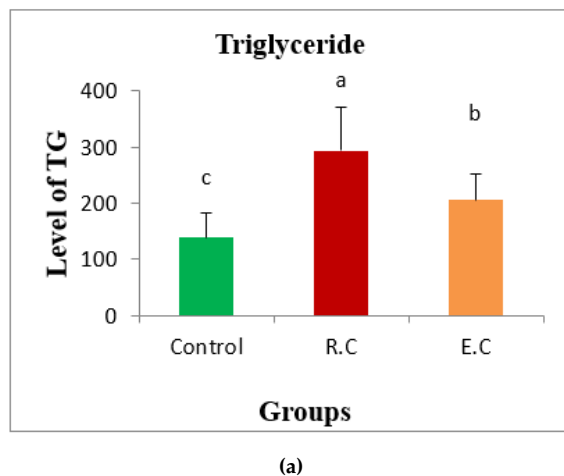


Figure 1: Levels of triglyceride (TG), Cholesterol (Chole), low-density lipoproteins (LDL), and very low-density lipoprotein (VLDL) in three groups: group 1 (control), group 2 (regular cigarette R.C), and group 3 (electron cigarette E.C). abc represent standard error

On the other hand, there was a significant increase in the R.C group in HDL level compared with the control group, while insignificant change in the E.C group when compared with the control group Figure 2.

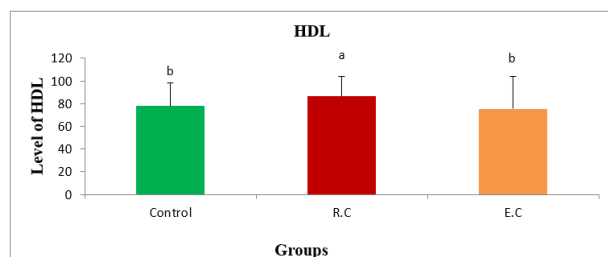


Figure 2: Level of high-density lipoprotein (HDL) in three groups: group 1 (control), group 2 (regular cigarette R.C), and group 3 (electron cigarette E.C). abc represent standard error

The level of iron increased in group E.C compared with both groups (control and R.C) but observed insignificant change in group R.C when compared with the control group Figure 3.

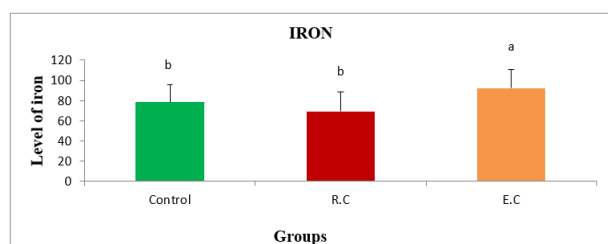


Figure 3: Level of high-density lipoprotein (HDL) in three groups: group 1 (control), group 2 (regular cigarette R.C), and group 3 (electron cigarette E.C). abc represent standard error

Level of Iron in three groups: group 1 (control), group 2 (regular cigarette R.C), and group 3 (electron cigarette E.C). abc represent standard error Discussion The popularity of electronic cigarettes has increased as they are used to reduce cravings, quit, or are less dangerous alternative [8] E-cigarettes can be considered a suitable alternative to tobacco [9]. It was observed that the control group had lower levels of LDL and TG which is consistent with (7). Results of (8) lipid status showed that nicotine alone induced increased concentrations of TG, VLDL, and HDL ratio. And at the same time, the test of lipid rank showed a notable decrease in LDL and cholesterol levels in EC groups compared with control groups, this is what the current results showed. Also, it was found 8 that the level of triglycerides and cholesterol increased among smokers compared to the levels of non-smokers [10–12] Showed that e-cigarette use is

associated with elevated TG, and LDL cholesterol levels when compared to nonsmokers. Smoking does not only affect the lungs and arteries, but it also has a bad effect on the health system and all functional body systems [13].

The decrease in the level of cholesterol (good cholesterol) is due to nicotine, and it also causes an increase in the level of bad cholesterol and an increase in the level of (VLDL), in addition to the accumulation of fat in the walls of the arteries [14]. These bad levels cause an increased risk of atherosclerosis. Tobacco users have high levels of (HDL), lower levels of total cholesterol, and higher levels of (TG) and also low levels of (LDL), when compared with non-smokers [15] smokers were found to have higher levels of TG by 9.1%, LDL levels by 1.7%, VLDL levels by 10%, TC levels by 3%, and minimized levels of HDL by 5.7%. There were clear relationships between response and dose for TC, TG, and LDL [16] leading to the secretion of growth hormones, cortisol, and catecholamines activating adenylyl cyclase in adipose tissue. This results in the release of free fatty acids to hydrolyze stored fats in TG which in turn increases the hepatic synthesis of VLDL and TG [17].

The nicotine and natural flavorings in electronic cigarettes are heated to form an inhaled aerosol. Regular tobacco cigarettes contain approximately 7,000 chemicals, most of which are toxic [18]. The dangerous chemicals in electronic cigarettes are not known, but it is possible that vaping contains fewer toxic chemicals than those in regular cigarettes, and this is what Blaha said [19].

4 Conclusion

The results showed that the use of electronic cigarettes E.C. was less severe than regular cigarettes R.C., while both had high marks compared to the control group.

Acknowledgment

The authors would like to express their gratitude to Al-Mustaqbal University College for their assistance, as well as their gratitude to all of the participants for their patience.

Funding

This project was made possible with financial support from Al-Mustaqbal University College (grant no.: MUC-M-0222). The organization that provides financing is not involved in the planning or execution of any step studies.

Conflict of interest

The authors have no conflict of interest to report.

Conflict of Interest: No conflicts of interest exist between the authors and the publication of this work.

Ethical consideration: The ethical committee approved the study at the Al-Mustaqbal University College.

References

- [1] Samet JM. Tobacco smoking: the leading cause of preventable disease worldwide. *Thoracic surgery clinics*. 2013;23(2):103-12. doi:10.1016/j.thorsurg.2013.01.009. [Backref page 2]
- [2] Peto R, Boreham J, Lopez AD, Thun M, Heath C. Mortality from tobacco in developed countries: indirect estimation from national vital statistics. *The Lancet*. 1992;339(8804):1268-78. doi:10.1016/0140-6736(92)91600-d. [Backref page 2]
- [3] OWADH HK, GHALEB RA, ALZUBAIDI FA. Forty Micromole Hydroxychloroquine Enhanced Cytotoxic Effect of Doxorubicin Against Laryngeal Cancer Cell Line HEp-2. 2022. doi:10.29228/jrp.169. [Backref page 2]
- [4] Alexander JM, Diez JM, Levine JM. Novel competitors shape species' responses to climate change. *Nature*. 2015;525(7570):515-8. doi:10.1038/nature14952. [Backref page 2]
- [5] Stampfli R. M., P. Anderson, G. Cigarette smoke lung disease and cancer. *Nature*. 2009;9:377-84. doi:10.1038/nri2530. [Backref page 2]
- [6] Rashan MAA, Dawood OT, Razzaq HAA, Hasali MA. The impact of cigarette smoking on lipid profile among Iraqi smokers. *International Journal of Collaborative Research on Internal Medicine & Public Health*. 2016;8(8):0-0. [Backref page 2]
- [7] Nath M, Rahman A, Nath M, Dutta A, Khan Z, Ghosh E, et al. The Effect of Cigarette Smoking on Fasting Lipid Profile: A Single Center Study. *Fortune Journal of Health Sciences*. 2022;5(2):363-73. doi:10.26502/fjhs.067. [Backref page 2]
- [8] Yan XS, D'Ruiz C. Effects of using electronic cigarettes on nicotine delivery and cardiovascular function in comparison with regular cigarettes. *Regulatory Toxicology and Pharmacology*. 2015;71(1):24-34. doi:10.1016/j.yrtph.2014.11.004. [Backref page 4]
- [9] Rahman MA, Hann N, Wilson A, Worrall-Carter L. Electronic cigarettes: patterns of use, health effects, use in smoking cessation and regulatory issues. *Tobacco induced diseases*. 2014;12:1-9. doi:10.1186/1617-9625-12-21. [Backref page 4]
- [10] Zhang P, Fang L, Wu H, Ding P, Shen Q, Liu R. Down-regulation of GR α expression and inhibition of its nuclear translocation by hypoxia. *Life sciences*. 2016;146:92-9. doi:10.1016/j.lfs.2015.12.049. [Backref page 4]
- [11] Barrett CE. Material evidence. *The Oxford Handbook of Ancient Greek Religion*. 2015:113-30. doi:10.1093/oxford journals.aje.a113598. [Backref page 4]
- [12] Majid S, McGlasson KL, Fetterman JL, Keith RJ, Weisbrod RM, Palmisano JN, et al. Electronic cigarette use is associated with altered lipid profiles in the CITU study. *Circulation*. 2019;140(Suppl_1):A14816-6. [Backref page 4]
- [13] Lakshmanan A, Saravanan A, et al. Effect of intensity of cigarette smoking on haematological and lipid parameters. *Journal of clinical and diagnostic research: JCDR*. 2014;8(7):BC11. doi:10.7860/JCDR/2014/9545.4612. [Backref page 5]
- [14] Koda M, Kitamura I, Okura T, Otsuka R, Ando F, Shimokata H. The associations between smoking habits and serum triglyceride or hemoglobin A1c levels differ according to visceral fat accumulation. *Journal of Epidemiology*. 2016;26(4):208-15. doi:10.2188/jea.JE20150086. [Backref page 5]
- [15] de Souza JD, Ribeiro AQ, Martinho KO, Franco FS, Martins MV, Rodrigues MG, et al. Lipid profile and associated factors among elderly people, attended at the Family Health Strategy, Viçosa/MG. *Nutricion hospitalaria*. 2015;32(2):771-8. doi:10.3305/nh.2015.32.2.8875. [Backref page 5]
- [16] Jain RB, Ducatman A. Associations between smoking and lipid/lipoprotein concentrations among US adults aged ≥ 20 years. *Journal of circulating biomarkers*. 2018;7:1849454418779310. doi:10.1177/1849454418779310. [Backref page 5]
- [17] Chen TC, Parker JD, Clark J, Shin HC, Rammon JR, Burt VL. National Health and Nutrition Examination Survey: estimation procedures, 2011-2014. *Vital and health statistics Series 2*. 2018;(177):1-26. [Backref page 5]

- [18] McCauley DM, Gaiha SM, Lempert LK, Halpern-Felsher B. Adolescents, Young Adults, and Adults Continue to Use E-Cigarette Devices and Flavors Two Years after FDA Discretionary Enforcement. *International Journal of Environmental Research and Public Health*. 2022;19(14):8747. doi:10.3390/ijerph19148747. [Backref page 5]
- [19] Park-Lee E, Ren C, Sawdey MD, Gentzke AS, Cornelius M, Jamal A, et al. Notes from the field: e-cigarette use among middle and high school students—National Youth Tobacco Survey, United States, 2021. *Morbidity and Mortality Weekly Report*. 2021;70(39):1387. doi:10.15585/mmwr.mm7039a4. [Backref page 5]

How to cite

Hasan Q. A.; Jawad S. F.; Abdulla A. K.; Zigam Q. A.; Owadh H. K.; Measuring The Concentration of Plasma Trace Elements of Al-Mustaqbal University College Smokers (employees and students). *Journal of Biomedicine and Biochemistry*. 2023;2(1):1-6. doi: 10.57238/jbb.2023.5911.1022