RESEARCH ARTICLE

TRIGLYCERIDE LEVELSON ELECTRONIC CIGARETTE VAPERS IN PALANGKA RAYA

Suratno, Dwi Purbayanti, Arnino Adhy Satya

Department of Medical Laboratory Technology, Faculty of Health Sciences
UniversitasMuhammadiyahPalangkaraya, Palangka Raya, Central Kalimantan

e-mail: nono.suratno89@yahoo.com

ABSTRAK

Rokok elektrik merupakan salahsatu terapi pengganti nikotin (NRT, *Nicotine Replacement Therap* yang menggunakan listrik dari tenaga baterai untuk memberikan nikotin dalam bentuk uap Nikotin diketahui dapat menstimulasi sekresi katekolamin yang dapat menyebabkan terjadinya peningkatan lipolisis dihati yang menyebabkan peningkatan sekresi trigliserida hepatik ke pembuluh darah. Penelitian ini bertujuan untuk mengetahui gambaran trigliserida pada perokok elektrik (*vape*) pada anggota suatu komunitas *vaporizer*di Pahandut,Palangka Raya,Kalimantan Tengah.Penelitian ini menggunakan metode deskriptif dengan jenis penelitian *cross–sectional*. Pemeriksaan kadar trigliserida dilakukan menggunakan metode fotometri otomatis dengan Fotometer (5010 V5+ Robert Riele). Hasil penelitian menunjukkan bahwa perokok elektrik (*vaper*) sebanyak 75,9% memiliki kadar trigliserida normal dengan rerata 100,6 mg/dL, sebanyak 13,8% memiliki kadar trigliserida batas-tinggi dengan rerata 180,8 mg/dL, dan sebanyak 10,3% memiliki kadar trigliserida tinggi dengan rerata 293.0 mg/dL.

Kata kunci:Rokok elektrik, *vaper*, kadar trigliserida

ABSTRACT

Electronic cigarette (e-cigarette) is one of the Nicotine Replacement Therap uses electricity from battery power to deliver nicotine as aerosols. Nicotinecan stimulate secretion ofcatecholaminelead to increase secretion of hepatic triglycerides to the blood vessels. This study aimed to asses the triglyceride levelson electroniccigarette smokers (also known as vapers) on a vaporizer community in Pahandut,Palangka Raya, Central Kalimantan. Thecross-sectionaldesign was carried out to asses triglyceride levels on 29 electronic cigarette users. Trilgliceride assay was determined by automated photometric techniqueusing Photometers (5010 V5+ Robert Riele).This study found that mostly e-cigarette user considered normal triglyceride level as 75.9% with average triglyceride level 100.6 md/dL, 13.8% considered borderline-high triglyceride level with average triglyceride level 180.8 md/dL, and only 10.3% considered high triglyceride level with average triglyceride level 293.0 md/dL.

Keyword: Electronic cigarettes, vapers, triglyceride levels

INTRODUCTION

Electronic cigarettes or e-cigarettesare NRTs or Nicotine Replacement Therapies devices that heat a liquid, to create an inhalable aerosol that can contain nicotine [1]. E-cigarettes also known as an electronic nicotine delivery systems (ENDS).The liquids or e-liquids are usually (but not always) composed of nicotine, as well as at least one solvent (usually propylene glycol and/or vegetable glycerin), and flavorants (tobacco, menthol, candy or beverage themed and more)[2].

Usage of e-cigarettes has increased dramatically in recent years. The Global Adult Tobacco Survey 2011 for Indonesia shows 10.9% of adults had heard about electronic cigarettes, although only 0.3% had used them (in males 0.5%)[2][3]. Electronic cigarettes are illegal in Indonesia. The Food and Drug Monitoring Agency in Indonesia (Badan Pengawas Obat dan Makanan Republic of Indonesia, BPOM RI) has warned the Indonesian people that electronic cigarettes could be more dangerous than regular cigarettes[3].

Smoking has become an independent risk factor for the formation of atherosclerosis. Nicotine affectsin stimulating sympathetic adrenal system leading to increased secretion of catecholamine. Catecholamines leading to increased lipolysis and increased concentration of plasma free fatty acids (FFA) . Further result in increased secretion of hepatic FFAs and hepatic triglycerides in the blood stream[4] [5].This study aimed to asses triglyceride levels on electronic cigarette smoker, also called “vaper or vaporizer”, in Pahandut, Palangka Raya, Central Kalimantan.

METHODS

A cross-sectional study design was conducted this study to triglyceride levels on electronic cigarette smoker within a vaper community members. This study was carried out in Pahandut, Palangka Raya, Central Kalimantan inApril to June, 2018. Triglyceride levels determination was conducted in Clinical Laboratory, Faculty of Health Science, UniversitasMuhammadiyahPalangkaraya.

Purposive sampling was used as the sampling technique in this study. Sample was collected based on some certain purposes and considerations. The inclusion criteria of the sample must be: (a) male who had been smoking electronic cigarettes longer than one year, (b) in good health, and (c) voluntarily agree to participate in this research proven by signed informed consent form.The vaper who meeting those criteria could complete the questionnaire and undergo the triglyceride assay.

Tools and Materials

The materials were used in this study consist of serum sample, Triglyceride Test kit: Reagent 1 (Buffer pH 7,5, 4-chlorophenol, 4-aminoantipyrine,

Mg^{2+}ions, ATP, lipases, peroxidase, glycerol kinase, and glycerol-3-phosphate oxidase) and Reagent 2 (standard of triglyceride), and alcohol swab 70%.The tools were used such as syringe 3 cc, micropipette (1000 µL, 50 µL, 20 µL, dan 5 µL), blue and white micropipette tips, test tube12x75 mm, plain vacutainer blood tube with redcap, vortex mixer and centrifuge. Trilgliceride assay was determined using Photometers (5010 V5+ Robert Riele).

Data and Sample Collection

The data obtained during the questionnaire and the triglyceride assay of the vapers blood. The questionnaire items included general information, duration of vaping, concentration of nicotine, time required to spend 1 bottle of liquid (60 mL) and the combination usageof conventional cigarettes (vaper or dual user).

The blood sample collection involved venipuncture procedure based on Department of Health of Republic of Indonesia 2008. The blood collected by venipuncture was collected in dry vacutainer tubes fortriglyceride determination.

Serum processing referred to Good Laboratory Practiceguidelines Department of Health of Republic of Indonesia 2008[6]. Blood sample was prior allowed at room temperature for 1-2hours, tranferred into plain vacutainer blood tube, and centrifuged at 3000 rpm for15 min. The determination of triglyceride level in serum was performed within 2 h after sample collection. No lipemicserum were analyzed.

The triglyceride level was obtained using an automated enzymatic photometric technique. Determination of triglycerides using GPO-PAP method (Glycerol-3-phosphate oxidase-p-amino-phenazone). The principle of the assay is that the triglyceride are determined after enzymatic hydrolysis with lipases. Indicator is quinoneimine formed from hydrogen peroxide, 4-aminoantipyrine and 4-chlorophenol under the catalytic influence of peroxidase, measured at 546 nm.

RESULTS AND DISCUSSION

The characteristics of the sample

The sample of this study consisted of 29 men electronic cigarette user. E-cig users were mostly young people as 65.5% of were aged 18 to25 years, and 27.6% were aged 26 to 35 years. Duration of vaping indicates period of vaping from the first-time usage until this study conducted.As 82.8% of e-cig users had usede-cigarettes for 1-2 years. The mostly used nicotine concentration was 3 mg by 82.8% of vapers, while only 1% vaper using 0 mg of nicotine. Only 27.6% vapers need less than a week to spend 1 bottle of liquid (60 mL package), and mostly vapers (72.4%) need more than aweek up to four weeks to spend the package of liquid. This study involved 69% vaper (e-cigarette only)and

31% dual user (both e-cigarette and cigarette)(**Table 1**).

Table 1. Characteristics of the samples

Characteristics	Variables	Number	Percentage (%)
Age category, y	18 – 25	19	65.5
	26 – 35	8	27.6
	36 – 50	2	6.9
Duration of vaping, y	1 – 2	24	82.8
	≥ 2	5	17.2
Concentration of nicotine, mg	0	1	3.4
	3	24	82.8
	6	1	3.4
	12	3	10.3
Time required to spend 1 bottle of liquid (60 mL)	0-1 week	8	27.6
	1-4 weeks	21	72.4
Combination usage of conventional cigarettes (vaper or dual user)	e-cigarette only (vaper)	20	69.0
	e-cigarette + cigarette (dual user)	9	31.0

Table2. Triglyceride levels on electronic cigarette users

Triglyceride levels classifications	Number	Percentage (%)	Average triglyceride level (mg/dL)
Normal (≤ 149 mg/dL)	22	75.9	100.6
Borderline-high (150-199 mg/dL)	4	13.8	180.8
High (200-499 mg/dL)	3	10.3	293.0

The normal range for serum triglyceride levels were less than 149 mg/dL. The triglyceride levels was considered abnormal when higher than the normal range. This study found that mostly e-cig user considered normal triglyceride level as 75.9% with average triglyceride level 100.6 md/dL. As 13.8% of vapers considered borderline-high level of triglyceride with average triglyceride level 180.8 md/dL. And only 10.3% of vapershave high level of triglyceride with average triglyceride level 293.0 md/dL (**Table 2**).

Based on **Table 3**, triglyceride levels of 24.1% e-cigarette vaper are abnormal. The overall lipid composition of rat plasma after e-cigarette aerosol exposure was markedly affected with significant increases in the content of esterified cholesterol (EC), total cholesterol (TC) and triglycerides (TG) ($P < 0.05$) [7].

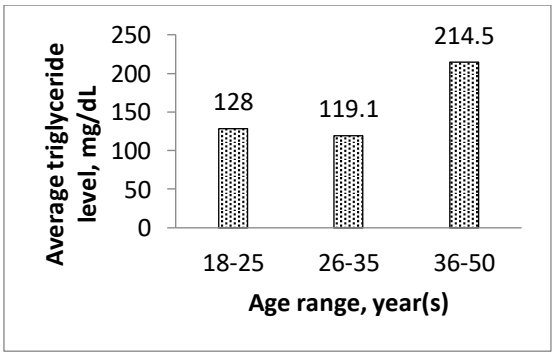

Figure 1. The average of triglyceride levels based on age

This study found thatthe average triglyceride levels of e-cigarette vapers at the age range of 36-50 years was high triglyceride levels (**Figure 1**). Nicotine can increase triglyceride concentrations in blood serum[8]. High serum triglyceride levels are a risk factor for early atherosclerosis[9].

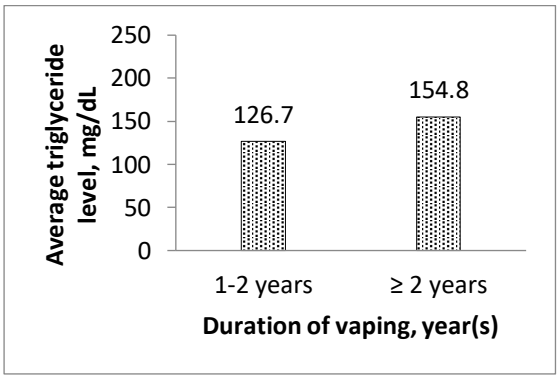

Figure 2. The average of triglyceride levels based on duration of vaping

Figure 2 shows the average triglyceride levels of e-cigarettes vaper with more than two years of vaping was higher than e-cigarettes vaper with only 1-2 years experience of vaping. Other study reported, there is a significant relationship between duration of smoking and the incidence of coronary heart disease. Longer duration of cigarette smokingincreases coronary heart disease risk, compared to new cigarette smoker [10].

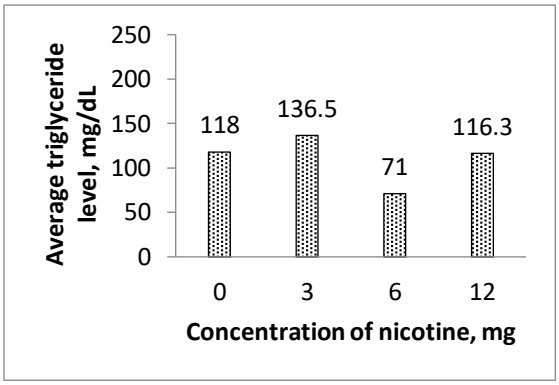

Figure 3. The average of triglyceride levels based on concentration of nicotine

The average triglyceride levels in electroniccigarette vaperbased on nicotine levels do not provide consistent results (**Figure 3**). A studycomparedexposure of nicotine alone to e-liquid with or without nicotine on metabolic parameters in Wistar ratsfoundthe triglyceride levels increased significantly sequentially in control rats, e-liquids with nicotine exposured rats,and nicotine-alone exposured rats[8].The averagetriglyceride level of vaper using 0 mg of nicotine is greater than 6 mg or 12 mg of nicotine, it can be caused by glycerol content in electronic cigarette liquid which leads increased triglyceride level.

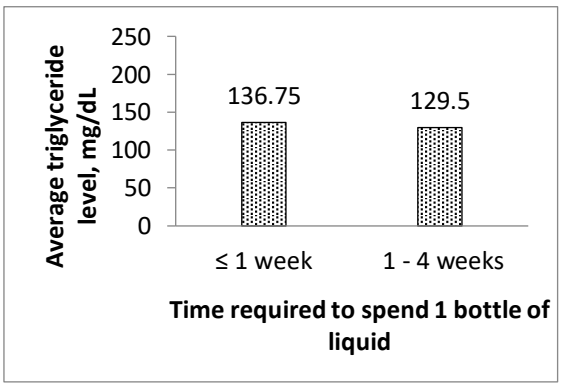

Figure 4. The average of triglyceride levels based on time required to spend 1 bottle of e-liquid

This duration of use shows the intensity of vaping. The shorter time to spend 1 bottle of liquid (60 mL), thehigher the intensity in the amount and time of vaping. **Figure 4** shows that the triglyceride levels of e-cigarettevapers who require less than 1 week to spend 1 bottle of liquid was higher than vaperswho require 1 up to 4 weeks.Triglyceride levels increase by the number of daily cigarettes used [11]. A study compared non smokers to 3 classes of smokers divided based on duration and amount of consumption per day (light smokers, moderate smokers and heavy smokers). The study found the higher intensity (duration and number of cigarettes per day), the triglyceride levels alsoincreased. It shows the amount of nicotine exposure increasedby duration of smoking[12].

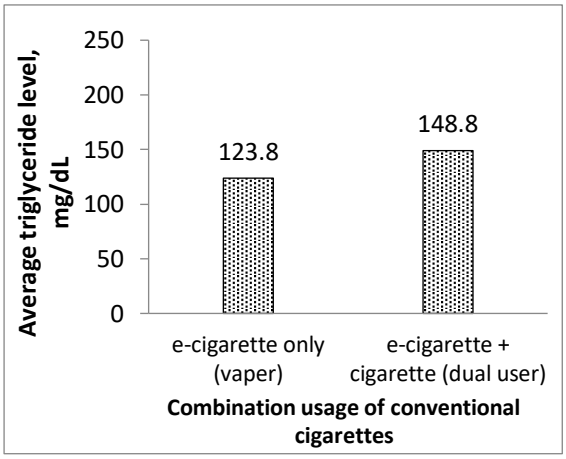

Figure 5. The average of triglyceride levels based on combination usage of conventional cigarette

The average triglyceride levels of e-cigarette only user (vaper) was lower than e-cigarette and cigarettes user (vaping and smoking, dual user) (**Figure 5**). It indicatesdual users are nicotine exposed both from e-cigarette and combustible cigarette. Since, the addition of nicotine exposure from conventional cigarettes.

CONCLUSIONS

This study found that mostly e-cigarette user considered normal triglyceride level as 75.9% with average triglyceride level 100.6 md/dL, 13.8% considered borderline-high triglyceride level with average triglyceride level 180.8 md/dL,and only 10.3% considered high triglyceride level with average triglyceride level 293.0 md/dL.

REFERENCES

1. Kennedy, RD., Awopegba, A., De León, E., Cohen, JE. 2016. Global approaches to regulating electronic cigarettes. Tob Control, 0:1–6.
2. Breland, A., Soule, E., Lopez, A.,Ramôa, C., El-Hellani, A., & Eissenberg, T. 2017. Electronic cigarettes: what are they and what do they do? *Ann N Y AcadSci*,1394(1): 5–30.
3. Bam TS., Bollow W., Berezhnova I., Jackson-Moris A., Jones A., danLatif E. 2014. Position statement on electronic cigarette or electronic nicotine delivery systems.*Int J Tuberc Lung Dis*, 18(1):5–7.
4. Kshitiz, K.K., et al. 2010. *A Study of Effects of Smoking on Lipid and Vitamin C Metabolism, A Pilot Study in Central Bihar*. International journal of Pharma and Bio Sciences, 1 (4): 106-113.

5. Neki, NS. 2002. Lipid profile in chronic smokers – A clinical study. *Journal Indian Academy of Clinical Medicine*, 3(1): 51-54.

6. Department of Health of Republic of Indonesia. 2008. *Good laboratory practice*. Department of Health of Republic of Indonesia: Jakarta.

7. Canistro D, Vivarelli F, Cirillo S, BabotMarquillas C, Buschini A, Lazzaretti M, Marchi L, Cardenia V, Rodriguez-Estrada MT, Lodovici M, Cipriani C, Lorenzini A, Croco E, Marchionni S, Franchi P, Lucarini M, Longo V, Della Croce CM, Vornoli A, Colacci A, Vaccari M, Sapone A, Paolini M. 2017. E-cigarettes induce toxicological effects that can raise the cancer risk.*Sci Rep*. 7(1): 1-9.

8. El Golli N, Dkhili H, Dallagi Y, Rahali D, Lasram M, Bini-Dhouib I, Lebret M, Rosa JP, El Fazaa S, Allal-El Asmi M. 2016. Comparison Between Electronic Cigarette Refill Liquid and Nicotine on Metabolic Parameters in Rats. *Life Sciences* 146: 131-138.

9. Chobanian AV. 1991. Single risk factor intervention may be inadequate to inhibit atherosclerosis progression when hypertension and hypercholesterolemia coexist. *Hypertension*. 18: 130-131.

10. Malaeny, CS., Katuuk, M., Onibala, F. 2017. HubunganRiwayat Lama MerokokdanKejadianPenyakitJantungKoroner di PoliklinikJantung RSU PancaranKasih GMIM Manado. *e-JurnalKeperawatan*, 5(1): 1-7.

11. Phillips NR, Havel RJ, Kane JP. 1981. Levels and Interrelationships of Serum and Lipoprotein Cholesterol and Trigliserida. Association with Adiposity and the Consumption of Ethanol, Tobacco, and Beverages Containing Caffeine. *ArteriosclerThrombVasc Biol*. 1(1): 13-24.

12. Devaranavadgi B. B, Aski B. S, Kashinath R. T &Hundekari. I. A. 2012. Effect of Cigarette Smoking on Blood Lipids – A Study in Belgaum, Northern Karnataka, India. *Global Journal of Medical Reserch*. 12.(6): 57-61.