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## **Physiological Study of Effect of Smoking Cigarette and Hookah on Non Enzymatic Antioxidant Level in Blood Serum**

**Qussay Noori Raddam AlMuhammadi\***

*Department of Biology , Education college ,University of AL Iraqia , Iraq.*

*Email: qussai74@yahoo.com*

### **Abstract**

Smoking cigarette and hookah are one of the common serious problem in the world , where it is especially popular among young people . Many of people think that hookah smoking to be less hazardous than cigarette smoking. We studied and comparative effect of smoking hookah and cigarette on levels of non enzymatic antioxidant [ Glutathione , Malondialdyhde ,and Peroxinitrite ] in blood serum of 52 men. Fourteen sample for each group of [ cigarette smokers , hookah smokers , and cigarette &hookah smokers ] used in this study. Serum samples were analyzed for glutathione ,malondialdyhde ,and peroxinitrite concentration. We found significant decreases  $p < 0.05$  in serum glutathione concentration comparable to control group of nonsmokers , so we found significant increases  $p < 0.05$  in serum Malondialdyhde and Peroxinitrite concentration comparable to control group of nonsmokers.

**Keywords:** smoking; non enzymatic antioxidant; blood serum.

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\* Corresponding author.

## **1. Introduction**

Smoking considers being the most important risk factor lead to many disease and death. Approximately 14 million new cases and the 8.2 million cancer related death in 2012, and the number of new cases is expected to rise by about 70% over the next two decades [1]. More than 100 million people worldwide smoke cigarette and hookah. Hookah also known as water pipe, shisha ,borry ,goza ,narghile ,shui yan dai , and hubble-bubble according to region of used [2] .A water pipe consists of a head that is connected to abowl containing water and a hose with mouthpiece. A tobacco preparation is placed in the head and burning charcoal is placed on top of the tobacco. The smoker inhales through a mouthpiece, which draws air and hot combustion products from the burning charcoal through the tobacco preparation, creating an aerosol consisting of volatized and pyrolyzed tobacco components. The smoke passes through the water in the bowl, cooling the smoke, before being carried through the hose to the smoker. Smoke cause to addictive on the component of tobacco like nicotine which absorbed into the blood and effects the brain in very short time, therefore the smoker feel good because the release of neurotransmitters [3]. Smoke of cigarette have a different oxidative materials like free radicals which play main role in organic and tissues damage [ 4].Gazes components in smoke such as Carbon monoxide [CO] which accumulated in human body with continuous smoking [5].There is no different between the components in hookah and cigarette, and the most common in both [ Nicotine , Tar , Carbon monoxide, heavy minerals ,Radiation materials [6]. Oxidative stress describes a state of physiological stress in the body that arises from exposure to high levels of reactive oxygen species [ROS] to an extent that overwhelms the antioxidant defense system [7]. The oxidative damage of cell components has been implicated in the pathogenesis of a wide variety of diseases, most notably heart disease and cancer. Recent studies suggest that oxidative stress induced by cigarette and hookah smoking poses a significant human health concern, especially as related to cardiovascular disease [8] . Cigarette smoking exacerbates ROS formation, evidenced by the increase in oxidative stress biomarkers in smokers compared with no smokers. In this context, previous studies indicate that smokers have higher oxidative stress levels compared to nonsmokers, and this can be explained in part, by reduced blood antioxidant capacity. Increased production of ROS from tobacco is recognized because of the more than 4,000 chemical substances found in tobacco .Therefore; ill-health related to smoking may be linked to increased production of ROS. Cigarette or hookah smoking induces almost the same causes of decreased levels of glutathione [9].

### **Comparison between Cigarette Smoking and Hookah**

According to the World Health Organization, a hookah smoker inhales as much smoke during one standard hookah session as a cigarette smoker would from a hundred cigarettes. Compared with cigarette smoking, hookah smoking is associated with comparable or even more inhalation of toxicants. The smoke from hookah contains higher levels of arsenic, lead, and nickel, thirty-six times more tar, and fifteen times more carbon monoxide than cigarettes. The higher levels are due taking longer and harder drags, increasing levels of inhaled nicotine and carcinogens in the lungs [10]. Hookah use increases contact with carcinogens because smokers use the hookah over a much longer period of time, often forty to forty-five minutes, rather than the five to ten minutes it takes to smoke a cigarette. In those forty minutes of hookah use, about two hundred puffs are taken compared to the twenty puffs taken with a cigarette. The societal facet of smoking hookah put many users at risk

for other infectious diseases due to the fact that the same mouthpiece is shared. While smoking tobacco has its own effects to health, hookah smoke has the added health effect of the charcoal. The charcoal is used to heat the tobacco. As it does its job of heating the shisha, it also increases health risks with its high levels of metal, carbon monoxide, and cancer causing chemicals.

### ***Non enzymatic antioxidant***

Glutathione: is a tripeptide molecular found in the reduction form GSH or in oxidative form GSSG. The concentration of glutathione in blood serum is very little, and although it cannot cross over cell membrane but its concentration could elevate after treatment with drugs [11]. Glutathione is one of the most important of non enzymatic antioxidant because of its role in save the balance between oxidation and reduction process [12]. Malondialdehyde : it is toxicity products generated from lipid peroxidation process and consider as a good sign for free radical generation [13].

Peroxynitrite : [ ONOO ] is a one of the strong oxidative material , reactive with wide range of target cells in the body and caused [tyrosine nitration , thiol oxidation , lipid peroxidation , DNA damage , and guanosine nitration or oxidation] at last lead to cell death [14].

Thus, the aim of this study is to investigate whether smoking cigarette or smoking hookah more effective on non enzymatic antioxidant concentration in blood serum.

## **2. Materials and Methods**

### ***2.1. Experimental samples***

56 young students from Education College used in this study. And divided into four group in each group 14 sample .first group include nonsmokers as control ,second group include cigarette smokers , third group include hookah smokers ,and fourth group include cigarette &hookah smokers.

### ***2.2. Experimental tests.***

#### ***A. Determination of Glutathione , Malondialdehyde, and Peroxynitrite concentration.***

Glutathione, Malondialdehyde, and Peroxynitrite concentration were measured spectrophotometrically using a spectrophotometer type DU-640 [Cecil Instruments, Inc., Uk] and the dosage kits of [GH ,Malondi ,Peroxi]were taken from Zidan Laboratories company.

### ***2.3. Statistical Analysis***

All statistical tests were processed using Minitab software program using unpaired T.test ,one-way ANOVA at  $p < 0.05$ , [ 15 ].

### 3. Results and Discussions

**Table 1:** Glutathione concentration [mmol/ L] in blood serum.

n	Groups	GSH Concentration [mmol / L]
1	Control	4.65± 1.68
2	Cigarette smokers	3.82±3.03 *
3	Hookah smokers	3.57± 2.2 *
4	Cigarette & Hookah smokers	2.91± 3.6 *

N= number of samples in each group [14]

± SD [standard deviation].

\* significant different  $p < 0.05$

Result of this study approved significant decreased  $p < 0.05$  in Glutathione concentration in blood serum for all groups comparable to control group from non smokers. Glutathione concentration in cigarette smokers group decreased significantly  $3.82 \pm 3.03$  comparable to control group  $4.65 \pm 1.68$ , also significant decreased in Hookah smokers  $3.57 \pm 2.2$  and the most decreased was in Cigarette & Hookah smokers group  $2.91 \pm 3.6$  comparable to control group. We explained the reason of this significant decreased in GSH to increase of consuming GSH because it is one of the most important non enzymatic antioxidant in human body which have ability to scavenge and removing Reactive Oxygen Species [ROS], which generated from the smoking. Glutathione changed from GSH form to GSSH, [s-s] group consider as reduction agent donor for electron that because of the weakness of bound between sulfur and hydrogen and easy to breakdown comparable to the strong bound between carbon and hydrogen [16]. Also significant decreased in GSH concentration may be return to the decreased in NADPH Co –enzyme which consider as reduction substance and essential in build Glutathione or as catalytic substance for Glutathione Reductase enzyme which work to return Glutathione from GSSH form to GSH [17].

Smoking is one of the most important risk factor lead to many disease and to cell damage from increasing of free radical generation which first it effects on cell membranes and especially the respiratory membrane which consider the first target for gases and smoke of smoking, Sialic acid one of the acids elevated with smoking and lead to increase of lipid peroxidation and then increase of free radical generation more than the process of removing and scavenge, therefore GSH concentration decreased [18]. Respiratory membranes one of the most important of defensive lines prevent entrance bacteria or external agents through respiratory system. Smoke of cigarette is one of Noxious agents which effect on respiratory membrane to be more permeability and then over activity of air alveoli [19].

Result of this study refers to significant increase  $p < 0.05$  in Malondialdehyde concentration in all group of study cigarette smokers, Hookah smokers, and Cigarette & Hookah smokers comparable to non smokers control group [ $1.910 \pm 0.4$ ], in cigarette smokers group elevated significantly to be [ $2.662 \pm 0.38$ ], also elevated in Hookah smokers group [ $2.861 \pm 0.32$ ] and in cigarette & hookah smokers group elevated to approach

[2.991± 0.36 ] .we explained this elevated in Malondialdehyde concentration because of the increase of lipid peroxidation processes in respiratory membrane the reason make it more rigidity [20] , also elevate MDA concentration may be return to Oxidative stress [OS] reason of increase of activity of Oxidase fatty acyl Co-A enzyme ,which stimulus the process of fatty acid oxidation and rapid formation of H<sub>2</sub>O<sub>2</sub> ,then increase in lipid peroxidation and MDA production [21].our result agreed with [22], and disagree with 23 ,1997 ; 24].

**Table 2:** Malondialdehyde concentration [mg/ L] in blood serum.

n	Groups	MAD Concentration [mg / L]
1	Control	1.910± 0.4
2	Cigarette smokers	2.662±0.38 *
3	Hookah smokers	2.861± 0.32 *
4	Cigarette & Hookah smokers	2.991± 0.36 *

N= number of samples in each group [14]

± SD [standard deviation].

\* significant different p<0.05

**Table 3:** Peroxynitrite concentration [ng/ mg] in blood serum.

n	Groups	Pn Concentration [ng / mg]
1	Control	2.542± 0.5
2	Cigarette smokers	4.173±1.3 *
3	Hookah smokers	3.992± 1.12 *
4	Cigarette & Hookah smokers	4.716± 2.4 *

N= number of samples in each group [14]

± SD [standard deviation].

\* significant different p<0.05

Result of this study indicate that significant increasing was happened in Peroxynitrite concentration [Pn] for all smokers cigarette , hookah , and cigarette& hookah comparable to control group [2.542± 0.5] ,Pn concentration arise in cigarette smokers group to be [4.173±1.3 ] , in hookah smokers group arise to be [3.992± 1.12 ] and in cigarette &hookah smokers group arise to be [4.716± 2.4 ]. PN is one of Reactive Nitrogen Species [RNS] formatted from the reaction between Nitric oxide [NO] and Superoxide and PN consider as strong oxidative substance have bad effect on the bimolecular in human body [25].

We explained this elevation in PN concentration to the reaction between Nitric oxide and Superoxide because of the materials within smoking substances . so we think these smoking substances expedite this reaction by the high reduction ability like Nicotine ,Hydroquinone , and Catechol [26].Pn have short life time in body tissue therefore it is hard to measured its concentration in direct way , for this reason use 3-Nitrotyrosine compound as

indicate [27]. Also we explained this elevate in PN concentration because of Oxidative stress which result in imperfection in cellular signaling translation and gene expression [ 22]. Also PN concentration elevated explain as a result to the increase of H<sub>2</sub>O<sub>2</sub> formation and its role in generation of free radicals and PN from the reaction between Superoxide and Nitric oxide which consider as the main cause to produce [RNS], this result agree with [4].

#### **4. Conclusion**

Smoking hookah &cigarette was the most effective comparable to smoking cigarette and smoking hookah on serum levels of non Enzymatic antioxidant in our sample

#### **5. Recommendation**

Avoid and advise the youth not use the smoking it's hard to the human being.

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