

The effects of pipe water smoking on endothelial function in healthy non smoker volunteers



Rania Gaber ^{a,*}, Manal Hamesa ^b

^a Department of Cardiovascular Medicine, Tanta University, Egypt

^b Department of Radiology, Tanta University, Egypt

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KEYWORDS

Pipe water smoking;
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FMD%

Abstract *Background:* Water pipe (WP) tobacco smoking is gaining wide popularity among young and middle aged males and females.

Aim of the work: The aim of this study was to evaluate the immediate effect of 1st pipe water smoking on brachial Flow mediated dilatation% (FMD%) and Nitrate mediated dilatation% (NMD%) as markers of systemic endothelial function.

Methods: The present study comprised of 40 young healthy volunteers with no cardiovascular risk factors (the mean age 28 ± 5 years, males) randomized to either smoking (cigarette or pipe water) or not smoking in a crossover fashion. All the participants underwent a physical examination, laboratory analysis, Standard echocardiography, brachial artery $FMD\% = [(D_{max} - D_{base}) / D_{base}]$ multiplied by 100 (%). and endothelium independent dilation (NMD%) = $[(D_{NTG} - D_{base}) / D_{base}]$ multiplied by 100 (%) were assessed with a high-resolution ultrasound probe and the arterial diameters before smoking, just after smoking, 1 h and 2 h after obtained.

Results: FMD% after 1 h of both water pipe and cigarette were significantly lower ($p < 0.001$) than FMD% of the base – line and normalized after 2 h. No differences in median NMD% values ($p > 0.05$).

Conclusion: Our findings confirm that even one time pipe water smoking is associated with systemic endothelial dysfunction comparable to cigarette smoking in young non-smoker volunteers with no cardiovascular disorders or risk factors.

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Abbreviations: WP, water pipe; FMD%, flow mediated dilatation%; NMD%, nitrate mediated dilatation; D_{max} , maximum diameter measure 60 s after deflation; D_{base} , baseline diameter before inflation or sublingual nitroglycerine; NTG base, diameter 5 min after sublingual nitroglycerine.

* Corresponding author. Department of Cardiovascular Medicine, Tanta University, Egypt

E-mail addresses: raniagaber2009@hotmail.com, mohamed_rawash2012@yahoo.com (R. Gaber).

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Introduction

Smoking is a major cause of cardiovascular disease mortality.^{1,2} Current research, treatment, and policy efforts focus on cigarette smoking, while many people in developing regions smoke tobacco using water pipes. Available evidence suggests that WP use is increasing globally.³ Studies on the cardiovascular effects of WP smoking are limited due to the quality of methods, the novelty of WP epidemic relative to cigarettes, and the highly variable WP tobacco contents.

The misconception that water pipe is less harmful than cigarette increases its spread to other segments of society, particularly among young men and women. Water pipes (also known as gouza, narghile, hubble-bubble, hookah, or shisha) are increasing in popularity, and more must be learned about them so that we can understand their effects on public health monitor spread and help users to quit.⁴

Smoking causes endothelial dysfunction through impairment of nitric oxide (NO) production, or increased oxidative stress by a large number of free radicals existing in smoke.⁵ Since endothelial dysfunction is a well-documented early phenomenon in atherosclerosis as it precedes structural changes and clinical manifestations, major research efforts have focused on its detection in humans.⁶

Flow-mediated vasodilation (FMD) of the brachial artery is a noninvasive, validated measure that evaluates endothelial function and predicts future CVD events.^{7,8} FMD is the most often used method to investigate the systemic endothelial function.^{7,9,10} This technique relies on brachial artery dilation produced by endothelial release of endogenous vasodilators [principally nitric-oxide (NO)] in response to increased blood flow and shear stress.

Previous studies have shown that chronic pipe water smoking is associated with impaired FMD%.^{11,12} However, exposure to pipe water smoke has also been shown to have more immediate effects.¹³ To demonstrate further the effects of pipe water smoking on the vasculature, we investigated the acute effects of active first time pipe water smoking compared to 1st cigarette smoking on the FMD% and NMD of healthy non smoker volunteers.

Study design

After the ethical committee of Tanta university approval, 59 young (28 ± 5 years, males), healthy non-smokers were included. Informed consent taken from all volunteers. All subjects had a normal health declaration. 19 volunteers exhibit nausea, sickness and cannot complete smoking. So only 40 continue the study protocol. 20 subjects smoked outdoors apple flavored pipe water for approximately 30 min and another 20 smoked one cigarette for 5 min. All the subjects were instructed not to eat, drink caffeine or take vitamin C supplements 12 h before the study, and no heavy physical exercise at least 1 day in advance of the study. FMD%, NMD% obtained at baseline, 15 min after, 1 and 2 h after exposure following at least 15 min of rest in a semi-supine position. 20 Of them smoke (10 cigarette, 10 pipe water) and other 20 subjects as controls and the opposite occurs after one week (Fig. 1).

Exclusion criteria

- 1- Cardiovascular disease or risk factors.
- 2- Asthma and or allergy.
- 3- Respiratory infection within 4 weeks of the study.

Methods

All study groups were subjected to the following assessment:

- 1- Complete history taking.
- 2- Clinical evaluation.
- 3- Routine laboratory investigations:

Complete blood count, urine analysis, kidney function tests and liver function test. Lipid profile which includes: Total cholesterol, Triglyceride, Low-density lipoprotein, high-density lipoprotein.

FMD%, NMD% assessment

FMD%, NMD % were assessed using a high resolution (7.5 MHz) vascular ultrasound probe. Vascular studies were performed by the 2 experienced investigators in a temperature-controlled room between 10 am and 12 am. After resting in supine position for 15 min, their heart rate, blood pressure were measured and baseline arterial image was acquired from the right arm 2–5 cm above the ante-cubital fossa. When a suitable 2-dimensional longitudinal axis image of the vessel was obtained and digitally recorded, the position of the ultrasound probe was fixed and remained unchanged throughout the examination.

Arterial diameter measurements were performed offline as a distance between the near and far wall lumen intima boundaries at end-diastole (onset of the R wave on the ECG).

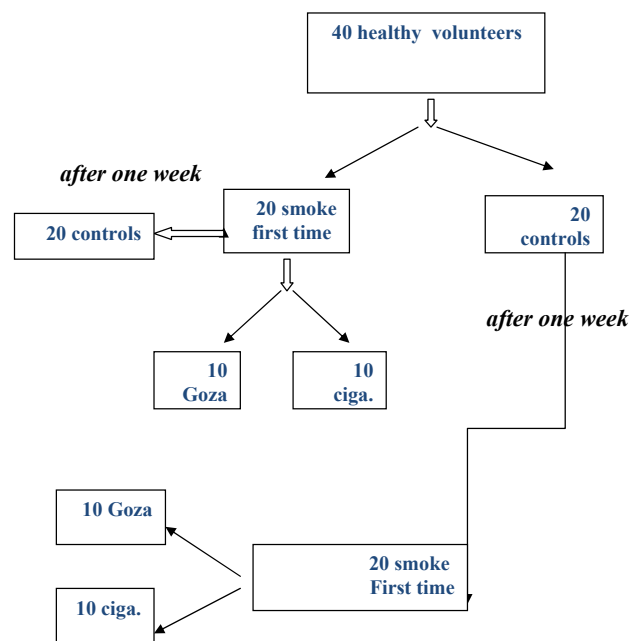


Figure 1 Study design.

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