

Original Article

Serum homocysteine level in male smokers of Bangladesh

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Abstract

Smoking may cause atherosclerosis and acute cardiovascular events and hyperhomocystenemia may found in smokers that play a vital role in development of atherosclerosis and acute cardiovascular events. The present cross sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka between July 2013 to June 2014 to assess the serum homocysteine (Hcy) level in male smokers. A total number of 200 male subjects were selected with age ranging from 20 to 40 years. Among them, 100 male smokers were included in the study group (Group B) and 100 male non-smokers of same age ranging were considered as controls (Group A). Detailed smoking and medical history was taken regarding drug intake and general examinations were done. The mean serum homocysteine level was significantly higher in adult male smoker than that of adult male non smoker ($p < 0.001$). This study concludes that serum homocysteine level increases in male smokers which may act as risk factor for future cardiovascular diseases and atherosclerosis.

Key Words: Serum homocysteine, smoker, atherosclerosis

Introduction

A smoker is a person who smokes any tobacco product either daily or occasionally. Daily smoker is a person, who smokes any tobacco product at least once a day and occasional smoker is a person, who smokes, but not every day.¹ More than 4000 compounds have been identified in tobacco smoke.² Among them, major components are nicotine, tar,

carbon monoxide and certain other poisonous substances like hydrogen cyanide, nitrogen oxide and ammonia etc.³ Current rate of smoking in the world is about 22.20%.⁴ Active smoking causes acute cardiovascular events including acute myocardial infarction, certain micro vascular complications, stroke, a range of cancers and sudden death. Moreover it also accelerates atherosclerosis in different arteries.^{5,6} Passive smokers may also suffer from these diseases.⁷ Smoking causes increase in serum homocysteine (Hcy) level and this high level may increase the risk of certain diseases including CVD, strokes, cancers, diabetes, depression and Alzheimer's disease. Some researchers state that 1 mol/L increase in serum Hcy concentration is associated with a 10% increase in CHD risk and it becomes 42% with every five unit increase in serum Hcy concentration.^{8,9} A high level of serum Hcy makes a person more prone to endothelial injury, which leads to vascular inflammation, atherogenesis and ischemic injury. It has been correlated with the occurrence of blood clots, which causes occlusion of arteries and leads to ischemic heart diseases, heart attacks and strokes.¹⁰

Elevated serum Hcy concentration may damage the vascular tree via platelet activation, lipid peroxidation, enhanced tissue factor activation, reduced Von Willebrand factor, increased fibrinogen levels and smooth muscle proliferation. All these risk factors can produce vascular damage.¹¹ Oxidation of serum Hcy can generate free radicals such as superoxide and copper-catalysed hydrogen peroxide that can damage arterial endothelium. Serum Hcy also promotes the oxidation of low density lipoprotein (LDL) cholesterol, which can lead to heart disease.¹²

Methods

The present cross sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka between July 2013 to June 2014. Protocol of this study was approved by Ethical Review Committee of Dhaka Medical College, Dhaka. For this study, hundred apparently healthy male cigarette smokers aged 20-40 years who smokes at least 5 sticks of cigarette per day for the last 5 years were included as study group (Group B). For comparison, age matched another hundred apparently healthy male non-smokers were included as controls (Group A). All of the subjects were

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selected by personal contact from different areas of Dhaka city by simple random sampling. After selection of the subjects, the nature, purpose and benefit and risks of the study were explained in details. They were encouraged for voluntary participation. They were also allowed to withdraw from the study whenever they like. Informed written consent was taken from the participants. Before taking blood, detailed family and medical history regarding drug intake were taken and recorded in a prefixed questionnaire. Serum Hcy level was estimated by AxSYM homocysteine assay based on the Fluorescence Polarization Immunoassay (FPIA) technology in the Department of Biochemistry, BSMMU, Dhaka. For statistical analyses unpaired Student's 't' test was performed as applicable using SPSS for Windows version 17.

Results

The mean serum homocysteine level was 18.20±3.62 in group B and 4.93±0.38 in group A. The difference was statistically significant (p <0.001). (Table-I)

Table-I: Serum homocysteine (Hcy) level in both groups (n=200)

Group A	Group B	p value
4.93±0.38	18.20±3.62	< 0.001

Results are expressed as Mean±SD. Unpaired Student's 't' test has been done as the test of significance.

Group A= Control group (Adult male non smoker), Group B= Study group (Adult male smoker)

Again in this study, among the 100 study subjects, 15 (15%) had serum homocysteine level of 5-15 µmol/L and rest 85 (85%) had serum homocysteine > 15 µmol/L. (Figure-1).

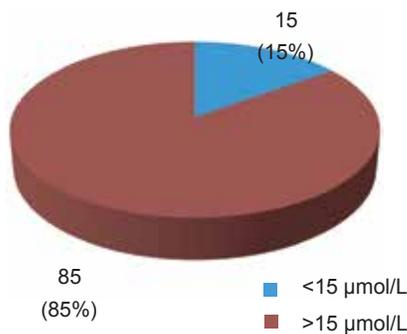


Figure-1: Distribution of the subject by serum homocysteine level in study group (n=100)

Discussion

In the present study, the mean serum homocysteine level was higher in smoker than that of non smokers. Various researchers from different countries also found almost similar result.^{13,14, 15}

There are some postulated mechanisms suggested by researchers of different countries which may imply the possible mechanism regarding these changes in the present study. Organic nitrites, nitrous oxide (NO), cyanide and hydrogen sulfid present in tobacco smoke are interact with folic acid and vitamin B12 coenzymes and transformed them into biologically inactive compounds. Thereby prevents remethylation of homocysteine and increases its blood concentration in smokers¹⁶. High level of homocysteine has been recognized as an independent risk factor for vascular disease in smokers.¹⁷

Smoking also causes decrease appetite and thereby produces vitamin deficiency. Thus deficiency and inactive form of B-vitamins blocks the recycling pathways of homocysteine metabolism and causes elevation of serum homocysteine concentration in smoker's blood.¹⁸

So all the findings of the study revealed that serum homocysteine increases in smokers which may act as risk factor for future cardiovascular diseases and as well as atherosclerosis.

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