

INFLUENCE OF HABITS ON MASONS' BLOOD CHOLESTEROL

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Abstract : Plasma total cholesterol, HDL cholesterol, glucose and total protein were estimated in (male) masons without any habits (normal masons) and masons with habits (cigarette smoking, alcohol consumption and betel-quid cum tobacco chewing) and compared with normal subjects. Masons had less total cholesterol and more HDL cholesterol when compared with normal subjects, which may be due to their occupational physical activities. Among masons, cigarette-smoking masons alone had more total cholesterol and less HDL cholesterol. Blood glucose also decreased in masons and more so in betel-quid cum tobacco chewing masons when compared with normal subjects while total protein content showed no variation.

Key words : masons cholesterol HDL cholesterol habits
cigarette smoking alcohol betel-quid chewing

INTRODUCTION

Cardiovascular diseases are the major causes of death in adults in most developed countries and in many developing ones, and are now the commonest cause of death worldwide. Munster Heart Study, one of the prospective studies identified nine independent factors for coronary heart diseases: age, smoking history, personal history of angina pectoris, presence or absence of a family history of myocardial infarction (MI), systolic blood pressure, low density lipoprotein (LDL) cholesterol, high density lipoprotein (HDL) cholesterol, triglyceride and presence of or absence of diabetes mellitus (1). Of the serum lipids,

cholesterol is most often singled out as being chiefly concerned with the incidence of atherosclerosis (2). The risk of coronary heart disease increase with increasing total cholesterol to HDL cholesterol ratio and a sharp rise is reported at ratios >5.0 (1).

Lack of exercise is a source of high coronary heart disease (CHD) risk, and this relationship is independent of other risk factors. There is strong epidemiological evidence that aerobic physical activity reduces the rise of CHD, with a dose-response relation that holds up to several hours of exercise per week. Thus moderately active men who habitually spend 2000–3000 kcals per week in exercise have 2–3 fold

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fewer coronary than those spending less than 500 kcals. Those who exercise regularly have less body weight, higher HDL cholesterol, lower LDL cholesterol and triglyceride levels, greater insulin sensitivity and lower blood glucose and blood pressure (1).

Masons by their occupation are involved in building construction work and their work involves regular physical activity. In this study we have investigated the plasma total cholesterol and HDL cholesterol in masons without habits (normal masons) and masons with habits such as cigarette smoking, alcohol consumption and betel-quid cum tobacco chewing and compared with age-matched normal population.

Betel-quid (pan) consists of four main ingredients: betel leaf (*Piper betel*), areca nut (*Areca catechu*), slaked lime (Ca(OH)_2) and catechu (*Acacia catechu*). *Acacia catechu* is not used in this region. Betel quid is chewed with tobacco. Tobacco is placed in quid or taken along (3). Since physical exhaustion following endurance effects can be accompanied by a low blood glucose level (4) we are interested in verifying the effect of mason's occupation on blood glucose level and we have also assayed the level of serum protein to verify whether masons suffer from any protein malnutrition. Further no report is available on masons' blood cholesterol and hence it is of interest to investigate these parameters in masons.

METHODS

The study comprised of 62 male masons who had more than 5 years experience and working 8–9 hours per day. They are from

in and around of Chidambaram, a taluk head-quarters of Cuddalore district, Tamil Nadu, India. Masons were divided into four groups, those who are not involved in any habits (normal masons) and those who regularly drink alcohol (equivalent to 30 to 60 ml of rectified spirit per day taken in one or two spells either before lunch or mostly in the evening) or smoke 8–10 cigarettes per day or betel-quid cum tobacco chewers (6–8 times per day). Their physical activity includes walking and/or cycling about 6–10 km per day besides their masonry work. Both normal and masonry subjects rarely take non-vegetarian food (average once in a month).

Normal subjects were twenty and chosen from the same family members (younger or elder brother or uncle). Subjects involved in any habits (cigarette smoking or alcohol consumption or betel-quid chewing) or medication were excluded from the study. Rice is the main food consumed by all of them three times a day and few of them consumed rice in the form of puddings in the morning. They were either agriculturists or petty shop owners or menial servants. Their physical activity include walking 6–10 km/day or agricultural fieldwork. All the participants were examined by a physician and were free from chronic illness and were normotensives. Oral consent was obtained from each one of them.

Venous blood was collected after an overnight fast into heparinised tubes. Plasma was separated by centrifugation at 3000 rpm for 15 minutes and stored at 4°C and analyzed within four hours. Total cholesterol was estimated by the method of Allian et al (5) using reagent kit (Teco

Diagnostics). In this method cholesterol esterase hydrolyses cholesterol esters in the plasma to produce free cholesterol and fatty acids. Cholesterol oxidase converts cholesterol to cholest-4-en-3-one and hydrogen peroxide. In presence of peroxidase, hydrogen peroxide oxidatively couples with 4-aminoantipyrine and p-hydroxy benzene sulfonic acid to produce red quinoneimine dye which has absorbance maximum at 510 nm. The intensity of the red colour is proportional to the amount of total cholesterol in the specimen. HDL cholesterol was estimated by the method of Lopes (6) using reagent kit (Autopak, Bayer Diagnostics India Ltd), in which lipoproteins fractions in plasma are separated from HDL by precipitating with phosphotungstic acid-magnesium chloride. After centrifugation, the cholesterol in the HDL fraction, which remains in the supernatant is assayed with enzymatic cholesterol method as above. Total protein was estimated by Lowry et al (7), in which protein reacts with Folin-Ciocalteu reagent to give blue coloured complex which is measured at 660 nm. The colour is due to the reaction of alkaline copper with protein

and the reduction of phosphomolybdate by tyrosine and tryptophan in the protein. Glucose is estimated by the method of Trinder (8) using reagent kit (Eco Pak, Accurex Bio Medical Pvt. Ltd.), in which glucose oxidase (GOD) converts glucose to gluconic acid. Hydrogen peroxide formed in this reaction, in presence of peroxidase (POD), oxidatively couples with 4-aminoantipyrine and phenol to produce quinoneimine dye. This dye has absorbance maximum at 510 nm. The intensity of the colour complex is directly proportional to the concentration of glucose in plasma.

Results are expressed as mean \pm SD. Intergroup differences were calculated by one-way analysis of variance (ANOVA) followed by Duncan's multiple range test (9).

RESULTS

Total cholesterol, HDL cholesterol, TC/HDL ratio, glucose and total protein levels are presented in Table I. Total cholesterol and glucose levels and TC/HDL ratio are less while HDL-cholesterol levels are more

TABLE I: Age, plasma total cholesterol (TC), HDL cholesterol (HDL-C), TC/HDL-C ratio, glucose and total protein in normal population and masonry normals and masons with habits between 20–40 years age.

<i>Parameters</i>	<i>Normal subjects n = 20</i>	<i>Masonry normals n = 18</i>	<i>Masonry smokers n = 18</i>	<i>Masonry alcoholics n = 12</i>	<i>Masonry quid-chewers n = 14</i>
Age	29.5 \pm 9.72	30.4 \pm 6.6	27.6 \pm 5	29.7 \pm 5.6	27.0 \pm 4.76
Total cholesterol (mg/dL)	182.8 \pm 13.3 ^a	131.6 \pm 21.4 ^b	162 \pm 35.6 ^c	142.5 \pm 29.6 ^b	150.8 \pm 29 ^b
HDL-cholesterol (mg/dL)	38.9 \pm 2.7 ^a	43.5 \pm 3.2 ^b	42.5 \pm 11 ^c	45.6 \pm 4.5 ^b	46.5 \pm 5.5 ^b
TC/HDL-C ratio	4.70 \pm 0.04 ^a	3.03 \pm 0.25 ^b	3.81 \pm 0.15 ^c	3.13 \pm 0.35 ^b	3.24 \pm 0.24 ^b
Glucose (mg/dL)	82.1 \pm 9.3 ^a	73.9 \pm 8.7 ^c	69.4 \pm 6.5 ^c	68.9 \pm 7.4 ^c	68.0 \pm 4.2 ^b
Total protein (g/dL)	6.7 \pm 0.43	7.0 \pm 0.47	6.9 \pm 0.5	7.6 \pm 0.73	6.9 \pm 0.59

Values are given as mean \pm SD.

Values in a row not sharing a common superscript (a, b and c) differ significantly with each other at P<0.05 (Duncan's multiple range test).

when masonry normals as well as masons with habits (masonry smokers, alcoholics and betel cum tobacco quid-chewers) are compared with normal subjects. When masons with habits are compared with masonry normals total cholesterol level is more and HDL cholesterol is less only in cigarette smokers. Glucose level is less only in betel-quid cum tobacco chewers when compared with masonry normals. Total protein shows no variation in any of the groups.

DISCUSSION

Plasma total cholesterol levels were less while HDL cholesterol were more in all the experimental groups when compared with normal. It has been reported that regular physical exercise has favourable effects on serum lipids and lipoprotein levels especially in reducing total cholesterol, LDL cholesterol and in elevating HDL cholesterol levels. (10, 11, 12, 13). Further it is reported that higher the initial serum cholesterol levels before the exercise programme, the more effective was increased physical activity in lowering the cholesterol concentration (14). Regular exercise affects the plasma lipid profile favourably and total cholesterol concentrations are reduced as a result of lowering of LDL cholesterol, whereas HDL cholesterol is raised (2). Hence the fall of total cholesterol and elevation of HDL cholesterol in all the experimental groups are due to masons' occupational physical activity. It is interesting to note that in spite of regular physical activity the maximum elevation of HDL cholesterol is only around 45 mg/dL though the range is from 29 to 61 mg/dL in male (15). Either other factors should

influence or that may be the maximum distribution of cholesterol possible in HDL to the given total cholesterol.

When masons with habits were compared with masonry normals, total cholesterol was significantly more only in cigarette smokers and a tendency to increase in tobacco chewers while HDL cholesterol is little less in cigarette smokers. Cholesterol in blood has been reported to increase to the extent of 4.5% and HDL cholesterol to decrease to the extent of 8.9% in smokers by Craig et al (16) in their review paper. A greater increase of total cholesterol and a greater decrease of HDL cholesterol is found in Indian vegetarian smokers compared to Westerners (17). Nicotine is the principal pharmacologically active component of tobacco and affects adrenal medulla in a biphasic manner. Small doses lead to catecholamines release and large doses prevent such release (18). In cigarette smokers, the nicotine ingested stimulates the secretion of catecholamines which increase the free fatty acids by lipolysis of adipose fat. The FFA reaching the liver is esterified as triacylglycerol and cholesteryl esters, which are secreted into the blood stream as VLDL. This gets converted to LDL in circulation. The greater the release of FFA, the greater the levels of LDL and cholesterol. Hence cholesterol is elevated in cigarette smoking masons. Our study shows that sustained physical activity in cigarette smoking masons, tries to maintain high HDL cholesterol than normal subjects and in cigarette smoking masons TC/HDL ratio also low, thereby offering protection to them from the risk factors. When compared with masonry normal, masonry smokers are at risk than masonry

alcoholics and betel-quin cum tobacco chewers. Among tobacco consumers cigarette smokers are at risk than that of quin-chewers perhaps other components in the betel-quin involved in lowering total cholesterol though there is a tendency for increase.

When masonry alcoholics were compared with normal subjects, total cholesterol was significantly less and HDL cholesterol was more in our experiment. Studies have shown that there is an association between moderate alcohol consumption and a lower incidence of coronary heart disease. This may be due to elevation of HDL concentrations resulting from increased synthesis of apo A-I and changes in the activity of cholesteryl ester transfer protein (2). The influence of alcohol is not so significantly noted in total cholesterol since physical activity masks the effect of alcohol.

We found that plasma glucose concentration was less in masons when compared with normal, since physical exhaustion following endurance efforts can be accompanied by a low blood glucose level (4). In the absence of any nutrient intake, the utilization of plasma fatty acids as energy substrate decreases as a proportion of total energy requirements as exercise

intensity increases. Conversely, the proportionate contribution of energy derived from carbohydrate oxidation increases (19). Hence during work (a regular physical activity) carbohydrate utilization is more resulting in decreased blood glucose level. The significant reduction of plasma glucose in masonry quin-chewers, when compared with masonry normals may be due to some components in betel-quin. Intubations of betel leaf extract to normal rats in our laboratory at fasting and after oral glucose load reduced plasma glucose significantly (unpublished data). Hence the reduction in blood glucose in betel-quin chewers may be due to betel leaf. Total protein content not varied in any of the groups studied, showing that they do not suffer from protein deficiency.

Our study demonstrates that masons' occupation offer them better protection when compared with normal subjects from some of the risk factors for CHD especially total cholesterol and cigarette smoking. Further masons have lower fasting plasma glucose than normals.

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