Original Article

Lipid profile in an urban healthy adult Bangladeshi population

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Abstract

Background and objectives: The prevalence of ischemic heart disease (IHD) has increased in most of the developing countries, including Bangladesh. An important marker of IHD is dyslipidemia which includes high levels of triglyceride (TG), total cholesterol (T-cholesterol), low density lipoprotein cholesterol (LDL-c) and low level of high density lipoprotein cholesterol (HDL-c). So it is very important to know the lipid levels of a particular population for early intervention and prevention of IHD. The present study investigated the lipid levels of healthy urban adult Bangladeshi population.

Methods: The cross sectional study was carried out over a period of one year at the Department of Physiology of Ibrahim Medical College, Dhaka, Bangladesh. A total number of 286 apparently healthy individuals were included in this study. Blood sample following overnight fast was collected for determination of serum TG, T-cholesterol, LDL-c and HDL-c. For all four lipid components, 95th percentile value was calculated and compared with values recommended by World Health Organization (WHO).

Results: A total number of 286 adult individuals were enrolled of which 130 (45.5%) and 156 (54.5%) were male and female respectively. The mean levels of TG (122±56 mg/dl) and T-cholesterol (178±25 mg/dl) of male participants were significantly (p=0.001, p=0.008) higher than that of females (79.3±35.6 and 170±26 mg/dl). The level of serum HDL-c was significantly (p=0.001) higher in females (46.1±7.8 mg/dl)) compared to the males (39.7±8.6 mg/dl). The 95th percentile values of TG, T-cholesterol and LDL-c were higher than that of values recommended by WHO. Of the total participants, 17.1% to 24.1% had TG, T-cholesterol and LDL-c levels higher than the WHO recommended range.

Conclusion: It is concluded that a proportion of our urban healthy young adult population had lipid profiles different from that recommended by WHO.

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Introduction

Metabolic abnormality is affecting the human health at an increased rate all over the world. Major characteristic features of the metabolic abnormalities include obesity, dyslipidemia, hypertension and insulin resistance. This cluster of conditions has been termed as metabolic syndrome (MS) [1]. Hypertriglyceridemia, low HDL-c and high LDL-c have been found to have strong correlation with obesity parameters like body mass index (BMI), fasting glucose, atherosclerotic disease and coronary heart disease [2-5].

The prevalence of ischemic heart disease (IHD) has increased in most of the developed countries and is gradually increasing in developing countries, including Ban00gladesh [6,7]. Ischemic heart disease is the major cause of death in developed countries as well as in developing countries.

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Coronary heart disease and stroke are the leading causes of death in South Asian population living in UK. The rates are higher than the white population of UK [8]. The major cardiovascular risk factors are hypertension, diabetes mellitus and dyslipidemia [9,10]. Lipids and lipoproteins are well known risk factors for IHD. Elevated levels of triglyceride and total cholesterol and LDL-c are documented as risk factors for atherogenesis [11,12].

Considering this fact, World Health Organization (WHO) has already set a low cut-off value for BMI (23 kg/m² for both sex) and waist to height ratio (WHtR; 0.88 and 0.81 for men and women respectively) for Asian population [13]. American Heart Association (AHA) has set up cut-off values for lipid profile (cholesterol - upto 200 mg/dl; TG<180 mg/dl; HDL - 30-60 mg/dl; LDL - 100-190 mg/dl) and blood pressure (systolic - 110-130 mm of Hg and diastolic - 60-90 mm of Hg) for their communities [14]. WHtR has been proved as a valuable obesity index for predicting diabetes, hypertension and dyslipidemia [15].

Different national and international bodies have proposed a cut-off value for the different lipid components. Among these, the reference value proposed by WHO is accepted worldwide. But these values may not reflect the normal lipid levels of diverse ethnic population living in different geographic regions having different life style. The present study was aimed to determine the lipid levels in an urban healthy adult Bangladeshi population.

Methodology

Study population and place: The cross sectional study was carried out over a period of one year at the Department of Physiology of Ibrahim Medical College, Dhaka, Bangladesh. Apparently healthy adult individuals aged 18 to 30 years living in Dhaka city were enrolled. The participants represented young urban affluent community. Anyone having diabetes, hypertension, pregnancy, taking oral contraceptives or lipid lowering agents were excluded. Informed written consent was obtained from all the participants after explaining the nature and purpose of the study. Detail family and medical history, anthropometric measurement and blood pressure were recorded in a predesigned data sheet.

Collection of blood and estimation of lipid profile: About 5 ml of blood was collected aseptically from each participant after overnight fasting for estimation of TG, T-cholesterol, LDL-c and HDL-c. Biochemical analysis were carried out using auto-analyzer. Normal ranges for lipid profile were taken as: TG<150 mg/dl; TC<200 mg/dl; HDL>60 mg/dl and LDL<130 mg/dl [16].

Data analysis: Data were expressed as Mean± SD, number (percentage), range and 95% confidence interval. 95^{th} percentile {K=k(n+1)/100, here, k=desired percentile, n=number of values} was calculated to work out the range of lipid components of the study participants.

Result

A total number of 286 adult individuals were enrolled of which 130 (45.5%) and 156 (54.5%) were male and female respectively. Table-1 shows the lipid profile of the study population. The mean levels of TG (122±56 mg/dl) and T-cholesterol (178±25 mg/dl) of male participants were significantly (p=0.001, p=0.008) higher than that of females (79.3±35.6 and 170±26 mg/dl). The level of serum HDL-c was significantly (p=0.001) higher in females (46.1±7.8 mg/dl)) compared to the males (39.7±8.6 mg/dl). Table-2 shows the 95^{th} percentile values for all the lipid components of the study population. The 95^{th} percentile values of TG, total cholesterol and LDL-c of male volunteers were higher compared to females (Table-2). The 95^{th} percentile values of HDL of both male and female volunteers were 54 mg/dl and 57 mg/dl respectively which were below the WHO recommended normal range (>60mg/dl) for HDL-c. Table-3 shows the number of individuals who had TG, T-cholesterol, HDL-c and LDL-c above the calculated 95^{th} percentile values and WHO recommended normal range for lipids. Of the total participants, 17.1% to 24.1% had TG, T-cholesterol and LDL-c levels higher than the WHO recommended normal range while only 5.2% to 6.3% individuals were above the calculated 95^{th} percentile of our study population. Only, 6 individuals (2.1%) were above the normal WHO range of HDL-c (>60 mg/dl).

Table-1: *Lipid profile of study population*

Lipid mg/dl	Mean±SD values for			p value
	Male (n=130)	Female (n=156)	Total (n=286)	M vs. F
Triglyceride	122±56 (112, 131)	79.3±35.6 (73.7, 84.8)	98.8±51 (92.9, 104.7)	0.001
T-cholesterol	178±25 (173.7, 182.3)	170±26 (165.9, 174.1)	173±26 (170, 176)	0.008
HDL-c	39.7±8.6 (38.2, 41.2)	46.1±7.8 (44.9, 47.3)	43.2±8.7 (42.2, 44.2)	0.001
LDL-c	113±22 (109.2, 116.8)	109±24 (105.2, 112.8)	111±23 (108.3, 113.7)	0.146

Note: p value is calculated by independent student's t test; M: Male; F: Female; 95% confidence interval is shown within parenthesis.

Table-2: *Ninety fifth (95^{th}) percentile values of four lipid components for male, female and all volunteers*

Study population	Triglyceride (mg/dl)	T-cholesterol (mg/dl)	HDL-c (mg/dl)	LDL-c (mg/dl)
Male (n=130)	227	213	54	150
Female (n=156)	150	210	57	147
Total (n=286)	204	210	57	149

Table-3: *Distribution of individuals with lipid values above the 95^{th} percentile and WHO recommended range for lipids*

Lipid	Number of male		Number of female		Total number of cases (%)	
	>95^{th} percentile	>WHO criteria	>95^{th} percentile	>WHO criteria	>95^{th} percentile	>WHO criteria
Triglyceride	9	53	9	12	18 (6.3)	65 (22.7)
T-cholesterol	9	32	6	17	15 (5.2)	49 (17.1)
HDL-c[a]	7	1	7	5	14 (4.9)	6 (2.1)
LDL-c	9	43	9	26	18 (6.3)	69 (24.1)

Note: p<0.01 when compared between cases above the 95^{th} percentile and WHO normal range for TG, T-cholesterol and LDL-c. For HDL-c p=0.0687. a=number below the WHO recommended value (<60 mg/dl).

Discussion

The present study has investigated the lipid profile of affluent urban healthy Bangladeshi adults to find out the normal as well as the status of lipid levels in this population group. The levels of TG, T-cholesterol and LDL-c were significantly higher in males compared to females. The HDL-c levels in male and female was significantly below the WHO recommended levels. Similar observations have been reported from studies conducted in Caribbean island, Iran and Brazil [17-19]. A significant proportion of participants in our study had lipid levels higher than those recommended by WHO. Also, the 95^{th} percentile values of TG, T-cholesterol and LDL-c of our study population were higher than those recommended by WHO. Similarly,

the 95th percentile value of HDL-c was less than that of WHO recommended value.

These high values for lipids may be due to ethno-geographic differences and specific life style. Considering this, the cut-off values for different lipid profile parameters should also be different for different ethnic groups. The gender variation should also be taken into consideration. Primary causes of dyslipidemia involve gene mutations that cause the body to produce too much LDL-c or triglycerides or to fail to remove those substances. Primary causes tend to be inherited and thus to run in families. The secondary causes of dyslipidemia include consuming a diet high in saturated fats, trans-fats, and cholesterol and physical inactivity. The high value of TG in Asian countries is probably due to the food habit i.e., consumption of high carbohydrate content food. Therefore, it will be interesting to study whether such lipid profiles in different ethnic population having different food habits, genetic make-up and life style have adverse impact on health or contribute to increase cardiovascular diseases [20]. If it does not affect the health adversely, then one should consider recommending different normal lipid range for different ethnic or regional population.

In the present study, dyslipidemia appeared to be markedly high in both male and female study population. To conclusively comment regarding the normal lipid levels, the number of participants needs to be expanded involving multicenter/region approach to circumvent the bias in enrollment of volunteers.

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Conflict of interest: None

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