

## Socio-economic Status and Risk of Coronary Heart Disease (CHD) in a Northern Urban Community of Bangladesh

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This cross-sectional study was done with a view to find out the risk of coronary heart disease by evaluating lipid status of apparently healthy urban people of both sexes, aged 30 - 60 years hailing at Rajshahi City Corporation area, Rajshahi, during July, 2007 to June, 2008. A total of 112 respondents of different socioeconomic class were selected randomly and serum lipid profile was analyzed. The mean value of serum total cholesterol was 4.8 mmol/L. Among them 8% of the respondents had high risk (>6.2 mmol/L) and about 32% had borderline hypercholesterolemia (5.18 – 6.2 mmol/L). The mean value of serum triglyceride was 1.6 mmol/L and 15 % had borderline hypertriglyceridemia (1.7 – 2.3 mmol/L). The mean value of serum LDL was 3.2 mmol/L. Among them 13% population had high risk (>4.2 mmol/L) and about 26% had borderline hypercholesterolemia (3.4 – 4.1 mmol/L). The mean value of serum HDL was 1.0 mmol/L and 15 % population had high risk (< 0.9 mmol/L) and about 85% had borderline risk (0.9 – 1.6 mmol/L). The patterns of dyslipidemias observed in this study, were not significantly different between the male and the female. The findings of the study indicated that the risk of coronary heart disease was prevailing among the urban study population. The risk was found significantly associated with the education level and economic status of the respondents (p<0.01). This study might help the urban people by providing important information about risk of coronary heart disease and for further in-depth study.

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**Key words:** Coronary heart disease (CHD), Total cholesterol (TC), HDL-cholesterol (HDL-C), LDL- cholesterol (LDL-C).

### Introduction

Bangladesh has undergone a remarkable demographic transition over the last three decades. Striking changes have also been observed in the lifestyle and food habit in our population.<sup>1</sup> Lifestyle modification and health awareness are known to reduce long term morbidity and mortality in patients with coronary heart disease. Coronary Heart Disease (CHD) is the leading cause of mortality and morbidity in industrialized countries, and it is emerging as a prominent public health problem in developing countries.<sup>2</sup> While Bangladesh is turning from agro-based socioeconomic

structure towards industry-based setting, coronary heart disease in middle aged and young group is also appearing into scene.<sup>3</sup> In the past three decades, much attention has focused on certain blood lipids and the lipoproteins that transport them in the circulation, mainly because of their strong association with coronary heart disease (CHD). Much of these association has been recognized through the conduct of large national and international collaborative analytical, epidemiological, and clinical studies.<sup>4,5,6</sup> Based on these trials the diagnosis and treatment of hypercholesterolemia have

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also established to address the risk of CHD. Henceforth, the measurement of plasma lipids and lipoproteins levels have been recognized as necessary for the prevention and clinical management of coronary heart disease. It is note-worthy, however that the incidence of stroke and heart attack in the developing region of the world has been increasing steadily over the past several decades and calls for steps to be taken towards the prevention of CHD in developing countries.<sup>7</sup>

It is established that a decrease in plasma cholesterol concentration results in the reduction of incidence of CHD.<sup>3,4,7</sup> There are also strong and continuous relations between total cholesterol and LDL-cholesterol concentration and coronary heart disease risk.<sup>8</sup> The relation between TC/HDL-C ratio is an important predictor of future cardiac event.<sup>9</sup> Increased triglyceride also plays an important role in the causation of CHD. Studies revealed that serum triglyceride (TG), total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) are directly associated with coronary heart disease (CHD) and high density lipoprotein cholesterol (HDL-C) is inversely associated with coronary heart disease.<sup>7,8,10, 9</sup> Fatty diet, obesity and physical inactivity are associated to increased TG, TC, and LDL-C.<sup>11</sup> Exercise and fiber rich diet is positively associated with increased HDL-C.<sup>12</sup> Low HDL-C as an independent predictor of CHD in non-diabetic patient has been reported.<sup>13</sup> While Bangladesh is turning from rural based socio-economic structure towards urbanization, coronary heart disease in middle aged and young group is also appearing at increasing level. A study revealed that the prevalence of CHD was 14 per 1000, and the incidence of CHD had showed an upward trend in Bangladesh.<sup>14</sup> The urban residents of the Rajshahi city have undergone significant changes in their lifestyle that are parallel to the development of the country. We used to provide a representative sample of community- dwelling adult and middle aged

residents in Rajshahi city. The aim of the present study was to evaluate demographic and socioeconomic characteristics and their association to blood lipids levels with a view to explore the predictive risk of CHD among the urban adult and middle-aged persons of different socioeconomic groups hailing at Rajshahi city of Bangladesh.

## Methods

This cross sectional study was carried out to determine the association of socio-demographic variable and the blood lipid status of the urban population at Rajshahi city. The study subjects were selected randomly from the apparently healthy individuals of different socioeconomic group aged 30 to 60 years from July, 2007 to June, 2008. In total 112 respondents were selected randomly from different wards of Rajshahi city. Those persons who were taking lipid lowering drugs and those were suffering from diabetes mellitus, liver disease, renal disease, hypertension and thyroid disorder excluded from the study. Following informed consent, each subject was interviewed a questionnaire covering parameters such as demographic data, education level and monthly family income. The socio-economic status was determined by taking educational level and monthly family income of the study population.

Fasting blood was collected in the following day and laboratory investigations for selected biochemical tests were carried out among 112 respondents at department of Biochemistry, Rajshahi Medical College, Rajshahi. Fasting blood glucose as well as Lipid profile including serum total cholesterol (TC), serum triglycerides (TG) and serum high density lipoprotein cholesterol (HDL-C) estimation were done by enzymatic method.<sup>15</sup> Serum low density lipoprotein cholesterol (LDL-C) was calculated out indirectly by using the empirical equation of Friedewald et al; [LDL

chol] = [ Total cholesterol] – [ HDL chol] – [ Triglyceride] /5. <sup>16</sup> Data were processed using SPSS version 10.0 Epi Info 2000. One way ANOVA test was done for statistical analysis. Following values were accepted as desirable, borderline and high risk values of lipid profile (Table I).<sup>5</sup>

Table I: Accepted values of lipid profile.

Lipid Profile	Desirable mmol/L (mg/dl)	Borderline mmol/L (mg/dl)	High risk mmol/L (mg/dl)
TC	<5.2(<200)	5.2–6.2(200-240)	>6.2(>240)
TG	<2.3 (<200)	2.3–4.5(200-400)	>4.5 (>400)
LDL-C	<3.4 (<130)	3.4–4.2 (130-159)	>4.2(>160)
HDL-C	>1.6 (>60)	0.9–1.6(35-60)	< 0.9(<35)

## Results

### *Comments on socio-demographic characteristics of the study population*

Table II shows the socio-demographic characteristics of the study population. Among 112 total study subjects 67 were male and 45 were female. Among the respondents 34% were in the age group of 30 - 39 years, 30% were in the age group of 40 - 49 years and 36% were in the age group of 50 years and above. Majority of the respondents (61%) had school level education and minor percentage (13%) had no education. The average monthly family income of the respondents was Tk. 8675.00. About 22% of the of the respondents were poor class, 59% of respondents were middle class and the remaining 19% were rich class.

### *Biochemical analysis*

Lipid profile of the study subjects was determined and the results shown as their mean value  $\pm$  SD in mmol/L. Different

findings observed during the study presented as follows.

Table III showed that the mean value of serum total cholesterol was  $4.8 \pm 0.9$  mmol/L. Among them 8% population had high risk (>6.2 mmol/L) and about 32% had borderline hypercholesterolemia (5.2 – 6.2 mmol/L). The mean value of serum triglyceride was  $1.6 \pm 0.6$  mmol/L and 15 % had borderline hypertriglyceridemia (1.7 – 2.3 mmol/L). The mean value of serum LDL was  $3.2 \pm 0.8$  mmol/L. Among them 13% population had high risk (>4.2 mmol/L) and about 26% had borderline hypercholesterolemia (3.4 – 4.1 mmol/L). The mean value of serum HDL was  $1.0 \pm 0.1$  mmol/L. The study showed that 15 % population had high risk (<0.9 mmol/L) and about 85% had borderline risk (0.9 – 1.6 mmol/L).

Table IV depicts the lipid profile status with the age group of the study subjects. According to the age of the respondents study subjects were categorized into three groups as 30 – 39 years, 40 – 49 years and 50 – 59 years. Age group 50 - 59 years had a little high level serum of total cholesterol ( $4.9 \pm 1.0$  mmol/L) compared to other age groups. One way AVOVA test was done and it was found that the differences of serum total cholesterol level (Mean  $\pm$ SD) in different age groups were non-significant. It was also found that serum triglycerides (TG), serum LDL-C and serum HDL-C level were closely similar in different age groups without statistical difference.

Table V showed the lipid profile status with the sex of the study subjects. Out of 112 respondents 67 were male and 45 were female. The mean serum total cholesterol level were lower (4.8 mmol/L) in male than (5.0 mmol/L) female but the difference was not statistically significant. On the contrary, the mean serum triglycerides level were

higher (1.6 mmol/L) in male than (1.5 mmol/L) female and the difference was insignificant. Serum LDL-C level were higher in female than the male and the difference was statistically significant ( $p < 0.05$ ). Serum HDL-C levels were closely similar in both sexes without statistical difference.

Table VI depicts the lipid profile status with education level of the study population and were categorized into three groups as illiterate, school level, and college level & above. It was observed that college and above level group respondents had highest level of serum total cholesterol (mean  $5.3 \pm 0.8$  mmol/L). The differences of serum total cholesterol level (Mean  $\pm$  SD) in different education level groups were found statistically significant ( $p < 0.01$ ). Serum LDL-C was found highest in college and above level group (mean  $3.4 \pm 0.7$  mmol/L) in comparison to other groups and the results

were statistically significant ( $p < 0.05$ ). Illiterate group respondents had lowest level of serum triglycerides (mean  $1.21 \pm 0.38$  mmol/L) compared to other groups and the serum TG levels in different groups showed significant difference ( $p < 0.01$ ). The HDL-C levels in different groups were found closely similar without statistically significant difference.

Table VII reveals that respondents of rich class had highest serum TC (mean  $5.2 \pm 1.0$  mmol/L) among three classes. One way ANOVA test was done and it was found that the differences of serum TC level in different classes were found statistically highly significant ( $p < 0.01$ ) and rich class had also highest serum LDL-C (mean  $3.5 \pm 0.8$  mmol/L) and the result was statistically significant in comparison to other economic classes of population.

Table II: Percentage Distribution of the Respondents by Socio-demographic Characteristics (n =112).

Variables	No. of subjects	% of subjects	X $\pm$ SD
Age (years)			
30 – 39	38	34	46.6 $\pm$ 10.5
40 – 49	34	30	
50 and above	40	36	
Sex			
Male	67	60	
Female	45	40	
Education level			
Illiterate	15	13	
School	68	61	
College and above	29	26	
Economic Class			
Poor Class	25	22	Tk. 8675 $\pm$ 1051
Middle class	66	59	
Rich class	21	19	

Table III: Distribution lipid profile status of the study population

Variable (mmol/L)	Total No	Mean $\pm$ (SD) (mmol/L)	Desirable No(%)	Borderline No (%)	High risk No (%)
TC	112	4.9 $\pm$ 0.9	67(59.8)	36(32)	9(8)
TG	112	1.6 $\pm$ 0.6	95(84.8)	17(15.2)	0 (0)
LDL-C	112	3.2 $\pm$ 0.8	67(59.8)	30(26.8)	15(13.4)
HDL-C	112	1.0 $\pm$ 0.1	0(0)	95(84.8)	17(15.2)
TC: HDL-C	112	5.0 $\pm$ 1.2	22(20)	72(64)	18(16)

Table IV: Distribution of lipid profile status of the study population by age

Variable	TC(mmol/L)	TG(mmol/l)	LDL-C(mmol/L)	HDL-C(mmol/L)
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
Age (Years)	(n=112)	(n=112)	(n=112)	(n=112)
30-39(n=38)	5.0 $\pm$ 1.0	1.6 $\pm$ 0.5	3.2 $\pm$ 0.8	1.0 $\pm$ 0.1
40 -49(n=34)	4.7 $\pm$ 0.8	1.5 $\pm$ 0.5	3.1 $\pm$ 0.7	1.0 $\pm$ 0.1
$\geq$ 50 (n=40)	5.0 $\pm$ 1.0	1.6 $\pm$ 0.7	3.2 $\pm$ 0.9	1.0 $\pm$ 0.1
	P >0.05	P >0.05	P >0.05	P >0.05

Table V: Distribution of lipid profile status of the study subjects by sex

Variable	TC(mmol/L)	TG(mmol/l)	LDL-C(mmol/L)	HDL-C(mmol/L)
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
	(n=112)	(n=112)	(n=112)	(n=112)
Male (n=67)	4.8 $\pm$ 0.8	1.6 $\pm$ 0.6	3.1 $\pm$ 0.8	1.0 $\pm$ 0.10
Female(n=45)	5.0 $\pm$ 1.0	1.5 $\pm$ 0.6	3.3 $\pm$ 0.9	1.0 $\pm$ 0.1
	P >0.05	P >0.05	P >0.05	P >0.05

Table VI. Distribution of lipid profile status of respondents by education level

Education Level	TC(mmol/L)	TG(mmol/l)	LDL-C(mmol/L)	HDL-C(mmol/L)
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
	(n=112)	(n=112)	(n=112)	(n=112)
Illiterate (n=25)	4.6 $\pm$ 0.8	1.2 $\pm$ 0.4	2.8 $\pm$ 0.5	1.1 $\pm$ 0.13
School (n=66)	4.9 $\pm$ 0.5	1.6 $\pm$ 0.7	3.2 $\pm$ 0.9	1.0 $\pm$ 0.1
College & >(n=21)	5.3 $\pm$ 0.8	1.6 $\pm$ 0.8	3.4 $\pm$ 0.7	1.0 $\pm$ 0.1
	P<0.01	P<0.01	P<0.05	P>0.05

Table VII: Distribution of lipid profile status of respondents by economic class

Economic class	TC(mmol/L)	TG(mmol/l)	LDL-C(mmol/L)	HDL-C(mmol/L)
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
	(n=112)	(n=112)	(n=112)	(n=112)
Poor	4.10 $\pm$ 0.67	1.17 $\pm$ 0.28	2.51 $\pm$ 0.59	0.98 $\pm$ 0.16
Middle	5.06 $\pm$ 0.82	1.67 $\pm$ 0.63	3.31 $\pm$ 0.83	1.00 $\pm$ 0.11
Rich	5.18 $\pm$ 0.98	1.74 $\pm$ 0.70	3.45 $\pm$ 0.81	0.97 $\pm$ 0.09
	P<0.001	P<0.001	P<0.001	P>0.05

## Discussion

This study provided some important information about the risk of coronary heart diseases, and LDL-cholesterol are established risk factors of coronary heart disease (CHD).<sup>6,7,8</sup> In developing countries like Bangladesh the incidence of coronary heart disease which is frequently related with hypercholesterolemia among adult and middle aged population dwelling at Rajshahi city, Bangladesh. Elevated serum total cholesterol, triglycerides, is not very alarming in our national experience but the morbidity and mortality due to CHD in our relatively privileged group of society demands due attention.<sup>14</sup>

An association between serum cholesterol and coronary heart disease (CHD) is well established. The rate of CHD increases linearly with the increasing concentration of plasma cholesterol.<sup>4</sup> The prevalence of high risk level (>6.2 mmol/L) of serum cholesterol (8%) of the present study finding was little higher than the previous other studies.<sup>17,18</sup> It was observed in the present study that the mean value of serum cholesterol, serum HDL-cholesterol and serum LDL-cholesterol was lower than the study findings observed abroad<sup>5,6,8</sup> but the results were consistent with other workers in Bangladesh.<sup>18,19,20</sup> It was also found in the present study that more respondents had high risk level of serum LDL-cholesterol and serum HDL-cholesterol than the study findings observed previously.<sup>17,18</sup> The mean values of total cholesterol of the present study were lower than the value observed among specific group of population at Dhaka city.<sup>18</sup> In our study the population selected were from different socioeconomic and professional groups but their food habits were not dissimilar. It also accords with the other study findings in Bangladesh<sup>20</sup> where low serum HDL-C and high serum LDL-C observed as compared to studies conducted in other countries.<sup>21,22</sup>

However, the higher serum LDL-cholesterol and lower concentration of serum HDL-C of the respondents may be due to physical inactivity, hereditary and dietary habit<sup>12</sup>. The concentration of serum TG level was consistent with other worker.<sup>20,21,23</sup>

It is well known that there is increasing tendency of serum cholesterol with increasing age<sup>24</sup> but in our study no such tendency serum cholesterol was observed. On the contrary, increasing levels of serum TC, serum TG and serum LDL-C with the increased of age observed among apparently healthy armed forces personnel of Dhaka cantonment in Bangladesh.<sup>18</sup> The reason for not obtaining a positive correlation between age and serum cholesterol may be explained by the fact that there was no selection bias in the study population in respect of particular socioeconomic group. This finding is in agreement with other study.<sup>17</sup> The lower level of total cholesterol in comparison to the developed countries may be due to the fact that low cholesterol intake in the study population. On the other hand, the higher triglycerides values may be due to more intake of carbohydrates diet in our population and similar value were observed by other researcher also.<sup>20,21</sup> Serum total cholesterol LDL – cholesterol and serum HDL-cholesterol levels in all age groups were found closely similar.

It was observed that the concentration of serum total cholesterol is lower in women aged 20 to 45 years than men of the same age group but the HDL-cholesterol is higher.<sup>25</sup> The secretion of ovarian hormones during the reproductive life of women aids in the relative prevention against the rise in cholesterol level. That is why men are more prone to CHD than women of reproductive age. On the other hand, serum cholesterol level after menopause increase abruptly and after 60 years there is little or no difference of serum

cholesterol level found between the sexes. Concomitantly greatly increased incidence of CHD is found in women after menopause.<sup>7</sup> In the present study the mean level of serum cholesterol of male subjects were  $4.8 \pm 0.8$  mmol/L and that of female were  $5.0 \pm 0.8$  mmol/L without significant difference between them. The mean Triglycerides concentration of the male was higher in comparison to female but the result was not statistically significant ( $p > 0.05$ ). The mean LDL-cholesterol of the male was lower in comparison to female but statistically non-significant. The mean HDL cholesterol of the male was closely similar to that of female. From the study it was found that overall results in both male and female group were closely similar which contradict with values observed in other countries<sup>5,23</sup> may be due to selection of study population where female group included both pre-menopausal and post-menopausal ages.

Education is a key determinant of the life style and status an individual enjoy in a society. Despite the improvement in the spread of education, levels of education attainment still remains low in Bangladesh.<sup>26</sup> In this study it was found that the levels of serum TC, serum TG and serum LDL-C were high among educated groups. The results indicate that awareness of the risk of coronary heart diseases among educated people is poor may be due to reflection of their sedentary job.<sup>14,12,27</sup>

It was evident from the study that the levels of serum lipids (TC, TG & LDL- C) was increased with the high income class and the results were consistent with the findings observed in several studies.<sup>17,18,22</sup> In our study only 19% study subject were found rich class but the results showed that the risk coronary heart diseases is high among both middle and rich classes of the study population may be due to intake of more saturated fat in their diet. So, the present

study findings suggest that adult and middle aged subject of affluent class in our country are also reported to be more prone to develop CHD.

Despite the relatively small number of subjects investigated in the present study, it is nevertheless noteworthy that the prevalence of risks of coronary heart diseases among the study population appears to be significant. Future extension of this type of study should take into consideration to explore additional risk factors including exercise and dietary practice of our population. The result of the present study might stimulate both educational and change of dietary habit that might be realistically considered by doctors and public health workers interested in providing the better health and longevity of the people of Bangladesh.

#### *Conclusion*

The depicted results and discussion clearly indicate that the risk of coronary heart diseases was prevailing among the urban populations of Rajshahi city. Socio-economic status was significantly associated with adverse changes in serum total cholesterol, serum triglyceride and serum low density lipoprotein cholesterol. The respondents those of highly educated and rich class were within the risk group of CHD. Current data strongly support to take appropriate preventive measures against CHD among the study population.

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