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A Study of Dyslipidaemia between Urban and Rural Population in Southern Part of Bangladesh.

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ABSTRACT

Background: *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.*

Aim of the study: *To determine the lipid levels and examine the effect of an urban lifestyle on dyslipidemia, by comparing the lipid levels and the prevalence of dyslipidemia of rural vs urban population in southern part of Bangladesh.*

Methods: *The cross sectional study was carried out over a period of one year at the Department of Cardiology, Khulna Medical College, Khulna, Bangladesh during the period January 2021 to December 2022. A total number of 298 urban and 160 rurul and urban population were included in this study.*

Result: *A total 458 population are including in this study in where urban 298(65.07) and rural 160(34.93%). The TG and HDL-C between urban and rural men was not significantly different. Urban men had a significantly higher prevalence of dyslipidemia (TC > 240 and LDL-C >160 mg/dl) than rural men (25.9 vs 3.7 per cent for TC and 16.7 vs 3.7 percent for LDL-C, p < 0.001) while the prevalence of hypertriglyceridemia (> 200 mg/dl) and low HDL-C (< 40 mg/dl) was significantly higher in rural women (18.2 vs 7.9 percent for TG and 15.0 vs 3.8 per cent of HDL-C, p < 0.001). The results were unchanged after matching for age and sex between the urban and rural populations.*

Conclusion:*This present study demonstrated a significant difference in urban vs rural lipid levels and the prevalence of dyslipidemia. Migration to urban centers and adopting an urban lifestyle is likely related to the rising lipid level and prevalence of dyslipidemia.*

Keywords:*Rural, Urban, Prevalence, Dyslipidemia, Epidemiology*

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I.INTRODUCTION

Coronary artery disease (CAD) is becoming more prevalent in developing countries, particularly in the urban areas. While trends indicate an improvement in the rates of CAD in many industrialized countries (1-3), in developing countriesthe burden is projected to rise considerably over the next decade (4).The prevalence of chronic diseases has been increasing globally for the last few decades [5-7]. Rapid urbanization and changes in the life style due to modernization have been reported to increase the risk for developing chronic diseases [8,9]. Urban people, specially in the developing countries, have sedentary life style, no scope of physical/ organized sports, unhealthy food behaviors, and exposure to pollution that make them vulnerable to a double risk of both infection and chronic degenerative ailments [10,11]. Although, Bangladesh is still a relatively low urbanized country compared to other Asian countries, Dhaka city has emerged as a fast growing megacity in recent years ranking the 11^{th} largest city in the world [12]. Individuals living inrural areas of Bangladesh are far different from the urban populations with regard to certain characteristics such as: life style and behavioral practices. Different studies have observed significantly higher prevalence of hypercholesterolemia and LDL hypercholesterolemia inurban populations [13-16]. Studies have investigated trends in the meantotal, non-HDL, remnant and total: HDL cholesterol, triglyceridesand HDL cholesterol in an urban Indian population [17]. Increased serum lipoprotein triggers micro vascular diseases that in addition to become a burden on affected individuals, also affect their families andthe society at large in terms of economic and other hardships. Earlier

studies have reported a better lipoprotein status of apparently healthy elderly individuals living in rural Bangladesh [18]. Recent study suggested that people living in the urban Dhaka, Bangladesh have reveled higher risk of increased lipoprotein level [19]. However, there is lack of comparative information on serum lipoprotein status between urban and rural populations of Bangladesh. To determine the lipid levels and examine the effect of an urban lifestyle on dyslipidemia, by comparing the lipid levels and the prevalence of dyslipidemia of rural vs urban population in southern part of Bangladesh.

II.METHODOLOGY & MATERIALS

The cross sectional study was carried out over a period of one year at the Department of Cardiology Khulna Medical College, Khulna, Bangladesh during the period January 2021 to December 2022. A total number of 298 urban and 160 rurul and urban population 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). The subjects were excluded from the analysis because of their having a history of: 1) recent acute illness (e.g. myocardial infarction or pneumonia); 2) dyslipidemia or chronic conditions (e.g. cancer, chronic infection, collagen vascular disease, hepatic or renal impairment, diabetes); 3) medication affecting lipid metabolism (e.g. corticosteroid, statin, fibrate, cholestyramine); 4) history of migration within 5 years before study; and, 5) subjects who have worked outside their communities. All data were presented in a suitable table or graph according to their affinity. A description of each table and graph was given to understand them clearly. All statistical analysis was performed using the statistical package for social science (SPSS) program, and Windows. Continuous parameters were expressed as mean ±SD and categorical parameters as frequency and percentage. Comparisons between groups (continuous parameters) were made by Student's t-test. Categorical parameters compared by Chi-Square test. The significance of the results as determined by a 95.0% confidence interval and a value of $P<0.05$ was considered to be statistically significant.

III. RESULT

A total 458 population are including in this study in where urban 298(65.07) and rural 160(34.93%) in figure-1.Mean age of the rural and urban individuals was 57 ± 10 and 55 ± 10 years; where males and females were equally distributed as 1:1.2 and 1:1.2 ratio respectively. Urban population had significantly higher levels of TC, LDL and TG, as well as in TC: HDL and LDL: HDL ratios than the rural population; however, HDL cholesterol level was significantly higher among individuals from rural areas in Table 1. Significant higher levels of these lipoproteins were found among urban females than their rural counterparts, but among urban male, only TG and LDL: HDL were found to be at higher level (Table 2). The prevalence of dyslipidemia increased with advancing age, however for TC and LDL-C, the prevalence of borderline high/high TC and LDL-C were observed in the younger age group in both urban and rural subjects, but it was more pronounced among urban subjects while the prevalence of borderline high/ high TG was observed in only rural subjects. For the entire population, the age-adjusted prevalence of high TC (> 240 mg/dl), TG (> 200 mg/dl), LDL-C (> 160 mg/dl) and low HDL-C in table 2. After matching for sex and age, 53 and 79 pairs of men and women, respectively, were analyzed. Urban men were significantly heavier than rural men while there was no significant difference between urban and rural women in Table 3. Both urban men and women had significantly higher TC and LDL-C levels than rural subjects but had similar TG levels. Urban subjects tended to have higher HDL-C level than rural subjects but a significant difference was observed only in women.

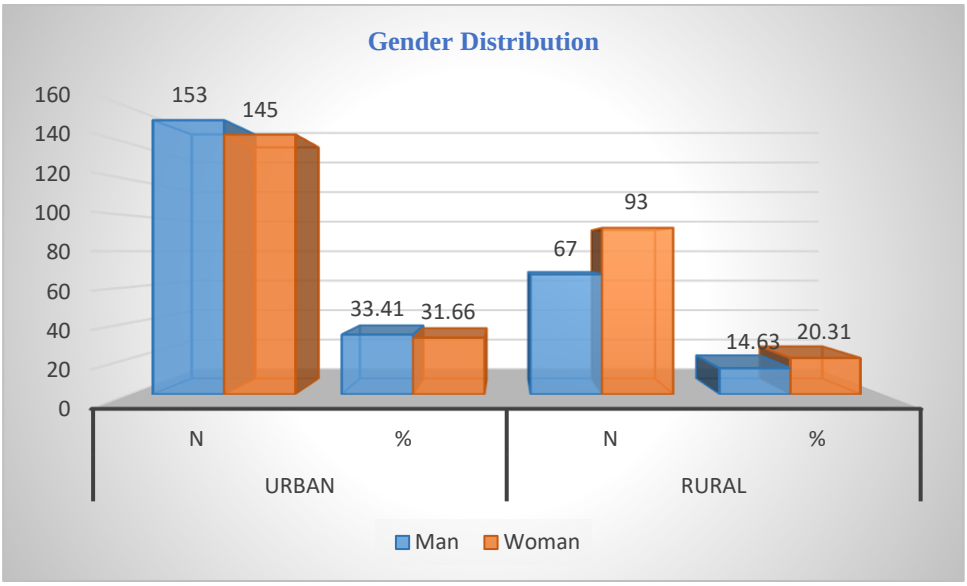

Figure -1: Gender distribution of study population (N=458)

Table 1. Characteristics of study subjects (N=458)

Indicators (mean ± SD)	Urban	Rural	Mean difference (95% CI)
Men(Urban=153, Rural=67)			
Age (Years)	45.2 + 9.9	51.1 + 18.2	-5.9 (-8.5 to -3.2)*
Body weight (kg)	66.0 + 10.6	58.4 + 9.0	7.6 (5.5 to 9.6)
Height (cm)	166.0 + 5.5	161.1 + 5.8	4.9 (3.7 to 6.0)
Body mass index (kg/m2)	23.9 + 3.6	22.5 + 3.1	1.4 (0.8 to 2.1)
TC (mmol/L)	206.7 + 42.5	169.4 + 41.9	37.3 (28.7 to 45.9)
TG (mmol/L)	171.7 + 109.7	158.8 + 85.0	12.9 (-8.0 to 33.8)
HDL (mmol/L)	52.6 + 11.1	51.0 + 11.7	1.5 (-0.8 to 3.8)
LDl (mmol/L)	120.0 + 38.6	86.6 + 34.9	33.4 (25.8 to 41.1)
Men(Urban=145, Rural=93)			
Age (Years)	45.2 + 9.9	55.7 + 17.1	-10.5 (-12.9 to -8.1)
Body weight (kg)	56.2 + 10.2	54.6 + 10.5	1.6 (-0.2 to 3.6)
Height (cm)	154.8 + 6.5	150.6 + 5.5	4.2 (3.1 to 5.4)
Body mass index (kg/m2)	23.4 + 4.6	24.0 + 4.1	-0.6 (-1.4 to 0.2)
TC (mmol/L)	204.2 + 40.2	159.0 + 106.6	11.6 (3.2 to 19.9)
TG (mmol/L)	111.4 + 78.1	159.0 + 106.6	-47.5 (-64.2 to -30.9)
HDL (mmol/L)	59.0 + 13.1	50.8 + 11.4	8.2 (5.9 to 10.5)
LDl (mmol/L)	122.2 + 36.5	110.1 + 44.6	12.1 (4.8 to 19.5)

Table 2. Prevalence of dyslipidemia using NCEP ATP III in urban and rural Population (N=458)

Characteristics	Urban		Rural		Odds Ratio (95%CI)	P-value
	N	%	N	%		
Borderline high and high cholesterol Men(Urban=153, Rural=67)						
Total cholesterol > 200 mg/dl	72	32.73	19	8.64	2.7 (1.9 to 3.9)	<0.001
Triglyceride > 150 mg/dl	51	23.18	35	15.91	1.1 (0.9 to 1.4)	0.465
LDL-cholesterol > 100 mg/dl	30	13.64	13	5.91	4.6 (2.6 to 8.1)	<0.001
Borderline high and high cholesterol Women(Urban=145, Rural=93)						

Total cholesterol > 200 mg/dl	69	28.99	34	14.29	1.3 (1.0 to 1.6)	0.015
Triglyceride > 150 mg/dl	21	8.82	31	13.03	0.5 (0.3 to 0.6)	<0.001
LDL-cholesterol > 100 mg/dl	55	23.11	28	11.76	1.3 (1.0 to 1.7)	0.031
High cholesterol Men(Urban=153, Rural=67)						
Total cholesterol > 200 mg/dl	55	25.00	9	4.09	9.0 (3.6 to 22.8)	<0.001
Triglyceride > 150 mg/dl	62	28.18	37	16.82	1.3 (0.8 to 2.1)	0.298
LDL-cholesterol > 100 mg/dl	36	16.36	21	9.55	5.2 (2.0 to 13.3)	<0.001
High cholesterol Women(Urban=145, Rural=93)						
Total cholesterol > 200 mg/dl	71	29.83	32	13.45	1.0 (0.6 to 1.6)	0.53
Triglyceride > 150 mg/dl	28	11.76	43	18.07	0.4 (0.2 to 0.7)	<0.001
LDL-cholesterol > 100 mg/dl	46	19.33	18	7.56	1.0 (0.6 to 1.7)	0.99
Low cholesterol Men(Urban=153, Rural=67)						
Low HDL-cholesterol (< 50 mg/dl)	21	9.55	27	11.34	0.7 (0.4 to 1.3)	0.368
Low cholesterol Women(Urban=145, Rural=93)						
Low HDL-cholesterol (< 50 mg/dl)	9	3.78	36	15.13	0.3 (0.1 to 0.5)	<0.001

Table 3. Characteristics of urban and rural Population after matching for sex and age

Indicators (mean ± SD)	**Urban**	**Rural**	**Mean difference (95% CI)**	**p-value**
Men(Urban=53, Rural=53)				
Body weight (kg)	63.8 + 8.8	58.7 + 9.6	5.1 (2.6 to 7.8)	<0.001
Height (cm)	5.1 (2.6 to 7.8)	161.1 + 5.7	1.5 (-0.4 to 3.3)	0.113
Body mass index (kg/m2)	24.2 + 3.2	22.6 + 3.2	1.6 (0.7 to 2.5)	0.001
TC (mmol/L)	209.5 + 44.2	168.1 + 43.8	41.4 (29.1 to 53.5)	<0.001
TG (mmol/L)	161.4 + 114.8	157.3 + 85.9	4.1 (-25.5 to 33.6)	0.785
HDL (mmol/L)	52.9 + 10.	51.6 + 11.3	1.3 (-1.6 to 4.1)	0.402
LDl (mmol/L)	125.4 + 39.1	85.0 + 36.7	40.4 (28.9 to 51.7)	<0.001
Women(Urban=79, Rural=79)				
Body weight (kg)	55.5 + 10.1	57.4 + 10.2	-1.9 (-4.8 to 0.9)	0.191
Height (cm)	151.2 + 7.4	153.0 + 4.92	-1.8 (-3.6 to -0.1)	0.041
Body mass index (kg/m2)	24.4 + 5.2	4.4 + 3.6	-0.1 (-1.3 to 1.2)	0.001
TC (mmol/L)	210.2 + 41.6	188.4 + 56.2	127.5 + 87.9	0.957
TG (mmol/L)	127.5 + 87.9	149.1 + 105.3	-21.6 (-50.2 to 7.0)	0.002
HDL (mmol/L)	57.0 + 12.6	50.3 + 11.4	6.7 (3.3 to 10.1)	<0.001
LDl (mmol/L)	127.2 + 38.3	108.3 + 46.6	18.9 (6.4 to 31.3)	0.003

IV. DISCUSSION

In this study, we noted better lipoprotein profiles of rural individuals compared to urban especially TC, TG and their ratios. Several factors might be associated with these biochemical differences between the two population groups. These populations vary by their socio-economic status, dietary habits, physical activity, and means of livelihood [20,21]. Rural populations in Bangladesh are usually dependent on agro- based economy and they are required to work in agricultural fields, whereas urban people are less exposed to perform such strenuous physical activities. Such activities are the major influencing factors that regulate the body anabolic and catabolic functions including metabolism of carbohydrate, protein and fat. LDL represents the chief pathogenic factor for atherosclerosis and physical activity influences this mechanism by reducing deposition of lipoprotein in the major arterial wall and in the micro vascular lumen [22-24]. Earlier studies reported modernization – related reduced physical activities of urban populations to be associated with higher level of plasma cholesterol than their rural counterparts [24-28]. Another study observed significantly lower levels of lipoproteins among agriculture workers and workers actively involved in physical works compared to sedentaryworkers [25]. A study reported

strong, causal association between regular physical activity and reduced prevalence of chronic diseases such as coronary heart disease, hypertension, diabetes mellitus and osteoporosis [25]. Dietary habit is another factor recognized to be associated with lipoprotein status [29]. In Bangladesh, rural populationgenerally consume plant protein more often than animal protein dueto easy access to locally-grown, fresh, and low-cost vegetables. On the other hand, urban populations, usually with higher income, consume higher amounts of animal protein. Vegetable diets contain less saturated fat and cholesterol, and greater amounts of dietary fiber, and their consumption helps lower the level of serum cholesterol [30,31]. Animal protein is rich in both saturated and unsaturated fat than vegetable based diet; its consumption in excessive amount, contributes to higher serum lipoprotein. These might explain our findings as living in urban areas had significant higher level of serum TC, LDL, TG, TC:HDL and LDL:HDL cholesterol ratio, and lower HDL-cholesterol. Other than dietary habit, environmental pollution especially air pollution with heavy traffic are major issues as well to be the reason for higher level of lipid profiles in the urban area population [32,33]. We noted urban women to have significantly higher level of total cholesterol, LDL cholesterol, and triglyceride than their rural counterparts, but no such difference was observed between the males living in urban and rural area. We do not have ready explanations for such findings. Although, men in industrialized society have higher rates of coronary heartdisease than women [34], body fat distribution could be an important determinant of male/female differences in different lipoprotein levels [35]. Moreover, more often use of contraceptives by urban women than rural might corroborate higher prevalence of hyperlipidemia among urban women than rural as observed in the present study [36,37], although, for such explanation the present study lacks related data.On the other hand, the pathophysiology of this increase with age; is not clear, there is reduction of lipoprotein lipase activity and delayed clearance of triglyceride-rich lipoproteins in elderly might play role in increasing the lipoprotein status. Prevalence of obesity is much higher in the urban women, even in Bangladesh [38,39]. Central obesity is higher as well and most of the women in Bangladesh, even in urban settings are less active, stay at home mostly, and unemployed. Elevated serum atherogenic lipoproteins and their higher ratios to different vasoprotective lipoproteins are primary risk for atherosclerotic changes with increased risk of micro vascular diseases. Higher total cholesterol, LDL-cholesterol and triglycerides, and higher ratio of LDL to HDL and lower serum HDL-cholesterol increase the risk of coronary heart disease, and are considered major risk factors besides smoking and high blood pressure [40]. Recent studies confirm that, increase in obesity, due to sedentary lifestyle [41] and intake of higher amounts of calorie results in multiple dyslipidemias [42]. Lack of physical activity,a feature of urban population, aggravates this process, and our results support that. There are likely several other factors that might influence the serum lipoprotein status among Bangladeshi urban population; however, for this preliminary study we could not perform risk-factor analysis; therefore the knowledge gap could be addressed in carefully designed studies in future. We made efforts to eliminate bias to the extent possible, by carefully selecting rural and urban populations for comparison. However, we could not extract information on health status and other socio-demographic (except age and sex), life style and behavioral factors (smoking, diet, drinking status, calorie consumption, physical activity at work and leisure etc.). Evolution of lifestyle-associated morbidities are indeed dramatic in developing countries, and the current paper showed that at least lipid profiles in urban centers in Bangladesh are predicting bad cardiovascular outcomes when compared to rural populations. Unfortunately, this study does only report lipid levels, gender and age in the two groups, but fails to make deductions or even theories on the real effects of this observation. Given the relatively low number of patients would be another limitation. However, significant association between outcome variables such as lipoprotein disorders and independent variables could not be ascertained due to lack of certain related information from laboratory based data. Individuals from the urban and peri-urban area attended the Clinical Laboratory either for regular health checkup or came to investigate their biochemical profile due to any kinds of disease condition because of referral by the clinicians. However, high quality performance of the laboratory was our strength. Despite our limitations, our observations were compatible with that of studies conducted in several geographical settings worldwide [13-16]. In our study, rural population had more favorable lipoprotein status than the urban population. Characteristics of urban population, including their dietary habit and physical activities, and factors known to be associated with dislipidemia, are different from rural population. In addition to life style factors, several environmental factors such as exposure to environmental pollution like air, and sound may aggravate these differences in results between them [32-43]. The present study describes unfavorable lipoprotein status of urban population, but this study was not designed to examine the underlying factors. Because of increasing prevalence of chronic diseases, particularly cardio-vascular and cerebro-vascular diseases, results of our study clearly indicate the need for well-designed study to understand the putative factors for recommending interventions for prevention of hyperlipidemia

Limitations of the study:

Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations of the present study are mentioned. Therefore, the results of the present study may not be representative of the whole of the country or the world at large. The number of patients included in the present

study was less in comparison to other studies. Because the trial was short, it was difficult to remark on complications and mortality.

V. CONCLUSION AND RECOMMENDATIONS

In conclusion, the present study demonstrated the urban-rural difference in lipid levels and prevalence of dyslipidemia. The effect of urbanization may be related to a rising lipid level and prevalence of dyslipidemia. Measures and screening should be implemented to encourage a healthy diet and lifestyle in order to reverse the rising lipid problem and prevent CAD in the Bangladeshi population.

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