Original Research Article

Comparative Study of Lipid Profile between Hypertensive Patient and Normotensive Individuals in Northern Region of Bangladesh

Dr. Md. Zainal Abedin[1*] 🆔, Dr. Md. Fakhrul Islam Khaled[2] 🆔, Dr. Rabindra Nath Barman[3], Dr. Probal Sutradhar[4], Dr. Md. Tufazzal Hossen[5], Prof. Dr. Md. Zakir Hossain[6]

[1]Consultant, Department of Cardiology, Lalmonirhat District Hospital, Rangpur, Bangladesh, **ORCID ID:** 0000-0003-1898-9569
[2]Associate Professor, Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, **ORCID ID:** 0000-0002-1003-6598
[3]Associate professor, Department of Cardiology, Rangpur Medical College, Rangpur, Bangladesh
[4]Junior Consultant, Department of Medicine, Haragach 31 Bedded Hospital, Rangpur, Bangladesh
[5]Assistant Professor, Department of Cardiology, Sheikh Hasina Medical College, Jamalpur, Bangladesh
[6]Principal, TMSS Medical College, Bogura and Founder, Hypertension & Research Centre, Rangpur, Bangladesh

*Corresponding Author: Dr. Md. Zainal Abedin
Consultant, Department of Cardiology, Lalmonirhat District Hospital, Rangpur, Bangladesh

Abstract

Background: Hypertension and dyslipidemia are well-established and partially overlapping risk factors for cardiovascular disease. Hypertension affects nearly 26% of the adult population worldwide and is an important independent predictor of cardiovascular disease, cerebrovascular accidents and death. The prevalence of cardiovascular diseases and Hypertension is rapidly increasing in developing countries. Hypertension has been reported to be responsible for 57% of all stroke deaths and 24% of all cardiovascular deaths in East Asians. ***Objective:*** To compare the lipid profile of hypertensive patients with normotensive individuals and socio-demographic and dyslipidemia patterns in hypertensive and normotensive individuals. ***Methodology:*** A total of 167 hypertensive patients. This is a descriptive cross-sectional study. An equal number of normotensive individuals were selected at Hypertension & Research Center, Rangpur and the Department of Medicine, Rangpur medical college hospital, Rangpur, from February 2013 to November 2013. Consecutive purposive sampling method and fasting lipid profile was done. Informed written consent was taken from the patient and the normotensive individual. ***Results:*** In this study, we studied a total of 334 patients; among them, 167 were hypertensive, and an equal number of normotensive individuals. The age range for hypertensive patients was 20-89 years, whereas for normotensive patients was 20-80. The mean age of the study population was 47.58 (SD±12.027) for the hypertensive group and 40.29 (SD±15.493) for the normotensive group. Males were dominant in both hypertensive (57.5% Vs 42.5%) and normotensive individuals (66.5% Vs 33.5%). The hypertensive population lived more in urban areas (55.6% vs 53.29%). ***Conclusion:*** Sub-categorized serum lipid profile as this study shows exceptionally high total cholesterol, high triglycerides and borderline LDL-cholesterol levels are positively associated with Hypertension. Higher lipids levels may be attributed to physical inactivity and stress. So timely lipid profile assessment is necessary in all hypertensive cases, especially in northern Bangladesh, to stop further aggravation and risks of coronary artery diseases.
Keywords: LDL, HTN, DM, CKD.

INTRODUCTION

Hypertension affects nearly 26% of the adult population worldwide1 and is an important independent predictor of cardiovascular disease, cerebrovascular accidents and death [1]. The prevalence of cardiovascular diseases and Hypertension is rapidly increasing in developing countries [2]. Hypertension has been reported to be responsible for 57 per cent of all stroke deaths and 24 per cent of all cardiovascular deaths in East Asians [3]. Hypertension and dyslipidaemia are well-established and partially overlapping risk factors for cardiovascular disease [4].

In the Physicians' Health Study, total cholesterol, non-high-density lipoprotein (HDL)-cholesterol and HDL- cholesterol predicted the onset of

Hypertension in 3110 men without self-reported hypertension. These findings agree with the few prospective studies on dyslipidaemia and incident hypertension [5]. Thus, Hypertension may be a consequence of dyslipidaemia or closely related metabolic abnormalities. Hypertension is commonly associated with other cardiovascular risk factors, such as obesity and diabetes. These cardiovascular risk factors and the resulting endothelial dysfunction may play a role in the pathophysiology of Hypertension. Dyslipidaemia, a strong predictor of cardiovascular disease, causes endothelial damage, and the loss of physiological vasomotor activity that results from endothelial damage may manifest as increased blood pressure (BP). Therefore, factors like dyslipidaemia that cause endothelial dysfunction may lead to Hypertension. Cross-sectional studies have suggested a link between abnormal lipids and Hypertension. A few studies have prospectively examined the relationship between plasma lipids and the future development of Hypertension, finding an association between plasma lipids and the development of Hypertension. Small trials have looked at the effect of lipid-lowering on BP [6, 7].

OBJECTIVES
- To compare the lipid profile of hypertensive patients with normotensive individuals.

MATERIALS AND METHODS
Study Design
It is an observational type of cross-sectional study.

Study Place
Hypertension & research Centre, Rangpur and Department of Medicine, Rangpur Medical College Hospital, Rangpur.

Study Period
From Feb 2013 to November 2013.

Study Population
All patients have Hypertension and healthy volunteers who are normotensive, attend at medicine department, at Rangpur Medical College Hospital. Rangpur, and Enrolled hypertensive patients who attend at Hypertension & research center, Rangpur.

Sample Size
Total 334. According to the protocol, the sample size was 456; reasoning of short time and investigation cost sample size was curtailed to 334 in number.

Data Collection
Data was collected according to inclusion & exclusion criteria.

Inclusion Criteria
1. Age 20 years & above.
2. Both sexes.
3. Hypertensive patient.
4. Patient who will give consent to take part in the study.

Exclusion Criteria
1. Patients unwilling to take part in the study.
2. Patient's age is less than 20 years.
3. Having systemic diseases like DM, CKD, Hyperthyroidism, Hypothyroidism.
4. Alcohol ingestion.
5. Patient taking the lipid-lowering drug.

Data Collection Procedure
The study and procedure were explained to the patient and written consent was taken. After taking a detailed history, a thorough physical examination was done. And following investigations were done on every individual:
1. Fasting lipid profile after 9-14 hours of Overnight fast.

The study did not involve significant risk as well as an economic burden to the patient.

Statistical Analysis
All the data were collected with a datasheet, and recorded in the fixed protocol. Collected data was classified, edited, coded & entered into the computer for analysis. And then were analyzed with SPSS, version 26. The significance of the proportion of the two groups has been calculated by the Z test. Z value >1.96 has been taken as significant.

RESULT
Normal HDL-cholesterol was more in hypertensive (28.1% vs. 18.6%) but low HDL were more in normotensive (76% vs. 66.5%). Optimal LDL cholesterol was more in normotensive (53.9% vs. 35.9%) whereas borderline LDL, high LDL and very high LDL cholesterol were more in hypertensive (24% vs. 4.8%), (4.8% vs. 3%) and (3% vs. 1.8%) respectively. High TG was more common in hypertensive (26.3% vs. 16.2) and normal TG was more in normotensive (53.9% vs. 43.7%). People who were educated up to the secondary level were more sufferers of Hypertension (39.55% vs. 26%). Hypertension was more common in-service holders (32.9% vs. 22.8%), among married people (86.8% vs. 70.7%) and among those who have high income [>15001tk/month] (21% vs. 19.2%). Though smoking was more common in normotensive (20.4% vs.18.6%) Hypertension was more among the tobacco derivative users (25.7% vs. 18%). Physically inactive people were suffers more from Hypertension (64.1% vs. 54.5%). Hypertension was more in obese people (28.3% vs. 23.4%). Borderline high total cholesterol was more in hypertensive people (32.3% vs. 23.4%) and high total

cholesterol was also more in hypertensive (16.2% vs. 9.6).

Table 1: Socio-demographic characteristics of the study populations (n=334)

Variables	Hypertensive	Normotensive	P value	CI	Comments
Age (Years)					
Mean Age	47.58	40.29	<0.1	--	Not significant
(SD)	SD (±12.027)	SD (±15.493)			
Age range	20-89	20-80			
Sex					
Male	96 (57.5%)	111 (66.5%)	<0.1	--	Not significant
Female	71 (42.5%)	56 (33.5%)	<0.1	--	Not significant
Residence					
Urban	93 (55.6%)	89 (53.29%)	---	----	----
Rural	74 (44.4%)	78 (46.71%)	---	---	----
Education					
No education	16 (9.6%)	37 (22.2%)	<0.002	>99.7%	Significant
Upto 5 years	34 (20.4%)	31 (18.6%)	---	---	----
6 to 12 years	66 (39.5%)	44 (26.3%)	<0.01	>99%	Significant
>12 years	16 (9.6%)	25 (14.9%)	<0.2	---	---
Graduate	26 (15.6%)	23(13.8%)	----	---	---
Post graduate	09 (5.4%)	07 (4.2%)	<0.4	---	---
Occupation					
Farmer	16 (9.6%)	29(17.4%)	<0.05	>95%	Significant
Service	55 (32.9%)	38 (22.8%)	<0.05	>95%	Significant
Businessman	27 (16.2%)	26 (15.6%)	----	---	----
Others	69 (41.3%)	73 (43.7%)	----	----	-----
Marital Status					
Unmarried	04 (2.4%)	30(18%)	<0.002	>99.7%	Significant
Married	145 (86.8%)	118 (70.7%)	<0.001	>99.9%	Significant
Widow	13(7.8%)	09(5.4%)	<0.4	---	---
Widower	01 (0.6%)	03(1.8%)	<0.4	---	---
Divorced	03(1.8%)	07(4.2%)	--	---	----
Separated	01 (0.6%)	00 (00%)	---	----	--
Monthly Family Income					
<5000 tk	77 (46.1%)	85 (50.9%)	---	---	---
5001-10000 tk	26(15.6%)	21 (12.6%)	----	----	----
10001-15000 tk	29 (17.4%)	29 (17.4%)	----	----	----
>15001tk	35 (21.0%)	32 (19.2%)	-----	----	----

In this study, we have studied a total of 334 patients and among them, 167 were hypertensive and an equal number of normotensive individuals. Measurement of blood pressure and fasting lipid profile was done in both groups. The result of the study is bellowed as shown in Table 1. The age group of the hypertensive patient was 20-89 years whereas for normotensive was 20-80. The mean age of the study population was 47.58 (SD±12.027) for the hypertensive group and 40.29 (SD±15.493) for the normotensive group. Males were found to be preponderance in both hypertensive (57.5% Vs 42.5%) and normotensive individuals (66.5% Vs 33.5%) In this study, the studied population were more from an urban area and among them, hypertensive were found preponderance (55.6% Vs 53.29%). People who are not conventionally educated were less suffered from Hypertension (9.6% Vs22.2%); P < 0.002, but those who had secondary level (6 to 12 years) education suffered more from Hypertension (39.5% Vs 26.3%); P < 0.01. Hypertension is also less in the farmer group (9.6% Vs 17.4%); P <0.05, whereas Hypertension is more in the service holder group (32.9% Vs 22.8%); P <0.05. married people were more suffered from Hypertension (86.8% Vs 70.7%); P <0.001.

Table 2: Risk factor association of the study populations (n=334)

Variables	Hypertensive	Normotensive	P value	CI	Comments
Smokers	31 (18.6%)	34(20.4%)	---	---	---
Other Addiction					
Tobacco derivatives	43 (25.7%)	30 (18%)	<0.1	---	Significant
Alcohol	02 (1.2%)	01(0.6%)	---	---	---
Physical activity					
Yes	60 (35.9%)	76 (45.5%)	<0.1	----	Significant
No	107 (64.1%)	91(54.5%)			
BMI					
18.5-22.9 (Normal)	60 (35.9%)	92 (55.1%)	<0.001	>99.9%	---
23-24.9 (Overweight)	34 (20.4%)	29 (17.4%)	---	---	Significant
>25 (Obese)	64 (38.3%)	39 (23.4%)	<0.005	>99.5%	---
<18.5 (Underweight)	09 (5.4%)	07 (4.2%)	--	---	Significant

Table 2 shows that who's BMI was normal (18.5-22.9) they were less suffered from Hypertension (35.9% Vs 55.1%); P<0.001, whereas obese people (BMI>25) were more suffered from Hypertension (38.3% Vs 23.4%); P<0.005. There was no significant difference between a hypertensive and normotensive group in the aspect of smoking, other addiction and physical activity.

Table 3: Total Cholesterol profile of the study populations (n=334)

Variables	Hypertensive	Normotensive	P value	CI	Comments
Total Cholesterol					
<200mg/dl (Desirable)	86 (51.5%)	112 (67.1%)	<0.002	>99.7%	Highly significant
200-239mg/dl (Borderline high)	54 (32.3%)	39 (23.4%)	<0.1	<95%	Not significant
>240mg/dl (High)	27 (16.2%)	16 (9.6%)	<0.03	<95%	Significant
Total	167(100%)	167 (100%)			

Table 3 shows that the total cholesterol in the desirable range (<200mg/dl) was much less in the hypertension group (51.1% Vs 67.1%); P<0.002, CI>99.7% and is statistically significant.
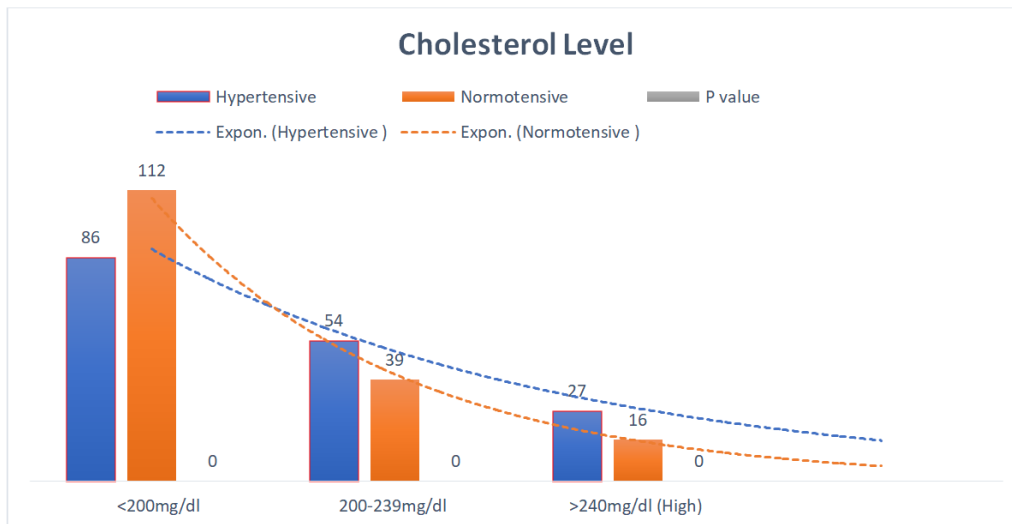

Fig. 1: The high total cholesterol (>240 mg/dl) was higher among hypertensive patients (16.2% Vs 9.6%) which was statistically significant; P<0.03%. There were no significant differences between hypertensive and normotensive groups in the aspect of borderline high total cholesterol (220-239mg/dl) 32.3% Vs 23.4%.

Table 4: HDL-Cholesterol profile of the study populations (n=334)

Variables	Hypertensive	Normotensive	P value	CI	Comments
HDL-cholesterol					
<40 mg/dl (Low)	111 (66.5%)	127 (76%)	<0.1	--	--
>60 mg/dl (High)	09 (5.4%)	09 (5.4%)	--	--	--
40-60mg/dl (Normal)	47 (28.1%)	31 (18.6%)	<0.05	>95%	Significant
Total	167 (100%)	167 (100%)			

Table 4 shows that HDL-cholesterol in the normal range (40-60mg/dl) were more hypertensive (28.1% Vs 18.6%); P<0.05, CL>95% and statistically significant. There was no significant difference between a hypertensive normotensive group in low HDL-C (<40mg/dl) and high HDL-C (>60mg/dl).

Table 5: LDL-Cholesterol profile of the study populations (n=334)

Variables	Hypertensive	Normotensive	P value	CI	Comments
LDL-cholesterol					
<100mg/dl (Optimal)	60 (35.9%)	90 (53.9%)	<0.001	>99.9%	Highly significant
100-129mg/dl (Above normal)	54 (32.3%)	61 (36.5%)	--	--	--
130-159mg/dl (Borderline)	40 (24%)	08 (4.8%)	<0.0001	>99.99%	Highly significant
160-189mg/dl (High)	08 (4.8%)	05 (3%)	<0.4	--	Not significant
>190mg/dl (Very high)	05 (3%)	03 (1.8%)	<0.5	--	Not significant
Total	167 (100%)	167 (100%)			

Table 5 shows that the LDL-cholesterol was in the optimal range (<100mg/dl) and significantly lower in a hypertensive group (35.9 vs. 53.9%); P<0.001, CI>99.9% and is statistically significant. On the other hand, LDL-C in the borderline (130-159 mg/d) was high in a hypertensive group (24% vs. 4.8%); P<0.0001, CI>99.99% and is statistically highly significant. There was no significant difference between a hypertensive and normotensive group in LDL-C of the above normal range (100-129 mg/dl), high range (160-189 mg/dl) and very high range (>190 mg/dl).

Table 6: Triglyceride profile of the study populations (n=334)

Variables	Hypertensive	Normotensive	P value	CI	Comments
Triglyceride					
<150mg/dl (Normal)	73 (43.7%)	90 (53.9%)	<0.1	---	Not significant
150-199mg/dl (Borderline high)	48 (28.7%)	48 (28.7%)	---	---	---
200-499mg/dl (High)	44 (26.3%)	27 (16.2%)	<0.05	>95%	Significant
>500mg/dl (Very high)	02 (1.2%)	02 (1.2%)	---	---	---
Total	167 (100%)	167 (100%)			

Table 6 shows that the TG in the high range (200-499 mg/dl) was high in a hypertensive group (26.3% Vs 16.2%); P<0.05, CI>95% and is statistically significant. There were no significant differences between hypertensive and normotensive group TG of the normal range (<150 mg/dl), borderline high range (150-199 mg/dl) and very high (>500 mg/dl).

DISCUSSION

Hypertension is recognized globally as a major public health problem [8]. It is known as the well-known risk factor for coronary heart disease, type 2 diabetes mellitus and renal diseases [9]. About 80% of hypertensive persons have co-morbidities such as obesity, glucose intolerance, hyperinsulinemia, low HDL-Cholesterol, high LDL-Cholesterol and increased triglycerides etc. Two or more co-morbidities are found in about more than 50% of hypertensive patients. Previous almost all studies were focused on the pattern of dyslipidaemia in Hypertension or the correlation of lipid profile in a gross with Hypertension or association of lipid profile with Hypertension and comparative study of lipid profile in hypertensive and control.

In this study, a total 334 number of patients were included and among them, 167 were hypertensive and an equal number of normotensive individuals. The age range of hypertensive patients was 20-89 years whereas for normotensive was 20-80. The mean age of the study population was 47.58 (SD±12.027) for the hypertensive group and 40.29 (SD±15.493) for the normotensive group. Males were found preponderance in both hypertensive (57.5% Vs 42.5%) and normotensive individuals (66.5% Vs 33.5%). The above findings were similar to that of the study result of Saha, M., Sana, N., & Shaha, R. K. *et al.,* [10]. The hypertensive population was more live in urban areas (55.6% vs. 53.29%). People who were educated up to the secondary level were more sufferers of Hypertension (39.55% vs. 26%). Hypertension was more common in service holders (32.9% vs. 22.8%), among married people (86.8% vs. 70.7%) and among those who have high income [>15001tk/month] (21% vs. 19.2%). Though smoking was more common in normotensive (20.4% vs.18.6%) Hypertension was more among the tobacco derivative users (25.7% vs. 18%). Physically inactive people suffered more from Hypertension (64.1% vs. 54.5%). Hypertension was more in obese people (28.3% vs. 23.4%). These findings are similar to the Ibekwe R U [11]. Borderline high total cholesterol was more in hypertensive people (32.3% vs. 23.4%) and high total cholesterol was also more in hypertensive (16.2% vs. 9.6). Normal HDL-cholesterol was more in hypertensive (28.1% vs. 18.6%) but low HDL were more in normotensive (76% vs. 66.5%). Optimal LDL cholesterol was more in normotensive (53.9% vs. 35.9%) whereas borderline LDL, high LDL and very high LDL cholesterol were

more in hypertensive (24% vs. 4.8%), (4.8% vs. 3%) and (3% vs. 1.8%) respectively. High TG was more common in hypertensive (26.3% vs. 16.2) and normal TG was more in normotensive (53.9% vs. 43.7%).

As the present study was focused on the study pattern of lipid profile in a specific range according to ATP III guidelines of hypertensive patients compared to normotensive individuals and the results revealed that the serum high total cholesterol was statistically significantly($P<0.03$) higher in hypertensive cases than those of normotensive individual. The serum borderline LDL-cholesterol was statistically significantly ($P<0.0001$) higher in hypertensive cases than those of normotensive. High TG levels also were statistically significantly ($P<0.05$) higher in hypertensive cases than those of the normotensive. In this study normal HDL-C level was high among hypertensive than a normotensive individual which contradicted other results. It would be explainable as a part of awareness hypertensive people may take part in regular physical exercise, healthy meal plans or give up smoking.

Researchers from Bangladesh conducted a prospective study which is based in the northern region of Bangladesh, to investigate the lipid profile status in hypertensive patients as compared to healthy normotensive controls. Their study revealed similar findings of elevated serum total cholesterol, triglycerides and LDL-cholesterol as observed in this study [10]. This study's findings of indirectly increased levels of total cholesterol in hypertensive subjects are similar to the findings of some other studies [12]. Another study which was carried out in Bangladesh to appraise the lipid profile in hypertensive patients also observed similar findings as observed in our study [13]. A study conducted on hypertensive persons in Nigeria found a significantly higher lipid profile except HDL-cholesterol and the findings were similar to the observations of our study [14]. Another study conducted in India on plasma lipoprotein (a) and lipid profile levels of hypertensive persons showed significantly higher levels of Lp(a), total cholesterol, Triglycerides, and LDL – cholesterol as compared to healthy controls. Low HDL- Cholesterol level was found among hypertensive patients than controls which is similar to the findings of our study [15, 16]. A study done in Andhra Pradesh on hypertensive persons has shown that the values of TC, TGL, LDL-C and VLDL-C were higher in hypertensive persons than in healthy controls. Their study also showed that HDL-C was higher among healthy controls than hypertensive cases but the difference was not found statistically significant [17].

Based on the results obtained from the present study, we conclude that sub-categorized serum lipid profile as this study shows especially total cholesterol; triglycerides and LDL-cholesterol levels are positively associated with Hypertension. Higher levels of these lipids may be contributed due to physical inactivity, stress, increased age, smoking, and high consumption of dietary fat etc. So timely assessment of lipid profile is a must in all hypertensive cases especially in the northern region of Bangladesh to stop further aggravation and risks of coronary artery diseases.

CONCLUSION
Dyslipidemia especially with Serum High Total Cholesterol, High Triglyceride and Borderline LDL-Cholesterol levels positively correlated with hypertensive patients whereas HDL-cholesterol has no significant changes with Hypertension.

RECOMMENDATION
- As dyslipidemia is an important risk factor for Hypertension, lipid profile should be investigated thoroughly in hypertensive patients in medical practice.
- To prevent or minimize target organ damage in hypertensive patients with concomitant dyslipidemia should be identified early and treated with the appropriate lipid-lowering drug.
- As Hypertension and dyslipidemia are more common in patients having increased BMI, weight reduction should be encouraged in hypertensive as well as in normotensive patients.

Limitations of the Study
- The study is conducted in two centres only for a limited time.
- Small and inadequate centre-based sample size.
- Known all risk factors are not considered.

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