ORIGINAL ARTICLE

Evaluation of Dyslipidemia among Hypertensive patients in Khyber Teaching Hospital, Pakistan

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ABSTRACT

Background: Dyslipidemia and hypertension are the major risk factors for cardiovascular disease. Both dyslipidemia and hypertension coexist in a single individual can double the risk of complication and a life threatening condition. No specific pattern of dyslipidemia reported among hypertensive patient. Therefore, this study was conducted to assess the correlation of dyslipidemia among hypertensive patients.
Materials and Methods: A cross-sectional study was carried out in duration of six months in Peshawar. A total of 200 newly diagnosed patients or already taking antihypertensive medications were included. Blood samples were collected from all patients after taking verbally informed consent. Lipid profile was evaluated in blood sample and the collected data was analyzed through SPSS-21.
Results: Among total 200 hypertensive patients, 59.5% (n=119) were male patients and 40.5% (n=81) female patients. Blood pressure (BP) were examined among all patients and the mean BP was 156/87. Hypertriglyceremia (TG>200mg/dl) was found in 32% (n=64/200) individuals, hypercholesterolemia (TC>200mg/dl) in 27% (n=54/200), and LDL (>100mg/dl) in 61.5% (n=123/200) hypertensive patients. High density lipid was found lower in 36.5% (n=73/200) hypertensive patients.
Conclusion: The findings of this study shows that patients with hypertension are likely exhibit dyslipidemia including elevated triglycerides, total cholesterol and LDL level and have reduced HDL level. This study will help to make future plans for preventing both dyslipidemia and hypertension by both proper lifestyle changes and medical management.
Keywords: Dylipidemia, Hypertension, TG, TC, Lipid profile, HDL, LDL

INTRODUCTION

Hypertension (a silent killer) is one among the biggest public health and economic issue worldwide[1, 2]. This chronic non-communicable disease leads to cardiac disease and brain stroke. Both cardiac and stroke are the leading cause of high morbidity[3] and mortality throughout the world[4]. Mostly the cause of hypertension is unknown and have no sign and symptoms in initial stages. Hypertension can damage several vital organs including kidney, eyes, heart, and brain[5]. Primary hypertension (90-95%) cause due to genetic (hormones and blood plasma volume) and environmental factors (stress and lack of proper exercise)[1] while secondary hypertension contributes approximately 2-10% and develop due to vascular, renal and endocrine causes[6].

Hypertension is significantly associated with dyslipidemia. It is reported that hyperlipidemia considerably worsen the prognosis in hypertensive individuals[7]. Lipid abnormalities may leads toward to accelerate the atherosclerosis [8]. A study finding shows that dyslipidemia is more frequently observed in hypertensive patients[9, 10]. Hypertension is the leading cause of cardiovascular disorder (CVD) and increase the morbidity and mortality in both developing and developed countries[11]. Dyslipidemia along with hypertension is independent risk factor for CVD[12]. Age and gender are also other factor that affect lipid level[13].

Hypertension has effected about 26% of the world population. Approximately, 972 million people throughout the world have hypertension and is expected to be increase to 29% by 2025 developing countries are most likely to be effected[14]. The prevalence varies around the world with the highest prevalence in Poland 68.9% and 72.5% in men and women respectively while the lowest prevalence in India 3.4% in men and 6.8% in women[15].

The national health survey of Pakistan estimated that hypertension mostly effect the adult (18%) and adults with more then 45 years with 33%. Only 12.5% of hypertension cases is adequately control in Pakistan because 50% of hypertension cases are diagnose and half of it were ever treated[16].

The dyslipidemia is more common in hypertensive patients than normotensive patients and as blood pressure increases lipid level of serum also increases[9, 10]. The dyslipidemia according to most studies is non-specific some studies shows that total cholesterols, triglycerides, and other fraction of lipoproteins tend to be individually abnormal[17, 18].

Abnormalities in serum lipids are also consider as modifiable risk factor for cardiovascular diseases[19]. The clustering of both hypertension and dyslipidemia has clearly seen to be synergic in their action and there combine action is multiplicative rather than additive that can lead to the development of cardio vascular diseases[8]. It is also estimated that each 20/10 mmHg rise in blood pressure in individual age 40 to 90 double the risk of fatal coronary heart events[20, 21].

A positive association among hypertension and dyslipidemia is existed but the result is inconsistent in population subgroups[22]. There is no specific pattern of dyslipidemia that is constantly reported in hypertensive patients and various studies have shown that total cholesterols, triglycerides and all fraction of lipoproteins can be abnormal in hypertensive patients however in a country socioeconomic status, diet, age and sex can significantly effects lipids level of serum[17, 18]. Few studies reported from our region regarding the correlation of hypertension and dyslipidemia. The current study was conducted to identify he pattern of dyslipidemia among various age groups, as well as the age distribution of hypertension.

MATERIALS AND METHODS

This descriptive cross sectional study was carried out in six month duration from July to December 2017 in Khyber Teaching Hospital, Peshawar. Two hundred hypertensive patients were recruited through non-probability consecutive sampling technique. All volunteer newly diagnosed hypertensive patients or were taking antihypertensive medications of age 30 or more than 30 years were included. While patients under 30 years, patients have other illness such as chronic obstructive pulmonary disease, diabetes mellitus, rheumatoid arthritis and renal diseases were excluded. Moreover, cigarette smoking patients, and who were taking any lipids lowering drugs were excluded from the study.

The study was conducted in the pathology Department of Khyber Teaching Hospital Peshawar. Hypertensive patients were selected and diagnosed based on their history, physical examination, and according to the JNC 7 Criteria (Joint National

Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure). Blood pressure (B.P) were measured through mercury sphygmomanometer by a well train Allied Health professional after the patient relax for 5 minutes. Two measures of B.P were taken and the average of which was taken a patient were diagnosed for hypertension when they had a systolic B.P of more than 140mmHg and diastolic B.P of more than 90mmHg or the patient were on antihypertensive medication. Three ml of blood was collected in a gel tube after overnight fasting of 9 hours from the patient for the assessment of lipid profile. Demographic characteristics (name, age, sex), were asked from the patients. verbal Informed consent was obtained from all subjects.

After collection of blood in a Gel tube the samples were kept in water bath for 3 to 5 minutes to clot, after clotting the sample were centrifuged at 300 RPM to extract serum. The sample were then run on chemistry Analyzer and note the result. The value of total cholesterols and triglycerides were obtain from the analyzer.
The High Density lipoprotein -cholesterol (HDL-C) was determined by precipitation method while a Friedewald formula was used to calculate LDL-cholesterol (LDL-C).
The friedewald formula used for LDL-C is:
HDL=Total cholesterols-HDL-Tg/5
The results were then compared with the normal ranges of serum lipids and lipoprotiens which is the following.
Total cholesterol less than 200 mg/dl of serum
Triglyceride less than 200 mg/dl of serum
High density lipoproteins more than 35 mg/dl of serum
Low density lipoprotein less than 100mg/dl of serum

The individuals having serum lipids higher than the above valus for TC, TGs and LDL were considered to have dyslipidemia while HDL level less than the above were also considered to have dyslipidemia in the study.

Initial collected data were entered in Microsoft Excel 2016 and then analyzed through statistical package for social science version 21. The descriptive data were shown in tables.

RESULTS
Among 200 hypertensive patients, 59.5% (n=119) were males and 40.5% (n=81) were females (Table 1). The mean blood pressure of participants was 156/87.

Table 1: Gender wise distribution of the study participants.

Gender	Total No.	Percentage
Male	119	59%
Female	81	41%
Total	200	100

The overall pattern of dyslipidemia was 32% (n=64/200) individuals, in which hypertriglyceremia were noted greater than 200mg/dl. Hypercholesterolemia was observed in 27% (n=54/200) hypertensive patients. Good lipid (high density lipoprotein) was also determined among hypertensive patients in present findings, which shows that majority patients have HDL level lower than normal. HDL was lower in 36.5% (n=73/200) participants. The LDL level were found more in hypertensive with 61.5% (n=123/200) patients (Table 2).

Table 2: Overall prevalence and pattern of dyslipidemia.

Pattern of dyslipidemia	Total No. of individuals	Overall Percentage
Hypertriglyceremia (TG>200mg/dl)	TG >200 (n =64)	32%
Hypercholesterolemia (TC>200mg/dl)	TC >200 (n=54)	27%
HDL (<35 mg/dl)	HDL <35 (n=73)	36.5%
LDL (>100mg/dl)	LDL >100 (n=123)	61.5%

The study group contain individuals of different ages among which 30.5% individuals was between age 30 to 40 years. The total number of this age group was 61 including 39 males and 22 females. The mean blood pressure recorded for this age group was 147/84.3mmHg. The number of patients with age of 41 to 50 year in the study was 25% including 58% males and 42% females. The mean B.P of this age group was 153/84.5. The proportion of individuals between age 51 to 60 was 27% containing 50% males and 50% females. The average blood pressure of 51 to 60 year age group was 155/90mmHg.

The number of patients with age between 61 to 70 years was 23 patients that is 11.5% of the total study participants among which 65.2% were males and 34.8% were females. The mean B.P recorded for this years of age was 159/89.5mmHg. The number of participants of age more than 70 years was 12 that was 6% of the study group. Among these 12 cases 8 (66.7%) were males and 4 (33.3%) were males the mean B.P noticed in this age group was 166/90.25mmHg. The study showed a linear relationship of age and B.P the lowest mean B.P were observed in the age group of 30 to 40 years while the highest mean B.P were recorded in the age group of more than 70 years. The systolic pressure become consistently increase with age and show a direct relationship with age while the diastolic pressure showed this relationship differently that is up to 50 year the mean diastolic B.P show an increase in mean diastolic pressure with increase in age while from 50 years onward this pressure were not consistent it was either same or less as the age were advancing.contain the age adjustment B.P of the participants (Table 3).

Table 3: Age adjusted mean blood pressure of the study participants.

Age (Years)	Male % (n)	Female % (n)	Total No. % (n)	Mean BP/mmHg
30 to 40	64.0 (39)	36.0 (22)	30.5 (61)	147/84.3
41 to 50	58.0 (29)	42.0 (21)	25.0 (50)	153/84.5
51 to 60	50.0 (27)	50.0 (27)	27.0 (54)	155/90
61 to 70	65.2 (15)	34.8 (08)	11.5 (23)	159/89.5
More than 70	75.0 (09)	25.0 (03)	6.0 (12)	166/90.25
Total	59.0 (119)	41.0 (81)	100 (200)	156.4/87.7

Table 4: Age adjusted pattern of dyslipidemia of study group.

Age in year	Total no.	Serum lipid level in mg/dl	Percentage
30 to 40	61	TG >200 (n=22/61)	36.1%
		TC >200 (n=18/61)	29.5%
		HDL <35 (n=15/61)	24.6%
		LDL >100 (n=29/61)	47.5%
41 to 50	50	TG >200 (n=26/50)	52%
		TC >200 (n=21/50)	42%
		HDL <35 (n=12/50)	24%
		LDL >100 (n=29/50)	58%
51 to 60	54	TG >200 (n=11/54)	20.4%
		TC >200 (n=10/54)	18.5%
		HDL <35 (n=15/54)	27.8%
		LDL >100 (n=24/54)	44.4%
61 to 70	23	TG >200 (n=4/23)	17.4%
		TC >200 (n=3/23)	13.0%
		HDL <35 (n=5/23)	21.7%
		LDL >100 (n=8/23)	34.8%
More than 70	12	TG >200 (n=1/12)	8.3%
		TC >200 (n=2/12)	16.7%
		HDL <35 (n=3/12)	25%
		LDL >100 (n=4/12)	33.3%
Total	200	TG >200 (n=64/200)	32%
		TC >200 (n=54/200)	27%
		HDL <35 (n=73/200)	36.5%
		LDL >100 (n=123/200)	61.5%

A total of 61 participants were found between ages 30 to 40 years. The more prevalent form of dyslipidemia in this age group was the higher level of low density lipoprotein in their blood that is 47.54%, followed by hypertriglyceremia in this age group was 36.1%, hypercholesterolemia was in 29.5% patients and lowest was found high density lipoproteins in 24.59% participants blood. Among total 50 individuals with age between 41 to 50 years, 58% (n=29/50) of the total were having more serum LDL than normal, 26 (52%) individuals were having hypertriglyceremia, 21 (42%) individuals have higher blood cholesterols level and 12 (24%) individuals have low serum high density lipoproteins. The most abundant lipid

abnormality seen in the individuals with the age of 51 to 60 years. Most prevalent proportion were found of high serum LDL level among 24 individuals out of 54 that are 44.45% were having high blood LDL level as compared to normal. Followed by low HDL level that is 27.77%. Individuals who have more TG was 11 out of 54 (20.4%) and with high Total cholesterols was 18.5%. Participants with the age between 61 to 70 years were 23 individuals among which 8 (34.78%) individuals showed high level of LDL than normal. Whereas, 5 (21.73%) individuals had low HDL than normal and 4 (17.39%) individuals showed high blood triglycerides while 3 (13.04%) were found to have hypercholesterolemia. The total number of participants between the age group of more than 70 was 12 containing 8 males and 4 females among which 4 (33.3%) individuals have more LDL level than normal. While 3 (25%) individuals have low blood HDL. In this age group, 2 (16.7%) individuals have higher TC than normal while 1 (8.3%) showed higher level of TGs in the blood. This study show that lipid derangement of blood are found mostly in the age of 41 to 50 years while the higher age group showed minimum derangement of blood lipids level. The most common lipid abnormality seen in this study was high serum LDL level (Table 4).

DISCUSSION

The current study showed that among the single pattern dyslipidemia, the most common abnormality was high level of LDL in serum that is 61.5% of the total dyslipidemia. The second more prevalent pattern of dyslipidemia was hypertriglyceremia 32.5%, followed by hypercholesterolemia (27.0%) and low HDL level abnormality was of less prevalent type of dyslipidemia (27.0%). Our study corresponds to the finding of Akentude[23], Lepiraet al[24], and cecstelot et al[25], who also shows that newly diagnosed hypertensive patient tend to have more low density lipoprotein. The most common dyslipidemia followed by hypertryglyceremia, hypercholesterolemia and lower HDL level. Low density lipoproteins is consider an independent risk factor for hypertension that's why there level were noticed high in our study. While, our study disagree with the study conducted in south east Nigeria by Charles et al[26]. They showed in their study that the most prevalent type of dyslipidemia in newly diagnosed hypertensive patients was hypercholesterolemia that is 35.6% followed by high LDL level (28.4%), lower serum HDL level (21.6%) and hypertriglyceremia was the least prevalent type that is (6.4%) of the total.

Our study also showed that with increase of dyslipidemia, the B.P of the individual also becomes increase. Our study also show that with increase in age there is progressive rise of blood pressure that is the participants age between 30 to 40 years have the mean B.P of 147/84.25mmHg while the individuals with age between 41 to 50 have mean B.P of 153/84.5mmHg. The study participant of age 51 to 60 had the mean B.P 155/90mmHg. With age 61 to 70 had B.P of 159.97/89.5mmHg and the age group of more than 70 years had a mean B.P of 166.25/90.25mmHg. This result of our study consistently match with the finding of Burt et al[27] and Franklin et al[28]. Who states that changing pattern of B.P occur with increase in age that is B.P rise with the progression of age. The rise of systolic B.P occurs throughout life in contrast to diastolic B.P which rises until approximately 50 years of age and may remain the same or fall later in life.

By studying the age adjusted dyslipidemia in hypertensive patients we observe that dyslipidemia mostly occurred between 41 to 50 years of age. The dyslipidemia then progressively decrease with the advancement in age the lowest prevalence were seen in the age group of more than 70 years. Our finding match with the study conducted by Goyal & Sarwate[29] who also reported that dyslipidemia is more prevalent in the middle age group study subjects.

The reason of this in our study may be a very less number of this age group that is 6% of study participants had the age of more than 70 years among which 33.3% individuals were having more LDL level in their serum. 25% have low HDL, 16.7% had more serum cholesterols while 8.3% had triglyceride more than normal value. This study includes only in uncomplicated cases of hypertension totally without any target organ damage. The causes of secondary hyperlipidemia like chronic renal failure, obesity diabetes mellitus, smoking, & drugs were eliminated from the study hence it may vary slightly from the previous reports which have included all these factors. As the study had been carried out in city (Central part of Pakistan), where people usually eats fried and oily food, which is high in spices. We had excluded the individuals who had history of any systemic illness or taking any lipids lowering drugs.

Only hypertensive patients serum lipid were seen there were no control group in this study to compare the lipid profile with them. The study subjects were not randomly selected it was a non-probability consecutive sampling which is not 100% representative of all hypertensive patients. Some patients were taking antihypertensive medication so their B.P at the time of measurement were not showing their original blood pressure. FRIEDWAID formula were used for the estimation of serum LDL which is not 100% correct and gives false result when TGs is more higher that is above 400 mg/dl. The current study were of cross sectional type which does not show any causal association that which condition has come first followed by the other.

CONCLUSION

This study showed a positive association of dyslipidemia in hypertensive patients. The high LDL level were more prevalent in the study subjects which make them more prone to the occurrence of other cardiovascular diseases because high level of LDL is also an independent cardiovascular risk factor. The study reveal that B.P of an individual rises as the age advance because the mean B.P of more than seventy years age group were much higher than the age group of 30 to 40 years. The study also showed that middle age group that is 41 to 50 had more lipid derangement as compare to other age groups. Both dyslipidemia and hypertension are major risk factor for cardiovascular disease both of the conditions can coexist in the same individuals as shown by this study. Dyslipidemia worsen the condition for hypertension. Therefore, the routine measurement and screening of serum lipid is recommended for hypertensive patient to prevent future complication such as stroke and myocardial infarction.

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