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Original Article

Association of Hypertensive Retinopathy with different serum lipid parameters in patients of Essential Hypertension: A Hospital Based Study.

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Abstract

Introduction

Abnormalities in serum lipid and lipoprotein levels are recognized as major modifiable risk factors for cardiovascular disease and essential hypertension and retinopathy. So this study was conducted to evaluate the role of dyslipidemia on development of retinopathy in hypertensive patients and to establish the association of parameters of serum lipid profile with hypertensive retinopathy.

Materials and Methods

A cross-sectional study was conducted in Ophthalmology Department among 135 patients in Nobel Medical College and Teaching Hospital (NMCTH), Biratnagar who were diagnosed with essential hypertension. Patients having diabetes mellitus, myopia, hazy ocular media and other posterior segment disorders were excluded from the study. The detailed ophthalmic examination was carried out in department of ophthalmology, NMCTH, Biratnagar and all the study population were investigated for fasting serum lipid profile.

Result

Out of 135 patients with essential hypertension, 65.44% had retinopathy and remaining had no signs of retinopathy. Mean age of patients were 60.24(±15.14) years. Although no gender preponderance was found with retinopathy but this study showed that hypertensive retinopathy increases significantly with increase in age and its incidence increases after the age of 60 years.

Conclusion

The duration of hypertension was found to be strongly associated with development of hypertensive retinopathy. The increase in all the lipid profile parameters (Serum TG, TC, and LDL and LDL:HDL) and the obesity were found to be strongly associated with retinopathy in hypertensive patients.

Key words: *Retinopathy, Low density lipoprotein, Dyslipidemis, Triglycerides, High density lipoprotein.*

Introduction

Hypertension is the emerging public health problem in both developing and developed countries. Systemic hypertension is a state of persistently elevated blood pressure above 140/90 mm of Hg based on an average of two or more blood pressure readings taken on two or more visits [1]. Hypertensive retinopathy (HR) is one among the vascular complication of essential hypertension and HR was 1st described by Marcus Gunn in 19th century

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in a series of patients with hypertension and renal disease[2]. HR is a condition characterized by a spectrum of retinal vascular signs in people with elevated blood pressure [3]. Hypertension and hyperlipidemia not only accelerate atherogenesis but also cause degenerative changes in the walls of large- and medium-sized arteries [4] which accelerate cerebrovascular hemorrhage [5] ischemic heart disease [6] and cardiac arrest [7,8]. Hence, this study helps to assess the association between hypertensive retinopathy in patients of essential hypertension with an altered serum lipid profile, with the aim of preserving vision by managing the elevated serum lipid profile parameters viz. serum total cholesterol (TC), serum triglycerides (TG), serum low density lipoprotein (LDL) and serum high density lipoprotein (HDL) .

Materials and Methods

A hospital based, descriptive cross-sectional study was carried out in 135 patients attending the Ophthalmology department of NMCTH, Biratnagar who were diagnosed to have essential hypertension by physicians of Internal Medicine Department of NMCTH, Biratnagar from January 2017 to august 2017, where intervention was done as per the need. The stage of hypertension was classified according to JNC 7 criteria. Verbal informed consent was taken from all the patients and proforma was filled up which includes detailed demographic data, duration of hypertension, fasting serum lipid profile which include serum LDL, serum HDL, serum TC and serum TG and obesity present or not according to WHO classification for South Asian population. Patients having diabetes mellitus, high myopia, hazy ocular media in both eyes, and other retinal vascular and posterior segment disorders were excluded from the study. Detailed Ophthalmological examination was carried out including slit lamp examination and fundus evaluation under mydriasis with tropicamide 1% with the both indirect ophthalmoscope (HEINE SIGMA 150 KC) and direct ophthalmoscope (HEINE Beta 200) to identify fundus changes related to hypertension. Patients were investigated for complete fasting serum profile. Staging of hypertensive retinopathy was carried out using Modified Keith Wagner Barker Classification. The data was entered and analyzed with SPSS program version 22. The associations between hypertensive retinopathy and serum lipid profile parameters were assessed using Chi-square test.

Results

A total of 135 hypertensive patients were included in this study after satisfying the selection criteria, of which 50.4%were male among them 67.6% had hypertensive retinopathy and 49.6% were female among them 64.2% had hypertensive retinopathy. There was no statistically significant association of retinopathy with gender($p=0.672$) table1. Of the total patients studied, 8.9% were in the age group of <40 years out of which 25% had hypertensive retinopathy and 10.4% were in the age group of ≥ 80 years of which 71.4%had hypertensive retinopathy, with an average age of study population being 60.24($\pm$ 15.14) years. This study showed that hypertensive retinopathy increases significantly with increase in age($p=0.0001$) and it increases significantly after age of 60 yearstable2. Among the 135 study subjects, 65.9% had hypertensive retinopathy and 23% of total had grade I retinopathy, 29.6% had grade II,12.6% had grade III and 0.7% had grade IV retinopathytable3. 28.1%of total hypertensive patient had duration of hypertension ≤ 5 years of which 28.9% had hypertensive retinopathy and 19.3%

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had >15years duration of which 100% had hypertensive retinopathy, with mean duration of hypertension10.13(±5.35) years. The duration of hypertension was found to be significantly associated with development of hypertensive retinopathy (p=0.0001) table4. Among the total of 135 hypertensive patients,42.97% were found to be obese out of which 86.20% had retinopathy and most of them had grade II retinopathy. Thus obesity was found to be statistically very significantly associated for development of hypertensive retinopathy (p=0.0001) table5. Among the total study subjects, 46.67% had TG level of ≥150mg/dl, out of which 87.30% had retinopathy and most of them had grade III retinopathy. Similarly, 20% of the total study subjects had TC level of (200-239) mg/dl, out of which 66.67% had retinopathy and 19.25% had TC ≥240mg/dl, of which 96.15% had retinopathy, and most of them had grade II retinopathy. Similarly, out of 135,14.81% hypertensive patients had LDL level of (130-159) mg/dl, of which 75% had retinopathy and 18.5% had LDL ≥160mg/dl, of which 100% had retinopathy, and most of them had grade II retinopathy. Among the total study subjects, 31.85%had LDL:HDL ratio of 2.5-5, of which 67% had retinopathy and 12.59% had LDL:HDL ratio >5, of which 100% had retinopathy, and again most of them had grade II retinopathy. Thus, increase in all those lipid profile parameters were found to be significantly associated with retinopathy in hypertensive patients with p-values of 0.0001, 0.0001, 0.0001, 0.001, respectivelytable6,7,8,10.

Table 1 Gender distribution of HR

Gender	HR (-) Frequency (%)	HR (+) Frequency (%)	Total Frequency (%)
Male	22(32.4)	46(67.6)	68(50.4)
Female	24(35.8)	43(64.2)	67(49.6)
Total	46(34.1)	89(65.9)	135(100.0)

Table 2 Age distribution of HR

Age group (years)	HR(-) Frequency(%)	HR(+) Frequency(%)	Total Frequency(%)
<40	9	3	12
	(75.0)	(25.0)	(100.0)
40-49	11	13	24
	(45.8)	(54.2)	(100.0)
50-59	13	14	27
	(48.1)	(51.9)	(100.0)
60-69	6	21	27
	(22.2)	(77.8)	(100.0)
70-79	3	28	31
	(9.7)	(90.3)	(100.0)
≥80	4	10	14
	(28.6)	(71.4)	(100.0)
Total	46	89	135
	(34.1)	(65.9)	(100.0)

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Table 3 HR grading

	TC				
HR	<200mgdl Frequency (%)	200-239mg/dl Frequency (%)	≥240mg/dl Frequency (%)	Total Frequency (%)	p-value
No retinopathy	36	9	1	46	0.0001
	(78.3)	(19.6)	(2.2)	(34.1)	
Grade I	20	8	3	31	
	(64.5)	(25.8)	(9.7)	(23)	
Grade II	21	7	12	40	
	(52.5)	(17.5)	(30.0)	(29.6)	
Grade III	5	3	9	17	
	(29.4)	(17.6)	(52.9)	(12.6)	
Grade IV	0	0	1	1	
	(0.0)	(0.0)	(100.0)	(0.7)	
Total	82	27	26	135	
	(60.7)	(20.0)	(19.3)	(100.0)	

Table 4 Duration of hypertension and retinopathy

Duration (years)	HR(-) Frequency(%)	HR(+) Frequency(%)	Total Frequency(%)
<5	27	11	38
	(71.1)	(28.9)	(28)
5-10	12	17	29
	(41.4)	(58.6)	(21)
11-15	7	35	42
	(16.7)	(83.3)	(31)
>15	0	26	26
	(0.0)	(100.0)	(20)
Total	46 (34.1)	89 (65.9)	135 (100.0)

Table 5 Association with obesity

HR retinopathy	Obesity(-) Frequency(%)	Obesity(+) Frequency(%)	Total Frequency(%)	p-value
No retinopathy	38 (87.6)	8 (17.4)	46 (100.0)	0.0001
Grade I	16 (51.6)	15 (48.4)	31 (100.0)	
Grade II	19 (47.5)	21 (53.5)	40 (100.0)	
Grade II	4 (23.5)	13 (76.5)	17 (100.0)	
Grade IV	0 (0.0)	1 (100.0)	1 (100.0)	
Total	77 (57.0)	58 (43.0)	135 (100.0)	

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Table 6 Association with triglyceride

HR	Triglyceride		Total Freqency(%)	p-value
	<150mg/dl Frequency(%)	≥150mg/dlFrequency(%)		
No retinopathy	40 (87.0)	6 (23.0)	46 (34.1)	0.0001
Grade I	15 (48.4)	16 (51.6)	31 (23)	
Grade II	13 (32.5)	27 (67.5)	40 (29.6)	
Grade III	4 (23.5)	13 (76.5)	17 (12.6)	
Grade IV	0 (0.0)	1 (100)	1 (0.7)	
Total	72 (53.3)	63 (46.7)	135 (100.0)	

Table 7 Association with total cholesterol

Retinopathy	Frequency	Percentage
No retinopathy	46	34.1
Grade I	31	23.0
Grade II	40	29.6
Grade III	17	12.6
Grade IV	1	0.7
Total	135	100.0

Table 8 Association with LDL

LDL					
HR	**<130mg/dl Frequency (%)**	**130-159mg/dl Frequency(%)**	**≥160mg/dl Frequency(%)**	**Total Frequency(%)**	**p-value**
No retinopathy	41	5	0	46	0.0001
	(89.1)	(10.9)	(0.0)	(34.1)	
Grade I	19	9	3	31	
	(61.3)	(29.0)	(9.7)	(23)	
Grade II	25	4	11	40	
	(62.5)	(10.0)	(27.5)	(29.6)	
Grade III	5	2	10	17	
	(29.4)	(11.8)	(58.8)	(12.6)	
Grade IV	0	0	1	1	
	(0.0)	(0.0)	(100.0)	(0.7)	
Total	90	20	25	135	
	(66.7)	914.8)	(18.5)	(100.0)	

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Table 9 Association with HDL

HR	HDL 35mg/dl Frequency(%)	36-60mgdl Frequency(%)	>60mg/dl Frequency(%)	Total Frequency(%)	p-value
No retinopathy	33	10	3	46	0.898
	(71.7)	(21.7)	(6.5)	(34.1)	
Grade I	19	9	3	(23)31	
	(61.3)	(29.0)	(9.7)		
Grade II	24	11	5	40	
	(60.0)	(27.5)	(12.5)	(29.6)	
Grade III	10	6	1	17	
	(58.8)	(35.3)	(5.9)	(12.6)	
Grade IV	1	0	0	1	
	(100.0)	(0.0)	(0.0)	(0.7)	
Total	87	36	12	135	
	(64.4)	(26.7)	(8.9)	(100.0)	

Table 10 Association with HDL:LDL

HR	HDL:LDL <2.5 Frequency (%)	2.5-5 Frequency (%)	>5 Frequency (%)	Total Frequency (%)	p-value
No retinopathy	32	14	0	46 (34.1)	0.001
	(69.6)	(30.4)	(0.0)		
Grade I	16	13	2	31	
	(51.6)	(41.9)	(6.5)	(23)	
Grade II	20	12	8	40	
	(50.0)	(30.0)	(20.0)	(29.6)	
Grade III	7	4	6	17	
	(41.2)	(23.5)	(35.3)	(12.6)	
Grade IV	0	0	1	1	
	(0.0)	(0.0)	(100.0)	(0.7)	
Total	75	43	17	135	
	(55.6)	(31.9)	(12.6)	(100.0)	

Discussion

In our hospital based study, the mean age of patients was 60.24(± 15.14) years which ranges from 23-93 years that is closely related to a cross-sectional study conducted by Bastola et al that showed the mean age of the study group was 58.5(±9.2) years; (range=33-48) [9].

There were 50.4% male among them 67.6% had HR and 49.6% female among them 64.2% had HR. There was no statistically significant gender preponderance (p=0.672). None of the past studies shown gender preponderance, though there were limited studies on incidence of HR.

The prevalence of HR was 65.9% which is more or less similar to the result showed by other studies;study conducted in India shows prevalence of hypertensive retinopathy 70%[10] and 69% [11].

In this present study, there was an increase prevalence of retinopathy in hypertensive patients having high serum TC level and this association was highly statistically significant (P<0.0001).

Similarly, Bastola et al in their study also showed that there was highly statistically significant difference in the mean serum cholesterol level ($P<0.001$) of patients with normal fundus and in those with different grades of HR[9]. And the result of our study also supports the findings of the study conducted by Gupta RP et al that showed there was an increase incidence of HR in patients having high serum cholesterol level($p<0.0008$)[11].

We, in our study, found a highly significant relation between serum LDL-cholesterol and the severity of retinopathy ($p<0.0001$).The studies conducted by Bastola et al[9] and Badhu et al[12] also showed a statistically significant association between high serum LDL-cholesterol and HR.

However, among total, 26.67% of patients had HDL level of <35 mg/dl, of which 72.22 % had retinopathy while 8.89% of patients had HDL >60 mg/dl, of which 75% had retinopathy and increase in HDL was notassociated with retinopathy. This result supports the findings of Bastola et al and Gupta RP et al, however no other studies have reported any direct association between serum HDL-cholesterol and HR so far. So, further studies in large scale are sought for establishment of this correlation.

Our study showed a significant association of LDL:HDL cholesterol ratio with HR with p value<0.001. The study conducted by Gupta RP et al also showed the same findings ($p<0.0001$). And also the overall association of serum TG was found to be statistically significant with retinopathy ($p<0.0001$). Similar results were shown by Gupta RP et al ($p<0.01$). In present study, among the total subjects, 46.67% had TG level of ≥150mg/dl, out of which 87.30% had retinopathy and most of them had grade III retinopathy. Similarly, in the study conducted by Bastola et al, the mean serum TG level were also found to be high in grade II and higher grades of HR.

Hence, our study shows a definite association between increased serum lipid parameters and the prevalence of HR.

Conclusion

Hypertensive retinopathy has been found to occur more commonly after 40 years of age, with the mean age of 60 years and there was no gender preponderance. It has been found that an increase in prevalence of HR with increase in serum TC, serum TG and serum LDL-cholesterol. However, no association was found between HDL-cholesterol and HR.

Hence, in conclusion, we can say that dyslipidemia must be considered as the important risk factors for prevalence and severity of HR. So lowering increased serum lipid parameters in hypertensive patients is advisable to preserve sight as well as other end organ damage in long run.

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