



# Association of Hypertensive Retinopathy with the Serum Lipid Profile in Hypertensive Patients Attending Tertiary Care Centre

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## ABSTRACT

### BACKGROUND

Elevated blood pressure is the most important public health problem in developing and developed countries. Hypertensive retinopathy is among the vascular complications of essential hypertension. Dyslipidemia in hypertensive patients is a predisposing risk factor, aggravating or complicating factor. Hypertension and hyperlipidemia accelerate atherogenesis cause degenerative changes in walls of large- and medium-sized arteries, which accelerate cerebrovascular hemorrhage, ischemic heart disease, stroke, and cardiac arrest.

### AIM AND OBJECTIVE

- To evaluate the role of hyperlipidemia on fundus changes in hypertensive patients and to correlate the above findings with components of lipid profile

### METHODS:

The present cross sectional study was conducted at Navodaya medical college hospital and research centre, Raichur, during the period of Jan 2017 to June 2018. A total of 100 subjects diagnosed to have essential hypertension were included in the study. All subjects were evaluated in detail regarding hypertensive status and their ophthalmic evaluation was done.

Staging of hypertensive retinopathy was done using Modified Keith Wagner Barker Classification and there association with serum lipid profile was studied.

### RESULTS

Of the 100 subjects, 66 had retinopathy, 69 were males, 31 were females with age range of 40-69 years. Hypertensive retinopathy correlated strongly with serum total cholesterol ( $p < 0.0001$ ), LDL cholesterol ( $p < 0.0001$ ), serum triglycerides ( $p = 0.008$ ) and LDL : HDL ratio ( $P < 0.001$ ). Higher grades of retinopathy were associated higher levels of serum total cholesterol, LDL cholesterol, serum triglycerides and LDL: HDL ratio.

### CONCLUSION

Our study demonstrated a definite association between serum lipid parameters and the prevalence of hypertensive retinopathy.

**Key words:** Hypertensive Retinopathy, Dyslipidaemia, Serum lipid profile.

## I. INTRODUCTION

Hypertension is the most important public health problem in developing and developed countries.

Hypertensive retinopathy is among the vascular complications of essential hypertension. Dyslipidemia in hypertensive patients is itself known to be a predisposing risk factor, an aggravating or complicating factor.<sup>1</sup> Hypertension and hyperlipidemia not only accelerate atherogenesis but also cause degenerative changes in the walls of large- and medium-sized arteries,<sup>2</sup> which accelerate cerebrovascular hemorrhage,<sup>3</sup> ischemic heart disease,<sup>4</sup> stroke, and cardiac arrest.<sup>5-7</sup>

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 tailoring a lipid-lowering treatment.

## II. AIM AND OBJECTIVE

- To evaluate the role of hyperlipidemia on fundus changes in hypertensive patients and to correlate the above findings with components of lipid profile

## III. METHODOLOGY

The study titled "ASSOCIATION OF HYPERTENSIVE RETINOPATHY WITH THE SERUM LIPID PROFILE IN HYPERTENSIVE PATIENTS ATTENDING NAVODAYA MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE" was carried out in the Department of Ophthalmology, Raichur during the period of January 2017 to June 2018 after obtaining ethical clearance.

### METHOD OF COLLECTION OF DATA

#### Sample Size:

100 Essential hypertensive patients attending Navodaya Medical College Hospital and Research Centre, Raichur.

#### Study Duration:

January 2017 to June 2018



### Inclusion Criteria

1. Patient who have given written informed consent in their own language.
2. Essential hypertensive patients attending Navodaya Medical College Hospital and Research Centre
3. Age >40years

### Exclusion Criteria

1. Diabetes mellitus
2. High myopia.
3. Hazy ocular media.
4. Pregnant women.
5. Glaucoma.
6. Chronic kidney disease
7. Anaemia
8. Other retinal vascular disorders.

### CLINICAL EVALUATION

The subjects were selected on the basis of inclusion and exclusion criteria. An informed consent was taken and demographic details of the patient like name, age, I.P or O.P no were documented.

Detailed history was taken, including the hypertensive status, duration of the disease, treatment history, family history and other risk factors like smoking, alcohol, tobacco consumption. Associated conditions like diabetes, renal, cardiovascular, cerebrovascular disease were also enquired.

Their detailed ophthalmological examination was carried out in department of Ophthalmology, Navodaya Medical College Hospital and Research Centre. The patients were examined thoroughly for visual acuity using Snellen's chart for distant vision and Jaeger's chart for near vision, intraocular pressure measurement by Schiotz tonometer, dilated fundus examination by direct and indirect ophthalmoscope, anterior segment examination using slit lamp and posterior segment examination by direct ophthalmoscopy, slit lamp biomicroscopy using 90D, and indirect ophthalmoscopy with +20D followed by fundus photography. Staging of hypertensive retinopathy was carried out using Keith Wagener Barker Classification<sup>66</sup> and subjects were graded as

1. Grade I retinopathy
2. Grade II retinopathy
3. Grade III retinopathy
4. Grade IV retinopathy

### LABORATORY PROCEDURE

5 ml of fasting blood sample was collected and following lipid components were analysed,

1. Serum total cholesterol
2. Serum triglyceride (TG)
3. Serum low density lipoproteins (LDL)
4. Serum high density lipoproteins (HDL)
5. Serum very low density lipoproteins (VLDL)
6. Serum LDL:HDL

### Statistical Analysis

The following methods of statistical analysis have been used in this study. The Excel and SPSS (Ver 11.5, SPSS Inc, Chicago) software packages were used for data entry and analysis.

One way analyses of variance were used to test the difference between groups.

In the entire above test a "p" value of less than **0.05** was accepted as indicating statistical significance.

### IV. RESULTS

A total of 100 patients were included in the study, 16(16%) patients belong to age group of 40-49years. Of these 13(81.25%) patients had retinopathy and 3(18.75%) patients did not have retinopathy. 45(45%) patients belong to age group of 50-59years. Of these 28(62.22%) patients had retinopathy and 17(37.78%) patients did not have retinopathy.

39(39%) patients belong to age >60years. Of these 25(64.10%) patients had retinopathy and 14(35.90%) patients did not have retinopathy [Table 1].

There is no significant difference among the age distribution of patients with retinopathy across all grades of retinopathy.

Out of 100 patients 69(69%) were male and 31(31%) were female.

Out of 69 males, 34(49.27%) patients had retinopathy and 25(36.23%) patients did not have retinopathy. Out of 31 females, 22(70.96%) patients had retinopathy and 9(29.03%) patients did not have retinopathy [Table 2].

There is no significant difference among grades of retinopathy with respect to gender of the subjects.

Out of 100 patients 65(65%) patients had total serum cholesterol level within normal limits (< 200mg/dl). Of these 35(53.84%) patients had retinopathy and 30(46.15%) patients had no retinopathy. 22(22%) patients had total serum cholesterol between 200 -239mg/dl which was considered borderline, of which 18(81.81%) patients had retinopathy and 4(18.18%) patients had no retinopathy. 13 patients had total serum lipid profile more than 240mg/dl which was considered abnormal. All 13 patients had



hypertensive retinopathy changes.

Overall the increase in total serum cholesterol levels correlated well with increasing severity of retinopathy ( $p < 0.0001$ ) [Table 3].

Out of 100 patients 62(62%) patients had LDL cholesterol level  $< 130$ mg/dl which was considered normal. of which 33 (53.22%) patients had retinopathy and 29(46.77%) patients had no retinopathy.

Remaining 26(26%) patients had LDL cholesterol levels more than or equal to 160mg/dl(abnormal).of which 24(92.30%) patients had retinopathy and 2(7.69%) patients had no retinopathy.12(50%) patients belonged to grade 3 hypertensive retinopathy category. and 3(12.5%) patients belonged to grade 4 hypertensive retinopathy category.

Overall, the increasing level of serum LDL-cholesterol showed statistically significant correlation with the grades of hypertensive retinopathy( $P < 0.0001$ ) [Table 4].

Out of 100 patients 26(26%) patients had LDL:HDL cholesterol ratio  $< 2.5$ ,of which 14(53.84%) patients had retinopathy and 12(46.15%) patients had no retinopathy.

60(60%) patients had LDL:HDL cholesterol ratio between 2.5-5 of which 39(65%) patients had retinopathy and 21(35%) patients had no retinopathy.

14(14%) patients had LDL:HDL cholesterol ratio  $> 5$  of which 13(92.85%) patients had retinopathy and 1(7.14%) patient had no retinopathy.

Overall, the increasing levels of LDL: HDL-cholesterol correlated positively with increasing severity of retinopathies, which was statistically significant ( $P < 0.001$ ) [Table 5].

Out of 100 patients, 44(44%) patients had serum triglycerides level  $< 150$ mg/dl ,of which 20(45.45%) patients had no retinopathy,24(54.54%) patients had retinopathy.

56(56%) patients had serum triglycerides level  $> 150$ mg/dl,of which 14(25%) patients had no retinopathy.42(75%) patients had retinopathy.

Overall, the increasing level of serum triglycerides showed statistically significant correlation with the grades of hypertensive retinopathy( $P < 0.05$ ) [Table 6].

## V. DISCUSSION

A total of 100 patients with essential hypertension were included in the study.

## Serum lipids

In our study, 66 subjects with retinopathy had mean serum lipid profiles as follows: Serum total cholesterol 219.05 mg/dl, LDL-cholesterol 153.54 mg/dl, HDL- cholesterol 36.59 mg/dl, VLDL-cholesterol 30.35 mg/dl, Serum Triglycerides being 164.45mg/dl and that of LDL: HDL-cholesterol ratio of 5.357.

Subjects with no retinopathy had mean serum lipid levels as follows: Serum total cholesterol 173.63 mg/dl, LDL-cholesterol 111.03 mg/dl, HDL-cholesterol 38.06 mg/dl, VLDL-cholesterol 26.59 mg/dl, Serum Triglycerides being 132.93 mg/dl and LDL: HDL-cholesterol ratio of 2.96.

In our study ,there was an increased incidence of hypertensive retinopathy in patients having high **serum Total cholesterol level** and this association was statistically significant ( $p < 0.0001$ ) Bastola et al<sup>8</sup> showed that there was a statistically significant difference in the mean serum total cholesterol level ( $F = 10.38$ ;  $p < 0.001$ ) of subjects with no retinopathy and in those with different grades of hypertensive retinopathy. In recent study, Gupta R P et al<sup>9</sup> also showed that there is an increased incidence of hypertensive retinopathy in subjects having high serum total cholesterol level which was statistically significant ( $p < 0.0008$ ). Akshar Soni et al.<sup>10</sup> showed increased serum total cholesterol levels with increasing severity of retinopathy.

In our study we found a significant association between high **serum LDL-Cholesterol** and the severity of the retinopathy, ( $p < 0.0001$ ).

Badhu et al<sup>11</sup> also assessed the serum level of LDL in hypertensive retinopathy. Their results showed a statistically significant ( $P < 0.0196$ ) higher serum level of LDL-cholesterol in hypertensive patients with retinopathy. The study concluded that an increased serum level of LDL cholesterol is associated with a higher incidence of hypertensive retinopathy, which corroborates with our findings. Bastola et al<sup>8</sup> also showed a significant correlation between serum LDL-cholesterol and grade II and higher hypertensive retinopathy ( $F = 30.39$ ;  $P < 0.001$ ).

In our study , the increasing levels of **LDL: HDL-cholesterol** correlated positively with increasing severity of retinopathies, which was statistically significant ( $P < 0.0001$ ).

Gupta R P et al<sup>9</sup> showed association of LDL: HDL-Cholesterol with retinopathy which was statistically significant ( $P < 0.0001$ ). Akshar Soni et al<sup>10</sup> showed increasing levels of LDL: HDL-cholesterol correlated positively with increasing severity of retinopathy ( $p < 0.0001$ )



In our study ,the increasing levels of **serum triglycerides** correlated positively with increasing severity of retinopathies, which was statistically significant ( $p=0.008$ ). Gupta R P et al<sup>9</sup> found a significant association between serum triglycerides and hypertensive retinopathy subjects ( $p< 0.01$ ). Akshar Soni et al<sup>10</sup> also showed significance with serum triglycerides and increasing severity of retinopathy ( $p<0.0001$ ).this study shows a definite association between serum lipid parameters and the prevalence of hypertensive retinopathy.

## VI. CONCLUSION

Our study demonstrated a significant association between serum lipid parameters and the prevalence of hypertensive retinopathy. The present study also showed statistically significant relationship between urinary protein excretion and hypertensive retinopathy( $p<0.05$ ).

So we conclude that routine ophthalmological check up of hypertensive patients is a must; particularly in view of high prevalence of hypertensive retinopathy in our setting. In patients having signs of hypertensive retinopathy further evaluation of cardiovascular risk factors including a lipid profile is also warranted as early identification and treatment of these risk factors may be helpful in preventing blindness as well as cardiovascular morbidity and mortality.

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