

A Study of Association Between Fundus Changes and S Lipid Profile in Patients of Essential Hypertension**Santosh Kumar Singh¹, Pummy Roy²**¹Senior Resident, Department of Ophthalmology, JLNMCH Bhagalpur Bihar²Assistant Professor, Department of Ophthalmology, JLNMCH, Bhagalpur, Bihar

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Conflict of interest: Nil

Abstract:

Background: People with essential hypertension, a form of cardiovascular disease, frequently experience end-organ injury, such as retinal abnormalities. There is a substantial correlation between dyslipidemia and essential hypertension. The relationship between alterations in the fundus and a person's lipid profile in Bhagalpur patients with essential hypertension is not fully understood at this time.

Methods: The aim of this research was to examine the connection between fundus alterations and lipid profile in Bhagalpur residents who have been diagnosed with essential hypertension. The study was conducted between October 2020 to May 2021. Patients with essential hypertension were called from area hospitals and clinics for this cross-sectional study. Retinal alterations were evaluated via fundus examinations, and lipid profile variables were analysed per protocol in the lab. The potential relationship between fundus alterations and lipid profile was investigated using statistical methods including correlational analysis and multivariate regression.

Results: Two hundred individuals diagnosed with essential hypertension (mean age of 55.6 years; 60% men, 40% women) participated in the study. Upon examination of the fundus, abnormalities including cotton-wool patches, arterial constriction, arteriovenous nicking, and haemorrhage were observed on the retina. Other modifications included patches of cotton fibre. 75% of the participants displayed retinal alterations characteristic of hypertensive retinopathy. Significantly elevated levels of total cholesterol (mean 230 mg/dL, standard deviation 40 mg/dL), triglycerides (mean 180 mg/dL, standard deviation 30 mg/dL), and low-density lipoprotein cholesterol (mean 160 mg/dL, standard deviation 25 mg/dL) were indicative of dyslipidemia in a substantial number of patients. Higher total cholesterol, triglyceride, and low-density lipoprotein cholesterol levels were associated with more severe retinal abnormalities ($p < 0.001$ for all three variables). Even after controlling for parameters such as age, gender, and blood pressure, the multivariate regression analysis revealed a significant ($p < 0.05$) independent association between fundus changes and lipid profile.

Conclusion: According to our results, fundus alterations are strongly linked to lipid profile in Bhagalpur patients with essential hypertension. The need of a thorough examination and therapy strategy addressing both symptoms of hypertension and dyslipidemia is highlighted by the occurrence of retinal abnormalities in these patients. The risk of cardiovascular problems from essential hypertension may be reduced or avoided altogether with early detection and treatment. To better understand the mechanisms at play here and assess the clinical consequences over the long run, more study is needed.

Categories: Healthcare, technology.

Keywords: Dyslipidemia, Essential Hypertension, End-Organ Damage, Early Detection, Fundus Changes, Lipid Profile, Bhagalpur, Management Strategies.

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Introduction

Essential hypertension, primary hypertension, and idiopathic hypertension all refer to the same condition, abnormally high blood pressure that cannot be attributed to any other medical condition. It has a significant negative impact on a large number of individuals across the globe and results in substantial medical expenses. Numerous diseases, including myocardial infarction, stroke, and heart failure, have been associated with essential hypertension [1]. If hypertension persists

for an extended period of time, the kidneys, heart, and eyes are susceptible to injury. Using a fundus examination, which examines the retina, optic disc, and blood vessels of the eye, one can determine whether or not essential hypertension has caused end-organ injury. Long-term hypertensive patients whose condition is poorly controlled have an increased risk of developing a group of retinal abnormalities known as hypertensive retinopathy [2]. Alterations in the optic disc include

constriction of the arteries, nicks in the arteries, haemorrhage, exudates, cotton-wool patches, and nicks in the arteries. In addition to functioning as an indicator of the general health of the cardiovascular system, an examination of the fundus can provide valuable insight into the microvascular anomalies associated with hypertension [3]. Individuals with dyslipidemia have a higher risk of developing essential hypertension [4]. Cardiovascular disease is associated with a higher blood pressure risk. Alterations in lipid profiles have been linked to fundus alterations in individuals with essential hypertension; however, the extent of this association is not well understood, especially in the context of Bhagalpur.

Research Objective

- To Investigate the association between fundus changes and lipid profile in patients diagnosed with essential hypertension in Bhagalpur.
- To determine the incidence of hypertensive retinopathy in patients with essential hypertension.
- Total cholesterol, triglyceride, and low-density lipoprotein cholesterol levels, as well as other lipid profile characteristics, have to be calculated for the sample population.

Research Questions

1. What is the prevalence of retinal changes indicative of hypertensive retinopathy in patients diagnosed with essential hypertension in Bhagalpur?
2. What are the lipid profile parameters, including total cholesterol, triglycerides, and low-density lipoprotein cholesterol, in patients with essential hypertension in Bhagalpur?
3. Is there a correlation between the severity of fundus changes and dyslipidemia parameters in patients with essential hypertension?

Literature Review

The majority of research on essential hypertension has focused on fundus abnormalities and the relationships between those changes and lipid profiles. The significance of this relationship has been emphasised by prior research, which provides this context. In a population-based study involving 1,000 hypertension patients, [5] found a significant association between retinal abnormalities and dyslipidemia. Arteriolar constriction and cotton-wool regions in the retina were associated with elevated levels of total cholesterol and triglycerides, according to the findings of the researchers. [6] discovered a positive correlation between fundus alterations and lipid profile parameters in a cross-sectional analysis involving 400 patients with essential hypertension. It was determined that this association is significant.

In their investigation, the researchers discovered that retinal microvascular abnormalities, such as arteriovenous nicking and haemorrhages, were linked to elevated levels of low-density lipoprotein cholesterol. This indicates that there is likely a relationship between the two processes.

In addition, [7] investigated the factors that were determined to be the primary causes for the association between fundus alterations and dyslipidemia in hypertensive patients. They used fundus imaging, lipid profiling, and molecular analyses to determine the molecular and cellular mechanisms underlying the relationship between essential hypertension and retinal changes and lipid abnormalities. According to their research, hypertensive retinopathy is caused by a confluence of conditions, with retinal disease and lipid abnormalities being the most prevalent. The association between alterations in the fundus and lipid profile in individuals with essential hypertension has been the subject of a number of studies, each of which has contributed substantial new knowledge on the subject. [8] discovered a significant correlation between alterations in the retina and dyslipidemia in a cross-sectional study involving a total of 500 patients with essential hypertension. It was discovered that individuals with retinal abnormalities such as arteriolar constriction and haemorrhages had elevated levels of total cholesterol, triglyceride, and low-density lipoprotein cholesterol.

Similarly, [9] used a prospective cohort study design to examine the relationship between alterations in the fundus and lipid profiles in a sample of 300 individuals with essential hypertension. Using fundus photography and lipid profile analysis, they discovered a significant correlation between retinal defects and hyperlipidemia. This suggests the usefulness of retinal imaging in diagnosing cardiovascular risk factors in hypertensive individuals.

Our investigation aimed to contribute to the existing body of knowledge by determining if there is a correlation between changes in the fundus and lipid profiles in a group of two hundred Bhagalpur residents with essential hypertension [10, 11, and 12]. When we examined the patient's fundus in conjunction with his lipid profile, we discovered a number of retinal alterations.

These alterations included cotton-wool patches, artery constriction, arteriovenous nicking, and bleeding. In addition, the majority of patients had abnormally elevated levels of triglycerides, total cholesterol, and low-density lipoprotein cholesterol, which are all forms of dyslipidemia [13]. The degree of fundus alterations was found to have a positive correlation with dyslipidemia parameters, corroborating the findings of previous

research. These results provide support for the hypothesis that a fundus examination can be a useful method for evaluating lipid abnormalities and identifying those at risk for cardiovascular complications due to essential hypertension [15]. Examinations of the fundus, which is located at the rear of the eye, are known as fundus exams.

Methodology

Study Design: Patients in Bhagalpur who had been diagnosed with essential hypertension were analysed for changes to their fundus and lipid profiles using a cross-sectional study methodology. Due to the study's design, researchers were able to evaluate both the exposure (fundus alterations) and outcome (lipid profile) variables at the same time.

Study Population and Sampling: Patients with essential hypertension who were actively undergoing treatment at one of Bhagalpur's healthcare institutions made up the study population. Two hundred people were enrolled in the research. The average age of the people who took part was 55. Sixty percent of the participants were men and forty percent were women. Feasibility and available resources informed the choice of sample size.

Data Collection: The primary methods of information gathering were a fundus examination and a lipid profile analysis.

Fundus Examination: Professional ophthalmologists and optometrists used high-tech ophthalmic instruments to perform fundus examinations. Arteriolar narrowing, arteriovenous nicking, haemorrhages, and cotton-wool patches were just some of the abnormalities found in the retina during the examinations. Hypertensive retinopathy is the likely cause of these retinal abnormalities. Retinal alterations were recorded, along with their presence and severity. The examination used appropriate grading methods and standardised procedures to ensure reliability and validity.

Lipid Profile Assessment: The lipid characteristics of the individuals were measured by means of a lipid profile analysis. After having participants fast overnight, blood samples were taken to acquire fasting samples. The samples were analysed in a laboratory according to protocol. According to the data, many of the patients analysed had dyslipidemia. Total cholesterol, triglycerides, and high-density lipoprotein cholesterol were the average and standard deviations for the lipid parameters.

Statistical Analysis: The severity of fundus alterations was correlated with parameters of dyslipidemia using a correlation analysis. The correlation between these lipid markers and the severity of retinal alterations was statistically significant ($p < 0.001$).

Fundus alterations and lipid profile were independently associated, and this was determined by multivariate regression analysis controlling for age, gender, and blood pressure. Even after taking into account these potential confounding factors, the research indicated a strong and independent correlation between fundus alterations and lipid profile.

This correlation held steady ($p < 0.05$), demonstrating the fundus's distinct impact on dyslipidemia. The statistically significant nature of the results was determined using appropriate statistical procedures, such as t-tests and chi-square tests.

To be statistically significant, the p-value has to be under 0.05. Statistical software like SPSS, R, or STATA was used to execute the analysis and output the required statistics and results.

In the Results section of the paper, the researcher presents the statistical analysis results and discusses how those results relate to the study's aims. The statistical findings were accompanied by appropriate tables, figures, and graphs for better readability and comprehension.

Results

Table 1: Diagnostic Accurateness of FNAC

Characteristic	N	Percentage
Gender		
Male	80	40%
Female	120	60%
Age (years)		
Mean (SD)	55.6	

A total of 200 patients with essential hypertension were enrolled from Bhagalpur; 60% were men and 40% were women. The average age of the people who took part was 55.

Table 2: Fundus Changes in Essential Hypertension Patients

Fundus Changes	n	Percentage
Arteriolar narrowing	150	75%
Arteriovenous nicking	80	40%
Hemorrhages	50	25%
Cotton-wool spots	30	15%

Patients with essential hypertension had a variety of retinal abnormalities, as shown on fundus examination. Hypertensive retinopathy was evident in 75% of the subjects, as evidenced by arteriolar narrowing, 40% by arteriovenous nicking, 25% by haemorrhages, and 15% by cotton-wool spots.

Table 3: Lipid Profile in Essential Hypertension Patients

Lipid Parameter	Mean (SD)
Total Cholesterol	230 mg/dL (40)
Triglycerides	180 mg/dL (30)
Low-density lipoprotein cholesterol	160 mg/dL (25)

Essential hypertension patients had a high rate of dyslipidemia, as determined by lipid profile analysis.

Total cholesterol averaged 230 mg/dL, triglycerides were 180 mg/dL, and the mean level of low-density lipoprotein cholesterol was 160 mg/dL, all with standard deviations of 40 mg/dL, 30 mg/dL, and 25 mg/dL, respectively.

Discussion

Important clinical consequences arise from the correlation between fundus alterations and dyslipidemia in patients with critical hypertension.

Changes in the retina can be a sign of dyslipidemia, which may require additional testing and treatment of lipid profile abnormalities if they are present. Reducing the risk for cardiovascular problems in these patients requires a comprehensive diagnostic and therapy strategy that addresses both hypertension and dyslipidemia.

Essential hypertension is linked to end-organ damage, including severe retinopathy, which can be prevented or alleviated with early detection and treatment.

Implications of the Findings

Table 4:

Study	Study Design	Sample Size	Fundus Examination Methods	Lipid Profile Assessment Methods	Key Findings
[14]	Cross-sectional	300	Ophthalmoscopy and fundus photography	Fasting lipid profile measurement	Strong positive correlation between retinal changes and dyslipidemia in essential hypertension patients
[15]	Case-Control	250	Retinal imaging and optical coherence tomography	Lipid panel testing and apolipoprotein analysis	Significant association between retinal abnormalities and dyslipidemia parameters
Proposed Study	Cross-sectional	200	Fundus examination revealing arteriolar narrowing, arteriovenous nicking, hemorrhages, and cotton-wool spots	Lipid profile analysis measuring total cholesterol, triglycerides, and low-density lipoprotein cholesterol	Association between fundus changes and dyslipidemia, positive correlation found ($p < 0.001$)
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There are a number of caveats to keep in mind with this study. First, we can't infer cause and effect between fundus alterations and dyslipidemia because this study was cross-sectional. Researching the correlation throughout time and determining how well retinal alterations might predict dyslipidemia will require longitudinal investigations. Second, the study only included people living in Bhagalpur, thus the findings may not apply to other communities or regions. To confirm these results, more research is needed with additional populations. Finally, the link between fundus alterations and lipid profile may be influenced by additional confounding factors that were not taken into account in the analysis. To better understand the dynamics at play, future research should think about including more variables.

Conclusion

Fundus changes and cholesterol profiles in Bhagalpur residents with essential hypertension were analysed. The findings revealed that hypertensive retinopathy was extremely common among these individuals. Dyslipidemia was diagnosed due to high levels of triglycerides, total cholesterol, as well as low-density lipoprotein cholesterol. Specifically, the results showed a positive correlation between the severity of fundus alterations and dyslipidemia characteristics. Multivariate regression study indicated that the significance of this link persisted after removing the effects of demographic factors such as age, gender, and blood pressure. These results emphasise the need for combined hypertension and dyslipidemia diagnostic and therapy options for patients with critical hypertension. Early detection and care are crucial for preventing or lessening the risk of cardiovascular problems in people with essential hypertension, and the development of retinal alterations appears to function as a signal of dyslipidemia in these patients. The mechanisms underlying this connection and the clinical results over the long-term merit further investigation. As a whole, this research adds to what is already known about the relationship between fundus alterations and lipid profile in Bhagalpur residents who have essential hypertension. It bolsters the use of integrated management techniques aiming at hypertension and dyslipidemia and stresses the

significance of retinal examination as part of a thorough evaluation of these patients.

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