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Research Article

A Prospective Comparative Study Evaluating Lipid Profile Alterations in Adults with Newly Diagnosed Hypertension versus Normotensive Individuals

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ABSTRACT

Background: Hypertension is a major global health problem and an important risk factor for cardiovascular disease. Dyslipidemia frequently coexists with hypertension and accelerates atherosclerosis, thereby increasing the risk of adverse cardiovascular outcomes. Early identification of lipid abnormalities in newly diagnosed hypertensive patients is crucial for effective risk stratification and preventive management, particularly in resource-limited settings like Bihar, where patients often present late to tertiary care centers.

Aim: To evaluate and compare lipid profile parameters in adults with newly diagnosed hypertension and normotensive individuals attending a tertiary care referral center in Bihar.

Methodology: This prospective comparative study included 200 participants (100 newly diagnosed hypertensive patients and 100 normotensive controls) selected randomly from the medicine OPD over a 6-month period. Blood pressure was measured using standard guidelines. Fasting lipid profile, including total cholesterol, triglycerides, LDL, HDL, and VLDL, was estimated using enzymatic methods. Data were analyzed using SPSS version 20. Independent t-test, chi-square test, and Pearson correlation were applied, with $p < 0.05$ considered statistically significant.

Results: Hypertensive patients had significantly higher mean levels of total cholesterol, triglycerides, LDL, and VLDL and significantly lower HDL levels compared to normotensive individuals ($p < 0.001$). Dyslipidemia was present in 72% of hypertensive subjects versus 36% of controls. A significant positive correlation was observed between blood pressure levels and total cholesterol, triglycerides, and LDL, while HDL showed a negative correlation.

Conclusion: Newly diagnosed hypertensive patients demonstrate significant lipid abnormalities at presentation. Routine lipid screening at diagnosis is essential for early cardiovascular risk assessment and integrated management to reduce long-term morbidity and mortality.

Keywords: Hypertension, Dyslipidemia, Lipid Profile, Cardiovascular Risk, Tertiary Care Centers

INTRODUCTION

Hypertension is one of the most important non-communicable diseases and a leading modifiable risk factor for cardiovascular morbidity and mortality worldwide. It contributes substantially to the global burden of ischemic heart disease, stroke, and chronic kidney disease, accounting for a large proportion of preventable deaths and disability-adjusted life years [1]. In recent decades, the prevalence of hypertension has increased significantly in low- and middle-income countries, including India, due to rapid urbanization, lifestyle transitions, dietary changes, and population aging [2]. The coexistence of other cardiometabolic abnormalities, especially dyslipidemia, further amplifies cardiovascular risk and accelerates atherosclerotic processes [3].

Lipid abnormalities play a pivotal role in the pathogenesis of atherosclerosis, endothelial dysfunction, and vascular inflammation. Elevated low-density lipoprotein (LDL), triglycerides (TG), and total cholesterol (TC), along with reduced high-density lipoprotein (HDL), are strongly associated with increased risk of coronary artery disease and cerebrovascular events [4]. Hypertension and dyslipidemia frequently coexist due to shared pathophysiological mechanisms such as insulin resistance, oxidative stress, neurohormonal activation, and endothelial dysfunction [5]. The combined presence of these conditions results in multiplicative cardiovascular risk rather than an additive effect, emphasizing the importance of early identification and comprehensive management [6].

Recent epidemiological studies have demonstrated a high prevalence of dyslipidemia among newly diagnosed hypertensive patients. A hospital-based observational study from Bihar reported dyslipidemia in nearly 62% of newly diagnosed hypertensive patients, with elevated triglycerides and total cholesterol being the most common abnormalities [7]. Similarly, studies from South Asia have shown that a large proportion of newly diagnosed hypertensive individuals exhibit significantly elevated TC, TG, and LDL levels along with reduced HDL levels, indicating an unfavorable lipid profile

even at the initial diagnosis stage [8]. These findings suggest that lipid abnormalities are present early in the course of hypertension and may contribute to early target-organ damage and cardiovascular complications.

India is currently undergoing an epidemiological transition characterized by a rapid rise in non-communicable diseases, particularly cardiovascular diseases (CVDs). Large multicenter data from India indicate that hypertension frequently coexists with diabetes and dyslipidemia, forming a cluster of metabolic risk factors that significantly increase cardiovascular morbidity and mortality [9]. Population-based studies from rural and tribal regions of India also demonstrate a rising prevalence of hypertension and dyslipidemia even in previously low-risk populations, highlighting the widespread nature of this health problem [10]. Therefore, early detection of lipid abnormalities in hypertensive patients is crucial for preventing future cardiovascular events.

Bihar is one of the most populous states in India, with a large rural population, limited healthcare resources, and a growing burden of non-communicable diseases. The state faces unique public health challenges, including low awareness of hypertension, late diagnosis, and inadequate screening for associated metabolic risk factors. Many patients present to tertiary care centers only after the onset of complications due to a lack of primary screening facilities in peripheral areas. Consequently, goverment medical colleges in Bihar function as major referral centers for patients with newly diagnosed hypertension and associated comorbidities.

Regional hospital-based studies from Bihar have shown a substantial burden of dyslipidemia among hypertensive patients, emphasizing the need for routine lipid screening at the time of diagnosis [7]. However, there is still limited prospective data evaluating lipid profile alterations specifically in newly diagnosed hypertensive individuals in this region. The majority of available data are retrospective or cross-sectional in nature, and few studies include appropriate comparison with normotensive individuals. Such comparative data are essential to establish the magnitude of lipid abnormalities attributable to hypertension and to identify early cardiovascular risk.

Furthermore, socioeconomic factors such as dietary habits rich in saturated fats, tobacco consumption, sedentary lifestyle, and limited health awareness contribute to increased cardiometabolic risk in the Bihar population. The lack of preventive health programs and limited access to lipid screening facilities further aggravate the situation. In this context, a prospective comparative study conducted in a tertiary care referral center would provide valuable insights into the pattern of lipid abnormalities in newly diagnosed hypertensive patients and help formulate region-specific preventive strategies.

Early identification of dyslipidemia in newly diagnosed hypertensive individuals is essential for cardiovascular risk stratification and initiation of timely interventions such as lifestyle modification and pharmacotherapy. Since hypertension and dyslipidemia share common risk factors and pathophysiological pathways, screening for lipid abnormalities at the time of diagnosis of hypertension can significantly reduce the burden of cardiovascular diseases. Moreover, comparison with normotensive individuals can help elucidate whether lipid abnormalities are significantly associated with hypertension in this population.

This study provides important epidemiological data on lipid profile patterns among newly diagnosed hypertensive patients in Bihar and contributes to the development of strengthened screening protocols and integrated management strategies at tertiary care centers.

The present study aims to evaluate and compare the lipid profile parameters (total cholesterol, LDL, HDL, and triglycerides) in adults with newly diagnosed hypertension and normotensive individuals attending a tertiary care referral center in Bihar, and to determine the prevalence and pattern of dyslipidemia associated with newly diagnosed hypertension.

MATERIALS AND METHODS

This study was designed as a hospital-based prospective comparative observational study conducted to evaluate lipid profile alterations in adults with newly diagnosed hypertension compared to normotensive individuals. The study followed standard epidemiological and ethical guidelines for observational research. Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient data was strictly maintained throughout the study.

The study was carried out in the Department of General Medicine at Jannayak Karpoori Thakur Medical College and Hospital in Bihar, which functions as a major referral center for patients from urban, semi-urban, and rural regions. The hospital's outpatient department (OPD) caters to a large number of patients with newly detected hypertension and other non-communicable diseases. The study was conducted over a period of 12 months from January 2025 to Dec 2025, ensuring adequate representation of patients presenting during different seasons and clinic cycles.

The study population consisted of adult patients (≥18 years) attending the medicine OPD during the study period. Participants were categorized into two groups:

Group A (Cases): Adults with newly diagnosed hypertension

Group B (Controls): Age- and sex-matched normotensive individuals attending OPD for routine check-ups or minor ailments

The sample size was determined based on the expected prevalence of dyslipidemia among newly diagnosed hypertensive patients from previous regional studies and assuming a confidence level of 95% with an acceptable margin of error. Considering feasibility and OPD load, a total of 200 participants were included in the study:

100 newly diagnosed hypertensive patients (cases)

100 normotensive individuals (controls)

Participants were selected using simple random sampling from eligible individuals reporting to the OPD during the 6-month study period.

Inclusion Criteria for Cases (Group A)

Adults aged ≥18 years. Newly diagnosed hypertension is defined as Systolic Blood Pressure (SBP) ≥140 mmHg and/or Diastolic Blood Pressure (DBP) ≥90 mmHg measured on at least two separate occasions as per standard guidelines. Patients not previously on antihypertensive therapy. Patients willing to provide informed consent.

Inclusion Criteria for Controls (Group B)

Adults aged ≥18 years. Normotensive individuals with SBP <120 mmHg and DBP <80 mmHg. No prior history of hypertension. Willing to provide informed consent.

Exclusion Criteria (for both groups)

Known cases of diabetes mellitus. Known cases of chronic kidney disease, liver disease, thyroid disorders, or cardiovascular disease. Patients already on lipid-lowering drugs. Patients on long-term steroid therapy or hormonal therapy. Pregnant women. Secondary hypertension. Alcohol dependence or severe systemic illness.

METHODOLOGY

All eligible participants were evaluated using a structured clinical proforma. The study procedure included the following steps:

Detailed history including age, gender, occupation, dietary habits, smoking status, alcohol intake, family history of hypertension or dyslipidemia, and physical activity levels

General physical examination including measurement of: height (cm), weight (kg), body mass index (BMI), Waist circumference.

Blood pressure was measured using a standard calibrated sphygmomanometer following standard protocol: Patient seated comfortably for at least 5 minutes, no caffeine or smoking 30 minutes prior, two readings taken at 5-minute intervals, the mean of the two readings considered for analysis.

After overnight fasting (8–12 hours), venous blood samples were collected under aseptic conditions and analyzed in the hospital's central laboratory.

The following lipid profile parameters were measured: Total Cholesterol (TC), Triglycerides (TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), Very Low Density Lipoprotein (VLDL) (calculated), All biochemical analyses were carried out using standard enzymatic methods on an automated analyzer with internal quality control.

Dyslipidemia was defined according to standard adult treatment panel guidelines as: TC ≥200 mg/dL, LDL ≥130 mg/dL, TG ≥150 mg/dL, HDL <40 mg/dL (men) and <50 mg/dL (women). Participants having any one or more abnormal parameters were considered to have dyslipidemia.

All data were recorded in a predesigned data collection sheet and later entered into a computerized database using Microsoft Excel. Data cleaning and verification were performed before statistical analysis.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) version 20.0. The following statistical methods were applied: Mean ± standard deviation (SD) for continuous variables. Frequency and percentage for categorical variables. Independent Student's t-test for comparison of mean lipid levels between hypertensive and normotensive groups. Chi-square test for comparison of categorical variables, such as the prevalence of dyslipidemia. Pearson correlation coefficient to evaluate the relationship between blood pressure levels and lipid parameters. A p-value <0.05 was considered statistically significant

The primary outcome measures included: Mean levels of lipid profile parameters in hypertensive and normotensive groups. Prevalence of dyslipidemia in newly diagnosed hypertensive patients. Association between blood pressure levels and lipid abnormalities.

RESULTS

A total of 200 participants were enrolled in the study, comprising 100 newly diagnosed hypertensive patients (cases) and 100 normotensive individuals (controls). The results were analyzed with respect to demographic characteristics, clinical parameters, and lipid profile variables.

The mean age distribution was comparable between the two groups ($p > 0.05$), indicating appropriate matching. However, BMI and waist circumference were significantly higher in the hypertensive group ($p < 0.001$), indicating increased adiposity. As expected, systolic and diastolic blood pressure values were significantly elevated in hypertensive patients.

All lipid parameters showed statistically significant differences between the two groups. Hypertensive patients had significantly higher TC, TG, LDL, and VLDL levels and significantly lower HDL levels compared to normotensive controls ($p < 0.001$ for all). This indicates a strong association between newly diagnosed hypertension and an adverse lipid profile.

The prevalence of dyslipidemia was significantly higher in the hypertensive group (72%) compared to normotensive individuals (36%). Each individual lipid abnormality—elevated TC, TG, LDL, and reduced HDL—was significantly more common in hypertensive patients ($p < 0.001$), demonstrating a strong link between hypertension and lipid derangement.

There was a moderate positive correlation between both systolic and diastolic blood pressure and total cholesterol, triglycerides, and LDL levels. Conversely, HDL showed a significant negative correlation with blood pressure. These findings suggest that increasing blood pressure is associated with worsening lipid abnormalities, highlighting the interrelationship between hypertension and dyslipidemia.

Table 1: Baseline demographic and clinical characteristics of study participants

Variable	*Hypertensive group (n=100)*	*Normotensive group (n=100)*	*p-value*
Mean age (years)	49.6 ± 10.8	47.9 ± 9.6	0.241
Male (%)	58%	55%	0.672
Female (%)	42%	45%	0.672
BMI (kg/m²)	26.4 ± 3.2	23.8 ± 2.9	<0.001
Waist circumference (cm)	94.6 ± 8.5	88.2 ± 7.4	<0.001
Systolic BP (mmHg)	148.2 ± 9.6	116.4 ± 6.8	<0.001
Diastolic BP (mmHg)	94.3 ± 6.5	74.8 ± 5.6	<0.001

Table 2: Comparison of Mean Lipid Profile Parameters.

Lipid parameter (mg/dL)	*Hypertensive group (Mean ± SD)*	*Normotensive group (Mean ± SD)*	*p-value*
Total cholesterol (TC)	212.6 ± 34.8	178.4 ± 29.2	<0.001
Triglycerides (TG)	178.2 ± 46.5	134.6 ± 32.1	<0.001
HDL cholesterol	38.2 ± 7.4	47.6 ± 8.2	<0.001
LDL cholesterol	138.4 ± 28.6	108.2 ± 24.5	<0.001
VLDL cholesterol	35.6 ± 9.3	26.9 ± 6.4	<0.001

Table 3: Prevalence of dyslipidemia in study groups

Lipid abnormality	*Hypertensive group (n=100)*	*Normotensive group (n=100)*	*p-value*
Elevated total cholesterol (>200 mg/dL)	64%	28%	<0.001
Elevated triglycerides (>150 mg/dL)	58%	26%	<0.001
Low HDL (<40 mg/dL men, <50 mg/dL women)	62%	30%	<0.001
Elevated LDL (>130 mg/dL)	55%	24%	<0.001
Any dyslipidemia	72%	36%	<0.001

Table 4: Correlation between blood pressure and lipid parameters in hypertensive group

Lipid parameter	*Correlation with SBP (r)*	*p-value*	*Correlation with DBP (r)*	*p-value*
Total cholesterol	+0.42	<0.001	+0.38	<0.001
Triglycerides	+0.39	<0.001	+0.35	<0.001
LDL	+0.44	<0.001	+0.40	<0.001
HDL	-0.36	<0.001	-0.32	0.002

DISCUSSION

The present prospective comparative study evaluated lipid profile alterations in adults with newly diagnosed hypertension compared to normotensive individuals attending a tertiary care referral center in Bihar. The findings of this study clearly demonstrate that newly diagnosed hypertensive patients have significantly deranged lipid profiles, characterized by elevated total cholesterol, triglycerides, LDL, and VLDL levels, along with reduced HDL levels. These findings highlight the close interrelationship between hypertension and dyslipidemia and reinforce the importance of early metabolic screening in hypertensive individuals.

In the present study, the mean levels of total cholesterol, triglycerides, and LDL were significantly higher in hypertensive patients compared to normotensive controls, while HDL levels were significantly lower. These findings are consistent with previous studies that have demonstrated similar lipid abnormalities in newly diagnosed hypertensive patients [1, 2]. A recent hospital-based study reported that more than 60% of newly diagnosed hypertensive individuals had at least one lipid abnormality, supporting the findings of the present study [1]. Similarly, a multicentric South Asian study also found significantly higher TC, TG, and LDL levels and lower HDL levels in hypertensive patients compared to normotensive individuals [2].

The prevalence of dyslipidemia in the present study was 72% among hypertensive patients, which is significantly higher than the 36% observed in normotensive individuals. This finding aligns with recent epidemiological evidence from India and other low- and middle-income countries showing that dyslipidemia is highly prevalent among hypertensive populations [3]. Dalal et al. reported that coexistence of hypertension and dyslipidemia is extremely common in Indian populations, contributing to increased cardiovascular risk and adverse clinical outcomes [3]. The coexistence of these two major cardiovascular risk factors leads to a synergistic increase in atherosclerotic burden and accelerates vascular damage [4].

The pathophysiological mechanisms linking hypertension and dyslipidemia are complex and multifactorial. Insulin resistance, endothelial dysfunction, oxidative stress, and chronic low-grade inflammation are common pathways contributing to both conditions [5]. Elevated LDL and triglycerides promote endothelial injury and atheroma formation, while reduced HDL impairs reverse cholesterol transport and antioxidant activity [6]. Additionally, activation of the renin–angiotensin–aldosterone system in hypertension has been shown to influence lipid metabolism and promote dyslipidemia [7].

In the present study, a significant positive correlation was observed between systolic and diastolic blood pressure and lipid parameters such as total cholesterol, triglycerides, and LDL, while HDL showed a negative correlation. These findings suggest that worsening blood pressure levels are associated with progressive lipid abnormalities. Similar correlations have been reported in earlier studies, indicating that both conditions may share common metabolic pathways and risk factors [2, 8]. This further supports the concept of a "cardiometabolic cluster," wherein hypertension, dyslipidemia, and obesity coexist and interact to increase cardiovascular risk [9].

Another important observation in this study was the significantly higher BMI and waist circumference in hypertensive patients compared to normotensive controls. Obesity, particularly central obesity, is a well-known risk factor for both hypertension and dyslipidemia. Increased adiposity leads to insulin resistance and altered lipid metabolism, contributing to elevated triglycerides and reduced HDL levels [5]. Previous Indian studies have also demonstrated a strong association between BMI, waist circumference, and lipid abnormalities in hypertensive individuals [3,10].

From a regional perspective, this study provides valuable insights into the pattern of lipid abnormalities in the Bihar population. Bihar, being a predominantly rural and resource-limited state, faces challenges such as a lack of awareness, late diagnosis of hypertension, and limited access to preventive healthcare services. Patients often present to tertiary care hospitals only after developing complications. Therefore, the high prevalence of dyslipidemia observed in newly diagnosed hypertensive patients in this study underscores the urgent need for routine lipid screening at the time of diagnosis of hypertension in this region.

The findings of the present study have important clinical and public health implications. Early detection of dyslipidemia in hypertensive patients allows timely initiation of lifestyle interventions such as dietary modification, weight reduction, increased physical activity, and smoking cessation. Pharmacological therapy with statins and other lipid-lowering agents can be initiated in high-risk individuals to prevent long-term cardiovascular complications [6]. Integrated management of hypertension and dyslipidemia is essential for reducing the burden of cardiovascular disease in India.

However, the study has certain limitations. Being a single-center study, the findings may not be generalizable to the entire population. The sample size, although adequate for comparison, may not capture all regional variations. Additionally, long-term follow-up was not performed to assess cardiovascular outcomes. Despite these limitations, the prospective design and inclusion of a normotensive control group strengthen the validity of the findings.

CONCLUSION

The present study demonstrates that newly diagnosed hypertensive patients have a significantly higher prevalence of dyslipidemia compared to normotensive individuals, and that lipid abnormalities correlate with blood pressure levels. These findings emphasize the importance of early lipid screening and comprehensive cardiovascular risk assessment in patients with newly diagnosed hypertension, particularly in tertiary care settings in Bihar. Early identification and management of these risk factors can play a crucial role in reducing the burden of cardiovascular morbidity and mortality.

REFERENCES

1. Kumari, A. ., Kishor, A. ., & Mishra, A. K. . (2024). Prevalence of Dyslipidemia in Recently Diagnosed Hypertensive Patients. *International Journal of Medical and Biomedical Studies*, *8*(4), 75–80.
2. Rahman MM, Akhter M, Rahman MA, Tabassum T, Hasan MR. Serum Lipid Profile and Its Association with Newly Diagnosed Hypertensive Patients in Bangladesh. Mymensingh Med J. 2024 Jul;33(3):848-855.
3. Dalal J, Chandra P, Chawla R, Kumar V, Abdullakutty J, Natarajan V, Naqvi SMH, Gaurav K, Rathod R, Dhanaki G, Kotak B, Shah S. Clinical and Demographic Characteristics of Patients with Coexistent Hypertension, Type 2 Diabetes Mellitus, and Dyslipidemia: A Retrospective Study from India. Drugs Real World Outcomes. 2024 Mar;11(1):167-176.
4. Miller M. Dyslipidemia and cardiovascular risk: the importance of early prevention. QJM. 2009 Sep;102(9):657-67.
5. Borghi C, Fogacci F, Agnoletti D, Cicero AFG. Hypertension and Dyslipidemia Combined Therapeutic Approaches. High Blood Press Cardiovasc Prev. 2022 May;29(3):221-230.
6. Yusuf S, Joseph P, Rangarajan S, Islam S, Mente A, Hystad P, Brauer M, Kutty VR, Gupta R, Wielgosz A, AlHabib KF, Dans A, Lopez-Jaramillo P, Avezum A, Lanas F, Oguz A, Kruger IM, Diaz R, Yusoff K, Mony P, Chifamba J, Yeates K, Kelishadi R, Yusufali A, Khatib R, Rahman O, Zatonska K, Iqbal R, Wei L, Bo H, Rosengren A, Kaur M, Mohan V, Lear SA, Teo KK, Leong D, O'Donnell M, McKee M, Dagenais G. Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. Lancet. 2020 Mar 7;395(10226):795-808. doi: 10.1016/S0140-6736(19)32008-2. Epub 2019 Sep 3. Erratum in: Lancet. 2020 Mar 7;395(10226):784.
7. Mallikarjuna Majgi S, Channa Basappa Y, Belagihalli Manjegowda S, Nageshappa S, Suresh H, Babu GR, Srinivas PN. Prevalence of dyslipidemia, hypertension and diabetes among tribal and rural population in a south Indian forested region. PLOS Glob Public Health. 2024 May 20;4(5):e0002807.
8. Anari R, Amani R, Latifi SM, Veissi M, Shahbazian H. Association of obesity with hypertension and dyslipidemia in type 2 diabetes mellitus subjects. Diabetes Metab Syndr. 2017 Jan-Mar;11(1):37-41.
9. Babu GR, Murthy GVS, Ana Y, Patel P, Deepa R, Neelon SEB, Kinra S, Reddy KS. Association of obesity with hypertension and type 2 diabetes mellitus in India: A meta-analysis of observational studies. World J Diabetes. 2018 Jan 15;9(1):40-52.
10. Hay, Simon I et al. Burden of 375 diseases and injuries, risk-attributable burden of 88 risk factors, and healthy life expectancy in 204 countries and territories, including 660 subnational locations, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. The Lancet, Volume 406, Issue 10513, 1873 – 1922.

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