Frontiers in Health Informatics
ISSN-Online: 2676-7104
www.healthinformaticsjournal.com
2024;Vol. 13:Issue 7
OpenAccess

An Evaluative Study Of Serum Adiponectin And Lipid Profile Level In Newly Diagnosed Hypertensive Patients In Garhwal Region Uttarakhand.

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Cite this paper as: Diksha Mishra, Javin Bishnu Gogoi, Jaskiran Kaur (2024) An Evaluative Study Of Serum Adiponectin And Lipid Profile Level In Newly Diagnosed Hypertensive Patients In Garhwal Region Uttarakhand.. *Frontiers in Health Informatics*, *Vol.13, No.7 (1624-1631)*

Abstract:

Background: Hypertension is a major public health problem due to its high prevalence all around the globe. Hypertension is prevalent in 34.5% of urban north Indians. Elevated BP is positively correlated to the risk of stroke and coronary heart disease and other related complications.

Aim: To evaluate the level of Serum adiponectin and lipid profile in newly diagnosed hypertensive patients and to find out the association between them.

Method: The current study was conducted in the Garhwal Region of Uttarakhand. A total of 384 subjects, including 192 newly diagnosed hypertensive subjects as cases and 192 age and sex matched subjects as control group, were enrolled. Patients with chronic illness, pregnancy, substance abuse, Type-1and Type-2 diabetes, and any other illness were excluded from the study. Subjects with age range of 30 -70 years were selected. Lipid profile and adiponectin were estimated in both groups.

Result: In our study, we have observed a lower level of adiponectin in cases as compared to the control group, which was found to be statistically significant($p<0.01$). High levels of Serum cholesterol, serum triglycerides, LDL, and VLDL and serum HDL were found low in newly diagnosed hypertensive cases as compared to Healthy Controls.

Conclusion:

Low levels of plasma adiponectin may be employed as an independent predictive risk factor for developing hypertension along with a deranged lipid profile

Keywords: Serum adiponectin, Hypertension, and lipid profile.

Introduction:

Hypertension is a serious public health concern due to its increased global prevalence[1].High blood pressure causes around 7.5 million fatalities or 12.8% of the yearly death toll globally[2].By the end of 2025, it is expected to increase to 1.56 billion cases. Elevated blood pressure has already been proven as a significant marker of stroke and coronary artery disease. Other consequences include heart failure, peripheral vascular disease, renal damage, retinal hemorrhage, and visual handicap [3]. A Study reported the Prevalence of hypertension based on

the National Family Health Survey 4 (NFHS) Uttarakhand Information Sheet in 2020, the prevalence of hypertension is greater in males (20.0%) than in women (11.1%) [4]. It is also linked to dyslipidemias, including high LDL, triglycerides and low HDL cholesterol [5, 6]. Adiponectin is a protein produced solely by white adipose tissues which may help in protection against hypertension by means of endothelium and brain-mediated processes[7]. By directly influencing elements of vascular tissue, adiponectin produces positive effects on vascular diseases[8]. Several studies have linked adiponectin to plasma lipids. A few researches showed that this hormone is inversely related to LDL, TG, and serum cholesterol and positively correlated with HDL[9] despite its high prevalence there is still a paucity of data pertaining to serum adiponectin levels in hypertensive patients and its correlation with lipid profile. So, this Case Control study was planned to evaluate the level of Serum adiponectin and lipid profile level in newly diagnosed hypertensive individuals of Uttarakhand and whether they can be used as an important biomarker in hypertension.

Aim and Objectives: To evaluate the level of Serum adiponectin and lipid profile in newly diagnosed hypertensive patients and also to find out the association between both parameters

Method: The current study was conducted in the Garhwal Region, Uttarakhand. A total number of 384 subjects, both male and female, aged 30-70 years, were enrolled in this study after obtaining ethical clearance from the institute. Out of these, 192 newly diagnosed hypertensive subjects served as cases and 192 age & sex matched subjects as controls. Any patients with chronic illness, pregnancy, substance abuse, Type-1 and Type-2 diabetes and any other disease were excluded from the study. Lipid profile and adiponectin were estimated for both groups.

Statistical Analysis:

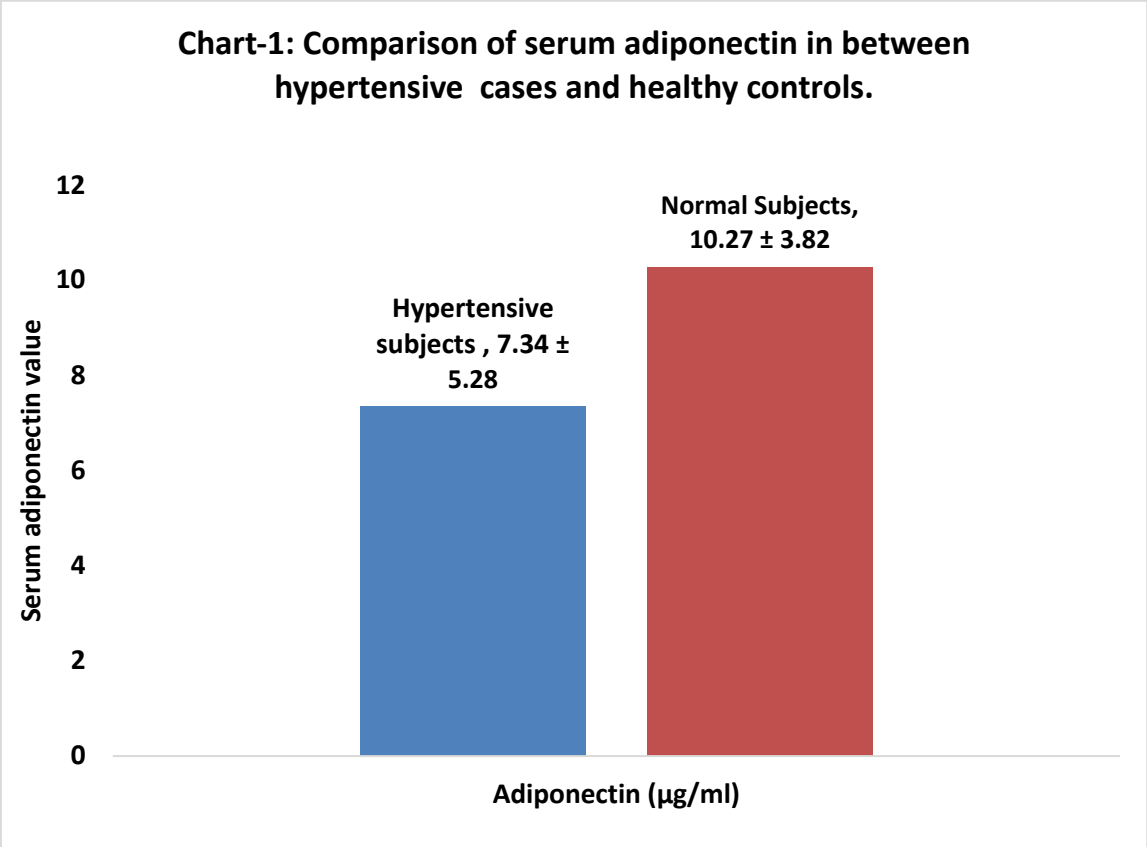
The statistical program for social sciences, known as SPSS version 29.0, was used for the statistical analysis. For statistical data and frequency of categorical variables, the mean and standard deviation were determined. The independent t-test was conducted on all continuous variables. Before doing any t-test, the data were assessed for normal distribution. Differences were considered significant at $p < 0.01$.

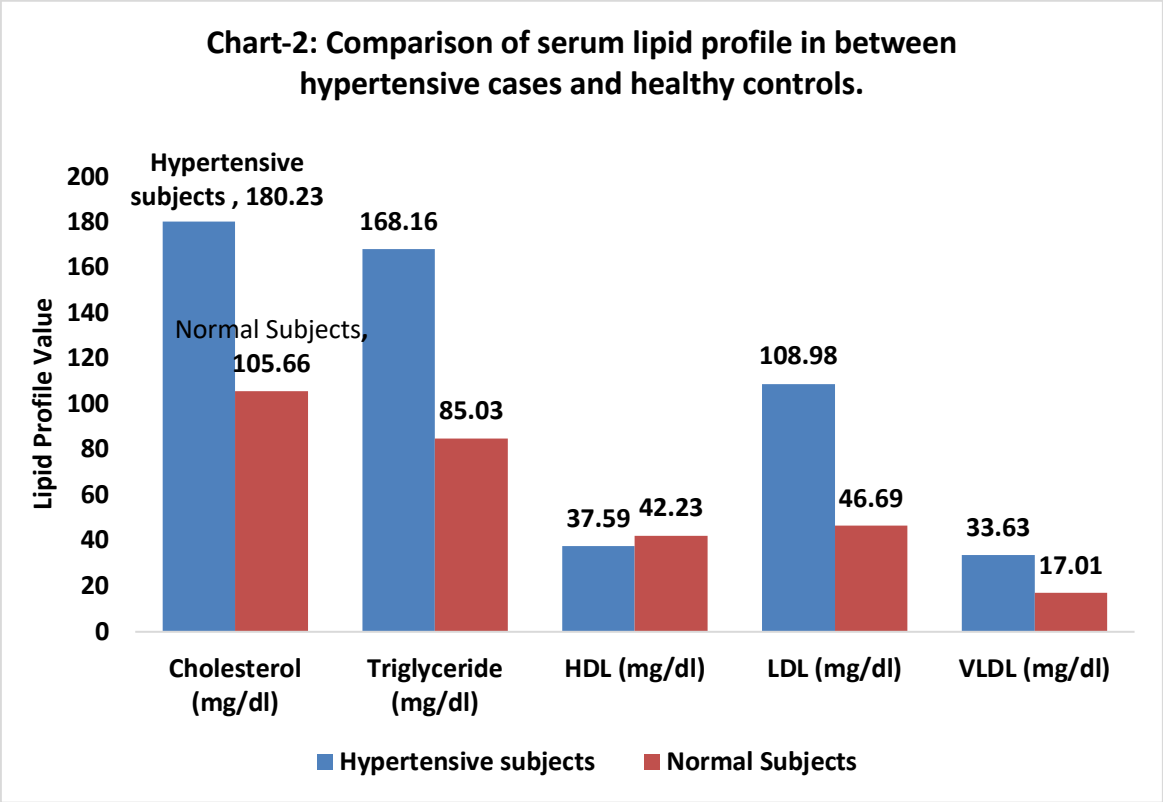
Result: In our study, we have observed lower level of adiponectin (mean ± SD: 7.34 ±5.28) in cases as compared to control group (10.27 ± 3.82) and mean difference (t-test value) of serum adiponectin was 17.96 and significance value was <0.01, which was found statistically significant. Serum cholesterol (180.23 ± 54.85), serum triglycerides (168.16 ± 72.89), LDL (108.98 ± 42.24) and VLDL (33.63 ± 14.58) were found higher and serum HDL level (37.59 ± 4.50) was found in newly diagnosed hypertensive cases as compared to Healthy Controls. Data was shown in following table-1.

Biochemical Markers	Hypertensive cases (Mean± SD)	Healthy Controls (Mean± SD)	t-test	p-value
Adiponectin (µg/ml)	7.34 ± 5.28	10.27 ± 3.82	17.967	<0.01
Cholesterol (mg/dl)	180.23 ± 54.85	105.66 ± 26.01	16.46	<0.01*
Triglyceride (mg/dl)	168.16 ± 72.89	85.03 ± 15.34	32.65	<0.01*
HDL (mg/dl)	37.59 ± 4.50	42.23 ± 6.12	10.633	<0.01*

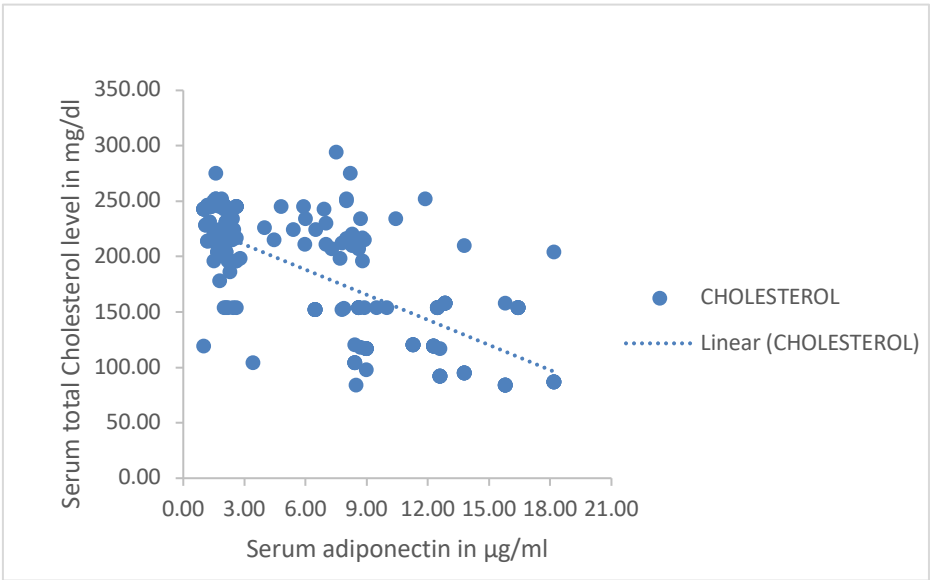
LDL (mg/dl)	108.98 ± 42.24	46.69 ± 24.71	9.288	<0.01*
VLDL (mg/dl)	33.63 ± 14.58	17.01 ± 3.06	32.712	<0.01*

Table-1: Comparison of serum adiponectin and lipid profile in between hypertensive cases and healthy controls.

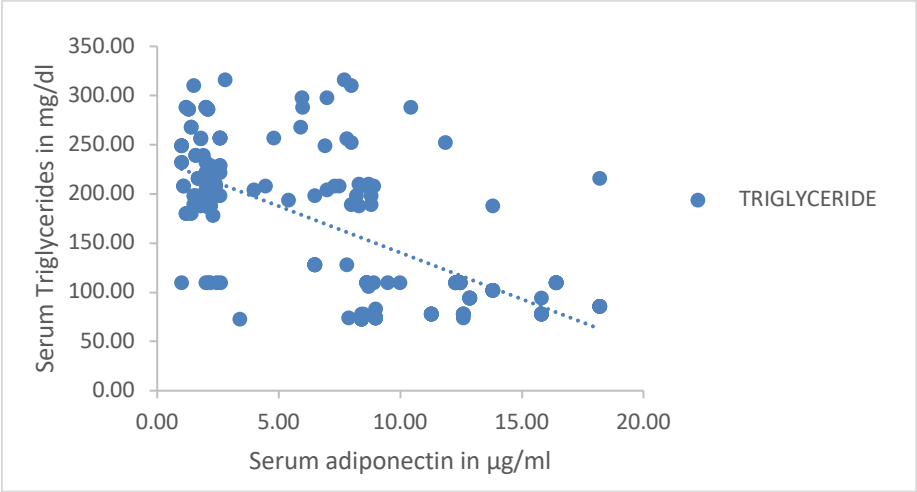




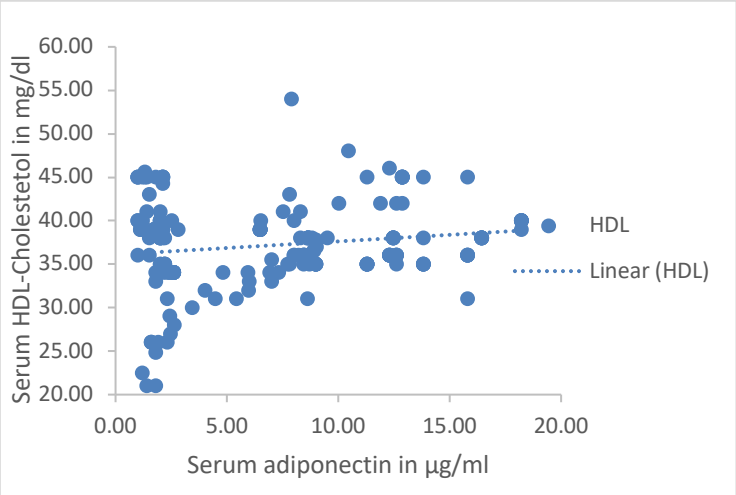
Graph chart 3, 4, 5, 6 and 7 are showing the correlation of serum adiponectin with serum total cholesterol, serum triglycerides, serum HDL-cholesterol, serum LDL-cholesterol and serum VLDL-cholesterol in the patients with hypertension. Serum adiponectin has positive correlation with serum HDL-cholesterol (R-value= +0.162) and negative correlation with serum total cholesterol (R-value= -0.718), serum triglycerides (R-value= -0.776), serum LDL-cholesterol (R-value= -0.701) and serum VLDL-cholesterol (R-value= -0.673), which was found statistically significant.



Graph-3: scatter plot for correlation of adiponectin to serum total cholesterol in hypertensive patients.



Graph-4: scatter plot for correlation of adiponectin to serum total triglycerides in hypertensive patients.



Graph-5: scatter plot for correlation of adiponectin to serum total HDL in hypertensive patient.

Discussion:

Our study demonstrated significantly lower serum adiponectin levels in newly diagnosed hypertensive patients compared to healthy controls. Additionally, we observed dyslipidemia in hypertensive patients, with higher levels of total cholesterol, triglycerides, LDL, and VLDL, along with lower HDL levels. These findings reinforce the hypothesis that adiponectin plays a critical role in blood pressure regulation and lipid metabolism.

Our results align with the findings of Brzeska et al. (2018), who reported significantly lower adiponectin levels in hypertensive patients, particularly those with metabolic syndrome, suggesting a protective role of adiponectin against hypertension [10]. Similarly, Hyun Kim D et al (2020) found an inverse correlation between adiponectin and blood pressure, supporting the hypothesis that adiponectin deficiency contributes to endothelial dysfunction and vascular complications [11,12]. Several mechanisms may explain why hypertensive patients exhibit lower adiponectin levels, based on our findings and previous research. Adiponectin plays a crucial role in maintaining vascular homeostasis by stimulating nitric oxide (NO) production, which promotes vasodilation. Low adiponectin levels can impair NO availability, leading to endothelial dysfunction and increased vascular resistance. Ohashi et al. (2011) reported that

low adiponectin levels impair endothelial function, increasing vascular resistance and contributing to hypertension [8]. Kim et al. (2021) found that hypertensive patients had significantly higher oxidative stress markers, which negatively correlated with adiponectin levels [7]. Ohashi et al. (2011) found that inflammatory markers negatively regulate adiponectin production, linking increased inflammation to hypertension [8]. Mustafaa et al. (2019) demonstrated that obese and hypertensive individuals have significantly lower adiponectin levels due to chronic inflammation [12]. We observed lower adiponectin levels in hypertensive patients. Low adiponectin levels have been linked to insulin resistance, a condition frequently observed in hypertensive individuals. Imatoh et al. (2008) found that hypoadiponectinemia was associated with insulin resistance and hypertension, supporting adiponectin's role in metabolic health [13]. Izadi et al. (2013) demonstrated that adiponectin improves insulin sensitivity, and low levels contribute to hypertension and cardiovascular risk [9]. We found a significant inverse association between adiponectin and hypertension. Adiponectin is involved in lipid metabolism by increasing HDL cholesterol and reducing LDL and triglycerides. Lower adiponectin levels can lead to lipid accumulation in arterial walls, increasing the risk of atherosclerosis and hypertension. Kim et al. (2021) reported that low adiponectin levels were associated with elevated LDL and triglycerides, contributing to hypertension [7]. Brzeska et al. (2018) found that hypertensive patients with metabolic syndrome had lower adiponectin levels and worse lipid profile [10]. In our study subjects as compared to control we found an inverse correlation between adiponectin and lipid profile supporting the link between adiponectin deficiency and dyslipidemia. In obesity and hypertension, adipose tissue becomes dysfunctional, leading to reduced adiponectin production. Mustafaa et al. (2019) found that obese and hypertensive individuals had significantly lower adiponectin levels due to adipose tissue inflammation and hypoxia [12]. Dakshina Murthy et al. (2020) showed that urban hypertensive populations had lower adiponectin levels due to obesity-related metabolic changes [4]. Adipose tissue dysfunction likely contributed to the observed low adiponectin levels in hypertensive patients.

Conclusion:

Our study highlights the significant role of adiponectin in hypertension, demonstrating lower adiponectin levels in newly diagnosed hypertensive patients compared to healthy controls. The observed dyslipidemia in hypertensive individuals, characterized by higher LDL, triglycerides, and VLDL along with lower HDL, further reinforces the link between adiponectin deficiency and cardiovascular risk. These findings suggest that adiponectin is not just a biomarker can be a potential therapeutic target for managing hypertension and metabolic disorders. Its anti-inflammatory, insulin-sensitizing, and vascular-protective properties make it a promising candidate for future research and intervention. To fully unlock the clinical potential of adiponectin, longitudinal studies, interventional trials, and genetic investigations are essential. Exploring adiponectin-modulating therapies, such as lifestyle interventions, pharmacological agents, and personalized medicine approaches, could pave the way for novel strategies in hypertension prevention and management. By integrating adiponectin assessment into routine clinical practice, we may move closer to personalized hypertension treatment, reducing cardiovascular complications and improving long-term patient outcomes.

Limitations:

1. Cross-sectional Design – Our study establishes associations but does not confirm causality between adiponectin levels and hypertension. A longitudinal study would be beneficial.

2. Region-Specific Sample – The study was conducted in the Garhwal region, which may limit generalizability to other populations. A multi-center study could provide broader insights.
3. Unmeasured Confounding Factors – Lifestyle factors like diet, exercise, BMI, genetic predisposition were not accounted for, which may influence adiponectin levels.

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