

## Evaluation of the Lipid Profile of Hypertensive Patients Compared to Non-Hypertensive Individuals

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| ARTICLE INFO  | ABSTRACT   |
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| <p><b>Article type:</b><br/>Original Article</p> <hr/> <p><b>Article history:</b><br/>Received: 2- Feb- 2014<br/>Accepted: 18- Mar-2014</p> <hr/> <p><b>Keywords:</b><br/>Hypercholesterolemia<br/>Hyperlipidemia<br/>Hypertension<br/>Hypertriglyceridemia</p> | <p><b>Introduction:</b> This study was designed to compare the lipid profiles of hypertensive and non-hypertensive cases.</p> <p><b>Materials and Methods:</b> In this case-control study, we assessed 200 hypertensive patients alongside 200 healthy individuals who were referred to our cardiology clinics from 2007 to 2008, in Mashhad, Iran. Blood pressure and serum lipids profile including total cholesterol, triglyceride, High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) were evaluated in both the case and control group.</p> <p><b>Results:</b> Total cholesterol and the mean of serum LDL level were significantly higher in the hypertensive patients compared to non-hypertensive cases (P=0.001), while the mean of serum triglyceride levels was higher in the case group compared to the control group (P= 0.001).</p> <p><b>Conclusion:</b> We concluded that only the serum triglyceride levels were significantly different between the hypertensive and non-hypertensive individuals.</p> |

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### Introduction

It has recently been estimated that many people worldwide and 60 million in the United States suffer from hypertension (1). Hypertension, the leading cause of mortality in the world, is also a simply-treatable risk factor of stroke, myocardial infarction, cardiac failure, peripheral vascular disease, aortic dissection, atrial fibrillation, and end-stage renal disease (1).

Several risk factors are known to play a role in the progress of hypertension (2,3). In an investigation on the different genetic and environmental risk factors of hypertension, Ruixing showed that age, hyperlipidemia, alcohol consumption, high Body Mass Index (BMI), and sodium intake were associated with hypertension (3). Several previous studies showed the relation between hyperlipidemia and hypertension (4,5). An excessive daily intake of saturated fats, cholesterol, and other sources of calories and subsequent disturbance of lipid profile leading to hypertriglyceridemia and hypercholesterolemia are associated with obesity and, consequently, hypertension (6,7).

Impaired insulin function (8), increased peripheral resistance, cardiac output, sympathetic tone, and salt congestion (6) are some of the responsible mechanisms

which lead to hypertension. While the relation between hyperlipidemia and hypertension is clearly shown, there are only a few studies which have compared the lipid profiles of hypertensive and non-hypertensive cases. In a study in 2000, Brown confirmed the association between several factors including BMI, serum cholesterol, HDL and hypertension (9).

Our study was designed to compare the serum triglyceride, cholesterol, HDL, and LDL levels in hypertensive and non-hypertensive individuals.

### Materials and Methods

In this case-control study, we assessed 200 hypertensive patients who were referred to cardiology clinics of Islamic Azad University, Mashhad Branch, Mashhad, Iran, from June 2007 to January 2008. Blood samples were obtained to measure serum total cholesterol, triglyceride, HDL, and LDL levels. The patients' blood pressures were recorded as well. Study sample size was 200 in each group regards to the study by Sabri (10), with a consideration power of 8% and  $\alpha=0.05$ .

The subjects' blood pressures were measured according to the guidelines introduced by the World

Health Organization (WHO).

Patients with systolic blood pressure above 140 mmHg or diastolic blood pressure above 90 mmHg, or the ones receiving antihypertensive medications were considered as hypertensive patients, and the remaining constituted the control group. We compared these cases with 200 healthy individuals who referred to the clinic for routine check-up. The study procedure has been approved by the Islamic Azad University of Medical Sciences Ethics Committee. It should be mentioned that all the participants were asked to sign a written consent after being given a thorough explanation of the research process.

Lipid profile was assessed after 12 hours of fasting by Biosystem Laboratories kit (Spain). Furthermore, the demographic characteristics of individuals, including age, gender, education, marital status, occupation, smoking, weight, and past and current medical and drug history were registered in a questionnaire. The cut-off points for LDL and cholesterol were 110 mg/dl and 200 mg/dl, respectively.

Additionally, smoking was defined as active smoking within the past 12 months.

### Statistical analysis

Data were collected and analyzed with chi-square fisher exact test using the SPSS for Windows™, version 15 (SPSS Inc., Chicago, Illinois, USA). All data were checked for normality by the Kolmogorov–Smirnov test (K–S test). Chi-square and t-independent tests were used to compare the study groups and to investigate the role of independent factors such as age, gender, education, marital status, occupation, weight, and smoking in the studied group.

Numerical data were expressed as mean± SD or as proportions of the sample size. A P-value less than 0.05 was considered significant.

### Results

The mean ages in the case and control groups were  $54.9 \pm 11.4$  and  $43.2 \pm 14.3$  years old, respectively.

Other demographic characteristics of case and control individuals are shown in table 1. The average weights was  $71.7 \pm 12.6$  and  $70.6 \pm 11.1$  kg in the case and control group, respectively. Serum total cholesterol was significantly higher in the hypertensive patients (222.9 mg/dl) compared to non-hypertensive subjects (202.5 mg/dl), ( $P = 0.04$ ). The mean serum triglyceride levels were significantly higher in the case group compared to the control group [197.3 mg/dl vs.164.5 mg/dl, respectively, ( $P = 0.05$ )]. However, there was no difference in the mean serum HDL level between the study groups [48.3 mg/dl vs. 47.9 mg/dl ( $P = 0.69$ )].

The mean serum LDL level was significantly higher in hypertensive patients ( 130.6 mg/dl ) compared to non-hypertensive individuals (119.7 mg/dl) ( $P = 0.03$ ).

Multivariate analysis of age, gender, education, marital status, occupation, smoking, and weight in

addition to the lipid profile showed a difference in the serum triglyceride levels between the case and control group ( $P = 0.027$ ). Furthermore, the difference between the two groups was not significant for serum total cholesterol level ( $P = 0.24$ ), HDL ( $P = 0.90$ ) and LDL ( $P = 0.24$ ).

**Table 1: Demographic characteristics of case and control individuals**

| Demographic characteristics |                      | Case Group  | Control Group | P-value |
|-----------------------------|----------------------|-------------|---------------|---------|
| Gender                      | Male                 | 82 (41.0%)  | 80 (40.0%)    | 0.83    |
|                             | Female               | 118 (59.0%) | 120 (60.0%)   |         |
| Marital Status              | Single               | 43 (7.0%)   | 57 (21.5%)    | 0.001   |
|                             | Married              | 157 (93.0%) | 143 (78.5%)   |         |
| Education                   | Illiterate           | 62 (31.0%)  | 21 (10.5%)    | 0.001   |
|                             | ≤ 12 years education | 114 (57.0%) | 113 (56.5%)   |         |
|                             | > 12 years education | 24 (12.0%)  | 66 (33.0%)    |         |
| Occupation                  | Householder          | 95 (47.5%)  | 54 (27.5%)    | 0.001   |
|                             | Employed             | 100 (50.0%) | 131 (65.5%)   |         |
|                             | Non- Employed        | 5 (2.5%)    | 15 (7.5%)     |         |
| Smoking                     | Positive             | 135 (67.5%) | 151 (75.5%)   | 0.24    |
|                             | Negative             | 65 (32.5%)  | 49 (24.5%)    |         |

### Discussion

This study clearly showed that the total cholesterol, triglyceride, and LDL level were higher in hypertensive patients in comparison with non-hypertensive individuals. These findings were completely in agreement with the results of some previous studies.

Sabri (10) and Yin (11) showed that total cholesterol level was higher in hypertensive patients than non-hypertensive subjects.

In 2008, Li revealed higher triglyceride levels in hypertensive patients in China (12). Our finding on LDL was similar to the results of Assmann's and Schulte's study (13). However, this research showed no statistically significant difference in serum HDL level between hypertensive and non-hypertensive individuals. This was in contrast to the results of Assmann, Schulte, and Li (12,13).

The logistic regression test showed that among the studied variables, the serum triglyceride level was significantly different between the case and control group. It seems that difference in the total cholesterol and LDL levels lose their significance when the demographic and other variables were included in the analysis.

It can also be said that the known unfavorable lipids, including LDL and cholesterol, are higher in the newly diagnosed hypertensive patients. The association between hyperlipidemia and hypertension has been confirmed earlier. Hyperlipidemia as a comorbid factor increases hypertension morbidity; so, combined corrections of these disorders tend to decrease morbidity among patients. It is shown that statins,

which are commonly used for treatment of hypercholesterolemia, might be effective in preventing both coronary and cerebrovascular events in hypertensive patients.

Treatment with statins is recommended in hypertensive cases with an estimated risk of cardiovascular death above five percent (4).

Statins may be useful in hypertensive individuals with high serum total cholesterol and might be considered as an antihypertensive therapy (5).

The association between hypercholesterolemia related obesity and hypertension is clear. However, the direct mechanisms leading from hypercholesterolemia to hypertension are not fully understood, ketosis (7).

During the early phases of obesity, renal tubular reabsorption results in primary sodium retention and

increased extracellular-fluid volume. Subsequently, plasma renin activity, angiotensinogen, angiotensin II, and aldosterone values increase significantly (7).

Furthermore, increased renal tubular reabsorption and increased arterial pressure lead to higher values of glomerular capillary wall stress, activation of neurohumoral systems, increased serum lipid level, and glucose intolerance (14). Several other mechanisms, including oxidative stress, autonomic dysregulation, and mechanical compression on the kidneys are all activated by obesity (15). By combining these facts with the results of our study, the effect of abnormal serum lipid levels in the progress of hypertension can be clearly seen. Thus, it seems rational to correct any lipid disorder in hypertensive patients.

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