

Serum HDL in Patients with Ischemic Stroke - A Case Control Study

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Abstract

Background Elevated high-density lipoprotein cholesterol (HDL-C) levels have been shown to be protective against cardiovascular disease. However, the association of specific lipoprotein classes and ischemic stroke has not been well defined.

Objectives To evaluate the association between HDL-C and ischemic stroke in men and women, and to compare the results with a control sample of the same age group.

Methods A hospital based case-control study was done comparing serum HDL-C levels in 48 ischemic stroke patients to 50 controls recruited from Al-Imamain Al-Kadhmain Medical City, all patients and control had negative past medical history, negative history for smoking and alcohol. Serum lipid profile was determined in all of them.

Results This study showed that regarding the serum HDL-C levels, 41 (85.4%) patients were found to have low levels (less than 40 mg/dl) while among the control group, only 19 (38%) have shown low serum HDL-C level.

Conclusion The study showed that there is a significant association between the low level of serum HDL-C cholesterol and the risk of ischemic stroke in this population.

Keywords cholesterol, lipoproteins, HDL-cholesterol, ischemic stroke

List of Abbreviation: HDL-C: High-density lipoprotein-cholesterol, VLDL: very low-density lipoprotein, LDL: low-density lipoprotein, CVD: cardiovascular disease.

Introduction

Stroke is the third most common cause of death in developed world after cancer and cardiovascular disease (CVD). It is the most common cause for severe physical disability⁽¹⁾. Stroke is defined by the world health organization as the clinical syndrome of rapid onset (usually seconds or minutes) of focal (or global, as in subarachnoid hemorrhage) cerebral deficit, lasting more than 24 hours or leading to death, with no apparent cause other than a vascular one⁽²⁾.

Strokes can be classified into two major categories: ischemic and hemorrhagic⁽³⁾.

Ischemic strokes are those that are caused by interruption of the blood supply⁽⁴⁾. Eighty percent of total strokes in the United States are due to an ischemic event which could be thrombosis, embolism or systemic hypoperfusion⁽⁵⁾.

Hyperlipidemia or hyperlipoproteinemia involves abnormally elevated levels of any or all lipids and/or lipoproteins in the blood⁽⁶⁾. Fatty acid consumption was associated with the risk of stroke, in general, long-chain saturated fatty acids (14 or more) tend to increase risk for CVD and cerebrovascular accident⁽⁷⁾.

High-density lipoprotein cholesterol (HDL-C) is one of the five major groups of lipoproteins, and it is the smallest in the molecular size. HDL-C carries many lipid and protein species, several of which have very low concentrations but are biologically very active. HDL-C help to inhibit oxidation, inflammation, activation of the endothelium, coagulation, and platelet aggregation. All these properties may contribute to the ability of HDL-C to protect from atherosclerosis⁽⁸⁾.

There is overwhelming evidence for a strong independent, inverse relation between levels of HDL-C and coronary heart disease⁽⁹⁾. However, their association with cerebrovascular disease is not clear. Indeed, HDL-C is not usually mentioned as a risk factor for ischemic stroke⁽¹⁰⁾. The association between coronary artery disease and cerebrovascular disease can be ascribed to a common pathophysiological antecedent, atherosclerosis. Many patients with clinically apparent or silent myocardial ischemia have coexistent cerebrovascular disease.

Atherosclerotic lesions tend to develop first in the aorta, then in the coronary arteries, and later in the cerebrovascular and peripheral circulation⁽¹¹⁾. Serum lipid levels have been related to carotid artery atherosclerosis in a variety of ultrasonographic and angiographic studies⁽¹²⁾, but their relation to stroke is unclear. A negative association between HDL-C levels and risk of stroke or transient ischemic attacks has been found in several, although not all, case-control studies⁽¹³⁾.

The purpose of this study was to examine the association of specific lipoprotein class (serum HDL) and ischemic stroke among men and women.

Methods

It is a case control study held at Al-Imamain Al-Kadhemain Medical City to evaluate the association between serum HDL-C levels and the occurrence of ischemic stroke.

From November 2013 to March 2015, 48 patients aged 43 to 89 years (21 males, 27

females) admitted to the Department of Medicine at the Al-Imamain Al-Kadhemain Medical City in Baghdad for acute ischemic stroke with negative past medical history were included in this study.

All of them presented with a focal neurological deficit of sudden onset. Transient ischemic attacks (complete regression of all neurological deficits in less than 24 hours) and strokes were both included.

Patients with vascular risk factors other than hyperlipidaemia were excluded from entry to the study by asking patients whether a doctor had ever told them that they had hypertension, angina or myocardial infarction (heart attack, coronary thrombosis), previous stroke, diabetes, or other disorders. They were also asked for details of any regular medical treatment including antihypertensive treatment, 12-lead ECG was recorded at rest. Serum lipid profile was determined in all patients.

Patients with hemorrhagic transformation were excluded during data collection.

Clinical examination and cerebral CT scan without contrast injection were performed in all of them after admission.

These information were obtained from the patients themselves if they were able to communicate or from their relatives if they were unable to talk.

Fifty healthy persons of the same age group from staff of the hospital were randomly recruited during the same period, asked whether a doctor had ever told them that they had hypertension, angina or myocardial infarction (heart attack, coronary thrombosis), stroke, diabetes, or other disorders. They were also asked for details of any regular medical treatment including antihypertensive treatment, Serum lipid profile was determined in all of them.

Data Analysis

Lipid profile was done for them for the purpose of this study; a serum sample after 12 hours of overnight fasting was taken to the lab for the

measurement the Total serum cholesterol, triglycerides, and HDL-cholesterol, using enzymatic colorimetric method.

Statistical Analysis

Analysis of data was carried out using the available statistical package of SPSS-17 (Statistical Packages for Social Sciences-version 17 "PASW" Statistics) for determination of statistical significance among different variables. A descriptive statistics like mean together with analytic statistics, have been done when appropriate. A *P* value of less than 0.05 was considered as significant.

Results

The study included 48 (patients with ischemic stroke and negative past medical history), and 50 (healthy persons served as control).

The frequency of ischemic stroke among patients was more in females 27 (56.25%), with only 21 male patients (43.75%), while the control group was chosen with equal male: female ratio (Table 1).

The frequency of ischemic stroke was also more frequent among the age older than 65 years with 35 cases (72.9%) while 13 cases (27%) were found to be younger than this age, In the control group the age difference was less prominent with 26 patients (52%) were older than 65 years and 24 patients (48%) younger than this (Table 2).

Regarding the serum HDL-C levels, 41 (85.4%) patients were found to have low levels (less than 40 mg/dl) while among the control group, only 19 (38%) have shown low serum HDL-C level (Table 5, Figure 1).

Table 1. Gender distribution among cases and control groups

Sex	Cases	%	Controls	%	<i>P</i> value
Male	21	43.75%	25	50%	0.5
Female	27	56.25%	25	50%	

Table 2. Age distribution in the cases and control groups

Sex	Cases	%	Controls	%	<i>P</i> value
> 65 years	35	72.9%	26	52%	0.03
≤ 65 years	13	27%	24	48%	

Table 3. The relationship between age and sex among cases

Sex	Male	Female	Total	<i>P</i> value
> 65 years	14	21	35	0.39
≤ 65 years	7	6	13	
Total	21	27	48	

Table 4. The frequency of the presenting symptoms among cases

Symptoms	Frequency	Percentage
Left sided weakness	16	33.0%
Right sided weakness	20	41.6%
Slurred speech	12	25.0%

Table 5. The serum HDL-C levels among cases and control groups

Serum HDL	Cases	%	Controls	%	P value
≤ 40 mg/dl	41	85.4%	19	38%	< 0.0001
> 40 mg/dl	7	14.5%	31	62%	

Odd Ratio= 9.56

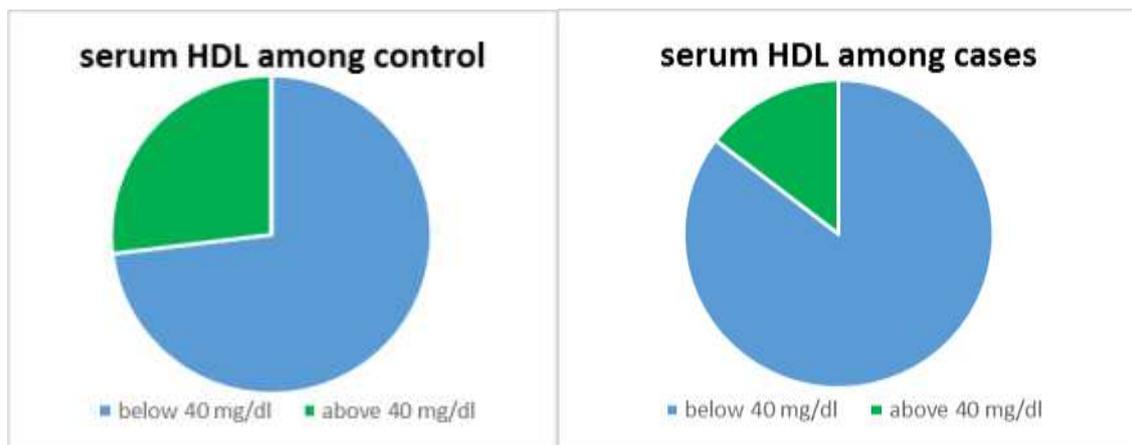


Figure 1. HDL-C level

Discussion

It has been shown in this case-control study, which is done on 48 ischemic stroke patients with negative past medical history and 50 control persons that the number of female patients was 27 compared to 21 male patients but this sex difference among cases wasn't statistically significant. It could be due to the small sample examined in this hospital based study since previous studies have indicated that Men have a higher risk for stroke. It has also revealed that 35 cases were older than 65 years while only 13 were younger than this age, and this is statistically significant difference among age group between patients

with ischemic stroke and the control group ($P = 0.03$)

These results were consistent with Senelick et al that showed that 95% of strokes occur in people aged 45 years and older and two-thirds of strokes occur in those over the age of 65 years⁽¹⁴⁾. They are also consistent with Al-Mahdawi et al study in which there was statistically significant difference among age group older than 55 years with ischemic stroke ($P = 0.04$), this indicates that old age is an important risk factor in the development of stroke⁽¹⁵⁾.

Regarding the level of serum HDL-C, this study showed that 85.4% of the patients were having

low levels while only 38% of the control group were having such results taking into consideration that the control group were healthy, this may point to the importance of serum HDL-C levels in patients with ischemic stroke. The Northern Manhattan Stroke study has demonstrated a protective effect of greater HDL-C level for ischemic stroke in an elderly, multiethnic population of men and women and that HDL-C levels showed more protection for atherosclerotic stroke than non-atherosclerotic infarction but was significantly protective against both subtypes⁽¹⁶⁾. The Veterans Affairs–High density lipoprotein cholesterol Trial (VA-HIT) showed an independent protective effect of HDL-C level for stroke and other vascular outcomes over the 5 years of the study⁽¹⁷⁾.

Prospective cohort studies generally support an inverse association between HDL-C levels and the risk of ischemic stroke⁽¹⁸⁻²⁰⁾ and this was also consistent with the findings of the inverse association between HDL-C and the risks of total and ischemic stroke in both men and women in Yurong Zhang et al study⁽²¹⁾.

However, the relationship between abnormalities of serum lipids and stroke has been less clear than for coronary artery disease⁽²²⁾. Some prospective cohort studies including the Framingham Heart Study have found no association between total serum cholesterol or HDL-C level and cerebral infarction⁽²³⁾; this could be because many of those studies did not differentiate between cholesterol components and the different stroke subtypes⁽²⁴⁾.

In this hospital based case-control study, there is a significant association between the occurrence of ischemic stroke and the low levels of serum HDL-C cholesterol.

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Author Contribution

Dr. Al-Khazraji: research idea & discussion. Dr. Mudhahir: cases collection & writing. Dr.

Hassan: reviewing of literatures of this & other researches.

Conflict of Interest

The authors disclose no any financial & personal relationships with other people or organizations that inappropriately influence (bias) outwork.

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