

Relationship of Serum Lipid Profiles and Serotonin with Major Depression: A Matched Case-Control Study

ARTICLE INFO

Article Type

Original Research

Authors

Hashemi Mohammad-Abad N.¹ MD,
Hoseiniyan L.¹ MD,
Malekzadeh J.^{*2} PhD

How to cite this article

Hashemi Mohammad-Abad N, Hoseiniyan L, Malekzadeh J. Relationship of Serum Lipid Profiles and Serotonin with Major Depression: A Matched Case-Control Study. Journal of Clinical Care and Skills. 2021; 2(2):83-86.

ABSTRACT

Aims Depression is a common mental disorder. This study aimed to evaluate the relationship between serum lipid profiles and serum serotonin with depressive disorder.

Materials & Methods This study was carried out on patients with depressive disorders referred to Shahid Mofteh Clinic in Yasuj, Iran, in 2016. The total serum cholesterol, LDL-C, HDL-C, and serum serotonin of 45 patients with the depressive disorder as a case group and 45 normal people without depressive disorder as a control group was measured. Age, sex, weight, and height were matched in both groups. Diagnosis of depression was conducted using both the Beck and Hamilton depression rating scale, followed by an interview by a psychiatrist. Data were analyzed using the SPSS 19 software by sample t-test and the chi-square test.

Findings The LDL-C serum concentrations of the case group was higher than the control group (121.1 ± 30.9 vs 107.9 ± 36.9 ; $p=0.07$); moreover, the HDL-C serum of the case group was significantly lower than the control group (52.6 ± 11.9 vs. 34.4 ± 9 ; $p<0.0001$). The Serum serotonin of the case group was higher than the control group, but this difference was not statistically significant (455.9 ± 393 vs. 418.1 ± 224.4 ; $p=0.58$). The total cholesterol and Triglyceride of the case group were higher than the control group, but these differences were not statistically significant (178 ± 37.8 vs. 191.2 ± 47 and 127.4 ± 56.2 vs. 148.5 ± 88.4 respectively; $p=0.14$).

Conclusion The serum HDL-C concentration of depressed patients is lower than normal people, and the serum LDL-C concentration of depressed patients is higher than normal people.

Keywords Depression; Cholesterol; Serotonin; LDL-C; HDL-C

¹Department of Psychiatry, Faculty of Medicine, Yasuj University of Medical Sciences, Yasuj, Iran

²Social Determinants of Health Research Center, Yasuj University of Medical Sciences, Yasuj, Iran

*Correspondence

Address: School of Health, Yasuj University of Medical Sciences, Yasuj, Iran. Postal Code: 7591875114.

Phone: +98 (74) 33223505

Fax: +98 (74) 33226715

malekjmd@yahoo.com

Article History

Received: January 29, 2020

Accepted: April 05, 2021

ePublished: June 20, 2021

CITATION LINKS

[1] Epidemiology of depression ... [2] The epidemiology of major depressive disorder: Results ... [3] Prevalence and distribution of major depressive ... [4] Cholesterol and mental ... [5] Association of low serum total cholesterol ... [6] Kaplan and Sadock's synopsis of psychiatry ... [7] Serum leptin and cholesterol values in ... [8] LDL cholesterol relates to depression ... [9] High cholesterol, triglycerides, and body ... [10] Low cholesterol is associated with ... [11] HDL cholesterol and the risk of depression ... [12] Associations between cholesterol and fatty acid ... [13] Association between total serum cholesterol ... [14] Are serum cholesterol levels associated with ... [15] Association of serum lipid profiles with ... [16] No evidence for an association ... [17] Low levels of cholesterol and the cholesterol ... [18] Relation of serum cholesterol, lipid ... [19] Relationship between serum cholesterol ... [20] Chronic cholesterol depletion using statin ... [21] Sample size tables for clinical ... [22] Psychometric properties of a Persian ... [23] Validity and reliability of the depression in old ... [24] Psychometric properties of the Beck depression ... [25] Psychometrics Characteristic of Beck Depression ... [26] The Hamilton rating scale for ... [27] Application of the Beck Depression ... [28] Attribution style in patients with anxiety ... [29] Serum lipids: New biological markers ... [30] Lower HDL-cholesterol, a known marker ... [31] Serum lipid concentrations in patients ... [32] Low serum cholesterol in suicide ... [33] Association of lipid profile with depressive ...

Introduction

Depression is a common mental disorder characterized by depressed mood, anhedonia, anorexia, insomnia, difficulty concentrating, lethargy, and suicidal considerations. The prevalence of depression is 10-15% in the general population and higher among women than men [1-3]. The definite etiology of depression is unknown, but biological, hormonal, environmental, genetic, and psychosocial factors have been reported. There are certain shreds of evidence about the relation between serum lipids and depressive disorder, aggression, suicide, and some other psychiatric disorders [4-8].

Various studies have reported that high serum cholesterol and/or triglyceride, high LDL-C, and/or low HDL-C are related to depression and suicidal attempts [8-12]; however, other studies showed a relation between low serum cholesterol and depression [10-13], higher serum LDL-C and lower depression [14] or did not show any significant association between lipid profiles and depressive disorders [15-17]. Serum serotonin levels were significantly lower in patients with depression committing a recent suicidal attempt than those who did not [18]. In one report, Terao *et al.* showed that the serum cholesterol levels might be positively associated with serotonergic receptor function and low serum levels of serotonin [19]. It appears that may be a relationship between serum cholesterol and serotonin action and also psychiatric disorders, especially depressive disorders [20].

According to the controversies on the relationship between cholesterol profiles and depression disorders, This study aimed to compare the total serum cholesterol levels, triglyceride, serum HDL-C, LDL-C, and serotonin in a group of newly-referred depressed patients with the matched healthy controls.

Materials and Methods

This study was carried out on patients with depressive disorders referred to Shahid Mofteh Clinic in Yasuj, Iran, in 2016. Forty-five samples in each group were estimated considering the 95% test confidence interval, 90% test power, and about 30mg/dL variance of total serum cholesterol according to the study by Deisenhammer *et al.* [16], to test the assumption of 15mg/dL different serum cholesterol concentrations between the two groups [21]. The sampling method was convenient. The inclusion criteria for cases were being newly diagnosed depressive patients and not receiving any medical treatment up to diagnosis. The patients who previously received any kind of antidepressant and hypolipidemic agents or were on a diet and those who were alcohol abusers, substance abusers, and who had cancer or any somatic disease were not included in the study. Also, Women were excluded if they were pregnant or breastfeeding their child.

A locally validated Beck depression inventory test was used to identify depressed candidates [22, 23]. For the Beck depression inventory, a score >10 was considered as depressed, within 10-19 regarded as mild, 20-29 as moderate, 30-39 as partially severe, and >40 as severe depression [24, 25]. A score of 0-7 was generally accepted within the normal range in the Hamilton rating scale, while a score of 20 or higher (indicating at least moderate severity) was required for entry into the study [26]. The validity and reliability of the beck test are approved by Rahimi *et al.* [27]. In this study, the reliability and correlation coefficients of 0.55 and 0.83 were obtained from test-retest and Cronbach's alpha methods, and Gharaie *et al.* reported the reliability coefficient of the Hamilton Stress Rating Scale with the Hilton Anxiety Rating Scale using the retest method of 0.85 and 0.89 [28]. The total serum cholesterol, LDL, and HDL cholesterol were measured by Auto-Analyzer, model 912 (Hitachi, Japan), and the serum serotonin by ELISA method using ELISYS-UNO (Human co, Germany).

The ethics committee and vice chancellor for research at Yasuj University of Medical Sciences approved the study. Patients were informed about this research, and written informed consent was obtained from participants or their legal guardians. The controls were matched with patients' age, sex, weight, height, and body mass index (BMI) were filled in a datasheet for all cases and controls. Patients filled the Beck depression rating scale and Hamilton rating scale; moreover, a psychiatrist visited them to determine not having a psychological problem. Forty-five newly diagnosed major depression patients diagnosed through evaluation by the Beck depression rating scale (score>39) and/or Hamilton rating scale (score>19) and psychiatrist interview were selected as cases. Forty-five healthy people were also selected as their control. Both the case and control groups were referred to the Laboratory of Imam Sajad Hospital of Yasuj to measure their total serum cholesterol, LDL-C, HDL-C, and serotonin.

Data were analyzed using the SPSS 19 software. The continuous data were tested for normality distribution, and they did not show significant distribution from normality, so the parametric independent sample t-test was used to compare two groups' means. The Qualitative variables were analyzed using the chi-square test.

Findings

There were 18 men and 72 women in both groups, 9 (20%) men and 36 (80%) women in the case group, and 9 (20%) men and 36 (80%) women in the control group.

There was no significant difference between the two groups regarding the basic demographic data, including age, gender, weight, height, and BMI (Table 1).

Table 1) The mean±SD of age, weight, height, and BMI of case and control groups

Variable	Case	Control	p-value
Age	35.2±11.4	35.6±9.7	0.8
Weight	64.2±12.2	66.7±9.8	0.3
Height	163.3±8.3	161.7±5.9	0.3
BMI	24.1±4.9	25.4±3.3	0.16

Although there was a difference between the two groups in terms of total cholesterol, TG, and serotonin, these differences were not significant. The LDL-C concentration of the case group was more than the control group; similarly, the HDL-C concentration of the case group was lower than the control group; these differences were significant (Table 2).

Table 2) Mean±SD of serum lipids and serotonin of case and control groups

Index	Case	Control	p-value
HDL (mg/dl)	34.4±9.0	52.6±11.9.0	0.0001
LDL (mg/dl)	121.1±30.9	109.7±36.9	0.07
Total cholesterol (mg/dl)	178±37.8	191.2±47.0	0.14
TG (mg/dl)	127.4±56.2	148.5±88.4	0.18
Serum serotonin (µg/dl)	455.9±393	418.1±224.4	0.58

Discussion

The present study's findings indicated that the serum HDL-C concentration of depressed patients was significantly lower than the control group. However, the total serum cholesterol, LDL, and triglycerides differences were not statistically significant between the two groups. Tedders *et al.* reported a U-shaped relation between LDL-C and depression, showing that both high and low serum LDL-C may be related to depression [10], while other studies reported a lower serum LDL-C in depression [29]. On the other hand, other studies did not find any significant relation between the serum LDL-C and depression in different human subjects [15-18].

Like the present study, Almeida-Montes *et al.* reported that lower HDL-C was related to depression in a five-year cohort study [11]. Melin *et al.* also reported the same findings [30]. Against the present study's findings, the studies of Khalid *et al.* and Olusi *et al.* displayed higher HDL-C concentrations in Major depressive disorder patients [29, 31].

Comparing the total serum cholesterol of the case and control group, we could not find any statistical difference; however other researchers reported a significant relationship between low serum cholesterol [5, 7, 10, 13, 19, 32] or high serum cholesterol [9] and mental disorders such as depression and suicide attempts. Like this study, some studies did not indicate any significant relationship between total serum cholesterol and depression [10, 15, 16, 18]. Gupta *et al.* reported that low HDL and high LDL might be protective against depression but did not report any statistical difference between the total cholesterol in depressed and non-depressed groups [33]. Almeida *et al.* indicated that the serum levels of serotonin were significantly lower in patients with depression who had a recent suicidal attempt than in those who had

not [18]. Terao *et al.* showed the serum cholesterol levels might be positively associated with serotonin function; low serum levels of serotonin may increase the risk of suicidal attempts in individuals with low cholesterol [19]. However, there was no significant difference between the case and control groups in this research in terms of serotonin.

Larger studies with larger sample sizes and implementing experimental and trial studies for more confident conclusions are suggested.

Conclusion

The serum HDL-C concentration of depressed patients is lower than normal people, and the serum LDL-C concentration of depressed patients is higher than normal people.

Acknowledgments: The authors thank all the participants along with their families. We are also grateful to our colleagues in Shahid Mofatteh Psychiatric Clinic, Rajae Hospital, and the vice chancellor for research, Yasuj University of Medical Sciences, to assist this study.

Ethical Permissions: The ethics committee and vice chancellor for research at Yasuj University of Medical Sciences approved the study.

Conflicts of Interests: None declared by Authors.

Authors' Contribution: Hashemi Mohammadabad N. (First author), Introduction author/Original researcher/Discussion author (350%); Hoseiniyan L. (Second author), Introduction author/Assistant researcher/Discussion author (30%); Malekzadeh J. (Third author), Assistant researcher/Methodologist/Statistical analyst/Discussion author (35%).

Funding/Sources: There was no funding.

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