

# Low Cholesterol Level in Patients With Antisocial Personality Disorder: the Association With Homicidal Behavior

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## SUMMARY:

LOW CHOLESTEROL LEVEL IN PATIENTS WITH ANTISOCIAL PERSONALITY DISORDER: THE ASSOCIATION WITH HOMICIDAL BEHAVIOR

**Object:** In the present study, we sought to determine whether an association exists between low cholesterol level and homicidal behavior. **Method:** The subjects of the study were antisocial personality disorder patients with (N=17) and without (N=13) homicidal behavior and 40 normal control subjects. When we compared serum lipid levels in patients with homicidal act, in patients without homicidal act, and in control subjects, we found that the mean serum triglyceride level of homicidal patients were lower than nonhomicidal patients and control subjects. **Results:** There is a relationship between lipid metabolism and cerebral serotonin in aggressive and homicidal behavior. **Conclusions:** It may be suggested that brain serotonin has an important and key role in the association between low cholesterol levels and violent behavior.

**Key words:** aggression, violence, homicide, antisocial behavior, cholesterol, serotonin.

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## ÖZET:

ANTİSOSYAL KİŞİLİK BOZUKLUKLU HASTALARDA DÜŞÜK KOLESTEROL DÜZEYİNİN HOMİSİDAL DAVRANIŞLA BİRLİKTELİĞİ

**Amaç:** Bu çalışmada düşük kolesterol seviyesi ile homosidal davranışı arasında bir bağlantı olup olmadığını belirlemeyi amaçladık. **Yöntem:** Çalışmaya denek olarak 17'si (N:17) homosidal davranış gösteren, 13'ü (N:13) göstermeyen 40 kişilik hasta grubuyla; 40 kişilik normal kontrol grubu alındı. Homosidal davranışta bulunan hastaların serum lipid seviyelerini, homosidal davranışta bulunmayanlar ve kontrol grubuyla karşılaştırdık. **Bulgular:** Homosidal davranışta bulunan hastaların serum trigliserit seviyeleri, homosidal davranışta bulunmayanlar ve kontrol grubuna göre anlamlı derecede düşük bulundu. **Tartışma:** homosidal davranış ve saldırganlık ile beyin serotonin ve lipid metabolizması arasında bir bağlantı vardır. Beyin serotonininin, düşük kolesterol seviyesi ile şiddet içeren davranışlar arasındaki bağlantıda önemli ve anahtar konumda olduğu ileri sürülebilir.

**Anahtar sözcükler:** saldırganlık, şiddet, homosid, antisosyal davranış, kolesterol, serotonin

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## INTRODUCTION

Recently, the relationship between serum cholesterol and psychiatric disorders had been focused on several psychiatric researches (1-18). High cholesterol levels have been demonstrated in patients with panic disorder (1, 2, 3, 6). An interesting topic is the relationship between cholesterol level and major depression. Low serum cholesterol level in the patients major depression has previously been noted by some authors (1, 11). Glueck et al (1994) demonstrated that patients with affective disorders had much lower plasma total cholesterol, LDL-cholesterol, HDL-cholesterol, and higher triglyceride concentrations (10). A link between cholesterol and depression is intriguing because of the risk of developing a bi-

ological marker. In a previous study, Ağargün et al (1998) examined the association between low cholesterol level and major depression in a group of patients with panic disorder (2). They found that there was an association between low cholesterol level and the presence of major depression in patients with panic disorder. They suggested that a low serum cholesterol level might serve as biological marker of major depression in patients panic disorder (2). Results from several cohort studies suggest that low serum cholesterol concentration is associated with an increased risk of suicide and attempted suicide (9). In a comprehensive study, Zureik et al (1996) suggested that both low serum cholesterol concentration and declining cholesterol concentration were associated with increased risk of death from suicide in men (18).

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Another actual topic is the relationship between serum cholesterol and aggressive behavior. During past decades, several studies examined this association (for a review see Bond 1993) (4). Recent studies in the medical literature have tended to ignore the wealth of psychological research which has been devoted to attempting to elucidate the relationship between serum lipids, stressful experiences, and personality characteristics (12). In the present study, we sought to determine whether an association exists between low cholesterol level and homicidal behavior in a sample of patients with antisocial personality disorder.

## METHOD

The subjects of the study were 30 patients with antisocial personality disorder, diagnosed according to DSM IV, and 40 normal control subjects. All of the patients included in this study were selected from a group of 112 subjects with antisocial behavior. Inclusion criteria for the study were: 1) meeting the DSM IV criteria for antisocial personality disorder (for patients); 2) an age between 18 and 65 years; 3) good physical health as determined by physical and laboratory examination; 4) no history of psychotic disorders or current substance abuse; and 5) having history of criminal behavior. The seventeen (57 %) of patients antisocial personality disorder had a history of, at least one, homicidal behavior. None of the patients were treated with psychotropic drugs during the study. There was a wash-out period (at least two-weeks) of psychotropic drug before blood was collected. None of control subjects had no history of homicidal or serious aggressive acts.

The mean ages for the groups were as: the patients with antisocial personality disorder  $17.6 \pm 4.3$  years and controls  $18.1 \pm 4.8$ . There was no significant difference between two groups in age (student's test;  $t=0.97$ ,  $p>0.05$ ). All of participants were male.

The mean body mass index (BMI in  $\text{kg}/\text{m}^2$ ) of the patients and control subjects were  $27.1 \pm 3.3$  and  $26.6 \pm 3.7$  (mean  $\pm$  SD) respectively.

All subjects gave informed consent to participate in this study and were requested to avoid medications affecting lipid levels (e.g. beta blockers, diuretics, androgens, estrogens, disulfiram, corticosteroids, levodopa, and aminosalicylic acid) for at least 2 weeks. All subjects were free of low-cal and cholesterol-

lowering diets. Blood samples were drawn after a night of fasting. Venipuncture was done in a sitting position using a tourniquet. An automated enzymatic colorimetric method was used for cholesterol and triglyceride determination. High-density lipoprotein (HDL) cholesterol was measured after precipitation of other lipoproteins with phosphotungstic acid-magnesium acetate (Cromotest kit). Low-density lipoprotein (LDL) cholesterol was calculated according to the method of Friedewald formula (Friedewald et al 1972). The inter-assay CV value was 0.72 for cholesterol and 0.68 for triglyceride.

All data are reported as the mean  $\pm$  1 SD. Group data were analyzed using Student's t test (two-tailed). Analyses were performed using the SPSS for Windows v6.0.

## RESULTS

The mean serum total cholesterol level of patients with antisocial personality disorder and control groups were 139.3 mg/dl (SD=18.7) and 159.3 mg/dl (SD=37.6), respectively. Student's t test revealed a significant variation in serum total cholesterol levels across the groups ( $t=2.58$ ;  $df=55$ ;  $p<0.05$ ); so serum total cholesterol level was significantly lower in patients with antisocial personality disorder than control subjects. Mean serum triglyceride level was 120.4 mg/dl (SD=51.1) and 169.2 mg/dl (SD=89.5), respectively. There is a significant difference between the groups in serum triglyceride level ( $t=2.56$ ;  $df=55$ ;  $p<0.05$ ). Mean serum HDL level was 39.8 mg/dl (SD=5.2) and 43.2 mg/dl (SD=5.9), respectively. Mean serum HDL level was lower in patients with antisocial personality disorder than the others ( $t=2.30$ ;  $df=55$ ;  $p<0.05$ ). Mean serum LDL level was 76.1 mg/dl (SD=22.6), 91.6 mg/dl (SD=20.7) and 78.8 mg/dl (SD=28.4), respectively. Serum LDL levels did not differ for patients and controls ( $t=0.40$ ;  $df=55$ ;  $p>0.05$ ).

In a second analysis, we compared serum lipid levels in patients with homicidal act (N=17), in patients without homicidal act (N=13), and in control subjects. The mean serum total cholesterol level of homicidal patients, nonhomicidal patients, and control subjects was 140.1 mg/dl (SD=17.8), 138.3 mg/dl (SD=16.9), and 159.3 mg/dl (SD=37.6), respectively. ANOVA revealed a significant variation in serum total cholesterol levels across the three groups ( $F=3.28$ ;  $df=2.54$ ;  $p<0.05$ ). Post-hoc comparisons of

three groups with the Student-Newman-Keuls multiple-range test revealed significant difference between the homicidal and control groups. Mean serum triglyceride level was 125.3 mg/dl (SD=62.1), 114.4 mg/dl (SD=59.4), and 169.2 mg/dl (SD=89.5), respectively ( $F=3.31$ ;  $df=2.54$ ;  $p<0.05$ ). Post-hoc comparisons of three groups with the Student-Newman-Keuls multiple-range test revealed significant differences between the three groups. Mean serum HDL level was 37.9 mg/dl (SD=4.2), 41.3 mg/dl (SD=5.1), and 43.2 mg/dl (SD=5.9), respectively. Post-hoc comparisons of three groups with the Student-Newman-Keuls multiple-range test revealed significant difference between the homicidal and control groups. Mean serum LDL level was 76.0 mg/dl (SD=25.4), 76.4 mg/dl (SD= 21.7), and 78.8 mg/dl (SD=28.4), respectively. There was no significant difference between the groups in serum LDL level ( $F=0.08$ ;  $df=2.54$ ;  $p>0.05$ ).

## DISCUSSION

In the present study, we found that patients with antisocial personality disorder had lower serum cholesterol, triglyceride, and HDL levels than the control subjects. When we compared serum lipid levels in patients with homicidal act, in patients without homicidal act, and in control subjects, we found that the mean serum triglyceride level of homicidal patients were lower than nonhomicidal patients and control subjects. Thus, it may be suggested that low serum triglyceride level might serve a biological marker of homicidal tendency in this population.

Several studies have examined the possible association between lipid levels and aggressive behavior.

Virkkunen (1979) found a 40 mg/dl lower mean total cholesterol level among men with antisocial personality disorder; the analysis, however, did not address several potential confounders and other psychiatric disorders that were observed (15). Relatively low cholesterol levels have also been seen among adolescent boys with aggressive conduct disorder (16), men who were violent under the influence of alcohol (17). In contrast, other investigators have reported that cholesterol levels show no association with either antisocial personality or aggression (8,14).

A possible mechanism that may explain low serum cholesterol and triglyceride levels involves the relationship between lipid metabolism and cerebral serotonin in aggression. In biological membranes, cholesterol is distributed in the phospholipid layer, where it is loosely bound and so can freely exchange with serum cholesterol (13). Thus, a reduction in serum lipid may decrease brain-cell-membrane cholesterol, lower the lipid microviscosity, and decrease the exposure of protein serotonin receptors on the membrane surface, resulting in a poorer uptake of serotonin from the blood and less serotonin entry into brain cells. When the role of brain serotonin in impulse control is considered, this chain of events is a pathway by which a lowered blood cholesterol might trigger suicide or violence in susceptible subjects (5).

As a consequence, the present study demonstrates that there is an association between low serum lipid levels, particularly cholesterol level, and the presence of aggressive and homicidal behavior. However, we need to know most about this association and future studies with large sample should be performed to confirm these findings.

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