

Correlation between Levels of Serum Cholesterol and Depression in Parasuicide Patients

Adila Reddy^{1*} and Lokesh Kumar Kalasapati²

¹Department of Psychiatry, Bhaskar Medical College and Bhaskar General Hospital, Hyderabad, India

²Department of Psychiatry, Bhaskar Medical College and Bhaskar General Hospital, Hyderabad, India

Corresponding author: Adila Reddy, Bhaskar Medical College and Bhaskar General Hospital, Hyderabad, India Email: adilabaddam@gmail.com

Citations: Reddy A, Kumar KL (2020) Correlation between levels of serum cholesterol and depression in parasuicide patients. Clin Psychiatry Vol.6 No.5:77.

Received Date: November 11, 2020; **Accepted date:** November 25, 2020; **Published date:** December 02, 2020

Abstract

Background: Studies on the association of cholesterol levels with depression have yielded mixed results. Similarly, the association between suicidality and cholesterol is conflicted. The effect of statins on various mental health diseases is also widely debated.

Objective: To assess and establish a correlation between levels of cholesterol and depression in parasuicide patients.

Methods: Study Design: Cross-sectional.

Study Period: June 2, 2016 to June 1, 2017.

Study Area: Yenkapally, Telangana.

Sample Size: 98.

Study population: Inpatients who have attempted suicide.

Exclusion criteria: Nutritional and metabolic disorders, schizophrenia, dementia, mental retardation, alcoholism, patients on antidiabetics, antidepressants or statins, etc. The exclusion criteria was extensive to exclude any cause known to influence cholesterol or depression levels.

Data collected: Demographic data, serum cholesterol level, and level of depression.

Data analysis: R Project statistical software and Social Science Statistics.

Results: The total serum cholesterol levels showed no variation in subjects from different sexes of similar age, nourishment, and built. They were consistent with the socio-economic status and the age of the individual. The level of depression among the subjects showed no discernable pattern with age, gender, and socio-economic status. A graph plotted shows an overall picture that the total serum cholesterol and the level of depression are inversely proportional to each other. The statistical correlation established was significant ($r=-0.3607$, $p=0.000272$). Upon gender stratification the values were consistent: Female ($r=-0.3452$, $p=0.005588$), Male ($r=-0.4487$, $p=0.010397$).

Conclusion: The level of cholesterol is inversely proportional to the level of depression. This correlation has a significant impact on the clinical practice of psychiatry and the treatment of depression. It helps in the identification of individuals at high risk of developing depression.

Keywords: Cholesterol; Suicide; Depression; HAM-D; Parasuicide

Introduction

Suicide is defined as the intentional taking of one's own life [1]. Suicide is the third leading cause of death in 15-19-year-olds. [2] A prior suicide attempt is the single most important risk factor for suicide in the general population [2].

The association between mental disorders and suicide has been excessively documented. [3-5] the role of serotonin in mood disorders is also known. [6,7] The doctoral work of PHA Steegmans suggested that, decrease in fatty acids, leads to decrease in protein bound fatty acids and protein bound tryptophan, leading to a decrease in tryptophan hydroxylase activity, which in turn leads to a fall in CNS serotonin levels, which leads to depression. [8] He further suggested that a fall in cholesterol level contributes to an increase in violent deaths, including suicide, which is supported by other papers [8-10].

The role of cholesterol lowering drugs, statins in causing depression has been inconclusive. Some studies show that statins could lead to depression [11] and though statins are widely tolerated, in some participants, may increase the risk of serious psychiatric events and/or behavioral changes [12] Other studies contradictorily suggest that statins be used as an adjunct drug in treatment for depression as they improve the patient's mood [13] and lower the risk of depression [14].

The level of total serum cholesterol in patients suffering from depression has not been adequately studied. Cholesterol levels were lower in manic and depressive than in mixed episodes. [15] A 1998 study concluded that depressive patients showed a significant depletion in the total polyunsaturated fatty acids, particularly docosahexaenoic acid in the RBC cell membrane. Incubation of RBC from the control subjects abolished all significant differences between patients and controls [16].

Similarly, there are mixed results on association between cholesterol levels and risk of suicide. Some studies found that lower cholesterol levels were associated with increased risk of suicidal behavior [17,18] and other studies found evidence in the contrary [19,20].

Objective

In this study we aim to assess and establish a relationship between serum cholesterol level and the level of depression in parasuicide patients. We also hope to assess the role of age, sex and socioeconomic status on the correlation.

Subjects and Methods

A cross-sectional study was conducted at a tertiary care teaching hospital located in a rural area of Yenkapally, Hyderabad, Telangana. The study lasted from June 2, 2016 to June 1, 2017.

A total number of 121 inpatients of the hospital were chosen to take part in the study. Out of which, patients with comorbidities, nutritional or mental disorders such as hypertension, diabetes mellitus, obesity, alcoholism, schizophrenia, dementia, mental retardation, drug dependency, and patients currently on any antidiabetic medication, antidepressants, statins, etc. were excluded. Attempt was made to exclude all causes that are known to influence the level of cholesterol and/or level of depression. The aim and procedure of the study was explained to the subjects prior to the start of the study and all questions were answered. Following which an informed consent was obtained from all participants. Some of the chosen participants did not consent to the procedure, bringing the study size to a total of 98 subjects. There were 65 female participants and 33 male participants. Ratio of female to male participants was of 2:1.

The subjects' cholesterol levels were assessed in a sterile biochemical laboratory by using prepacked kits based on modified Roeschlau's method. Blood sample needed for assessment was collected from the antecubital vein of arm by a trained medical professional following all aseptic precautions.

Level of depression in the subjects was evaluated using the Hamilton Rating Scale of Depression or 'HAM-D', a gold standard scale to rate depression in clinical practice. A multiple item questionnaire was presented to every subject to assess their level of depressiveness. The answers were evaluated in accordance with the scale suggested:

0-7=Normal

8-13=Mild Depression

14-18=Moderate Depression

19-22= Severe Depression

>23=Very Severe Depression

The data obtained from the above tests was statistically evaluated using R Project software and Social Science Statistics.

A correlation was established. Its significance was assessed using Pearson's correlation and a p-value.

Results

The total serum cholesterol levels assessed from the samples showed no variation in subjects from different genders of similar age, nourishment and built. They were consistent with the socio-economic status of the individual. A rise in the cholesterol level was seen with the rise in the patient age, which corresponds to existing data.

Levels of cholesterol	Subjects
Low Cholesterol Level (≤ 150 mg/dL)	81 subjects
High Cholesterol Level (≥ 150 mg/dL)	17 subjects
Lowest recorded Cholesterol Level	86 mg/dL
Highest recorded Cholesterol Level	204 mg/dL
Mean	130.01 mg/dL
Median	124.5 mg/dL
Mode	126 mg/dL

Table 1: Observed cholesterol levels- cholesterol levels.

The overall study sample on showed a moderate level of depression. No variation with age or gender was seen.

Levels of depression	Total
Lowest recorded HAM-D Score	7
Highest recorded HAM-D Score	32
Mean	16.81
Median	16
Mode	14

Table 2: Observed depression levels-level of depression.

4.3 Total Serum Cholesterol Level vs. Level of Depression.

A graph (**Figure 1**) plotted using the obtained values, shows the inverse relationship between total serum cholesterol and level of depression.

Overall: Pearson's correlation coefficient is -0.3607, showing a negative association. P value is 0.000272, significant.

Female: Pearson's correlation coefficient is -0.3452, showing a negative association. P value is 0.005588, significant (**Table 3**).

Male: Pearson's correlation coefficient is -0.4487, showing a negative association. P value is 0.010397, significant (**Table 4**).

Both genders showed a statistically significant correlation.

Phases (depending of level of depression)	
Phase I-7 to 10	There is nominal increase in the level of total serum cholesterol from 140

	mg/dL to 145 mg/dL with rising level of depression in females.
Phase II-10 to 26	There is a constant fall in the blood cholesterol level from 145 mg/dL to 115 mg/dL over a significantly higher range. There is a small dip at the HAM-D score of 15.
Phase III-26 to 32	With growing score of Hamilton scale of depression, there is a rise in total cholesterol from 115 mg/dL to 120 mg/dL.

Table 3: Level of depression female curve.

Phases (depending of level of depression)	
Phase I-7 to 15	There is an initial increase of cholesterol level from 100 mg/dL to 145 mg/dL with increasing levels of depression.
Phase II-15 to 18	With rising depression levels, there is a dramatic fall of cholesterol from 145 mg/dL to 124 mg/dL.
Phase III-18 to 22	With increasing level of depression, there is a slight increase in the cholesterol level from 124 mg/dL to 125 mg/dL.
Phase IV-22 to 27	The last phase of the graph shows a constant fall from 125 mg/dL to 96 mg/dL in the cholesterol level with regards to increasing depression level.

Table 4: Level of depression male curve.

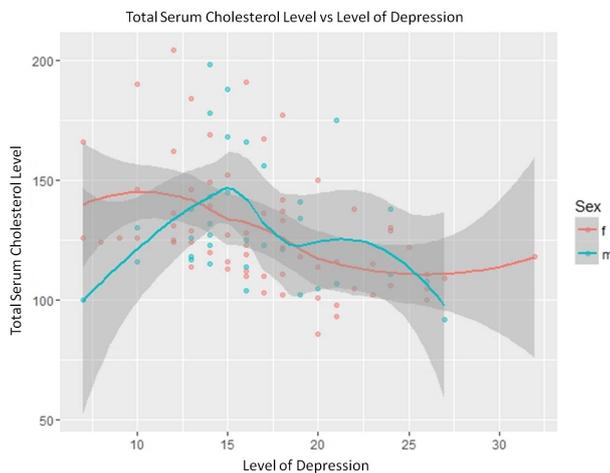


Figure 1: Graph showing the inverse relationship between 'Total Serum Cholesterol Level' and 'Level of Depression'.

Female ($r=-0.3452$, $p=0.005588$), Male ($r=-0.4487$, $p=0.010397$), and Overall ($r=-0.3607$, $p=0.000272$) values are significant ($n=98$).

Discussion

A small pilot study conducted by Ernst E, et al showed mood changes suggestive of depression associated with the use of a fibrate-induced lowering of cholesterol concentration, which is in accordance with the results of the present study [21].

A Cleveland researcher found that unipolar depressed subjects, regardless of their subtype and relatives of the depressed subjects had significantly lower esterified cholesterol ratio than normal controls. The results of this study are similar to the current study [22]. It was hypothesized that lower esterification in serum cholesterol may constitute a vulnerability factor for depression through alterations in cell membrane micro viscosity. This may contribute to the pathophysiology leading to suicide [22].

Like our study, a meta-analysis found higher total cholesterol was associated with lower levels of depression. This association was found to be substantially larger among medication-free samples [23].

A study titled 'Lipids, Depression and Suicide' stated that clinical recovery from depression may be associated with a significant increase of total cholesterol. It further mentioned that decreased levels of cholesterol in plasma were observed in patients who have committed suicide when compared to others which was also found in the current study [24].

The present study is supported by a study published in The American Journal of Clinical Nutrition which postulated that adequate long-chain polyunsaturated fatty acids, particularly docosahexaenoic acid may reduce the development of depression [25].

Association between low cholesterol level and the presence of major depression in patients with panic disorder was found in a Turkish study with suggested a broader relation between cholesterol and other psychiatric illnesses [26].

A significant decrease in serum cholesterol in patients with Major Depressive Disorder was noted in both sexes and in all age groups which was similar to the current study [27].

When the blood cholesterol levels were compared between parasuicide and normal individuals, the study showed low cholesterol concentrations in the former which is in favor of the current study [28].

A Parisian study found that both low serum cholesterol concentration and declining cholesterol concentration were associated with increased risk of death from suicide in men. This differs from the current study which found no variation based on genders [29].

A study on two trails found that when risk factors such as alcohol intoxication and psychiatric histories were considered, there was little evidence remains to support the hypothesis that cholesterol-lowering drugs are associated with deaths due to homicides, suicides, and accidents. This is dissimilar to the results of our study [30].

In direct contrast to our study it was mentioned that in recent trials using statin treatment, there were slightly fewer deaths from accidents and suicide in the treated group compared with the placebo group [31].

Highlights

Lower cholesterol levels are associated with higher aggression, impulsivity and depression. Individuals with

depression have higher chances of attempting suicide. Are individuals with low cholesterol more susceptible to depression?

Can cholesterol levels be used as an indicator to identify high risk individuals of committing suicide?

Conclusion

The conclusion of this study is that the level of cholesterol is inversely proportional to the level of depression. That is decrease in total serum cholesterol level causes an increase in the level of depression exhibited by the subject and vice versa.

Total serum cholesterol level \propto 1/level of depression.

Establishing this relation will help in better management of the patients with a history of depression and suicide. It also helps in tracking the improvement of a person's mental health following therapy as the rate of attempting suicide in the year following an episode of deliberate self-harm is hundred times more than the population in general. It helps in determining if the patient is dangerous to himself or to people around him. It further works as a marker for suicidal depressiveness. Additionally, it helps in identifying suspected individuals with a family history of depression i.e. it acts as a prognostic test. Lastly, this goes a long way in understanding the biochemical mechanism leading to suicide.

Limitations

This study fails to compare data with urban population, which may show a similar or different picture.

A longitudinal study would shed better light on the long-term effect of cholesterol on the level of depression.

Data from other ethnicities was not taken. Hence, a comparison could not have been established.

Other psychiatric adverse drug reactions could not have been assessed adequately.

The study does not take different types of lipoproteins into consideration.

This study does not assess the effect of cholesterol modifying drugs on depression.

Acknowledgements: The authors would like to thank our subjects for their participation in the research.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Suicide (2008) Gale Encyclopedia of Medicine.
2. Suicide (2019) Gale Encyclopedia of Medicine.
3. Foster T, Gillespie K, McClelland R (1997) Mental disorders and suicide in Northern Ireland. *Br J Psychiatry* 170:447.
4. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM (2003) Psychological autopsy studies of suicide: a systematic review. *Psychol Med* 33: 395-405.
5. Arsenault-Lapierre G, Kim C, Turecki G (2004) Psychiatric diagnoses in 3275 suicides: a meta-analysis. *BMC Psychi* 4: 37.
6. Meltzer HY (1990) Role of serotonin in depression. *Ann N Y Acad Sci* 6: 56-78.
7. Stockmeier CA (2003) Involvement of serotonin in depression: evidence from postmortem and imaging studies of serotonin receptors and the serotonin transporter. *J Psychiatr Res* 37: 357-73.
8. Steegmans PHA (1995) Low serum cholesterol, serotonin metabolism, and violent death. *Netherlands Institute for Health Sciences*: 123-136.
9. Reddy A, Kalasapati LK (2020) Study on Serum Cholesterol Level and Level of Violence in Individuals Attempting Suicide. *Minerva Psichiatr* 61: 61-153.
10. Engelberg H (1992) Low serum cholesterol and suicide. *Lancet* 339: 727-9.
11. You H, Lu W, Zhao S, Hu Z, Zhang J (2013) The relationship between statins and depression: a review of the literature. *Expert Opin Pharmacother* 14: 1467-76.
12. Cham S, Koslik HJ, Golomb BA (2016) Mood, personality, and behavior changes during treatment with statins: a case series. *Drug Saf- Case Rep* 3: 1-13.
13. Salagre E, Fernandes BS, Dodd S, Brownstein DJ, Berk M (2016) Statins for the treatment of depression: A meta-analysis of randomized, double-blind, placebo-controlled trials. *J Affect Disord* 200: 235-42.
14. Parsaik AK, Singh B, Hassan MM, Singh K, Mascarenhas SS, et al. (2014) Statins use and risk of depression: a systematic review and meta-analysis. *J Affect Disord* 160: 62-7.
15. Ghaemi SN, Shields GS, Hegarty JD, Goodwin FK (2000) Cholesterol levels in mood disorders: high or low? *Bipolar Disord* 2: 60-4.
16. Peet M, Murphy B, Shay J, Horrobin D (1998) Depletion of omega-3 fatty acid levels in red blood cell membranes of depressive patients. *Biol Psychiatry* 43: 315-9.
17. Kunugi H, Takei N, Aoki H, Nanko S (1997) Low serum cholesterol in suicide attempters. *Biol Psychiatry* 41: 196-200.
18. Lee HJ, Kim YK (2003) Serum lipid levels and suicide attempts. *Acta Psychiatr Scand* 108: 215-21.
19. Lester D (2002) Serum cholesterol levels and suicide: a meta-analysis. *Suicide Life-Threat. Behav* 32: 333-46.
20. Golier JA, Marzuk PM, Leon AC, Weiner C, Tardiff K (1995) Low serum cholesterol level and attempted suicide. *Am J Psychiatry* 152: 419-23.
21. Ernst E, Saradeth T, Seidl S, Resch KL, Frischenschlager O (1994) Cholesterol and depression. *Arch Intern Med* 154: 1166-7.
22. Maes M, Delanghe J, Meltzer HY, Scharpe S, D'hondt P, et al. (1994) Lower degree of esterification of serum cholesterol in depression: relevance for depression and suicide research. *Acta Psychiatr Scand* 90: 252-8.
23. Shin JY, Suls J, Martin R (2008) Are cholesterol and depression inversely related? A meta-analysis of the association between two cardiac risk factors. *Ann Behav Sci* 36: 33-43.

24. Colin A, Reggers J, Castronovo V, Anseau M (2003) Lipids, depression and suicide. *Encephale* 29: 49-58.
25. Hibbeln JR, Salem Jr N (1995) Dietary polyunsaturated fatty acids and depression: when cholesterol does not satisfy. *Am J Clin Nutr* 62: 1-9.
26. Agargün MY, Algün E, Şekeroğlu R, Kara H, Tarakçioğlu M (1998) Low cholesterol level in patients with panic disorder: the association with major depression. *J Affect Disord* 50: 29-32.
27. Olusi SO, Fido AA (1996) Serum lipid concentrations in patients with major depressive disorder. *Biol Psychiatry* 40: 1128-31.
28. Gallerani M, Manfredini R, Caaracciolo S, Scapoli C, Molinari S, et al. (1995) Serum cholesterol concentraions in parasuicide. *Bmj* 310: 1632-9.
29. Zureik M, Courbon D, Ducimetiere P (1996) Serum cholesterol concentration and death from suicide in men: Paris prospective study I. *Bmj* 313: 649-51.
30. Wysowski DK, Gross TP (1990) Deaths due to accidents and violence in two recent trials of cholesterol-lowering drugs. *Arch Intern Med* 150: 2169-72.
31. Manfredini R, Caracciolo S, Salmi R, Boari B, Tomelli A, et al. (2000) The association of low serum cholesterol with depression and suicidal behaviours: new hypotheses for the missing link. *J Int Med Res* 28: 247-57.