Original Article

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Study on Association Between Lipid Profile Values and Psychiatric Disorders

Psychiatry/Mental Health Section

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ABSTRACT

Background: Cholesterol is especially abundant in nervous system, where it plays important role in different aspects of cellular structure (e.g. fluidity of cell membranes) and function (e.g. membrane). Several studies showed that there may be a link between depression and low cholesterol because of altered central serotonergic functions. On the other hand, some studies also showed either no such association or yielded inconsistent results. However, many studies have related low cholesterol with different psychiatric disorders. Hence, we intend to see the possible link between the two.

Aim: To study the association between lipid profile and psychiatric disorders.

Materials and Methods: Patients attending Amala Institute of medical science, Psychiatry clinic in the month of January 2013 and whose lipid profile data before the start of treatment is available.

Design: Descriptive study. The patients were classified into Neurotic and Psychotic spectrum after being diagnosed with the psychiatric diseases based on International Classification of Diseases, 10th edition (ICD10) by a Psychiatrist. There lipid profile (Total cholesterol; LDL=Low Density Lipoprotein; HDL=High Density Lipoprotein; TAG=Triacylglycerol) were estimated before the initiation of anti-psychotic treatment.

Results: The lipid profile values though showed some statistically significant association between the psychotic and neurotic spectrum, there was no statistical significance between the low lipid profile and different psychiatric diseases.

Conclusion: We have found that there is no significant association between low lipid profile and any psychiatric diseases.

Keywords: Bipolar affective disorders (BPAD), Bipolar disorders (BPD), Depression, Lipid profile, Schizophrenia

INTRODUCTION

Cholesterol is a core component of the central nervous system (CNS), essential for the cell membrane stability and the correct functioning of neurotransmission [1]. It is known that cholesterol affects the fluidity of cell membranes, membrane permeability, exchange processes, and may influence serotonergic function hence if there is cholesterol depletion it may impair function of 5-HT1A and 5-HT7 receptors and serotonin receptor activity. Over time, lower cholesterol levels may further decrease expression of serotonin receptors and cause a reduction serotonergic activity [2]. Many psychiatric diseases can occur due to such reductions and alterations.

Certain psychiatric symptoms have been shown to be associated with low cholesterol these include anxiety, depression, euphoria, irritability, aggression, and suicidal ideation. Shrivastava S et al., showed a link between cholesterol and mood disorders [2]. However, in the recent years, involvement of serum cholesterol in pathogenesis of psychiatric disorders has been doubted by few authors on the basis of their studies that have not found any correlation between serum cholesterol and psychiatric disorders [3].

Hence, we took up the study to see if there was any association between low cholesterol and psychiatric diseases.

MATERIALS AND METHODS

Inclusion criteria: Two hundred and ninety seven patients who visited for the first time to the psychiatric OPD of Amala medical hospital, during the month of January 2013 were selected for the study. These pateints were diagnosed with different psychiatric diseases based on International Classification of Disease, 10th edition (ICD 10) [4] and later they were broadly classified into two spectrum of psychiatric diseases namely Neurotic and Psychotic spectrum.

Diseases under Neurotic spectrum (N=141) include: Bipolar Disorders (BPD) (N=38), Depression (N=63), Obsessive Compulsive Disorder (OCD) (N=39), Panic disorder (N=1). Diseases under psychotic spectrum (N=156) include: Delusional Disorder (N=24), Psychosis NOS (N=45), Schizophrenia (N=87).

Exclusion Criteria: Patients with co-morbid conditions like Hypothyroidism, Diabetes mellitus, hypertension, familial history of hyperlipoproteinemias, patients on statins or any drug known to alter lipid profile were excluded as we wanted to study the effect of low cholesterol by default and association with psychiatric diseases.

Before start of anti-psychotic treatment these patients underwent lipid profile tests and the values of these were taken for the study [Table/Fig-1]. Lipid profile tests include, total cholesterol; LDL=Low Density Lipoprotein; HDL=High Density Lipoprotein; TAG=Triacylglycerol. The lipid profile were estimated by dry chemistry automated analysers, VITROS® 5,1 FS, Ortho Clinical Diagnostics. The LDL was calculated by the machine based on Friedewald's calculation. The lipid profiles were classified based on National Cholesterol Education Programme (NCEP), Adult Treatment Panel III (ATP III) guidelines.

STATISTICAL ANALYSIS

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance.

Student t-test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis) on metric parameters. Leven1s test for homogeneity of variance has been performed to assess the

Lipid parameters (mg/dl)	Number of patients (n=297)	%
Total Cholesterol		
<200	188	63.3
200-240	83	27.9
>240	26	8.8
LDL		
<100	86	29.0
100-130	103	34.7
130-160	73	24.6
160-190	24	8.1
>190	11	3.7
TAG		
<150	245	82.5
150-200	39	13.1
>200	13	4.4
HDL		
Male <40;Female<50	125	42.1
Male >40;Female>50	172	57.9

[Table/Fig-1]: Distribution of lipid parameters amongst the patients studied Based on National Cholesterol Education Programme (NCEP), Adult Treatment Panel III(ATP III) guidelines *LDL=Low Density Lipoprotein; HDL=High Density Lipoprotein; TAG=Triacylglycerols*

Lipids	Male	Female	Total	p-value
Total cholesterol	187.8±47.14	186.72±38.76	187.04±41.38	0.832
LDL	119.53±32.43	121.25±36.58	120.73±35.33	0.701
HDL	40.03±10.43	44.28±10.38	42.99±10.56	0.001**
TAG	122.76±57.18	103.98±48.21	109.67±51.73	0.004**

[Table/Fig-2]: Comparison of Lipid parameters between male and females
*** Strongly significant (p-value : P<0.01). LDL=Low Density Lipoprotein; HDL=High Density Lipoprotein; TAG=Triacylglycerols*

Lipids(mg/dl)	Neurotic Spectrum (N=141)	Psychotic Spectrum (N=156)	p-value
Total Cholesterol			
<200	85(60.2%)	103(66.0%)	0.835
200-240	44(31.2%)	41(26.3%)	
>240	12(8.5%)	12(7.7%)	
LDL			
<100	37(26.2%)	49(31.4%)	0.764
100-130	48(34.04%)	55(35.2%)	
130-160	40(28.3%)	33(21.2%)	
160-190	10(7.09%)	14(8.97%)	
>190	6(4.2%)	5(3.2%)	
TAG			
<150	115(81.56%)	129(82.7%)	0.830
150-200	18(12.76%)	21(13.5%)	
>200	8(5.67%)	6(3.8%)	
HDL			
<40	49(34.7%)	61(39.10%)	0.140
40-50	92(65.2%)	95(60.9%)	

[Table/Fig-3]: Comparison of lipid parameters between the two psychiatric spectrums LDL=low density lipoprotein; HDL=high density lipoprotein; TAG=triacylglycerols; Based on national cholesterol education programme(ncep), adult treatment panel iii(atp iii) guidelines. p-value is >0.05= no statistical significance

homogeneity of variance. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, Med Calc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc [5-7].

RESULTS

Low Total cholesterol of <200mg/dl and Low TAG of <150mg/dl was found in 63.3% and 82.5% of patients respectively and only 29% of patients showed Low LDL of <100mg/dl [Table/Fig-1]. Comparison of lipid profile values between males and females showed some statistically significant association (p<0.01) with respect to HDL and TAG values, however they were still in the normal range [Table/Fig-2]. Further when lipid profiles were compared between psychotic and neurotic spectrum. There was no statistically significant association as p<0.05 [Table/Fig-3].

DISCUSSION

Hence, from our study we found no significant association between the low levels of serum lipid profile and psychiatric diseases since the results aren't strongly suggestive of link between low cholesterol and psychiatric disorders. Our findings are consistent with very few studies since majority of studies strongly support the association between the low lipid profiles and psychiatric diseases. Fiedorowicz JG et al., studied association between low serum cholesterol levels and suicide attempts in patients with major affective disorders and reported that there was no link between the two [8].

Pompili et al., found no significant difference in serum cholesterol and triglyceride levels between patients with major affective disorders who had been admitted for a medically serious suicide attempt and patients who had not made a recent suicide attempt [9].

We would like to justify our novel findings because, high rates of de novo cholesterol synthesis in the glia and neurons keeps taking place to provide the cholesterols from birth, necessary for early brain development. Once a stable brain size is achieved in the adult, cholesterol synthesis continues, much lower rate, and this synthesis is just balanced by the excretion of an equal amount of cholesterol. Hydrophobic membranes around each axon are created by oligodendrocytes that are able to synthesize vast sheets of plasma membrane that are wrapped around numerous adjacent neurons and dehydrated to form compact myelin. As these sheets of myelinare rich in Cholesterol, both the concentration and pool size of cholesterol in the CNS is much higher than in most of the other organs in the body [10].

In theory, this large pool of Cholesterol could be acquired either by uptake of plasma lipoproteins across the blood-brain barrier or by de novo synthesis within the neurons and glia themselves. However, the endothelial cells forming the brain capillaries are uniquely different from those making up other capillary beds in the body. There are no fenestrations, as in hepatic sinusoidal capillaries, there is little or no trans-endothelial bulk-phase vesicular transport, and the junctions between cells are very tight with high electrical resistance [11]. Taken together, all these many observations provide compelling evidence that there may not be net contribution of cholesterol from lipoproteins in the plasma to the pool of sterol within the CNS and even if there is such a contribution, it is very small and below the level of detection by current techniques [10].

Hence, any changes in the cholesterol levels in the plasma wouldn't make much bigger changes in the brain thus low cholesterol being the reason for psychiatric diseases is unlikely.

CONCLUSION

Our results do not support the use of biological indicators such as serum total cholesterol HDL LDL or TAG either to predict the psychiatric outcome or any association between the two. There are very few studies showing no significant association between low lipid profile and psychiatric disorders. Also those studies have studied only one of the psychiatric diseases with respect to its association with low lipid profile.

LIMITATIONS OF THE STUDY

We couldn't study the role of serotonergic functions in our present study as it was beyond the scope of the study. Furthermore psychiatric diseases, both rare and common should be studied for longer duration to know more about its association with lipid profile.

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