International Journal of Nursing and Health Sciences

ISSN Print: 2664-9187
ISSN Online: 2664-9195
Impact Factor: RJIF 5.42
IJNHS 2025; 7(2): 16-22
www.nursingjournals.net
Received: 10-05-2025
Accepted: 15-06-2025

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Case-control study to evaluate the level of serum lipid profile among alcoholic patients and non-alcoholic patients admitted at tertiary care hospital Belagavi

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DOI: https://www.doi.org/10.33545/26649187.2025.v7.i2a.108

Abstract
Alcohol abuse is one of the most widespread forms of addiction worldwide. Its effects on the primary bodily systems are well-documented. Extended consumption of alcohol in large amounts results in toxic repercussions on the liver, which disrupts lipid metabolism, leading to changes in the serum lipid profile. The aim of this study is to compare the serum lipid profiles of alcoholics (cases) with those of non-alcoholics (controls). Method: This research was conducted at the tertiary care teaching hospital in Belagavi. The study was carried out from July 2025 to August 2025. A total of 90 male subjects aged between 30 and 40 years were included in the study. Among these, 40 were classified as alcoholics [Heavy drinkers (those consuming 5 or more drinks on the same occasion on each of 5 or more days over the past 3 years)] and 30 males who refrained from alcohol were also part of the study. The serum lipid profile (Triglycerides, Total Cholesterol, LDL-C, HDL-C, VLDL-C levels) was assessed using a fully automated analyser EM 360 in the Biochemistry laboratory at Dr. Prabhakar Kore Charitable Hospital and Medical Research Centre, Belagavi, Karnataka, India.

Keywords: Case-control study, evaluate, serum lipid profile, alcoholics, non-alcoholics, tertiary care teaching hospital

Introduction
Alcohol abuse constitutes a major form of addiction that is widespread in both developed and developing countries. India also faces a significant challenge in this area. As per the World Health Organization's 2014 reports, alcoholism accounts for 5.9% of annual fatalities, with the disease burden representing 5.1% [WHO. 2014]. The intake of alcohol is associated with a heightened risk of various health complications, such as alcohol dependence, liver cirrhosis, cardiovascular diseases, and cancers. Additionally, excessive alcohol consumption can result in serious social and economic consequences for individuals, families, and society at large. The consumption of alcoholic beverages has been an integral part of many cultures for thousands of years [1].

Chronic liver disease impacts individuals in their most productive years of life and significantly affects the global economy due to premature death, illness, and disability. The liver is crucial in lipid metabolism, playing a role in several stages of synthesis, transportation, and degradation of lipoproteins. It serves as the primary site for the formation and clearance of lipoproteins. Thus, the liver is integral to both the exogenous and endogenous cycles of lipid metabolism and the transport of lipids through plasma. Given the liver's involvement in numerous steps of lipid metabolism and transport, chronic liver disease can influence plasma lipid levels in various ways. Chronic liver disease, arising from different causes, is frequently linked to significant reductions in plasma triglycerides and cholesterol levels due to diminished lipoprotein biosynthetic capacity [2].

Hepatocytes play a crucial role in managing lipid metabolism. The liver is acknowledged as the primary site for cholesterol and lipoprotein synthesis. In individuals with good health, there is a sophisticated balance between the biosynthesis, utilization, and transport of lipid components. In contrast, in instances of cirrhosis, lipid metabolism becomes impaired, resulting in a notable reduction in glycogen reserves, which initiates lipolysis and malnutrition [3].

Objectives

- To evaluate the lipid profile level among alcoholic patients and non-alcoholic patients admitted at tertiary care hospital Belagavi.
- To determine the comparison of lipid profile level associated with alcoholic patients (Case group) admitted at tertiary care hospital Belagavi.
- To determine the comparison of lipid profile level associated with non-alcoholic patients (Control group) admitted at tertiary care hospital Belagavi.

Hypothesis

- **H_1:** There will be no significant association between lipid profile level and alcoholic patients (Case group) admitted at tertiary care hospital Belagavi.
- **H_2:** There will be a significant association between lipid profile level and non-alcoholic patients (Control group) admitted at tertiary care hospital Belagavi.

Review of Literature

Alcohol abuse constitutes a major form of addiction that is widespread in both developed and developing countries. India also faces a significant challenge in this area. As per the WHO reports from 2014, alcoholism accounts for 5.9% of annual fatalities, with the disease burden representing 5.1%. The intake of alcohol is associated with a heightened risk of various health complications, such as alcohol dependence, liver cirrhosis, cardiovascular diseases, and cancers. Additionally, excessive alcohol consumption can result in serious social and economic consequences for individuals, families, and society at large. The consumption of alcoholic beverages has been an integral part of many cultures for thousands of years [4].

This research represents a comparative, analytical, cross-sectional, institution-based, single-centre study that evaluated various aspects of the fasting lipid profile among 150 randomly chosen participants. This cohort consisted of 50 individuals from each of the groups: alcoholic cirrhosis, non-alcoholic cirrhosis, and healthy normals, all recruited from the Outpatient Department (OPD) and Indoor Wards of the Department of General Medicine at Medinipur Medical College and Hospital, situated in the Paschim Medinipur district of West Bengal. The investigation was carried out following the acquisition of written and informed consent from the participants, spanning the timeframe from July 2015 to June 2016 [5].

A cross-sectional, retrospective study was conducted in which the medical records of 314 patients from the Gastroenterology outpatient clinic at Santa Casa Hospital Complex in Porto Alegre, RS, Brazil, were analysed, covering the timeframe from January 2006 to June 2010. The subjects of the study were adult patients (aged over 18 years) diagnosed with cirrhosis due to either excessive alcohol consumption, hepatitis C virus infection, or a combination of both. Their diagnoses were confirmed through clinical evaluations, histological assessments, or imaging studies. Patients with hepatic steatosis, hepatocellular carcinoma, Wilson's disease, autoimmune disorders, antibodies against human immunodeficiency virus (HIV), and other conditions that could influence lipid metabolism (including primary dyslipidaemia, hypothyroidism, cystic fibrosis, and chronic renal failure) were excluded from the study [5].

Materials and Methods

Research methodology: The methodology employed for this study was descriptive in character.

Research design: In this investigation, the researcher employed a cross-control research design [Experimental].

Population: The demographic comprised among alcoholic patients and non-alcoholic patients admitted at tertiary care at Belagavi.

Sampling method: In the present study the investigator employed purposive sampling method.

Data collection method: A structured interview schedule was chosen as the suitable approach for gathering data in this study. This technique is relevant among alcoholic patients and non-alcoholic patients admitted at tertiary care at Belagavi.

Development of tool: During the tool's development, the investigator examined both research and non-research literature and engaged in discussions with experts in laboratory and biochemistry. Formal discussions were also conducted with research specialists and peer group members. This process facilitated the selection of content for the tool's development.

Validity: To ensure the content validity, the tool was presented to 8 research experts specializing in laboratory and biochemistry. These experts were consulted to assess and confirm the items for their adequacy, clarity, and suitability of the tool, and they were encouraged to provide comments and suggestions.

Reliability: To determine the reliability, the tool was tested by administering it to alcoholic patients and non-alcoholic patients admitted at tertiary care at Belagavi. The reliability coefficient of the tool was calculated using the Spearman-Brown prophecy formula. The reliability of the structured questionnaire was established at r=0.582. Therefore, the investigator is authorized to proceed with the study. Additionally, the Guttmann split-half method collaborates this finding (Part-1, α=0.55 and Part-II, α=0.51). The structured questionnaire has been confirmed as reliable for conducting the main study.

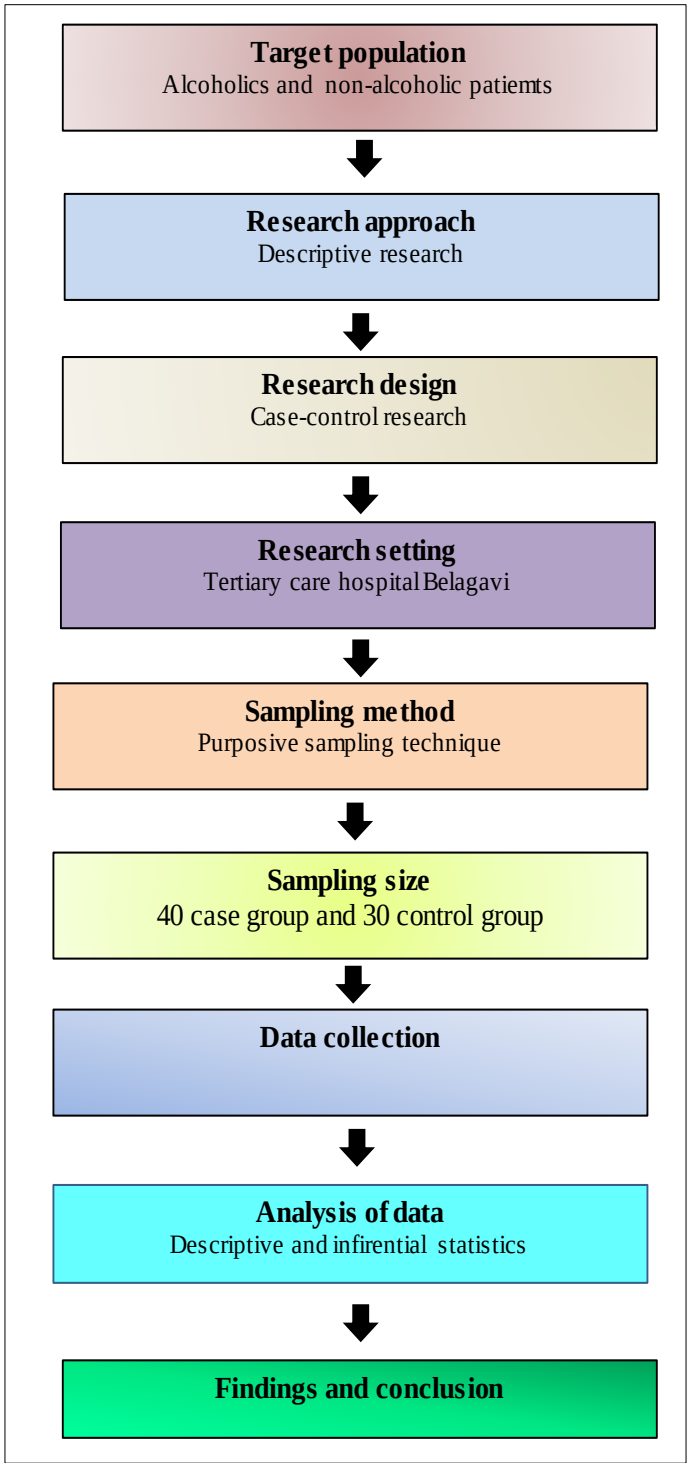
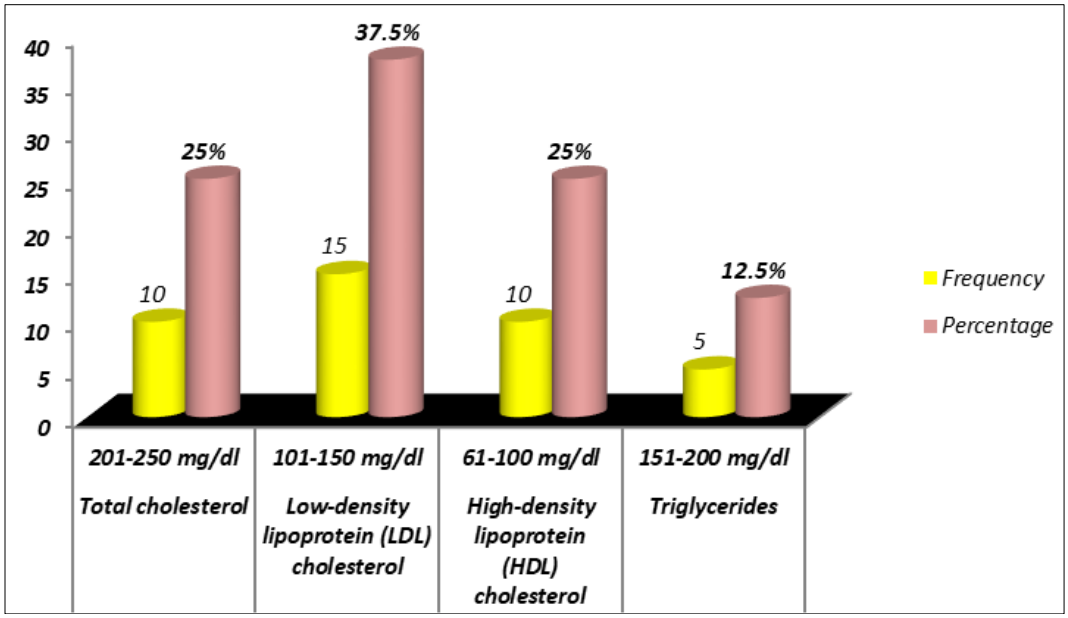


Fig 1: Schematic representation of research plan

Results

Table 1: Shows that frequency and percentage distribution among alcoholic patients (Case group) with desirable levels of lipid profile. N= 40

Lipid Profile	Desirable Level	Patient Values	Case Group (f)	Percentage (%)
			N= 40	
Total cholesterol	< 200 mg/dL	201-250 mg/dl	10	25%
Low-density lipoprotein (LDL) cholesterol	< 100 mg/dL	101-150 mg/dl	15	37.5%
High-density lipoprotein (HDL) cholesterol	> 60 mg/dL	61-100 mg/dl	10	25%
Triglycerides	< 150 mg/dL	151-200 mg/dl	5	12.5%
Overall			40	100

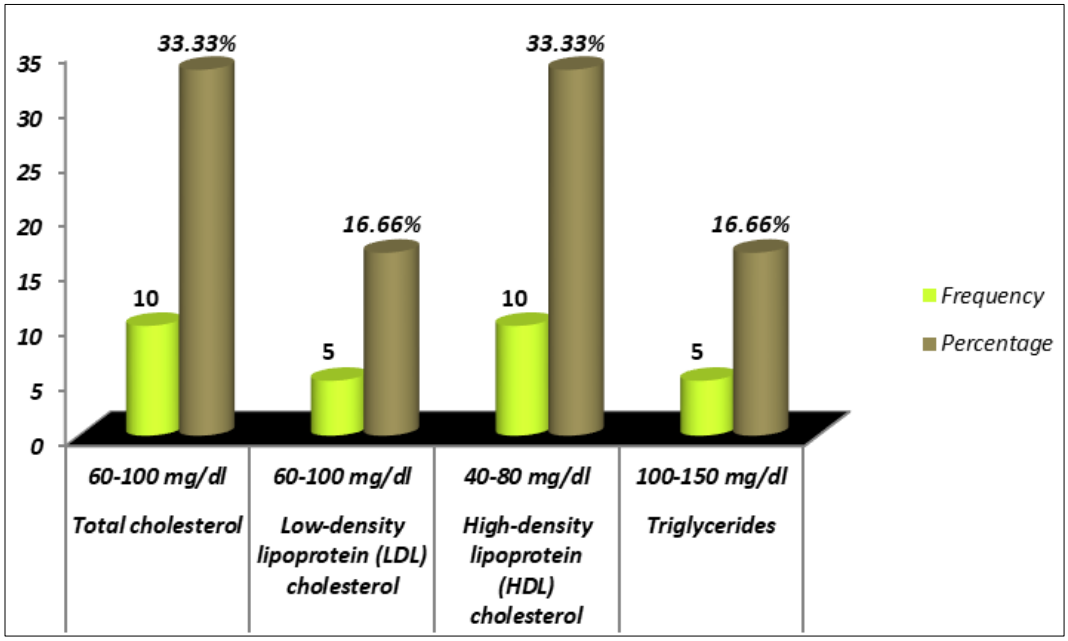


Graph 1: Distribution of lipid profile among alcoholic patients (Case group).

Graph 1, shows that, in accordance to the level of lipid profile, majority of the findings were 15 **(**37.5%) of subjects belonged to elevated low density lipoprotein (LDL) cholesterol, 10 (25%) of subjects belonged to elevated total cholesterol, 10 (25%) of subjects belonged to elevated high density lipoprotein (HDL) cholesterol, and 5 (12.5%) of subjects belonged to elevated triglycerides.

Table 2: Shows that frequency and percentage distribution among non-alcoholics patients (Control group) with desirable levels of lipid profile. N= 30

Lipid Profile	Desirable Level	Control Group (f)	Percentage (%)
		N= 30	
Total cholesterol	60-100 mg/dl	10	33.33%
Low-density lipoprotein (LDL) cholesterol	60-100 mg/dl	5	16.66%
High-density lipoprotein (HDL) cholesterol	40-80 mg/dl	10	33.33%
Triglycerides	100-150 mg/dl	5	16.66%
Overall		**30**	**100%**

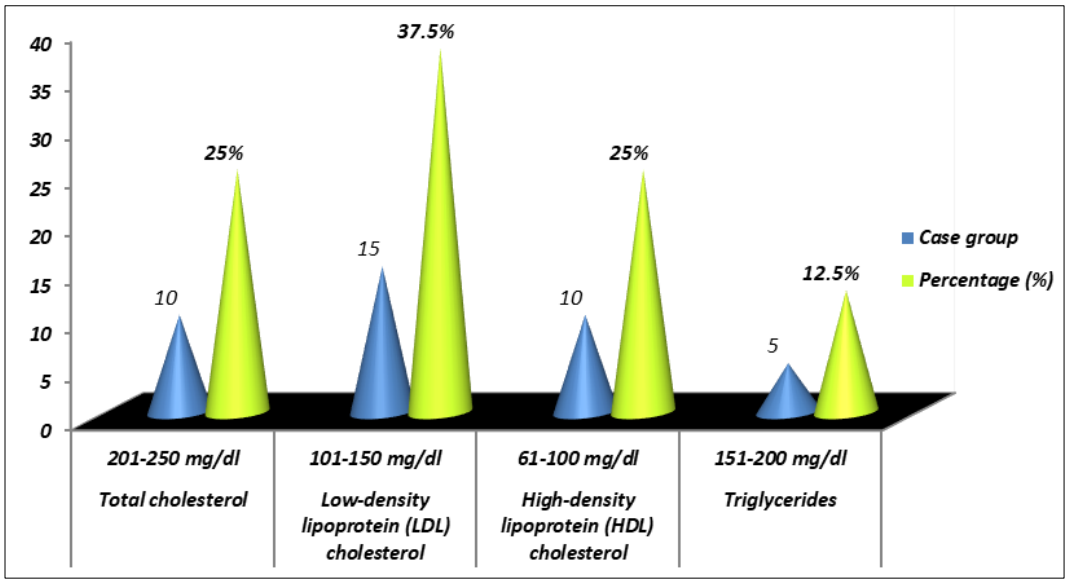


Graph 2: Distribution of lipid profile among non-alcoholic patients (Control group).

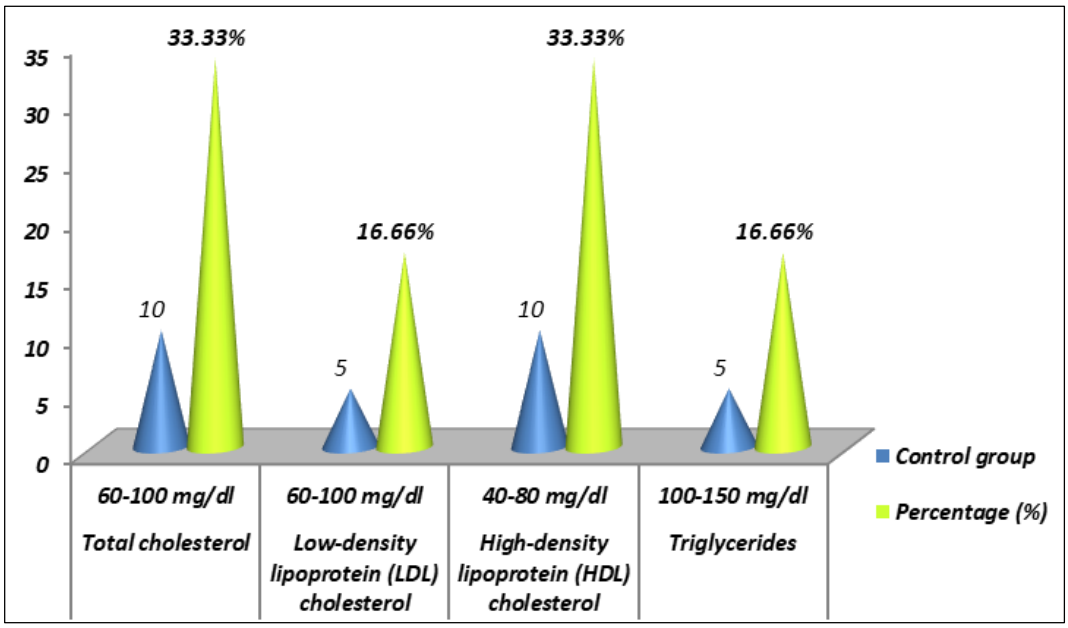
Graph 2, shows that, in accordance to the level of lipid profile, majority of the findings were 10 **(**33.33%) of subjects belonged to average total cholesterol, 10 (33.33%) of subjects belonged to average high density lipoprotein (HDL) cholesterol, 5 (16.66%) of subjects belonged to average low density lipoprotein (LDL) cholesterol, and 5 (16.66%) of subjects belonged to average triglycerides.

Table 3: Shows that frequency and percentage distribution among alcoholics patients (Case group) and frequency and percentage distribution among non-alcoholics patients (Control group) with desirable levels of lipid profile. N= 70

Lipid Profile	Desirable Level	Patient Values	Case Group (f)	Percentage (%)	Patient Values	Control Group (f)	Percentage (%)
			N= 40			N= 30	
Total cholesterol	< 200 mg/dL	201-250 mg/dl	10	25	60-100 mg/dl	10	33.33%
Low-density lipoprotein (LDL) cholesterol	< 100 mg/dL	101-150 mg/dl	15	37.5	60-100 mg/dl	5	16.66%
High-density lipoprotein (HDL) cholesterol	> 60 mg/dL	61-100 mg/dl	10	25	40-80 mg/dl	10	33.33%
Triglycerides	< 150 mg/dL	151-200 mg/dl	5	12.5	100-150 mg/dl	5	16.66%
Overall			40	100		30	100%



Graph 3: Comparison of lipid profile level in relation to alcoholics (Case group).



Graph 4: Comparison of lipid profile level in relation to non-alcoholics (Control group).

Table 4: Comparison of lipid profile level associated with alcoholic patients (Case group) with mean and standard deviation. N= 40

Lipid Profile	Desirable Level	Case group	Mean	Mean (%)	SD	Chi square
Total cholesterol	201-250 mg/dl	10	0.25	25	0.5	X^2= 3.483 DF= 6 P value= 0.7
Low-density lipoprotein (LDL) cholesterol	101-150 mg/dl	15	0.37	37.5	0.9	
High-density lipoprotein (HDL) cholesterol	61-100 mg/dl	10	0.25	25	0.5	
Triglycerides	151-200 mg/dl	5	0.12	12.5	0.9	

*P Value > 0.05 level of significance; hence there will be no significant association between lipid profile level and alcoholic patients (Case group).

Table 4; Shows that, distribution of Mean and SD, comparison of lipid profile level in relation to alcoholic patients (Case group) with Mean, Mean percentage, and SD, the highest Mean score is 0.37±0.9 which is 37.5% of patients belonged to Low-density lipoprotein (LDL) cholesterol (101-150 mg/dl), more or less similar Mean score is 0.25±0.9 which is 25% of patients belonged to Total cholesterol (201-250 mg/dl), more or less similar Mean score is 0.25±0.5 which is 25% of patients belonged to Low-density lipoprotein (LDL) cholesterol (60-100 mg/dl) High-density lipoprotein (HDL) cholesterol (61-100 mg/dl), and less Mean score is 0.12±0.9 which is 12.5% of patients belonged to Triglycerides (151-200 mg/dl).

Table 5: Comparison of lipid profile level associated with non-alcoholic patients **(Control group)** with mean and standard deviation. N= 30

Lipid profile	Desirable Level	Control group	Mean	Mean (%)	SD	Chi square
Total cholesterol	60-100 mg/dl	10	0.33	33.3%	0.5	
Low-density lipoprotein (LDL) cholesterol	60-100 mg/dl	5	0.16	16.6%	0.7	X^2= 6.82
High-density lipoprotein (HDL) cholesterol	40-80 mg/dl	10	0.33	33.3%	0.5	DF= 6
Triglycerides	100-150 mg/dl	5	0.16	16.6%	0.4	P value= 0.3

*P Value < 0.05 level of significance; hence there will be significant association between lipid profile level and non-alcoholic patients (Control group)**.**

Table 5; Shows that, distribution of Mean and SD, comparison of lipid profile level in relation to non-alcoholic patients (Control group) with Mean, Mean percentage, and SD, the highest Mean score is 0.33±0.5 which is 33.3% of patients belonged to total cholesterol (60-100 mg/dl), similar Mean score is 10±0.5 which is 33.3% of patients belonged to High-density lipoprotein (HDL) cholesterol (40-80 mg/dl). The lowest Mean score is 5±0.7 which is 16.6% of patients belonged to Low-density lipoprotein (LDL) cholesterol (60-100 mg/dl), and more or less similar Mean score is 5±0.4 which is 16.6% of patients belonged to Triglycerides (100-150 mg/dl).

Discussion

In the present study, the total number of patients was 70, in the total 40 subjects are case- group and 30 subjects are control group, Table 4; Shows that, distribution of Mean and SD, comparison of lipid profile level in relation to alcoholic patients (Case group) with Mean, Mean percentage, and SD, the highest Mean score is 0.37±0.9 which is 37.5% of patients belonged to Low-density lipoprotein (LDL) cholesterol (101-150 mg/dl), more or less similar Mean score is 0.25±0.9 which is 25% of patients belonged to Total cholesterol (201-250 mg/dl), more or less similar Mean score is 0.25±0.5 which is 25% of patients belonged to Low-density lipoprotein (LDL) cholesterol (60-100 mg/dl) High-density lipoprotein (HDL) cholesterol (61-100 mg/dl), and less Mean score is 0.12±0.9 which is 12.5% of patients belonged to Triglycerides (151-200 mg/dl). And Table 5; Shows that, distribution of Mean and SD, comparison of lipid profile level in relation to non-alcoholic patients (Control group) with Mean, Mean percentage, and SD, the highest Mean score is 0.33±0.5 which is 33.3% of patients belonged to total cholesterol (60-100 mg/dl), similar Mean score is 10±0.5 which is 33.3% of patients belonged to High-density lipoprotein (HDL) cholesterol (40-80 mg/dl). The lowest Mean score is 5±0.7 which is 16.6% of patients belonged to Low-density lipoprotein (LDL) cholesterol (60-100 mg/dl), and more or less similar Mean score is 5±0.4 which is 16.6% of patients belonged to Triglycerides (100-150 mg/dl).

In the similar study, the total number of 100 patients (cases) and 50 individuals who were non-cirrhotic and non-alcoholic (controls). The age group most frequently affected was 41-50 years, accounting for 41% of the cases. All participants classified as cases were male, with the exception of one individual. We found that the majority of the cases (51%) had a history of regular alcohol consumption for duration of 5-10 years, while 22% of the cases reported consuming alcohol for 10-15 years. A significant portion of the cases (53%) ingested a daily amount of 75-100 g of alcohol, followed by 43% of the cases who consumed 50-75 g of alcohol. The cases in our study reported consuming various types of alcoholic beverages, including molasses preparation, rice beer, brandy, and whisky, among others. We observed that all types of alcoholic beverages were associated with the development of alcoholic cirrhosis to a similar extent.

Conclusion

Dyslipidaemia frequently occurs in individuals with alcoholic cirrhosis. Consequently, it is essential to routinely assess the lipid profiles of patients suffering from alcoholic cirrhosis. Additional research in this area is warranted. Such studies may eventually establish a significant correlation between the advancement of alcoholic cirrhosis and the intensity of dyslipidaemia. Therefore, investigations into lipid profiles could assist us in predicting outcomes and formulating treatment strategies for alcoholic cirrhosis in the foreseeable future. Hence the investigatory finally concluded that increased lipid profile level above the normal range in alcoholic patients (Case-group) than compared to non- alcoholic patients (Control-group) admitted in tertiary care hospital located at Belagavi.

Acknowledgement

Authors gratefully extended their thanks to hospital admistrative staffs and also patients willingly participated in the study.

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How to Cite This Article
Manjunath J, Ashok K, Vinod B, Ashwini P, Veena K, Vidyashri K. Case-control study to evaluate the level of serum lipid profile among alcoholic patients and non-alcoholic patients admitted at tertiary care hospital Belagavi. International Journal of Nursing and Health Sciences 2025; 7(2): 16-22