

Evaluation and Significant Correlation of Serum Lipid Profile and Alanine Transaminase Levels in Drug Addict Individuals During Rehabilitation

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Abstract

Background: Drug addiction is a significant global health concern, particularly due to its impact on liver function and lipid metabolism.

Objectives: This study investigates the alterations in serum lipid profiles and alanine transaminase (ALT) levels and showing their correlation in drug-addicted individuals undergoing rehabilitation.

Methods: A cross-sectional study was conducted on 50 male drug addicts aged 15 to 63 years and a control group of 50 healthy males. Blood samples were collected and analyzed using the Roche Cobas C311 chemistry analyzer to measure serum lipid profiles and ALT levels.

Results: Drug-addicted patients exhibited significantly lower levels of total cholesterol, triglycerides, HDL, and LDL compared to the control group across all age ranges. Conversely, ALT levels were consistently higher in the drug-addicted group, indicating potential liver impairment. Strong positive correlations were found between age and lipid parameters (cholesterol, HDL, LDL), with weaker correlations for triglycerides and ALT.

Discussion: The findings suggest that drug addiction leads to significant alterations in lipid metabolism and liver function. The reduced lipid levels and elevated ALT observed in drug addicts align with previous studies, reinforcing the association between substance abuse and metabolic disturbances. The elevated ALT levels, particularly in younger individuals, highlight the potential for early liver damage in drug users.

Conclusion: This study underscores the need for regular monitoring of lipid profiles and liver enzymes in drug-addicted individuals, particularly those in rehabilitation, to mitigate long-term health risks. The results provide valuable insights into the physiological impacts of drug addiction and emphasize the importance of comprehensive care in addiction treatment programs.

Key words: Alcohol Dependence Syndrome, Gamma-glutamyl transferase, Lipid profile

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Introduction

Drug addiction is a universal human malaise and humanity is suffering from it, no parts of the world are exempted including Pakistan where social as well medical consequences were higher. Numerous studies over the years have shown that chronic abuse of drugs of dependence results in a range of different physiological changes, most notably with respect to liver function and lipid metabolism.¹ Any form of prolonged drug use results in the toxicity and malnutrition on part of liver, which is central organ involved in detoxification functions as well metabolism.² A marker of liver health (alanine transaminase). Increased ALT levels are typically indicative of liver damage, one potential side effect of habitual substance abuse. Moreover,

lipid profile consisting of cholesterol, triglycerides and lipoprotein (LDL), HDL & VLDL have also proved to be critical in giving an insight into metabolic disturbance caused by substance abuse deviantore.^{3,4}

By testing and observing these patients thought to be immune to virus at this center, the study would help researchers understand how well a whole-body approach can counteract drug abuse's scourge.⁵

To translate, this work offers a new perspective on how drug addiction changes lipid metabolism in the liver and its function- overall health important markers. The study will give us better ideas about the physiological effects of addiction and how well rehabilitation works in terms of those parameters.^{6,7} Understanding the role of opioid use in mortality

rates can also help studying how medical professionals and policymakers might intervene to improve health for people with addiction. The study might also serve as a reminder about the need for regular monitoring of lipid profiles and liver enzymes among people with drug dependency participating in rehabilitation programs, which may help to provide better patient management while minimizing long-term health costs.^{8,9} The opioid crisis is a significant global public health emergency, within the United States (U.S.) experiencing the highest prevalence of opioid used disorders compared to other countries. According to the (Global Burden of Disease (GBD), 2016, Disease and Injury Incidence and Prevalence Collaborators, 2017) and the United Nations Office on Drugs and Crime (UNODC, 2020), opioids were utilized by approximately 57.8 million individuals worldwide in 2018, contributing to two-thirds of all drug-related deaths. Within the U.S, alarming statistics indicate that around 9.9 million people engaged in the misused of prescription opioids, nearly 1 million individuals resorted to heroin used, and approximately 2 million individuals were diagnosed with an opioid used disorder in 2018, as reported by the Substance Abuse and Mental Health Services Administration (Abuse, 2020).^{10,11}

Methods

This Cross Sectional Study was conducted at Ali medical Hospital after taking permission from Ethical review committee. Samples were collected from individuals with in drug addict and control groups, utilizing the Roche Cobas C311 chemistry analyzer for quantification of lipid profile and Alanine Transaminase (ALT), a comparative analysis were conducted on the outcomes of these two distinct cohorts. The blood samples were collected from rehabilitation center and transported in a secured and appropriate manner to Ali medical Hospital Islamabad, Pathology Laboratory. Samples were transported in temperature- controlled containers to maintain their integrity during transport. A total of 50 male drug addicted patients and of 50-control group were included in the study.

Non-probability selective sampling technique was used. The study included drug addict patients, males aged 18 years to 63 years old, who had a history of substance abuse like heroine, cannabis, opioids, chas, ice and were admitted in the rehabilitation center.

Patients with a history of other liver diseases, comorbidities, or on lipid-lowering medications were excluded from the study.

The data were collected through a questionnaire with closed ended questions where every patient was asked individually. All the blood samples were taken from males only. The blood samples were collected from drug addict persons and were transported to Ali medical hospital. Samples were run on Roche Cobas C311 for evaluating the levels of Alanine Transaminase and lipid profile. The blood samples (5ml) of the patients were collected in vacutainer tubes and centrifuged at 4000rpm for 10 minutes. After centrifugation, the serum samples were loaded into the appropriate positions in the machine and run according to the manufacturer's instructions. The tests were run for serum Lipid Profile and alanine transaminase using the appropriate test kits and reagents. The machine automatically performed the tests and provided the results.

The data collected was analyzed using statistical software, such as SPSS version 29.0.2.0. Descriptive statistics, including means and standard deviations of interest. Lipid profile was analyzed in laboratory by using Cobas C311 chemistry analyzer and the results were recorded. ALT was also analyzed in laboratory by using Cobas C311 chemistry analyzer and then results were recorded.

Results

In this study a total of 50 cases for only male were included with minimum age of 15 years and maximum age 63 years, with mean and Standard deviation of 33.1 ± 10.3 . The minimum cholesterol level in case group recorded was 20 mg/dl and maximum value was 185 mg/dl with mean and standard deviation of 101.3 ± 45 . For triglyceride the minimum value observed was 20 mg/dl and the maximum values was 279 mg/dl, with mean and standard deviation of 119 ± 70.1 . For HDL the minimum observed was 05 mg/dl and maximum value was 46 mg/dl, with mean and standard deviation of 25.3 ± 11 . For LDL the minimum value observed was 09 mg/dl and maximum value was 120 mg/dl, with mean and standard deviation of 54.6 ± 29.9 . Lastly ALT had a minimum value of 13 IU/L and maximum value of 188 IU/L, with mean

and standard deviation of 34.96 ± 27.6 shown in Table-1.

Table 1: Descriptive Analysis of Drug Addicts Patients

	N	Minimum	Maximum	Mean	Std. Deviation
Age	50	15	63	33.1	10.3
Cholesterol	50	20 mg/dl	185 mg/dl	101.30	45
HDL	50	05 mg/dl	46 mg/dl	25.3	11.0
LDL	50	09 mg/dl	120 mg/dl	54.6	29.9
Triglyceride	50	20 mg/dl	279 mg/dl	119	70.1
ALT	50	13 IU/L	188 IU/L	34.96	27.6
Valid N (list wise)	50				

In this study a total of 50 control group for only male were included with minimum age of 21 years and maximum age 55 years, with mean and Standard deviation of 33.6 ± 7.8 . The minimum cholesterol level in control group recorded was 104 mg/dl and maximum value was 190 mg/dl with mean and standard deviation of 158 ± 20.9 . For triglyceride the minimum value observed was 26 mg/dl and the maximum values was 198 mg/dl, with mean and standard deviation of 139.2 ± 28.4 . For HDL the minimum observed was 26 mg/dl and maximum value was 48 mg/dl, with mean and standard deviation of 39.6 ± 5.1 . For LDL the minimum value observed was 56 mg/dl and maximum value was 128 mg/dl, with mean and standard deviation of 96 ± 16.7 . ALT had a minimum value of 12 IU/L and maximum value of 31 IU/L, with mean and standard deviation of 20.6 ± 3.4 shown in Table-2.

Table 2: Descriptive Analysis of Control Group

	N	Minimum	Maximum	Mean	Std. Deviation
Age	50	21	55	36.6	7.8
Cholesterol	50	104 mg/dl	190 mg/dl	158.0	20.9
HDL	50	26 mg/dl	48 mg/dl	39.6	5.1
LDL	50	56 mg/dl	128 mg/dl	96.0	16.7
Triglyceride	50	26 mg/dl	198 mg/dl	139.2	28.4
ALT	50	12 IU/L	31 IU/L	20.6	3.4
Valid N (list wise)	50				

The Figure-1 categorizes the individuals in the Case Group based on age ranges. The age range "15-30 years" with frequency of 23 individuals, which accounts for 46%, "31-46 years" comprises 19 individuals, representing 38%, "47-63 years" consists of 8 individuals, making up 16% of the case group.

In the age range of 15-30 years, the drug addicted group ($n=50$) showed significantly lower cholesterol levels with a mean and standard deviation of 101.1 ± 47.5 mg/dl compared to the control group ($n=50$) with a mean of 167.6 ± 35.1 mg/dl. Similarly, the triglyceride levels in drug addicted were also lower with a mean of 115.1 ± 64.5 mg/dl, as opposed to the control group with a mean of 134.5 ± 22.7 mg/dl. HDL level in addicted individuals were lower with a mean and standard deviation of 25.3 ± 11.5 as compared to control group with a mean 37.3 ± 4.4 . LDL of this group showed lower level with a mean and standard deviation of 53 ± 30.5 as compared to control group with mean 92.6 ± 18.1 . (Table-3).

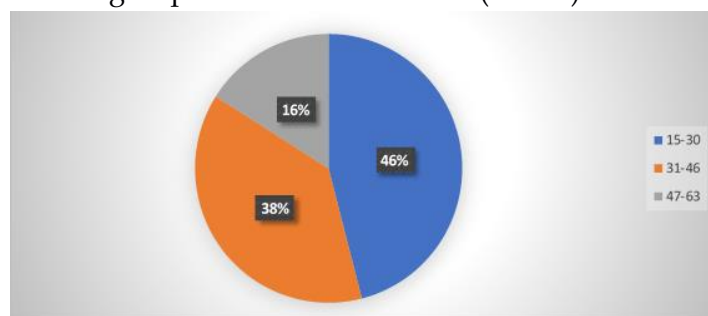


Figure 1: Age wise drug addict patients' distribution

Table-3: Age-based comparison of the biochemical parameter in drug addict and control groups

Age (years)	Biochemical Tests	Drug Addict (n=50) Mean $\pm$ SD	Control (n=50) Mean $\pm$ SD
15-30	Cholesterol	101.1 ± 47.5	167.6 ± 35.1
	HDL	25.3 ± 11.5	37.3 ± 4.4
	LDL	53 ± 30.5	92.6 ± 18.1
	Triglyceride	115.1 ± 64.5	134.5 ± 22.7
	ALT	39.6 ± 39.4	21.6 ± 3.3
31-45	Cholesterol	93.7 ± 41.6	199.2 ± 57.0
	HDL	23.4 ± 9.9	40.4 ± 5.20
	LDL	55.8 ± 28.3	100.5 ± 15.9
	Triglyceride	105.2 ± 76.5	161.1 ± 37.8
	ALT	32.0 ± 10.8	17.5 ± 4.3

Events based on duration and frequency, revealing that the majority of events (40%) occur with a duration of 37-156 months 20. individuals, while 36% of events have a duration of 1-36 months with a frequency of 18.

The prevalence of various substances, with Chars having the highest percentage at 28%, followed closely by Ice at 26%. Heroin accounts for 18%, while opium and alcohol were at 11% and 10%, respectively.

Hashish showed the lowest prevalence of 7%. This information provides insights into the relative usage rates of these substances within the studied groups. (Figure-2).

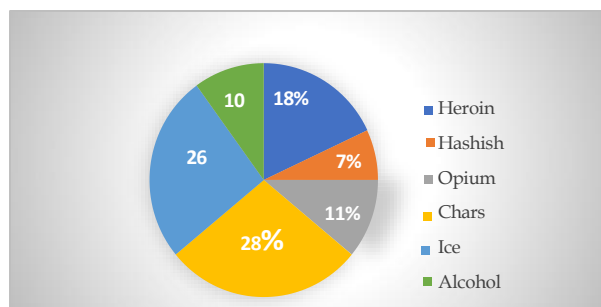


Figure 2: Percentage distribution of substance use

Table-4 shown for the correlation analysis with age as a controlled, strong positive associations were observed between age and Cholesterol ($r = .999$), HDL ($r = .999$), and LDL ($r = .912$), all highly significant ($p < .001$). Weaker correlations exist with Triglyceride ($r = .256$) and ALT ($r = .188$), with Triglyceride showing moderate significance ($p = .064$). HDL exhibits strong positive correlations with Cholesterol ($r = .999$) and LDL ($r = .911$), both highly significant ($p < .001$). ALT weakly correlates with LDL ($r = .211$), marginally significant ($p = .130$) of events last 157-360 months with a frequency of 12. (Table-4).

Table-4: Correlation of control variable of age with Cholesterol, HDL, LDL, Triglycerides & ALT

Control Variables			Cholesterol	HDL	LDL	Triglyceride	ALT
Age	Cholesterol	Correlation	1.000	.999	.912	.256	.188
		Significance (2-tailed)	.	.000	.000	.064	.178
		df	0	51	51	51	51
	HDL	Correlation	.999	1.000	.911	.257	.189
		Significance (2-tailed)	.000	.	.000	.064	.176
		df	51	0	51	51	51
	LDL	Correlation	.912	.911	1.000	.010	.211
		Significance (2-tailed)	.000	.000	.	.943	.130
		df	51	51	0	51	51
	Triglyceride	Correlation	.256	.257	.010	1.000	.134
		Significance (2-tailed)	.064	.064	.943	.	.340
		df	51	51	51	0	51
	ALT	Correlation	.188	.189	.211	.134	1.000
		Significance (2-tailed)	.178	.176	.130	.340	.

Discussion:

In this study total of 50 samples were collected randomly from drug addicts' patients from Islamic Medical rehabilitation center. The data were collected through a questionnaire with closed ended questions where every patient was asked individually. All the samples were taken from males only. And 50 samples were collected randomly from control group at Ali medical center. Based on the findings of this research,

drugs significantly affected cholesterol level compared to the control group and triglycerides level also shown significant decreased in Methamphetamine dependent patients. These results align with a previous study conducted by Zhang et al., (2017) results shown addicts individuals in which cholesterol and triglyceride levels were significantly reduced.¹²

Another study conducted by (Lin et al.,2012), shown reduced level of cholesterol and no significant difference in triglyceride level.¹³ Additionally, (Kouros et al.,2010) found a significant reduction in cholesterol levels among drug addicted patients, which supporting and reinforcing our study's results. The research conducted by (Kouros et al.,2010) provides strong support and enhances the credibility of the findings in our study. Their results, showed a significant reduction in cholesterol levels among drug addicted patients, reinforce, the validity and importance of our own findings.¹⁴ The liver enzyme, specifically ALT, demonstrated statistically significant elevations in all age groups, with the most pronounced increase observed in the age groups up to 30 years. In a research investigation involving individuals addicted to opium, notable findings revealed a significant elevation in ALT levels (Asgari et al., 2008) into the relationship between drug use and cholesterol-triglyceride profiles, emphasizing the potential implications for cardiovascular health.¹⁵ The impact of drug usage on various physiological parameters has been a subject of significant interest in recent research. In our study, we investigated the effects of drug consumption on cholesterol and triglyceride levels and compared them to a control group. The findings from our research revealed striking results, indicating a significant influence of drug usage on both cholesterol and triglyceride levels.

Moreover, the study conducted by (Zaib et al.,2022) further strengthens the evidence for the effects of drug consumption on physiological markers. Reported that individuals who engaged in long-term heroin and hashish use exhibited a considerable elevation in liver enzymes, particularly Alanine transaminase and Aspartate transaminase. Notably, this elevation was more pronounced in individuals up to 40 years old. These findings provided valuable insights into the profound impact of drug consumption on liver function, highlighting potential health implications related to hepatic enzyme elevation.

In addition to the effects on liver enzymes, our research also demonstrated a significant reduction in cholesterol levels associated with drug usage. This finding aligns with the results reported by (Zaib et al.,2022) indicating that drugs not only affect liver function but also have a notable influence on lipid profiles, specifically cholesterol levels. Taken together, our study and the research conducted by (Zaib

et al., 2022) collectively emphasize the importance of understanding the repercussions of drug consumption on various physiological aspects. The observed alterations in liver enzymes and cholesterol levels underscore the potential risks associated with long-term drug use and its impact on overall health.¹⁶

Conclusion:

The findings provide evidence that drug dependence has a profound impact on metabolism of lipids and functions in the liver. More specifically, drug addicts are all of lower cholesterol and triglycerides HDL LDL, also ALT levels consistently higher than the control group. These differences imply both liver insult and metabolic disruption related to substance dependence (mostly in youth). High ALT values mean there may be something wrong with your liver and this bad result shows that we need to continue diagnosing for early prevention. Hence, monitoring of lipid profile and liver enzymes need to be a part of routine healthcare for patients undergoing rehabilitation from drug addiction. This allows health care teams to monitor and address possible medical concerns in the early stages, decreasing the odds they could lead to persistent problems later on. Indeed, doing so will improve the quality of addiction treatment programs and potentially health outcomes for patients. The study underscores the need for holistic treatment (psychosocial and medical management) when addressing drug addiction to care not only psychomotor but also physiological conditions associated with substance use.

Ethical Permission: The Ethics Review Committee, Ali Medical Center Islamabad approved this study.

Conflict of Interest / Disclosure: Nil.

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Authors' contribution:

UH: Conception & design, acquisition of data, analysis & interpretation, drafting of article, final approval, critical revisions

HJ: Drafting of article, critical revisions

AN: Drafting of article

IK: Analysis & interpretation

MS: Final approval of the version to be published

HI: Final approval of the version to be published

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