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Non Alcoholic Fatty Liver Disease: Assessment of Lipid Profile Estimation in Different Grades of Fatty Liver on Ultrasound

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Abstract

Background: Non Alcoholic Fatty Liver Disease (NAFLD) is common hepatic disorder which is recognized as a great health problem causing different diseases worldwide. To determine non-alcoholic fatty liver and assess the relation of fasting total lipids with different grades of fatty liver (NAFLD) subjects diagnosed through ultrasound. By identifying the risk factors of Lipid Profile and NAFLD, the health care provider can properly manage it, even awareness specific for patients and community as general being launched to diminish the morbidity and mortality by this study. **Methods:** This cross-sectional research carried out at Medicine Department of PMCH, Shaheed Benazirabad. This study comprises 300 subjects of NAFLD. Patients who attended the medicine department with abdominal complains after examination consultant advised ultrasound. The ultrasound performed in Radiology department, patients with findings of fatty liver selected, and history taken from all the patients with special regard to alcoholism. Fasting lipid profile done in all patients included in present study. The blood samples collected from a vein and immediately sent to the laboratory. **Results:** This present study enlisted total 300 patients out of them 203 (67.7%) belonged to male gender and 97 (32.3%) were females. A ratio of 2.1:1 observed in male and female subjects. There were 176 (58.7%) patients in grade I, while 82 (27.3%) patients in grade II and 42 (14%) patients in grade III. The cholesterol value was abnormal in 186 (62%), while normal in remaining 114 (38%) patients. Triglycerides were abnormal in 152 (50.7%) while in 148 (49.3%) patients were normal. HDL in 155 (51.7%) patients was abnormal while 145 (48.3%) patients had normal values. Low den-

sity lipoprotein value in 117 (39%) patient was abnormal and 183 (61%) patient normal. Very low-density lipoprotein in 117 (39%) patients was abnormal and 183 (61%) patient normal. The mean age and SD of patients in present study was 46.83 ± 8.82, with minimum 30 years and maximum age 65 years respectively (p value 0.000). The mean and SD of total cholesterol value was 154.66 ± 58.88 mg/dl (p value 1.000), TG 180.98 ± 96.46 mg/dl (p value 0.974), HDL-C 32.13 ± 5.88 mg/dl (p value 0.000), LDL-C 116.41 ± 41.002 mg/dl (p value 0.000), and VLDL-C was 43.47 ± 34.34 mg/dl (p value 0.000). **Conclusions:** In current study, variable changes in lipid profile observed amongst NAFLD (non-alcoholic fatty liver disease) patients who diagnosed on ultrasound. Early diagnosis and treatment of non alcoholic fatty liver with abnormal lipids can prevent from long-term complication of fatty liver.

Keywords

Lipid Profile, NAFLD (Nonalcoholic Fatty Liver Disease), Ultrasound, Grades of Fatty Liver

1. Introduction

In non-alcoholic population, excessive and abnormal fat deposition in the liver cells is identified as NAFLD. NAFLD had been identified as a common frequent etiologic factor of hepatic ailment [1]. Nonalcoholic fatty liver disease first described almost 60 years ago, although Jurgen Ludwig a pathologist finally recognized it in 1980. In patients with steatohepatitis without noteworthy or with minimal alcohol utilization, histo-pathological findings were described by him. His observations were valid and he described that in majority of subjects there were marked inflammation of liver with necrotic areas. Fatty liver (non-alcoholic disease) is deposition of fats in hepatocytes (steatosis) and is either simple steatosis or steatohepatitis. When there is fatty change due to deposition of abnormal lipids in the hepatic cells, it leads to steatohepatitis simply or steatosis associated with hepatic fibrotic or cirrhotic change called steatohepatitis [2].

In western population, fatty liver disease (non-alcoholic) is widespread etiologic agent for chronic hepatic disease (CLD) [3]. However, it is now growing in the Asia-Pacific location especially due to change in life style as increased use of fat, lack of exercise, and rising burden of the DM-2 [4].

On the basis of histological characters, NAFLD (Non-alcoholic fatty liver disease) is classified in grade I, II, and III. In grade I (simple steatosis), liver echogenicity is raised and the periportal and diaphragmatic echogenicity is visualized on ultrasonography. In grade II, there is alteration in the echo pattern of liver characterized by inflammation of lobules with steatosis and ballooning of liver cells. Ultrasonic characters in grade III are raised hepatic echogenicity along with imperceptible periportal echogenicity with obstruction of diaphragm (inflammation of lobules with steatosis and ballooning of liver cells and fibrosis of

Mallory hyaline) [5]. It is simply from deposition of fat (steatosis) to fibrotic and or cirrhotic change (steatohepatitis). In simple steatosis, there is buildup of fats as TG inside hepatic cells, and in non-alcoholic steatohepatitis, there is deposition of lipid in the liver cells along with evidence of liver cell injury, fibrosis (various degrees) and inflammation [6].

NAFLD occurs with obesity approximately in 40%, as well as 15% of overweight subjects. There is increased occurrence of non-alcoholic fatty liver disease (NAFLD) in relationship to T2DM. It is suggested that by 2020 size of populace with DM-2 will be touching to 100 million worldwide. Unpredictably 60% will be from Asia. NAFLD seems frequently asymptomatic without signs of hepatic ailment in subjects at diagnosis. NAFLD is exposed either on usual ultrasonography, or when performing investigations for other ailments such as Hypertension and DM with or without obesity [6] [7] [8]. Feeling of fullness and uneasiness in right upper abdomen, tiredness and malaise is reported in many subjects. Enlargement of liver is clinically observed in many patients [9]. It is more prone to develop in patients with diabetes mellitus; hypertension, obesity and male gender [10].

Occurrence of fatty liver disease (non-alcoholic) is 7% - 9% in general populace throughout World; amazingly, 12% - 24% general Asian population is affected. 30%, of United States general inhabitants have NAFLD and non-alcoholic fatty liver morbidly affects 90% of the obesity subjects [11].

To observe the incidence of risk factors a study done in Rawapindi, Pakistan, which shown obesity in 66%, increased levels of triglycerides in 48%, DM in 34% and increased levels of cholesterol in 28% of subjects [12]. A study performed at Institute of Pharmaceutical Sciences, Telangana, India observed various grading of NAFLD with ultrasonography and estimated fasting profile of lipid in patients. To analyze the abnormal lipid profile in NAFLD, subjects with various age levels were included in the research. Lipid profile alteration observed 12.72% in 30 - 39 years, 33.93% in 40 - 49 years, 20.61% in 50 - 59 years and 17.58% in 60 - 69 years respectively. Santoshini A *et al.* in their study concluded that the effect of age has great impact on lipid profile in different grades of NAFLD subjects which were statistically significant [13].

Biopsy of liver (LB) is an authentic final invasive test to diagnose and stage with numerous disadvantages, because of pain, cost, high rates of complications with agony and uneasiness. Ultrasonic findings along with considerably raised fasting lipid profile are the safe, cheap, easy, and accurate available diagnostic tool for fatty liver disease (non-alcoholic). Ultrasound (USG) considered as the foremost imaging technique for establishing and categorizing the fatty liver disease and is extensively used in suspects of fatty liver (non-alcoholic disease) also analyzing asymptomatic subjects with raised hepatic enzymes.

This cross-sectional research conducted for estimation of the fasting lipids in NAFLD grades assessed by Ultrasound [14] [15] [16].

Only a little number of studies reported on fatty liver (non-alcoholic disease)

subjects from Pakistan established on ultrasound. This research compared lipid profile of subjects through various grading of NAFLD diagnosed ultrasonographically.

Present study was done to assess fasting lipids and their association with different NAFLD grades through Ultrasonography.

By early reorganization of abnormal fasting lipids and NAFLD will help in early protective management and prevention of complications due NAFLD through prompt specific measures to decrease the burden of disease and outcome in terms of disability and death.

2. Methods

2.1. Ethical Considerations

This study was performed after the permission of ethical committee Peoples Medical University Hospital Nawabshah Pakistan. All the subjects were provided written informed consent.

2.2. Study Population

This cross sectional research conducted in departments of Medicine Peoples Medical College Hospital Nawabshah (SBA), criteria of patients in this study male and female subjects with age from 30 years above and diagnosed NAFLD on ultrasonography. Sample size was 300 subjects. Online calculator of rao-software for sample size calculation was used, with margin of error 5.68% and confidence level 91.7% population size of 1,600,000. Study conducted from March 2016 to February 2017. Particular proforma was designed for the data collection. History obtained in full from all subjects and particularly of alcohol consumption. Fasting lipid profile done in all patients under study. Blood samples were collected after strict antiseptic measures from a vein and immediately transported to the laboratory for lipid profile analysis. Blood samples were centrifugated and serum was drawn for blood and analyzed through Micro-lab 300 Merck. Different grades of hepatic fat were assessed by ultrasound and its relation with lipid profile. In this research patients included with age range from 30 - 65 years with NAFLD (non-alcoholic fatty liver disease) on ultrasound. Exclusion criteria included subject's age less than 30 years and more than 70 years or above, denied to participate, with comorbidities of DM, viral hepatitis (Hepatic viruses B or C) and alcoholism. Accumulation/deposition of Fat in hepatic cells leading to fatty liver owing to reasons excluding alcohol abuse in patients is defined as NAFLD.

2.3. Biochemical Examination

A blood test that primarily used to detect the derangements of lipid by measuring the serum levels of TC and TG levels. Normal values of lipid profile are TC less than 200 mg/dl, TG 46 - 236 mg/dl, HDL > 35 mg/dl, LDL < 130 mg/dl and levels of VLDL < 30 mg/dl are considered normal [17].

TEST	Cholesterol Level	Category
CHOLESTROL	Less than 200 mg/dl 200 - 239 mg/dl 240 mg/dL and above	Desirable Borderline high High
TRIGLYCERIDES	<150 mg/dl 150 - 199 mg/dl 200 mg/dL - 499 mg/dl ≥500	Normal Borderline high High Very High
H.D.L	More Than Or Equal To 40 Mg/Dl	Optimal
L.D.L	<100 mg/dl 100 - 129 mg/dl 130 - 159 mg/dl 160 - 189 mg/dl ≥190 mg/dl	Optimal Level Above Optimal Level Borderline High Level High Level Very High Level
V.L.D.L	<30 mg/dl	OPTIMAL

NCEP ATP III Guidelines.

2.4. Ultrasound Examination

Valid guidelines as per recommendations of association of American gastroenterologist were followed to diagnose fatty liver according to severity as mild grade I, moderate as grade II and severe as Grade III. In Grade I there is little widespread increase in fine echoes on ultrasound. Hepatic appearance is light in contrast to renal cortex. In Grade II there is moderately diffusing fine echoes on ultrasound. Grade III there is distinct raise in fine echoes on Ultrasound [2].

2.5. Statistical Analysis

Data collected was analyzed through SPSS version 20.0. Different variables like TC, TG, HDL, LDL and VLDL were assessed to check percentages and frequencies with different grades of fatty liver. Categorical variables were assessed for mean & SD, like age sex and others. Effect modifiers; age, gender, lipid profile all controlled by stratification. Variables were analyzed by chi-square test.

3. Results

This present study enlisted total 300 patients out of them 203 (67.7%) belonged to male gender and 97 (32.3%) were females, 280 (93.9%) married and 20 (6.7%) were unmarried.

Education profile show that 80 (26.7%) illiterate, 107 (35.7%) primary level, 30 (10%) middle level, 30 (10%) matriculation level, 34 (11.3%) intermediate level while only 17 (5.7%) were graduated. A waste number of patients 274 (91.3%) belonged to lower economic class, while 17 (5.7%) to middle class and 09 (3.0%) to upper class.

Regarding occupation of patients, 29 (9.7%) no occupation, 63 (21%) housewife, while major portion of patients 190 (63.3%) were manual workers and remaining 18 (6%) were office workers. Most of the patients belonged to the rural

community 231 (77%) and 69 (23%) were living in urban areas (Figure 1).

Body mass index BMI was normal in 177 (59%), 112 (37.3%) overweight & 11 (3.7%) patients were obese. There were 176 (58.7%) patients in grade I, while 82 (27.3%) patients in grade II and 42 (14%) patients in grade III.

The cholesterol value was abnormal in 186 (62%), while normal in remaining 114 (38%) patients. Triglycerides were abnormal in 152 (50.7%) while in 148 (49.3%) patients was normal. HDL in 155 (51.7%) patients was abnormal while 145 (48.3%) patients had normal values. Low density lipoprotein value in 117 (39%) patient was abnormal and 183 (61%) patient normal. Very low-density lipoprotein in 117 (39%) patients was abnormal and 183 (61%) patient normal (Figure 2).

The mean age and SD of patients in present study was 46.83 ± 8.82, with minimum 30 years and maximum age 65 years respectively (p value 0.000). The mean and SD of total cholesterol value was 154.66 ± 58.88 mg/dl (p value 1.000), TG 180.98 ± 96.46 mg/dl (p value 0.974), HDL-C 32.13 ± 5.88 mg/dl (p value 0.000), LDL-C 116.41± 41.002 mg/dl (p value 0.000), and VLDL-C was 43.47 ± 34.34 mg/dl (p value 0.000) (Table 1).

In present study there was statistically significant correlation of triglycerides with grades of fatty liver (p value 0.012), age (p value 0.030), cholesterol (p value 0.000), LDL-C (p value 0.000) and VLDL-C (p value 0.000).

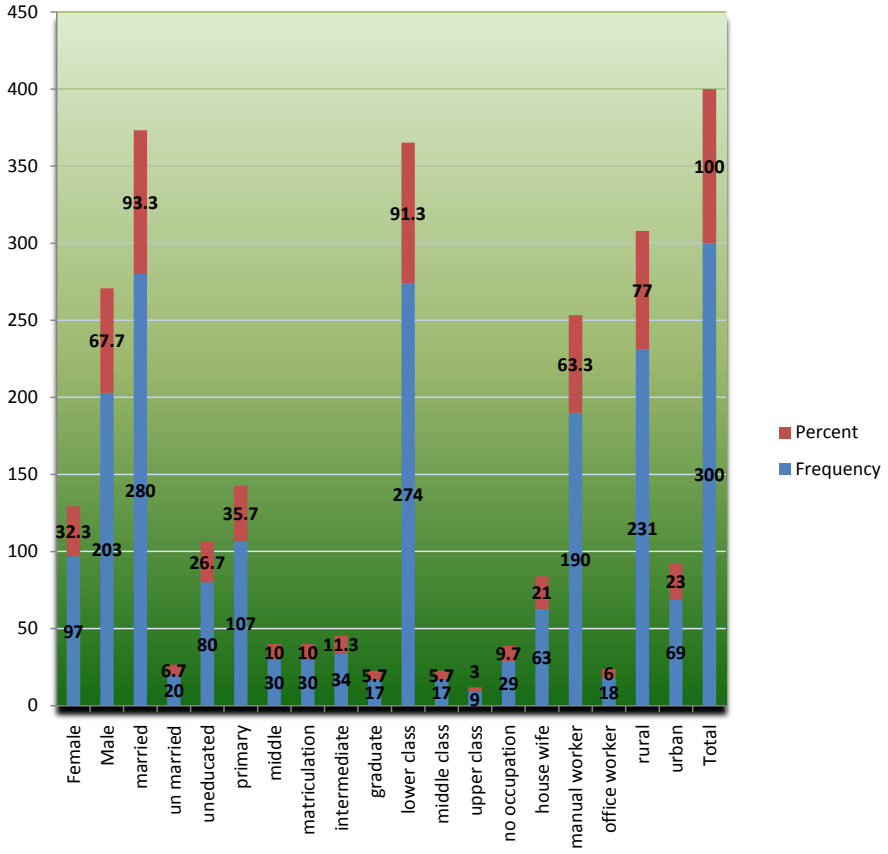

Figure 1. Frequency and percentages of demographic variables. n = 300.

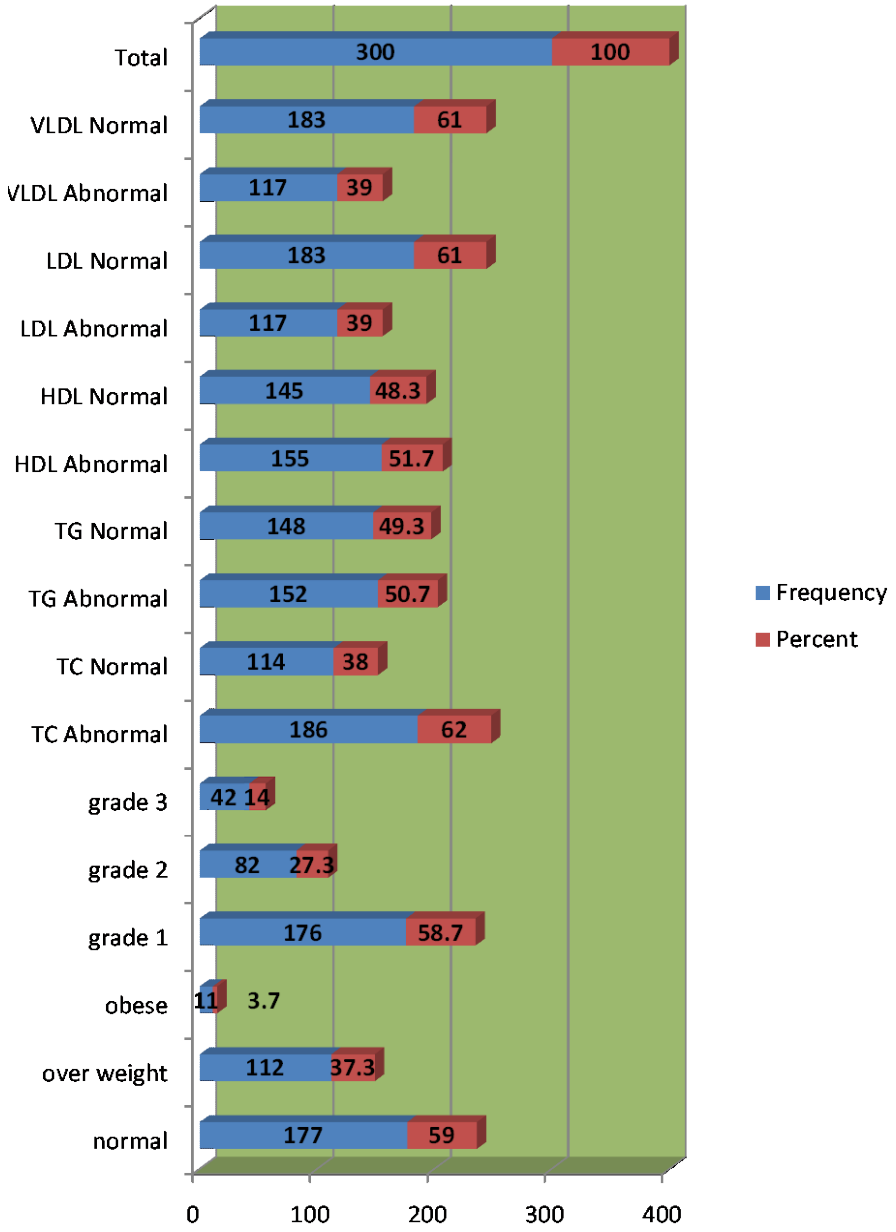

Figure 2. Frequency and percentages of lipid profile, grades of fatty liver and BMI. n = 300.

The correlation of age was statistically significant with TG-C (p-value 0.030) and no significant relation with grading of fatty liver and rest of lipid profile.

The correlation of grades of fatty liver was statistically significant with TG-C (p-value 0.012) and no significant relation with age and other variables of lipid profile (**Table 2**).

The percentage of total cholesterol within different grades of fatty liver was normal in 114 (38%) and abnormal 186 (62%) of patients. In grade I there were 72 (40.90%) normal and 104 (59.140%) abnormal, in grade II there were 31 (37.80%) normal and 51 (62.20%) abnormal and in grade III 11 (26.20%) normal, 31 (73.80%) were abnormal (p value 0.210).

Table 1. Statistical values of age and lipid profile n = 300.

Statistics Statistivariable	**Age In Years**	**Cholesterol Level mg/dl** Normal Less than 200 mg/dl	**Triglyceride Level mg/dl** Normal < 150 mg/dl	**High Density Cholesterol Level mg/dl** Normal > 40 mg/dl	**Low Density Lipoprotein Level mg/dl** Normal< 100 mg/dl	**Very Low Density Lipoprotein Level mg/dl** Normal < 30 mg/dl
Mean	46.8367	154.6679	180.9884	32.1379	116.4180	43.4762
Std. Error of Mean	0.50937	3.39960	5.56970	0.33971	2.36727	1.98281
Median	47.0000	147.9500	192.4500	30.9500	102.2250	29.0000
Mode	49.00	95.23[a]	28.50[a]	36.00	100.20	28.50
Std. Deviation	8.82248	58.88273	96.46998	5.88387	41.00236	34.34324
Variance	77.836	3467.176	9306.457	34.620	1681.194	1179.458
Range	35.00	188.98	306.22	36.15	193.02	173.13
Minimum	30.00	77.25	26.90	22.00	5.23	11.12
Maximum	65.00	266.23	333.12	58.15	198.25	184.25
p-value	0.000	1.000	0.974	0.000	0.000	0.000

a. Multiple modes exist. The smallest value is shown.

Table 2. Correlations of different grades of fatty liver and age with lipid profile n = 300.

	Statistical parameters	**Grades Of Fatty Liver**	**Age In Years**	**Cholesterol Level**	**Triglyceride Level**	**High Density Cholesterol Level**	**Low Density Lipoprotein Level**	**Very Low Density Lipoprotein Level**
Grades Of Fatty Liver	Pearson Correlation	1	0.025	0.052	0.145*	0.015	0.096	0.097
	Sig. (2-tailed)		0.672	0.366	0.012	0.797	0.098	0.093
Age In Years	Pearson Correlation	0.025	1	0.086	0.125*	−0.094	0.081	0.057
	Sig. (2-tailed)	0.672		0.139	0.030	0.103	0.161	0.326
Cholesterol Level	Pearson Correlation	0.052	0.086	1	0.518**	−0.261**	0.639**	0.544**
	Sig. (2-tailed)	0.366	0.139		0.000	0.000	0.000	0.000
Triglyceride Level	Pearson Correlation	0.145*	0.125*	0.518**	1	-0.025	0.685**	0.537**
	Sig. (2-tailed)	0.012	0.030	0.000		0.664	0.000	0.000
High Density Cholesterol Level	Pearson Correlation	0.015	−0.094	−0.261**	−0.025	1	−0.236**	−0.362**
	Sig. (2-tailed)	0.797	0.103	0.000	0.664		0.000	0.000
Low Density Lipoprotein Level	Pearson Correlation	0.096	0.081	0.639**	0.685**	−0.236**	1	0.676**
	Sig. (2-tailed)	0.098	0.161	0.000	0.000	0.000		0.000
Very Low Density Lipoprotein Level	Pearson Correlation	0.097	0.057	0.544**	0.537**	−0.362**	0.676**	1
	Sig. (2-tailed)	0.093	0.326	0.000	0.000	0.000	0.000	

*Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

The percentage of TG within different grades of fatty liver was normal in 148 (49.30%) and abnormal 152 (50.70%) of patients. In grade I there were 90 (51.10%) normal and 86 (48.90%) abnormal, in grade II there were 36 (43.90%)

normal and 46 (56.10%) abnormal. and in grade III 22 (52.40%) normal, 20 (47.60%) were abnormal (p value 0.509).

The percentage of HDL-C within different grades of fatty liver was normal in 145 (48.30%) and abnormal 155 (51.70%) of patients. In grade I there were 82 (46.60%) normal and 94 (53.40%) abnormal, in grade II there were 41 (50%) normal and 41 (50%) abnormal and in grade III 22 (52.40%) normal while 2 0 (47.60%) were abnormal (p value 0.748).

The percentage of LDL within different grades of fatty liver was normal in 183 (61%) and abnormal 117 (39%) of patients. In grade I there were 106 (60.20%) normal and 70 (39.80%) abnormal, in grade II there were 49 (59.80%) normal and 33 (40.20%) abnormal and in grade III 28 (66.70%) normal, 14 (33.30%) were abnormal (p value 0.717).

The percentage of VLDL within different grades of fatty liver was normal in 183 (61%) and abnormal 117 (39%) of patients. In grade I there were 109 (61.90%) normal and 67 (38.10%) abnormal, in grade II there were 46 (56.10%) normal and 36 (43.90%) abnormal and in grade III 28 (66.70%) normal while 14 (33.30%) were abnormal (p-value 0.482) (**Table 3**).

4. Discussion

In present study we had demonstrated the lipid profile abnormalities with different grades of fatty liver. NAFLD is a global health issue. It is also very common in our setup also. Lot of factors is responsible in our setup. It needs urgent consideration for the better management. It may result in lot of complications if not controlled accordingly. Pakistan is a resource poor country, the prevalence of the different disease burden is very high, and here mortality and morbidity is increasing day by day. Low education profile, poverty, poor sanitation, lack of health education, lack of resources, gender dominance, urbanization, un-employment are the main hindrances in health management of common peoples.

Pathological findings of NAFLD in consequence with progression range deposition of cells in liver cell (steatosis) to cirrhosis and advanced fibrosis (steatohepatitis), these all-pathologic characteristics are also seen in alcoholic liver disease and in non-alcoholics. Steatohepatitis (non-alcoholic) usually considered as intermediate stage of fatty liver (non-alcoholic disease) and is described by the steatosis, injury to hepatic cells, and inflammation of liver, necrosis and fibrosis [18]. Male subjects who have obesity, hypertension and diabetes mellitus had more commonly NAFLD (Non-alcoholic fatty liver disease). Very few researches had conducted ultrasound studies in fatty liver (non-alcoholic disease) subjects. It is prevalent amongst male gender; most reported cases are normotensive, non-diabetic and have normal BMI [13]. In current study males are predominant as compared with females; 203 males (67.7%) and 97 females (32.3%) included; with male: female ratio of 2.1:1. In a study by Santoshini A *et al.*, majority of participants 97 (58.79%) males and females were 68 (41.21%) [13].

Table 3. Cross tabulation of lipid profile with different grades of NAFLD. n = 300.

Variable with P values	Statistical parameters	GRADE I			GRADE II			GRADE III			Grade I II III Abnormal Total	Grade I II III Normal Total	Total %
		Abnormal	Normal	Total	Abnormal	Normal	Total	Abnormal	Normal	Total	Abnormal	Normal	Total %
TC p 0.210	Count	104	72	176	51	31	82	31	11	42	186	114	300
	% Within Grades Of Fatty Liver	59.10%	40.90%	100.00%	62.20%	37.80%	100.00%	73.80%	26.20%	100.00%	62.00%	38.00%	100%
TG p 0.509	Count	86	90	176	46	36	82	20	22	42	152	148	300
	% Within Grades Of Fatty Liver	48.90%	51.10%	100.00%	56.10%	43.90%	100.00%	47.60%	52.40%	100.00%	50.70%	49.30%	100%
HDL p 0.748	Count	94	82	176	41	41	82	20	22	42	155	145	300
	% Within Grades Of Fatty Liver	53.40%	46.60%	100.00%	50.00%	50.00%	100.00%	47.60%	52.40%	100.00%	51.70%	48.30%	100%
LDL p 0.717	Count	70	106	176	33	49	82	14	28	42	117	183	300
	% Within Grades Of Fatty Liver	39.80%	60.20%	100.00%	40.20%	59.80%	100.00%	33.30%	66.70%	100.00%	39.00%	61.00%	100%
VLDL p 0.482	Count	67	109	176	36	46	82	14	28	42	117	183	300
	% Within Grades Of Fatty Liver	38.10%	61.90%	100.00%	43.90%	56.10%	100.00%	33.30%	66.70%	100.00%	39.00%	61.00%	100%

Mean age and SD of study subjects were 46.83 ± 8.82 years. The peak age group with presentation of NAFLD in recent research was 40 to 65 years which is comparable to other study conducted by Roli Agarwal *et al.* [19] in which mean age of subjects were 42.90 ± 10.54 years and Amrapurkar *et al.* [20] had shown mean age as 55.4 years. In western communities, studies had shown mean age of subjects ranging from 41 - 45 years. In this study it is observed that our subjects were 5 - 10 years elder than the subjects studied elsewhere, this is because NAFLD in our subjects is observed in 4^{th} and 5^{th} decades.

Difference of fat distribution in the body or antioxidant system possibly regarded as the genetic sensitivity in our general population. Triglycerides deposited in the liver cells are required for the ontogenesis of NAFLD. The reason in favor of this metabolic proceeding to deposition of lipids in the liver cells remains tacit, but it is suggested that this could be due to the resistance of insulin alters the pathway of consumption, formation, degradation and are releasing of the substances in liver metabolism. The basic mechanism of consequences resulting in lipid accumulation are not understand, but alteration in the pathway related with uptake, formation, deprivation, or oozing of substances in metabolism in liver result due to resistance for insulin are assumed. Resistance for Insulin is the common agent leading to ontogenesis of NAFLD [21].

In these subjects, significant variations had observed in fasting lipid profile. Increased serum triglycerides observed in fatty liver (non-alcoholic disease) pa-

tients in a research conducted in USA by Clark [22]. Also another study had shown increased serum triglycerides in these (NAFLD) subjects conducted in Brazil [23].

Research conducted in Maxico by Lizar-di-Cervera *et al.* [24] analyzed that 63% of fatty liver (non-alcoholic disease) subjects had higher cholesterol levels. The findings of current study were compareable with other studies and shown that there were remarkable alterations in the lipid profile with different grades of fatty liver, the cholesterol value was abnormal in 186 (62%), while normal in remaining 114 (38%) patients. Triglycerides were abnormal in 152 (50.7%) while in 148 (49.3%) patients was normal. HDL in 155 (51.7%) patients was abnormal while 145 (48.3%) patients had normal values. Low density lipoprotein value in 117 (39%) patient was abnormal and 183 (61%) patient normal. Very low-density lipoprotein in 117 (39%) patients was abnormal and 183 (61%) patient normal. Total serum cholesterol and serum triglyceride levels increased in fatty liver (non-alcoholic disease) patients as compared with controls [25]. Another study by Bajaj *et al.* [26] in fatty liver (non-alcoholic disease) patients shown increased total serum cholesterol and triglycerides levels. Present study results are comparable at global level.

Ultrasonic findings along with considerably raised fasting lipid profile are the safe, cheap, easy, and accurate available diagnostic tool for fatty liver (non-alcoholic disease) [11]. Ultrasound (USG) foremost imaging technique used to establish and categorize the fatty liver disease and extensively used for the suspects of NAFLD and also asymptomatic subjects having raised hepatic enzymes.

In current study, ultrasound provided excellent utility for diagnosis of fatty liver (NAFLD) by means of raised levels of fasting lipid profile. This is detected earlier by ultrasonography. There is statically significant relation in subjects diagnosed on ultrasound and serum fasting profile of lipid of fatty liver (non-alcoholic disease). Ultrasound is cost effective technique to analyze the changes seen in various grades of NAFLD. Ultrasonography also decreases needless contact, costly, complex and tiresome investigations in these subjects as well as in asymptomatic patients.

There were 176 (58.7%) patients in grade I, while 82 (27.3%) patients in grade II and 42 (14%) patients in grade III.

The cholesterol value was abnormal in 186 (62%), while normal in remaining 114 (38%) patients. Triglycerides were abnormal in 152 (50.7%) while in 148 (49.3%) patients was normal. HDL in 155 (51.7%) patients was abnormal while 145 (48.3%) patients had normal values. Low density lipoprotein value in 117 (39%) patient was abnormal and 183 (61%) patient normal. Very low-density lipoprotein in 117 (39%) patients was abnormal and 183 (61%) patient normal. Santoshini A *et al.* [13] in their research found that lipid profile was greatly altered in NAFLD with Grade I, II and III (48.48%, 38.79% and 12.73%) respectively. In present study there was statistically significant correlation of triglycerides with grades of fatty liver (p value 0.012), age (p value 0.030), cholesterol (p

value 0.000), LDL-C (p value 0.000) and VLDL-C (p value 0.000). The correlation amongst grades of fatty liver was statistically significant with TG-C (p-value 0.012) and no significant relation with other variables of lipid profile and age. This study has shown that subjects diagnosed as having fatty liver on ultrasound, their fasting lipid profile remains deranged. Subjects diagnosed on ultrasonographically had shown statically a substantial relationship with fasting lipid profile (p value < 0.05). Current study established that ultrasonography is the most cost effective technique to analyze the changes seen in various NAFLD grades. Ultrasonography also decreases needless contact, costly, complex and tiresome investigations in these subjects as well as in asymptomatic patients. Ultrasound (USG) is the foremost imaging technique used to establish and categorize changes related to fatty liver (non-alcoholic disease). Ultrasound is the cost effective technique to analyze the changes seen in various grades of NAFLD. Ultrasonography also decreases needless contact, costly, complex and tiresome investigation in these subjects as well as in asymptomatic patients. So this study recommends that fatty liver (NAFLD) can be detected earlier by ultrasonography.

5. Conclusion

Early detection and precautionary measurements should be taken to understand the pattern of the disease. Time tested decision for the treatment of disease should be carried out immediately to control the possible unwanted outcome of the NAFLD in terms of disability and death.

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Conflict of Interest

Author declares no conflict of interest.

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