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STUDY OF LIPID PROFILE AND HEPATIC CHANGES IN ULTRASONOGRAPHY IN OBESE AND OVERWEIGHT INDIVIDUALS IN CENTRAL INDIA

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ABSTRACT

Background-Current study is an attempt to study the lipid profile and hepatic changes in ultrasonography in overweight & obese individuals in central India. **Methodology-** This was a cross sectional study at tertiary care Hospital for a period of 1 year on all the overweight and obese individuals belonging to >18 years of age. All the selected participants were subjected to further investigation including routine investigations (Fasting glucose, CBP, RFT including serum protein, LFT), Lipid Profile, hepatitis B and C testing and Ultrasonography (Abdomen). The findings thus obtained were studied to see for the change/variation of lipid profile and hepatic changes in ultrasonographic in different grades of Obesity. **Result-**The present study was conducted on a total of 150 overweight and obese individuals with BMI ≥25kg/m2. The study observed statistically significant association of obesity with age, waist circumference and TC/HDL ratio ($p<0.05$) whereas no such association was observed with gender, body fat %, and other lipid profile parameters ($p>0.05$). Pearson correlation coefficient observed triglyceride ($r=10.194$, $p=0.018$),WC ($r=0.367$, $p<0.001$) and Body fat % had significant positive correlation with the grades of obesity. However, HDL ($r=-0.247$, $p=0.002$) was negatively corrected which means by increasing the grades of obesity, HDL decreases. No association was obtained between grades of obesity and USG finings. Grades of obesity has no effect on different grades of fatty liver ($p>0.05$). **Conclusion-**Lipid abnormalities are observed during all stages of the obesity. Variable changes have been in lipid profile observed amongst fatty liver patients diagnosed on ultrasound. Early diagnosis and treatment of fatty liver with abnormal lipids and abnormal anthropometric parameters can prevent from long-term complication of fatty liver and obesity.

KEYWORDS : Lipid profile, fatty liver, NAFLD, USG, obesity

Introduction-

Obesity has long been an important health problem in high income countries, but now it is emerging in Low Middle Income countries like India, especially in urban areas, paradoxically co-existing with undernutrition. Almost 30-65% of adult urban Indians are either overweight or obese or have abdominal obesity. The rising prevalence overweight and obesity in India has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM), and cardiovascular disease (CVD).[1]

Abdominal obesity is defined as an excessive accumulation of fat in the body and is measured by simple measures of obesity such as waist circumference (WC) and waist-to-hip circumference ratio (WHR).[2,3] Though BMI, WC or WHR correlate well with each other, it is also believed that combined use of these parameters of generalized and abdominal obesity may be better in identifying people at risk of CVD than either of them alone.[3]

Obesity is increasingly being recognized as a key factor in the development of Non-alcoholic fatty liver disease (NAFLD), and the majority of patients with NAFLD are either obese or overweight. However, NAFLD has been reported in lean subjects residing in developing countries as well as developed countries. The spectrum of NAFLD ranges from simple steatosis and non-alcoholic steatohepatitis (NASH) to cirrhosis. NAFLD is a major cause of chronic liver disease worldwide.[4]

The diagnosis of fatty liver is usually made on ultrasound which is an accurate, reliable imaging technique for the detection of fatty liver, as compared with histology, with a sensitivity of 84.8% and a specificity of 93.6% for detecting 20–30% steatosis. The diagnosis of NAFLD is made usually with exclusion of other causes of fatty liver and raised liver enzymes if present.[5]

Current study is an attempt to study the lipid profile and hepatic changes in ultrasonography in overweight & obese individuals in central India.

Objectives:

- To study the ultra-sonographic findings and lipid profile amongst overweight and obese individuals
- To study the co-relation of abnormalities in lipid profile and anthropometric parameters with severity of obesity.

Methodology- The present study was conducted as an observational cross sectional study atDepartment of Medicine, Gandhi Medical College, & associated HamidiaHospitals Bhopal for a period of 1 year i.e. from 1st November 2018 to 30th October 2019. All the individuals reporting to indoor and outdoor department of medicine belonging to >18 years of age were subjected to screening by measuring body mass index and waist hip circumference and body fat% and those found to be overweight and obese (BMI ≥25kg/m2) were included in the study. However the exclusion criteria was individuals with any amount of Alcohol consumption, pregnancy, known case of chronic infectious hepatitis(B & C) and individuals taking medications which induce fatty liver changes e.g. OC Pills, Methotrexate,Estrogens,Tamoxifen,Amiodarone, Rifampicin etc. Details regarding sociodemographic profile was obtained from all the participants and entered in pretested questionnaire. Subjects were divided into different grades of obesity based upon BMI criteria.All the selected participants were subjected to further investigation including routine investigations (Fasting glucose, CBP, RFT including serum protein, LFT), Lipid Profile, hepatitis B and C testing and Ultrasonography (Abdomen). The findings thus obtained were studied to see for the change/variation of lipid profile and hepatic changes in ultrasonographic in different grades of Obesity.

Statistical analysis:

All the data analysis was performed using IBM SPSS ver. 20 software. Frequency distribution and cross tabulation was used to prepare the tables. Quantitative variables were expressed as the mean and standard deviation. Categorical data was expressed as percentage. Pearson correlation was used to predict the association between the quantitative parameters. Chi Square test was used to compare the categorical data. P value of < 0.05 is considered as significant.

OBSERVATION

The present study was conducted on a total of 150 overweight and obese individuals with BMI ≥25kg/m2. Based on BMI, participants were categorized into overweight (BMI 25-29.9kg/m2), Obese grade I (BMI 30-34.9kg/m2), Obese grade II (BMI 35-39.9 kg/m2) and obese grade III (BMI≥40 kg/m2). Overweight, obesity grade I, II and III were documented in 14 (9.3%), 63 (42%), 39 (26%) and 34 (22.7%) participants respectively.

Table 1: Association of Obesity with Sociodemographic variables

Sociodemographic variables		BMI				Total	P value
		Overweight (25-29.9)	Grade I (30-34.9)	Grade II (35-39.9)	Grade III (≥40)		
Age group	21-30	0 (0)	7 (38.9)	10 (55.6)	1 (5.6)	18	0.007
	31-40	3 (7)	17 (39.5)	14 (32.6)	9 (20.9)	43	
	41-50	5 (10.6)	20 (42.6)	7 (14.9)	15 (31.9)	47	
	51-60	3 (8.6)	17 (48.6)	6 (17.1)	9 (25.7)	35	
	61-70	3 (42.9)	2 (28.6)	2 (28.6)	0 (0)	7	
Gender	Male	9 (10.1)	40 (44.9)	22 (24.7)	18 (20.2)	89	0.727
	Female	5 (8.2)	23 (37.7)	17 (27.9)	16 (26.2)	61	

In present study, Grade 3 obesity was more common among the patients with age 41-50 years (31.9%) whereas grade 2 obesity was more common in age group of 21-30 years (55.6%). The observed association between grades of obesity and age was highly significantly p value of 0.007. However, no significant association was observed between grades of obesity and gender (p>0.05).

Table 2- Comparing anthropometry and lipid profile with grades of obesity

	Grades of obesity				P value
	Overweight (25-29.9)	Grade I (30-34.9)	Grade II (35-39.9)	Grade III (≥40)	
Body fat% deranged	13 (9.1)	59 (41.3)	38 (26.6)	33 (23.1)	0.75
WC raised	11 (8.8)	48 (38.4)	32 (25.6)	34 (27.2)	0.025
TC>200	13 (10)	51 (39.2)	35 (26.9)	31 (23.8)	0.367
LDL>130	11 (8.5)	5 (43.1)	33 (25.4)	30 (23.1)	0.734
HDL<40	5 (7.9)	31 (49.2)	13 (20.6)	14 (22.)	0.426
Abnormal TC/HDLratio	14 (9.5)	63 (42.9)	39 (26.5)	31 (21.1)	0.015

The present study observed statistically significant association of grades of obesity with waist circumference and total cholesterol/HDL ratio (p<0.05). However, no such association was observed with other parameters of lipid profile (p>0.05).

Table 3- Pearson correlation between Grades of obesity and other parameters

	Pearson Correlation (n=150)	Sig. (2-tailed)
BODY FAT %	.225	0.006
WC	.367	<0.001
TC	.158	.053
TG	.194	.018
LDL	.158	.054
HDL	-0.247	.002
TC/HDL RATIO	-.002	.984

In present study, on Pearson correction we found that triglyceride (r=10.194, p=0.018),WC (r=0.367, p<0.001) and Body fat % had significant positive correlation with the grades of obesity. That means as the TG, WC and body fat of patients increase, grade of obesity also increases. However, HDL (r=-0.247, p=0.002) was negatively corrected which means by increasing the grades of obesity, HDL decreases.

Table 4- USG(LIVER) with GRADE OF OBESITY

USG	Grades of obesity				P value
	Overweight (25-29.9)	Grade I (30-34.9)	Grade II (35-39.9)	Grade III (≥40)	
Normal Study	12 (15)	33 (41.3)	17 (12.9)	18 (22.5)	0.385
Grade 1 Fatty Liver	2 (3.8)	23 (42.6)	16 (29.6)	13 (27)	
Grade 2 Fatty Liver	0 (0)	6 (40)	6 (40)	3 (20)	
Grade 3 Fatty Liver	0 (0)	1 (100)	0 (0)	0 (0)	

In present study no significant correlation was obtained between grades of obesity and USG finings. Grades of obesity has no effect on different grades of fatty liver as revealed by the insignificant p value of 0.385.

DISCUSSION

Fatty liver was thought to be a benign condition but is now increasingly recognized as a major cause of liver-related morbidity and mortality. Studies introduced that non-alcoholic fatty liver disease (NAFLD) may progress to cirrhosis, liver failure, and hepatocellular carcinoma.[6]

In present study, on comparing the grades of obesity with age groups, it was found that majority of the patients with grade 1 obesity had age between 51-60 years (48.6%) whereas majority of the grade 2 obesity patients belonged to 21-30 years (55.6%). Grade 3 obesity was more common among the patients with age 41-50 years (31.9%) followed by 51-60 years (25.7%). The observed difference was statistically highly significant (p<0.01). These findings are similar to of Nyaruhucha, C et al who recorded the prevalence of obesity to be higher among the subjects in 41-50 year age group (45.4%) than the other age groups.[7]Singh S et al. also recorder similar findings where the Point prevalence of 'overweight' and 'morbid obesity' was maximum in age group of 40-49 years and that of 'obesity' in 50 years or older subjects in the study population.[8] However Khabazkhoob M et al observed no significant differences in prevalence's of obesity among age groups (P=0.643).[9]

The present study observed no significant association of gender and obesity, these findings were similar to study by Al-Baghli et al, in which no significant association of obesity was found with gender, education, physical activity and personal habits.[10]

In present study, abnormal Body fat was equally distributed in different grades of obesity (p>0.05). These findings were contrasting to the findings ofKo HI et al where body fat and visceral fat, were found to be associated with NAFLD. A larger WC, higher BMI, higher levels of body and visceral fat significantly correlated with the presence of a fatty liver.[11] However, association between grades of obesity and waist

circumference was statistically significant (p>0.05).Homa-Sadat V et al reported that the mean waist circumference of the patients in the group of patients was 84.35 ± 10.18 cm and was significantly higher than the healthy subjects (78.65±8.27) (P<0.0001).[12] Deeb A et al also observed strong association of waist circumference with dyslipidemia and FLD (P=0.04 and 0.003).[13]

The present study observed no association of obesity with cholesterol, LDL, HDL and triglycerides level whereas a statistically significant association was observed with TC/HDL ratio (p<0.05). In present study, on Pearson correlation we found that triglyceride (r=10.194, p=0.018), WC (r=0.367, p<0.001) and Body fat % had significant positive correlation with the grades of obesity. That means as the TG, WC and body fat of patients increase, grade of obesity also increases. However, HDL (r=-0.247, p=0.002) was negatively corrected which means by increasing the grades of obesity, HDL decreases. Similar observations were made by Shao, Congxiang et al where lipid profiles and uric acid (UA) were significantly increased in parallel with BMI categories (pair wise comparison P < 0.001).[14] For LFC ≥ 10%, increased waist circumference (WC) was an independent predictor in all groups, while UA elevation (P = 0.02) was predictive in the overweight patients, but BMI ≥ 28 kg/m2 (P = 0.029) and IR (P = 0.026) were significant in the obese patients. For fibrosis, alanine aminotransferase (ALT) > 40 U/L (P = 0.031), increased WC (P = 0.012) and BMI ≥ 28 kg/m2 (P < 0.001) plus ALT > 40 U/L (P = 0.007) were predictors in the lean, overweight and obese patients, respectively.[14]

In Present study no significant correlation was obtained between grades of obesity and USG finings. Mean Grades are obesity has effect on different grades of fatty liver as revealed by the insignificant p value of 0.385. Similar study by Barros F, et al recorded that the levels of glycated hemoglobin (p=0.05) and LDL cholesterol (p=0.01) were significantly altered in patients with fatty liver disease. However, weight, body mass index and excess weight did not differ significantly between the groups (p=0.835, p=0.488 and p=0.727, respectively).[15]

Present study is not devoid of the limitation; small sample size and cross sectional nature were the main due to which present study findings cannot be applied to large population. A large randomized clinical trial is needed to provide strength to present study findings.

Conclusion-

In present study, HDL, TG, TC, LDL, and body fat (%) were equally distributed among different grades on obesity, except WC & TC/HDL ratio, which have significant distribution in different grades of obesity. However, abnormality in triglyceride, WC and Body fat % increases with increasing the grades of the obesity as evident from the Pearson correlation whereas HDL was negatively correlated with grades of obesity. TG, WC, Body fat percentage & HDL can be used as indicators of severity of obesity. Thus, lipid abnormalities are observed during all stages of the obesity. Variable changes have been in lipid profile observed amongst fatty liver patients diagnosed on ultrasound. Early diagnosis and treatment of fatty liver with abnormal lipids and abnormal anthropometric parameters can prevent from long-term complication of fatty liver and obesity.

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