

# Obesity and Non Alcoholic Fatty Liver Disease in Females in tertiary care Hospital

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## Abstract

**Background:** Obesity is now recognized as a disease in its own right due to increase in morbidity and mortality. Obesity is strongly associated with metabolic disorders like diabetes hypertension cardiovascular disease and NAFLD. NAFLD is the most common liver disorder affecting the world and it is now considered as the most common cause of abnormal liver function tests. **Aim:** To study biochemical profile NAFLD in females and to study its association with obesity. **Methodology:** This is a descriptive study done in female patients who were diagnosed with fatty liver were enrolled in the study after detailed clinical, anthropometric study and lab work up. Focus was on biochemical and components of metabolic syndrome. Subjects were divided into two groups according to BMI as lean and obese NAFLD and various biochemical and metabolic parameters were compared. **Results:** This study concluded NAFLD is common in obese middle aged females. 90% patients had truncal obesity. Two third of patients had metabolic syndrome with 90% having one component of metabolic syndrome. Biochemical and metabolic dysfunction were more significant in the obese NAFLD group showing that obesity plays a key role in the pathogenesis of NAFLD. **Conclusion:** Obesity is prevailing in rural Indian population. Lack of awareness and health care programmes directed toward identifying obesity as a disease on its own needs to be strengthened. Lifestyle modification and weight is the only effective treatment modality in liver diseases due to obesity.

**Keywords:** obesity, NAFLD, metabolic syndrome, insulin resistance.

## 1. INTRODUCTION

According to world health organization, obesity is one of the most common, yet among the most neglected, public health problem in both developed and developing countries. According to WHO statistics, one in six adults is obese and nearly 2.8 million people die due to obesity and overweight each year [1]. Obesity is now recognized as a disease in its own right due to increase in morbidity and mortality. Obesity is strongly associated with metabolic disorders like diabetes hypertension cardiovascular disease and Non alcoholic fatty liver disease (NAFLD).

India which is the second most populous county is now experiencing a rapid epidemiological transition from undernutrition due to poverty in the past to obesity associated with affluence [2]. Industrialization and urbanization also contribute to increased prevalence of obesity. In a recent ICMR study obesity was more prevalent in women belonging to rural and urban areas. Overall prevalence of generalized obesity was 24.6% in Tamil Nadu. Higher prevalence of combined obesity was seen in women belonging to Tamil Nadu and Chandigarh. Increasing trend in obesity was seen with higher education, income and socioeconomic status [1].

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Obesity is associated with a spectrum of liver dysfunction, known as non alcoholic fatty liver disease (NAFLD), characterized by an increase in the intra hepatic triglyceride content (IHTG) with or without inflammation and fibrosis. [3] NAFLD is an increasingly recognized condition, fuelled by the increasing prevalence of obesity, and is very rapidly becoming a major health problem world-wide. In India the prevalence of the disease ranges from 23.4% to 46%. [4]

NAFLD is the most common liver disorder affecting the world and it is now considered as the most common cause of abnormal liver function tests. NAFLD has been predicted to be the major cause of liver transplantation in 2020 [5].

NAFLD is characterized by insulin resistance and hepatic fat accumulation, in the absence of other identifiable causes of fat accumulation, such as Alcohol abuse, Viral hepatitis, Autoimmune hepatitis, Alpha-1 antitrypsin deficiency, medications like corticosteroids and estrogens, and other conditions [6].

Numerous studies show that NAFLD is the hepatic component of metabolic syndrome whose central features are peripheral insulin resistance, obesity, Hyperinsulinemia, Hypertriglyceridemia and hypertension. 90% percent of patient with fatty liver will have 1 criteria for metabolic syndrome and at least 33 % will have all criteria for metabolic syndrome [7].

We have taken up this study exclusively in female population because of higher prevalence of obesity and virtue of custom, tradition and social upbringing alcohol consumption is rare among rural Indian women.

## 2. Materials and Methodology

Study design:

a. Inclusion Criteria:

- Female patients diagnosed with fatty liver by ultrasound attending the medical

Gastroenterology OPD

b. Exclusion Criteria:

- Non consenting patients
- Patients with significant alcohol consumption (more than 20gms/day).
- All patients referred with elevated transaminitis, overt chronic liver disease, and other diseases that contribute to fat accumulation in liver.

Methodology:

a. Study design: Descriptive study

b. Study location: Meenakshi medical college hospital and research institute, Department of Community Medicine with Central Research Lab, Kancheepuram, Tamil Nadu.

c. Study group: female patients detected with fatty liver on ultrasonogram attending Medical Gastroenterology OPD

d. Study period: November 2016 to November 2017

This study will include all consenting female patients detected with fatty liver on ultrasonogram presenting to medical gastroenterology OPD from November 1st 2016 to November 30th 2017. Brief history and clinical examination will be carried out in OPD. Patient's height, weight, BMI, and waist circumference will be measured. Patient will undergo blood investigations like complete blood count, FBS, LFT, FLP, HbsAg, Anti-HCV and screening for Wilsons disease. Patient data will be entered to Patient proforma for statistical analysis. Obesity will be classified according to Body mass index (BMI) using WHO guidelines as normal range, overweight and obese. Metabolic syndrome is diagnosed using the International Diabetic Federation criteria. Tg/HDL-c ratio more than 3.5 used as a marker for insulin resistance. Modified Kuppaswamy's scale used for socio economic status (SES).

Statistical analysis: The results were recorded in Microsoft excel 2007 using windows XP. The mean, standard deviation was calculated using excel. Comparison between the groups was done using chi square/ fisher's exact test and p value was calculated. Statistical analysis was done using standard SPSS version 17.0.

## 3. Results

This study included fatty liver disease detected on ultrasonogram exclusively in female patients who presented to medical gastroenterology OPD of our institute. We have 51 patients with fatty liver disease and they were diagnosed with NAFLD after clinical and biochemical evaluation. Mean age was 45 years. Age distribution (Figure 1) showed that 47% belonged to 40-50 years and 23% belonged to age more than 50 years. Remaining 30% were less than 40 years affecting productive population. Our hospital serves mainly the low and middle socio economic status group. 69% of patients belonged to lower middle class, 10% in upper middle class and 21% upper lower class according to modified Kuppaswamy's SES scale. Patients in our study were classified as normal range, overweight and obese according to BMI (figure 2). 47% of females in our study belonged to overweight (25-29.9kg/m<sup>2</sup>) and 43% were obese (>30kg/m<sup>2</sup>) according to BMI. Only 10 % patient had normal weight Patient with NAFLD belonging to normal range were grouped as Lean NAFLD and patients with BMI more than 30kg/m<sup>2</sup> were grouped as obese NAFLD. Study parameters are compared between the two groups to find the statistical

significance (Table 1). Various metabolic dysfunctions are compared and analyzed between the two groups (Table 2). 90% of females in our study had a waist circumference (figure 3) more than 80cm showing that truncal obesity can be a confounding factor to NAFLD. None patients were previously diagnosed to be diabetics and yet 51% had fasting blood sugars more than 100mg/dL. Hypertriglyceredemia with low HDL level is common biochemical abnormality in NAFLD. Mean Triglyceride (Tg) level in our study was 154+/- 42mg/dL. 70% had Tg level more than 150mg/dL. 94% of females in our study had a HDL level less than 50mg/dL. 15 % of patients had high blood pressure. In our study we followed the international diabetic federation criteria for metabolic syndrome and 70% had metabolic syndrome (figure 4). Tg/HDL ratio more than 3.5 was used as a marker for insulin resistance. 63% had a Tg/HDL ratio more than 3.5(figure 5) which showed insulin resistance is one of the confounding mechanisms for NAFLD.

Table 1: comparison between various parameter of the study with lean and obese NAFLD

PARAMETERS	LEAN NAFLD	OBESE NAFLD
AGE	47.9 ± 11.2	44.6 ± 11.7
WEIGHT	56 ± 4.0	72.7± 5.8
BMI	23.01± 2.19	30.13 ± 4.04
WC	83.8 ± 5.2	96.1 ± 7.6
FBS	88.8 ± 13.4	105.15 ± 18.5
TG	134 ± 56	159.3 ± 45.5
HDL	42 ± 11.4	39.1 ± 7.13
TG/HDL	3.2 ± 1.06	4.2 ± 1.3

Table 2: comparison of metabolic abnormalities between lean and obese NAFLD

METABOLIC DYSFUNCTION	LEAN NAFLD (5)	OBESE NAFLD (46)	SIGNIFICANT P < 0.001
FBS >100	0	26(56%)	HS

TG >150	1(20%)	35(76%)	HS
HDL < 50	4(80%)	44(95%)	NS
WC >80	1(20%)	45(97%)	HS
MS + (IDA)	1(20%)	35(76%)	HS
TG/HDL > 3.5	1(20%)	32(69%)	HS

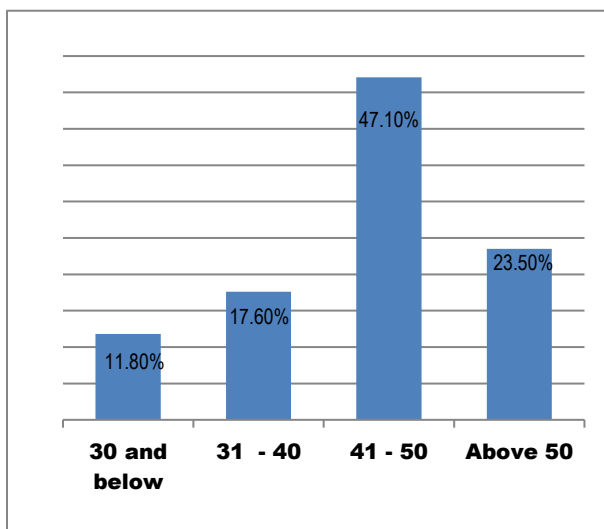


FIGURE 1: AGE DISTRIBUTION

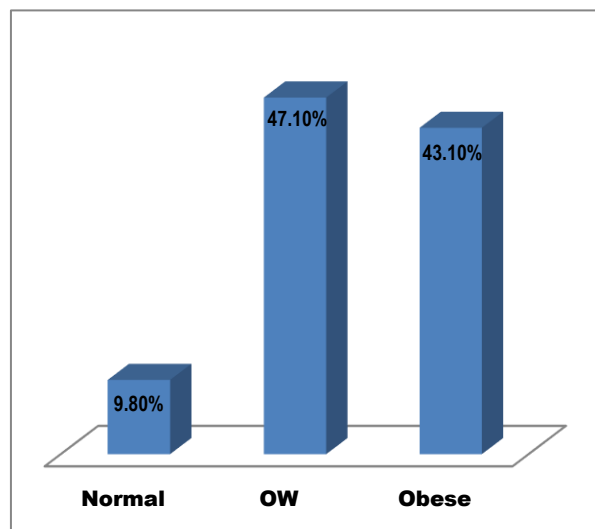


FIGURE 2: BMI CLASSIFICATION

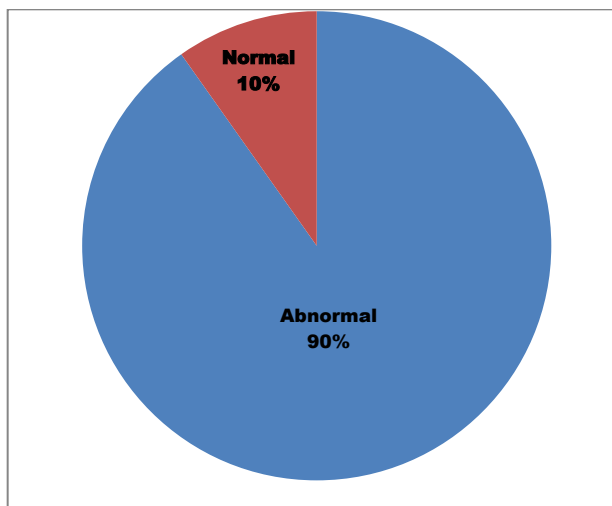


FIGURE 3: WAIST CIRCUMFERENCE

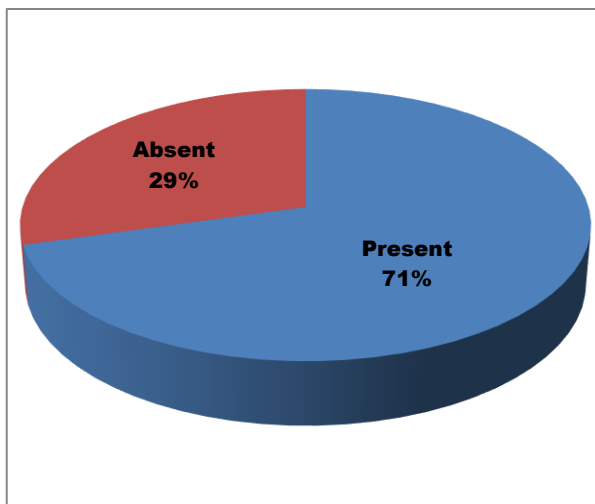


FIGURE 4: METABOLIC SYNDROME

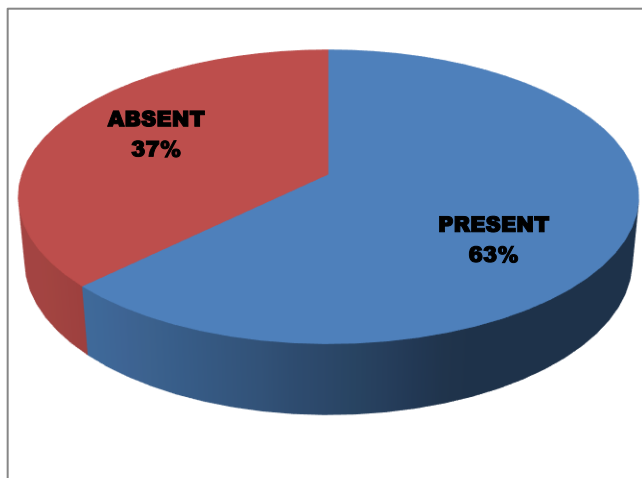


FIGURE 5: INSULIN RESISTANCE

#### 4. Discussion

The prevalence of obesity is on a global increase, rising in tow are a number of condition related to obesity, not limited

to diabetes, hypertension, atherosclerosis, dyslipidemia, osteoarthritis, obstructive sleep apnea and gallstones[8]. The importance of liver disease in obesity is now widely recognized. NAFLD is identified as one of the commonest cause for altered liver function test worldwide. In the last few decades developing countries like India have maximal increase in the rates of obesity especially in younger population.

In our study we have taken 51 female patients who were diagnosed with non alcoholic fatty liver disease by ultrasonogram who presented to our outpatient department. Our hospital serves a rural population with patient belonging to low and middle socio economic status of Kanchipuram district, Tamil Nadu. In our study 69% of patients belonged to lower middle class,10% in upper middle class and 21% upper lower class according to modified Kuppaswamy's SES scale. WHO fact sheets states that obesity is more common among belonging to rural population [1].

This study is exclusively planned in females as obesity appears to be more common among them and by virtue of their social upbringing alcohol consumption is rare (0.3%) among rural Tamil women. Studies shows that with urbanization, most of the rural area have urban facilities and people tend to have decreased physical activities and hence obesity is prevailing inspite or reports showing obesity is low among rural women[9].

In our study 47% of patient were classified as overweight (BMI> 25kg/m<sup>2</sup>) and 43% were classified as obese (BMI>30 kg/m<sup>2</sup>) according to WHO guidelines. Of all NAFLD patient 90% were obese or weight which shows that NAFLD is strongly associated with obesity. Study done by Kim et al [11] on NAFLD patients showed that mean BMI of patients with NAFLD was 27±1.3kg/m<sup>2</sup> and mean BMI in lean NAFLD patient was 23± 1.3 kg/m<sup>2</sup>. In general population the prevalence of NAFLD ranges from 10-24% and prevalence increases to 57 to 74% in obese population. Lean NAFLD was identified in 10% of patients which shows that other than obesity there are other factors responsible in the development of NAFLD.

Truncal obesity was noted in 90% of patient in our study. Waist circumference of more than 80 cm was taken as truncal obesity in females according to IDA criteria for metabolic syndrome. Increase in central adiposity is associated with increased morbidity and mortality. The presence of intra abdominal fat has been proposed as the major determinant of insulin resistance. Studies done by Kirovski et al [12] and Das et al [13] shows that truncal obesity was common in NAFLD when compared to normal population.

There have been few studies showing the association NAFLD with poly cystic ovarian diseases (PCOD). In our study none of our patients were diagnosed to have PCOD [8].

As obesity is associated with metabolic dysfunction, biochemical abnormalities noted in our studies were that 51% of our patient who were previously undiagnosed of Diabetes mellitus. None of the patients belonging to the lean NAFLD

had fasting hyperglycemia. Hypertriglyceridemia and low HDL level were noted in 46% and 88%. When these data were analyzed in obese NAFLD patients, 76% and 95% had Hypertriglyceridemia and low HDL which was statistically significant ( $p < .001$ ). Studies done by Bagheri Lankarani et al [14] had patients with higher HDL values which in contrary to our study. Study by Das et al [13] showed that patients with NAFLD have Hypertriglyceridemia and low HDL.

Liver function tests were abnormal 20% in the obese NAFLD group when compared to lean NAFLD group which was not statistically significant. In our study 71% were diagnosed with metabolic syndrome using the IDA criteria. NAFLD is now identified as the hepatic component of metabolic syndrome. Study done by Das et al [13] showed that 70 % of patient with fatty liver has metabolic syndrome and 30% with metabolic syndrome had fatty liver. 35 of 46 (76%) patients in the obese NAFLD group fulfilled the criteria for metabolic syndrome where as only one in the lean NAFLD and evidence of metabolic syndrome which was statistically significant ( $p < .001$ ).

Insulin resistance plays a key role in the pathogenesis of NAFLD. In our study we used Tg/HDL ratio more than 3.5 to detect insulin resistance. This ratio has been compared with HOMA IR and has shown that the ratio can be used as a simple method for detection of insulin resistance [6]. 63% of our patients were found to have insulin resistance. 76% of patient in the obese NAFLD group has IR compared to 20% in lean NAFLD which is statistically significant ( $p < .001$ ). This shows that insulin resistance is one of the confounding factors along with obesity in the development of NAFLD.

With rising prevalence of obesity in the developing countries like India, the deadly quartet or syndrome X is threatening even the larger segments of productive population. Insulin resistance and central obesity are now firmly established as indisputable mechanisms in the pathogenesis of NAFLD. Our study in females with NAFLD with focus on anthropometry biochemical abnormalities has led to better understanding of the disease which gaining importance. With understanding there can be an effective management protocol when such patients appear in clinical practice. With the prevalence of obesity and metabolic syndrome we should not forget NAFLD which when undetected can progress to NASH, cirrhosis or Hepatocellular carcinoma. Ultrasonogram is till the cheapest and most widely available cost effective modality for the detection of fatty liver. Lifestyle modification and weight reduction is now the current management practice which has shown improvement in hepatic steatosis and fibrosis.

## 5. Conclusion

This study concludes that NAFLD is prevalent among obese

middle aged women belonging to low socio economic status. Truncal obesity was noted in 90% of patients. Fasting hyperglycemia, Hypertriglyceridemia and Low HDL were common biochemical abnormalities. Metabolic syndrome was detected in two third of patients with insulin resistance as the confounding mechanism. Early detection and life style modification is only effective treatment modality. Awareness and health care programmes needs to be strengthened in the rural areas.

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