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NUTRITIONAL STATUS OF NON-ALCOHOLIC FATTY LIVER PATIENTS IN A PRIVATE HOSPITAL, COIMBATORE

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ABSTRACT

Fatty liver is an acquired, reversible disorder of metabolism resulting in an accumulation of triglycerides within the hepatocytes. The most common cause likely is obesity. The aim of the study is to assess the body composition and nutritional status among non-alcoholic fatty liver patients. The study participants (123 adults, 82 males and 41 females aged 18-75 years old) were selected from a multi-specialty hospital. The Body Composition Analysis (anthropometry, BMI,

Fat, and Muscle mass), biochemical investigations, clinical findings, 24-hour diet history, and fatigue were assessed. Results revealed that the majority of the subjects (87%) led a sedentary lifestyle among which males (60.16%) were found to be more sedentary than females (26.82%). Most of the subjects were obese (73.98%), males being either grade I or grade II obese and females belonging to grade I obesity. BMI when correlated with the nutrient intake showed a weak positive correlation (energy (0.025), carbohydrate (0.043), protein (0.065), fat (0.020)). All the participants showed very high-fat percentages (male >25%) and female (>35%) whereas the muscle mass percentages of all of them were low (5-32.8%). There was a significant weak positive correlation between the Body Mass Index and Fat mass (r=0.140) and the muscle mass was negatively correlated (0.075). The majority of them (73.9%) were well-nourished. On fatigue analysis majority of the participants showed mild fatigue. The results showed that obesity is the major contributing factor for NAFLD diagnosis which is associated with nutrient intake and fatigue.

Keywords: NAFLD, Dietary intake, BMI, Fat mass, Muscle mass, Fatigue

INTRODUCTION:

Fatty liver corresponds to the presence of follicular changes without inflammation and lobular inflammation without significant alcohol consumption. It can be divided into NAFL (nonalcoholic fatty liver disease) or simply steatosis and NASH (nonalcoholic steatohepatitis). Alcoholic fatty liver is a condition in which fat accumulates in the liver after drinking too much alcohol. Pathogenesis begins with insulin resistance leading to fatty liver. This leads to increased oxidative stress, which in some individuals leads to steatohepatitis (NASH), fibrosis, and cirrhosis **[1]**. Most people with NAFLD have no symptoms or signs of liver disease at the time of diagnosis. It refers to a wide spectrum of liver disorders ranging from simple steatosis (more than 5% hepatocytes showing fat accumulation), to nonalcoholic steatohepatitis (NASH), which increases the risk of end-stage liver disease, namely liver cirrhosis and hepatocellular carcinoma **[2]**.

The overall prevalence of NAFLD worldwide was estimated to be 32.4% (95% CI 29·9-34·9). Prevalence increased significantly over time, from 25·5% (20·1-31·0) in or before 2005 to 37·8% (32·4-43·3) in 2016 or later (p=0·013). The overall prevalence of NAFLD was significantly higher in men than in women (39·7% [36·6-42·8] vs 25·6% [22·3-28·8]; p<0·0001).) **[3]**. NAFLD affects 10-24% of the general population in various countries. However, the prevalence of NAFLD increases significantly to 57.5-74%

in obese individuals **[4]**. Studies suggest that NAFLD is present in up to 75% of overweight people and over 90% of severely obese people. Total NAFLD statistics worldwide are estimated at 32.4%. The overall prevalence of NAFLD was significantly higher in men (39.7%) than in women (25.6%). NAFLD statistics in the Indian general population range from 9% to 53%. Non-alcoholic fatty liver disease (NAFLD) affects 20-30% of the general adult population **[5]**.

Fatty liver was diagnosed by liver biopsy. A liver biopsy is the current reference standard for NAFLD diagnosis **[6]**. Conventional imaging tests such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) can also be used to diagnose fatty liver **[7]**. The subjective global assessment tool is a method of assessing nutritional status based on medical history and physical examination characteristics. Subjective global assessment is an excellent approach for subjectively evaluating patients with liver disease and is thought to help assess nutritional status in end-stage liver failure **[8]**.

METHODOLOGY

Selection of Area: The area selected for the present study was Coimbatore City. PSG Institute of Medical Sciences and Research was selected for its easy accessibility to approach the subjects by the investigator.

Ethical clearance: Any human study its conduct requires ethical clearance from the human ethics committee. This is usually done to ensure that the clinical trial does not cause any harm or affect the patient in any form. All and any research in humans must be preceded by permission from an Ethics Committees – be it an Institutional Review Board or an Institutional Ethics Committee or an Independent Ethics Committee – whichever is accessible **[9]**.

Selection of subjects: The subjects were selected from the population through the purposive sampling technique, which is widely used in qualitative research for the identification and selection of information-rich cases for the most effective use of limited resources.

Inclusion criteria: The participants under the age group 18 years to 75 years who were diagnosed with Non-alcoholic fatty liver disease not older than a year and the subjects with and without co-morbidities like diabetes mellitus, obesity, and renal problems were included in the study.

Exclusion criteria: The subjects with other advanced stages of fatty liver disease like cirrhosis, and chronic liver disease and the subjects aged were excluded. Pregnant women and subjects aged above 75 years were excluded. Also, subjects diagnosed with Non-

alcoholic fatty liver older than a year and those with advanced stages of fatty liver disease and/or with other hepatic disorders were excluded.

A total number of 123 Non-alcoholic fatty liver patients were selected as subjects for the study.

Tools of Assessment: For the prospective and retrospective cross-sectional study on Non-alcoholic fatty liver patients, primary data was collected for the nutritional assessment of the patients. The subjects were assessed for their weight, height, BMI, body composition, biochemical data, food intake, and fatigue score using the tools-

- Digital weighing scale for weight.
- Drop down the tape for height.
- Digital body composition monitors for body composition analysis.
- SGA for nutritional and clinical assessment.
- Modified Fatigue Impact Scale (MFIS) for fatigue score.

Demographic data: The demographic data contains the participant's personal details and general primary information such as name, age, gender, occupation, type of work, and intake habits.

Anthropometric Measurement: Nutritional anthropometry is defined as the measurements of the variations of physical dimensions and the gross composition of the human body at different age levels to assess the degree of malnutrition **[10]**.

Weight: Body weight is one of the most helpful and expedient indicators of nutritional status. It is a non-specific measure of all the body components, including fat, protein and water. The weight of all the subjects was recorded using a digital weighing scale, expressed in Kilogram (Kg).

Height: Height was measured in centimeters using a drop-down measuring device(tape).

Body Mass Index (BMI): Body Mass Index (BMI) estimates the total body mass but shows the highest correlation with the highest body fat, it is recorded that having a diagnosis of NAFLD/NASH increased linearly with increasing BMI leading to the risk factor of NAFLD **[11]**.

Body Composition Analysis: A person's Nutritional status can be defined as "the condition of the body, resulting from the balance of intake, absorption, and utilization of nutrients and the influence of particular physiological and pathological status" **[12, 13]**. The main aim of measuring body composition in this study is to evaluate nutritional status through Fat mass and Muscle mass **[14]**. Body composition analysis was done by using a digital body composition

monitor. The monitor estimates the body fat percentage by the Bioelectrical Impedance (BI) method **[15]**.

Biochemical Assessment: Biochemical parameters have been widely used to assess and monitor nutritional status in several different clinical conditions including Non-alcoholic fatty liver patients. Biochemical parameters like albumin, SGOT, SGPT levels were obtained from each subject through blood analysis using blood samples of the subjects.

Clinical Assessment: Clinical assessment is an essential part of all nutritional surveys. It aims to assess the health of an individual or a population based on the diet they consume.

Dietary Assessment: Dietary assessment was done by food habits 24 diet recall method.

Food Habits: This is to find out the food pattern, mode of feeding, meal and fluid composition per day, and the regularity of consumption of all meals.

24-hour recall: The goal is to determine the nutrient content of the food and the appropriateness of the intake of each subject which helps to recognize the degree of risk of nutritional problems. The subjective data collected through diet history can be used to determine the nutritional adequacy of the subjects' usual intake **[12]**.

Physical Activity: Data related to physical activity was collected on the subjects' ability to work, mobility, and sleeping pattern.

Medical History: Information related to co-morbidities was recorded.

Physiological Indices: Indices such as blood pressure, pulse rate, and respiratory rate was recorded.

Fatigue Severity Scale for Fatigue Score: The fatigue score was calculated using the Fatigue Severity Scale. The modified Fatigue Impact Scale (MFIS) is designed to differentiate fatigue from clinical depression, since both share some of the same symptoms. Essentially, the FSS consists of answering a short questionnaire that requires the subject to rate his or her own level of fatigue. The subject is asked to read each statement and circle a number from 1 to 7, depending on how appropriate they felt the statement applied to them over the preceding week.

Statistical analysis: The collected data were analyzed using SPSS package version 16.

RESULT & DISSCUSSION

Out of the 123 subjects, the male subjects were 86 and the females were 37, aged 18-35 years, 36-55 years, and 56-75 years were assessed. The socio-demographic data reveals that the majority of the subjects (87%) led a sedentary lifestyle among which males (60.16%) were found to be more sedentary

than females (26.82%). On nutritional assessment 73% of selected participants were well nourished, 22% were moderately malnourished and 5% were severely malnourished **(Figure 1)**. On Fatigue analysis, 79.1% of males showed mild fatigue and females showed 66% and the severity of the fatigue was observed in the 36-55 yrs.' age group among both genders **(Table 2)**.

BMI and Body Composition change

Among the selected participants BMI shows 80% of males were under Grade I and Grade II obesity II whereas females (100%) were under Grade I obesity **(Figure 2, 3)**. During the biochemical examination, the mean value of SGOT (24.2), SGPT (26.2), and Albumin (4.2) was obtained **(Table 1)**. During body compartment analysis 93% of males within the age group (18-35 years) have shown a very high-fat percentage and 25% of females within the age group (35- 55 years) have shown a very high-fat percentage. Around 24.3% of Females had a normal Fat % whereas males had only 10% **(Figure 4, 5)**. On Muscle mass analysis 89% of the male had low muscle mass among the groups and females showed 94% **(Figure 6, 7)**. On the correlation between BMI and Body Composition, Visceral fat and BMI had shown a significant difference (*p-.34),* and negative significance was shown between BMI and Muscle mass (*p.-075),* and no significant differences were observed between the fat mass and BMI **(Table 3)**.

Dietary Intake

During Dietary intake analysis, the male participants showed meal values of Energy (kcals), protein (g), carbohydrate (g), and fat(g) were 1381, 45, 201, and 43 respectively. RDA for Energy is 2110 kcal, protein-54g, carbohydrate 130g, and fat -25g which shows the intake of Energy among the male participants is 34.5% deficit, protein is 17% deficit, Carbohydrate is 55% excess, and fat is 73% excess **(Table 4)**. Among the Female participants, the meal values of Energy (kcals), protein (g), carbohydrate (g), and fat(g) were 1477, 35, 202, and 47.3 respectively. RDA for Energy is 1660 kcal, protein-45.7g, carbohydrate 130g, and fat -20g which shows the intake of Energy among the female participants is 11 % deficit, protein is 23.4% deficit, Carbohydrate is 55% excess and fat is 137 % excess **(Table 5)**. No significant differences were observed when we correlated dietary intake with BMI **(Table 6)**.

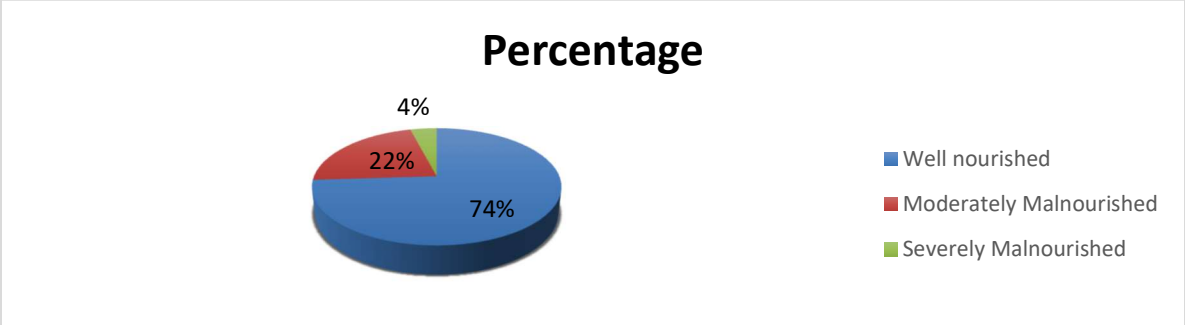

Figure 1: Subjective Global Assessment of selected subjects (n=123)

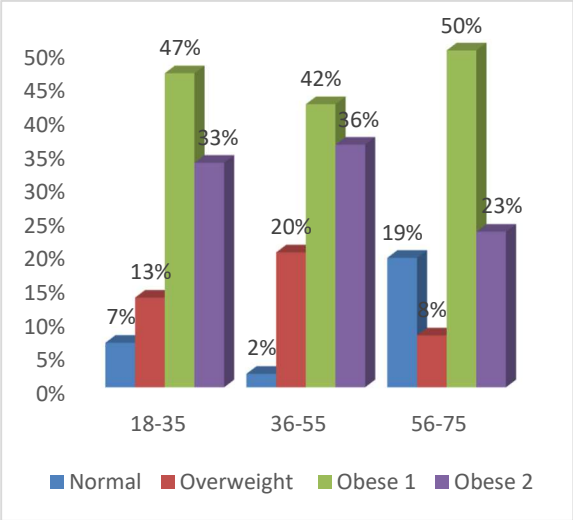

Figure 2: BMI of selected male subjects

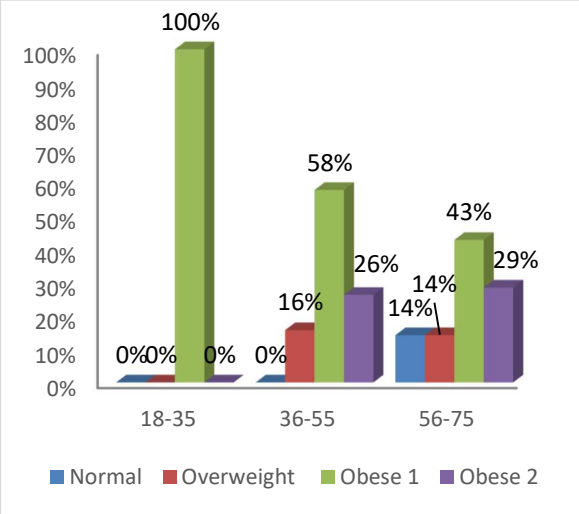

Figure 3: BMI of selected Female subjects

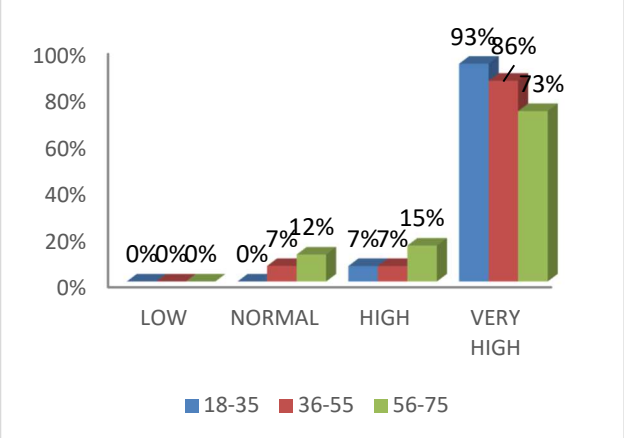

Figure 4: Fat Mass Percentage (male)

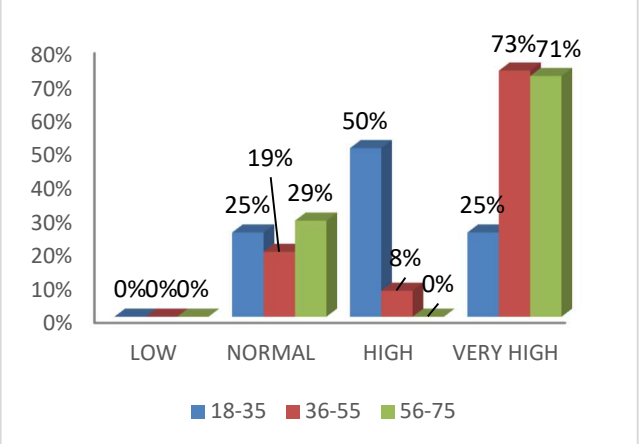

Figure 5: Fat Mass Percentage (Female)

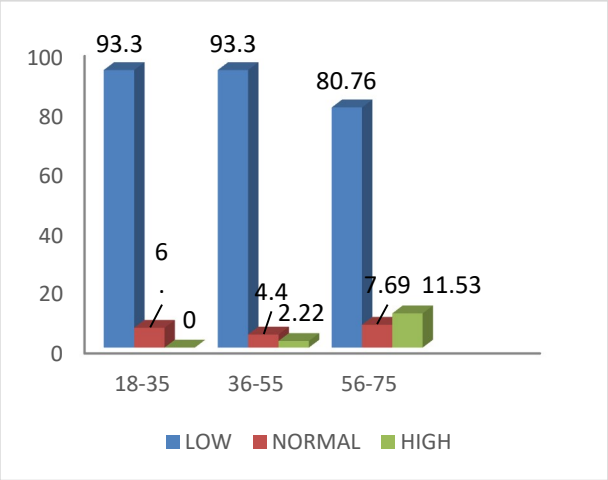

Figure 6: Muscle Mass Percentage (male)

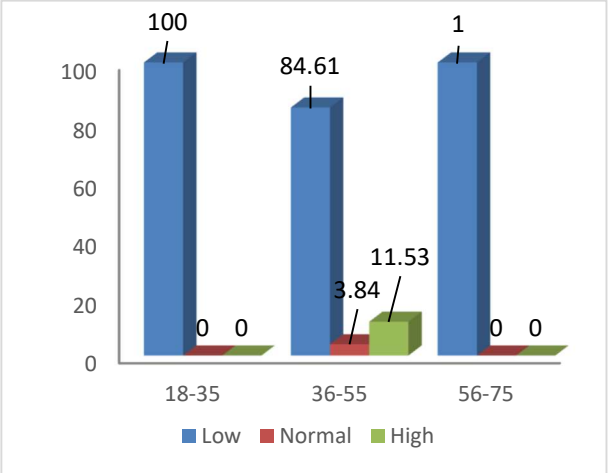

Figure 7: Muscle Mass Percentage (female)

Table 1: Categorization of selected subjects based on fatigue score (n=123)

	Mild (1-2)		Moderate (3-4)		Severe (5)	
Age (yrs)	Male *n* (%)	Female *n* (%)	Male *n* (%)	Female *n* (%)	Male *n* (%)	Female *n* (%)
18-35	12 (80%)	2 (50%)	1 (6.66%)	2 (50%)	2 (13.34%)	-
36-55	38 (84.44%)	20 (76.9%)	6 (13.34%)	3 (11.53%)	1 (2.22%)	3 (11.53%)
56-75	19 (73.07%)	5 (71.42%)	6 (23.07%)	2 (28.57%)	1 (3.84%)	-

n – number of participants; %- percentage obtained

Table 2: Biochemical data of selected subjects (n=123)

Biochemical parameters	Patient's mean value	Normal range	Patient's mean value	Normal range
	Male (n=86)	Male	Female (n=37)	Female
SGOT	25.08	5-38 U/L	25.5	5-38 U/L
SGPT	29.05	5-41 U/L	24.8	5-41 U/L
Albumin	4.45	3.5- 5.0g/dl	4.2	3.5-5.0g/dl
Haemoglobin	14.47	13-18gm%	12.5	11.5-16.5gm%

Table 3: Relationship between the Body Mass Index (BMI) and the Body Composition Measurements of the selected subjects (N=123)

	Age group	Fat mass percentage		Muscle mass percentage		Visceral Fat	
		n (mean)	r value	n (mean)	r value	n (mean)	r value
BMI	18-35	19 (30.05%)	0.140	19 (27.2%)	-.075	19 (11.7)	.340
	36-55	71 (32.9%)		71 (25.2%)		71 (12.8)	
	56-75	33 (30.2%)		33 (28.3%)		33 (12.7)	

r- Correlation coefficient; %- percentage obtained

Table 4: Mean Nutrient Intake of Selected Male Subjects (n=86)

		18-35 years		36-55 years		56-75 years	
Nutrients	RDA	Mean intake	Excess / Deficit (%)	Mean intake	Excess / Deficit (%)	Mean intake	Excess / Deficit (%)
Energy (Kcals)	2110	1316	-79 (-37.6%)	1490	-62(-29.3%)	1338	-780 (-37%)
Protein (g)	54	61	+7 (+12.96%)	34	-20 (-37%)	39	-15 (-27.77%)
CHO (g)	130	198	+68 (+52.3%)	208	+78 (+60%)	198	+68 (+51.3%)
Fat (g)	25	43	+18 (72%)	43	+18 (+72%)	43	+18 (+72%)

%- percentage obtained

Table 5: Mean Nutrient Intake of Selected Female Subjects (n=37)

		18-35 years		36-55 years		56-75 years	
Nutrients	**RDA**	**Mean intake**	**Excess / Deficit (%)**	**Mean intake**	**Excess / Deficit (%)**	**Mean intake**	**Excess / Deficit (%)**
Energy (Kcals)	**1660**	**1486**	**-174(-10.5%)**	**1510**	**-150(-9.03%)**	**1436**	**-224(-13.5%)**
Protein (g)	**45.7**	**37**	**-8.7(-19 %)**	**36**	**-9.7 (-21.2%)**	**32**	**-13.7 (-30%)**
CHO (g)	**130**	**192**	**+62 (47.7%)**	**218**	**+88 (+67.7%)**	**197**	**+67(+51.5%)**
Fat (g)	**20**	**51**	**+31 (+155%)**	**46**	**+26 (+130%)**	**45**	**+25 (+125%)**

%- percentage obtained

Table 6: Relationship between the Body Mass Index (BMI) and the nutrient intake of the selected subjects (n=123)

	Nutrient	**Mean**	**Correlation coefficient (r)**	**Sig (ρ)**
BMI	**Energy**	**1411.4**	**0.025**	**0.789**
	Carbohydrate	**216.3**	**0.043**	**0.633**
	Protein	**38.7**	**0.065**	**0.472**
	Fat	**43.3**	**0.020**	**0.823**

CONCLUSION:

The above study concluded that even though the Nutritional assessment using the SGA tool had shown that most of the participants were Well-nourished but by looking into their lifestyle 87% were sedentary and 73% were experiencing mild Fatigue. On further analysis of BMI and Body composition changes the study concluded that even though the BMI of the selected participants was high (i.e., 90%) there is no significant difference between fat mass and BMI but a negative correlation was observed between the BMI and muscle mass, which clearly indicates that the participants had very low lean body mass even with a high BMI and in a well-nourished condition. This can be because of less protein intake or loss of muscle protein due to less energy consumption, though the energy consumption is low the intake of fat and carbohydrate % is high than RDA for the selected participants. Having a balanced meal with enriching protein can help in building muscle mass and which can lead to a good progression of the disease.

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