

THERAPEUTIC EFFECTS OF RESTRICTED DIET IN OBESE PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD)

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ABSTRACT:

Objective: In this study, the effect of restricted diet in obese patients with Non-Alcoholic Fatty Liver Disease (NAFLD) was evaluated.

Design: A convenient, clinical trials study (before and after) with 6 weeks treatment period.

Subjects: Forty NAFLD patients (15 men and 25 women) with mean age 45.8±7.6 years were selected among the patient referred to gastroenterology clinic of Motahary Center.

Setting: Patients selection was based on BMI \geq 25 kg/m² and NAFLD patient. Anthropometric indices were measured and BMI was calculated. A food frequency questionnaire was collected before and after consumption of diet containing 12-15% protein, 25-30% fat and 55-60% carbohydrate. A fasting blood sample for measuring LFT were collected at the beginning and after 6 weeks consumption of low fat and low calorie diet.

Result: There were statistically significant decrease in mean body weight (p<0.001) and BMI (p<0.001) after 6 weeks consumption of low fat, low caloric diet. Mean serum Alkaline Phosphatase (p<0.05), ALT (p<0.05), AST (p<0.01) and direct bilirubin (p<0.01) were significantly decreased after 6 weeks consumption of restricted diet. Mean Serum Total Cholesterol (p<0.05), LDLc (p<0.001) and FBS (p<0.05) decreased but mean HDLc and serum globulin were significantly (p<0.001) increased after 6 weeks dietary restriction.

Conclusions: These findings suggest that consumption of low fat, low caloric diet for 6 weeks in obese patient with NAFLD have a positive effect on body weight, BMI and it improves blood glucose lipids and LFT profile.

KEY WORDS: Diet Therapy, Non-Alcoholic Fatty Liver Disease (NAFLD), Obesity

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INTRODUCTION

Non-Alcoholic Fatty Liver Disease (NAFLD) is becoming the preferred term, and it refers to a wide spectrum of liver damage, ranging from simple steatosis to steato-hepatitis, advanced fibrosis and cirrhosis. NAFLD affects 10 to 24% of general population in various countries. The prevalence increases to 57.5%¹ to 74%^{2,3} in obese persons.

Non-Alcoholic Fatty Liver Disease affects 2.6% of children⁴ and 22.5%⁴ to 52.8%⁵ of obese children. The prevalence of type 2 diabetes varied between 10 and 75% and the prevalence of hyperlipidemia varied between 20 and 92 percent⁶⁻⁸.

Fatty liver is defined as fat, largely triglyceride exceeding 5% of the liver weight. It is caused

by a failure of normal hepatic fat metabolism, due to a defect either within the hepatocytes or in the delivery of lipid from the liver cells. When the fat content in the liver is obese 10%, fat begins to appear in many hepatocytes. When the amount of fat exceeds 30% of the weight, almost all of the hepatocytes contain a large drop of fat. The amount of fat can be roughly estimated by how much of the acinus has fat laden hepatocytes; the involvement is characterized as mild for the perivenular third only, moderate for two-thirds, and severe for the entire acinus⁹.

The degree of fatty liver correlates with the increase in body weight¹⁰. Some investigators have reported that fatty liver in obese patients progresses to liver cirrhosis^{6,11,12}.

In the present study in a clinical trial study (before and after) we evaluate the effect of restricted diet in obese patients with NAFLD.

SUBJECT AND METHODS

Subjects:Forty Non-Alcoholic Fatty Liver Disease (NAFLD) patients (15 men and 25 women) with mean age 45.8 ± 7.6 years and $BMI \geq 25$ kg/m² were selected among the patient referred to gastroenterology clinic of Motahary Center. Patients with a history of alcohol consumption, drug abuse, acute or chronic liver disease or transfusion or hepatitis were excluded. The selected patients demonstrated normal renal function, and no evidence of heart or lung diseases. Fatty liver were diagnosis by ultrasonography by the same physician at the baseline and 6 weeks after low fat, low calorie diet intake. The diet contains 12-15% protein, 25-30% fat and 55-60% carbohydrate. Calorie requirement of each patient with respect of age, sex, height and ideal body weight were measured by and for weight reduction 500-1000 cal / day less than energy requirement were calculated. Exercise included walking recommended for each patient 30 min or one hour per day.

Measurements: At the clinic, 5ml of fasting venous blood sample were taken for measuring LFT before and after low fat low calorie diet. Laboratory tests included plasma

ASpartate amino-Transferase (AST), ALanine amino-Transferase (ALT), Total Protein (TP), Albumin (Alb), Total Cholesterol (TC), Tri-Glyceride (TG), LDLc, HDLc and Fasting Blood Glucose (FBS) were examined before and after restricted diet. All laboratory analyses were performed by standard clinical laboratories. Body weight and height were measured at the baseline and 6 weeks after restricted diet and BMI was calculated.

Statistical analysis: The Statistical Package for Social Sciences (SPSS) was used for statistical analysis. The results were analyzed by student's-t test. Correlations were calculated using the pearson correlation coefficient. Probability values below 0.05 were considered significant. Data are presented as the mean \pm standard deviation.

RESULTS

Forty NAFLD patients (15 men and 25 women) with mean age 45.8 ± 7.6 years were received low fat low calorie diet for 6 weeks. Table- I shows that the mean value of body weight and BMI were significantly ($p < 0.001$) decreased after dietary-restriction for 6 weeks compared to the baseline.

The mean value of total cholesterol ($p < 0.016$), LDLc ($p < 0.001$) and FBS ($p < 0.04$) were also significantly decreased but the mean value of HDLc ($p < 0.001$) was significantly increased after 6 weeks dietary restriction compared to the baseline. No significant change was found in the mean value of serum triglyceride.

As shown in Table- II, the mean value of serum Alkaline Phosphatase (AP), AST, ALT, serum direct bilirubin and serum globulin significantly decreased after 6 weeks dietary restriction compared to the baseline. The mean value of serum total bilirubin, albumin and total protein showed no significant change compared to the baseline observed.

DISCUSSION

The results of the present study show that restricted diet had beneficial effect in obese patient with NAFLD: the mean value of body

Table-I: Anthropometric and biochemical characteristic of NAFLD patient before and after low fat low calorie diet

	Base line (mean±SD)	6 weeks dietary treatment (mean±SD)	p-value
Age (y)	45.78±7.6	-	-
Height (cm)	162.85±7.4	-	-
Weight (kg)	79.26±9.149	76.762±8.57	<0.001
BMI (kg/m ²)	29.93±3.2	28.99±2.86	<0.001
Total cholesterol (mg/dl)	225.32±63.23	203.8±39.174	0.016
LDLc (mg/dl)	130.43±29.11	108.29±29.5	<0.0001
HDLc (mg/dl)	41.425±11.42	51±11.44	<0.0001
Triglyceride (mg/dl)	236.8±143.41	20.9±27.5	0.142
Fasting plasma glucose (mg/dl)	146.3±89.38	125.825±57.41	0.041

*significant , p-value <0.05

Table-II: Liver biochemistry of NAFLD patients before and after low fat, low calorie diet

Hepatic tests	Base line (mean±SD)	6 weeks dietary treatment (mean±SD)	p-value
Serum alkaline phosphatase (U/L)	192.5±55.43	174.22±50.27	0.027
Serum aspartate amino transferase (AST) (U/L)	29±10.568	22.32±9.452	0.004
Serum alanine amino-transferase (ALT) (U/L)	38.625±21.392	23.65±11.95	0.0001
Serum total bilirubin (mg/dl)	0.7158±0.2952	0.6243±0.332	0.130
Serum direct bilirubin (mg/dl)	0.2712±0.1682	0.2±0.087	0.019
Serum albumin (g/dl)	4.557±0.373	4.46±0.707	0.483
Serum total protein (g/dl)	7.68±0.561	7.86±0.744	0.195
Serum globulin (g/dl)	1.485±0.247	1.387±0.397	0.043

weight, BMI, serum Alkaline Phosphatase (AP), AST, ALT, serum direct bilirubin and serum globulin significantly decreased after diet therapy. Our results were similar to other studies¹³⁻¹⁶. Our results also indicate that the mean value of serum Tc, LDLc and FBS were significantly decrease and HDLc was significantly increased after diet therapy which was similar to the Venot et al study¹⁶. Improvement in liver test result is almost universal in obese adults³ after weight reduction. The degree of fatty infiltration usually decreases with weight loss in most patients³.

Since the actual mechanisms are still being worked out, a net retention of lipids within hepatocytes, mostly in the form of triglycerides, is responsible for the development of NAFLD. The primary metabolic abnormalities leading to lipid accumulation are not well understood,

but they could consist of alterations in the pathways of uptake, synthesis, degradation, or secretion in hepatic lipid metabolism resulting from insulin resistance.

Insulin resistance owing to inhibition of tumor necrosis factor- α (TNF- α) leads to the accumulation of fat in hepatocytes by two main mechanisms: Lipolysis, which increases circulating fatty acids and hyperinsulinemia. Increased uptake of fatty acids by hepatocytes leads to mitochondrial β -oxidation overload, with the consequent accumulation of fatty acids within hepatocytes. Hyperinsulinemia resulting from insulin resistance increases the synthesis of fatty acids in hepatocytes by increasing glycolysis and favors the accumulation of triglycerides within hepatocytes by decreasing hepatic production of apolipoprotein B-100¹⁷. Since weight reduction leads to de-

crease in TNF- α and other factors it may improve the liver disease.

As regards the cause of extracellular matrix deposition in liver tissue, the hepatic sinusoidal lumens are narrowed by swollen hepatocytes containing fat droplets and abundant enlarged endoplasmic reticula in their cytoplasm, and the hepatic sinusoidal microcirculation is impaired. Consequently, ischemia occurs in the perivenular or intralobular spaces, and hepatic fibrogenesis appears to be enhanced by ischemia, which may lead to liver cirrhosis ¹⁶.

CONCLUSION

Diet therapy can decrease body weight, Body Mass Index (BMI) and liver biochemical abnormalities and therefore may help to improve Non-Alcoholic Fatty Liver Disease (NAFLD).

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