Management of Non-Alcoholic Fatty Liver Disease with Diet and Lifestyle Modification

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Abstract

Background: Non-Alcoholic Fatty Liver Disease (NAFLD) has become a leading cause of Chronic Liver Disease (CLD) and a major financial burden on the society. Excess caloric intake, unhealthy diet and physical inactivity remain the main culprits. This study was on management of NAFLD with focus on these precipitating events.

Objectives: To study the impact of weight reduction by diet and lifestyle modifications in the management of NAFLD.

Methods: A prospective observational single cohort study was conducted over a period of one and a half years. Interview method, a semi structured questionnaire (Proforma) was used to collect data from the subjects. Patients were motivated to reduce weight and educated about healthy eating habits and lifestyle modifications. The effect of weight reduction on serum levels of liver enzymes was assessed by estimating the liver enzyme on follow ups.

Results: It was identified that out of 50 study subjects with NAFLD 48 were either overweight or obese. There is a strong association of with weight gain, physical inactivity, consumption of high carbohydrate, high protein diet, intake of junk food, inadequate vegetables and decreased fruits intake. 56% of the study population achieved significant weight reduction sufficient to produce fall in serum SGPT levels by following the advised dietary and physical activity modifications. The association between reduction in weight and the follow up level of serum SGPT was found to be statistically significant (p<0.001).

Conclusion: Weight reduction by diet and lifestyle modification normalizes SGPT levels implying that it could prevent NAFLD. There is lack of awareness on hazards of weight gain and lifestyle diseases even among the educated.

Keywords: NASH; NAFLD; Fatty liver; Cirrhosis; Lifestyle; Balanced diet

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Introduction

Non-Alcoholic Fatty Liver Disease (NAFLD) is one of the rapidly growing epidemics worldwide. It has been explained as the accumulation of fat in the liver in the absence of recent or on-going intake of significant amount of alcohol. A non-alcoholic patient is defined as either total abstainer or with alcohol intake of less than 20 g/day [1]. It represents a spectrum of disease ranging from simple steatosis (considered relatively benign) to Non-Alcoholic Steatohepatitis (NASH) and NAFLD associated cirrhosis, Hepatocellular Carcinoma (HCC) and end stage liver disease [1]. NASH is currently the second indication for liver transplantation and will become the leading indication in the next two decades [2]. The global prevalence of NAFLD is estimated to be around 25.24% and the highest prevalence is reported from the Middle East with 31.79%, followed by South America with 30.45% and the least prevalence rate is from Africa with 13.48% [3]. It is estimated that 16% to 32% of general population in India (nearly 120 million) has NAFLD and among them nearly 31% are diagnosed with NASH. It is also estimated that 63 million Indians are Type 2 diabetic, and among them 70% are having NAFLD (44 million). Recent National health survey has shown that the state of Kerala, India is becoming the capital of all Non-Communicable Diseases (NCD).

Obesity is the first and the most important risk factor for NAFLD, which highlights the role of excess intake of calories in any form. The excess caloric intake has its roots in decreased intake of fiber-rich, low calorie vegetables and the consequent higher consumption of calorie rich foods, especially as fast foods and junk foods. The majority of the population find difficulty in modifying their diet and have even more difficulty in initiating an effective exercise program. The lack of

knowledge about a balanced diet and the reluctance to accept the flaws in their dietary practices are the main hurdles, but it has to be addressed by the medical professionals. Unfortunately, most of the physicians do not communicate this need for a balanced diet and the tips on calorie restriction to their patients, despite them being well aware of the importance of healthy diet and exercise. Therefore, in this study we concentrated on these least addressed aspects in the management of NAFLD, that is diet and lifestyle modification [4].

Objectives

1) To assess the impact of weight reduction with diet and lifestyle modifications in the management of nonalcoholic fatty liver disease.

2) To detect Nonalcoholic Fatty Liver Disease (NAFLD) in the early stage it and thereby prevent complications.

3) To provide knowledge to the patients regarding the importance of maintaining a balanced diet and healthy lifestyle to improve their overall health and thereby prevent lifestyle diseases.

Materials and Methods

It was a prospective observational single cohort study which was conducted in the Department of General Medicine at PVS Hospital Kozhikode, Kerala over a period of one and a half years (January 2017 to May 2018). We started enrolling all the overweight or obese patients, above 18 years with features of NASH till the sample size of 50 was reached. The inclusion criteria were a) those with history of weight gain from their previous normal weight, b) palpable hepatomegaly and or USG evidence of fatty liver c) Elevated liver enzymes with SGPT more than SGOT with no other cause for it. For the study purpose, the previous normal weight was taken as the lowest recorded weight after completion of skeletal maturity or their lowest weight at the age of 18 to 20 years, when they were healthy and physically active. The exclusion criteria were: Those patients with features of established or decompensated Chronic Liver Disease, even if it is due to NAFLD and those who were taking any amount of alcohol, liver disease due to Hepatitis B or C infection, ceruloplasmin deficiency, iron overload, autoimmune etiology, usage of drugs known to cause steatosis and alpha-1-antitrypsin deficiency. In addition, pregnant or lactating mothers, those with end stage disease, severe cognitive impairment, or psychiatric disease that could interfere with memory and compliance. Interview method, using semi structured questionnaire was used to collect data from the subjects. Height was measured using non-flexible stretchable measuring tape and weight recording was done with electronic weighing machine. We ensured use of the same weighing machine throughout the study. A baseline questionnaire on personal details, diet and lifestyle was used to collect general information regarding type of food intake, frequency of fruits, vegetables and protein intake. A baseline dietary history was collected by dietary recall method (on an average for a week) and food frequency and nutritive intake questioning. Detailed systemic examinations were conducted in every study subject. Progression to impending NAFLD was identified by the external skin changes (loss of luster, white nails) and firmness of the liver. The baseline SGPT levels, along with other baseline laboratory investigations were done in their first visit. Subjects were educated about the medical condition they were having, its predisposing factors, how they developed it, what all measures they can do to reverse or not to worsen the situation further. In our study we focused on advises on diet and lifestyle modification.

All enrolled subjects were given practical tips using a diet chart developed by us on balanced diet (Figure 1) with one source of calorie (e.g.: any one cereal), adequate intake of protein (e.g.: any one of the pulses, yogurt, fish, egg or meat), adequate vegetables (preferably raw or steamed and never over cooked), fresh seasonal fruits and adequate safe drinking water. Tips on reducing the caloric intake was also given using this diet charts designed by us. Protein intake was restricted to 1 g/kg body weight to be consumed in three divided meals. Vegetables constituted the major proportion of an individual meal. Water consumption should be adequate so as to produce sufficient urine output (2 to 2.5 L/day). Subjects were advised to restrict total number of meals to a maximum of three times per day [5,6]. We advised all of them to start their meal with a glass of water, next with large amount of vegetables, followed by some amount of fruits, and after these only carbohydrates and protein were suggested, this order of eating helped in reducing the appetite and thereby decreasing unintentional intake of excess carbohydrates and also ensured that they got all the essential nutrients and vitamins which are usually missed in the diet.

As physical activity in the form of weight lifting or daily gym exercises were not easy to be accomplished and was found to be easily dropped by the patients in the long run, they were advised to do any level of exercises that could be incorporated into their routine daily activity like avoiding elevators and the use of staircase, walking instead of using automobiles for short commutes, avoiding electrical appliances for household chores. On every visit their weight was recorded meticulously, and details of the dietary habits were reviewed by a 24 h recall method. Rectifications in their dietary flaws were made and the motivation to adhere to a healthy lifestyle was reinforced in each visit. Reviews were scheduled at 2 months interval and SGPT values were reassessed on every visit and the need for regular follow up was conveyed to every patient. Data was analyzed using SPSS 21.0 and graphs were depicted using Microsoft Excel. Continuous variables were summarized as Mean Standard Deviation or with median. The paired continuous variable was tested using paired t test. Comparison of continuous variables between two groups was performed using independent sample t test. Categorical data was summarized in terms of frequency with percentage. The results are represented in tables as well as diagrams and charts. For all tests p value <0.05 was considered statistically significant.

Results and Discussion

All the 50 subjects selected for analysis had fatty liver and elevated liver enzymes, among them 48 (96%) were either overweight or obese as per BMI criteria for Asian population. There was a strong association of NAFLD with weight gain, physical inactivity, consumption of high carbohydrate, high protein diet, and intake of junk food, inadequate vegetables and fruits intake. Increased incidence of NAFLD was observed among people with high educational qualification and reputable occupation implying that they were more prone for overeating and reduced physical activity. Palpable liver in a person with weight gain could indicate development of NAFLD, whereas the absence of it does not exclude the same and ultrasonography is a very sensitive tool for screening for NAFLD. Though only 4% of patients had history of pre-existing hypertension, on evaluation 76% of the study population were noted to have high blood pressure, 16% subjects had already diagnosed diabetes mellitus, and 4% had ischemic heart disease, it supports the fact that NAFLD, diabetes, hypertension and dyslipidaemia are associated disorders. Sixty-four percentage of the study population complied well to the advices given regarding the diet and life style modification and achieved a mean weight reduction

Figure 1: Diet plan developed for educating the patients (Dr. Sasidharan PK).
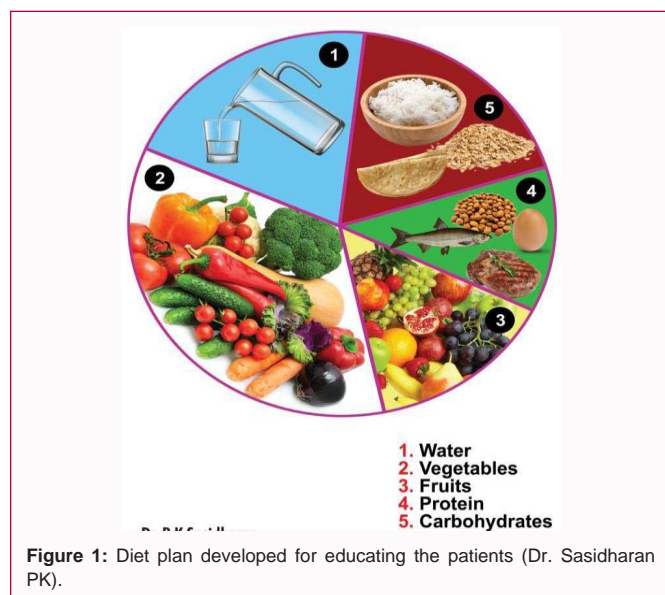
of 8.31 kg and their SGPT levels normalized too. The association between reduction in weight and follow up level of serum SGPT was found to be statistically significant (p<0.001). Therefore, it is possible to achieve weight reduction and with that reversal of NAFLD.

Nutritional status and NAFLD

Excess caloric intake with or without reduced physical activity and the consequent weight gain or obesity is the most important risk factor for NAFLD. The mean weight was 84.58 kg and mean BMI of the studied patients was 30.05 kg/m^2. 96% of study populations were either over weight (4%) or obese (92%) and they all had high SGPT value too. Out of 50, subjects 35 had given history of recent weight gain and they were found to have higher value of SGPT levels as compared to NAFLD patients without history of recent weight gain. However, the relationship between weight gain and SGPT value was statistically not significant. This is probably because many people do not notice the weight gain and they tend to ignore smaller weight gains of 2 kg to 3 kg which also can cause NASH as in the two patients with apparently normal weight and normal BMI. Only careful scrutiny can bring out smaller weight gains which could lead to development of NASH or similar diseases related to weight gain and obesity.

Dietary habits and NAFLD

Out of 50 patients, 46 were taking excess amount of carbohydrate. Similarly, entire study population had either adequate or excess protein intake and majority were deficient in daily intake of vegetables and fruits; it is an unidentified reason for increased total caloric consumption and simultaneous deficiency of several micronutrients which protect from organ damage. Association between NAFLD and intake of various dietary components like carbohydrates, proteins, vegetables, fruits has not been studied previously and no existing literature could be found on this subject. It was clear that there were lots of misconceptions regarding diet among the subjects. None of the subjects believed that they were eating more than what they needed and they were overweight; so, it was a huge task to convince the patients the reality as everyone has the tendency to compare their weight with the people around them who are mostly overweight. Our next goal was to motivate them to achieve weight reduction by following the prescribed dietary changes and to make sure that they were following the same. We always ensured that subjects were

getting the real concept and sometimes we used some examples to make them know the required number of calories based on their job and physical activity levels. Majority had wrong concepts regarding what constitutes vegetables and there was an undue fear of harmful insecticides which prevented many from consuming vegetables and fruits. Sometimes when they claim that they ate vegetables, they were truly not vegetables; what they considered as vegetables were carbohydrate- rich roots and tubers like potatoes, and consumed them along with rice or wheat leading to excess calorie intake [6]. Another alarming information was about consumption of fast foods and junk foods, majority were fond of junk food, some had the habit of taking it even on regular basis. Guthrie et al. substantiated that energy intake during a meal is usually larger while eating out than while eating at home [7].

Occupation, physical activity and NAFLD

In the study 50% were professionals and 24% were house wives. Majority (60%) had no physical activity at all and remaining 40% were doing apparently adequate physical activity. The development of NAFLD was attributable to their sedentary lifestyle too. Such an association between NAFLD and occupational status has not been studied previously and no existing literature could be found on this subject. Physical activity alone is not sufficient to achieve weight reduction, the amount of calories that is burnt by physical activity alone is limited compared with the calorie deficit achieved by calorie restriction, and hence we focused more on calorie restriction. However, physical activity, in sufficient frequency and intensity, slowly reduces the weight and abdominal obesity and hepatic fat.

Co-morbidities and NAFLD

Among 50 patients, 38 did not have any co-morbidity other than obesity; remaining 12 patients had co-morbidities like diabetes, hypertension and ischemic heart disease. This may be because majority of the study population belonged to the younger age group (31 to 45 years) and they are likely to develop these comorbidities in the immediate future if they continue to have the same dietary behavior and physical inactivity. Another interesting fact was about hypertension, only two patients had past history of hypertension but while checking blood pressure in OPD on multiple occasions, it was found that 38 patients (76%) of the study population had blood pressure more than 120/80 mmHg, of these 17 patients were in pre-hypertensive group and 19 had stage I hypertension. Two patients were known hypertensive's and their blood pressure was not under control with the medications they were already on. They were grouped in stage II hypertension. Insulin resistance and activation of the Renin-Angiotensin-Aldosterone System (RAAS) is the main pathophysiologic link between these clinical entities. Until further evidence is available, patients with hypertension should be meticulously evaluated and treated for fatty liver disease and *vice versa* [8].

Palpable liver and NAFLD

Among the 50 subjects, 24 patients had palpable liver, 26 did not. As most of the patients were obese, accuracy of the findings was doubtful. Hepatomegaly is a sign which is neither sensitive nor specific and inter examiner variation also exists. Both groups had high values of serum SGPT. Thus, it was clear that palpable liver in an overweight person could indicate NAFLD, whereas the absence of it does not exclude NAFLD. The association between palpable hepatomegaly and NAFLD is not studied previously, and no existing literature could be found on this topic. Out of 50 subjects, only 28

underwent ultrasonographic evaluation of the abdomen. Among them, 27 patients were found to have fatty changes in the liver. USG is thus a sensitive, non-invasive, easily available investigation modality in the diagnosis of NAFLD; however sonographic evaluation was deferred in rest of the study population because of the affordability issue.

Weight reduction and NAFLD

Sixty-four percentage of the study group (32 out of 50) complied with advices given, good compliance seen in our study was only due to regular personal counseling sessions and encouraging them to have frequent follow up visits. For the compliant group mean initial weight was 85.81 kg and mean follow up weight was 78.24 kg. Even though 3 of this group were pretending to be compliant their weight had not reduced, therefore the mean follows up weight of those who achieved weight reduction was 76.93 kg and the mean change in weight was a loss of 8.31 kg. Maximum weight loss achieved in this group was 35 kg. For non-compliant group (18 out of 50) mean initial weight was 82.38 kg and mean follow up weight was 87.05 kg with a mean weight gain of 4.67 kg and the association between compliance of the patient and change in weight was statistically significant with a p-value of <0.001. The fact that some developed weight gain, instead of weight loss shows how difficult it is to educate them and make them complaint to follow diet and lifestyle changes.

Among 29 patients who achieved weight reduction 28 patients (96.55%) were noted to have a fall in SGPT level and SGPT level remained unchanged in only one patient even after weight reduction. Eighteen subjects failed to achieve the weight reduction goal; instead they gained weight (mean weight gain 4.67 kg). Among them, 14 were noted to have raised SGPT from the baseline value. SGPT levels decreased in spite of weight gain in 4 subjects, this may be because of the improved quality of diet which they were advised to consume as a part of the study. Weight remained unchanged in 3 subjects, one was noted to have risen in SGPT value on follow up and remaining 2 subjects didn't have any change in SGPT levels. A statistically significant association exist between change in weight of the study population on follow up and change in SGPT (p value <0.001).

Conclusion

Weight reduction can reverse NAFLD and it is the cornerstone in the management of it, balanced diet in moderation with excess of high fiber vegetables, and adequate physical activity were the two important steps to achieve weight reduction. Balanced diet should be taken with lots of vegetables, adequate protein, fruits and water, and limited calorie consumption which could happen naturally with use of vegetables as the main component of every meal. Increasing routine activities like using stairs, walking, reducing the use of labor-saving devices can reduce weight similar to structured exercise programs and also provide greater weight maintenance over time. Both needs social empowerment by school health programs, creating awareness on calorie restriction to all individuals and increasing number of places for exercise and accessibility to them. Most crucial issue is motivation, majority of NAFLD patients do not perceive their condition as a disease, and their attitude and perseverance in maintaining a healthy diet and habitual physical activity is low. Therefore, education of the patient about the benefit of weight reduction and lifestyle modification in the management of NAFLD is of utmost important.

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