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Nutritional Profile of Patients with Compensated Alcoholic Liver Disease (ALD)- Cirrhosis

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Abstract

Nutritional profile in fifty patients of alcoholic liver disease (ALD) with compensated cirrhosis was studied for its relationship to amount and duration of alcohol intake. Anthropometric, clinical signs of nutritional deficiencies, dietary assessment, heamatological and biochemical parameters were used for nutritional assessment. Clinical signs of nutritional deficiencies were found in all subjects. The mean values of body mass index (BMI), triceps skin fold thickness (TFT) and midarm circumference (MAC) were found to be decreased as compared to normal subjects. Vitamins B_{12} and serum folate levels were decreased in 12% and 44% cases respectively. Serum magnesium, serum phosphorus and serum zinc levels were also lower than that found in normal population (in 46%, 38% and 42% cases respectively). Total calorie intake was found to be significantly decreased in these subjects. Nutritional deficiencies were more pronounced in patients with increased amount and duration of alcohol intake. Thus, nutritional deficiencies are present in compensated ALD-cirrhotics and correlate with amount and duration of alcohol intake.

Keywords: Alcoholic liver disease, cirrhosis, nutritional profile.

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Introduction

Alcoholism is a common form of drug abuse in India, especially in Punjab (1). The diet of alcoholic cirrhotic patient is usually inadequate and frequently grossly deficient in nutrients (2). Nutritional intake in patients taking only alcohol cannot compensate for the nutritional needs completely (3). The prevalence of malnutrition closely correlates with severity of liver disease (4). The alcoholic cirrhotic patients are often found to have deficiency of calories, vitamins and minerals (5). Anthropometrically these patients are also found to be malnourished (6).

The various methods to assess the nutritional status in alcoholic cirrhotic patients include history, physical examination, laboratory parameters, anthropometry and specialized methods like bioelectrical impendence analysis, energy expenditure, 24 hours urinary creatinine, creatinine height index and 24 hours urinary proteins excretion (7). Anthropometry has now been accepted as a standard method for evaluating nutritional status of cirrhotics with or without ascites, edema or both (8). Malnutrition in alcoholics has been classified as primary or secondary. Primary malnutrition refers to the failure of alcoholic patients to consume a nutritionally balanced diet due to appetite suppressant effect of alcohol, the preference of chronic alcoholics to spend their limited financial resources on ethanol and to the fact that with exception of beer, most alcoholic beverages are nearly devoid of essential vitamins and minerals (9). Secondary malnutrition is due to effects of chronic ethanol ingestion on utilization of nutrients. Chronic alcoholism also affects intestinal absorption and hepatobiliary metabolism of a variety of nutrients (10). In view of these, it is important to assess the nutritional status of patients with alcoholic liver disease, to institute a suitable and timely intervention to improve survival as well as quality of life.

Methods

Fifty patients with compensated alcoholic liver disease-cirrhosis coming to outpatient clinic of Medicine and Gastroenterology department of Dayanand Medical College & Hospital, Ludhiana were enrolled. Inclusion criteria were:

1. History of significant amount of alcohol intake that is 80 gm/day for ten years or 160 gm/day for 5 years with

a. Ultrasound of abdomen suggestive of cirrhosis i.e. showing coarse echotexture of liver, irregular

margins or presence of collaterals or

b. Upper gastrointestinal endoscopy (UGIE) showing oesophageal/ fundal varices.

2. Absence of other aetiology of cirrhosis (i.e viral, autoimmune etc).

Exclusion criteria were:

1. Patients with positive viral serology i.e. Anti-HCV or HBsAg.
2. Patients having decompensation in form of gastrointestinal bleed, ascites, hepatic encephalopathy and high Child-Pugh score (score>7).
3. Patients having comorbid conditions in form of renal failure (serum creatinine > 2 mg/dL), diabetes mellitus, malignancy or other chronic infections.

The patients with jaundice were included and all patients were advised to abstain from alcohol at the time of study.

The methods used to assess nutritional status in cirrhotics included measurement of anthropometric indices (weight, height, body mass index (BMD), triceps skin fold thickness (TFT) measured using Heperden skin fold caliper and midarm circumference (MAC)). Clinical signs of nutritional deficiencies were noted. 24-hour dietary intake was recorded. Hematological parameters (hemoglobin, peripheral blood film) and biochemical parameters (total proteins, serum albumin, vitamin B_{12}, serum folate, serum magnesium, serum calcium, serum phosphorus, serum zinc, serum iron, serum sodium and serum potassium) were obtained for all the patients. Institutional ethical committee approval was taken for this study.

Statistical Methods

The data were expressed as mean or median and/or range as appropriate. The quantitative variables were compared using student's t-test and qualitative variable using the chi square test.

Results

Fifty subjects were assessed by means of anthropometric, biochemical, heamatological and dietary intake recall method. All subjects were male and mean age was 47.46 ± 1.41 years (range 27-67 years). All these patients had irregular liver margins and coarse echotexture on ultrasound examination. All the patients were in Child Pugh Class A (score=6). Twenty-three (46%) of patients had esophageal varices on endoscopy.

The mean weight of subjects was 64.40±1.29 kg while height was

173.16±1.55 cms. The Body Mass Index (BMI) was 21.86±0.60 kg/m^2. The midarm circumference (MAC) was 22.04±0.55 cm and the triceps skin fold thickness (TFT) was 6.74 ± 0.36 mm (Table 1).

The haemoglobin was 11.54±0.30 g/dl and was below the normal reference range in 22 subjects (44%) (Table 1). The most common type of anemia was found to be dimorphic anemia (n=12, 24% subjects) followed by microcytic hypochromic anemia.

The total serum proteins were 6.68±0.09 g/dl and it was below the reference range in 38% cases (n=19). Serum albumin was decreased in 50% cases (n=25). Vitamin B_{12} levels were decreased in 12% (n=6) and serum folate was decreased in 44% (n=22) cases as compared to the normal reference range. Serum zinc was decreased in 42% cases (n=21), serum magnesium was decreased in 46% cases (n=23), serum iron was decreased in 22% cases (n=11), serum calcium was decreased in 14% cases (n=7) and serum phosphorus was decreased in 38% cases (n=19). Serum sodium and potassium were decreased in 26% cases (n=13). The values were significantly decreased for vitamin B_{12}, serum magnesium, serum calcium, serum iron, serum sodium and serum potassium (Table 1). The 24-hour dietary recall method was used to quantify the intake of various nutrients (calories, protein, carbohydrate and fats). The total calories intake was 2045.92±72.23 Kcal/day (Table 1). The protein intake was low in 18% (n=9) cases, carbohydrate intake was low in 80% (n=40) and fat intake was low only in 2% (n=1) of the cases.

Nutritional deficiencies and amount of alcohol intake

The subjects in our study took amount of alcohol ranging from 100g/day to 320g/day. The mean value of this range i.e. 210g/day was taken to study the effect of amount of alcohol intake on nutritional status. The patients were divided into two groups :

Group A consisted of 24 subjects with amount of alcohol intake < 210 g/day, and

Group B consisted of 26 subjects with amount of alcohol intake > 210 g/day.

The mean and standard deviation of all parameters were computed for each group (Table 2). Results of both the groups were compared. Significant decrease (p-value<0.01) in BMI, MAC, TFT, minerals (serum zinc, serum magnesium, serum phosphorus), calories and protein intake parameters was seen in patients with increased amount of alcohol intake. Nutritional

TABLE 1

Mean Values of Anthropometric, Hematological, Biochemical And Nutritional Parameters In Compensated ALD Cirrhotic Patients

A) Anthropometric parameters	**Mean ± SD**
Weight (kg)	64.40 ± 1.29
Height (cm)	173.16 ± 1.55
Body mass index (BMI) (Kg/m^2)	21.86 ± 0.60
Midarm circumference (MAC) (cm)	22.04 ± 0.55
Triceps skin fold thickness (TFT)(mm)	6.74 ± 0.36
B) Hematological parameters (normal values)	
Hemoglobin (12.2-17.2 gm/dl)	11.5 ± 0.30
MCV (82.2-97.4 cubic µm)	97.38 ± 2.35
INR (<1.6)	1.65 ± 0.05
C)Biochemical parameters (normal values)	
RBS (70-140 mg/dL)	114.08 ± 3.87
Total Protein (6.6-8.7 gm/dl)	6.68 ± 0.09
Serum albumin (3.5-5.0 gm/dL)	3.34 ± 0.08
Vitamin B_{12} (187-1059 pg/ml)	454.48 ± 44.73
Serum Folate levels (>5.31 ng/ml)	12.18 ± 1.95
Serum Zinc (80-140 µg/dl)	83.46 ± 4.12
Serum Magnesium (1.7-2.5 mg/dl)	1.94 ± 0.14
Serum Calcium (8.6-10.2 mg/dl)	8.94 ± 0.11
Serum Phosphorus (2.7-4.5 mg/dl)	2.92 ± 0.16
Serum Iron (45-158 µg/dl)	80.52 ± 5.11
Serum Sodium (136-148 mmol/L)	137-92 ± 0.80
Serum Potassium (3.6-5.0 mmol/L)	3.76 ± 0.08
D) Nutritional parameters	
Total calorie intake (Kcal/day)	2045.92 ± 72.23
Protein intake (gm/day)	69.29 ± 2.08
Carbohydrate intake (gm/day)	292.90 ± 11.6
Fat intake (gm/day)	44.50 ± 2.62

TABLE 2
Nutritional Parameter Relation with Amount of Alcohol Intake

Parameter	Mean ± S.D in group A	Mean ± S.D. in group B	p-value
Age (years)	41.54 ± 1.80	52.92 ± 1.49	> 0.10 NS
Body Weight (kg)	67.31 ± 1.83	61.72 ± 1.69	> 0.10 NS
Height (cms)	172.04 ± 2.55	174.19 ± 1.86	> 0.10 NS
BMI (kg/m^2)	22.94 ± 0.68	20.86 ± 0.94	< 0.01 S
MAC (cm)	24.38 ± 0.65	19.89 ± 0.64	< 0.01 S
TFT(mm)	7.70 ± 0.59	5.85 ± 0.36	< 0.01 S
Hb (gm/dl)	12.67 ± 0.28	10.48 ± 0.42	> 0.10 NS
MCV (cubic µm)	96.83 ± 4.46	97.88 ± 1.95	> 0.10 NS
INR ratio	1.62 ± 0.09	1.69 ± 0.07	> 0.10 NS
RBS (mg/dl)	108.13 ± 4.25	119.58 ± 6.22	> 0.10 NS
Total Protein (gm/dl)	6.87 ± 0.14	6.50 ± 0.11	> 0.10 NS
S. Albumin (gm/dl)	3.48 ± 0.11	3.22 ± 0.11	> 0.10 NS
Vit B_{12} Level (pg/ml)	499.08 ± 73.54	413.31 ± 5.61	> 0.10 NS
Folate Levels (ng/ml)	14.60 ± 3.26	9.95 ± 2.20	> 0.10 NS
S. Zinc (µg/dl)	91.79 ± 5.87	75.77 ± 5.46	< 0.01 S
S. Magnesium (mg/dl)	2.20 ± 0.18	1.70 ± 0.20	< 0.01 S
S. Calcium (mg/dl)	9.11 ± 0.15	8.78 ± 0.15	> 0.10 NS
S. Phosphorus (mg/dl)	3.51 ± 0.19	2.37 ± 0.21	< 0.01 S
S. Iron (µg/dl)	93.17 ± 7.32	68.85 ± 6.44	> 0.10 NS
S. Sodium (mmol/l)	138.17 ± 1.17	137.69 ± 1.11	> 0.10 NS
S. Potassium (mmol/l)	3.82 ± 0.11	3.71 ± 1.12	> 0.10 NS
Calorie intake (Kcal/day)	2325.88 ± 114.83	1787.50 ± 53.87	< 0.01 S
Protein (gm/day)	77.90 ± 3.03	61.54 ± 1.84	< 0.01 S
Carbohydrate (gm/day)	291.42 ± 16.13	294.27 ± 15.76	> 0.10 NS
Fats (gm/day)	48.13 ± 3.03	55.31 ± 14.70	> 0.10 NS

Group A = patients with amount of alcohol intake < 210 gm/day

Group B = patients with amount of alcohol intake > 210 gm/day

NS= Non Significant

S= Significant

deficiencies were more severe and mean of all parameters were less in patients of group B with exception of height, MCV (Mean corpuscular volume), INR and carbohydrate intake, which were comparable to group A values. Amount of fat intake was more in group B patients than in group A patients. On reviewing dietary history, it was found that there was excessive consumption of dairy products and non-vegetarian fried food in group B patients.

Nutritional deficiencies and duration of alcohol intake

The duration of alcohol intake in our patients ranged from 8-22 years. The mean value of this range i.e 15 years was taken to study the effect of duration of alcohol on nutritional status. The patients were divided into two groups :

Group I consisted of 21 subjects with duration of alcohol intake < 15 years and

Group II consisted of 29 subjects with duration of alcohol intake > 15 years.

The mean and standard deviation of all parameters were computed for each group (Table 3). The results of both the groups were compared. Significant decrease (p-value<0.01) in BMI, MAC, TFT, minerals (serum zinc, serum magnesium, serum phosphorus), calories, proteins and carbohydrate intake parameters was seen in patients with increased duration of alcohol intake.

Discussion

Alcoholism is a common problem in Punjab. The prevalence of malnutrition in patients with alcoholic liver disease and cirrhosis varies widely, depending upon the nature of study population and the method of nutritional assessment used. A number of studies have suggested the beneficial effect of nutritional therapy in malnourished patients with cirrhosis (11-14). Nutritional status improvement in chronic liver disease has been shown to decrease morbidity and mortality in chronic liver disease (15,16). Therefore, appropriate measures should be taken to avoid, promptly recognize and treat nutritional deficiencies, which are present in ALD-cirrhotics. In our study, emphasis was laid on these selective important nutritional measurements, which have been universally recommended to determine nutritional status of human subjects.

The mean BMI (21.86 ± 0.60 kg/m^2) in present study was within normal range (18.5-24.99 kg/m^2) as recommended by World Health Organization (WHO) [17]. Narayanan LS *et al* (18), while studying 30

TABLE 3
Nutritional Parameters Relation with Duration of Alcohol Intake

Parameter	Mean ± S.D. in group I	Mean ± S.D. in group II	p-value
Age (years)	38.10 ± 0.93	54.24 ± 1.27	> 0.10 NS
Body Weight (kg)	66.94 ± 2.04	62.56 ± 1.61	> 0.10 NS
Height (cms)	172.10 ± 2.85	173.93 ± 1.74	> 0.10 NS
BMI (kg/m^2)	23.45 ± 1.14	20.70 ± 0.55	< 0.01 S
MAC (cm)	24.48 ± 0.71	20.28 ± 0.63	< 0.01 S
TFT (mm)	7.75 ± 0.58	6.00 ± 0.42	< 0.01 S
Hb (g/dl)	12.69 ± 0.34	10.70 ± 0.38	> 0.10 NS
MCV (cubic μm)	96.90 ± 4.98	97.72 ± 1.94	> 0.10 NS
INR ratio	1.60 ± 0.10	1.70 ± 0.06	> 0.10 NS
RBS (mg/dl)	113.62 ± 4.60	114.41 ± 5.86	> 0.10 NS
Total Protein (gm/dl)	6.81 ± 0.16	6.58 ± 0.10	> 0.10 NS
S. Albumin (gm/dl)	3.34 ± 0.10	3.34 ± 0.12	> 0.10 NS
Vit B_{12} Level (pg/ml)	451.43 ± 64.64	456.69 ± 56.63	> 0.10 NS
Folate Levels (ng/ml)	16.12 ± 3.58	9.32 ± 2.03	> 0.10 NS
S. Zinc (μg/dl)	95.48 ± 6.02	74.76 ± 5.10	< 0.01 S
S. Magnesium (mg/dl)	2.70 ± 0.21	1.61 ± 0.16	< 0.01 S
S. Calcium (mg/dl)	8.97 ± 0.24	8.91 ± 0.07	> 0.10 NS
S. Phosphorus (mg/dl)	3.60 ± 0.19	2.42 ± 0.20	< 0.01 S
S. Iron (μg/dl)	101.52 ± 7.31	65.31 ± 5.61	> 0.10 NS
S. Sodium (mmol/l)	138 ± 1.07	137.86 ± 1.15	> 0.10 NS
S. Potassium (mmol/l)	3.77 ± 0.14	3.76 ± 0.11	> 0.10 NS
Amt. of alcohol (gm/day)	175.71 ± 12.36	300 ± 16.90	> 0.10 NS
Calorie intake (Kcal/day)	2312.95 ± 124.00	1852.55 ± 67.89	< 0.01 S
Protein (gm/day)	77.83 ± 3.30	63.28 ± 2.04	< 0.01 S
Carbohydrate (gm/day)	313.87 ± 20.78	277.74 ± 11.53	< 0.01 S
Fats (gm/day)	48.10 ± 3.11	41.90 ± 3.89	> 0.10 NS

Group I = duration of alcohol intake < 15 years
Group II= duration of alcohol intake > 15 years
NS= Non Significant
S = Significant

hospitalized ALD-cirrhotic patients, made the same observation. BMI was decreased in subjects with increased amount and duration of alcohol intake, which was similar to the finding of Santolaria F *et al* (19). The midarm circumference (MAC) was 22.04±0.55 cm, which was less when compared with that of Punjabi Healthy adult male reference values of 24.01±2.07 cm (20). The TFT of present study group was significantly less when compared with that of Punjabi Healthy adult male reference values of 11.79±2.12 mm (21). The mean TFT values were found below the fifty percentile of WHO values given for normal healthy adult male for that particular age group (17).

The most common type of anemia in the present study was dimorphic anemia. In comparison to this, the most common type of anemia in alcoholics as studied by Linderbaum J *et al* (22) was megaloblastic anemia. The cause of difference in present study could be the poor dietary intake, increased phosphate, decreased vitamin C intake and increased incidence of worm infestation in Indian population (23). The mean hemoglobin value was less in subjects with increased amount and duration of alcohol in present study. The international normalized ratio was also more in patients with increased amount and duration of alcohol intake suggesting role of amount and duration of alcohol intake in causing more severe disease.

The mean total serum proteins and albumin were below normal range in the present study. Sarin *et al* (24) obtained similar results in moderate to severe alcoholic cirrhotic patients in Indian population. The values of these parameters were less in patients with increased amount and duration of alcohol. Vitamin B_{12} was decreased only in 12% cases. Serum folate levels were decreased in 44% cases. Among minerals, significant decrease of serum magnesium, serum phosphorus and serum zinc was seen in subjects (46%, 38% and 42% cases respectively). The study in western countries on alcoholics had also shown significantly decreased levels of serum zinc level (30-60% alcoholics without liver disease and 70% of alcoholic cirrhotic patients) (19). Serum calcium levels were decreased in 14% cases and serum iron levels were decreased in 22% cases. All these minerals were found to have inverse correlation with amount of alcohol intake and their mean values were less in patients with increased amount and duration of alcohol intake.

The mean total calorie intake was significantly decreased as compared with intake of normal healthy Indian adult male as recommended by ICMR (Indian Council of Medical Research).

Sarin *et al* (24) found similar results in moderate to severe ALD patients. It was found that the total caloric intake decreased as amount and duration of alcohol increased. The mean carbohydrate intake was also found to be significantly decreased in present study with mean value of 292.90 ± 11.6g/day. The ICMR recommendation for carbohydrate intake in normal healthy adult male is 375 g/day. The decrease in carbohydrate intake was more severe as amount and duration of alcohol increased. The mean protein intake was in normal range when compared with ICMR standard (normal recommended intake = 60 gm/day). Therefore, patients in the present study were on adequate protein diet. However, the mean protein intake in present study decreased, as amount and duration of alcohol increased. The fat intake in the present study was in the higher range than recommended by ICMR for healthy Indian adult males (normal recommendation is 20 g/day). Sarin *et al* (24) found the same results in patients with moderate to severe ALD-cirrhotic patients. Our study showed that nutritional deficiencies were present even in compensated ALD-cirrhotics. Anthropometery was found to be the single most reliable and cheapest method of determining nutritional status in ALD-cirrhotic patients. Fat intake in ALD-cirrhotics did not correspond with total serum protein or serum albumin levels. Nutritional deficiencies were more pronounced in patients with increased amount and duration of alcohol intake.

The comparison of alcoholic cirrhotics with a similar group of non-alcoholic cirrhotic patients might have been more informative but we included only patients with alcoholic liver disease in our study.

Conclusion

Nutritional deficiencies are present even in compensated ALD-cirrhotics. Nutritional deficiencies of vitamins, minerals and carbohydrates are more severe in patients with increased amount and duration of alcohol intake. Thus, nutritional intervention strategy is also needed even in compensated ALD-cirrhotic patients.

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