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Assessment of Nutritional Status of Adult Patients with Liver Cirrhosis in Menoufia Governorate

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Abstract:

The present study aimed to assess the nutritional and health status of patients with liver cirrhosis and to know the extent of the impact of liver problems on human health. The study subjects were composed of 64 patients (41 male and 23 female) who were randomly selected from Liver Institute Hospital (39 patients) and Menoufia University Hospital (25 patients). Anthropometric measurements and biochemical markers were determined; also, 24 hours recall method was used to estimate nutrient intakes. Data collection was continued for six consecutive months. The results showed a significant decrease in serum concentration of ALT, AST, ALP, and urea in the liver institute hospital compared to the university hospital. At the same time, there was an increase in total and direct bilirubin, total protein, and serum albumin in the liver institute hospital compared to the university hospital. Cirrhotic patients in liver institute hospitals had lower vitamin D, phosphorous, sodium, and iron levels than in the university hospital. The intakes of protein, fiber, and calcium in the liver institute hospital were higher than in the university hospital. So, the study concluded that patients with cirrhosis are not concerned about the quantity and quality of nutrients needed to avoid nutritional disease.

Keywords: Cirrhosis, Liver, Kidney, Anthropometric, Diet.

Introduction

The World Health Organization ^[1] has defined cirrhosis of the liver as a chronic, progressive condition that leads to hepatocyte dysfunction and portal hypertension. Malnutrition causes complications in patients with cirrhosis that exacerbate the condition and lead to liver failure. The nutritional goals of patients with cirrhosis should be to restore

liver function, prevent associated complications, and overcome nutritional deficiencies that cause malnutrition [2].

Furthermore, protein energy malnutrition (PEM) is common in patients with liver disease. It directly impacts cirrhosis diagnosis and liver function deterioration and negatively affects clinical development [3]. The prevalence of malnutrition in patients with decompensated cirrhosis ranges from 60%-100%, while 20%-30% of patients with compensated cirrhosis are also malnourished [4].

According to Huijsman *et al.*, (2013) [5] trace elements such as iron, copper, zinc and manganese are components of many metalloproteinases and mineralo-enzyme and act as cofactors for hepatic processes, on the other hand the prevalence of nutritional deficiency depends on the severity of hepatic insufficiency [6].

As for sodium, restriction is often the first dietary intervention for the liver that a patient receives, due to its effects on water retention and subsequently on the development of ascites, or the accumulation of fluid in the abdominal cavity [7].

It is critical to carefully evaluate patients and provide them with the treatment that will benefit them the most, based on their signs and symptoms and the severity of their liver disease. The American Association for the Study of Liver Diseases (AASLD) position paper on the management of ascites reports a dietary sodium limit of ≤ 2000 mg/day [8].

Health care providers should provide them with the best and most appropriate nutritional intervention beneficial for the patient according to his needs, clinical condition and stage of disease [9].

This study was conducted to assess cirrhotic patients' nutritional and health status in hospitals in the Menoufia Governorate and to determine the adequacy of cirrhotic patients' nutrient intake.

Aim of study: assessment the nutritional status of patients with cirrhosis of the liver and knowing the relationship between the severity of liver disease and nutrition in order to improve the condition of liver patients in hospitals.

Subjects and Methods

Subjects

1. Sample Size

There are national data on the prevalence of liver cirrhosis among the Egyptian population, so the World Health Organization stated that the mortality rate from cirrhosis of the liver was 41.6%. In Egypt, there was an increase in the incidence and prevalence of cirrhosis. It was important to assess the nutritional status of this group of patients because these patients are protein and calorie malnourished, which contributes to serious complications such as ascites, hepatitis encephalitis, and infections, and causes significant impairment in health-related quality of life (QOL) and morbidity.

2. Inclusion criteria

- a. Egyptian adults (male and female).
- B. Age: 21 to 60 years old.
- C. For cases of people with cirrhosis of the liver.

D. who live in Menoufia governorate (rural and urban).

e. Agree to share.

3. Exclusion criteria

A. refuses to participate.

4. Sample preparation

The instrument of this study consists of a structured interview questionnaire

It consists of three parts:

The first is to elicit socioeconomic characteristics of patients with cirrhosis.

The second is to collect data about the diet and health history of the patient under study.

The third is anthropometric measurements and laboratory tests.

Methods

Demographic data: Information about socio-economic status including age, sex, residence, educational status, social status, employment status, work nature, and monthly income were collected by questionnaire through interview.

Daily food history (Dietary assessment) : 24 hours recall method: obtaining accurate amounts of foods and beverages consumed by patients and the data from the 3 days dietary recall were used to arrive at estimates of daily nutrient intake from standard recipes (in 24 hours) [10].

Anthropometric assessment: Weight was measured in kilograms with minimal clothing without shoes, and height measured using centimeters [11]. Body mass index ($\text{metre}^2 \text{ (kg/m}^2\text{)}$ [12]. BMI) was calculated according to the following equation, weight in (kg) / height in

Biochemical assessment:

- Liver and kidney functions: AST and ALT were measured according to the methods described by [13, 14].
- (BIL.T, BIL.D) and ALB were measured according to the methods described by [15, 16] respectively.
- Determination of serum creatinine, urea and uric acid [17, 18, 19] respectively.

Statistical Analysis: Data were analyzed using statistical program for social science (SPSS) version, 8. Quantitative data were expressed as mean + standard deviation (SD) [20].

Results and Discussion

The data in Table (1) showed the characteristics of socioeconomic variables of liver cirrhosis in Liver Institute Hospital in Shebin El-Kom and The University Hospital. These results were in agreement with [21, 22] which reported that cirrhosis was significantly higher in males compared to females. These results may be because most Egyptian females are housewives and also do not participate in the health insurance sector. With regard to marital status, it is noted that the total samples of married women in The University Hospital and Liver Institute Hospital are (70%) and (46.15%), respectively. While the percentage of married males and the first hospital was (50%), while the percentage of The University Hospital was (60%). Thus, The University Hospital was higher than Liver Institute Hospital in terms of married males and females, while in The University Hospital the percentage of females was greater than males.

With regard to housing, the highest percentage of the study sample was from rural areas (65.38%), (61.54%) for males and females in Liver Institute Hospital, respectively while in The University Hospital, the majority came from urban areas, where the percentage of females was (20%), while the percentage of males was (26.67%) for patients coming from rural areas (73.33%) and (80%) for males and females, respectively.

The same table showed that 46.15% of the male patients were of the same age group [41-21] years in Liver Institute Hospital.

Thus, more than half of the study and control groups were in the average adult. With respect to education status, the percentage in Liver Institute Hospital in terms of illiterates was (7.69%) (15.39%) and in terms of reading and writing (30.77%) - (30.77%), while the middle stage recorded (38.46%) (46.15%) while for higher education (23.08%) - (7.69%) for males and females, respectively. The percentage in The University Hospital in terms of illiteracy (33.33%) - (20%), reading and writing (6.67%) - (10%), while the intermediate stage (46.67%) scored (40%), while for university education (13.33%) - (30%) for males and females, respectively. Based on the results of the current study, the majority of patients were females and males in their forties and fifties, and with regard to marital status, the majority were married. Regarding education level, the majority were I am educated. These results are inconsistent with ^[23] who reported this; more than half the study patients were illiterate. According to the study by Vanderplas et al., (2012) ^[24] on a number of liver patients, which revealed that the majority of the sample had secondary education, and this result differs from the current study, which may be due to the difference in the nature of the study community.

Regarding the patient's stay, the results of the present study are in agreement with a study by Rao et al., (2013) ^[25] who reported: In Egypt, cirrhosis was more common in rural areas than in urban areas, because in rural areas the regions provided a suitable environment for, to develop to schistosomiasis infection due to exposure for channel water that may be contaminated by snails it harbors the schistosomiasis parasite.

Likewise, ^[26] added that cirrhosis of the liver in Egypt with or without active chronic hepatitis, about 50% of long-standing liver diseases Egypt and a higher percentage in the countryside Egypt. This means that cirrhosis is the most common chronic liver disease in the country.

With regard to marital status, the current study revealed that the majority of males the patients were married while most of the patients were married women and housewives. This result is supported by ^[27], according to the study performed on a number of cirrhosis of the liver patients in Egypt reported that the majority of the patients were married.

Table (1): The characteristics of social variables of Liver Cirrhosis patients:

Social status	Liver Institute Hospital				The University Hospital			
	Males (n=26)		Females (n=13)		Males (n=15)		Females (n=10)	
	Mean±SD		Mean±SD		Mean±SD		Mean±SD	
Marital Status	N	Percent	N	Percent	N	Percent	N	Percent
Single	5	19.23	2	15.38	2	13.33	1	10
Married	13	50	6	46.15	9	60	7	70

Social status	Liver Institute Hospital				The University Hospital			
	Males (n=26)		Females (n=13)		Males (n=15)		Females (n=10)	
	Mean±SD		Mean±SD		Mean±SD		Mean±SD	
Widower	8	30.77	5	38.47	4	26.67	2	20
Total	26	100	13	100	15	100	10	100
Age group								
21 > 41	12	46.15	3	23.08	5	33.33	4	40
41-59	10	38.46	4	30.77	8	53.34	5	50
< 59	4	15.39	6	46.15	2	13.33	1	10
Total	26	100	13	100	15	100	10	100
Residence								
Rural	17	65.38	8	61.54	11	73.33	8	80
Urban	9	34.62	5	38.46	4	26.67	2	20
Total	26	100	13	100	15	100	10	100
Education status								
Unlettered	2	7.69	2	15.39	5	33.33	2	20
Reads and writes	8	30.77	4	30.77	1	6.67	1	10
Intermediate Education	10	38.46	6	46.15	7	46.67	4	40
High Education	6	23.08	1	7.69	2	13.33	3	30
Total	26	100	13	100	15	100	10	100

The data of the means and standard deviations of anthropometrics show the anthropometric measurements of inpatients at the Hospital of the Liver Institute of Shebin El-Kom and the University Hospital.

The value of the BMI for males is 27.46 ± 1.6 kg / m² while the BMI for females is 28.39 ± 1.73 . This means that these patients are overweight (BMI) between 25 to 30 kg / m² [28].

The results of the table for the University Hospital showed that the body mass index of males was 26.46 ± 1.53 , while for females it was 28.13 ± 1.06 , and therefore the Hospital of the Liver Institute was higher than the second.

The same table showed the differences between males and females in the two hospitals respectively, as the BMI of males and females in the Hospital of the Liver Institute is greater than that of males in the University Hospital, and the BMI of the females in the Hospital of the Liver Institute is even greater of females in the university hospital in agreement with [29]. It was found that the average body mass index (BMI) of male and female inpatients was (21.9 - 4.4 kg). It was also found that (16.7%) were underweight (less than 18.5 kg). The results differed from the previous study of [30].

A significant decrease in height in females and an increase in the body mass index of the two hospitals.

There were statistically significant differences between the heights in the two hospitals (P <0.001).

Table (2): Anthropometric measurements of liver cirrhosis at some hospitals in Menoufia governorate (N=64).

Anthropometric measurements	Liver Institute Hospital		The University Hospital		T.TEST
	Males (n=26)	Females (n=13)	Males (n=15)	Females (n=10)	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Weight (kg)	84.01±1.11	72.7±1.49	79.2±1.23	76.6±1.01	1.633
Height (cm)	175±2.82	160±1.17	173±2.87	165±3.05	3.625***
BMI (kg /m ²)	27.46±1.6	28.39±1.73	26.46±1.53	28.13±1.06	.149

Significant, * $p \leq 0.05$, ** $p \leq 0.01$ and *** $p \leq 0.001$

Data in table(3) indicate that the average AST values for males and females at the Hospital of the Liver Institute were 38.05 ± 1.76 u/l and 34.5 ± 2.05 u/l for (AST) while (ALT) the values were 62.37 ± 2.52 and 58.71 ± 1.13 respectively.

While the values of the University Hospital were 41.06 ± 1.66 U/L and 47.33 ± 1.81 U/L for (AST) and (ALT) 78.01 ± 3.07 and 72.2 ± 3.46 respectively.

There were statistically significant differences between AST in the two hospitals ($P < 0.01$).

It can be seen that the average serum bilirubin values of the Hospital of the Institute of the Liver were higher than those of the University Hospital for males and females, 5.83 ± 1.43 and 4.3 ± 0.11 mg /dL versus 4.03 ± 1.9 and 2.08 ± 1.1 mg /dL, respectively.

This result corresponds to [31], which documented an increase in bilirubin levels with a further decrease in nutrients and functions.

This finding is very important when we begin to manage increased bilirubin levels in liver (jaundice) patients because the role of nutritional support in managing such a problem is usually neglected by all healthcare practitioners. The results were consistent with [32,33,34].

As for the average albumin in the hospital, it was twice as high as the average albumin in the first male and female hospital. Our findings are consistent with [33] which show that the level of albumin in the blood is significantly lower in patients.

There were statistically significant differences between bilirubin in the two hospitals ($P < 0.001$).

It should be noted that the percentage of urea in the blood and serum creatinine was higher in females of the Liver Institute Hospital compared to the University Hospital.

While the number of males in the Liver Institute Hospital was lower than the number of males in the University Hospital. There were statistically significant differences ($P < 0.05$) in urea and ALP between the two hospitals.

Table (3): Renal and Liver function of the liver cirrhosis at some hospitals in Menoufia governorate (N=64).

Parameters	Normal	Liver Institute Hospital		The University Hospital		T.TEST
		Males (n=26)	Females (n=13)	Males (n=15)	Females (n=10)	
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	
T. Bilirubin (gm/dl)	UP to 0.55	5.83±1.43	4.3±0.11	4.03±1.9	2.08±1.1	***3.859

Parameters	Normal	Liver Institute Hospital		The University Hospital		T.TEST
		Males	Females	Males	Females	
		(n=26)	(n=13)	(n=15)	(n=10)	
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	
D. Bilirubin (gm/dl)	UP to 0.55	4.45±1.78	3.61±1.51	3.43±0.18	2.38±0.24	*2.347
Total Protein Test(g/dl)	4.6:7.15	7.38±1.34	8.12±1.25	7.52±1.09	7.26±0.55	1.339
Albums(gm/dl)	3.8:4.4	6.45±1.38	5.87±0.77	6.62±1.61	6.83±0.10	.963
AST (U/l)	UP to 12	38.05±1.76	34.5±2.05	41.06±1.66	47.33±1.81	**3.113
ALT (U/l)	UP to 40	62.37±2.52	58.71±1.13	78.01±3.07	72.2±3.46	***3.411
ALP (U/l)	Up to 40	63.38±2.03	58.2±1.97	67.81±1.33	61.46±2.77	*2.745
UREA (mg/dl)	Male 15-45 Female 15-45	60.97±1.18	51.12±2.44	67.16±3.75	50.64±2.26	2.538*
Creatinine (mg/dl)	Male 0.4-1.3 Female 0.4-1.3	1.96±0.11	1.75±0.02	1.81±.13	1.73±.17	1.088

Significant, * $p \leq 0.05$, ** $p \leq 0.01$ and *** $p \leq 0.001$

Data in table (4) indicates that the average calorie intake for males in Liver Institute Hospital is lower than in The University Hospital, and vice versa in females.

Consistent findings were found in agreement with previous studies researched to determine the amount of calories consumed daily in hospital for cirrhosis patients, who observed a daily calorie drop. Found by [35, 36].

Cut the rate of inpatient calorie intake that benefited from the stability of their health as it reached (1535-370 calories/day). It can be noted that total male protein intake was higher at the Liver Institute Hospital compared to the University Hospital where RDA ratios were 86% and 67% for Liver Institute Hospital and the University Hospital respectively.

According to (Perier *et al.*, 2004) [37] it showed that the average daily protein intake for cirrhosis patients was stable health conditions (1 ± 0.4 g/kg/day), while the average protein intake for patients with serious diseases such as the heart and respiratory tract decreased. The results were also consistent with [38] as 30-50% of hospital inpatients were found to have protein and calorie deficiencies.

This table revealed slight differences in total fat intake in both hospitals, it can be seen that fat intake was low and meal monitoring showed the fat content is somewhat higher (82.6 g/day) per meal compared to the DRI (74.09 g/day).

These results are in agreement with those of [39] where they indicated a lower amount of fatty foods in the lists provided to inpatients.

According to ADA (2008) [40], fat should be restricted only if a person with cirrhosis of the liver develops fatty diarrhea, which is a clear sign of malabsorption. It can be seen that the average carbohydrate intake for males at the University Hospital was higher than the average carbohydrate intake for males at the Liver Institute Hospital, and there were statistically significant differences ($P < 0.05$) between carbohydrate intake in the two hospitals.

For the average cholesterol intake, the average male cholesterol intake at the Liver Institute Hospital was higher than at the University Hospital at 278.11 ± 1.99 mg and 239.66 ± 3.51 respectively, and this finding is consistent with ^[41] where it states that cholesterol should be limited to 300 mg/day to reduce the risk of cardiovascular disease and we do not agree with ^[42] which states that cholesterol intake should be less than 200 to 300 mg per day.

Average fiber is higher in Liver Institute Hospital than in The University Hospital male ^[43] indicated that patients with liver disease tolerate vegetables better than meat protein, possibly because vegetable protein contains fewer amino acids, is easily formed of ammonia, and less aromatic amino acids than meat, plus diets high in plant foods contain more fiber, which prevents constipation, by reducing the time available for the production and absorption of ammonia in the digestive tract.

Table (4): Macronutrient intakes of the hospitals cirrhosis patients by comparing with RDA

Macronutrients	Liver Institute Hospital		The University Hospital		T.TEST
	Males (n=26)	Females (n=13)	Males (n=15)	Females (n=10)	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Energy (kcal)	1128.21±5.22	1252.87±3.08	1249.80±8.85	1004.33±3.11	2.526*
RDA Cal. %	56.60±10.31	59.12±12.94	70.80±11.99	43.66±7.73	.539
Pro. A (gm)	25.71 ±1.10	21.27±1.22	22.42±1.09	27.23±1.50	1.204
Pro. P (gm)	19.22±1.99	19.13±1.41	21.48±1.22	14.44±1.2	.022
T. pro. (gm)	44.93 ±1.09	40.40±2.59	43.90±1.13	41.66±1.46	1.108
RDA T pro%	86.03±32.40	87.72±20.26	67.72±20.26	66.10±22.90	1.095
Fat A (gm)	18.61±1.29	19.68±1.33	19.32±1.21	17.66±15.95	.428
Fat P (gm)	15.59±10.18	14.55±9.27	19.88±9.91	7.43±.75	2.249*
T fat (gm)	34.20±1.47	34.27±2.63	39.20±1.48	25.09±1.44	.018
CHO(gm)	160.44±3.97	193.3±2.01	179.7±3.73	153.9±3.75	* *3.115
Fiber(gm)	9.72±1.15	11.52±1.49	8.48±1.61	6.63±1.53	2.682*
Cholesterol (gm)	243.15±2.21	278.11±1.99	248.26±3.84	239.66±3.51	2.384*

Significant, * $p \leq 0.05$, ** $p \leq 0.01$ and *** $p \leq 0.001$

The results of Table (5) showed unfortunate results. This is because the intake of a lot of minerals and vitamins was lower than the control meal, including calcium, vitamin D and B12 of these nutrients which were also lower than those in the DRI including CA, B6, 12 and vitamin D. The same control of the diet when compared to the DRI was low so the diet should be corrected to control the lack of minerals and vitamins, and the actual intake should be raised by patients University Hospital and Liver Institute.

There is no statistically significant relationship between iron intake and disease type ^[44]. 35% of cirrhosis patients did not take the necessary daily iron requirements.

According to (Alvares-da-Silva and Reverbel, 2005) ^[45] the result was that the intake of calcium and phosphorus was fairly sufficient. Take Na (1545.2 mg / day). It was less than control (3479.6 mg / day), but the direct reduction index was also lower to control the diet, so there is no need to increase sodium intake ^[46] if dropsy develops, sodium should be

ingested, as it is limited to 1000-2000 mg / day, and the actual intake has already decreased in this range (1545.2 mg / day).

The same table indicates for males and females in one hospital they were 1.4 ± 0.12 and 2.12 ± 1.05 for (Vit D) while the values in The University Hospital were 5.86 ± 1.99 and 4.86 ± 0.33 , respectively.

There was a significant difference between Liver Institute Hospital and The University Hospital for vitamin D ($p < 0.001$). The results of the study were in agreement with [47].

Table (5): Micronutrient intakes of the hospitals cirrhosis patients by comparing with Dietary Reference Intake (DRI).

Micronutrients	Liver Institute Hospital		The University Hospital		T.TEST
	Males (n=26) Mean±SD	Females (n=13) Mean±SD	Males (n=15) Mean±SD	Females (n=10) Mean±SD	
Minerals					
Calcium (mg)	536.57±3.62	414.81±4.13	430.88±2.29	370.13±30.11	3.738***
RDA Calcium %	67.06±1.45	51.85±2.48	53.86±2.15	46.26±3.85	2.717*
Phosphor (mg)	785.87±1.34	773.6±2.23	978.26±2.53	861.3±2.97	3.145**
RDA Phosphor%	98.23±2.53	96.7±3.02	122.28±3.45	107.66±3.79	2.811*
IronA (mg)	3.59 ±1.14	2.7±0.11	2.71±1.75	5.23±1.79	2.031*
IronB (mg)	6.68±0.51	6.86±1.31	6.34±1.95	5.86±1.59	0.062
T. iron (mg)	10.27±1.69	9.56±1.22	9.08±1.29	11.09±1.37	0.234
RDA.T. Iron %	103.03±1.61	95.77 ±2.28	91.1±3.03	111.30±3.59	0.508
Sodium (mg)	1388.12±2.42	1494.02±3.76	1509.36±4.06	1521.43±3.07	2.553*
RDA sodium%	277.63±2.08	298.81±3.96	301.87±3.88	304.30±3.64	0.553
Vitamins					
VitD (mg)	1.4 ±0.12	2.12±1.05	5.86±1.99	4.86±0.33	3.283***
RDA Vit. D%	27.94±1.67	42.43±1.87	117.38±3.56	97.16±2.46	3.324***
VitB12 (mg)	1.92±0.11	1.5±0.82	1.52±0.98	1.96±.92	.960
RDA.VitB12 %	96.11±2.06	75.13±4.69	76.94±2.76	97.8±3.31	.953

Significant, * $p \leq 0.05$, ** $p \leq 0.01$ and *** $p \leq 0.001$

Conclusions

We recommend paying attention to the quality of nutrition provided to patients with cirrhosis of the liver and maintaining it laboratory tests, such as liver and kidney tests, have a clear effect on improving health. Nutritional support, advice, and guidelines by dietitian of the nutritional regimen should be undertaken for all cirrhotic patients to prevent the occurrence of complications of malnutrition and improve clinical outcome.

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تقييم الحالة التغذوية لمرضى تليف الكبد البالغين ببعض مستشفيات محافظة المنوفية

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الملخص العربي:

تهدف الدراسة الحالية إلى تقييم الحالة التغذوية والصحية لمرضى تليف الكبد ومعرفة مدى تأثير مشاكل الكبد على صحة الإنسان. حيث أجريت الدراسة في مستشفى معهد الكبد بشبين الكوم والمستشفى الجامعي وتم اختيارهم عشوائياً وقسمت العينة إلى (39) مريضاً من المستشفى الأول و(25) مريضاً من المستشفى الثاني. تم إجراء المقاييس الجسمية وإجراء التحاليل المعملية لكل من وظائف الكبد والكلية، وتم الاسترجاع الغذائي على مدار 24 ساعة، واستغرقت مدة جمع البيانات 6 أشهر. وأظهرت النتائج أن مرضى تليف الكبد بالمستشفى الجامعي كانوا يعانون من سوء التغذية بدرجة أكبر من مستشفى معهد الكبد، حيث كان مؤشر كتلة الجسم للحالات حوالي 28، مما يشير إلى أن معظم الحالات يعانون من زيادة الوزن. أظهرت النتائج انخفاضاً معنوياً في ALT وAST وALK.PH وUREA في المستشفى الأول مقارنة بالمستشفى الثاني، بينما كانت هناك زيادة في BIL.D وBIL.T وT.PROT وALB في المستشفى الأول مقارنة بالمستشفى الثاني. كان لدى مرضى تليف الكبد في المستشفى الأول مستويات أقل من فيتامين (د) والفسفور والصوديوم والحديد مقارنة بالمستشفى الثاني وارتفاع في المستوى الغذائي في المستشفى الأول عن المستشفى الثاني في البروتين والألياف والكالسيوم، مما يشير إلى أن المؤشر الغذائي في المستشفى الأول أعلى في المستوى الغذائي.

الكلمات المفتاحية: تليف الكبد، وظائف الكبد، وظائف الكلية، المقاييس الأنثروبومترية.