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Dietary Recommendation for Management of Malnutrition in Cirrhosis Based on Iranian Traditional Medicine, A Systematic Review

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ABSTRACT

Malnutrition is prevalent in cirrhosis and can lead to more complications and reduce the quality of life. Therefore, improving the nutritional status of cirrhotic patients is necessary. The aim of this review was to assess the efficacy of dietary interventions for malnutrition management in cirrhosis suggested by Iranian traditional medicine (ITM). Recent research articles about malnutrition in cirrhotic patients were obtained through Google Scholar and PubMed and were compared with nutritional recommendations in ancient medical books. The recommended foods were classified based on their amino acid content according to the United States Department of Agriculture (USDA) online database. Food is recommended for improving cirrhotic patients in ITM based on the notion that food can produce a good blood supply and can benefit the biliary duct obstructions and work as a tonic for liver. The recommended foods were shown to have beneficial effects they were claimed for based on modern nutrition findings. Nutritional advices in Iranian Traditional Medicine for cirrhosis diet modification can significantly improve malnutrition and living conditions in these patients according to the current knowledge of nutrition.

Keywords: Liver, Food, Amino acids, Iranian Traditional Medicine, cirrhosis

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INTRODUCTION

Human liver is responsible for the metabolism of protein, carbohydrate, and lipid [1]. Chronic and acute liver disease can profoundly alter nutritional status and amino acids metabolism. It has been recognized for many years that patients with chronic parenchymal liver disease are malnourished [2]. The prevalence of malnutrition in patients with liver disease varies from 10% to 100%, depending largely on the method of nutritional assessment and the population studied [1]. Cirrhosis is defined as changes in liver tissue including nodular substitution of the liver structure with fibrosis which results in reduced liver parenchyma and impaired function of the liver. Cirrhosis is usually caused by prolonged alcohol consumption, infection with hepatitis C and B, autoimmune hepatitis, non-alcoholic fatty liver disease, heart disease and diseases affecting biliary tract [3]. The prevalence of liver cirrhosis has increased due to the increasing prevalence of

its underlying causes. Cirrhosis is associated with various complications which are associated with significant morbidity and mortality. On the other hand, cirrhotic patients are mainly malnourished and their malnutrition can lead to further complications and can lead to decreased quality of life [4]. There is no definitive medical treatment for cirrhosis except liver transplantation. As it is shown that improving nutritional status of cirrhotic patients reduces symptoms in cases who are in waiting list or not eligible for transplantation [5], current treatments are utilized to improve the quality of life and reduce the side effects [5]. Due to the crucial role of liver in the metabolism of fats, proteins and carbohydrates, 20 to 60% of cirrhotic patients are malnourished. Main leading factors for malnutrition in liver cirrhosis include reduced food intake due to anorexia, early satiety, nausea and vomiting, increased protein catabolism, malabsorption and indigestion [4, 6, 7]. On the other hand, renal involvement in cirrhosis can cause electrolyte imbalance which can impair the body food storage and exacerbate the malnutrition [8]. Therefore malnutrition, including protein and energy deficiency is considered as the most common reversible side effect, which is capable of adversely affecting the quality of life due to loss of muscle mass and reduced fat tissue [4, 9, 10]. Recent research conducted between 2008 and 2012 on the effect of nutrition on cirrhosis showed that dietary counselling and nutritional intervention with dietary supplements containing protein may lead to a degree of improvement in cirrhotic patients [11]. One of the most important metabolic abnormalities in patients with cirrhosis is the alteration of amino acids metabolism [5, 9]. This alteration is characterized by low levels of circulating branched chain amino acids (BCAAs) (leucine, isoleucine and valine) and elevated levels of circulating aromatic amino acids (AAA) (phenylalanine, tryptophan and tyrosine) along with methionine which is computed as 'Fisher ratio' [12]. In advanced cirrhosis, long term nutritional supplementation with oral BCAA is useful to prevent progressive hepatic failure, improve surrogate markers and maintain the current health status but the non-compliance with the formula containing BCAA is high. Consequently there is a need for new efficient and safe products such as medicinal foods [13]. Iranian Traditional medicine has long been used to cure ailments in human diseases and is now used by many believers especially in Asia and Africa [14-16]. The main reasons for preference of traditional medicine to modern medicine were reported as culturally acceptable, cheap price and efficacy in the management of some diseases [16-18]. Due to these characteristics of traditional medicine, new interventions have been designed to use traditional medicine in promoting health in societies with traditional beliefs [14, 19]. The recommended foods by ITM might be suitable in management of cirrhosis based on its holistic root and valuable nutritional aspects. To assess the validity of traditional treatments in the cure of ailments for exploring new and effective therapies, bibliographic and comprehensive critical searches are the first steps [20]. In this article, existing ITM literature was thoroughly and critically reviewed to assess its nutritional efficacy according to the current knowledge of medicine in cirrhosis.

MATERIALS AND METHODS

In this review study, research articles about malnutrition in cirrhotic patients that published from 1991-2015 were searched and obtained from Google Scholar and PubMed. Furthermore, the nutritional recommendations to strengthen the liver and improve its function were extracted from ITM medical textbooks including "Al-Hawi" [21], (The Liber Continens, by Rhazes), "Al-Qanoon Fi Al-Tibb" [22], (The Canon of Medicine, by Avicenna), "Makhzanoladvieh" [23], (Makhzan-ol-advieh, by Aghili Khorasani), and "Zakhireh Kharazmshahi" [24], (Zakhireh-i Kharazmshahi, by Sayed Isamail Jorjani). Then the extracted results were classified based on their amino acid content According to the United States Department of Agriculture (USDA) online database.

RESULTS

In ITM cirrhosis (sou of gonieh and estesgha in Arabic) is characterized as a liver disease and specific nutritional management strategies have been recommended to improve liver function in cirrhosis. From the viewpoint of ITM, proper and tonic nutrition can improve liver functions when disrupted [25-30]. ITM considers cirrhosis as a disease of various types and scientists of traditional medicine have a broader perspective in disease management.

Liver in ITM

Based on the standpoint of the ITM liver is important and necessary for human health [22]. In the stage of gastric digestion, food is broken down and changed into an absorbable emulsion in the form of a milky bodily fluid that is called chylos. Chylos is absorbed into the liver through mesenteric vessels. In the stage of liver digestion, the chyle changes into chymos, and the four humors of blood, phlegm, yellow bile, and black bile are produced during the chymification process. These humors are transferred from the digestive system to the bloodstream and then to all tissues in the body for the purpose of creating and repairing the various cells and tissues [21, 22, 24, 31, 32]. Based on the ITM belief, human health depends on the balance of humors and that many diseases occur due to the imbalance between these humours [22]. Therefore, it can be inferred that liver dysfunction can be a risk to health due to the impairment in humors production in the body [33, 34]. Thus, modification of liver function is important in every disease [22, 35], and therapeutic tonic foods for liver are recommended in case [22].

Recommended Foods for cirrhosis in ITM

Treatment with food is of tremendous importance in traditional medicine. Rhazes, Iranian great scientist, on the priority of health improving foods says 'Do not apply medication as long as you can use food in the treatment' [21, 22]. ITM prescribes a variety of foods, including certain meals, Medicinal food and food medicine [23]. Based on ITM classification, certain foods such as Soft-boiled egg yolk produce healthy temperate humors named 'absolute food' while another group of foods called 'Medicinal food' such as lettuce and spinach, in addition to some nutritional effects, they also have pharmacological effects. Another type of food in ITM is 'food medicine', in which medicinal effects dominate nutritional benefits, such as garlic, onion and mint [23]. Based on the belief in ITM that cirrhosis is due to weakness in liver function, ITM prescribes foods in order to relieve the symptoms of cirrhosis by strengthening the liver and therefore produce a better quality of life [22, 33].

The main reasons for prescribing foods in management of cirrhosis in ITM include:

- Production of a balanced healthy blood and removing the weakness such as Yolk egg, Chicken and Lamb [22].
- Resolving bile obstructions such as Amygdalus communis Linn, Cicer arietinum Linn, Apium graveolens Linn, Cucurbita pepo DC, Zataria multiflora Boiss [22, 23].
- Strengthening the liver: Olea europea Linn and Cydonia oblonga Mill [22, 23].
- Beneficial in ascites: Olea europea Linn, Cicer arietinum Linn, Apium graveolens Linn [22].
- Preventing the superfluous Materials from permeating viscera (liver, stomach) e.g. Cydonia oblonga Mill, Malus domestica Linn [22].
- Anti-inflammation: Olea europea Linn [22].
- Treatment of jaundice: Cicer arietinum Linn, Lactuca sativa Linn, Spinacia oleracea Linn, Cucurbita pepo DC [22, 23].
- Detoxification of the liver: Apium graveolens Linn, Zataria multiflora Boiss, Hordeum vulgare Linn, Cicer arietinum Linn [22, 23].

Amino Acids Fischer ratio

low levels of circulating BCAAs (leucine, isoleucine and valine) with elevated levels of circulating AAAs (phenylalanine, tryptophan and tyrosine), and methionine is seen in cirrhosis due to alterations in the amino acid metabolism [12, 36, 37], and ratio of BCAAs to AAAs (Fischer ratio), that is defined as a molar ratio of Val + Leu + Ile to Phe + Tyr is reduced in liver disease [37, 38], and called a low Fischer ratio which is associated with hepatic encephalopathy [37]. Based on this definition a peptide with high levels of BCAA and low levels of aromatic amino acids (AAA) is called high Fischer ratio oligopeptide. Patients with severe hepatic disease generally have an amino acid imbalance characterized by low levels of BCAA and high levels of AAA in their systemic blood [39]. The types of amino acids and the Fischer ratio provided by nutritional ITM recommendations, were obtained and calculated based on United States Department of Agriculture database (USDA)[40], and included in Table 1. A great proportion of BCAA to AAA in all recommended foods in ITM was shown with Fisher ratio.

Table 1. Amino acid content of recommended foods for cirrhotic patients by ITM

Common Name	Traditional Medicine Name	Scientific Name	Leucine Mg/100gr	Isoleucine Mg/100gr	Valine Mg/100gr	Phenyl alanine Mg/100gr	Tyrosine Mg/100gr	Tryptophan Mg/100gr	BCAA/AAA
Almond	Loze	*Amygdalus communis* L.	1209	677.1	802.8	869.4	550.7	280.6	1.58
Apple	Tofah	*Malus domestica*	17.06	11.18	12.94	8.235	5.294	2.941	2.50
Barley	Shair	*Hordeum vulgare* L.	783.9	467.9	525.5	600	0	111.6	2.50
Caraway	Kamon	*Cuminum cyminum* L.	1238	809.5	1047	857.1	619	238.1	1.80
Celery	Karafs	*Apium graveolens* L.	39	25.02	33.03	24.03	11	11	2.11
Chickpea	Hemas	*Cicer arietinum* L.	226.1	170.3	183.6	173.9	129.7	37.03	1.70
Cucurbita	Qare	*Cucurbita pepo* DC	52.78	32.78	41.11	32.22	23.89	7.778	1.98
Garden Thyme	Satar	*Zataria multiflora* Boiss	428.6	500	500	500	500	214.3	1.18
Hen	Dajaj	Chicken	2509	1765	1659	1327	1127	389.5	2.08
Lamb	Haml	Lamb	2156	1338	1496	1129	931.6	324.6	2.09
Lettuce	Khas	*Lactuca sativa* L.	98.04	105	86.96	68.04	40	12	2.42
Olive	Zeiton	*Olea europea* L.	45.45	22.73	45.45	22.73	22.73	22.73	1.67
Quince	Safarjal	*Cydonia oblonga* Miller	5.6	21.4	17.9	6.5	1	9.4	2.65
Spinach	Esfenaj	*Spinacia oleracea*	243.9	160	177.1	142	119	41.95	1.92
Yellow yolk	Moh	Yolk yellow	1472	848.1	932.9	716	746.1	195.9	1.96

DISCUSSION

Many studies were performed to improve nutrition in cirrhotic patients by adding BCAA to their diet and increasing the level of serum albumin thus reducing ascites and edema [11, 41, 42]. This study showed a large proportion of BCAA to AAA in all recommended foods in ITM especially in Cydonia oblonga Mill, Malus domestica Linn, Hordeum vulgare Linn, Lactuca sativa Linn, and Apium graveolens Linn, which have a high Fischer ratio. Therefore consumption of these foods in the diet of cirrhotic patients can reduce complications of the disease. Hepatoprotective effects have been observed for Olea europea Linn, and Cydonia oblonga Mill, mainly due to antioxidant effects and improving the hepatic steatosis [43, 44]. Cydonia oblonga Mill, was found to inhibit liver transferase activity and result in reduced triglyceride, total cholesterol and low-density lipoprotein while increasing high-density lipoprotein [44]. This finding was in line with the claim of ITM that Cydonia oblonga Mill, is capable of preventing the superfluous materials from penetrating viscera [44]. Amygdalus communis Linn, has been used to treat gastrointestinal conditions in traditional medicine and was found to have antioxidant activities which makes it beneficial for rejuvenating damaged hepatocytes [45].

Hepatoprotective effects of Cucurbita pepo DC, have also been attributed to its high antioxidant activity [46]. Lactuca sativa Linn, demonstrates its antioxidant activity through increased activity of catalase, superoxide dismutase, peroxidase and glutathione while Spinacia oleracea Linn was shown to produce its antioxidant activity through increased glutathione levels [47, 48]. Terpenoid, flavonoid, glycoside and saponin content of Hordeum vulgare Linn, were found to be associated with its antioxidant and hepatoprotective activity [49]. Cicer arietinum Linn, was found to have anti-inflammatory and anti-oedematous effects in rat studies due to the high content of flavonoids, phenols, saponins and tannins [50]. Hepatoprotective and anti hepatocarcinogenic effects of Apium graveolens Linn, has also been established in previous studies [51, 52]. Zataria multiflora Boiss was found to demonstrate its anti-hepatocarcinogenic effects through its role in suppressing genes and interfering with hepatocyte cell cycle as well as reducing hepatocellular injury biomarkers [53, 54]. The hepatoprotective effects of Malus domestica Linn were found to be attributed to its terpenoid content [55].

CONCLUSION

In ancient times the role of nutrition as one of the most important factors that can influence overall mortality and morbidity in liver disease was well understood and respected in ITM. Liver cirrhosis drives the patients to a catabolic state depriving them of essential nutrients. Therefore, correction of nutritional deficit can improve the patient's clinical outcome by the ITM nutritional advice for cirrhosis which includes oral administration of anti-oxidant, hepatoprotective foods with higher Fischer ratio. In this review, effective diet for cirrhotic patients was introduced based on ITM practice. Conducting high quality clinical studies in this area would be required.

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