

# Nutrition Management in Patients with Cirrhosis in Present COVID-19 Pandemic

## Review Article

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### Abstract

**Purpose:** COVID-19 pandemic has affected millions all over the world. People who are obese, elderly, with chronic kidney disease, cardio vascular disease, chronic liver disease, associated malignancy and chronic airway disease are prone to develop severe COVID-19 with increased mortality. Malnutrition is a common problem in all these co morbid illness including chronic liver disease and it is possible that malnutrition and sarcopenia add on to increased severity in these patients.

**Results:** Malnutrition is seen in 20-50% of patients with chronic liver disease and chronic liver disease is an independent risk factor for increased severity and mortality in patients with COVID-19 disease. Social myths about COVID-19 and intake of many herbal, Chinese and ayurvedic preparation with add on heavy metals may affect the liver function in this pandemic. Home quarantine has led to increase screen time and reduced physical activity time. This has affected many malnourished and sarcopenic patients with cirrhosis.

**Conclusion:** Malnutrition is common in patients with chronic liver disease and good nutrition, regular exercises and adequate supplementation with vitamins and nutrients is required in the present pandemic to improve survival.

**Keywords:** Malnutrition; Cirrhosis; COVID-19; Management

## Introduction

Corona viruses are a family of viruses that can affect humans. Upper respiratory tract infections are the commonest symptoms though it can affect liver and intestine also. Majority of the infections are mild and self limiting with symptoms of cough, fever, body ache, anosmia and diarrhoea however severity can vary leading to severe acute respiratory syndrome, multi organ failure and even death in few cases [1,2].

### Importance of nutrition in COVID-19 and its outcome

Nutrition and immunity is a key determinant against various bacterial and viral illnesses. Improving and supplementing nutrition remains an important part of treatment regimen for acute and chronic diseases for which a definitive etiologic treatment has not yet been approved [3]. Adequate nutrition and enhanced immunity may apply to the current SARS-CoV-2 (or COVID-19) pandemic as till now we do not have definitive management protocol [4]. Patients

who are obese, hypertensive, diabetic, associated malignancy, renal disease, cardiovascular disease, chronic respiratory disease, chronic liver disease, old age and hypoalbuminemic patients had poor outcome in COVID-19 [5-8]. There are no direct study evaluating the role of nutrition per se on severity of COVID-19. However considering together the various co morbid conditions in COVID-19, indirect evidence supports the relevance of nutrition in present pandemic as older age and the presence of comorbid conditions like chronic renal and liver disease are almost invariably associated with impaired nutritional status and sarcopenia. Similarly obesity with associated sarcopenic obesity suggest role of nutrition in COVID-19 outcome. The presence of at least two chronic diseases in the same individual can be defined as polymorbidity and is also characterized by high nutritional risk. Presence of polymorbidity and addition of inflammation and sepsis may further contribute to enhance severity of SARS-CoV-2 infections [9,10]. Various nutritional markers like lymphopenia and hypoalbuminemia are also negative prognostic factor in patients with COVID-19. Though serum albumin as a

nutritional marker, its role in patients with inflammatory response is a questionable importance, but low prealbumin level predicts progression to Acute Respiratory Distress Syndrome (ARDS) may suggest role of nutrition. These evidences support the role of nutrition in prognosis of COVID-19 [11-13].

### Prevalence of malnutrition in cirrhosis

Malnutrition is very common in patients with liver cirrhosis, occurring in 20-50% of patients with compensated cirrhosis and more than 50% of patients with decompensated liver disease [14]. Malnutrition spectrums include muscle mass loss (sarcopenia) and/or protein calorie deficiencies. Sarcopenia and malnutrition are not equivalent terms in patients with cirrhosis. Severe malnutrition are associated with a higher rate of complications such as more infections with increase severity, Hepatic Encephalopathy (HE) both overt and covert, ascites, increased pretransplant waiting list mortality, increased post transplant intensive care stay and post transplant infections [15-18]. Various screening tools like Subjective Global Assessment (SGA), royal free hospital nutrition prioritising tool (RFHNPT) are used for rapid screening of malnutrition followed by detailed assessment by methods of nutritional status (total lymphocyte count, mid arm muscle circumference, mid arm muscular area, tricep skin fold thickness, subscapular skinfold thickness, BMI and handgrip measurement and Computed Tomographic (CT) image analysis at the L3 vertebra [14].

### Liver disease a risk factor of severe COVID-19

Liver involvement as suggested by impaired liver enzymes is seen in more than one third to half of patients with COVID-19. Majority of the studies had only 3-8% of the patients with pre existing liver disease and increased severity of COVID-19 in these patients has not yet been fully evaluated [2,5-7]. Singh et al. which included 250 patients with chronic liver disease [CLD, 42% Metabolic Fatty Liver Disease (MAFLD) and n=50 with cirrhosis] [19]. These patients had associated co-morbidities like hypertension (68%), diabetes mellitus (48%), chronic kidney disease (CKD, 32%), chronic respiratory disease (40%) and congestive heart failure (CHF, 24%). Relative Risk (RR) of mortality in cirrhosis was (RR, 4.6) and in CLD (RR 3.0) compared to non CLD patients. In a large study by Moon et al. 103 patients with cirrhosis and 49 with non-cirrhotic CLD were enrolled and deaths occurred in 12.2% of CLD without cirrhosis [20], 24% CTP-A cirrhosis, 43% CTP-B cirrhosis, and 63.0% CTP-C cirrhosis. These studies had shown that underlying pre-existing liver disease is a risk factor for increased severity of COVID-19 and these patients should be looked upon by trained hepatologist and Internist.

Patients who have MAFLD (Metabolic Fatty Liver Disease) and chronic liver disease (fatty liver) are also prone to develop severe COVID-19 as MAFLD shares common risk factors (hypertension, obesity, dyslipidemia) with severity of COVID-19 [21].

### Management of Nutrition in chronic liver disease in COVID-19 pandemic

Majority of chronic liver disease patients which includes both compensated and decompensated liver disease have poor nutrition. Cirrhosis itself is a risk factor for severe COVID-19 so these patients should be monitored very carefully in the present pandemic.

Social myths/practises about diet in the present COVID-19 pandemic: Though majority of the people know that best strategy for prevention of COVID-19 is self quarantine at home and maintaining social distance and wearing mask outside home. Many local practises also prevails in society which varies from country to country and includes intake of some homemade remedies like kadha which is a mixtures of Indian black pepper, ginger, resins, cardamom, cinnamon and honey with warm water and to consume it three or four times a day. Avoid high calories diet and take bland diet which contains less fat and protein to avoid extra work on liver during this pandemic. Some people are using Chinese herbs, ayurvedic herbs with added heavy metals to boost the immunity [22-24]. There is no scientific basis for these and how much they affect liver is also not known. Avoiding good nutritious diet which is rich in proteins like meat, fish and other animal products like milk and milk products is affecting patient with cirrhosis who are already protein and calorie malnourished.

WHO has given its guidelines in the present pandemic and advised for proper nutrition and hydration which are vital in the present pandemic. WHO advised to eat a variety of fresh and unprocessed foods every day to get the vitamins, minerals, dietary fibre, protein and antioxidants which our body require to boost up immune response. Drink enough water which includes 8-10 cups of water. Avoid sugar, fat and salt to significantly lower risk of overweight, obesity, heart disease, stroke, diabetes and certain types of cancer. These guidelines are followed by majority of people including patients with cirrhosis and decompensated cirrhosis. Though majority of the guidelines are good but for people who had chronic kidney disease, chronic decompensated liver disease and chronic heart disease with failure need special precaution as are already fluid overloaded and excess water intake may worsen there problem [25].

Common principles to be followed while dealing with chronic liver disease patients in present pandemic

Assessment of malnutrition: All patients with cirrhosis, malnutrition assessment should be done. Common easy methods include measurement of body mass index with corrected body weight, assessment of Child's status, SGA and RFH-NPT should be assessed in all patients. These are simple methods and questionnaire based assessment of malnutrition and can be easily calculated by a physician or his supporting staff without taking much time. These can also be calculated on a telephonic discussion if patient do not want to come to clinic/hospital during present pandemic. Patients with BMI less than 18.5 kg/m<sup>2</sup>, Child's Pugh class C and SGA score of mild and severe malnutrition and RFH-NPT score more than 1 are the patients that should be screened in detail and corrective measures to be taken to improve nutrition [14]. Preserving nutritional status and treating malnutrition is also important to reduce complications in patients with cirrhosis at nutritional risk who might incur in COVID-19 in the future.

Though there are no direct study evaluating the role of malnutrition in non cirrhotic or cirrhotic patients and severity of COVID-19. However in a previous study in influenza infections, increased mortality predictors includes type of virus (OR 7.1), malnutrition (OR 25.0), hospital-acquired infection (OR 12.2) and respiratory

insufficiency (OR 125.8) [26]. Subjects with malnutrition should try to optimize their nutritional status, ideally by diet counseling from an experienced dietician with sound knowledge of diet in patients with liver disease (preferably through video conferencing to prevent contact). Obesity, chronic liver disease and old age patients are risk factors of severe COVID-19 so obesity does not preclude these patients for nutrition assessment. Dietician should regularly follow these patients for adherence to dietary plan and reassess the nutrition status of these patients.

#### Total calories/protein/carbohydrate and fat intake

Majority of patients with cirrhosis are malnourished and hence even at home for self quarantine and not doing enough work out/exercise does not mean taking fewer calories. Patient should continue to follow the guidelines of ESPEN as before the COVID-19 pandemic [27] (Table-1). Patient with cirrhosis should continue with daily multivitamin supplement (Table 2). Routine testing for vitamin deficiency or their level should not be monitored in every patients of cirrhosis as is not cost effective and not available routinely.

As most patients will remain at home adequate intake of Vitamin D should be encouraged in all. Vitamin D is a well-known regulator of innate immunity. Vitamin D deficiency has been associated with a number of viral and bacterial diseases including influenza, Human Immunodeficiency Virus (HIV), hepatitis and mycobacterial infection. Vitamin D role in bovine corona has been seen [28-31]. Vitamin A has been defined as “anti-infective” vitamin since many of the body’s defences against infection depend on its adequate supply. In an animal study it was found that the effect of infection with Infectious Bronchitis Virus (IBV), which is a kind of corona viruses, was more pronounced in animals fed a diet marginally deficient in vitamin A than in those fed on an adequate vitamin A diet. Adequate supplementation with Vitamin A is advised for all patients with cirrhosis [32].

Role of vitamin C to lower incidence of lower respiratory infection has been seen in few studies. The COVID-19 had been reported to cause lower respiratory tract infection, so supplementation with vitamin C could be one of the effective choices for the treatment of COVID-19 [33-35]. Selenium deficiency also increases influenza virus infection so supplementation will help in all patients [36]. Zinc has an important role in immune cells of both the innate and adaptive immune system and its deficiency may results in dysfunction of both

humoral and cell-mediated immunity. In addition, the combination of zinc and pyrithione at low concentrations inhibits the replication of SARS Coronavirus (SARS-CoV) [37-38]. Zinc supplementation also decreases the hepatic encephalopathy in cirrhosis patients [39]. Therefore, zinc supplement may have protective effect in COVID-19 and should be supplemented in all patients with cirrhosis [40] (Table 2).

#### Physical exercises while remaining quarantine

Best preventive measure to reduce infectious risk is to remain quarantine at home and is endorsed all over the world [40]. However, prolonged home stay may lead to increased sedentary life and its associated problems. More and more people including patients with cirrhosis are spending time in lying down and watching television and mobile phones. Increase in screen time had led to lower physical activity time. Prolonged sedentary behaviour in patients with cirrhosis who are sarcopenic can lead to worsening of their muscle strength. Reduced aerobic exercises can also alter immune system and make them prone to develop secondary infections [41]. Many people have underlying diabetes and obesity related problems and sedentary lifestyle affects glycemic control and associated problems of increased susceptibility to secondary infections.

In the developed and developing countries majority of people are living in a small apartment with little free space. Patient with cirrhosis can continue exercise at home even open space is a constraint using various safe, simple, and easily implementable exercises tools. These easy steps will also avoid the airborne coronavirus and maintain fitness levels in these patients. Exercises that can be easily done at home include strengthening exercises, stretching exercises, or a combination of these along with some aerobic exercises if space allows. Common example of home exercises include stand-to-sit and sit-to-stand using a chair and from the floor, chair squats, and sit-ups and push ups if possible. Even walking in home and climbing stairs with support, playing with kids or pets for 20 minutes, dancing at home or traditional yoga should be considered since they require no equipment, little space, and can be practiced at any time. Various health programmes on television, internet and mobile apps are some other ways to keep your health in a good shape. Regular exercise improves your muscle and improves appetite and general well being.

**Table 1:** Summary of general nutrition guidelines for patients with cirrhosis.

Intervention
· Overall provision 30–35 kcal/kg dry body weight
Calories distribution (%):
– Carbohydrates 50–60
– Proteins 25–30 (1–1.5 g/kg body weight)
– Fats 15–20
· Avoidance of unnecessary dietary restriction
· A low-sodium diet (<2 g/day) should be recommended only if ascites or oedema is present
· Frequent (4-6) small meals including night-time snacks: to be encouraged
· Screen for deficiency of serum zinc, calcium and vitamins A, D, E and K and supplement as needed
· In case of protein intolerance: vegetable or dairy and branched chain aminoacids to be supplemented

**Table 2:** Common Vitamins and Minerals and proposed benefit against viral illness.

Vitamins	Recommended daily allowance	Common sources	Active against virus
Vitamin A	600 ug/d	Carrots, sweet potatoes, spinach, kale.	Measles virus, human immunodeficiency virus, avian coronavirus
Vitamin D (Cholecalciferol)	5 µg/d	Fortified dairy products and soya milk, Fish, cod liver oil, mushrooms	Bovine coronavirus
Vitamin C	75 mg/d	Lemmon, broccoli, spinach, strawberry, Kiwi, papaya, citrus fruits	Avian coronavirus; lower respiratory tract infections
Vitamin E (tocopherol)	10 mg/d	nuts, seeds, vegetable oils.	Coxsackievirus, bovine coronavirus
Vitamin B complex Thiamin(B1) Riboflavin(B2) Niacin(B3) Pantothenic acid(B5) Pyridoxine(B6) Folate	1.4 mg/d 1.6 mg/d 18 mg/d 6 mg/d 2 mg/d 400 ug/d	Fruits, green leafy vegetables, Lentils, meat, milk and milk products	MERS-CoV; ventilator-induced lung injury
Zinc	7.0 mg/d	Sea food, whole grains, egg	Measles virus, SARS-CoV
Selenium	34 ug/d	Sea food, organ meat, grains	Influenza virus, avian coronavirus; viral mutations
Calcium	1,000 mg/d	Milk and milk products	-
Magnesium	260 mg/d	Nuts, whole grains, fruits	-
Iodine	130 ug/d	Sea food, iodized salt	-

Limited outdoor activities such as garden walk or light outdoor games like table tennis and badminton can be tried. Every day >20-30 min or every second day > 40-60 minutes exercise is recommended to maintain mental and physical health, muscle mass and thus energy expenditure [42].

Patients who have decompensated cirrhosis and ascites should also do exercises which may include walking in the home for 15-20 minutes, playing with kids/pets or some sort of stretching or strengthening exercises during this pandemic. Daily monitor of weight is also important to keep watch on amount of ascites. Excessive amount of water should be avoided and these patients must ask or inform their treating physician if taking any alternative/off label medicines.

## Conclusion

Majority of patient with cirrhosis are malnourished and its severity increases with increase in Child's Pugh status. Cirrhosis patients either compensated or decompensated and patients with MAFLD are also prone to develop severe COVID-19. In the present pandemic best preventive strategy to COVID-19 is to stay home and keep proper social distancing and wearing face mask. However staying at home has increased screen time compared to physical activity time in all persons including patients with cirrhosis. Prolonged screen time can worsen the already prevalent sarcopenia in patients with cirrhosis. Social myths about diet and cultural practises while staying home also add to nutrition problem in patients with cirrhosis. Taking herbal, Chinese, ayurvedic treatment with add on heavy metals to improve immunity can lead to worsening of liver status in these patients. All patients with cirrhosis should have a screening test for malnutrition which can be done either by doctor or his paramedical staff or dietician even on video conferencing. Patient who found to be malnourished should be screened by trained dietician on telephone or preferably on video conference and corrective measures to be taken. All patients should get supplements with multivitamins on regular basis as regular exercises which can be done even at home should be enforced in all patients.

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