

Original Research Article

Prevention of Sarcopenia in Chronic Liver patients amongst Rajasthani population

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Abstract

Assessment of Sarcopenia is a very reliable tool to assess status of malnutrition in patients suffering with chronic liver disease and is associated with adverse clinical outcomes including reduction in quality of life, increased mortality and post transplant complications. Muscle protein synthesis is severely influenced in CLD that is the major cause of Sarcopenia. Non-alcoholic fatty liver disease (NAFLD) leads to liver cirrhosis, Type 2 diabetes and cardiac disorders. Hepatitis A, Hepatitis B, Hepatitis C caused by viruses which can cause fatal conditions. Too much alcohol, drugs, poisons lead to fatty liver disease (FLD) and cirrhosis. This research study was planned to find out prevalence of Sarcopenia in chronic liver disease patients in Rajasthani population. The study was conducted on 90 subjects who were suffering from chronic liver disease. Data obtained for study was demographic data, anthropometric data, biochemical reports, clinical signs and symptoms and nutritional intake. Mean and percentage was calculated to arrive at conclusion.

Keywords

Sarcopenia, cirrhosis, post transplant, NAFLD, CLD, anthropometric, sarcopenic obese

Introduction

Liver is the largest gland in the human body. It performs essential, life sustaining functions. Toxic and carcinogenic agents, dietary habits, lifestyle behavior, hepatotoxic substances can cause serious complications which may eventually result in death. It is situated in abdominal cavity, underneath diaphragm, upside of stomach, right kidney and intestines. It

is dark reddish brown in color, weighs approximately 1500 grams. Right and left are the two lobes of liver. Right lobe is moreover divided into anterior and posterior segments. Both the segments are separated by right segmental fissure. Blood is supplied to the liver from hepatic artery and portal vein. Approximately one third of blood from aorta is supplied by hepatic artery and remaining two thirds is supplied by portal vein which also collects drained blood from digestive tract. Circulation of approximately 1500 ml blood takes place through liver which exits via left and right hepatic veins into inferior vena cava. Production of bile takes place in liver cells which dissolve fat in the intestine and form a mixture with fatty acids to ease their absorption. (Krause & Mahan, 2021). Fibrous tissue layer known as Glisson's capsule covers the outer area of liver. This fibrous tissue layer is covered by peritoneum which is a lining of abdominal cavity that protects the liver from physical damage. Blood vessels segregate into small capillaries which end in lobules. Functional unit of liver are lobules which consists of hepatocytes. (Sethi & Ford, 2022).

Liver is the only internal organ which can regenerate. Even if 25% of tissue remains it can completely regenerate and re-grow to its previous size and ability. According to researchers, liver mass completely restores within 3 months of surgery with maximum recovery in the post surgical period of 7-10 days.

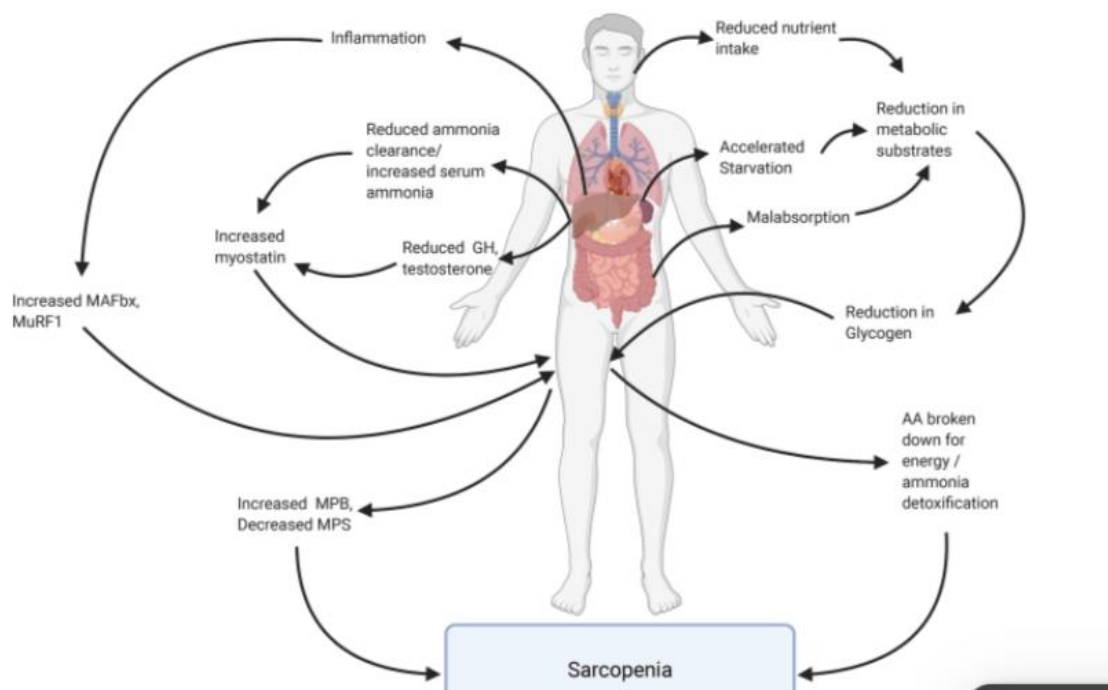


Figure 1: Factors which leads to Sarcopenia

In Greek terms, sarco means flesh and penia means loss. In chronic liver diseases, loss of muscle mass and muscle strength is very common that leads to higher rates of mortality and morbidity in these patients (Ooi et al., 2019). It may also affect post transplant recovery and may increase complications after transplant. Sarcopenia can be defined in CLD patients through measurement of skeletal muscle index at third lumbar spine. Due to imbalance in muscle protein turnover that is increased muscle protein breakdown and decreased muscle protein in CLD contributes to Sarcopenia. Causes of this imbalance are accelerated starvation, lack of amino acid, chronic inflammation, lack of physical activity, increased consumption of alcohol and hyperammonemia. Late evening snacks, supplements of branched chain amino acids and physical activity might be beneficial in treatment and management of Sarcopenia. Nutraceutical Urolithin A and myostatin inhibition have been proven beneficial in age related Sarcopenia (Allen et al., 2021).

Sarcopenic obesity can be by body composition. Abnormal or excessive fat accumulation is termed as obesity which negatively affects health. As per Stenholm et al. (2009), causes for increased muscle mass loss may be less physical activity, inflammation, growth hormone, insulin resistance, poor nutritional state and weight loss.

Rationale of the study

Malnutrition is very common in chronic liver disease patients. It includes both under nutrition or over nutrition. Sarcopenia is one of the major nutrition related problems in chronic liver disease patients. Although some research work have been carried out in this direction as following -

- Sarcopenic obesity in liver cirrhosis (Nishikawa et al., 2021)
- Sarcopenic obesity in non-alcoholic fatty liver disease (Ali et al., 2015)
- Sarcopenia in chronic liver disease (Allen et al., 2021)
- EASL Clinical practice guidelines on nutrition in chronic liver disease

Yet no work has been done on prevalence of Sarcopenia in CLD patients of Rajasthani population. Therefore, present research project has been planned to study nutritional status of chronic liver disease patients and provide information on prevalence of Sarcopenia.

Aim of the study

- To find out prevalence of Sarcopenia in chronic liver disease patients

Research Methodology

Phase 1

Collection of Literature: Literature or research work done related to the topic was searched from institutional library and from internet using Pubmed, Google scholar, Researchgate and other relevant search portals from where studies were searched and downloaded to understand the concept thoroughly. A lot of understanding was achieved about the problem, methodology used by various researchers, prevalence, and magnitude of the problem after study of this literature.

Phase 2

Sample Selection

Total sample size 90

Purposive sampling technique was used. All adult patients were taken who came to IPD or OPD of Hepato Pancreatic Biliary Department of Mahatma Gandhi Hospital until the required number of samples was completed.

Inclusion criteria:

- Patients who were willing to participate
- Patients between age group 18-59 years
- Both male and female
- Patients should have decompensated chronic liver disease

Exclusion criteria:

- Patients < 18 years and >59 years of age
- Who was not willing to participate
- Patients suffering with some serious neurological problem
- Dialysis or cardiac patient

Phase 3

Collection of General Information: Patient's general information was collected on a set questionnaire from their OPD or IPD record or from patient or their attendants. In this section information regarding patient's name, age, gender, marital status, economic status, occupational status, activity pattern, contact number & address was recorded.

Phase 4

Nutritional Status assessment: Patient's nutritional status assessment was done for all IPD and OPD patients. It was done under following headings:

4.1 Anthropometric measurements

a) Height - A vertical measuring rod - Heightometer is used to measure height. Subject should stand erect on a flat surface looking in front with heels together and toes apart. Head piece should be placed over the hair exerting slight pressure (Bamji et al., 2019).

b) Weight - For measuring weight, beam or lever actuated weighing scales were used. Before taking weight zero error should be checked. Subjects should wear minimum clothing and be without shoes. Subject should not hold or lean against anything. (Bamji et al., 2019).

c) Body Mass Index (BMI) - It is calculated from the height and mass of a person. It is defined as body mass divided by square of body height and is expressed in units of kg/m²

BMI formula= weight in kg / height in m²

Obesity classification according to WHO and Asia-Pacific guidelines (2000)

	WHO (BMI)	Asia - Pacific (BMI)
Underweight	< 18.5	< 18.5
Normal	18.5 - 24.9	18.5 - 22.9
Overweight	25 - 29.9	23 - 24.9
Obese	> 30	> 25

Table 1: Classification of BMI

If patient is having ascites then dry weight will be calculated as following (Journal of Hepatology 2018).

Actual body weight - 5% if grade I ascites

Actual body weight - 10% if grade II ascites

Actual body weight - 15% if grade III ascites

d) Mid Upper Arm Circumference (MUAC) - It is taken on left hand between the tip of acromion of scapula and tip of olecranon process of ulna with the arm flexed at elbow at right angle. A non stretchable measuring tape is firmly embraced the arm without exerting

extra pressure (Bamji et al., 2019). Normal angle of MUAC in males is >23 cm and in females it is >22 cm (Yallamraju et al., 2014).

e) Triceps skinfold thickness was measured using vernier calipers. Triceps skinfold of less than 5 mm reflects low stores of body fat.

f) Fat free mass & muscle mass was measured using the body fat analyzer of Omron. Normal range of fat % for male is <28% normal adipose (NA) and $\geq 28\%$ high adiposity. For female normal range is <40% and $\geq 40\%$ indicates high adiposity (Tomlison et. al., 2019).

g) Lean body mass - It is a component of body composition. With increasing age, there is fall in lean body mass (LBM) and very often rise in adiposity. Fall in LBM may also be followed by reduction in physical function and when a pathological doorstep is reached, person is said to have Sarcopenia (Yu et al., 2013).

4.2 Biochemical Reports

Normal range of parameters were taken from lab reports of Mahatma Gandhi Hospital, Sitapura, Jaipur. Reports collected were for liver function test, renal function test, random blood sugar and hemoglobin.

4.3 Clinical Examination

Clinical signs & symptoms of the patients were recorded for anorexia, loss of appetite, loss of taste, fatigue, weakness, Anaemia, ascites, fat mass loss, muscle mass loss, constipation and diarrhoea, etc. that factors may be responsible for lower food intake.

SPPB (Short Physical Performance Battery) – It is a group of measurements composed of gait speed, repeated chair stands and balance test (Guralnik et al., 2000).

Balance

Side-by-side stand > 10 seconds 1 point

Semi-tandem stand > 10 seconds 1 point

Tandem stand

≥ 10 seconds 2 points

3.00–9.99 seconds 1 point

≤ 2.99 seconds 0 points

4 m gait speed

Unable to walk 0 points

> 8.70 seconds 1 point

6.21–8.70 seconds 2 points

4.82–6.20 seconds 3 points

< 4.82 seconds 4 points

Chair stands

Unable to perform maneuver or > 60 seconds to complete 0 points

≥ 16.70 seconds 1 point

13.70–16.69 seconds 2 points

11.20–13.69 seconds 3 points

< 11.2 seconds 4 points

Figure1: Short Physical Performance Battery components and scoring (Bjerk, M, S. et al. 2013)

Equipment required (Puthoff M., 2008)

Chair with arms 18-19" in height	Stopwatch	Tape measure	2 cones to mark 2.44 m
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Figure 2: Repeated chair stands

- **Balance testing**



Figure 3: Balance stands

1. Hand grip dynamometer was used to measure hand grip strength. By this muscle strength and weakness can be easily predicted. Besides measuring muscle of upper limb, it also reflects comprehensive strength and muscle performance (Amaral et al., 2019).

2. Sarcopenia was determined by using following formula:

Fat mass	High	Sarcopenic obesity	Obesity
	Low	Sarcopenia	Healthy
		Low	High
		Muscle mass	

Figure 4: Sarcopenic obesity by body composition (physical activity and sarcopenic obesity. Lee et al., 2016)

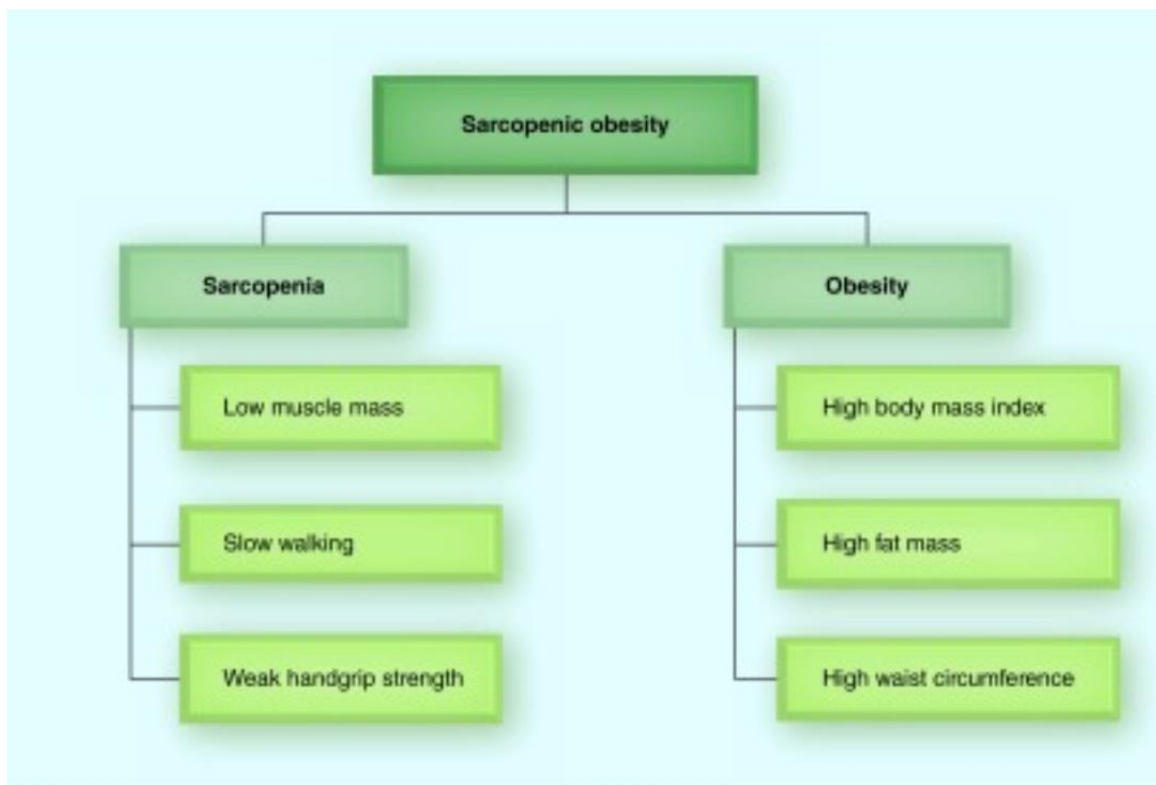


Figure 5: Diagnostic criteria for sarcopenic obesity (Lee et al., 2016)

4.4 Dietary Recall (24 Hours)

There are a number of diet survey methods which can be chosen according to purpose and level at which information is needed. These methods include:

- Food balance sheet method
- Inventory food list method
- Weighment method
- Expenditure pattern method
- Diet history method a) qualitative b) quantitative
- 24-hour recall method
- Duplicate sample method
- Dietary score method
- Recording method (Bamji et al., 2019)

24 hour dietary and nutrient and recall as per table:

Meal	Menu	Quantity	Energy	Protein	Fat	Carbohydrate
Breakfast						
Mid meal						
Lunch						
Evening tea						
Dinner						
Bedtime						

Table 2: Format for 24 hr dietary recall

In this recall method, an oral questionnaire was prepared and dietary data was obtained from respondent using a set of standard cups, teaspoons, tablespoons, tea cups, bowls (katori) for calculation of amount or weight of food item eaten by patients to conclude whether patient's intake is sufficient or not.

4.5 Statistical Analysis

Mean and standard deviation was calculated to arrive at conclusion whether the results are significant or not. Central tendency is defined as middle point of distribution. Measure of central tendency is calculated through mean, median and mode (Arihant, 2021).

Standard Deviation: It is the measure of variability or deviance from the standard values. It is denoted by Greek letter sigma (Arihant, 2021).

Results And Discussion

This study presents the results of prevalence of Sarcopenia in CLD patients. The result has been divided under following sections:

- Demographic profile of patients

Parameters		Total no. of patients 90	%
Age	21 - 30	13	14.40%
	31 - 40	18	20%
	41 - 50	20	22.22%
	> 50	39	43.33%
Sex	Male	72	80%
	Female	18	20%
Activity	Sedentary	40	44.40%
	Moderate	30	33.30%
	Heavy	20	22.20%
Education	Secondary	35	38.80%
	Sr secondary	13	14.40%
	Graduate	32	35.50%
	Illiterate	10	10%
Income group	LIG	2	2.20%
	MIG	86	95.50%
	HIG	2	2.20%
Working status	Working	75	83.30%
	Non working	15	16.60%
Marital status	Married	86	95.50%
	Unmarried	2	2.20%
	Widow	2	2.20%

Table 3: Demographic data interpretation

Table 3 concludes that majority of patients who are suffering from chronic liver disease were above 50 years of age (43.3%), apart from this it was also observed in 41- 50 years of age (22.22%) followed by age group 31-40 (20%) and 21-30 (14.4%). It was seen in males which was noted for 80% more than females which accounted for 20%. CLD was observed in patients who were sedentary, accounted for 44.4% followed by moderate workers 33.3% and heavy workers 22.2%. Majority of patients who were suffering from CLD comes under the category of MIG (Middle Income Group).

2. Assessment of nutritional status

2.1 Anthropometric measurements

2.2 Biochemical investigation

2.3 Clinical examination

2.4 Nutritional intake

2.1 Anthropometric measurement

Parameter	Male			Female		
Mean Height (cm)	170			155		
Mean weight (kg)	75			69		
Mean BMI	25.95			28.75		
Fat mass %	<28%	19	26.38%	<40%	4	22.22%
	>28%	53	73.61%	>40%	14	77.77%
MUAC (cm)	<23	59	81.94%	<22	16	88.88%
	>23	13	18.05%	>22	2	11.11%
Skinfold thickness (mm)	<5%	55	76.38%	<5%	15	83.33
	>5%	17	23.61%	>5%	3	16.66
Mean lean body mass	51.21			40.66		

Table 4: Anthropometric Measurements

Table 4 depicts anthropometric measurements of male and female patients in terms of height, weight, BMI, MUAC, skinfold thickness and lean body mass. Mean height for males was found 175 cm while for females, it was 155 cm. Mean weight for males was 75 kg and for females, it was 69 kg. Mean BMI of males and females was found 25.95 kg/m² and 28.75 kg/m² respectively. Fat percentage of 73.61% males was found above 28% while 77.77% females showed fat % above 40%. In males 82% showed MUAC <23 cm while in females MUAC below 22 was noticed in 88.88% patients. Skinfold thickness of < 5% was found in 76.38% males and in 83.33% females. Mean lean body mass in males was seen 51.21% while in females, it was just 40.66%.

2.2 Biochemical examination

Parameter - Haemoglobin

Gender	Value	Normal range	No. of patients	Percentage
Male	< 13	13-17 g/dl	67	93.5 %
Female	< 13	13-17 g/dl	18	100 %

Table 5: Assessment of Anaemia in patients

Table 5 concludes that 93.5% male and 100% female in study were anaemic.

Parameter	Ranges	Total no of patients 90	Percentage %
Sodium	< 137 mmol/ L	69	76.6
	137 - 145 mmol/ L	19	21.1
	> 145 mmol/ L	2	2.22
Potassium	< 3.5 mmol/ L	25	27.7
	3.5 - 5.1 mmol/ L	59	65.5
	> 5.1 mmol/ L	6	6.6
Albumin	< 3.5 g/ dL	70	77.7
	3.5 - 5 g/dL	20	22.2
	> 5 g/ dL	x	x
Serum bilirubin total	< 0.2 mg/dL	x	x
	0.2 - 1.3 mg/dL	8	8.8
	> 1.3 mg/dL	82	91.1
SGOT/ AST	<15 U/L	1	1.1
	15 - 46 U/L	15	16.6
	>46 U/L	74	82.2
SGPT/ ALT	<13 U/L	8	8.8
	13 - 69 U/L	69	76.6
	> 69 U/L	13	14.4
Serum alkaline phosphatase	<38 U/L	2	2.2
	38 - 126 U/L	45	50
	> 126 U/L	43	47.7
Serum total protein	< 6.3 g/dL	26	28.8
	6.3 - 8.2 g/dL	60	66.6
	> 8.2 g/dL	4	4.4
Serum globulin	< 2 g/dL	x	x
	2 - 3.5 g/dL	42	46.6
	>3.5 g/dL	48	53.3
Serum creatinine	<0.52 mg/dL	5	5.5
	0.52 - 1.25 mg/dL	65	72.2
	>1.25 mg/ dL	20	22.2

Table 6: Assessment of biochemical parameters

Table 6 conclude that out of 90 subjects 69 (76.6%) were sodium deficit. 59 subjects (65.5%) were presented with normal potassium level. 77.7% patients were albumin deficit and 91.1% patients were presented with high serum bilirubin level. SGOT was high in 82.2% patients whereas 76% patients presented normal level of SGPT. Out of 90 subjects 45 presented normal level of serum alkaline phosphatase and 60 patients were deficit in

serum total protein. 53.3% patients presented high level of globulin followed by 46.6% patients who presented normal level of globulin. Out of 90 patients 65 have normal creatinine level and 20 have high creatinine level.

2.3 Clinical examination

2.3.1 Short Physical Performance Battery

Scoring	Interpretation	Total no of patients (90)	%
0 - 2	Sarcopenia	31	34.4
3- 9	Sarcopenia but no mobility disability indicates frailty	53	58.8
> 10	No Sarcopenia and no mobility disability indicates robustness	6	6.6

Table 7: interpretation of results of SPPB

Table 7 concluded that out of 90 patients 31 were sarcopenic (34.4%), 53 were sarcopenic without disability (58.8%) and 6 were non-sarcopenic (6.6%).

2.3.2 Hand grip strength

Hand grip strength	Scoring	No. of patients	%
	Male		
	< 27	60	83.3
	> 27	x	x
	Not able to perform	12	16.6
	Female		
	< 16	5	27.7
	> 16	1	5.5
	Not able to perform	12	66.6

Table 8 Interpretation of result of hand grip strength

Table 8 unveils the fact that out of 72 males 12 (16.6%) were not able to perform test. Remaining 60 males (83.3%) presented low hand grip strength. Out of 18 females 12 (66.6%) were not able to perform test, 5 females presented with low hand grip strength and only 1 woman had normal hand grip strength.

2.3.3 Clinical signs and symptoms

Sign		No. of patients	%
Anorexia	Yes	25	27.7
	No	65	72.2
Loss of appetite	Yes	60	66.6
	No	30	33.3
Loss of taste	Yes	28	31.1
	No	62	68.8
Fatigue	Yes	85	94.4
	No	5	5.5
Weakness	Yes	90	100
	No	0	x
Anaemia	Yes	85	94.4
	No	5	5.5
Ascitis	Yes	73	81.1
	No	17	18.8
Fat mass loss	Yes	10	11.1
	No	80	88.8
Muscle mass loss	Yes	84	93.3
	No	6	6.6
Constipation	Yes	8	8.8
	No	82	91.1
Diarrhoea	Yes	13	14.4
	No	77	85.5

Table 9: Interpretation of signs and symptoms

From table 9 conclusion is, out of 90 subjects 25(27.7%) were anorexic, 60 (66.6%) subjects were suffering from loss of appetite, 28 (31.1%) patients were suffering from loss of taste. 85 (94.4) patients were feeling fatigue, and all of them (100%) were feeling weakness. 85 patients (94.4%) were anaemic and 73 (81.1%) patients presented with ascites. Fat mass loss was seen only in 10 patients (5.5%) but muscle mass loss was seen in 84 patients (93.3%). Out of 90 patients 8 (8.8%) were suffering from constipation and 13 (14.4%) from diarrhoea.

2.4 Nutrient intake in comparison to RDAs

Parameter		Total no of patients	%
Energy	< 50%	32	35.5
	50 -70 %	33	36.6
	70 - 100 %	25	27.7
	> 100 %	X	x
Protein	30 -50%	49	54.4
	50 -70%	23	25.5
	70 -100 %	18	20
	> 100 %	X	x
Fat	< 50%	16	17.3
	50 -70%	30	33.3

	70 -100 %	41	45.5
	> 100 %	3	3.3
Carbohydrate	<50%	24	26.6
	50 -70 %	34	37.7
	70 -100 %	31	34.4
	> 100 %	1	1.1
Calcium	<50%	38	42.2
	50 -70 %	30	33.3
	70 -100 %	22	24.4
	> 100 %	X	X
Vitamin C	<50%	60	66.6
	50 -70 %	30	33.3
	70 -100 %	X	x
Vitamin D	<50%	42	46.6
	50 -70 %	48	53.3
	70 -100 %	x	x

Table 10 Comparison of intake and RDAs

Table 10 concludes that 35.5% patients had calorie intake of less than 50%, while 36.6% patients had calorie intake of 50-70% followed by 27.7% patients who had calorie intake of 70-100%. 54.4% patients had protein intake of 30-50%, whereas 45% patients had protein intake of 50-70% and 70-100%. According to the table, fat consumption of 17.7 % of patients was less than 50%, 33.3% of patients were presented with 50-70%, followed by 45.5% patients who were in range of 50-70% and 3.3% patients were in range of more than 100%. 26.6% patients had carbohydrate intake of less than 50%, 71% had carbohydrate intake of 50%-100%. Only 1.1% patient had carbohydrate intake of more than 100%. 42.2% patients had calcium intake of less than 50%, while 33.3% had intake of 50-70% followed by 24.4% patients with intake of 70-100%. 66.6% patients were found to be consuming low vitamin C in diet which is less than 50% remaining 33.3% patients were consuming only 50-70% vitamin C in diet. 46.6% patients had vitamin D intake of less than 50%, while 53.3% patient intake was 50-70%.

Nutritional diagnosis

Parameters	Total no. of patients	%
Sarcopenic	31	34.4
Sarcopenic obesity	38	42.2
Normal	21	23.3

Table 11 Nutritional diagnosis of patients

Table 11 is presenting that out of 90 subjects 34.4% were sarcopenic 42.2% were sarcopenic obese and 23.3% were presented normal.

Result & Discussion

Sarcopenia or degradation of muscle mass and strength leading to decreased performance is a very common feature of chronic liver disease. According to demographic data, it is seen prevalent in patients above 50 years of age. A study conducted on Sarcopenia in older adults stated that Sarcopenia is a condition, common in elderly people that contributes to decline in function, falls, disability and frailty (Walston, 2014). Prevalence of Sarcopenia was less in females as compared to males. Study was conducted on sex-specific differences in risk factors for Sarcopenia amongst community-dwelling older adults in which prevalence of Sarcopenia was found 24.8% in women and 25.4% in men (Tay, 2015). This study concluded that sedentary workers were at high risk of chronic liver disease. Majority of patients were in the category of overweight and obese according to BMI. Anaemia was positively associated with slowness and weakness and it was significantly associated with Sarcopenia 93.5% male and 100% female were found to be anaemic in study. A study was conducted on link of hemoglobin levels and Sarcopenia in which results indicated that hemoglobin levels were independently associated with Sarcopenia (Tseng et al., 2021). Sodium and albumin levels were found below the normal ranges. Out of 90 subjects 34.4% were sarcopenic and 58.8% were sarcopenic but no mobility disability indicates frailty. A study was conducted on 294 community-dwelling older persons to examine diagnostic value of SPPB where SPPB was found useful in diagnosis of Sarcopenia (Phu, 2020). In the present study, out of 72 males 83.3% were having low hand grip strength and out of 18 females 27.7% were presented with low hand grip strength. It was supported with the study of Chan (2022). Micronutrient deficiencies and malnutrition often develop in patients with chronic liver disease. On a part of nutrient intake of macronutrients consumption was low in 35%-50% patients but consumption of micronutrient, vitamin D and vitamin C was low in about 60% patients. A study was conducted on 125 patients where micronutrient deficiencies were observed for vitamin D, vitamin A, vitamin B6 and zinc (Nieto, 2021). Out of 90 subjects 34.4% were sarcopenic 42.2% were sarcopenic obese, 23.3% were presented normal.

Prevalence of Sarcopenia is common in patients who are suffering from liver disease. It was found that weight, BMI, MUAC, fat %, and clinical signs such as loss of appetite, low score of SPPB, weak HGS, low hemoglobin levels, low albumin and serum total proteins are co-related with each other in chronic liver disease patients. Low nutrient intake can worsen the condition. Therefore, role of micronutrients and macronutrients cannot be

neglected. An energy intake of 25-30 Kcal/Kg/day in compensated liver disease and 30-35 Kcal/Kg/day in decompensated cirrhosis has been mentioned in current clinical practice guidelines. Protein intake of 1.2-1.5 g/Kg/day in compensated, while upto 2g/kg/day in decompensated has been recommended.

Conclusion

Sarcopenia is seen as a common consequence of chronic liver disease associated with adverse outcomes and poor life expectancy. The prevalence of Sarcopenia was 34.4% with significant difference between the male and female patients. Short physical performance battery, hand grip strength, albumin, hemoglobin, sodium, fat mass %, skin fold thickness, MUAC, were significantly associated with Sarcopenia. Ascites, low food intake, high BMI are significantly associated with Sarcopenia. Timely assessment of Sarcopenia provides a therapeutic window to provide early interventions that can bring beneficial changes.

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