

ORIGINAL ARTICLE

FREQUENCY OF SARCOPENIA IN CIRRHOTIC PATIENTS DETERMINED ON ABDOMINAL COMPUTED TOMOGRAPHY**Rimsha Khan, Amna Khalid, Faryal Asmat, Muhammad Bilal*, Kiran Fatima Farooq, Sarah Anwar**

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Background: Fibrosis of the liver progresses to cirrhosis resulting in hepatocellular dysfunction. Sarcopenia is an early sign of liver malfunction. Early detection of sarcopenia may provide a chance to cure or delay deterioration of liver function. This study aimed to detect sarcopenia on abdominal computed tomography (CT). **Methods:** This descriptive, cross-sectional study was carried out at the Department of Diagnostic Radiology, Fauji Foundation Hospital Rawalpindi from 1st October 2022 to 31st March 2023. All patients suffering from Hepatitis B or C referred for evaluation of complications were included in the study. After informed consent and examination, at LV3 level an axial CT image in abdominal window was assessed on each scan using Radiant[®] software. Muscles including internal and external obliques and transversus abdominus, rector spinae, quadratus lumborum, and psoas were identified and evaluated. A threshold of -29 to -150 HU, and -29 to 150 HU for fatty tissue and skeletal muscles respectively was used. Cross-sectional area of each muscle was calculated on the vitrea and skeletal muscle index was calculated. Cut-off value for men was taken as 52.4 Cm²/m², and for women it was 38.5 Cm²/m². **Results:** A total 120 chronic liver disease patients (21 males and 99 female) were studied. All (100%) men, and 82 (83.8%) women had sarcopenia. **Conclusion:** Sarcopenia was a common finding with male predominance in patients suffering from Hepatitis B and/or C. CT evaluation is an effective and non-invasive tool for evaluation of sarcopenia as an indicator of liver dysfunction.

Keywords: Sarcopenia, Cirrhosis, Liver, Hepatitis, Hepatocellular carcinoma, Computed tomography

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INTRODUCTION

Cirrhosis is the last stage of progressive liver fibrosis due to viral, non-alcoholic, or alcoholic steatohepatitis.¹ Its consequences include liver damage leading to fibrosis, necroinflammation, vascular remodelling and hepatocellular dysfunction. Liver transplantation can be a curative treatment, but it cannot be done in many cases.² Management is directed towards prevention or delaying complications like variceal bleeding, ascites, hepatorenal syndrome, hepatic encephalopathy, or hepatocellular carcinoma (HCC).³

Sarcopenia is defined as loss of skeletal muscle mass, and appears in patients with cirrhosis of liver.⁴ It indicates bad prognosis like hepatic decompensation, poor quality of life, longer intensive care unit and hospital stay, higher incidence of infection, high overall healthcare cost, and high mortality in cirrhotic patients who are considered and evaluated for liver transplantation.⁵ Skeletal muscle area of cross-section calculated on computed tomography (CT) is an index of diminished muscle mass (myopenia), skeletal muscle depletion, and increased muscle fat deposition (myosteatosis) which are associated with decreased muscle quantity and quality.^{6–8} The role of CT scan to establish sarcopenia syndrome in cirrhotic patients can be of value to help improve the outcomes and decision making of vital surgery.

This study aimed at looking for prevalence of sarcopenia using abdominal CT in patients of cirrhosis liver presenting to Radiology Department of Fauji Foundation Hospital Rawalpindi, Pakistan.

MATERIAL AND METHODS

After approval from Hospital Ethical Review Committee this study was conducted from 1st October 2022 to 31st March 2023 in CT Scan Department of Diagnostic Radiology, Fauji Foundation Hospital, Rawalpindi on patients of Hepatitis B and/or C referred for evaluation of hepatic complications. The sample size was calculated⁹ as 113 using RAOSOFT calculator at 95% confidence level. Written informed consent was given by all patients under study. Detailed data of each patient was recorded including age, height, gender, Hepatitis B and C profile, substance abuse (alcohol etc.), and history of known chronic medical diseases (e.g., chronic hypertension, diabetes mellitus). Hepatitis B and C negative patients were not included in the study.

Image on axial CT at the level of LV3 in abdominal window was assessed on each scan. Radiant[®] software was used for analysis of the images. Muscles including internal oblique, transversus abdominus, external oblique, psoas, quadratus lumborum, and rector spinae at LV3 were identified and evaluated. Threshold for fatty tissue was kept as -29 to -150 HU, and for skeletal muscle it was -29 to 150 HU. Cross-sectional

area of each muscle was manually calculated on the vitrea and normalised for height and skeletal muscle index was calculated as total measured area at LV3 divided by patient's height in meter squared. Cut-off value for men was taken as 52.4 Cm²/m², and for women it was 38.5 Cm²/m².¹⁰

Data was entered and analysed using SPSS-21. Quantitative variables like age, height and skeletal muscle index were presented as Mean±SD. Qualitative variables like hepatitis profile, hepatocellular carcinoma, history of known chronic medical diseases (chronic hypertension, diabetes mellitus) were presented as frequencies and percentages. Student's *t*-test was used for data interpretation and *p*≤0.05 was considered as statistically significant.

RESULTS

A total of 120 chronic liver disease patients (21 males and 99 female) were included in the study. Mean age of male patients was 50.05±6.57 years while that of female patients was 50.05±5.85 years. There were no significant mean differences between males and females (*p*>0.05). Mean height of males was 1.73±0.04 m while that of females was 1.55±0.08 m with significant differences between males and females (*p*<0.05). The mean skeletal mass index in men was 31.75±9.20, and in women it was 32.32±6.90 with non-significant differences between males and females (*p*>0.05). The relationship between height of males and females was compared with mean skeletal mass index using Pearson correlation, and it was non-significant (*p*>0.05). The correlation between age and skeletal muscle index was also non-significant (*p*>0.05). (Table-1).

All 21 (100%) male patients, and 82 (83.8%) female patients had sarcopenia, showing male predominance having sarcopenia in Hepatitis. Gender differences in the frequency of sarcopenia were significant statistically (*p*<0.05). (Table-2).

Table-1: Age and height of the patients (Mean±SD)

Patients	Age (Years)	Height (m)	Skeletal Muscle Index
Male (n=21)	50.048±6.569	1.732±0.042	31.747±9.200
Female (n=99)	50.051±5.853	1.554±0.075	32.315±6.901
<i>p</i>	<i>p</i> >0.05	<i>p</i> <0.05	<i>p</i> >0.05

Table-2: Frequency of sarcopenia in patients with Hepatitis B and/or C

Patients	Sarcopenia	No sarcopenia	<i>p</i>
Male (n=21)	21	0	<0.05
Female (n=99)	82	17	

Table-3: Comparison of Skeletal Muscle Index (Cm²/m²) in men at the level of L3–4 vertebrae with other studies

Study	n	Men [n (%)]	Cut-off values for Sarcopenia	Prevalence	
This study	120	21 (17.5)	Men: ≤52.4 Cm ² /m ² Women: ≤38.5 Cm ² /m ²	85.83% (men 100%, women 83.8%)	
Cruz <i>et al</i> ¹⁹	234	157 (67)		70% (men 76%, women 58%)	
DiMartini <i>et al</i> ²⁰	338	223 (66)		68% (men 76%, women 51%)	
Hanai <i>et al</i> ⁷	130	76 (58)		68% (men 82%, women 50%)	
Montano-loza <i>et al</i> ²¹	112	78 (70)		40% (men 50%, women 18%)	
Tandon <i>et al</i> ²²	142	85 (60)		41% (men 54%, women 21%)	
Meza-Junco <i>et al</i> ²³	116	98 (84)		Men: BMI ≥25 Kg/m ² : ≤53 Cm ² /m ² , BMI <25 Kg/m ² : ≤43 Cm ² /m ²	30% (men 31%, women 28%)
Montano-loza <i>et al</i> ²⁴	248	169 (68)		Women: ≤41 Cm ² /m ²	45% (men 52%, women 30%)

DISCUSSION

Significant association of sarcopenia in patients with cirrhosis was revealed in this study. With a few exceptions the findings of the present study were in agreement with previous work.

Puneeta Tandon *et al*¹¹ conducted a study on sarcopenia and frailty in decompensated cirrhosis and found that 43% (57% men and 25% women) patients with cirrhosis had sarcopenia. Liu J *et al*¹² observed sarcopenia in 113 of 159 (71%) men, and 32 of 65 (49%) women with cirrhosis. We also found higher percentage of sarcopenia in men than women. Our finding of 100% cases having sarcopenia in males may be attributed to a comparatively lesser number of males in our patients.

Jaya Benjamin *et al*¹³ in a computed tomography-based study on patients having cirrhosis due to alcoholism found 68.2% patients having sarcopenia assessed through skeletal muscle index. Elizabeth *et al*¹⁴ found sarcopenia in 62% of their patients. Tatsunori Hanai *et al*¹⁵ conducted a retrospective study and observed that sarcopenia was found in 68% of their patients. They concluded that it was more likely in females and Hispanic patients; this could be due to any racial and/or ethnic factors in their study population.

Xin Xing Tantai *et al*¹⁶ observed a that sarcopenia was present in 37.5% cirrhotic patients, more in males, those with alcohol related liver diseases, and child Pugh grade C cirrhosis. Toshiro Masuda *et al*¹⁷ observed sarcopenia collectively in 47.1% cases, 58.3% in males, and 35.65% in females. Findings of our study are in agreement with these studies.

Topan MM *et al*¹⁸ found liver cirrhosis in 55.2% alcoholics and sarcopenia in 57.2% cases with no significant differences between males and females. They found association of sarcopenia with higher risk of HCC besides other complication. They concluded that sarcopenia was a frequent complication of cirrhosis liver and was associated with adverse effects on health, and poor survival rates. They recommended prioritization of this simple test for early detection of complications to increase survival rate and decrease hospital burden. Similar results have been reported by many other workers; some are summarised in Table-3.

Sarcopenia can result after loss of appetite due to liver malfunction. It can be taken as an indication of deteriorating liver function, and an early warning sign. Appropriate treatment measures to delay the progress of the disease can be practiced which can help in prolonging lives of the patients. It is of significant importance in our set-up because of the widespread liver disease in Pakistan, especially due to Hepatitis B and C.

CONCLUSION

Sarcopenia is common in patients with Hepatitis B and/or C with male predominance for sarcopenia evaluated non-invasively on CT. Sarcopenia may be taken as an important diagnostic and prognostic tool in patients with cirrhosis or hepatocellular carcinoma to start early measures for management especially those considered for liver transplantation.

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