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Nutritional Status and Sarcopenia in Patients with Non-Alcoholic Fatty Liver Disease at a Private Hospital in Coimbatore, India

Status Gizi dan Sarkopenia pada Pasien Penyakit Hati Berlemak Non-Alkohol di sebuah Rumah Sakit Swasta di Coimbatore, India

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ABSTRACT

Background: The Global prevalence of sarcopenia was estimated as 10% to 27% among Non-Alcoholic Fatty Liver Disease (NAFLD) patients.
Objectives: To investigate the association between nutritional status and sarcopenia among NAFLD patients.
Methods: The study was conducted between January 2024 and June 2024 and included 218 study participants. The social and demographic profile, dietary habits, fatigue, and 24-hour recall dietary intake were assessed using the interview cum questionnaire. Bio Impendence Analysis (BIA) and a hand grip dynamometer were used to assess the MM and MS. Functional capacity was analysed using the 6-Minute Walk Test (6MWT).
Results: The relationship between relative risk factors and sarcopenia showed that male had a Relative Risk Ratio (RRR)=4.048 (95% CI: 1.073-15.275), overweight RRR=5.929 (95% CI: 1.42-24.763), Muscle Mass (MM) RRR=0.857 (95% CI: 0.741-0.99), Muscle Strength (MS) RRR=0.809 (95% CI: 0.729-0.898), Neutrophil-to-Lymphocyte Ratio (NLR) RRR=0.254 (95% CI: 0.069-0.933), moderate fatigue RRR=0.313 (95% CI: 0.107-0.921), 6MWT RRR=0.989 (95% CI: 0.981-0.996).
Conclusions: A reduction in MM, MS, and physical performance had shown a significant association with sarcopenia, indicating the reduction in these factors can lead to an increase in sarcopenia. Tailoring the intervention to increase the MM, strength, and physical performance can help in reducing the progression of sarcopenia and disease outcomes.

INTRODUCTION

NAFLD is well-defined by excessive deposition of fat in hepatic cells, which is mostly related to the metabolic disorder[1,2]. Worldwide, the prevalence of NAFLD based on epidemiological studies is 20-30%, and in India, the prevalence is 16.0% to 32.0%[3,4]. Sarcopenia is defined by the reduction of lean MM and diminished MS, which is a significant concern in patients with NAFLD[5,6] often resulting in low physical performance and the progression of the disease[7]. The incidence of sarcopenia ranges from 10% to 27% globally[8], and in India about 14.2% in older adults[9], and the sarcopenia affects 10% of the individuals with NAFLD. Both sarcopenia and NAFLD have a common pathophysiological mechanism, particularly systemic inflammation, hormonal imbalances, and nutritional deficiencies that lead to muscle loss and hepatic dysfunction[11,12,13,14]. Sarcopenia is associated with contrary outcomes, including increased mortality and disability, which are often influenced by countless risk factors such as age, Body Mass Index (BMI), poor nutritional status, physical activity, and fatigue. Understanding these risk factors and their impact on sarcopenia can guide interventions expected to improve the quality of life in affected populations[16,17].

The Asian Working Group for Sarcopenia (AWGS) is an investigative criterion that helps in assessing sarcopenia, which aids in identifying at-risk individuals and facilitating early intervention strategies[18].The AWGS 2019 criteria emphasize the importance of MS, mass, and physical performance in diagnosis[19,20]. Since NAFLD is commonly increasing worldwide, making it essential to understand its complications, including sarcopenia, the current study intends to assess the incidence of sarcopenia among NAFLD patients. Sarcopenia can

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significantly affect the overall health, functional ability, and quality of life of NAFLD patients. Understanding the nutritional factors influencing sarcopenia can lead to better health outcomes. So, the present study intends to investigate potential risk factors such as age, gender, BMI, MM, lean MS, dietary intake, and physical activity levels.

METHODS

In this cross-sectional study, the patients who visited the gastroenterology outpatient department in PSG hospitals in Coimbatore, India, were enrolled, and the study was conducted between January 2024 and June 2024. The sample size was determined using the single proportion formula ($Z \times \frac{2p(1-p)}{e^2}$)[21], assuming a prevalence (p) of 16%, a standard normal distribution value at a 95% confidence level (Z) of 1.96, and a margin of error (e) of 5%. The required sample size for the study was established at 216, accounting for a 5% dropout rate. This study included 218 adult patients (≥18 years) who had abnormal Aspartate Transaminase (AST) and Alanine Transaminase (ALT) levels were further studied with abdominal ultrasound to diagnose NAFLD and minimal alcohol intake (less than 20 g/day for women, less than 30 g/day for men). Those with significant alcohol consumption, other liver ailments such as viral hepatitis, autoimmune or drug-induced liver disease, uncontrolled comorbid conditions, cardiovascular disease, lung illness, or neurological disease were excluded from the study. This study received formal ethical approval from the Institutional Human Ethics Committee (IHEC) PSG IMS&R (Ref. No.: PSG/IHEC/2022/Appr/FB/010) dated 16/03/2022. Informed verbal and written consent were obtained from all participants.

All participants' socio-demographic characteristics like age, gender, marital status, occupation (nature of work), education, and income were evaluated using an interview-cum-questionnaire method. Based on the World Health Organization recommendation, anthropometric measurements such as body weight and height were performed. A hand grip dynamometer was used to evaluate MS in both hands. The dynamometer breadth was adjusted to ensure that the participant felt relaxed squeezing the grip. During the examination, participants were asked to sit with their elbows at 90° flexion and squeeze the dynamometer as hard as they could without forcing the instrument against their body or bending their elbow. The measurement was taken twice, and the highest value was taken into consideration[22]. BIA was used to measure fat mass, lean mass, and visceral fat. The measurement was taken on an empty stomach or 2 hours post-meal, not on any vigorous physical activity 24 hours before analysis to avoid the hydration weight. Approximately 5 mL of fasting venous blood was obtained by trained staff and biochemical markers like NLR, hemoglobulin, and albumin were evaluated.

The consumption of macronutrients (carbohydrate, protein, fat) of the participants was assessed using the 24-hour recall method. The 24-hour recall approach was implemented to capture the composition of meals and fluid intake daily, as well as the participant's food consumption over the preceding 24 hours on non-consecutive days. Functional capacity was tracked using the 6MWT[23]. The participants were instructed to walk in the 12-m lane as much as possible in six minutes at their own pace without running. Vitals parameters including heart rate, blood pressure, and oxygen saturation were taken before the examination. The participants were informed they could slow down or stop to rest, if necessary, though the timer would continue. After six minutes, it is computed by multiplying the total number of laps by 12m and adding the distance of the partial lap completed when the test is finished. The normal distance was calculated by distance (in meters) for their gender, age, height, and weight using these equations: MEN: $distance = (7.57 \times height\ cm) - (5.02 \times age) - (1.76 \times weight\ kg) - 309$; WOMEN: $distance = (2.11 \times height\ cm) - (2.29 \times weight\ kg) - (5.78 \times age) + 667$. The value obtained was compared to the distance covered in meters.

The Fatigue Assessment Scale (FAS) consists of 10 items designed to assess indications of long-lasting fatigue. Each item is rated on a five-point Likert scale, with responses ranging from 1 ("never") to 5 ("always"). Items 4 and 10 are scored in the opposite direction. Total scores can vary from 10, representing the lowest level of fatigue, to 50, symbolizing the highest[24]. The assessment of sarcopenia risk was piloted utilizing the newly revised fact-finding algorithm as recommended by the AWGS. The study participants were categorised as sarcopenic when there was a combination of low MM along with either low MS or diminished physical performance[19] and non-sarcopenic who exhibited no signs of low MS, low MM, or low physical performance.

Statistical analysis was done using SPSS version 27.0 for Windows (SPSS Inc., Chicago, IL, US). Descriptive statistics was used to calculate the weighted percentage and 95% Confidence Intervals (CI) that summarize the categorical variables such as age, gender, education, occupation, and health-related measures. The Chi-square test was done to find the distribution of all-known risk factors and their association between sarcopenia participants with a level of statistical significance p-value<0.05. The relationship between the sarcopenic vs. non-sarcopenic group and its association among categorical and independent variables were analysed using multinomial logistic regression and the RRR, which were used to measure the relative likelihood of being in one outcome category compared to a reference group.

RESULTS AND DISCUSSIONS

This study included a total of 218 participants who were diagnosed with NAFLD. The respondents were mostly between 26 and 44 years of age (46.3%), women (69.5%), and married (87.4%). The majority of the participants were doctors, engineers, bank employees, and teachers (50.5%) with a postsecondary education level (82.5%), monthly income <₹30,000/- (37.9%), and a sedentary lifestyle (91.6%). The majority of the study participants fall under the obese grade 2 categories (37.9%), having high visceral fat (47.4%), high-fat mass (47.4%), and low MM (77.9%) with low MS (91.6%). The study participants were reported to have mild fatigue (83.2%) and (84.2%) walking less than 400m in 6 minutes. The study participants had reported having normal NLR

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(90.5%), which indicated the absence of inflammation.
(Table 1)

Table 1. Complex Samples Frequencies of Socio-Demographic, Health, and Lifestyle Characteristics among study participants (N=218)

Characteristic	n	Weighted % (95% CI)
Age Score (years)		
18-25	10	6.34 (3.5,11.3)
26-44	92	46.32 (38.8,54)
45-59	94	38.91 (31.8,46.7)
>60	22	8.43 (5,13.8)
Gender		
Male	91	30.5 (23.9,38)
Female	127	69.5 (62,76.1)
Education		
Primary	8	3.8 (1.3,7.3)
Secondary	25	13.7 (9.2,19.9)
Post-Secondary	185	82.5 (76.6,88.2)
Marital Status		
Married	196	87.4 (81.3,91.7)
Unmarried	22	12.6 (8.3,18.7)
Occupation		
IT	48	21.1 (15.5,28)
Homemaker	57	28.4 (21.1,34.7)
Doctors, Teachers, Bank employees	113	50.5 (42.9,58.1)
Monthly Income (₹)		
20,000-30,000	54	27.4 (21.1,34.7)
30,000-40,000	86	37.9 (30.8,45.6)
>40,000	78	34.7 (27.8,42.4)
Nature of Work		
Sedentary	202	91.6 (86.2,95)
Moderate	16	8.4 (5,13.8)
BMI (kg/m²)		
Underweight (16.0 to 18.4)	10	4.2 (2,8.6)
Normal (18.5 to 24.9)	49	21.1 (15.5,28)
Overweight (25.0 to 29.9)	38	21.1 (15.5,28)
Obese Grade 1 (30.0 to 34.9)	80	37.9 (30.8,45.6)
Obese Grade 2 (35.0 to 39.9)	41	15.8 (11,22.2)
Visceral Fat (%)		
Normal (1-9)	53	28.4 (22,35.8)
High (10-14)	100	47.4 (39.8,55.1)
Very High (15-30)	65	24.2 (18.2,31.4)
Fat Mass (%)		
Low (5.0-19.9)	25	13.7 (9.2,19.9)
Normal (20.0-29.9)	91	38.9 (31.8,46.7)
High (30.0-34.9)	102	47.4 (39.8,55.1)
MM (%)		
Low (5.0-32.8)	180	77.9 (70.9,83.6)
Normal (32.9-35.97)	36	20.0 (14.5,26.9)
High (35.8-37.3)	2	2.1 (0.7,5.9)
Hand Grip (kg)		
Low (<20.3)	199	91.6 (86.2,95)
Normal (20.3-34.1)	19	8.4 (5.0,13.8)
NLR (%)		
Low (<0.7)	4	3.2 (1.3,7.3)
Normal (0.8-2.2)	207	90.5 (85,94.2)
High (2.3-3.0)	7	6.3 (3.5,11.3)
Fatigue Score		
Mild (<22)	174	83.2 (76.6,88.2)
Moderate (22-34)	34	13.7 (9.2,19.9)
Severe (>35)	10	3.2 (1.3,7.3)
6MWT (m)		
Low (<400)	177	84.2 (77.8,89)

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Characteristic	n	Weighted % (95% CI)
	41	15.8 (11.0,22.2)

Table 2. Prevalence of sarcopenia based on the revised diagnostic criteria recommended by AWGS 2019

Risk Factor	Male (n=91) (n, %)	Female (n=127) (n, %)	p-value
MM			
Low	85 (39.0)	95 (43.6)	0.002*
Normal	6 (2.8)	30 (13.8)	
High	0	2 (0.9)	
Hand Grip (MS)			
Low	91 (41.7)	108 (49.5)	0.001*
Normal	0	17 (7.8)	
High	0	2 (0.9)	
6 Minute Walk test			
Low	64 (29.4)	113 (51.8)	0.001*
High	27 (12.4)	14 (6.4)	
Sarcopenic Risk			
No Risk	53 (24.3)	61 (28.0)	0.137
Risk	38 (17.4)	66 (30.3)	

n=number of participants, significant difference from participants with a risk of sarcopenia at *) p-value<0.01

Table 2 represents the prevalence of sarcopenia among male and female participants based on AWGS 2019 criteria. Both male and female participants showed low MM (39.0%, 43.6%), with a positive significance (p-value<0.01). Low MS was seen among males (41.7%) compared with females (49.5%, p-value=0.01). Male and female participants had walked less than 400 m in the 6-minute walk test (29.4%, 51.8%) with p-value=0.01 shows significant. Based on AWGS, the statistical data doesn't show any significance (p-value=0.137) between the male and female groups, but the female showed a higher prevalence of the risk of sarcopenia with 30.3% when compared to the male (17.4%).

Table 3. Prevalence of Predictors and their Bivariate Relationship sarcopenia among adults 18 Years or Older (N=218)

Characteristic	Non Sarcopenic n (%)	Sarcopenic n (%)	p-value
Age Score (years)			
18-25	10 (8.8)	0 (0)	0.092
26-44	54 (47.4)	38 (36.5)	
45-59	48 (42.1)	46 (44.2)	
>60	2 (1.8)	20 (19.2)	
Gender			
Male	53 (46.5)	38 (36.5)	0.088
Female	61 (53.5)	66 (63.5)	
Education			
Primary	5 (4.4)	3 (2.9)	0.771
Secondary	12 (10.5)	13 (12.5)	
Post-Secondary	97 (85.1)	88 (84.6)	
Marital Status			
Married	103 (90.4)	93 (89.4)	0.826
Unmarried	11 (9.6)	11 (10.6)	
Occupation			
IT	28 (24.6)	20 (19.2)	0.406
Homemaker	29 (24)	28 (26.9)	
Doctors, Teachers, Bank employees	57 (50)	56 (53.8)	
Monthly Income (₹)			
20,000-30,000	26 (22.8)	28 (26.9)	0.623
30,000-40,000	44 (38.6)	42 (40.4)	
>40,000	44 (38.6)	34 (32.7)	
Nature of Work			
Sedentary	103 (90.4)	99 (95.2)	0.201
Moderate	11 (9.6)	5 (4.8)	
BMI (kg/m²)			
Underweight (16.0 to 18.4)	6 (5.3)	4 (3.8)	0.001*
Normal (18.5 to 24.9)	21 (18.4)	28 (26.9)	
Overweight (25.0 to 29.9)	16 (14)	22 (21.2)	

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Characteristic	Non Sarcopenic n (%)	Sarcopenic n (%)	p-value
Obese Grade 1 (30.0 to 34.9)	46 (40.4)	34 (32.7)	
Obese Grade 2 (35.0 to 39.9)	25 (21.9)	16 (15.4)	
Visceral Fat (%)			
Normal (1-9)	26 (22.8)	27 (26)	
High (10-14)	52 (45.6)	48 (46.2)	0.061
Very High (15-30)	36 (31.6)	29 (27.9)	
Fat Mass (%)			
Low (5.0-19.9)	10 (8.8)	15 (14.4)	
Normal (20.0-29.9)	50 (43.9)	41 (39.4)	0.845
High (30.0-34.9)	54 (47.4)	48 (46.2)	
NLR (%)			
Low (<0.7)	2 (1.8)	2 (1.9)	
Normal (0.8-2.2)	108 (94.7)	99 (95.2)	0.045**
High (2.3-3.0)	4 (3.5)	3 (2.9)	
Fatigue Score			
Mild (<22)	89 (78.1)	85 (81.7)	
Moderate (22-34)	19 (16.7)	15 (14.4)	0.642
Severe (>35)	6 (5.3)	4 (3.8)	

n=Number of Participants
Significant difference from participants with a risk of sarcopenia at *) p-value<0.01; **) p-value<0.05

The predictors such as BMI, (p-value=0.01), and NLR (p-value=0.05) showed a significant simple association with sarcopenia. Forty-four per cent of study participants belonging to the age group of 45-59 years showed a high percentage of sarcopenic risk. Female, 63.5% are at sarcopenic risk but they did not have any statistically significant with sarcopenia (p-value=0.088). Among the study participants (81.7%) of them exhibited mild fatigue among the sarcopenic risk group.

Table 4. Multivariable Multinomial Logistic Regression Investigating all known risk factors of sarcopenia among the study participants (N=218)

Characteristic	RRR (95% CI)	p-value
Age Score (years)		
18-25	3.24×10^{-9} (0,.b)	0.989
26-44	0.187 (0.01,3.426)	0.259
45-59	0.168 (0.02,1.394)	0.098
>60	**Reference Group**	
Gender		
Male	4.048 (1.073,15.275)	0.039*
Female	**Reference Group**	
Education		
Primary	0.853 (0.11,6.618)	0.879
Secondary	3.669 (0.976,13.789)	0.054
Post-Secondary	**Reference Group**	
Marital Status		
Married	0.396 (0.101,1.556)	0.185
Unmarried	**Reference Group**	
Occupation		
IT	0.764 (0.281,2.081)	0.599
Homemaker	8.64×10^{-8} (2.40×10^{-8} ,3.11×10^{-7})	0
Doctors, Teachers, Bank employees	**Reference Group**	
Monthly Income (₹)		
20,000-30,000	$1.12\times10^{+}7$ ($1.12\times10^{+7}$, $1.12\times10^{+7}$)	0.644
30,000-40,000	1.285 (0.443,3.723)	
>40,000	**Reference Group**	
Nature of Work		
Sedentary	2.873 (0.582,14.19)	0.195
Moderate	**Reference Group**	
BMI (kg/m²)		
Underweight (16.0 to 18.4)	1.935 (0.226,16.557)	0.547
Normal (18.5 to 24.9)	9.782 (2.316,41.315)	**0.002***
Overweight (25.0 to 29.9)	5.929 (1.42,24.763)	**0.015***
Obese Grade 1 (30.0 to 34.9)	2.617 (0.798,8.589)	0.113

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Characteristic	RRR (95% CI)	p-value
Obese Grade 2 (35.0 to 39.9)	**Reference Group**	
Visceral Fat (%)		
Normal (1-9)		
High (10-14)	1.069 (0.971,1.178)	0.174
Very High (15-30)		
Fat Mass (%)		
Normal (20.0-29.9)	1.03 (0.961,1.105)	0.4
MM (%)		
Normal (32.9-35.97)	0.857 (0.741,0.99)	0.036*
Hand Grip (kg)		
Normal (20.3-34.1)	0.809 (0.729,0.898)	0.01*
NLR (%)		
Normal (0.8-2.2)	0.254 (0.069,0.933)	0.039*
Fatigue Score		
Moderate (22-34)	0.313 (0.107,0.921)	0.035*
6MWT (m)		
Normal (400-700)	0.989 (0.981,0.996)	0.003*
Dietary Intake		
Energy (kcal)	1.00 (1.00,1.00)	0.54
Carbohydrate (g)	1.00 (1.00,1.01)	0.36
Protein (g)	1.01 (0.99,1.03)	0.25
Fat (g)	1.00 (0.97,1.05)	0.83

RRR=Relative Risk Ratio, 95% CI=95% Confidence Interval
Significant difference from participants with a risk of sarcopenia at *) p-value<0.05

Table 4 present the results of Multivariable Multinomial Logistic Regression Investigating all known risk factors of sarcopenia among the study participants. This study was designed to estimate the predictive risk factors of sarcopenia among NAFLD in Coimbatore, India. The age groups 26-44 years (RRR=0.187, p-value=0.989) and 45-59 years (RRR=0.168, p-value=0.259) have less risk of being sarcopenic compared with the >60-year group which indicated that the risk of sarcopenia increases with age. The decline in MM and function is attributed to reduced protein synthesis and increased degradation with a study indicating that individuals aged 40 and above had a negative correlation between Age and MS with 15.4% at risk of sarcopenia[25].

The RRR for males was 4.048 (95% CI: 1.073-15.275), with a p-value=0.05. Both males and females showed a significant risk of sarcopenia, whereas male was associated with a higher risk of sarcopenia among the study participants (RRR=-4.048). This disparity highlights the need for gender-specific approaches in prevention and treatment. Similar results were found that male was particularly affected by factors such as height and body mass index, while female showed a stronger association with metabolic parameters[26] and the prevalence of sarcopenia was found to be 41.2% in males compared to 37.2% in females[27].

The study participants who were overweight RRR of 5.929 (95% CI: 1.42-24.763 showed a high risk for sarcopenia, with a positive significance (p-value=0.015). Our findings were similar to the other studies highlighting the association between overweight and MM decline[28]. Low MM alongside high fat, poses serious health risks, including increased morbidity and mortality[29]. Sarcopenia is also linked to metabolic syndrome, with studies showing that each quartile increase in appendicular skeletal MM percentage significantly reduces the risk of metabolic syndrome by 25%[30]. This highlights the critical role of MM in mitigating obesity-related health risks.

The MMRRR of 0.857 (95% CI: 0.741-0.99) with a p-value=0.05 The NAFLD patients in the current study exhibited low MM revealed a significant association with sarcopenia risk. RRR of 0.857 indicates that a lower percentage of MM is associated with an increased risk of sarcopenia, indicating that maintaining normal MM is protective against the development of sarcopenia among the study participants. The presence of NAFLD has been shown to predict low MM and strength, indicating a compounding risk for sarcopenia[31]. The MS was analysed using a hand grip dynamometer among the study participants indicating that lower hand grip strength RRR 0.809(95% CI: 0.729,0.898) was associated with an increased risk of sarcopenia suggesting that greater grip strength is protective against the development of sarcopenic risk in the study participants. The diagnosis of sarcopenia, characterized by low MM[32,33] and low grip strength correlates with increased risks of adverse health outcomes, including mortality and disability[34].

The pro-inflammatory markers of the participants indicated that the NLR, and the risk of sarcopenia is significant, with a reported Relative Risk reduction RRR of 0.254 (95% CI: 0.069-0.933) with a p-value=0.05. This suggests that elevated NLR may be a critical biomarker in predicting sarcopenia. Chronic low-grade inflammation is often tended to decrease MM and strength[35]. The results of the present study were similar to the study[35] that higher levels of inflammatory markers correlate with lower Appendicular Lean Mass (ALM) and physical performance, reinforcing the role of inflammation in sarcopenia. Fatigue assessment scores of the study group showed that an increase in fatigue had shown to significantly increase sarcopenia RRR of 0.313 (95% CI: 0.107-0.921). This statistically significant finding indicates that a lower fatigue score is associated with a decreased

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risk of sarcopenia. This suggests that individuals reporting less fatigue are protective against the development of sarcopenic risk. The findings of the study[17] were similar to our current study where increased fatigue was associated with a higher risk of sarcopenia.

The 6MWT RRR 0.989 (95% CI: 0.981-0.996) had shown a significance with sarcopenic risk indicating the increase in age, BMI, NLR, fatigue and reduction in MM. The physical activity was performed among the study group using 6MWT, and those who walked less than 400m were shown to have an increased risk of sarcopenia. This statistically significant result indicated that longer walking distances are associated with a reduced risk of sarcopenia. Thus, maintaining or improving physical activity is protective against the progress of sarcopenia in the study participants. A similar study was conducted[36] showed 71.5% of patients with poor performance on the 6MWT, showing a strong link between low physical performance and sarcopenia risk. A Mendelian randomization study found an inverse relationship between physical activity and sarcopenia-related traits also play a critical role in the progress of sarcopenia[37]. In the present study, the study participants energy intake (RRR of 1.00 (95% CI: 1.00-1.00) carbohydrates (RRR of 1.00 (95% CI: 1.00-1.01) protein (RRR of 1.01 (95% CI: 0.99-1.03) and fat (RRR of 1.00 (95% CI: 0.97-1.05) does not significantly impact the risk of developing sarcopenia. This finding was supported by other studies indicating that dietary intake of energy, carbohydrates, protein, and fat and the risk of developing sarcopenia remains complex and not fully understood[39] and the dietary factors were less significant than physical activity in predicting sarcopenia outcomes, emphasizing lifestyle over diet alone[40].

Strengths and Limitations of Research

The study described the relationship between sarcopenia and nutritional status among NAFLD patients which are often underexplored in clinical settings. It examined a multifaceted view of how the above conditions may affect patients with NAFLD. It will help to understand the link between sarcopenia, NAFLD and nutritional status which will lead to a better management strategy and help inform clinical decisions about the treatment and care of the patients. The use of the AWGS tool is a comprehensive and practical assessment of sarcopenia, and its advantage is to support early detection and intervention among NAFLD patients. The nutritional status of participants may reflect the local culture in Coimbatore, making it difficult to apply the findings to other cultural contexts or regions with differing diets and lifestyles.

CONCLUSIONS

Sarcopenia is recognized as an emerging public health issue globally, as it substantially impacts daily functional activities and overall quality of life. The current study reveals a prevalence of sarcopenia risk at 47.7% among NAFLD patients in Coimbatore, India. The verdicts of this study show substantial demographic differences in the risk of sarcopenia among NAFLD in the study area, with the highest risk observed among gender, overweight or obese, MM, MS, NLR, fatigue, and physical performance. This study provides some evidence for the fact that the association between the significant predictors among sarcopenia in NAFLD patients. Lifestyle modification and improving physical performance can help high-risk individuals with sarcopenia by improving the loss of muscle and reducing the progression of the disease. More targeted dietary and lifestyle interventions can be framed to prevent or slow the decline of MM and strength which consequently leads to sarcopenia among NAFLD patients.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The authors have no conflicts of interest to disclose. The research is self-funded.

AUTHOR CONTRIBUTIONS

KA: methodology, validation, formal analysis, investigation, data curation, writing original draft, writing-review & editing, project administration, software, validation, formal analysis; SD: conceptualization, methodology, validation, formal analysis, writing original draft, writing review & editing, supervision, project administration; KB: investigation, resources, data curation; SM: investigation, resources, data curation; FF: data curation, manuscript editing, and write up.

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