

**ORIGINAL RESEARCH**

# Prognostic Value of Isolated Sarcopenia or Malnutrition–Sarcopenia Syndrome for Clinical Outcomes in Hospitalized Patients at tertiary care hospital, Gujarat

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## ABSTRACT

**Background:** Variable levels of nutritional depletion, such as malnutrition and sarcopenia, are found in hospitalized patients' profiles. Sarcopenia is a generalized, progressive muscle disease with a poor prognosis in various clinical settings. malnutrition is a combination of inadequate dietary intake and nutrient absorption, which results in alterations in body composition and biological function. In contrast to individuals without sarcopenia, people with sarcopenia have longer hospital stays, a higher chance of in-hospital death, and worse results following discharge. Additionally, patients have a worse prognosis if they have MSS. Aim and Objective: To Determine whether sarcopenia alone or in combination with malnutrition is a better predictor of clinical outcomes (extended length of hospital stay and hospital readmission) in hospitalized patients. **Methods:** It's a Hospital-based Cross-sectional study Conducted in Tertiary Care Hospital over Hospitalized Patients during the period of January 2023 - March 2023, All the Hospitalized Patients with age at least 18 years old and Give consent were included and Participants who did not give consent to participate in the study were excluded. Critically ill patients who couldn't respond were also excluded from the study, So total sample size was 150. Malnutrition were assessed by MNA-SF (Mini - Nutritional Assessment - Short Form) and GLIM (Global Leadership Initiative on Malnutrition) criteria. Sarcopenia was assessed by Muscle mass and muscle strength which were measured by Hand Dynamometer and BIA (Bio-impedance Analyser). **Result:** A total of 150 patients were included in the current analysis, the mean age of patients was 48+5 Years. 43% (n=65) were males. The Mean of actual body weight and BMI was 50 +8, and 23+5 Kg/m<sup>2</sup>, respectively. Around 80% (n=120) have low HSG and 59% (n=89) were found to be sarcopenic. Around 46% (n=69) were found to have Malnutrition. The MSS was Diagnosed in 57 patients (38%). **Conclusion:** The study provides evidence that malnutrition and sarcopenia are prevalent in hospitalized patients and are associated with worse outcomes, including prolonged length of stay and readmission. The findings highlight the importance of screening for malnutrition and sarcopenia in clinical practice and implementing appropriate interventions to optimize patient outcomes

**Key words:** Sarcopenia, Malnutrition, Malnutrition - Sarcopenia Syndrome, Hospitalized Patients, MNA-SF, GLIM criteria, BIA

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## INTRODUCTION

Variable levels of nutritional depletion, such as malnutrition and sarcopenia, are found in hospitalized patients' profiles <sup>[1]</sup>. Sarcopenia is a generalized, progressive muscle disease with a poor prognosis in various clinical settings <sup>[2]</sup>. With or without varying

degrees of inflammation, malnutrition is a combination of inadequate dietary intake and nutrient absorption, which results in alterations in body composition and biological function <sup>[3,4]</sup>.

Depending on the diagnostic technique used, the prevalence and severity of sarcopenia dramatically

increase with age, ranging from 9.9% to 40.4% in community-dwelling individuals, 28% to 69% in hospitalized patients, and 71% in patients in intensive care units [5-8]. Malnutrition is commonly acknowledged as being extremely common and a significant risk factor for poorer clinical outcomes in hospitalized patients [9]. With a wealth of literature available, sarcopenia is also known to increase the risk of poorer clinical outcomes, particularly in non-hospitalized persons (with impairment of daily activities and instrumental daily living, risk of hip fracture, and mortality) [10-12]. According to several studies on hospitalized patients, those with sarcopenia had lower mobility, lower quality of life, a longer hospital stay, post-surgical problems, and mortality than those without it [1,12-15]. Due to acute illnesses, mobility issues, and anorexia, hospitalized patients are at a disproportionately high risk of developing sarcopenia and associated disorders, including cachexia and malnutrition [16].

Sarcopenia and malnutrition overlap despite being classified as separate illnesses since they share comparable etiological reasons and the loss of body tissue as a common feature. As a result, their relationship is complex, and each condition makes the other worse [17,18]. Sarcopenia and malnutrition frequently coexist in hospitalized patients. An extensive correlation [OR: 4.06 (95% CI: 2.43, 6.80), I<sup>2</sup> = 71.4%] and significant overlap (41.6%) between sarcopenia often known as malnutrition-sarcopenia syndrome (MSS), might predict death in elderly hospital patients and serve as a prognostic indicator in their management. There is a need for more research in this field due to the paucity of studies on the prognostic usefulness of this syndrome, the exclusion of and (risk of) malnutrition in older hospitalized persons were found by a systematic evaluation of seven studies (2506 patients) [19]. Additionally, the coexistence of these disorders, older individuals, and clinical outcomes other than mortality.

In contrast to individuals without sarcopenia, people with sarcopenia have longer hospital stays, a higher chance of in-hospital death, and worse results following discharge. Additionally, patients have a worse prognosis if they have MSS. Determining whether sarcopenia alone or in combination with malnutrition is a better predictor of clinical outcomes (extended length of hospital stay, and hospital readmission) in hospitalized patients was the goal of this study.

## MATERIALS AND METHODS

**It's a Hospital-based Cross-sectional study** Conducted in Tertiary Care Hospital over Hospitalized Patients during the period of Jan 2023- March 2023, All the Hospitalized Patients with age at least 18 years old and Give consent were included and Participants who did not give consent to participate in the study were excluded **and** Critically ill patients who couldn't respond were also excluded from the study .So total

sample size was 150. All the participants were Given instructions about the study before start of the study. Written Informed Consent were taken in their Vernacular Language. Ethical Approval were taken before the start of the study

### Data Collection Tool

Their socio-demographic data like age, sex, Skeletal muscle %, and hand grip strength by hand dynamometer were recorded. Assessment of risk malnutrition was taken by **Mini Nutritional Assessment-Short Form questionnaire (MNA-SF) and GLIM criteria.**

The diagnosis of malnutrition was confirmed if at least one phenotypic and at least one etiologic criterion was fulfilled, as recommended by **the GLIM experts.**

### Phenotypic Criteria

(1) unintentional body weight loss: the loss of >5% habitual body mass within the past six months, or the loss of >10% in more than six months,

(2) low body mass index (BMI): <20 kg/m<sup>2</sup> in subjects below 70 years and <22 kg/m<sup>2</sup> in individuals 70 years or older

3. muscle mass was assessed based on the measurement of appendicular lean mass and calculation of the Appendicular Lean Mass (ALM) and an ALM index, which represents the ratio of ALM (kg) and square of height (m<sup>2</sup>). ALM index below the cut-off points for the Polish population (5.6 kg/m<sup>2</sup> in women and 7.4 kg/m<sup>2</sup> in men) was indicative of low muscle mass (LMM). The appendicular lean mass was measured with the electrical bioimpedance method (BIA) (Omron Karada scan, 702T)

### Etiologic Criteria

(1) Reduced food intake or assimilation was recognized in subjects declaring any reduction in food intake within the past three months in the MNA-SF questionnaire,

(2) the disease burden/inflammatory condition was recognized in all participants with a COPD diagnosis

### Body Mass Index

Height and weight were measured using a stadiometer and scale and then used to calculate BMI. Those with a BMI in excess of 23 kg/m<sup>2</sup> and 25 kg/m<sup>2</sup> were considered overweight and obese respectively. Those with a BMI between 18.5 and 22.9 kg/m<sup>2</sup> were considered "normal", and those less than 18.5 kg/m<sup>2</sup> were underweight.

To diagnose **sarcopenia**, the following measurements can be taken:

- Muscle mass was measured using bioelectrical impedance analysis (BIA), and muscle mass index (MMI) of less than 7.0 kg/m<sup>2</sup> for men and less than 5.7 kg/m<sup>2</sup> for women can be used to diagnose sarcopenia using BIA. The cut-off points for low muscle strength and Muscle mass were following the AWG SOP (Asian Working Group of Sarcopenia in Older patients) recommendations

- **Muscle strength** was measured using handgrip strength:

To perform the test, the person being tested holds a handgrip dynamometer and squeezes it with maximum effort for a few seconds. The test was repeated three times on each hand, and the highest value was used for analysis.

The cut-off value for diagnosing sarcopenia using handgrip strength varies depending on factors such as age, sex, and population studied. However, a handgrip strength of less than 28 kg for men and less than 18 kg for women is commonly used as a cut-off value for diagnosing sarcopenia

#### Statistical Analysis

All data were Transferred and cleaned in MS 2006. Descriptive statistics were also calculated. Mean and standard deviation for parametric quantitative variables, median and interquartile range for non-parametric variables, and absolute and relative frequency for categorical variables. Kolmogorov–Smirnov was used for testing the quantitative variable normality. For the data analysis, we grouped patients with probable sarcopenia and those with sarcopenia, comparing them to non-sarcopenic ones by Student's t-test, Mann–Whitney test, chi-squared, or Fisher's exact test in bivariate analysis. Multivariate analyses were performed considering the outcomes of in-hospital death (Cox regression), prolonged LOS

(categorized by a median of 10 days considering its data distribution in our sample), and hospital readmission six months after discharge (logistic regression). Variables included in multivariate analysis were selected by the p-value ( $p < 0.20$ ) obtained on bivariate analysis for comparison of patients with and without sarcopenia. The entire analysis was performed in SPSS 22.0 software, and p values  $< 0.05$  were considered statistically significant.  $P < 0.001$  were highly Statistically Significant.

## RESULT

### General Features of Patients

A total of 150 patients were included in the current analysis, the mean age of patients was  $48 \pm 5$  Years. 43% ( $n=65$ ) were males

More than half of the patients ( $n=78, 50\%$ ) were admitted to the hospital due to respiratory problems, and the rest due to cardiac problems, and gastrointestinal problems.

The Mean of actual body weight and BMI was  $50 \pm 8$ , and  $23 \pm 5$  Kg/m<sup>2</sup>, respectively. Around 80% ( $n=120$ ) have low HSG and 59% ( $n=89$ ) were found to be sarcopenic. Around 46% ( $n=69$ ) were found to have Malnutrition. The MSS was Diagnosed in 57 patients (38%).

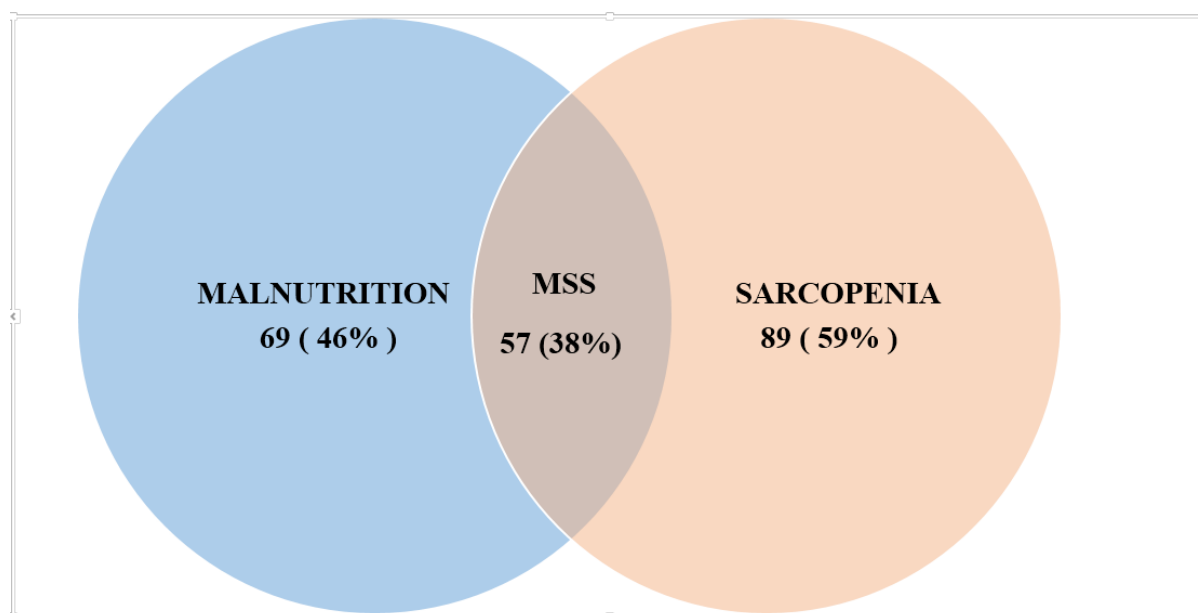


Figure -1, Overlap between Malnutrition and Sarcopenia in Hospitalized Patients (150)

Table 1. General and clinical outcomes comparison of patients grouped according to sarcopenia diagnosis.

	Non Sarcopenic Patients	Sarcopenic Patients	p Value
Age	$47 \pm 16$	$47.43 \pm 17$	0.883
Body Weight	$59.43 \pm 10.7$	$48.64 \pm 11$	$< 0.001$
Height	$157 \pm 10$	$160.69 \pm 9.7$	0.079
BMI	$24.03 \pm 4.7$	$19.02 \pm 5$	$< 0.001$
Body Fat %	$21.79 \pm 7.2$	$24.32 \pm 7.5$	0.043
FFM	$23 \pm 4.5$	$18 \pm 4.4$	$< 0.05$

MNA-SF	11±2.3	8 ± 2.1	<0.05
SMMI	19.98 ±4.19	5±0.8	< 0.001
Hand Grip (Kg)	13.13±13.07	7.4±6.7	< 0.001

**Table 2. General and clinical outcomes comparison of patients grouped according to Malnutrition diagnosis**

	Non-Malnourished Patients	Malnourished Patients	p Value
Age	44±15.11	50±19.03	0.023*
Body Weight	61±6.2	43±6	< 0.001*
Height	156±10	162±8	< 0.001*
BMI	25±4	16.4±2	< 0.001*
Body Fat %	24±8.41	22±6	0.091
FFMI	23±5	16±4.5	<0.05*
MNA-SF	13±2.5	8.5±3	<0.001*
SMMI	14.81±8	6.86±4.4	< 0.001*
Hand Grip (Kg)	11.74±11	7.38±8	0.008*

**Table 3. General and clinical outcomes comparison of patients grouped according to MSS diagnosis.**

	Non-MSS Patients	MSS Patients	p Value
Age	49±15.9	44 ± 19	0.104
Body Weight	59.72±10.5	42±5.4	< 0.001*
Height	157.85±10.4	162.5 ± 8.3	< 0.003*
BMI	24 ± 4.4	16±2.292	< 0.001*
Body Fat %	23.63 ± 8.3	22.74 ± 6	0.486
FFMI	22±3.2	17±4	<0.05*
MNA-SF	12.25±3	9±2.2	<0.05*
SMMI	14.96 ± 7.75	4.93 ± 0.893	< 0.001*
Hand Grip (Kg)	11.77 ± 11.77	6.40 ± 5.434	< 0.001*

**Table 4. Association of sarcopenia, MSS, and malnutrition with clinical outcomes: multivariate analysis**

Predictors	Malnutrition		Sarcopenia		MSS	
	OR	p Value	OR	p Value	OR	p Value
Prolonged Los (>10 Days)	2.240	<b>0.039</b>	3.729	<b>0.004</b>	2.601	<b>0.014</b>
Re-Admission within 6 months	2.662	<b>0.006</b>	4.163	<b>0.001</b>	2.12	<b>0.034</b>

## DISCUSSION

The prevalence of malnutrition, MSS, and sarcopenia in the study was 46%, 38%, and 59%, respectively. Comparing these findings with previous studies, the prevalence of malnutrition in the present study is similar to the prevalence reported in a study by Ballesteros-Pomar et al. <sup>(20)</sup> which reported a prevalence of 60-64%. However, the prevalence of malnutrition in the present study is higher than the prevalence reported in a study by Sousa et al. <sup>(21)</sup> which reported a prevalence of 10.4%. The prevalence of MSS in the present study is higher than the prevalence reported in a study by Ballesteros-Pomar et al. <sup>(20)</sup> which reported a prevalence of 20%. The prevalence of sarcopenia in the Current study is similar to the prevalence reported in a study by Anne <sup>(22)</sup>. which reported a prevalence of 21.4%. However, the prevalence of sarcopenia in your study is similar to the prevalence reported in a study by Ballesteros-Pomar et al. <sup>(20)</sup> which reported a prevalence of 65-

71.1%. Overall, the study's findings suggest that malnutrition, MSS, and sarcopenia are prevalent in hospitalized patients and should be considered in clinical practice

The present study also found that malnutrition had an odds ratio of 2.2 and 2.6 for prolonged length of stay and readmission within 6 months, respectively. This means that patients with malnutrition were 2.2 times more likely to have a prolonged length of stay and 2.6 times more likely to be readmitted within 6 months compared to patients without malnutrition. This finding is consistent with previous studies that have reported a similar association between malnutrition and prolonged length of stay and readmission. For example, a study by Jensen et al. <sup>(23)</sup> reported that malnourished patients had longer hospital stays and were more likely to be readmitted within 15 days. Another study by Correia et al. <sup>(24)</sup> found that malnutrition was associated with a longer length of stay and increased risk of readmission. Similarly, a

study by Kyle et al. <sup>(25)</sup> reported that malnutrition was associated with increased length of stay and readmission rates in oncology patients. These findings suggest that malnutrition is an important factor to consider in clinical practice, as it can impact patient outcomes and healthcare costs.

The Current study also found that sarcopenia had an odds ratio of 3.7 and 4.1 for a prolonged length of stay and readmission within 6 months, respectively. This means that patients with sarcopenia were 3.7 times more likely to have a prolonged length of stay and 4.1 times more likely to be readmitted within 6 months compared to patients without sarcopenia. These findings are consistent with previous studies that have reported a similar association between sarcopenia and prolonged length of stay and readmission. For example, a meta-analysis by Cruz-Jentoft et al. <sup>(26)</sup> found that sarcopenia was associated with a higher risk of mortality and readmission in hospitalized elderly patients. Another study by Ballesteros-Pomaret al. <sup>(20)</sup> reported that sarcopenia was associated with worse outcomes in medical inpatients. Similarly, a study by Correia et al. <sup>(24)</sup> found that sarcopenia was associated with a longer length of stay and increased risk of readmission. These findings suggest that sarcopenia is an important factor to consider in clinical practice, as it can impact patient outcomes and healthcare costs.

The Present study also found that MSS had an odds ratio of 2.6 and 2.12 for a prolonged length of stay and readmission within 6 months, respectively. This means that patients with MSS were 2.6 times more likely to have a prolonged length of stay and 2.12 times more likely to be readmitted within 6 months compared to patients without MSS. These findings are consistent with previous studies that have reported a similar association between MSS and prolonged length of stay and readmission. For example, a study by Sousa et al. <sup>(21)</sup> found that MSS was a predictor of worse outcomes in hospitalized patients. Another study by Correia et al. <sup>(24)</sup> reported that a decline in nutritional status in the first week of hospitalization was associated with an increased likelihood of prolonged length of stay and readmission. Similarly, a study by Cruz-Jentoft et al. <sup>(24)</sup> found that sarcopenia and malnutrition were associated with a higher risk of readmission and mortality in hospitalized elderly patients. These findings suggest that MSS is an important factor to consider in clinical practice, as it can impact patient outcomes and healthcare costs.

## CONCLUSION

The study provides evidence that malnutrition and sarcopenia are prevalent in hospitalized patients and are associated with worse outcomes, including prolonged length of stay and readmission. The findings highlight the importance of screening for malnutrition and sarcopenia in clinical practice and implementing appropriate interventions to optimize patient outcomes. However, further research is needed

to investigate the effectiveness of interventions targeting malnutrition and sarcopenia in hospitalized patients.

## RECOMMENDATIONS

- Screening for malnutrition and sarcopenia should be implemented in clinical practice to identify patients at risk and provide appropriate interventions.
- Multidisciplinary teams should be involved in the management of malnutrition and sarcopenia to optimize patient outcomes.
- Further research is needed to investigate the effectiveness of interventions targeting malnutrition and sarcopenia in hospitalized patients.

## LIMITATIONS

- The study was conducted in a single center and may not be generalizable to other populations.
- The sample size was relatively small, which may limit the statistical power of the study.
- The study was observational in nature and cannot establish causality between malnutrition, sarcopenia, and worse outcomes.

## CONFLICT OF INTEREST

None

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