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PREVALANCE OF SARCOPENIA IN CARCINOMA ESOPHAGUS: A HOSPITAL BASED PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Esophageal cancer remains a disease with poor survival and many complications. The aim of this study was to determine the prevalence of sarcopenia in esophageal malignancy patients using computed tomography. **Methods:** A hospital based prospective observational study was conducted in the Department of General Surgery of a tertiary care hospital in Shimla, Himachal Pradesh. All patients who reported to Department of Surgery during the study period of 1st September 2021 to 30th September 2022 with diagnosis of esophageal cancer were considered for the study. **Results:** Eighteen patients were included in the study. Prevalence of sarcopenia was 44.44% (8 patients) based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations. Patients had a mean age of 60.43± 14.16 years. Sarcopenia was detected in 8(44.44%) patients based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations. The mean age was 65.37 years in the sarcopenic group (SG) and 55.5 years in the non-sarcopenic group (NSG).The mean SMI (Skeletal Muscle Index) was 42.23±7.10 cm^2/m^2 and 47.14±6.24 cm^2/m^2 in the SG and NSG, respectively. The mean body mass index (BMI) was lower in the sarcopenic group than in the nonsarcopenic group (19.11 ± 1.99 vs. 19.83± 2.13s kg/m^2). **Conclusions:** Prevalence of sarcopenia was 44.44% (8 patients) based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations.

KEYWORDS: Sarcopenia _ Prevalance_ esophageal malignancy _Sub Himalayan Region.

INTRODUCTION

As of 2020, esophageal cancer (EC) is the eighth most common cancer to be diagnosed and the sixth largest cause of cancer-related death, according to the most recent data available from the Global Cancer Observatory (GLOBOCAN) database.[1] Furthermore, esophageal cancer incidence has been rising substantially in the past few years. Chemotherapy, radiation therapy, and surgical resection are now essential treatments for esophageal cancer.[2] Histologically, esophageal cancer is characterized as either adenocarcinoma or squamous cell carcinoma (SCC), with varying prognoses, treatment options, tumor locations, etiologies, and pathologies.[3,4] Worldwide, esophageal squamous cell carcinoma (ESCC) accounts for more than 85% of all instances of esophageal cancer.[5] The majority of ESCC cases globally are caused by alcohol intake and smoking, whereas the primary risk factors for EC are smoking, abdominal obesity, and gastroesophageal reflux disease (GERD).[4,5] In contrast to esophageal adenocarcinoma, which is more common in North America and Western Europe, ESCC is typically found at or above the tracheal bifurcation, has a poor prognosis, a tendency for early lymphatic spread, and is the most common histologic type in Eastern Europe, Asia, and Africa.[4,6] Also, the primary treatment for ESCC is chemoradiotherapy (CRT), which can be administered with or without surgery. On the other side, induction therapy and surgical resection are typically used to treat adenocarcinoma (AC), while there is debate over the best induction schedule.[7] Less than 20% of patients with esophageal cancer survive past five years despite advancements in treatment, which is regrettably due to the fact that most patients with this disease are discovered at an advanced stage. The International Classification of Diseases-10 formally established the diagnosis of sarcopenia in 2016, while the idea of muscular function was first proposed through six consensus definitions in 2010.[8] A useful definition of sarcopenia was published by the European Working Group on Sarcopenia in Older People (EWGSOP) in 2010.[9] A similar approach was adopted by the Asian Working Group on Sarcopenia (AWGS).[10]

These definitions state that reduced muscle mass and impaired muscular function are characteristics of sarcopenia. According to AWGS, sarcopenia is defined as having reduced muscle mass along with low muscle strength and/or low physical performance. These definitions state that reduced muscle mass and impaired muscular function are characteristics of sarcopenia. According to AWGS, sarcopenia is defined as having reduced muscle mass along with low muscle strength and/or low physical performance. They also suggest outcome markers for additional studies and the circumstances under which sarcopenia should be evaluated. Additionally, they recommend cutoff values for handgrip strength (< 26 kg for men and < 18 kg for women), usual gait speed (< 0.8 m/s), and muscle mass measurements (7.0 kg/m^2 for men and 5.4 kg/m^2 for women by using dual X-ray absorptiometry and 7.0 kg/m^2 for men and 5.7 kg/m^2 for women by using bioimpedance analysis). In 2018, EWGSOP revised the consensus and proposed a new definition of sarcopenia, EWGSOP-2.[11] The EWGSOP-2 has modified its definition to take muscle strength into account and suggests certain cut-off points for the various components of sarcopenia. Low levels of measurements for three parameters—muscle strength, muscle quantity/quality, and physical performance as a severity indicator—are indicative of sarcopenia, according to EWGSOP-2.[11] For diagnosis of sarcopenia as defined by the EWGSOP2 cut off values are.

Assessing muscle strength cut off values are.

Grip strength	<27 kg for men
	<16 kg for women
Chair stand test	>15 s for five rises

Assessing muscle mass/volume cut off values are

DEXA	<7.0 kg/m^2 for men
	<5.5 kg/m^2 for women
Bio-impedance analysis	8.87 kg/m^2 for men
	6.42 kg/m^2 for women
CT imaging	<55 cm^2/m^2 for men
	<39cm^2/m^{2}for women

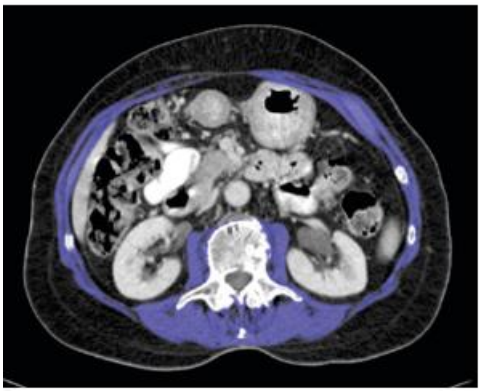
Physical Performance tests

Short physical performance battery test	<8
400 m (Walk 20 m laps)	Non completion or > 6minutes
Gait speed (Over a 4 m course)	<0.8 m/s

Sarcopenia is defined as a rapid loss of muscle mass and function associated with a broad skeletal muscle condition that progresses over time. Specifically, sarcopenia has been found to be a predictor of several cancer types' prognosis and linked to a higher risk of unfavourable outcomes, such as falls, diminished function, frailty, physical disability, and death.[8,11] Sarcopenia has been related to heart disease, respiratory disease, and cognitive impairment, which can result in movement disorders and a lower quality of life. It also increases the risk of falls and fractures and affects mobility and activities of daily living.[11] Sarcopenia is now considered a major indicator of long-term prognosis for patients with esophageal cancer and has received a lot of attention in the oncology community.[12–14] It is noteworthy that an increasing number of older patients with esophageal cancer are also typically malnourished due to malignancy, which further exacerbates the development of sarcopenia.[15] Furthermore, it has been shown that aging-related conditions such sarcopenia may make it more difficult to recover from esophageal cancer.[16] In India, the prevalence of sarcopenia in cancer patients is an area of investigation, as very few Indian studies have evaluated the prevalence of sarcopenia in cancer patients. Therefore, we aimed to study the prevalence of sarcopenia in patients with esophageal malignancy.

Screening for sarcopenia

Sarcopenia was assessed by calculating the Skeletal Muscle Index (SMI) using CT scans at the L3 vertebra. In this study, the contrast-enhanced CT abdomen (CECT) used for diagnosing gastric malignancy was used to calculate the SMI, with no additional CECT performed solely for this purpose. Patients underwent CT scans using a 64-slice MDCT (LightSpeed VLT – XTE, GE Medical System), with cross-sectional images taken at the L3 vertebral level where both transverse processes were visible. The areas of the psoas, quadratus lumborum, erector spinae, transversus abdominis, internal and external obliques, and rectus abdominis muscles were manually measured using the area measurement tool in RadiAnt DICOM viewer. The threshold range for identifying skeletal muscle was set between -30 to +150 Hounsfield units. The skeletal muscle area was then normalized for height to calculate the SMI.



The skeletal muscle index is calculated as follows

Cross-sectional area of the total skeletal muscles at L3 (psoas, quadratus lumborum, erector spinae, transversus abdominis, internal and external obliques and rectus abdominis muscles) in $[cm]^2$
Height $[m]^2$

Patients were categorized into sarcopenic and non-sarcopenic groups based on CT measurement of total skeletal muscle mass in cross sectional area at the level of L3. Based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations, SMI < 55 cm^2/m^2 was considered the cutoff for men, compared to < 39 cm^2/m^2 for women.

Statistical analysis

The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data were presented as the means ± SD and as median with 25th and 75th percentiles (interquartile range). The following statistical tests were applied for the results:

The association of the variables which were quantitative in nature were analysed using Independent t test (for two groups) and ANOVA (for more than two groups).

The association of the variables which were qualitative in nature were analysed using Chi-Square test. If any cell had an expected value of less than 5 then Fisher's exact test was used.

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0. For statistical significance, p value of less than 0.05 was considered statistically significant. Ethical approval was obtained from institutional ethical committee.

RESULTS

Patient characteristics

Eighteen (18) patients were included in the study. Prevalence of sarcopenia was 44.44% (8patients) based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations. Patients had a mean age of 60.43± 14.16 years.

Among the 18 patients with diagnosis of esophageal cancer; 8 patients (44.44%) were diagnosed as sarcopenic and the remaining 10 patients non sarcopenic (55.56%) based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations. The mean age of patients with sarcopenia with esophageal malignancy was 63.37 years and the mean age of patients without sarcopenia with esophageal malignancy was 55.5 years. Clinicopathological features of the two groups are shown in Table 1.

Regarding gender, the proportion of women was higher in the sarcopenic group than men in the non-sarcopenic group (61.1% vs. 37.5%). Of body weight and composition, mean body mass index (BMI) was lower in the sarcopenic group than in the nonsarcopenic group (19.11 ± 1.99 vs. 19.83± 2.13 kg/m^2). Nutritional parameters such as mean serum albumin was lower in the sarcopenic group than in the non sarcopenic group (sarcopenic, 3.13± .48 g/dl vs. non-sarcopenic, 3.22± .59 g/dl). Mean skeletal muscle index (cm^2/m^2) in patients of esophageal carcinoma in sarcopenic patients was 42.23±7.10cm^2/m^2 while skeletal muscle index (cm^2/m^2) in patients of esophageal carcinoma in non sarcopenic patients was 47.14±6.24cm^2/m^2.

Table 1: Clinicopathological features of Sarcopenic and Non-sarcopenic patients.

Clinicopathological features	Sarcopenic group (n=8)	Non Sarcopenic group (n=10)
Mean age (years)	63.37	55.5
Gender Men Women	 3(37.5%) 5(62.5%)	 3(30%) 7(70%)
BMI (kg/m ^{2})	19.11 ± 1.99	19.83± 2.13
Serum albumin (g/dl)	3.13± .48	3.22± .59
SMI (cm²/m²)	42.23±7.10	47.14±6.24

DISCUSSION

Elderly people with gastrointestinal cancers have been increasing dramatically as the world's population ages and lifespans lengthen. Additionally, the prevalence of sarcopenia also increases with age in gastrointestinal malignancy patients. Depending on the definitions, diagnostic techniques, classifications, and cut-off points used, the frequency of sarcopenia varied significantly.[17] This study aimed to estimate the prevalence of sarcopenia in esophageal malignancy. Sarcopenia cut-off points depend on the measurement technique and the availability of reference studies and populations. The most widely used method for assessing muscle mass is computed tomography (CT), specifically by evaluating the skeletal muscle index at the third lumbar vertebra, with specific cut-off points for each sex. In our study, we used the cut-off points from EWGSOP2 (The European Working Group on Sarcopenia in Older People 2), which defines sarcopenia as a lumbar skeletal muscle index by CT imaging (at the 3rd lumbar vertebra) of <55 cm²/m² in men and <39 cm²/m² in women. Our findings indicated that the prevalence of sarcopenia in patients with esophageal cancer is 44.44%.Notably, a number of studies have shown variations in sarcopenia prevalence among various age groups and geographical areas.[18] Sarcopenia specifically affects 5–13% of individuals 60–70 years old and up to 50% of those 80 years old.[19] Moreover, it has been shown that sarcopenia is a common ailment in the cancer sector, impacting roughly 35.3% of patients.[20] Sarcopenia is very common (43.68%) in people with gastrointestinal malignancies, according to a study by Haiducu et al.[21] Esophageal cancer has the highest frequency (70.4%) because dysphagia is a commonly related symptom. Furthermore, Jogiat et al.'s meta-analysis,[13] which included 21 studies and 3966 patients, found that 1940 of the participants had sarcopenia, indicating a 48.1% prevalence rate. However, due to variations in study populations, age, diagnostic techniques, and criteria, the incidence of sarcopenia in patients with esophageal cancer varies greatly, with prevalence rates ranging from 14.4 to 81%. For example, Tan et al.[22] used computed tomography (CT) data to diagnose sarcopenia in patients with esophageal cancer retrospectively; the results showed a prevalence of 75.9% for sarcopenia. On the other hand, Yoshida et al.[23] used the bioelectrical impedance analysis (BIA) approach to detect sarcopenia in a prospective research comprising 71 patients who had esophageal cancer. They found that 40.8% of the patients in this cohort had sarcopenia. Sarcopenia was often identified during preoperative tests in patients with esophageal cancer, despite differences in diagnostic criteria and techniques. Given that esophageal cancer exhibits the highest prevalence of sarcopenia among gastrointestinal tumors, it is imperative to allocate greater attention to this condition in esophageal cancer patients. The current study has several limitations. This was a single-center prospective observational study and the sample size was small. A validation study with large sample size will be necessary to confirm the prevalence of sarcopenia in esophageal cancer patients. In conclusion, prevalence of sarcopenia was 44.44% (8 patients) based on EWGSOP2 (The European Working Group on Sarcopenia in Older People 2) recommendations in our study.

Compliance with ethical standards

Ethical standards

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1964 and later versions. Informed consent was obtained from all patients for inclusion in the study.

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Conflict of interest

We declare that we have no conflicts of interest.

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