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ORIGINAL RESEARCH

Prevalence and Severity of Anemia in Treatment-Naïve Patients with Esophageal Squamous Cell Carcinoma at Diagnosis

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Abstract

Introduction: Anemia is common among patients with solid malignancies and may be particularly prevalent in esophageal cancer because dysphagia can contribute to inadequate nutritional intake and deficiencies. Pretreatment anemia may also adversely affect treatment tolerance and clinical outcomes, particularly in patients receiving radiotherapy. This study evaluated the prevalence and severity of anemia at diagnosis among patients with esophageal squamous cell carcinoma (ESCC). **Materials and Methods:** This prospective cross-sectional study included 160 newly diagnosed patients with ESCC. Blood samples were collected before initiation of any cancer-specific treatment to assess hemoglobin levels and determine the presence and severity of anemia. All participants provided informed consent. **Results:** Of the 160 patients, 72 (45.0%) had anemia at diagnosis. Among anemic patients, 55.6% had mild anemia, 26.4% had moderate anemia, and 18.0% had severe anemia. The prevalence of anemia was slightly higher among males than females (47.7% vs. 41.7%). **Conclusion:** Anemia was common among patients with ESCC at the time of diagnosis, with nearly half of the study population affected. Routine assessment of hemoglobin levels at diagnosis may facilitate early identification and appropriate management of anemia and may help optimize subsequent cancer treatment.

Keywords: Esophageal squamous cell carcinoma, anemia, hemoglobin, prevalence, radiotherapy, nutritional deficiency

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Introduction

Esophageal cancer is an aggressive malignancy associated with high mortality and poor prognosis. Most patients present with locally advanced or metastatic disease and may experience cancer-related complications, including dysphagia, pain, and weight loss. Esophageal cancer comprises two major histological subtypes: esophageal squamous cell carcinoma (ESCC) and adenocarcinoma. Although adenocarcinoma is the predominant histological subtype in many Western countries, ESCC remains more common in several Asian populations. ESCC is also one of the most common malignancies in the Kashmir Valley [1].

Abnormalities in hematological parameters have been associated with poor prognosis in patients with cancer and may reflect systemic and pathophysiological responses to advanced disease [2]. Anemia is particularly common among patients with malignancy, with approximately half of patients with solid tumors reported to have anemia at diagnosis. Pretreatment anemia has been associated with reduced survival in several malignancies, including head and neck, lung, cervical, and esophageal cancers [3-6].

Hemoglobin concentration may also influence patients' quality of life and tolerance of cancer treatment. Several randomized controlled trials and community-based studies have reported associations between higher hemoglobin levels and improved quality of life [7-10]. Furthermore, maintaining adequate hemoglobin levels has been proposed as a potential factor in optimizing treatment outcomes, particularly among patients with advanced malignancies [11-13].

Patients with esophageal cancer frequently present with dysphagia, which can impair oral intake and contribute to malnutrition and micronutrient deficiencies. These factors may further increase the risk of anemia. Because anemia may affect treatment tolerance and potentially influence the effectiveness and outcomes of cancer therapy, particularly radiotherapy, identifying anemia before treatment initiation is clinically relevant.

Therefore, this study aimed to determine the prevalence and severity of anemia among patients with newly

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diagnosed ESCC before the initiation of cancer-specific treatment.

Materials and Methods

This prospective cross-sectional study was conducted between June 2016 and May 2018. A total of 160 newly diagnosed patients with esophageal squamous cell carcinoma (ESCC) registered at the Department of Radiation Oncology, Sher-i-Kashmir Institute of Medical Sciences, Srinagar, Kashmir, were included in the study. The inclusion criteria comprised all newly diagnosed patients with ESCC who provided informed consent. The exclusion criteria were non-squamous histological subtypes, a history of prior blood transfusion, or refusal to participate.

Blood samples were collected at the time of initial diagnosis, before initiation of any treatment. A 2-mL venous blood sample was obtained from each patient and transported to the hematology laboratory. A complete blood count, including hemoglobin concentration, white blood cell count, and platelet count, was performed.

Anemia was defined as a hemoglobin concentration of <13 g/dL in adult men and <12 g/dL in non-pregnant adult women [14]. The severity of anemia was classified into three groups: mild (11–11.9 g/dL in non-pregnant women and 11–12.9 g/dL in men), moderate (8–10.9 g/dL in both men and women), and severe (<8 g/dL in both men and women) [14].

Data were analyzed using SPSS for Windows, version 22. Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation.

Ethical approval for the study was obtained from the Institutional Ethics Committee of Sher-i-Kashmir Institute of Medical Sciences. The study was conducted in accordance with the Declaration of Helsinki (1975), and written informed consent was obtained from all participants.

Table 1. Baseline Characteristics of the Study Population (N = 160)

Characteristic	Frequency (n)	Percentage (%)
Age (years)		
≤60	68	42.5
>60	92	57.5
Sex		
Male	88	55
Female	72	45
ECOG performance status		
≤1	109	68.1
≥2	51	31.9
Disease stage		
Early	13	8.1
Locally advanced	96	60.0
Metastatic	41	25.6
Unknown	10	6.3

ECOG, Eastern Cooperative Oncology Group.

Table 2. Distribution of Anemia According to Sex among Patients with ESCC

Sex	Anemic, n (%)	Non-anemic, n (%)	Total, n
Male	42 (47.7)	46 (52.3)	88
Female	30 (41.7)	42 (58.3)	72
Total	72 (45.0)	88 (55.0)	160

ESCC, esophageal squamous cell carcinoma.

Table 3. Severity of anemia according to Sex among Anemic Patients with ESCC

Sex	Mild, n (%)	Moderate, n (%)	Severe, n (%)	Total, n
Male	9 (21.4)	10 (23.8)	23 (54.8)	42
Female	4 (13.3)	9 (30.0)	17 (56.7)	30
Total	13 (18.1)	19 (26.4)	40 (55.6)	72

Note: Percentages in the male and female rows are calculated using the number of anemic patients within each sex as the denominator. Percentages in the total row are calculated using all 72 anemic patients as the denominator. Abbreviation: ESCC, esophageal squamous cell carcinoma.

Results

Over the 2-year study period, 160 patients with esophageal squamous cell carcinoma were included in the study. The mean age of the patients was 61.6 years. There were 88 male patients (55%) and 72 female patients (45%). An Eastern Cooperative Oncology Group (ECOG) performance status of ≤1 was observed in 68.1% of patients, while 31.9% had a score of ≥2. The majority of patients had locally advanced disease (60%), followed by metastatic disease (25.6%) and early-stage disease (8.1%). In the remaining 6.3% of patients, the disease stage was unknown (Table 1).

Of the 160 patients evaluated, 45% (72 patients) were found to be anemic. Among the anemic patients, 18% had severe anemia, 26.4% had moderate anemia, and 55.6% had mild anemia (Table 2).

The prevalence of anemia was slightly higher in males (47.7%) than in females (41.7%). Among the 42 anemic male patients, 21.4% had severe anemia, 23.8% had moderate anemia, and 54.8% had mild anemia. Among the 30 anemic female patients, 13.3% had severe anemia, 30% had moderate anemia, and 56.7% had mild anemia (Table 3).

Discussion

More than 30% of cancer patients present with anemia at diagnosis, before the initiation of antineoplastic therapy. Anemia is more frequently detected in patients with advanced-stage disease, and chronic inflammation associated with advanced malignancy may contribute substantially to its development. The presence of anemia can adversely affect survival, disease progression, treatment efficacy, and patients' quality of life.

SCC occurs most commonly in older adults, while anemia is also a common health problem in developing countries, particularly among elderly populations [15]. In our region, ESCC is one of the most common cancers [1]. Therefore, the present study was conducted to assess the prevalence of anemia among patients with ESCC at initial presentation, before the initiation of treatment.

Our findings indicate that ESCC patients in our region have a high prevalence of anemia. Anemia may affect patients' ability to tolerate and respond to treatment. Radiotherapy, an important component of ESCC treatment, has been reported to be more effective in patients without anemia than in those with anemia [16]. In addition, anemia may contribute to chemotherapy dose reductions or treatment delays, which may subsequently reduce treatment intensity and tumor response.

The causes of anemia in ESCC patients are likely to be multifactorial. Differences in age, comorbidities, dietary habits, physical activity, nutritional status, and other individual characteristics may contribute to variations in the underlying causes and severity of anemia. Therefore, an individualized approach is required to identify the contributing factors and appropriately manage anemia in these patients.

In conclusion, anemia is a clinically important problem among patients with ESCC and may adversely affect survival, disease progression, treatment efficacy, and quality of life. Patients with ESCC should be carefully evaluated for the underlying causes of anemia, and appropriate treatment should be initiated promptly to correct reversible causes and optimize their overall management.

In this prospective study, nearly half of newly diagnosed patients with esophageal squamous cell carcinoma (ESCC) were found to have anemia before the initiation of cancer-specific therapy. Given the potential adverse effects of anemia on treatment tolerance, therapeutic response, and patient outcomes, routine assessment of hemoglobin levels should be incorporated into the initial evaluation of patients with ESCC. Early identification of the underlying causes and timely correction of anemia may improve supportive care and facilitate the optimal delivery of multimodality treatment.

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Statement of Transparency and Principles

• The authors declare no conflict of interest.

• The study was approved by the Research Ethics Committee of the authors' affiliated institution.

• The study data are available upon reasonable request.

• All authors contributed to the implementation of this research.

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