SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Radiotherapy

Impact of Baseline Nutritional Status on Treatment Tolerance in Cancer Patients Undergoing Radiotherapy: A Prospective Observational Study

Sara Harbaj[1*], Boutaina Agdi[1], Rania Chakir[1], Amina Majdi[1], Amine Lachgar[1], Karima Nouni[1], Hanan El Kacemi[1], Tayeb Kebdani[1], Khalid Hassouni[1]

[1]Department of Radiotherapy, National Institute of Oncology, Faculty of Medicine and Pharmacy – University Mohammed V, Rabat, Morocco

DOI: https://doi.org/10.36347/sasjm.2026.v12i05.030 | **Received:** 07.04.2026 | **Accepted:** 19.05.2026 | **Published:** 26.05.2026

***Corresponding author:** Sara Harbaj
Department of Radiotherapy, National Institute of Oncology, Faculty of Medicine and Pharmacy – University Mohammed V, Rabat, Morocco

Abstract **Original Research Article**

Nutritional status is a critical determinant in the management of oncology patients, as malnutrition can significantly impair treatment tolerance and exacerbate therapy-related toxicities. This prospective observational study, involving 140 patients at the Department of Radiotherapy, evaluated the impact of baseline nutritional status on the clinical tolerance of radiotherapy or concurrent chemoradiotherapy. Nutritional status was assessed prior to treatment using body mass index (BMI), recent weight loss, and serum albumin levels. Tolerance was monitored throughout therapy by recording adverse events according to CTCAE v5.0, treatment interruptions, protocol modifications, and unplanned hospitalizations. The cohort had a mean age of 57 years, with a predominance of head and neck (47.85%), cervical (30.71%), and prostate (21.43%) cancers. At the initiation of treatment, 45% of patients presented with impaired nutritional status. Among them, 65% experienced reduced treatment tolerance, compared to only 25% in the well-nourished group ($p < 0.001$). Malnourished patients exhibited significantly higher rates of severe fatigue (40% vs. 18%, $p = 0.02$), treatment interruptions or modifications (30% vs. 10%, $p = 0.01$), and unplanned hospitalizations (22% vs. 8%, $p = 0.02$). These findings demonstrate that baseline malnutrition is a strong predictor of poor tolerance and increased toxicity. This highlights the necessity for systematic early nutritional screening and proactive intervention to optimize therapeutic adherence and clinical outcomes for patients undergoing radiotherapy.

Keywords: Nutritional status, Malnutrition, Radiotherapy, Concurrent chemoradiotherapy, Treatment tolerance, Oncology.

INTRODUCTION

Cancer is frequently associated with nutritional disorders, particularly malnutrition and involuntary weight loss. These alterations are multifactorial and may result from tumor-induced metabolic changes, systemic inflammation, treatment-related toxicities, or reduced dietary intake due to symptoms such as anorexia, nausea, or dysphagia [1]. It is estimated that 30% to 50% of cancer patients experience some degree of malnutrition during their disease [2].

Malnutrition has been consistently associated with adverse clinical outcomes, including increased treatment-related toxicity, decreased tolerance to therapy, prolonged hospitalization, impaired immune function, and reduced quality of life [3]. In patients undergoing radiotherapy or concomitant chemoradiotherapy, nutritional deterioration may be further exacerbated by treatment-related side effects such as mucositis, dysphagia, nausea, and fatigue, which significantly impair oral intake [4].

Previous studies have demonstrated that poor nutritional status is an independent prognostic factor for treatment complications and mortality in oncology patients [5]. The underlying mechanisms involve a complex interplay between systemic inflammation, metabolic dysregulation, and progressive loss of skeletal muscle mass (sarcopenia), leading to reduced physiological reserve and decreased capacity to tolerate aggressive treatments [6].

Given these considerations, early nutritional assessment and intervention are now recognized as essential components of comprehensive cancer care. International guidelines from the European Society for Clinical Nutrition and Metabolism recommend systematic nutritional screening at diagnosis and throughout treatment to identify patients at risk and implement appropriate nutritional strategies [1].

Despite its clinical importance, the impact of nutritional status on treatment tolerance remains insufficiently explored in routine clinical practice, particularly in low- and middle-income countries. The aim of this study was therefore to evaluate the relationship between baseline nutritional status and treatment tolerance in patients undergoing radiotherapy or concomitant chemoradiotherapy at the National Institute of Oncology in Rabat.

MATERIALS AND METHODS

Study Design and Setting:

We conducted a prospective, descriptive, and analytical observational study within the Radiotherapy Department of the National Institute of Oncology in Rabat. This setting allowed for the monitoring of a diverse cohort of patients receiving modern radiotherapy protocols.

Study Population:

The study included 140 patients undergoing radiotherapy or concurrent chemoradiotherapy (CCRT) between January and June 2025.

- **Inclusion Criteria:** Patients aged ≥18 years, with a histologically confirmed cancer diagnosis, receiving curative-intent radiotherapy or CCRT, and having complete baseline nutritional data.
- **Exclusion Criteria:** Patients with severe cognitive impairment, those receiving exclusively palliative care, or those with incomplete medical records.

Nutritional Assessment:

Nutritional status was assessed at baseline, immediately before the initiation of treatment. Patients were classified as having "impaired nutritional status" if they met at least one of the following criteria: BMI < 18.5 kg/m², unintentional weight loss > 10% within the previous 6 months, or documented hypoalbuminemia.

Assessment of Treatment Tolerance:

Treatment tolerance was evaluated throughout the course of radiotherapy. Adverse events were recorded and graded according to the Common Terminology Criteria for Adverse Events (CTCAE) v5.0. "Reduced treatment tolerance" was defined as the occurrence of at least one of the following: unplanned treatment interruption, protocol modification, unplanned hospitalization, or severe clinical toxicity requiring medical intervention.

Data Collection:

Clinical and nutritional data were collected prospectively throughout the study period using a standardized data collection form.

Statistical Analysis:

Descriptive statistics were used to summarize patient characteristics. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation. Comparisons between groups were performed using the Chi-square test (or Fisher's exact test) and the student's t-test. A p-value < 0.05 was considered statistically significant. Statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA).

RESULTS

Patient Characteristics

A total of 140 patients were included in the study. The population consisted of 82 females (58.6%) and 58 males (41.4%), with a mean age of 57 ± 12 years (Table 1).

Table 1: Socio-demographic characteristics of the study population (N=140)

Characteristic	Number (%)
Female	82 (58.6%)
Male	58 (41.4%)

Tumor site distribution

The most frequent tumor sites were head and neck cancer (47.85%), cervical cancer (30.71%), and prostate cancer (21.43%) (Table 2).

Table 2: Distribution of patients according to primary tumor site

Cancer type	Percentage
Head and neck cancer	47.85%
Cervical cancer	30.71%
Prostate cancer	21.43%

Baseline Nutritional Status

At baseline, 63 patients (45%) presented impaired nutritional status based on predefined criteria (Figure 1).

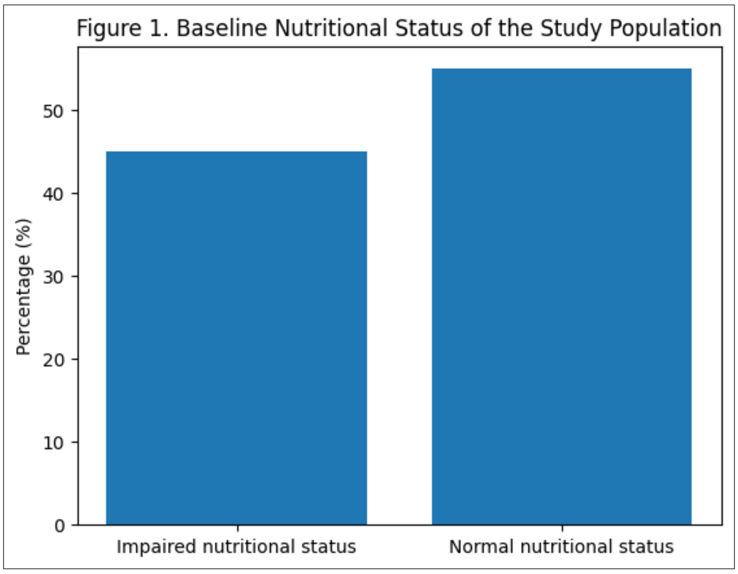

Figure 1. Baseline Nutritional Status of the Study Population

Distribution of patients according to nutritional status at baseline.

Among these patients, the most frequently observed abnormalities were:

- Significant weight loss (>10%)
- Low BMI (<18.5 kg/m²)
- Hypoalbuminemia

Treatment Tolerance

Overall Treatment Tolerance

Reduced treatment tolerance was significantly more frequent in patients with impaired nutritional status compared to those with normal nutritional status (65% vs 25%, $p < 0.001$) (Figure 2).

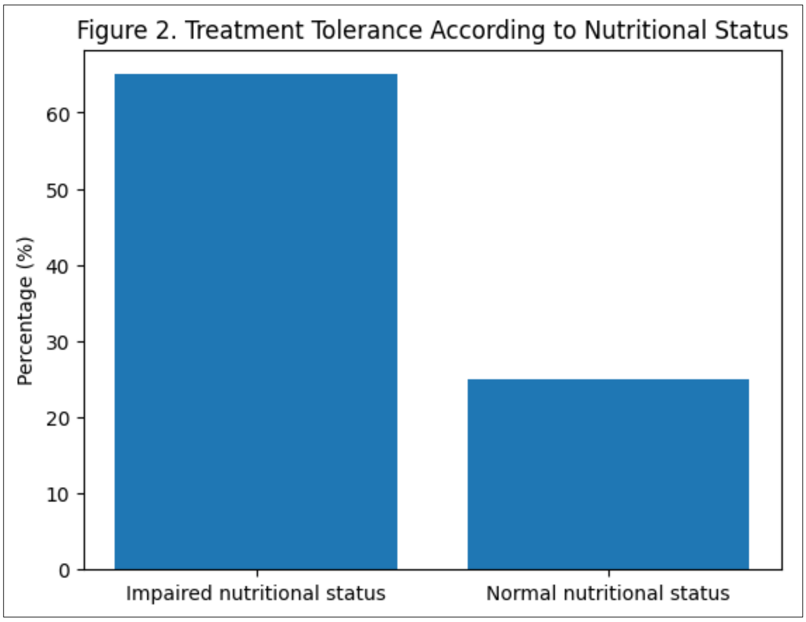

Figure 2. Treatment Tolerance According to Nutritional Status

Reduced treatment tolerance was significantly higher in malnourished patients (65% vs 25%, $p < 0.001$).

This finding indicates a strong association between impaired nutritional status and reduced treatment tolerance.

Adverse Events

Adverse events in malnourished patients were dominated by severe fatigue (40%) and digestive toxicity (28%). Other adverse events accounted for 32% of cases (including mucositis, hematological toxicity, and other less frequent complications) (Figure 3).

Fatigue was the most common adverse event and was significantly more frequent in malnourished patients compared to well-nourished patients (40% vs 18%, p = 0.02).

Digestive toxicity also tended to be more frequent in malnourished patients, although this difference did not reach statistical significance (28% vs 18%, p = 0.08).

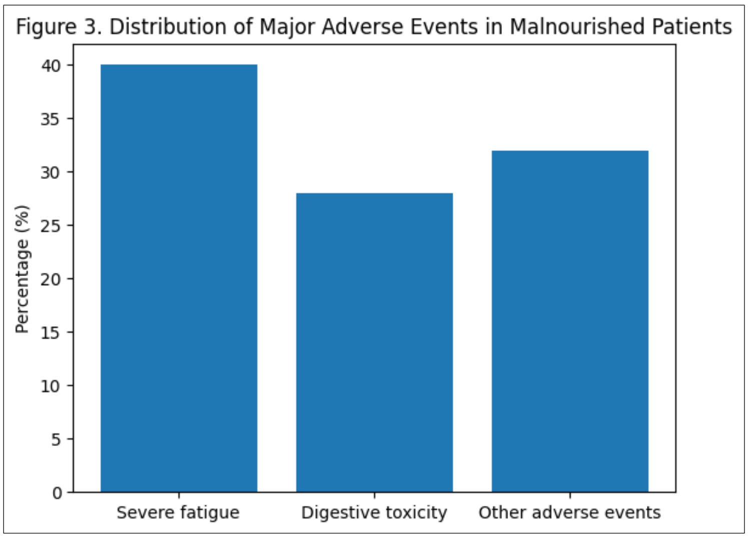

Figure 3. Distribution of Major Adverse Events in Malnourished Patients

Severe fatigue and digestive toxicity were the most frequent adverse events. Other events included mucositis, hematological toxicity, and less frequent complications.

Treatment Interruptions and Modifications

Treatment interruption or protocol modification occurred in 30% of malnourished patients compared to 10% in patients with normal nutritional status (p = 0.01).

Hospitalization

Hospitalization during treatment was significantly more frequent in malnourished patients (22% vs 8%, p = 0.02) (Figure 4).

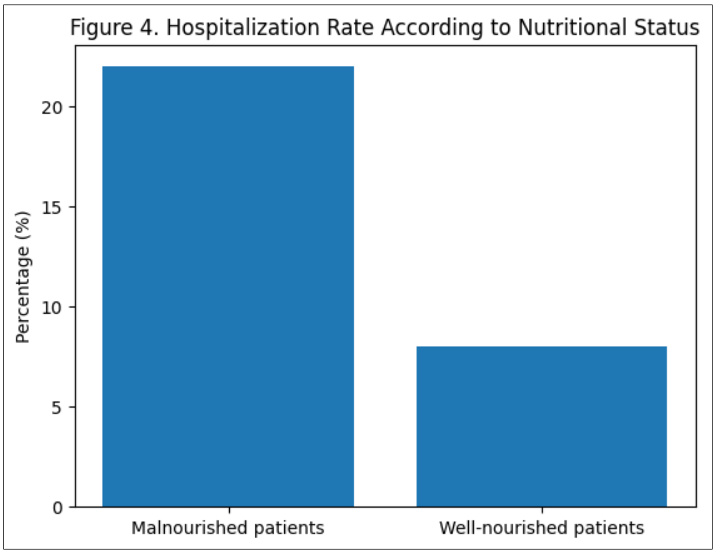

Figure 4. Hospitalization Rate According to Nutritional Status

Hospitalization was more frequent in malnourished patients (22% vs 8%, p = 0.02).

DISCUSSION

Malnutrition is a major clinical issue in oncology and is associated with increased morbidity, reduced treatment tolerance, and poorer clinical outcomes [1–3]. Its pathophysiology is multifactorial, involving complex interactions among tumor-induced metabolic alterations, systemic inflammation, and reduced dietary intake.

In cancer patients, chronic inflammation driven by cytokines such as interleukin-6 and tumor necrosis factor-alpha contributes to a hypercatabolic state, leading to progressive weight loss and muscle wasting. This process, commonly referred to as cancer cachexia, is characterized by a negative protein and energy balance and is often resistant to conventional nutritional support [2,4]. In addition, the development of sarcopenia further compromises functional status and reduces patients' ability to tolerate aggressive treatments such as radiotherapy or chemoradiotherapy [5].

In the present study, 45% of patients presented impaired nutritional status at baseline, which is consistent with previously reported prevalence rates in cancer populations ranging from 30% to 50% [3,6]. This high prevalence is consistent with previous literature and reinforces the need for systematic nutritional screening in routine oncology practice.

Our findings demonstrate a strong association between malnutrition and reduced treatment tolerance. Malnourished patients were more likely to experience severe fatigue, treatment interruptions, and hospitalization. These results are consistent with previous studies showing that poor nutritional status is an independent predictor of treatment-related toxicity and clinical complications [7].

Fatigue, the most frequently observed adverse event in our cohort, is a multifactorial symptom closely linked to systemic inflammation, metabolic imbalance, and reduced muscle mass [5]. The loss of skeletal muscle (sarcopenia) leads to decreased physical performance and reduced physiological reserve, thereby limiting patients' capacity to cope with treatment-related stress.

Digestive toxicity plays a central role in the deterioration of nutritional status during radiotherapy. Treatment-induced mucositis, nausea, vomiting, and anorexia reduce oral intake and contribute to progressive weight loss. This creates a vicious cycle in which malnutrition exacerbates treatment-related toxicity, and toxicity further worsens nutritional status [4]. Similar findings have been reported in studies demonstrating that gastrointestinal toxicity is associated with reduced oral intake and poorer outcomes during radiotherapy [8].

Treatment interruptions are of particular concern in radiotherapy, as prolongation of overall treatment time may compromise tumor control. Accelerated tumor cell repopulation during radiotherapy has been well described and is a key mechanism underlying treatment failure with prolonged treatment duration [9].

Hospitalization was also more frequent among malnourished patients in our study, reflecting the increased burden of complications associated with undernutrition. Previous studies have demonstrated that malnutrition is associated with higher morbidity, increased infection risk, longer hospital stays, and increased healthcare costs [10].

International guidelines from the European Society for Clinical Nutrition and Metabolism emphasize the importance of early nutritional assessment and intervention in cancer patients [1]. Nutritional strategies, including dietary counseling, oral nutritional supplementation, enteral nutrition, and parenteral support, may improve treatment tolerance and clinical outcomes [11].

In addition, early nutritional intervention has been shown to improve quality of life and reduce treatment interruptions in patients undergoing radiotherapy [12]. These findings support the integration of structured nutritional pathways into standard oncological care.

From a clinical perspective, our results highlight the need for systematic nutritional screening at the time of diagnosis and throughout treatment. Identifying patients at risk of malnutrition allows for early intervention, which may improve treatment adherence and reduce complications.

This study has several limitations. Its observational design does not allow for establishing causal relationships between nutritional status and treatment tolerance. In addition, the absence of multivariate analysis limits the ability to control for potential confounding factors. The definition of malnutrition was based on available clinical parameters rather than standardized criteria, which may have led to misclassification. Finally, the single-center design may limit the generalizability of the findings.

These findings are particularly relevant in resource-limited settings, where nutritional support is often underrecognized despite its potential impact on treatment outcomes.

CONCLUSION

This study demonstrates that impaired nutritional status is strongly associated with reduced treatment tolerance in patients undergoing radiotherapy or concomitant chemoradiotherapy. Malnourished patients experienced higher rates of severe toxicity, treatment interruption, and hospitalization.

These observations highlight the importance of systematic nutritional assessment at baseline and throughout treatment. Early and appropriate nutritional interventions may help reduce treatment-related complications, improve adherence to therapy, and ultimately enhance clinical outcomes.

Future prospective studies using standardized diagnostic criteria for malnutrition are needed to define better the role of nutritional support in optimizing tolerance to oncological treatment.

Nutritional management should therefore be considered an integral component of comprehensive oncological care.

REFERENCES

1. Arends J, Bachmann P, Baracos V, *et al.,* ESPEN guidelines on nutrition in cancer patients. *Clinical Nutrition*. 2017 ;36(1):11–48. DOI: https://doi.org/10.1016/j.clnu.2016.07.015
2. Fearon K, Strasser F, Anker SD, *et al.,* Definition and classification of cancer cachexia: an international consensus. *Lancet Oncology*. 2011;12(5):489–495. DOI: https://doi.org/10.1016/S1470-2045(10)70218-7
3. Pressoir M, Desné S, Berchery D, *et al.,* Prevalence, risk factors and clinical implications of malnutrition in French Comprehensive Cancer Centres. *British Journal of Cancer*. 2010;102(6):966–971.DOI: https://doi.org/10.1038/sj.bjc.6605664
4. Argilés JM, Busquets S, Stemmler B, López-Soriano FJ. Cancer cachexia: understanding the molecular basis. *Nature Reviews Cancer*. 2014;14(11):754–762. DOI: https://doi.org/10.1038/nrc3829
5. Bower JE. Cancer-related fatigue—mechanisms, risk factors, and treatments. *Nature Reviews Clinical Oncology*. 2014;11(10):597–609. DOI: https://doi.org/10.1038/nrclinonc.2014.127
6. Hébuterne X, Lemarié E, Michallet M, *et al.,* Prevalence of malnutrition and current use of nutrition support in patients with cancer. *JPEN J Parenter Enteral Nutr*. 2014;38(2):196–204.DOI: https://doi.org/10.1177/0148607113502674
7. Langius JAE, Zandbergen MC, Eerenstein SEJ, *et al.,* Effect of nutritional interventions on nutritional status, quality of life and mortality in patients with head and neck cancer receiving (chemo) radiotherapy: a systematic review. *Clinical Nutrition*. 2013;32(5):671–678. DOI: https://doi.org/10.1016/j.clnu.2013.06.012
8. Ravasco P, Monteiro-Grillo I, Vidal PM, Camilo ME. Dietary counseling improves patient outcomes during radiotherapy. *Journal of Clinical Oncology*. 2005;23(7):1431–1438. DOI: https://doi.org/10.1200/JCO.2005.02.054
9. Withers HR, Taylor JMG, Maciejewski B. The hazard of accelerated tumor clonogen repopulation during radiotherapy. *Acta Oncologica*. 1988;27(2):131–146. DOI: https://doi.org/10.3109/02841868809090333
10. Correia MITD, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. *Clinical Nutrition*. 2003;22(3):235–239. DOI: https://doi.org/10.1016/S0261-5614(02)00215-7
11. Baldwin C, Spiro A, Ahern R, Emery PW. Oral nutritional interventions in malnourished patients with cancer: a systematic review and meta-analysis. *Journal of the National Cancer Institute*. 2012;104(5):371–385. DOI: https://doi.org/10.1093/jnci/djr556
12. Isenring EA, Capra S, Bauer JD. Nutrition intervention is beneficial in oncology outpatients receiving radiotherapy to the gastrointestinal or head and neck area. *British Journal of Cancer*. 2004;91(3):447–452. DOI: https://doi.org/10.1038/sj.bjc.6601962