Oncology Section

Assessing Cancer-related Fatigue in Survivors Undergoing Diverse Treatments: A Prospective Cohort Study

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ABSTRACT

Introduction: Cancer-related Fatigue (CRF) is a common and debilitating concern among cancer survivors, significantly affecting their physical, emotional, and social well-being. In India, the growing number of survivors has made CRF a major post-treatment issue. However, it remains under-recognised and inadequately addressed. This study explores the prevalence, determinants, and severity of CRF among Indian cancer survivors, underlining the need for targeted interventions.

Aim: To assess the prevalence and contributing factors of CRF in cancer survivors undergoing diverse treatments.

Materials and Methods: This prospective cohort study was conducted at the Outpatient Department (OPD) of Radiotherapy (RT), Midnapore Medical College and Hospital, West Bengal, India, between 1st May 2024 and 31st October 2024. Demographic and clinical data were collected through case files and structured interviews. The Brief Fatigue Inventory (BFI) was administered pre- and post-treatment. Statistical analysis was performed using Chi-square and Fisher's-exact test to compare the means of clinical data and other demographic data, with a significance threshold of p-value≤0.05. IBM, Statistical Package for Social Sciences (SPSS) software, version 23.0, was used.

Results: A total of 154 patients were evaluated, with a median age of 50 years and a female predominance of 122 (79.20%). Breast cancer was the most prevalent cancer, 72 (46.80%), followed by head and neck, 20 (13%) and gynaecological cancers (ovary + cervix) 28 (18.20%). Multimodality treatment was administered to 94 patients (61%). Disease status was stable in 117 (75.97%) and relapsed/progressive in 37 (24.03%) patients. Median BFI scores increased from 2.80 (pre-treatment) to 4.55 (post-treatment), indicating a shift from mild to moderate fatigue. Significant associations were observed between fatigue severity and advanced stage, combined treatment modality, multiple chemotherapy lines, poor Performance Status (PS), and relapsed disease (p-value<0.05).

Conclusion: CRF was highly prevalent among Indian cancer survivors, particularly in those with advanced-stage or relapsed disease and those undergoing multimodal treatment. These findings highlight the pressing need for structured interventions and fatigue-specific support in survivorship care.

Keywords: Cancer survivors, Neoplasms, Quality of life, Patient-reported outcome measures

INTRODUCTION

Cancer-related Fatigue (CRF) is a pervasive and multifactorial condition that substantially impairs the physical, emotional, and social well-being of cancer survivors. It is characterised by a persistent, subjective sense of exhaustion or lack of energy, disproportionate to recent activity levels and not relieved by rest [1]. CRF can manifest during treatment and often persists well beyond its completion, remaining one of the most commonly reported and distressing symptoms among cancer survivors [2].

As cancer survival rates continue to improve globally—largely due to advancements in early detection and treatment—post-treatment survivorship issues such as CRF have become increasingly prominent [3,4]. In India, this trend is mirrored by rising incidence rates and an expanding survivor population. According to the National Cancer Registry Programme, India has over 14 million cancer survivors, with breast, oral, and colorectal cancers being among the most prevalent [5]. Despite this growing burden, CRF remains under-recognised and insufficiently addressed within the Indian healthcare system, where supportive care services are often limited [6].

The pathophysiology of CRF is complex, involving treatment-induced inflammation, immune dysregulation, neuroendocrine alterations, and psychological stress [7,8]. Chemotherapy, radiotherapy, and surgery—individually or in combination—contribute to fatigue through different mechanisms such as oxidative stress, circadian rhythm disruption, and tissue injury [9,10]. In addition, psychosocial factors such as depression, anxiety, and nutritional deficiencies further amplify fatigue severity [11].

Despite the extensive international literature on CRF, Indian data on its prevalence, determinants, and management strategies remain sparse. This lack of context-specific evidence hinders the integration of fatigue assessment and management into routine oncology practice. Hence, the present study was designed with the primary objective to estimate the prevalence of CRF in cancer patient populations. And the secondary objective was to study the association or impact of CRF with different treatment modalities, i.e., chemotherapy, radiation, etc. and correlation of CRF severity with clinical and demographic parameters

MATERIALS AND METHODS

This prospective cohort study was conducted at the Department of Radiotherapy, Midnapore MCH, West Bengal, India, between 1st May 2024 and 31st October 2024 [Ethical clearance was obtained with the number as IEC/2024/11].

Inclusion and Exclusion criteria: A total of 154 patients were enrolled based on predefined eligibility criteria. Adult patients (aged ≥18 years) with biopsy-confirmed malignancies of various primary sites and stages, attending either the Outpatient Department (OPD) or the daycare unit, were included. Patients with significant cognitive impairment or those unable to comprehend or complete the fatigue assessment tool were excluded from the study.

Sample size calculation: Sample size was calculated as per the OPD registration data. Around 20 patients came for chemotherapy, and 40 patients attended OPD every week. The study recruitment time was 6 months, and additionally, 6 months were allotted for follow-up of the last enrolled patient. All 154 eligible patients

who turned up during the follow-up visits were finally accrued for analysis.

Study Procedure

Parameters studied were

a) Demographic data

b) Disease parameters (Primary, Stage)

c) Treatment details (Cycles of chemotherapy, chemotherapy drugs, surgery, radiotherapy details)

d) The BFI scale questionnaire for the estimation of CRF was provided to cancer patients in their respective languages.

Study tools:

a) A questionnaire containing demographics, disease description/ stage/extent of treatment (chemotherapy/radiotherapy/surgery or any combination, etc.) was completed from the patient interview and case records.

b) Brief Fatigue Inventory (BFI)- The BFI is a screening tool which measures the severity of fatigue over the previous 24 h. The BFI has only nine items, with the items measured at 0-10 numeric rating scales. Three items ask patients to rate the severity of their fatigue at its "worst," "usual," and "now" during normal waking hours, with 0 being "no fatigue" and 10 being "fatigue as bad as you can imagine." Six items assess the amount that fatigue has interfered with different aspects of the patient's life during the past 24 h. The interference items include general activity, mood, walking ability, normal work (includes both work outside the home and housework), relations with other people, and enjoyment of life. The interference items are measured on a 0-10 scale, with 0 being "does not interfere" and 10 being "completely interferes". Fatigue was categorised using the BFI as either severe (score 7-10) or no severe (score 0-6), with the latter further subcategorised into moderate (score 4-6) and mild (score 0-3) [6].

Biopsy-proven cancer of different primaries and different stages attending the OPD and daycare of the department were enrolled based on the mentioned inclusion criteria. Basic demographic and clinical data were collected from patients' files and also from history taking or interviews. Each patient was asked for informed consent first, and after that, data collection began. Each patient was interviewed in private with the BFI questionnaire in the presence of their respective caregivers and our departmental nurse. Post-treatment questionnaire was taken 2 weeks after completion of treatment.

STATISTICAL ANALYSIS

Data were compiled and analysed using standard statistical software [IBM SPSS, version 23.0 software was used for statistical analysis.] Continuous variables were summarised using median and interquartile ranges, while categorical variables were expressed as proportions. The difference in pre- and post-treatment BFI scores was evaluated using paired t-tests. Associations between fatigue severity and clinical-demographic factors such as age, gender, cancer site, treatment modality, disease stage, and performance status were examined using Chi-square and Fisher's-exact tests where appropriate. A p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 154 cancer survivors were included in the analysis. The median age was 50 years (range: 21–75 years), with a predominant female representation 122 (79.20%). Breast cancer was the most frequently encountered primary site 72 (46.80%), followed by head and neck 20 (13%) and gynaecological cancers (ovary + cervix) 28 (18.20 %) [Table/Fig-1].
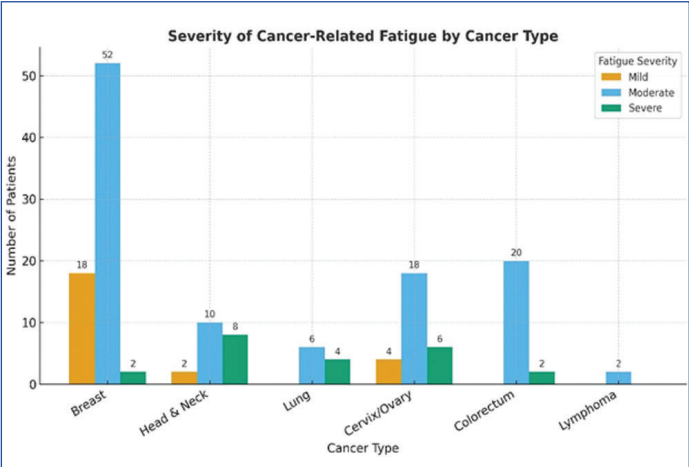
Parameters	Category	n (%)
Age (in years)	< 60	137 (89.0%)
	≥60	17 (11.0%)
Gender	Male	32 (20.80%)
	Female	122 (79.20%)
Primary site	Breast	72 (46.80%)
	Head and neck	20 (13.0%)
	Lung	10 (6.50%)
	Gynaecological cancer (cervix +ovary)	28 (18.20%)
	Colorectum	22 (14.30%)
	Lymphoma	2 (1.30%)
Treatment modality	Combined (Chemo + RT + Surgery)	94 (61%)
	Chemotherapy only	54 (35.10%)
	Radiotherapy only	04 (2.60%)
	Surgery only	02 (1.30%)
Disease stage	Locally advanced	74 (48.10%)
	Early	8 (5.20%)
	Advanced	18 (11.70%)
Fatigue score (Post-treatment)	Mild (0–3)	24 (15.60%)
	Moderate (4–6)	108 (70.10%)
	Severe (7–10)	22 (14.30%)

[Table/Fig-1]: Demographic and clinical characteristics of the study population (N=154).
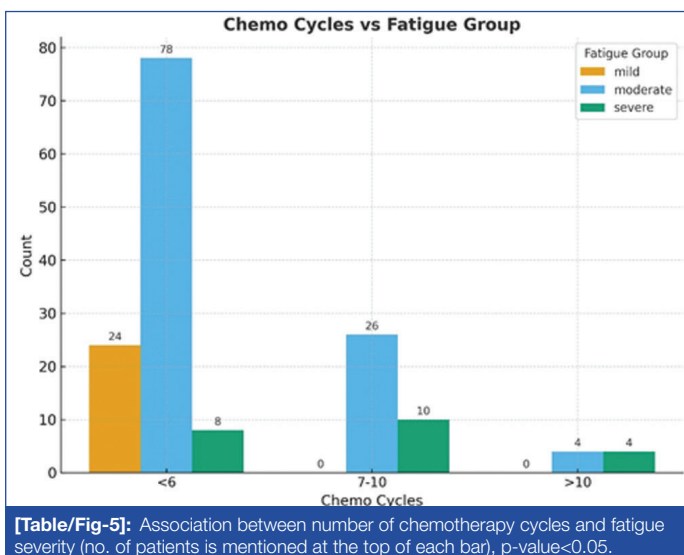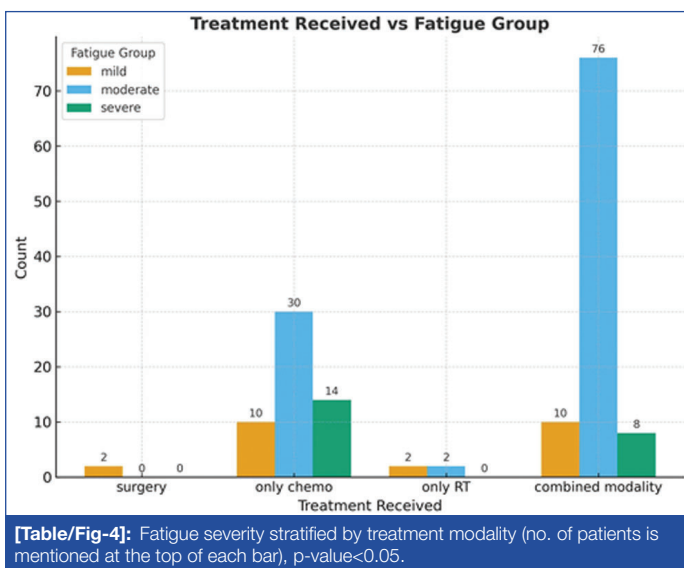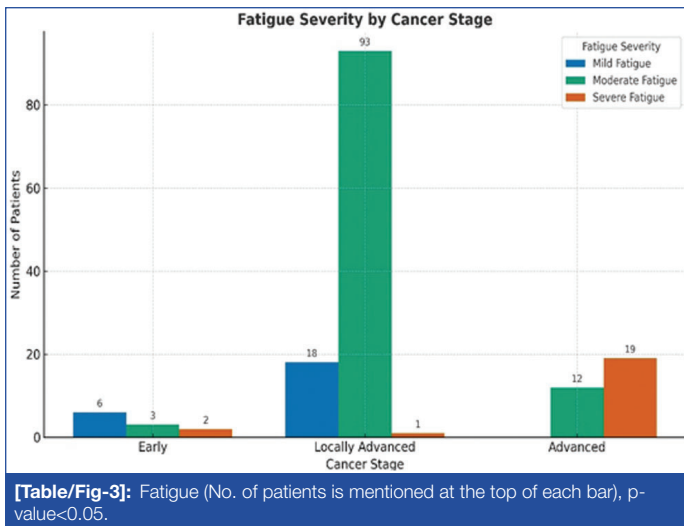RT: Radiotherapy; Chemo: Chemotherapy.

Multimodality treatment was administered to 94 (61%) of patients. Disease status was stable in 117 (75.97%) and relapsed/progressive in 37 (24.03%). Median follow-up duration was 6 months (range: 6-12 months).

The median pre-treatment BFI score was 2.80, indicative of mild fatigue. Post-treatment, the median score significantly increased to 4.55, reflecting moderate fatigue levels. This increase in fatigue severity was statistically significant (p-value<0.05).

Significant associations were observed between post-treatment fatigue severity and several clinical parameters [Table/Fig-1-5]. Advanced disease stage at presentation was significantly associated with moderate to severe fatigue (p-value<0.001). Single modality treatment, like only surgery or only RT, reflected mild fatigue, while multimodality treatments were significantly correlated with greater fatigue (p-value=0.01). Among patients who underwent chemotherapy, more than 7 cycles of chemo reflected greater fatigue (p-value=0.03). Poor performance status and poor outcome / relapsed cases were associated with a higher BFI score (p-value<0.05).

[Table/Fig-2]: Distribution of fatigue severity across primary cancer sites (no. of patients is mentioned at the top of each bar).

[Table/Fig-3]: Fatigue (No. of patients is mentioned at the top of each bar), p-value<0.05.

[Table/Fig-4]: Fatigue severity stratified by treatment modality (no. of patients is mentioned at the top of each bar), p-value<0.05.

[Table/Fig-5]: Association between number of chemotherapy cycles and fatigue severity (no. of patients is mentioned at the top of each bar), p-value<0.05.

DISCUSSION

The current prospective study highlights the significant prevalence and severity of CRF among Indian cancer survivors. The findings reveal that moderate to severe fatigue is common post-treatment, especially among patients with advanced disease stages, poor performance status, relapsed conditions, and those undergoing multimodal therapy.

The observed median increase in BFI scores—from 2.80 pre-treatment to 4.55 post-treatment—demonstrates a clinically meaningful progression from mild to moderate fatigue. This trend aligns with previous literature suggesting that cancer treatment,

particularly when combined across modalities, contributes to the amplification of fatigue symptoms [2,4,11-13].

Among the major contributing factors, advanced stage and relapsed disease were significantly associated with higher fatigue severity. This can be attributed to the cumulative physiological stress, increased inflammatory burden, and psychological toll associated with progressive malignancy [14,15]. Patients with stage III or IV disease frequently undergo more intensive treatment regimens, compounding fatigue through both biological and psychosocial mechanisms.

Another notable factor was treatment modality. Patients receiving combined therapies exhibited a higher proportion of moderate to severe fatigue compared to those undergoing monotherapy. Chemotherapy and radiotherapy are both independently associated with mitochondrial dysfunction, immune modulation, and hypothalamic-pituitary-adrenal axis disruption, all of which are implicated in the pathogenesis of CRF [7-9,13]. This was further reinforced by the association between an increased number of chemotherapy cycles and rising fatigue levels. Furthermore, poor performance status (ECOG ≥2) emerged as a strong predictor of post-treatment fatigue. This relationship is bidirectional—low functional reserve contributes to fatigue, while unresolved fatigue further limits activity, forming a self-perpetuating cycle [16].

The present study results are consistent with global studies. For example, Bower JE et al., reported persistent moderate to severe fatigue in nearly 40% of breast cancer survivors [17]. Similarly, Liu L et al., demonstrated a strong link between CRF severity and advanced stage, chemotherapy exposure, and psychological distress in a large Chinese cohort [18]. The current findings extend this evidence into the Indian context, where supportive care services remain fragmented and under-resourced, and longitudinal studies have demonstrated a sustained negative impact of cancer-related fatigue on quality of life among survivors [6,19,20]

Despite its prevalence, CRF is often under-reported by patients and under-recognised by clinicians. In resource-constrained settings like India, there is a need for low-cost, scalable interventions, such as structured physical activity programmes, nutrition counselling, and basic psychoeducation. Several studies support the efficacy of aerobic exercise and Cognitive Behavioural Therapy (CBT) in alleviating CRF [21-24]. While pharmacological options exist, they should be cautiously prescribed and are often adjunctive rather than first-line [22].

From a clinical perspective, routine screening for fatigue using validated tools like the BFI should be integrated into survivorship protocols given its reliability and feasibility in oncology settings [25]. This would allow timely identification and triage of at-risk patients for supportive interventions. Moreover, clinician awareness and multidisciplinary collaboration remain crucial in effectively managing CRF.

Limitation(s)

Median follow-up period was 6 months; hence, authors could not document late relapses. The department does not have a radiotherapy machine or a dedicated surgical oncology unit, hence a lot of patients were referred to other affiliated hospitals for further management. Many patients had defaulted, hence post-treatment fatigue scoring could not be evaluated, reflecting the small sample size. In the chemotherapy part, authors could not focus on the nature of chemotherapy drugs because of the vast diversity of regimens.

CONCLUSION(S)

Cancer-related fatigue is a highly prevalent and clinically significant concern among Indian cancer survivors, particularly those with advanced or relapsed disease, poor performance status, and those undergoing multimodal therapy. The study underscores the need for routine fatigue assessment in clinical practice and highlights the

urgency of integrating fatigue management into survivorship care. Implementation of targeted, low-cost, and scalable interventions—such as exercise, psychosocial support, and patient education—can substantially improve the quality of life for affected individuals. Greater awareness and prioritisation of CRF in oncology care pathways is essential to address this often-neglected but debilitating symptom.

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