effects of hypoxia on radiation therapy outcome are well established. The exact prevalence of anemia in Indian cancer patients is not well documented, especially in those presenting for radiotherapy treatment. The National Cancer Institute (NCI) defines anemia as a hemoglobin level less than 12g/dl. Haemoglobin levels between 10 and 12 g/dl, 8 and 10 g/dl, 6.5 and 7.9 g/dl, and less than 6.5 g/dl are graded as mild, moderate, severe, and life threatening anemia respectively.^[1] Mild-to-moderate anemia in cancer patients often gets neglected in the pursuit for controlling the primary disease. Disruption in radiotherapy treatments as a consequence of anemia can also adversely affect the final treatment outcome by prolonging overall treatment time. With widespread use of concurrent chemoradiotherapy schedules, anemia evaluation becomes all the more important.

A retrospective analysis of pre-treatment hemoglobin levels was done in 400 cancer patients attending our radiotherapy clinic from January 2007 to July 2007. Only patients with solid malignancies were included in the analysis. An analysis of patient treatment records prior to starting of radiotherapy treatment was done.



Figure 1: Distribution of hemoglobin levels according to gender

PRE-TREATMENT ANEMIA EVALUATION IN CANCER PATIENTS ATTENDING RADIOTHERAPY CLINIC: RESULTS FROM A SINGLE INDIAN CENTER

Sir,

Anemia evaluation is important in cancer patients undergoing radiotherapy treatment as hypoxic cells are known to be 2-3 times more radioresistant than euxoic cells. The detrimental



Figure 2: Distribution of hemoglobin levels according to age



Figure 4: Mean hemoglobin levels correlated with stage of disease of the patients. Error bars represent standard deviation

The inclusion criteria included (1) no prior radiotherapy or chemotherapy treatment, (2) age more than or equal to 14 years, (3) patients planned for radical treatment or postoperative adjuvant treatment. The exclusion criteria included (1) all hematological malignancies, (2) patients planned for palliative treatments. After screening, 300 patients were available for final evaluation. Anemia was classified as mild, moderate, or severe as per National Cancer Institute (NCI) criteria.^[1]

The results are shown in Table 1 and Figures 1-4. The hemoglobin level for the whole group



Figure 3: Karnofsky performance scale (KPS) as a function of mean hemoglobin level. Error bars represent standard deviation

ranged from 6.5 g/dl to 15.2 g/dl with a mean of 11.5 ± 1.1 g/dl (mean \pm SD). Overall, 54.7% patients had hemoglobin below 12 g/dl. There were 46 patients above 65 years of age, with hemoglobin values ranging from 6.1 g/dl to 14.1 g/dl. Mean hemoglobin for male patients in this group was 11.4 ± 1.3 g/dl and for female patients, 10.7 ± 1.7 g/dl.

The optimum hemoglobin level in cancer patients is considered to be 12g/dl. Anemia in patients with solid malignancies is multifactorial though in our patients, a major contributing factor may be poor pre-treatment nutritional status and bleeding from tumors. Cancer-related anemia and anemia of chronic disease are responsible for low hemoglobin levels in a significant number of such patients. Pure red cell aplasia, a form of hypoproliferative anemia, has been associated with thymoma, lymphomas, leukemias, bronchogenic cancer, adenocarcinomas, etc.

Anemia is an established prognostic marker in head and neck, bladder, cervix, and anal cancer patients. The European Cancer Anemia Survey (ECAS) found incidence of anemia in 38.9% of cancer patients at the time of enrolment, and

Table 1: Characteristics of patients under study (n = 300)

Age (range) 20 – 80 years Mean age - 52 years Males - 167 Females - 133

Tumor type	No. of patients (%)	Median KPS	Hb range (g/dl)	Mean Hb (g/dl)	%age with Hb <12g/dl
Head and neck	96 (32)	70	7.2-14.8	10.4±1.3	44.8
Cancer cervix	48(16)	60	6.5-14	9.9±1.8	60.4
Cancer breast	37(12.3)	80	8.2-13.5	11±1.2	72.9
CNS tumors	26(8.7)	60	7-14.8	12.5±2	42.3
Lung cancer	20 (6.7)	60	8-14	11	75
Esophageal cancer	18(6)	60	9-12.5	10.6 ±1.1	55.6
Rectal and anal cancer	13(4.3)	70	8-13.4	11±1.4	53.8
Bone tumors	9(3)	70	10-13.7	11±1.8	44.4
Others*	11.1	-	-	-	40

*Genitourinary, endometrium, eye, gall bladder, stomach, and soft tissue sarcomas, KPS - Karnofsky performance status, Hb - hemoglobin, CNS - central nervous system

Table 2: Studies of anemia prevalence in cancer patients

Study	No. of patients	Median age of patients (years)	Anemia prevalence at enrolement (%)	Patients treated for anemia (%)
French anemia cancer treatment (F-ACT) ^[4]	2782	61	44	75
Australian anemia cancer survey ^[5]	694	60	35	41
European anemia cancer survey (EACS) ^[2]	15,367	59	39.3	38.9
Anemia in japanese cancer patients ^[6]	148	-	44	-
Italian survey at national level ^[7]	1763	-	56	-

this increased to 67% during the survey. Majority of these patients (61%) remained untreated for anemia.^[2] The overall prevalence of anemia in our cancer patients who had not received any treatment was 54.7%. This is likely to be higher post-treatment and if all stages and age groups are included. Harrison et al. have reported 41% of patients as having anemia hemoglobin less than 12 g/dl) before starting radiotherapy, and this increased to 54% at the end of treatment. ^[3] Anemia prevalence in cancer patients has also been studied in a few other studies [Table 2].^[2,4-7] A common consequence of anemia in cancer patients is fatigue, which is seen in 78% of anemic patients. Fatigue due to anemia can be even more debilitating than pain but is largely ignored during treatment.

Anemia in malignancy is usually managed using oral hematinics, blood transfusions; though the

use of recombinant human erythropoietin is increasing in patients with chemotherapy-induced anemias. Newer cancer treatment protocols in our country should be designed keeping in mind the high prevalence of anemia in our cancer patients. Measures directed towards characterization and treatment of anemia should be incorporated as an integral part of our cancer management protocols.

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