



“PREVALENCE AND RISK FACTORS OF ANEMIA IN PATIENTS DIAGNOSED WITH CANCER AT A TERTIARY CARE CENTER”

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Abstract

Introduction: Anemia, defined as a reduction in hemoglobin levels, is a significant comorbidity in patients with cancer, often contributing to poor treatment outcomes and reduced quality of life. This study aimed to assess the prevalence and risk factors of anemia among cancer patients at a tertiary care center.

Methods: This retrospective study was conducted in the Department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, from January 2016 to July 2016. In this study, we included 170 patients diagnosed with various malignancies admitted to the Transfusion Medicine department of our study institution.

Result: The mean age of participants was 49.17 ± 17.93 years, with the majority (24.71%) aged 41–50 years. Females comprised 55% of the total patients. The most prevalent blood group was A+ (37.06%), and 70% had a history of blood transfusion. Lung (24.71%), stomach (21.76%), and breast cancers (16.47%) were the most common diagnoses. Anemia was present in 90.59% of patients, with

moderate anemia (34.42%) and severe anemia (41.56%) being the most frequent. Life-threatening anemia (Hb <6.5 g/dL) was found in 18.83% of cases. The average hemoglobin level was 8.02 ± 6.53 g/dL. Identified risk factors for anemia included age >50 years (34.71%), chronic inflammation (30.00%), history of blood transfusions (11.18%), sex, nutritional deficiencies, etc.

Conclusion: Anemia is highly prevalent among cancer patients, with moderate to severe forms being most common. Timely identification and management of underlying risk factors are essential to improve clinical outcomes and quality of life in this patient population.

Keywords: Anemia, Cancer, Hemoglobin, Risk Factors, Prevalence, Blood Transfusion

Introduction

Anemia, defined as a reduction in red blood cells or hemoglobin levels, typically below 12 g/dL^[40] or hematocrit less than 37 cL/L, is a widespread health issue affecting populations in both developed and developing countries.^[1,2] While normal hemoglobin levels differ by sex, ranging from 14–18 g/dL in men and 12–16 g/dL in women^[40], any significant drop in these values, particularly in vulnerable groups such as cancer patients, can lead to serious clinical consequences.^[3]

Anemia is a common comorbidity in cancer and is particularly prevalent in patients with solid tumors, with reported rates ranging from 30% to 90%^[41]. Among patients with gynecologic malignancies, this prevalence ranges from 26% to 85%.^[4] The causes of anemia in cancer are multifactorial, involving both disease-related factors, such as bone marrow infiltration and chronic inflammation, and treatment-related effects like chemotherapy-induced myelosuppression and reduced erythropoietin production. Anemia in this setting is associated with reduced survival, impaired treatment response, and diminished quality of life.^[5–7]

Incidence rates of anemia in cancer patients vary from 22.7% to 63%, increasing significantly to 89% following chemotherapy.^[8–10] In breast cancer, for instance, the development of anemia correlates with decreased treatment response and quality of life.^[11,12] A 6-month follow-up study by Seshadri et al. found that 73% of patients receiving both chemotherapy and radiotherapy developed anemia, compared to 58% of those undergoing chemotherapy alone.^[13] The European Cancer Anemia Survey (ECAS), a large-scale multinational prospective study, further highlighted the burden of anemia across different tumor types and treatment modalities.^[14]

Multiple factors contribute to the development of anemia in cancer patients, including demographic and biological variables, treatment modalities, and cancer type.^[15–17] Socio-demographic factors such as advancing age, female sex, and Hispanic ethnicity have been shown to increase the risk.^[15] The malignancy itself, depending on its type and biological behavior, also plays a critical role.^[18,19] Additionally, direct bone marrow infiltration, surgical interventions, chemotherapy, radiotherapy, and inflammatory cytokine release further contribute to anemia in cancer patients.^[20]

Therefore, this study aimed to evaluate the prevalence and associated risk factors of anemia in patients diagnosed with cancer at a tertiary care center.

Methodology & Materials

This retrospective study was conducted in the Department of Transfusion Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, from January 2016 to July 2016. In this study, we included 170 patients diagnosed with various malignancies admitted to the Transfusion Medicine department of our study institution.

These are the following criteria to be eligible for enrollment as our study participants: a) Patients of all ages and genders; b) Patients diagnosed with various malignancies; c) Patients undergoing chemotherapy, radiotherapy, surgery, or hormonal therapy; d) Patients who were willing to participate were included in the study. And a) Patients with any surgical complication; b) Patients with Coagulopathy or receiving anticoagulants; c) Patients with any hemorrhage in the past 3 months as massive hemoptysis, epistaxis, hematemesis, hematochezia, melena, and menorrhagia; d) Patients with transfusion of red cell concentrates in the past 3 months were excluded from our study.

Data Collection: Patient data were collected using a structured proforma and included demographic information (age, sex), blood group, history of blood transfusions, type of malignancy, and comorbidities (e.g., diabetes mellitus, chronic kidney disease). Laboratory data were obtained from hospital records and included hemoglobin levels and serum markers for vitamin B12, folate, and iron, where available.

Study Outcomes: Hb levels were determined in patients’ medical records based on blood analysis, and patients with Hb levels ≤ 12 g/dL (during all follow-ups) were considered as anemic breast cancer patients. Hemoglobin levels >12 g/dL were considered normal (anemia not present). According to the National Cancer Institute, anemia is classified as mild (10 g/dL – lower limit of normal range, moderate 8g/dl-10g/dl, severe 6.5 g/dl to 7.9 g/dl, and life threatening <6.5 g/dl.

Statistical Analysis: All data were recorded systematically in a pre-formatted data collection form. Quantitative data was expressed as mean and standard deviation, and qualitative data was expressed as frequency distribution and percentage. The data were analyzed using the chi-square test. A p-value <0.05 was considered significant. Statistical analysis was performed by using SPSS 19 (Statistical Package for Social Sciences) for Windows version 10. This study was ethically approved by Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

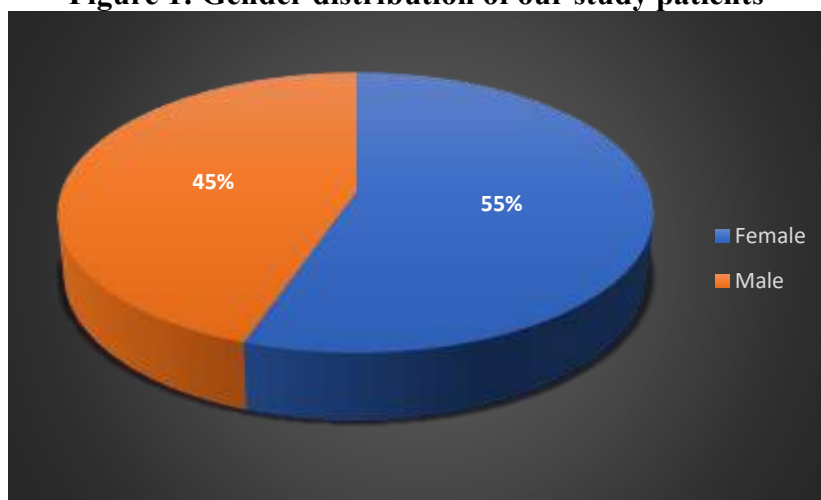
Results

Table 1: Age distribution of our study patients

Age Group (years)	N=170	P (%)
1–20	13	7.65
21–30	10	5.88
31–40	18	10.59
41–50	42	24.71
51–60	41	24.12
61–70	38	22.35
>70	8	4.71
Mean $\pm$ SD	49.17 $\pm$ 17.93	

Table 1 shows that the majority of patients were in the age groups 41–50 years (24.71%) and 51–60 years (24.12%), followed by those aged 61–70 years (22.35%). The smallest proportion of patients belonged to the >70 years age group (4.71%). Patients under 30 years accounted for only 13.53% of all study patients. The mean age of the participants was 49.17 years with a standard deviation of 17.99 years.

Figure 1: Gender distribution of our study patients



The pie chart shows that out of the total 170 cancer patients enrolled in the study, 55% were female (n=94) and 45% were male (n=76). The male and female ratio was approximately 1:1.24 in the study.

Table 2: Distribution of study patients by blood group, H/O of transfusion, and diagnosis of malignancy

Blood Group	N	P(%)
A+	63	37.06
B+	41	24.12
O+	39	22.94
AB+	18	10.59
A-	2	1.18
B-	3	1.76
O-	2	1.18
AB-	2	1.18
Total	170	100.00
History of Transfusion more than 3 months		
Yes	119	70.00
No	51	30.00
Total	170	100.00
Diagnosis of Malignancy		
Lung cancer	42	24.71
Stomach cancer	37	21.76
Breast cancer	28	16.47
Ovarian cancer	14	8.24
Cervical cancer	12	7.06
Hepatocellular cancer	26	15.29
Buccal mucosa cancer	11	6.47
Total	170	100.00

Table 2 shows the distribution of blood groups, transfusion history, and types of malignancies among the 170 cancer patients. The most common blood group was A+ (37.06%), followed by B+ (24.12%) and O+ (22.94%). Rh-negative blood types were relatively rare, accounting for only 3.53% of the sample. A significant proportion of patients (70%) had a history of blood transfusion. Regarding malignancy types, lung cancer was the most prevalent (24.71%), followed by stomach cancer (21.76%) and breast cancer (16.47%). Other malignancies included hepatocellular (15.29%), ovarian (8.24%), cervical (7.06%), and buccal mucosa cancers (6.47%).

Table 3: Hb level (gm/dL) in cancer patients diagnosed with or without anemia

Hb (gm/dL)	Range	N=170	P(%)
4.0–4.9		3	1.76
5.0–5.9		11	6.47
6.0–6.4		15	8.82
6.5–7.9		64	37.65
8.0–8.9		34	20.00
9.0–9.9		19	11.18
10.0–10.9		4	2.35
11.0–12.0		4	2.35
>12.0		16	9.41
Total		170	100.00
Mean Hb (mg/dL)		8.02 ±6.53	

This table shows that the majority of patients (37.65%) had Hb levels between 6.5 and 7.9 g/dL, indicating a high prevalence of severe anemia. Life threatening anemia (Hb <6.5 g/dL) was observed in 17.05% of patients, while only 4.7% had Hb levels above 11 g/dL. Among all cancer patients, 9.41% were not diagnosed with anemia, having Hb levels of >12 g/dL. The mean hemoglobin level in the study population was 8.02 ± 6.53 g/dL, indicating a generally anemic profile among the cancer patients.

Table 4: Prevalence and Risk Factors of Anemia in Patients Diagnosed with Cancer

Parameters	N=170	P(%)
Anemia	154	90.59
Mild anemia (Hb 10.0–lower limit of normal range)	8	5.19
Moderate anemia (Hb 8.0-10.0 g/dL)	53	34.42
Severe anemia (Hb 6.5-7.9 g/dL)	64	41.56
Life-Threatening Anemia (Hb < 6.5 g/dL)	29	18.83
Risk Factors		
Age >50	59	34.71
Sex	24	14.12
B12 deficiency	9	5.29
Folate deficiency	5	2.94
Iron deficiency	7	4.12
Chemotherapy/Radiotherapy	18	10.59
Chronic Inflammation	51	30.00
Previous Blood Transfusions	19	11.18
Comorbidities (DM, CKD)	22	12.94

As showing table 4, chi-square indicated that Anemia was highly prevalent, affecting 90.59% of the study population. Among anemic patients, moderate anemia (Hb 8.0–10.0 g/dL) was most common (34.42%), followed by severe anemia (41.56%) and life-threatening anemia (Hb <6.5 g/dL) at 18.83%. Only 5.19% had mild anemia. The most frequently identified risk factor was age over 40 years (34.71%), followed by chronic inflammation (30.00%) and previous blood transfusions (11.18%). Other contributing factors included sex, nutritional deficiencies (vitamin B12, folate, iron), chemotherapy/radiotherapy exposure, and comorbidities such as diabetes mellitus and chronic kidney disease.

Discussion

In our study, the prevalence of anemia among cancer patients was found to be 90.59%, which is notably higher than rates reported in earlier studies. For instance, the European Cancer Anemia Survey (ECAS) recorded a prevalence of 39% at the time of cancer diagnosis, increasing to 67% during follow-up as hemoglobin levels declined in many patients.^[21] Similarly, another study reported a baseline anemia rate of 54.7% in patients before receiving cancer treatment.^[22] It is also well-documented that anemia becomes more common during cancer therapy, with some reports noting rates as high as 90% following chemotherapy.^[23] In contrast, a study investigating anemia in newly diagnosed solid tumors found a much lower prevalence of 18.9%, attributing the difference to factors such as older age, poor nutritional status, and bleeding history.^[24]

Numerous studies have consistently reported high rates of anemia in cancer populations, although the exact prevalence varies depending on cancer type, stage, and treatment approach. For instance, ECAS found an overall anemia rate of 39.3%, which remains lower than our observed prevalence.^[21] Conversely, our findings were higher than those of Chaumard et al., who reported anemia in 64.8% of breast cancer patients.^[25]

Anemia in cancer patients is driven by multiple factors. These factors include nutritional deficiencies, bone marrow infiltration by malignant cells, chronic inflammation, bleeding, hemolysis, and treatment-related effects such as chemotherapy and radiotherapy. ^[27-29] In our study, several factors were significantly associated with anemia, including increasing age, chronic inflammation, female sex, comorbidities (such as diabetes or chronic kidney disease), and nutritional deficiencies.

Age was a particularly strong predictor of anemia in our cohort. Patients aged 65 years and older had significantly higher rates of anemia compared to younger patients. This trend held even when using alternative age cutoffs at 60 and 70 years. These findings align with general population data, which show that anemia prevalence increases with age, affecting approximately 11% of men and 10.2% of women aged 65 and above. ^[30,31] In elderly individuals, common causes of anemia include chronic disease, iron deficiency, vitamin B12 and folate deficiencies, gastrointestinal bleeding, and myelodysplastic syndromes. ^[32]

Interestingly, a previous study that screened 226 cancer patients found no cases of B12 deficiency and a 7% rate of folate deficiency. ^[33] However, other literature reported that iron deficiency is more frequent in cancer populations, with a prevalence ranging from 29% to 60%. ^[34] Gilreath et al. recommended limiting B12 and folate testing to cases with overt clinical symptoms or strong suspicion. ^[27] Nevertheless, our study found B12 deficiency in 5.29% of patients, iron deficiency in 4.12%, and folate deficiency in 2.94%. These findings suggest that a comprehensive baseline evaluation including iron, B12, and folate levels should be considered for all cancer patients at diagnosis, particularly in settings where nutritional deficiencies are prevalent.

Data on anemia in elderly cancer patients are limited, but it is well recognized that both anemia and cancer incidence increase with age. ^[36] The association between anemia and age is an important consideration in cancer management because cancer is most commonly found in older individuals, with the median age at cancer diagnosis being 68 years. ^[37] Data from the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) show that individuals aged 65 and older have a cancer incidence rate of 2,261.0 per 100,000, compared to just 207.3 per 100,000 in younger individuals. ^[38] Overall, about 58% of all malignancies occur in patients aged 65 or older, reinforcing the notion that age itself is a major risk factor for cancer. ^[39]

Anemia in older cancer patients carries serious clinical implications. It has been associated with decreased survival, increased fatigue, reduced functional status, and a higher risk of complications such as heart failure, myocardial infarction, cognitive decline, and adverse drug effects. ^[37] These findings emphasize the need for the management of anemia in the elderly cancer population, recognizing the broader impact on patient quality of life and outcomes.

Limitations of the study

Our study was a single-center study. We took a small sample size due to the short study period. After evaluating those patients, we did not follow up with them for the long term and did not know other possible interference that may happen in the long term with these patients.

Conclusion and recommendations

The study findings show that Anemia is highly prevalent among cancer patients, with the majority exhibiting moderate to severe forms. The findings highlight that advancing age, chronic inflammation, and history of blood transfusions are key risk factors contributing to anemia in this study population. Baseline evaluation of iron, ferritin, vitamin B12, and folate should be an integral part of cancer diagnosis. Early identification and management of anemia and its underlying causes are essential to improve the overall prognosis and quality of life in cancer patients.

Further study with a prospective and longitudinal study design, including a larger sample size, needs to be done to validate the findings of our study.

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