

Original Research Article

Packed red cell blood transfusion practices review in medical oncology unit in a tertiary cancer center, South India

Veerendra Angadi*, Manjunath Nandennavar, Shashidhar V. Karpurmath, Roshan Jacob, Yamini Donekal

Department of Medical Oncology, Vydehi Institute of Medical Sciences and Research Centre, Bengaluru, Karnataka, India

Received: 31 October 2019

Accepted: 06 November 2019

*Correspondence:

Dr. Veerendra Angadi,

E-mail: angadi_veerendra@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Anaemia is a very common complication in cancer patients. Up to 60% of solid tumor patients and 70-90% of patients receiving myelosuppressive chemotherapy have anaemia. Pathophysiology of anaemia in cancer patients is multifactorial. The treatments for cancer related anaemia include Erythropoietin Stimulating Agents (ESAs), iron supplementing therapies (intravenous iron, oral iron) and blood transfusion. There are various safety concerns regarding usage of ESAs; also, their usage is less in India due to cost factor. There is scant literature regarding blood transfusion practices in patients undergoing chemotherapy.

Methods: Patients diagnosed with cancer and patients receiving chemotherapy were included in the study. Retrospective case record review of cancer patients who received chemotherapy between January to March 2019 was done. Type of malignancy, presence of symptoms related to anemia and trigger for packed red cell transfusion were recorded.

Results: Among 342 patients received total of 1365 cycles of chemotherapy in this time period. Mean age of patients was 46 years. 46 of the 342 patients received blood transfusion. Only 13% of the patients had symptoms of anemia like weakness and fatigue the average hemoglobin level at which transfusion was given was 6 gm/dL.

Conclusions: Packed Red blood cell transfusion was usually administered at Hb <7 gm/dL. Very few patients reported anaemia related symptoms prior to transfusion. No patient received erythropoietin. Further data is needed from other tertiary cancer centres to understand the blood transfusion practices in Indian cancer patients undergoing chemotherapy.

Keywords: Anemia, Blood transfusion, Cancer related anaemia, Chemotherapy

INTRODUCTION

Anemia in cancer patients is very common and may be found in 40% of patients.¹ Anemia in cancer patients may be caused by the disease itself or the effects of treatments such as cytotoxic chemotherapy, radiation therapy and surgery.^{1,2} Severe anemia will increase the burden of treatment, contribute to fatigue and reduced quality of life and may even delay or limit further treatment. Intravenous Iron therapy and erythropoietin are used in

mild to moderate anemia. Blood transfusion is currently used in severe anemia or in symptomatic patients. The use of blood transfusions in patients undergoing oncologic surgery or radiotherapy has been reviewed but less has been published about patients receiving chemotherapy. An audit of the packed red cell transfusion practices at our tertiary cancer referral hospital was undertaken to determine the triggers of blood transfusion in patients receiving chemotherapy in the medical oncology unit.

METHODS

Inclusion criteria

- The patients diagnosed with malignancy and the patients on chemotherapy were included in the study. Patients presenting with symptoms suggestive of anemia were included in the study.

Exclusion criteria

- The patients without the evidence of malignancy and the anemia due to other than the malignancy and chemotherapy were excluded from the study.

Objectives of the study were to study the types of malignancies requiring the blood transfusion, the triggers for blood transfusion in cancer patients, the patients on treatment requiring blood transfusion.

Study group and study methodology

Patients who are diagnosed with malignancy and patients receiving chemotherapy who present with history suggestive of anaemia were analyzed. Case records of patients who received chemotherapy from January 2019 to March 2019 in Department of Medical Oncology in

Vydehi Institute of Medical Sciences and Research Center, Bangalore were retrospectively reviewed. Records from patients receiving chemotherapy in that time period for solid and hematological cancers were included in the audit. Details of blood transfusions (number of transfusions) was noted along with the triggers for the Packed Red Cell (PRC) transfusion.

Statistical analysis

Data was analyzed using Microsoft excel. Descriptive statistics has been used and mean triggers (hemoglobin values) were calculated for the patients receiving transfusion.

RESULTS

Among 342 patients received a total of 1365 cycles of chemotherapy from January 2019 to March 2019. The patients had a mean age of 46 years and comprised of 196 female and 146 male patients. 59 patients received chemotherapy for hematological cancers (lymphomas, leukemias and myelomas) and 283 received chemotherapy for non-hematological cancers (breast, lung, cervix, ovary, testicular, prostate and others). 46 out of 342 patients received blood transfusion (PRC transfusion). This is represented in Figure 1.

Table 1: Types of malignancy and blood transfusion given.

Tumor type	Number of pts	Patients requiring an blood transfusion	Percentage	>1 transfusion	Percentage
Leukemia	23	14	65.21	7	30.43
Ovary	15	3	20	1	6.6
Prostate	4	3	75	0	0
Breast	70	2	2.8	0	0
Cervix	41	4	9.7	1	2.4
Lymphoma	27	8	29.6	5	18.51
Rectum	7	1	14.2	1	14.28

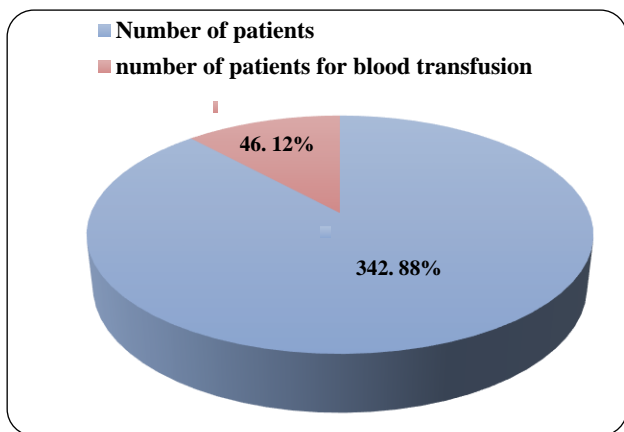


Figure 1: Patients receiving blood transfusion.

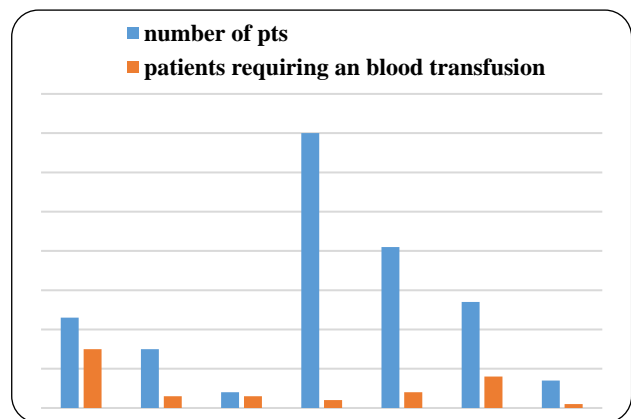


Figure 2: Patients requiring blood transfusion according to type of malignancy.

Out of the 46 patients, 16 patients (34.78%) patients required >1 transfusion. 60.8% of the leukemia patients received transfusion and 30.43% received >1 transfusion. 29.6% of lymphoma patients received blood transfusion. Others were ovarian cancer (20%), prostate (75%), cervix (9.7%) among others. 18.51% of lymphoma patients received >1 PRC transfusion. This data is represented in Table 1 and Figure 2. Most of the patients receiving PRC transfusion were leukemia patients and comprised of 32.61% of all patients receiving transfusion. The second highest was patients with lymphoma who constituted 17.39% of all patients receiving transfusion. 34.7% of patients receiving chemotherapy underwent >1 PRC transfusion.

Triggers for transfusion

The triggers for blood transfusion were the dropping hemoglobin levels post chemotherapy or radiotherapy although in 4.3% of the patients, it was due to intra operative blood loss. The maximum and minimum values of the hemoglobin for which transfusion was started was 8.7gm/dL and 4gm/dL respectively which is depicted in

Table 2: Haemoglobin levels necessitating transfusion.

	Trigger (hbgm%)
Maximum	8.7
Minimum	4
Average	6

Table 2 and 3 the average hemoglobin levels for which PRC transfusion was started was 6.0gm/dL.

The hematological cancers like leukemia, lymphoma and myeloma which constituted 17.2% of the total number of patients undergoing chemotherapy received 50% of the

blood transfusions (Figure 3). 38.98% of the patients having hematological cancers received blood transfusion and 20.33% of them received >1 transfusion. Only 8.12% of the patients with non-hematological tumors like breast, ovarian, prostate, cervical cancers etc. received blood transfusion (Table 4).

Table 3: Haemoglobin ranges in pts undergoing transfusion.

Tumor type	Max(gm%)	Min(gm%)	Avg(gm%)
Leukemia	8.7	5.5	6.6
Ovary	6.8	6.7	6.7
Prostate	7.4	5.2	6.5
Breast	4.6	4.6	4.6
Cervix	6.6	5.8	6.2
Rectum	5.1	4.6	4.9
Lymphoma	8	4	6.7
Averages	6.7	5.2	6

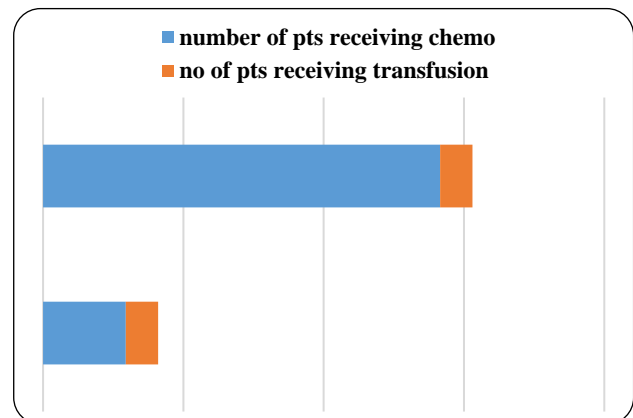


Figure 3: Blood transfusion requirements.

Table 4: Haematological and solid tumors receiving transfusion.

Types of cancer	Number of pts receiving chemo	No of pts receiving transfusion	Percentage	> transfusion	Percentage
Hematological cancers	59	23	38.98	12	20.33
Non hematological cancers	283	23	8.12	4	1.41

Table 5: Haematolymphoid neoplasms requiring transfusion.

Type of leukemia	Number of pts	>1 transfusion
ALL	11(73.3%)	4
CML	2(13.3%)	1
AML	2(13.3%)	2
Total	15	7

Out of the 15 leukemia patients who received blood transfusion, 11 had Acute Lymphoblastic Leukemia (ALL), 2 had Chronic Myeloid Leukemia (CML) and 2 had Acute Myeloblastic Leukemia (AML). 4 ALL patients, 1 CML patient and 2 AML patients received >1 PRC transfusions. This data is depicted in table 5 and Figure 4. Symptoms of anemia: Only 13.04% of the patients reported symptoms of fatigue and generalized weakness before transfusion. 4.35% of the patients

reported loss of blood (menorrhagia and melena) and another 4.35% of patients received transfusion for intraoperative blood loss.

The rest of the 78.26% of patients received blood transfusion after routine blood checkup before or after chemotherapy wherein low hemoglobin values (>7 gm/dL) were detected.

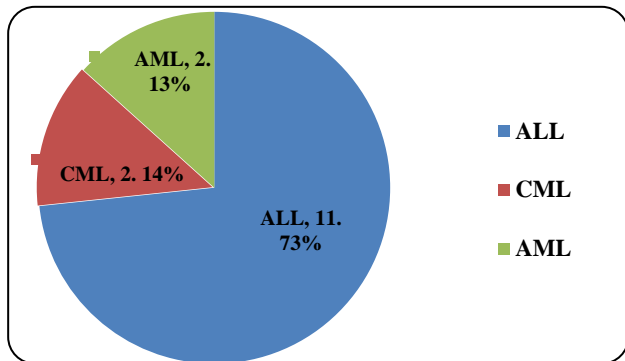


Figure 4: Hematological malignancy requiring blood transfusion.

DISCUSSION

Anemia is common in patients with cancer and is a frequent complication of myelosuppressive chemotherapy. The severity of anemia depends on the extent of disease and the intensity of treatment. Repeated cycles of chemotherapy may impair erythropoiesis cumulatively.³ It results in a decreased functional capacity and Quality of Life (QOL) for cancer patients.^{4,5}

Severe anemia is treated with red blood cell transfusions, but mild-to-moderate anemia in patients receiving chemotherapy has traditionally been managed conservatively on the basis of the perception that it was clinically unimportant. Until the early 1980s, RBC transfusions-which were usually administered empirically when hemoglobin concentrations declined below 10 g/Dl-were the primary treatment of cancer-related anemia, including chemotherapy-induced anemia; however, concern about the safety of the blood supply, related to potential transmission of the Human Immunodeficiency Virus (HIV), prompted clinicians to alter their treatment approach. Detailed evaluation of anemia with reticulocyte count, serum folate and vitamin B12 levels, serum Iron, Transferrin saturation helps in delineating the possible underlying pathogenesis of anemia in a patient.⁶⁻⁸

Mild to moderate anemia may be treated with Iron replacement or erythropoietin. Prior to 2006, Erythropoiesis Stimulating Agents (ESAs) were commonly used in treating cancer related anemia.⁹ However, several detrimental observations were noted, and restrictions were placed on its usage.^{6,9}

Indications for red blood cell transfusion in cancer patients

Asymptomatic Anemia

- Hemodynamically stable chronic anemia without acute coronary syndrome: Transfusion goal to maintain Hb 7-9 g/dL

Symptomatic Anemia

- Acute hemorrhage with evidence of hemodynamic instability or inadequate oxygen delivery: Transfuse to correct hemodynamic instability and maintain adequate oxygen delivery
- Symptomatic (including tachycardia, tachypnea, postural hypotension) anemia (Hb<10 g/dL): Transfusion goal to maintain Hb 8-10 g/dL as needed for prevention of symptoms
- Anemia in setting of acute coronary syndromes or acute myocardial infarction: Transfusion goal to maintain Hb ≥10 g/dl

The incidence and severity of chemotherapy-related anemia depend on a variety of factors, including the type, schedule, and intensity of therapy administered and whether the patient has received prior myelosuppressive chemotherapy, radiation therapy, or both. Symptom severity depends on the degree of anemia, the type of underlying malignancy, and the patient's pulmonary and cardiovascular function.⁸ Elderly cancer patients frequently manifest clinical symptoms of anemia at higher hemoglobin levels than do anemic patients without cancer.^{10,11} Cancer related anemia also causes fatigue which may be debilitating in patients undergoing various modalities of treatment, this is more so in the elderly cancer patients.^{12,13}

The usage of blood transfusion has been controversial. In the United States, about 12 million units are collected each year, of which approximately 1 million are used in anemic cancer patients.¹⁴

Apart from infections, lung injury and alloimmunization, there have been reports of increased incidence of malignancies after blood transfusion.^{15,16} Various reports are available regarding adverse effects on prognosis of patients receiving perioperative blood transfusions in various kinds of malignancies.¹⁷ Estrin et al, report their retrospective study of 103 patients with cancer related anemia who received blood transfusions.

They noted a mean of 2.3 units transfused per patient.¹⁴ The average Hemoglobin level at transfusion was 7.9 gm% (lowest being 4.3 and highest being 15 gm/dL). In this study, the average hemoglobin for transfusion was 6 gm/dL (least 4 gm/dL and highest being 8.7 gm/dL). They noted the highest transfusion rate with etoposide and 5 Fluorouracil therapy.

Patients with lowest hemoglobin before first transfusion were breast cancer patients. There is far more literature on blood transfusion practices in patients undergoing cancer surgery than in patients undergoing chemotherapy. There is very scant literature regarding blood transfusion practices in Indian cancer patients.¹⁸ To our knowledge, this is the first study regarding packed red blood cell unit transfusion practices in oncology patients receiving chemotherapy.

CONCLUSION

This audit revealed that pre-chemotherapy or post-chemotherapy values of low hemoglobin have been considered more than the symptoms for starting blood transfusion. Patients who received PRC transfusion had an average of 6 gm/dL hemoglobin prior to transfusion. Most of the patients who received transfusion were patients with hematologic malignancies. Further research is required to determine the cost effectiveness of blood transfusion.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Dicato M, Plawny L, Diederich M. Anemia in cancer. *Ann Oncol*. 2010 Oct 1;21(7):67-72.
- Birgegård G, Aapro MS, Bokemeyer C, Dicato M, Drings P, Hornedo J, et al. Cancer-related anemia: pathogenesis, prevalence and treatment. *Oncol*. 2005;68(1):3-11.
- Groopman JE, Itri LM. Chemotherapy-induced anemia in adults: incidence and treatment. *J Natl Cancer Inst*. 1999 Oct 6;91(19):1616-34.
- Sabbatini P. The relationship between anemia and quality of life in cancer patients. *Oncol*. 2000 Jun 1;5(2):19-23.
- Doni L, Perin A, Manzione L, Gebbia V, Mattioli R, Speranza GB, et al. The impact of anemia on quality of life and hospitalisation in elderly cancer patients undergoing chemotherapy. *Crit RRev Oncol/Hematol*. 2011 Jan 1;77(1):70-7.
- Gilreath AJ, Stenehjem DD, Rodgers GM. Diagnosis and treatment of cancer related anemia. *Am J Hematol*. 2014;89:203-12.
- Knight K, Wade S, Balducci L. Prevalence and outcomes of anemia in cancer: a systematic review of the literature. *Am J Med*. 2004 Apr 5;116(7):11-26.
- Preston NJ, Hurlow A, Brine J, Bennett MI. Blood transfusions for anaemia in patients with advanced cancer. *Coch Data Syst Rev*. 2012(2).
- Bohlius J, Wilson J, Seidenfeld J, Piper M, Schwarzer G, Sandercock J, et al. Recombinant human erythropoietins and cancer patients: updated meta-analysis of 57 studies including 9353 patients. *J Natl Cancer Inst*. 2006 May 17;98(10):708-14.
- Beghé C, Wilson A, Ershler WB. Prevalence and outcomes of anemia in geriatrics: a systematic review of the literature. *Am J Med*. 2004 Apr 5;116(7):3-10.
- Balducci L, Hardy CL, Lyman GH. Hemopoiesis and aging. *Cancer Treat Res*. 2005;124:109-31.
- Curt GA, Breitbart W, Cella D, Groopman JE, Horning SJ, Itri LM, et al. Impact of cancer-related fatigue on the lives of patients: new findings from the Fatigue Coalition. *Oncol*. 2000 Oct 1;5(5):353-60.
- Cynthia O, Harvey C, Tao F, William T, Supriya G, Mohile, et al. Anemia and Functional Disability in Older Adults with Cancer. *J Natl Compr Canc Net*. 2015;13(10):1233-9.
- Estrin JT, Schocket L, Kregenow R, Henry DH. A retrospective review of blood transfusions in cancer patients with anemia. *Oncol*. 1999 Aug 1;4(4):318-24.
- Schrijvers D. Management of anemia in cancer patients: transfusions. *Oncol*. 2011 Aug 1;16(3):12-8.
- Castillo JJ, Dalia S, Pascual SK. Association between red blood cell transfusions and development of non-Hodgkin lymphoma: a meta-analysis of observational studies. *Blood*. 2010 Oct 21;116(16):2897-907.
- Vamvakas EC, Blajchman MA. Deleterious clinical effects of transfusion-associated immunomodulation: fact or fiction?. *Blood, The J Am Soci Hematol*. 2001 Mar 1;97(5):1180-95.
- Cata JP, Gottumukkala V. Blood transfusion practices in cancer surgery. *Ind J Anaesth*. 2014 Sep;58(5):637.

Cite this article as: Angadi V, Nandennavar M, Karpurmath SV, Jacob R, Donekal Y. Packed red cell blood transfusion practices review in medical oncology unit in a tertiary cancer center, South India. *Int J Res Med Sci* 2019;7:4433-7.