Original Article

A study of various haematological parameters in patients with non-haematological malignancies with reference to age and sex

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Abstract

Introduction: A survey of 38 studies, most of which evaluated anaemia prevalence in cancer patients before treatment found that the prevalence ranged from 5% (prostate cancer) to as high as 90% (multiple myeloma).The prevalence of anaemia appears to be especially high in patients with uterine-cervical cancers, advanced multiple myeloma and those suffering from cancer- related renal impairment. **Aims and Objectives:** To Study various haematological parameters in patients with non-haematological malignancies with reference to Age and Sex. **Methodology:** This study was carried out in the department of Clinical Pathology on the patients admitted to an urban referral hospital. A total number of 40 inpatients with various nonhaematological malignancies were screened for anaemia. Based on Hb cut-off of 12 g/dL, 33 of them were recruited for the study. Complete haemogram was done using Sysmex KX-21, fully automated haematology analyzer (manufacturers: Sysmex Corporation, Japan). Statistical analysis was done by ANOVA and Unpaired –t test. **Result:** In our study we have found that Mean Haemoglobin levels varied significantly based on age. When ANOVA test was conducted ($F=3.246$; $P<0.05$) the mean Hb level was highest in the age group of 41 – 50 years (10.78 g/dL) and lowest in the age group of 61– 69 years (9.04 g/dL) .Mean RBC count varied significantly based on age .When ANOVA test was conducted ($F=3.089$; $P<0.05$) the mean RBC count was highest in the age group of 19-40 years (4.42 million/mm^3) and lowest in the age group of 61–69 years (3.59 million/mm^3).Mean haematocrit varied significantly based on age .When ANOVA test was conducted ($F=5.566$; $P<0.01$) the mean haematocrit was highest in the age group of 19- 40 years (36.10%) and lowest in the age group of 61–69 years (29.59%).Mean Haemoglobin levels did not vary significantly between men and women. When t-test was applied ($t=1.232$; $P>0.05$)) the average Hb in men was 9.50 g/dL whereas for women it was 10.28 g/dL. Mean RBC count did not vary significantly between men and women. When t-test was applied ($t=0.075$; $P>0.05$)) the average RBC count in men was 3.89 million/mm^3 whereas for women it was 3.91 million/mm^3 Mean Haematocrit did not vary significantly between men and women. When t-test was applied ($t=1.463$; $P>0.05$)) the average HCT in men was 30.94% whereas for women it was 33.34% **Conclusion:** From this it is clear that the with increasing age the anemia is increasing significantly in older age while there is no role of sex in anaemia with non haematological malignancies.

Keywords: Non-Haematological Malignancies, Haematological Parameters.

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INTRODUCTION

A survey of 38 studies, most of which evaluated anaemia prevalence in cancer patients before treatment found that the prevalence ranged from 5% (prostate cancer) to as high as 90% (multiple myeloma).The prevalence of anaemia appears to be especially high in patients with uterine-cervical cancers, advanced multiple myeloma and those suffering from cancer- related renal impairment[1]. Incidence of malignancies is on the rise. Advances in treatment protocols have resulted in increased longevity of the patients. Therefore greater focus is now on

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comorbid conditions, treatment of which would improve the survival and quality of life. Over the past decade, there has been a growing appreciation of anaemia as the source of a wide range of symptoms and poorer outcomes in cancer patients. Data published in the European Cancer Anaemia Study (ECAS) on 15th September, 2004 in the European Journal of Cancer[1] (online edition) reveals two out of three cancer patients suffer from anaemia and only 40% of these patients receive appropriate treatment (anaemia defined as haemoglobin less than 12 g/dL). Low haemoglobin levels correlate with poor quality of life and physical performance. Performance status deteriorates with decreasing haemoglobin. This correlation remains regardless of disease status or cancer treatment. J Jaime Caro *et al*[2], in their systematic and quantitative review of anaemia as an independent prognostic factor for survival in patients with cancer, found that anaemia was associated with shorter survival times for patients with lung carcinoma, cervicouterine carcinoma, head and neck cancer, prostatic carcinoma, lymphoma and multiple myeloma. The overall estimated increase in risk of death was 65% (54 – 77%). Tumour hypoxia may directly contribute to the resistance of the cancer patient to radiation therapy or chemotherapy via deprivation of the oxygen essential for the cytotoxic actions of these agents. Indirectly, tumour hypoxia may contribute to radioresistance and chemoresistance by inducing proteomic and genomic changes that lead ultimately to malignant progression, with reduced local control and metastatic spread, and ultimately, increased resistance and decreased survival time. A direct association between hypoxia and anaemia appears likely, and anaemia is a modifiable condition in many cancer patients. This being the case, reducing tumour hypoxia by correcting anaemia with recombinant human erythropoietin (rHuEPO) and other agents appears to offer one possible therapeutic option for enhancing the effectiveness of standard cancer therapies[4]. Hence, it is worthwhile to study the incidence and pattern of anaemia in cancer patients in our hospital and create a database so that timely intervention by the oncologists with strategies to improve the outcome of treatment can be instituted whenever anaemia is diagnosed.

MATERIAL AND METHODS

This study was carried out in the department of Clinical Pathology on the patients admitted to an urban referral hospital. Patients with non-haematological malignancies aged 19–69 years with Hb< 12 g/dL, newly diagnosed, no prior chemo or radiotherapy and no prior steroid administration were included into study while patients in relapse, patients on chemo or radiotherapy, prior surgery for the same and systemic illnesses like cardiac, renal or hepatic disease (severe enough to affect haematopoisis) were excluded. A total number of 40 in patients with various nonhaematological malignancies were screened for anaemia. Based on Hb cut-off of 12 g/dL, 33 of them were recruited for the study. Since we receive about 1200 samples of nonhaematological malignancies in our department in a year, it represents about 2.75% of the incidence in our department. Complete haemogram was done using Sysmex KX-21, fully automated haematology analyzer (manufacturers: Sysmex Corporation, Japan). Statistical analysis was done by ANOVA and Unpaired –t test.

RESULT

Table 1: Agewise Distribution of Haemoglobin

Age	Hb(g/dL)		
	Mean	S.D	No.
19-40 Yrs	10.73	.55	3
41-50 yrs	10.78	.97	13
51-60 yrs	10.20	1.10	6
61-69 yrs	9.04	2.02	11
Total	**10.09**	**1.56**	**33**

Mean haemoglobin levels varied significantly based on age. When ANOVA test was conducted (F=3.246; P<0.05) the mean Hb level was highest in the age group of 41 – 50 years (10.78 g/dL) and lowest in the age group of 61– 69 years (9.04 g/dL) (Table–1).

Table 2: Agewise Distribution of RBC count (million/mm^3)

Age	RBC count		
	Mean	S.D	No.
19-40 Yrs	4.42	.74	3
41-50 yrs	4.10	.53	13
51-60 yrs	3.78	.43	6
61-69 yrs	3.59	.50	11
Total	**3.90**	**.57**	**33**

Mean RBC count varied significantly based on age. When ANOVA test was conducted (F=3.089; P<0.05) the mean RBC count was highest in the age group of 19-40 years (4.42 million/mm^3) and lowest in the age group of 61–69 years (3.59 million/mm^3) (Table-2).

Table 3: Agewise Distribution of Haematocrit

Age	HCT (%)		
	Mean	S.D	No.
19-40 Yrs	36.10	.56	3
41-50 yrs	34.78	2.17	13
51-60 yrs	32.50	3.26	6
61-69 yrs	29.59	4.82	11
Total	**32.75**	**4.11**	**33**

Mean haematocrit varied significantly based on age. When ANOVA test was conducted (F=5.566; P<0.01) the mean haematocrit was highest in the age group of 19- 40 years (36.10%) and lowest in the age group of 61–69 years (29.59%) (Table-3).

Table 4: Distribution of Haemoglobin in both sexes

Sex	Hb(g/dL)		
	Mean	S.D	No.
Male	9.50	1.67	8
Female	10.28	1.51	25
Total	**10.09**	**1.56**	**33**

Mean haemoglobin levels did not vary significantly between men and women. When t-test was applied (t=1.232; P>0.05)) the average Hb in men was 9.50 g/dL whereas for women it was 10.28 g/dL (Table–4).

Table 5: Distribution of RBC count(million/mm^3) in both sexes

Sex	RBC count		
	Mean	S.D	No.
Male	3.89	.72	8
Female	3.91	.53	25
Total	**3.90**	**.57**	**33**

Mean RBC count did not vary significantly between men and women. When t-test was applied (t=0.075; P>0.05)) the average RBC count in men was 3.89 million/mm^3 whereas for women it was 3.91 million/mm^3 (Table-5).

Table 6: Distribution of Haematocrit(%) in both sexes

Sex	HCT		
	Mean	S.D	No.
Male	30.94	4.25	8
Female	33.34	3.97	25
Total	**32.75**	**4.11**	**33**

Mean Haematocrit did not vary significantly between men and women. When t-test was applied (t=1.463; P>0.05)) the average HCT in men was 30.94% whereas for women it was 33.34% (Table-6).

DISCUSSION

Data published in the European Cancer Anaemia Study (ECAS) in the European Journal of Cancer (online edition) dated 15th September 2004 reveals the following: (Anaemia defined as Hb<12 g/dL) Factors that contribute to anaemia in patients with nonhaematological malignancy[5,6]: blood loss, infections and 'inflammatory – like' response. Less common factors: bone marrow infiltration, inadequate nutrition, impaired renal function, haemolysis and myelosuppressive effects of treatment[7] The anaemia of chronic disease presents itself as a normochromic normocytic anaemia[8]. It normally does not lead to a decrease in haemoglobin below 8 g/dL. In our study we have found that Mean Haemoglobin levels varied significantly based on age. When ANOVA test was conducted (F=3.246; P<0.05) the mean Hb level was highest in the age group of 41 – 50 years (10.78 g/dL) and lowest in the age group of 61– 69 years (9.04 g/dL). Mean RBC count varied significantly based on age .When ANOVA test was conducted (F=3.089; P<0.05) the mean RBC count was highest in the age group of 19-40 years (4.42 million/mm^3) and lowest in the age group of 61–69 years (3.59 million/mm^3). Mean haematocrit varied significantly based on age .When ANOVA test was conducted (F=5.566; P<0.01) the mean haematocrit was highest in the age group of 19- 40 years (36.10%) and lowest in the age group of 61–69 years (29.59%). Mean Haemoglobin levels did not vary significantly between men and women. When t-test was applied (t=1.232; P>0.05)) the average Hb in men was 9.50 g/dL whereas for women it was 10.28 g/dL. Mean RBC count did not vary significantly between men and women. When t-test was applied (t=0.075; P>0.05)) the average RBC count in men was 3.89 million/mm^3 whereas for women it was 3.91 million/mm^3 .Mean Haematocrit did not vary significantly between men and women. When t-test was applied (t=1.463; P>0.05)) the average HCT in men was 30.94% whereas for women it was 33.34%. From this it is clear that the with increasing age the anemia is increasing significantly in older age while there is no role of sex in anaemia. This could be due to the fact that as age increases the loss of iron is more may be due to osteo-lytic malignancy or GI loss e.g. piles etc and absorption of iron is also less while such difference is not observed in gender. Anemia in the elderly (defined as people aged > 65 years) is common and increasing as the population ages. In older patients, anemia of any degree contributes significantly to morbidity and mortality and has a significant effect on the quality of life. Despite its clinical importance, anemia in the elderly is under-recognized and evidence-based guidelines on its management are lacking. Part of the problem here relates to its definition, which is based on WHO-criteria established in 1968. [9]Causes of anemia in the elderly are divided into three broad groups: nutritional deficiency, anemia of chronic disease (ACD) and unexplained anemia (UA). These groups are not, however, mutually exclusive. In any given patient, several causes may co-exist and may each contribute independently to the anemia. Nutritional deficiencies represent a treatable subgroup and include lack of iron, vitamin B12 or folate. The most frequent nutritional anemia is due to iron deficiency, which is characterized by low serum ferritin levels and transferrin saturation. However, normal/high serum ferritin levels do not rule out iron deficiency, as ferritin represents an acute phase protein, which might be elevated in inflammatory processes and with advanced age. Thus, the diagnosis should be mainly based on decreased transferrin saturation. Diagnosis of iron deficiency should not be an end in itself but should rather be the initiation of a search for its cause, including looking for a possible site of blood loss and for possible underlying malignancy. The pathophysiology of ACD is multifactorial and relates to a

reduced efficiency of iron recycling from red blood cells resulting in a functional iron deficiency. There is enhanced apoptosis of erythroid progenitor cells in the marrow, an inadequate production of erythropoietin (EPO) and impaired response to EPO. It has been proposed that elevated pro-inflammatory cytokines such as TNFα, IL-6, IL-1 and macrophage migration inhibitory factor (MIF) underlie ACD and a key mediator is the induction of hepcidin synthesis by IL-6. Hepcidin inhibits iron absorption in the intestine and the release of recycled iron from the macrophages, resulting in an iron-restrictive anemia (reviewed by Weiss and Goodnough[10]. Unexplained anemia (UA) accounts for approximately one-third of all anemias in the elderly and represents primarily a diagnosis of exclusion, unclassifiable by currently available methods. The pathophysiology is complex and poorly understood. Although undiagnosed malignancy including myelodysplasia,[11] previously unrecognized chronic kidney disease, and other uncommon causes may explain a proportion of the UAs, their combined contribution is relatively small. In populations where thalassemia is prevalent, thalassemia trait may account for another proportion of the UAs. [12,13] Dissecting the causes of UA is confounded by the high frequency of co-morbidities in the elderly, age-associated increases in levels of pro-inflammatory cytokines such as IL-6 that may reduce sensitivity of stem cells and progenitors to growth factors and induce hepcidin synthesis in an environment of reduced pluripotent hemopoietic stem cell reserve. Elevated hepcidin levels have been detected in UA, suggesting that inflammatory processes might contribute to anemia in the elderly, involving mechanisms similar to those encountered in ACD.[14]

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