Research Article

Prevalence of anemia and micronutrient deficiency in elderly

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Received: 07-09-2013
Revised: 22-09-2013
Accepted: 31-10-2013

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ABSTRACT

Background: *Untreated geriatric anemia is important to diagnose early as it is associated with greater morbidity and mortality in comparison to the anemia in younger adults.*

Objectives: *To determine the prevalence, patterns of anaemia, and to assess haemopoietic nutrient status of geriatric population attending a hospital.*

Material and methods: *2540 subjects aged 60 years and above, attending our geriatric clinic were screened for presence of anemia. 100 anemic subjects were randomly selected for further characterization. Tests carried out were, pattern of anemia, full blood count, serum ferritin and stool for occult blood. Vitamin B12, folate and other additional investigations were carried out in selected patients as per study protocol. Main outcome measure: Prevalence, pattern and underlying etiologies of anemia.*

Results: *The prevalence of anemia was 71%. Normocytic blood picture was most common. Eleven cases had absolute iron deficiency. 5 and 2 cases had low vitamin B12 and folate levels respectively. Nine out of 11 (82%) patients with depleted iron stores had positive stool occult blood.*

Conclusions: *Screening for anemia is important in all geriatric patients seeking medical care, irrespective of the presenting illness. Also a dedicated search for micronutrient deficiency and stool occult blood should be a routine component of the etiological work up of anemic elderly.*

Keywords: *Vitamin B12, ferritin, folate, anemia, elderly*

Introduction

Anemia is a common concern in geriatric age group and can have significantly more severe complications than anemia in younger adults. All the types of anemia are known to occur in this age group. Anemia in the elderly is an extremely common problem that is associated with mortality and poorer health-related quality of life, regardless of the underlined cause of the low hemoglobin. However anemia should not be accepted as an inevitable consequence of ageing. [1] Studies indicate that the prevalence of anemia increases with advancing age and under age 75 years, anemia is more common in females, but over age 75 years it is more common in males. [2] Multiple pathophysiologic abnormalities in a single elderly patient with anemia are well known. Micronutrient deficiencies as cause of anemia have been repeatedly documented in the elderly. They are thought to be due, among other factors, to lower energy requirements of the elderly which lead to reduced food intake. [3]

Suboptimal iron, folic acid and vitamin B12 status has been shown to impair cognitive function and immune status. It is essential, therefore, that the treating physician is aware of the coexistence of anemia in elderly, although the presenting manifestation may be for a different reason. It therefore becomes all the more pertinent to look for severity of anemia, type of anemia, possible etiologies and appropriate correction. Untreated geriatric anemia is associated with greater risk of death, comorbidities, and impaired functional status.

Similar data for Indian geriatric population are sparse and hence this study was undertaken to determine the prevalence of anaemia and its patterns and to assess the haematopoietic micronutrient status of this population.

Material and Methods

The study was approved by the local ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study. Approval of institutional Ethics Committee was taken. The study design was clinical observational study.

All patients above 60 years of age attending the geriatric clinic in our hospital, over a period of two years, were included in the study to screen for the prevalence of anemia based on WHO criteria of anemia [4] [Hemoglobin (Hb) < 13 in males, Hb<12 in females].

A random and nonconsecutive selection of 100 anemic in-patients was done amongst the anemic population to study the pattern of anemia. The following hematological investigations were carried out for all patients- Hb, Total Leucocute Count (TLC), Differential Leucocyte Count (DLC), Erythrocytic Sedimentation Rate (ESR), Platelet count, Blood urea, Serum creatinine, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration) MCHC, Mean Corpuscular Hemoglobin (MCH), Packed Cell Volume (PCV), Reticulocyte count, Peripheral smear for blood picture and Serum ferritin. The serum ferritin level is the most effective way to diagnose iron deficiency anemia. When serum ferritin is less than 15ng/ mL, iron deficiency is virtually certain. [5]

Iron deficiency is unlikely if ferritin level is greater than 100ng/mL (pmol/L). Ferritin levels between 15 and 100 ng/mL are moderately predictive of iron deficiency anemia.

Vitamin B_{12} deficiency was defined as serum B_{12} concentration less than 200 pg/mL. Folate deficiency was defined as serum folate concentration less than 2.6 ng/mL. [6] Bone marrow studies (aspiration/biopsy) were carried out in patients with blood smear showing immature white cells or nucleated red cells, indeterminate status of iron stores and unexplained progressive or unresponsive anemia. Vitamin B12 and folate assays were done for dimorphic and macrocytic anemia or in patients with normocytic or microcytic blood picture in which no other cause could be found. Additional investigations as indicated for detection of underlying cause-chest X-ray, Ultrasonography (USG) of abdomen and pelvis, Stool occult blood, Upper Gastrointestinal (GI) endoscopy and colonoscopy, serum electrophoresis, tissue biopsy, imaging-Computed Tomography (CT)/Magnetic Resonance Imaging (MRI), and Anti Nuclear Antibodies (ANA).

Results

A total of 2540 patients were screened for the presence of anemia during the study period. 1473 (58%) patients were males and 1067 (42%) were females. Maximum numbers of subjects (1575) were in age group between 60- 69 years, 660 in 71-79 year's age group and 305 were in age group of 80 years and above. Total 1800 out of 2540 (71%) patients were found to be anemic. Total 948/2540(37%) males and 852/2540(33%) females were found to be anemic amongst the study population. The anemic subjects were further classified according to age groups. Table 1 depicts that the prevalence of anemia increases as the age increases.

Table 1: Depicts distribution of anemia in different age groups

Age (in years)	Anemia		Prevalence
	Yes	No	
60-69	1044	531	**41.1%**
70-79	468	192	**18.4%**
>80	**288**	**17**	**11.3%**

The numerals indicate the number of patients

For the study of pattern of anemia, a random selection of 100 patients was done from among the anemic study subjects. Amongst this cohort, 54 (54%) were males and 46 (46%) were females. Further age and gender wise distribution of the patients was done which is depicted in table 2. It shows that the maximum numbers of anemic patients were found in the age group 60-69 years.

Table 2: Depicts age and gender wise distribution of patients

Age	Male	Female	Total
60 - 69 yrs	33	22	55
70 - 79 yrs	11	17	28
≥80 yrs	10	7	17
Total	54	46	100

The numerals indicate the number of patients

The peripheral smear was further studied to fix the type of anemia. According to the peripheral smear, patients were classified into four categories, the normocytic, microcytic, macrocytic/dimorphic and pancytopenic anemia. The most common type of anemia was normocytic.

Microcytic group: Thirty four patients of the total of 100 patients had microcytic blood picture. Out of 34 patients, 17 were males and 17 were females. Nine patients out of the 34 patients had positive stool occult blood test. A total of 11(32%) patient had serum ferritin values less than 15ng/ml in the microcytic group (absolute iron deficiency) and nine(26%) patients had no evidence of iron deficiency having ferritin values more than 100ng/ml. Fourteen (41%) patients had ferritin in the range of 15-100ng/ml. Diabetes and hypertension were seen in 12 and nine patients, respectively. Two out of 34 patients had underlying osteoarthritis. 32 patients had no underlying disease.

Normocytic group*:* Fifty six out of 100 patients had normocytic anemia. Out of these, 30 were males and 26 were females. Thirteen out of the 56 patients had positive stool occult blood test. None of the patients had serum ferritin values less than 15ng/ml and 50(89%) had ferritin values more than 100ng/ml. Six (11%) patients had ferritin in the range of 15-100ng/ml. Diabetes was seen in 17(30%) and hypertension in 20 patients (36%). Two out of 56 had underlying osteoarthritis, nine had tuberculosis, and two had rheumatoid arthritis

Macrocytic/Dimorphic Anemia: Eight out of 100 patients had underlying macrocytic /dimorphic anemia. Amongst these, six (75%) were males and two (25%) were females. One patient had positive stool occult blood test. All (100%) patients had ferritin values more than 100ng/ml. Five out of eight patients (62%) had low vitamin B12 levels; two (25%) patients had low folate levels. Three patients had diabetes and two had underlying hypertension. Bone marrow studies were done in all patients and were suggestive of megaloblastic anemia.

Pancytopenic group: Two patients were in the pancytopenic group. One was male and the other was female. None had positive stool occult blood. Both the patients had serum ferritin more than 100 ng/ml. Bone marrow study revealed evidence of aplastic anemia in one patient. One patient had both hypertension and diabetes. The presence of occult blood in stool and serum ferritin levels in different types of anemias are summarized in tables 3 and 4 respectively.

Table 3: Depicts presence of stool occult blood in different types of anemia

Types of Anemia	Stool Occult Blood
Normocytic (56)	13
Microcytic (34)	9
Macrocytic/dimorphic (8)	1
Pancytopenia (2)	0

The numerals indicate the number of patients

Table 4: Depicts serum ferritin levels in different types of anemias

Types of Anemia	Serum ferritin (<15ng/ml)	Serum ferritin (15-100ng/ml)	Serum ferritin (>100ng/ml)
Normocytic (56)	0	6	50
Microcytic (34)	11	14	9
Macrocytic/dimorphic (8)	0	0	8
Pancytopenia (2)	0	0	2
Total	11	20	69

Discussion

Literature has revealed that ageing does have an effect on blood production with reduced ratio of bone marrow to fat cells and reduced marrow response when stimulated with erythropoietin. [7] However, the decline of hemoglobin and resulting increase in anemia with age should not be presumed to be a result of "normal aging" and blanket treatment with hematinics should be avoided.

Literature has revealed that ageing does have an effect on blood production with reduced ratio of bone marrow to fat cells and reduced marrow response when stimulated with erythropoietin. MCV increases slightly with increasing age but usually not enough to produce significant macrocytosis. Although there is a paradoxical feedback in renal production of erythropoietin, since the levels of this hormone actually increase over time, it has also been reported that the erythroid marrow may become less sensitive to erythropoietin stimulation, a key factor contributing along with possible nutritional deficits and comorbidities to the development of anaemia in the elderly. Even distinguishing anemia of chronic inflammation from anemia of chronic kidney disease is somewhat challenging considering the fact that increased inflammation is seen in older adults even without chronic kidney disease and there are coexisting morbidities in this age group. [8] Anemia algorithms used for evaluation of younger adults are based on the mean corpuscular volume. Such algorithms may be less helpful in the elderly because the classic changes in erythrocyte size do not often accompany anemia in this age group. In most elderly patients with anemia, red cell indices disclose normocytic, normochromic anemia. Clinicians therefore might begin the evaluation of anemia as they would in younger adults, but, if they do not find one of the classic causes of microcytosis or macrocytosis, the search for a cause might need to be enlarged. [9]

Prevalence of anemia in older individuals in our study is of higher magnitude (71%) than that previously

reported by WHO report (2000) which was about 50% in developing countries and 12% in developed countries. [10] NHANES-III study of World health organization revealed presence of anemia in 11% of men and 10.2% of women aged 65 years and older. [7] In our study, 37% males and 33% females were anemic, which was higher as compared to the above stated study. Chul won choi et al in their study of anemia in elderly have observed 171 out of 1254 patients to be anemic. Out of them 144 (11.4%) have been women and 27(2.1%) men. [11] These differences, however, can be explained as ours was a hospital based study as compared to the above study which was population based. Prevalence of anemia in males was more as compared to females in our study which is in accordance with Guralink JM et al. [12]

In our study, the prevalence of anemia increased with each decade in contrast with Beal, who showed that prevalence of anemia decreased after 65 years. [13] Normocytic anemia was the most prevalent anemia accounting for 56% of all the cases in our study. Elis et al have also shown that most common anemia in elderly is normocytic normochromic type. [14] Hee-seon Kim et al study correlates closely with present study. [15]

Our study depicted normocytic anemia to be the most common in both sexes, followed by microcytic and macrocytic closely tallying with study done by Ania et al. [16] Thirty four patients of the total of 100 patients had microcytic blood picture. Out of 34 patients, 17 were males and 17 were females. Nine patients out of the 34 patients had positive stool occult blood test. Milman et al has found iron deficiency anemia in 39% of men. [17] None of the women had iron deficiency anemia. Whereas in our study, 25% of females had iron deficiency which could be explained due to differences in the dietary and socioeconomic patterns.

In the present study, nearly one third (31%) of anemic subjects had iron deficiency. Seven out of eight patients with macrocytic/dimorphic anemia had VitB12 or folate deficiency, in contrast to study by Chernetsky et al who has shown that anemia primarily found due to Iron, VitB12 or folate deficiency was only 4%. [10] This difference may be accounted for by difference in the dietary intake and dietary patterns between the two populations. Iron deficiency was the most common micronutrient deficiency compared to Vitamin B12 and folate in this study population which is in agreement with study done by Jack M et al. [12]

The prevalence of folic acid and vitamin B12 deficiency varies (6-7%) as shown by Jack M et al. [9] However, on the basis of determination of abnormal intermediary metabolites, a substantially higher prevalence has been reported (39-68%) by Joosten et al. [5] A high percent of elderly anemic (11%) had depleted iron stores (<15ng/ml). Milman et al however, has shown that 2.4% of anemic elderly had depleted iron stores. [17]

In a study done by Jacob et al [18] it was shown that all subjects with microcytic anemia with depleted iron stores were associated with occult gastrointestinal bleeding [nine out of 11 (82%) patients with microcytic anemia with depleted iron stores had positive stool occult blood in our study], primarily due to gastrointestinal malignancy. It is therefore, pertinent that all elderly people presenting with microcytic picture or iron deficiency be subjected to gastrointestinal evaluation. Noting this, it may be worthwhile to say that gastrointestinal evaluation in elderly with normocytic blood picture or with normal iron stores (or normal ferritin values) also, should not be overlooked as we found a large number of elderly (13 out of 56) having positive stool occult blood with normocytic blood picture.

Detection and subsequent treatment of Vitamin B12 and folate deficiency during evaluation of anemia is crucial especially in patients with macrocytic and dimorphic picture, as other than contributing to anemia, suboptimal levels of these have been associated with significant impairment in cognitive function,

and along with vitamin B6 are associated with elevated levels of homocysteine, which has a causal relation with cardiovascular, peripheral vascular and cerebrovascular diseases. [19, 20, 21]

Mild, normochromic normocytic anemia with a hemoglobin concentration usually between 11 and 12 g/dL has been reported in people over the age of 70. This anemia cannot be accounted for by any underlying disease or deficiency, and the bone marrow does not contain ringed sideroblasts. This unexplained anemia is said to account for over 30 percent of the anemias in this age group. It is associated with low neutrophil, lymphocyte, and platelet counts, and there is an increased red blood cell 2, 3 – DPG level, implying that this condition is not merely a normal age – related variant. The significance of this type of anemia is presently unknown, but it is probably a myelodysplastic syndrome. [22]

Finally, it may be noted that our study revealed that not all subjects with microcytic blood picture were iron deficient which may be due to thalassaemia, sideroblastic anaemia or falsely raised ferritin concentrations. Also, cut off points for ferritin have been questioned, as iron deficient erythropoiesis can occur in elderly with ferritin levels at a higher cut off value than the younger population. [23] As ferritin is an acute phase reactant, levels may be falsely raised, therefore iron deficiency may remain undiagnosed when it coexists with chronic disease. The multifactorial causes of these micronutrient deficiencies which include achlorhydria and lower secretion of intrinsic factor, chronic disease and inflammation, chronic polypharmacy, gastro-intestinal bleeding as well as poverty, physical inability to prepare food, alcoholism and inadequate dietary intake should be taken into account in evaluation of anemia.

Since the prevalence of anemia in elderly attending our hospital was much higher than community based studies, we recommend screening for the presence of anemia in all geriatric population seeking medical care. Also a directed approach should be undertaken to seek micronutrient deficiencies and contributory factors in anemic elderly, since a high percentage of this cohort is likely have some underlying malady, whose rectification will lead to overall improved outcome with respect to physiological parameters as well as quality of life.

All geriatric population seeking medical care should be screened and evaluated for anemia including micronutrient status and stool for occult blood. Failure to evaluate anemia in elderly could lead to delayed diagnosis of potentially treatable conditions. An effort should always be made to reach etiological diagnosis before instituting specific therapy

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Cite this article as: Kaur H, Piplani S, Madan M, Paul M, Rao SG. Prevalence of anemia and micronutrient deficiency in elderly. Int J Med and Dent Sci 2014; 3(1): 296-302.

Source of Support: Nil
Conflict of Interest: No