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# Clinico-pathological Profile of Anemia in Elderly: An Experience in a Tertiary Care **Hospital in Central India**

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## ABSTRACT

Background: Anemia is a critical clinical problem in the elderly population. With the sharp increase in the number of older persons, it will have a significant public impact on our healthcare provision. Loss in physical function resulting from anemia threatens the independence and quality of life of older adults having substantial social and economic effects.

Objectives: To study the clinical profile and hematological patterns of anemia in elderly patients and to establish the possible etiological factors for diagnosis of anemia.

Materials and Methods: It was a hospital based prospective study of one and a half years on 150 patients. Initial work-up with basic investigations such as Complete Blood Count (CBC) and Peripheral smear examination were done and based on the initial typing of anemia, further work-up including total iron profile, vitamin B12 and folate assays were carried out. Bone marrow examination and upper GI endoscopy/colonoscopy were performed only in selected cases.

**Results:** Most of the elderly were in the age group of 60-70 years and majority were female. Easy fatigability and pallor were the commonest signs and symptoms. Normocytic anemia was the commonest pattern and the most common cause identified was anemia of chronic disease. Renal failure was the underlying cause in 19% of patients and 14% patients had an underlying malignancy. 50% patients in the microcytic group revealed chronic blood loss through GI tract. As anemia is a sign, not diagnosis, an evaluation is always warranted to identify the type of anemia and to direct the investigation of anemia for profiling the etiology

## Keywords: Anemia of chronic disease, elderly, iron deficiency, fatigability **INTRODUCTION**

The world population is aging. Aging population will impact on healthcare provision, since extra years are not necessarily spent in good health. Therefore, it is important to identify the significance of common medical problems in old. Anemia is one such problem associated with a worse prognosis for both morbidity and mortality. The WHO criteria of anemia

is a hemoglobin concentration of <13g/dL in men and <12g/dL in women [1].

In general, hemoglobin levels are low in older than in young. The reasons for this are not completely understood, whether anemia is a feature of normal aging, or it is always pathological [2].

**Old age is a major risk factor for anemia**(3). Loss in physical function resulting from anemia threatens the independence and quality of life of older adults (4). Interestingly, cognitive impairment has also been shown to be linked with anemia(5). Anemia, even if mild, is also associated with an increased risk of hospitalization and mortality (6).

Aging may favour the development of anemia due to a reduction in peripheral hematopoietic stem cell reserve (PHSC), reduced production of growth factors, reduced sensitivity of stem cells and growth factors progenitors to and microexperimental abnormalities. environmental In systems, the concentrations of hematopoietic stem cells in younger and older animals during baseline conditions and hematopoietic stress showed that the concentration of PHSC at baseline was similar in mice of different ages, but it declined in the older animals during hematopoietic stress. These results suggest an age-related restriction of stem-cell reserve. humans. several observations In suggest progressive exhaustion of PHSC. The hematopoietic tissue of the marrow contracts progressively with aging(7).

The concentration of PHSC in the peripheral blood of persons older than age 70 and persons younger than age 30 were studied which showed that the baseline concentration of PHSC was similar for subjects of different ages but following administration of growth factor (GM-CSF), younger individuals experienced a greater rise in the concentration of these elements(8).

A group of Italian investigators found that the production of burst promoting activity (BPA) is reduced in the bone marrow of older individuals which appeared to be related to the declining concentration of helper T cells(9). In addition, the response of BPA to cimetidine was blunted in older individuals, suggesting an underlying dysfunction of suppressor T cells as well. Normally, cimetidine stimulates the release of BPA by reversing the inhibitory activity of suppressor B cells on erythropoiesis. The reduction in BPA did not correlate with clinical anemia, indicating that although physiologic changes of aging generally do not cause anemia, they may increase the older individual's susceptibility to intervening causes of anemia.

Joosten et al(10) found that the serum erythropoietin concentration in patients aged 70 to 96 years were lower in patients with anemia of chronic disorders than with iron deficiency anemia and concluded that the erythropoietin response may become blunted with age in such persons with chronic anemia. Nafziger et reported a lower concentration al(11) of erythropoietin in the serum of patients aged 74 to 95 vears with iron-deficient anemia compared with younger anemic patients. This observation also suggested an age-related blunting of erythropoietin response. A study by Matsuo et al(12) provided different results. These authors found similar serum erythropoietin concentration in anemic Japanese patients older than age 70 and younger than age 60. The reticulocyte count was lower in the aged, suggesting decreased sensitivity to erythropoietin. Kario et al(13) compared the concentration of erythropoietin in the serum of younger and older individuals with iron deficiency and found that patients of both age groups experienced the same erythropoietin production. increment in The circulating levels of erythropoietin increased earlier in older individuals compared with their younger counter-parts before the hemoglobin concentration dropped below 12 g/dL. This observation suggests that hypoxia may be present at higher levels of hemoglobin in the elderly compared with younger individuals.

### Remarks:

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In recent years there has been a sharp increase in the number of older persons. The UN agreed cut off to refer to older patients (geriatric age group) is 60+ years(14). There were 703 million persons aged 65 years or over in the world in 2019 which is projected to double to 1.5 billion in 2050. Globally, this population (65 years or more) increased from 6 percent in 1990 to 9 per cent in 2019(15). In India, the elderly population constituted 7.4% of the total population(16). In Chhattisgarh itself, the aging population increased from 6.4% in 2001 to 7.2% in 2006 to 7.9% in 2011(17).

In Bhilai, Chattisgarh, our hospital stands as the leading healthcare provider as it caters to all people working in Bhilai Steel Plant, SAIL and their families and the non-entitled. Out of this, elderly population form a significant number, attending various

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outpatient departments and admissions in indoor wards.

With this increase in aging population, the incidence of co-morbidities is expected to rise having an impact on their health facilities, longevity and fertility. It is easy to overlook anemia in elderly, since symptoms such as fatigue, weakness, shortness of breath may be attributed to the aging process itself, but the decline of hemoglobin and concomitant increased degree of anemia with age is not necessarily a result of normal aging. Effects of anemia in the elderly include decreased strength and increased risk for falls. Anemia may have adverse effects on the heart increasing the severity of cardiac conditions, including reduction of survival rates from congestive cardiac failure and myocardial infarction. Even mild anemia may possibly lead to cognitive impairment or worsen existing dementia (18).

This study was conducted to assess the clinical profile of geriatric patients with anemia, to study the hematological patterns and to establish the etiological factors for diagnosis of anemia in such patients.

## **MATERIALS AND METHODS:**

It was a one and a half year prospective crosssectional study conducted in J.L.N. Hospital and Research Centre, Sector 9, Bhilai, Chattisgarh after approval from the hospital Ethics Committee. Geriatric patients who were clinically diagnosed as anemic with hemoglobin values of less than 13 gm/dl in men and less than 12 gm/dl in women who visited various clinical out- patient departments and admitted to the indoor wards and whose blood samples were tested in our Hematology section during this period were included in the study. However, patients with inadequate clinical details or follow up, patients who received blood transfusion and those on chemoradiation and treatment related anemia were excluded.

Sample size was 157 calculated by the formulae N =  $1.96^2 * p * q$ 

 $e^2$  where

- P = Proportion of geriatric patients with fatigue = 74% = 0.74 (from previous studies)
- 1 P = 1 0.74 = 0.26
- 1.96 = z value for 5% confidence level

- e = precision = 0.07
- Minimum sample size = (Cochran formula for descriptive analysis.)
- Level of significance was set at p<0.05.
- P value<0.05 was considered to be significant.

In all cases, the clinical details were obtained after examining the patients and their case records and complete data was collected in a specially designed Case Record Form including history of illness, detailed clinical examination and relevant investigations. Before subjecting the patients for investigations and diagnostic procedures, а written/informed consent was obtained from each patient/ legal guardian. The symptom analysis of patients was done. Patients were also analysed based upon underlying co-morbid conditions, dietary habits, medication and presence of parasites or blood in stool.

Initial investigations like complete hemogram (by Beckman coulter LH 750 Hematology Analyzer) including Hb, TLC, DLC, ESR, platelet count, blood urea, serum creatinine and red cell indices (MCV,MCHC, MCH, PCV), reticulocyte count and peripheral blood smear picture were performed. Total iron profile including serum ferritin (Microplate Immuno-enzymometric Assay Method (Accu Bind ELISA Microwells , Monobind Inc. CA), serum Iron and Total Iron Binding Capacity by Ferrozine method (TECO DIAGNOSTICS Anaheim, CA) and Transferrin Saturation were also studied.

Bone marrow aspiration and biopsy was carried out in patients with blood smears showing immature WBCs or nucleated RBCs, indeterminate status of iron stores or unexplained progressive or unresponsive anemia. Special stains like Pearl's reaction for assessing iron stores, myeloperoxidase (MPO) and PAS stains were done as required.

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 such as Chest X-ray, ultrasonography (USG) of abdomen and pelvis, stool for parasites and occult blood, upper gastrointestinal (GI) endoscopy and colonoscopy, CT scan / magnetic

resonance imaging (MRI) were undertaken as indicated for detection of underlying cause. Upper GI endoscopy was carried out in all patients with iron deficiency. Colonoscopy was carried out in above set of patients in whom endoscopy findings were insignificant as well as in patients in whom stool occult blood was positive or no relevant underlying cause could be evaluated. Patients with suspicion of underlying malignancy were also evaluated based on clinical symptoms, laboratory parameters or imaging studies.

#### **RESULTS:**

After getting clearance of the local Ethical Committee, a total of 157 cases were identified. However, due to insufficient clinical details or inadequate follow-up, only 150 cases were included in the study.

The mean age was 70.33 years. The lowest age and the highest age amongst the subjects studied were 60 years and 92 years respectively. Most of the patients were in the age group of 60-70 years. Overall percentage of male patients was 48.67 % and female were 51.33%. Male to female ratio was around 0.9.

Easy fatigability was the most common presenting complaint (86%) followed by breathlessness on exertion (4.67%), chest pain (4.67%), palpitation (3.33%) and vertigo (1.33%). Pallor was detected as the commonest sign.

Based on CBC and peripheral blood smear picture, all patients were distributed into different patterns of anemia. 58% of patients had normocytic normochromic anemia, microcytic hypochromic anemia (20%) and macrocytic normochromic anemia (14%). Pancytopenic patients constituted 5.33% and a dimorphic pattern was seen in 2.67% of cases.

Thus, anemia characterization on peripheral smear showed that most common type of anemia was normocytic.

### Cause distribution of normocytic anemia

Eighty seven out of one hundred and fifty patients (58%) had normocytic anemia based on a normal MCV (92 $\pm$ 9 fl) and peripheral blood film showing predominantly normocytic red cells (red cell diameter slightly < size of small lymphocyte nucleus). Forty out of 87 patients were vegetarian and 47 patients had

non- vegetarian diet. One patient had a history of alcoholism and one patient was a chronic smoker.

The characteristics of normocytic group were as follows: 54 patients (62.07%) out of total 87 showed adequate iron stores with serum ferritin levels > 100ng/ml and no signs and symptoms of iron deficiency. Remaining 33 patients (37.9%) had values < 100ng/ml and correlating with peripheral blood picture and total iron profile (serum iron, TIBC, TSAT) they were diagnosed with iron deficiency. On further evaluation, they had history of chronic blood loss, 2 patients revealed history of malaena in the past and 1 patient was a diagnosed case of mild factor 8 deficiency (haemophilia A). Endoscopy of all such patients were carried out and only 4 patients (12.12%) who were follow-up cases each of gastric erosion, esophageal varices, mild hemophilia A and gastric polyp were diagnosed with iron deficiency. As shown in Table.2, twenty-nine patients (33.33%) had anemia of chronic disease presently known as 'anemia of chronic inflammation' (ACI) based on low serum iron, low TIBC but elevated serum ferritin and CRP (30). While 4 out these 29 patients had osteoarthritis, one had rheumatoid arthritis and 4 had tuberculosis. Fourteen patients (16.09%) were follow-up cases of various malignant disorders. Seventeen patients (19.54%) were being treated for chronic renal disease. They were found to have deranged renal function tests (serum creatinine levels > 1.5 mg/ml). Six out of total 87 patients had no underlying disease grouped as unexplained anemia (UA).

### Profile of anemia in microcytic group of patients

Thirty out of total 150 patients (20%) showed microcytic pattern of anemia based on low MCV of < 80 femtolitre and the peripheral blood picture showing were microcytic (smaller in size when compared to the nucleus of a small lymphocyte) and hypochromic (when the central pallor was > 1/3rd of the red cell diameter) (dacie &lewis chap 23,551). Seventeen out of 30 patients were vegetarian and 13 out of 30 patients had a non-vegetarian diet. Stool analysis in microcytic anemic patients revealed that 9 (30%) out of 30 patients had positive test results for occult blood in stool.

Serum ferritin levels were measured in all patients with microcytic anemia. Fifteen out of total 30 patients (50%) had absolute iron deficiency with

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ferritin < 15 ng/ml, 13 patients (43.3%) showed varying degrees of iron deficiency having intermediate ferritin levels (15 to 100ng/ml). Two patients (6.67%) showed no signs of iron deficiency with ferritin levels >100ng/ml.

Therefore, majority of patients in this group had iron deficiency anemia (IDA 66.7%), followed by anemia of chronic disease found in 5 patients (16.67%). These 5 patients were on treatment for osteoarthritis, ischemic heart disease, coronary artery disease, lower respiratory tract infection and diabetes with hypertension. However, no underlying cause could be defined in 5 (16.67%) out of 30 patients, grouped under Unexplained Anemia (UA 16.67%). Further analysis by endoscopy and colonoscopy revealed that the commonest cause of iron deficiency was chronic blood loss through gastrointestinal tract, diagnosed in 10 patients (50%). Among the remaining 20 patients, 2 patients (10%) were diagnosed with malignant colonic polyp and another 2 (10%) had gastric cancer. 6 patients (30%) had nutritional iron deficiency.

### Cause distribution of macrocytic anemia

Twenty-one patients out of total 150 (14%) had macrocytic anemia based on a high MCV >100 femtolitre and peripheral blood smear showing predominantly macrocytosis (when compared with nucleus of small lymphocyte), macro-ovalocytes and hyper-segmented neutrophils suggesting folate or vitamin B12 deficiency and is an indication for assays of these vitamins. Out of these 21 patients, 14 patients were vegetarian and remaining 7 patients had a non-vegetarian diet. None of the patients had a positive faecal occult blood test. Three patients (14.28%) had intermediate serum ferritin values (15-100ng/ml). Remaining 18 patients (85.7%) had serum ferritin values > 100ng/ml indicating adequate iron stores. Eleven out of 21 patients (52.38%) had megaloblastic anemia (based on blood film picture, folate and vitamin B12 assays and bone marrow examination). Seven (63.64%) out of these 11 patients had vitamin B12 deficiency (serum VitB12 < 150 per mol/L). One patient (9.09%) had both vitamin B12 and folic acid deficiency. One patient had only folic acid deficiency while remaining 2 had normal vitamin B12 and folate levels. Malignancy was detected in 3 (14.29%) out of total 21 patients of which one patient was diagnosed as Myelodysplastic

syndrome (MDS) based on bone marrow picture, 1 patient diagnosed with acute myeloid leukaemia(AML) and one patient had chronic myeloid leukemia (CML) (based on blood picture).

Six out of 21 patients (28.57%) had an underlying chronic disease (2 had lung disease, 2 had chronic renal disease and remaining 2 had chronic liver disease). No significant etiology could be detected in one patient (4.67%), hence grouped under unexplained anemia.

## Pancytopenia

Eight out of total 150 patients (5.33%) had pancytopenia with hemoglobin < 10g/dl, TLC <4,000/ $\mu$ l and platelets <1.5 Lakh / mm<sup>3</sup>. Eight patients (50%) were diagnosed with an underlying malignancy, megaloblastic anemia was detected in 2 patients (25%) and one patient showed an aplastic bone marrow picture (12.5%).

## Dimorphic anemia

Only 4 out of total 150 patients (2.67%) showed a dimorphic blood picture of which 2 cases were diagnosed with chronic inflammation, 2 had renal cause and no cause could be identified in one case.

Serum ferritin levels were intermediate (between 15-100ng/ml) in 2 patients. Other 2 cases had values >100ng/ml.

Statistically, hemoglobin and serum ferritin levels showed a highly significant relation with pattern distribution of anemia with 47% of patients having Hb < 8g/dl and 50% patients with ferritin < 15 ng/ml in microcytic group.

## **DISCUSSION:**

The prevalence of anemia among elderly, as reported in the Indian cross sectional studies varies between 6% and 30 % among males and 10% and 20% among females (19).

It was previously believed, that the decline in hemoglobin levels might be a normal consequence of aging, but evidence has accumulated that anemia does reflect poor health and increased vulnerability to adverse outcomes in older people. However, detecting the type of anemia and instituting appropriate treatment goes a long way improving overall outcome and quality of life (20).

Volume 3, Issue 6; November-December 2020; Page No 537-547 © 2020 IJMSCR. All Rights Reserved In our study, the mean age distribution of anemia in elderly was 70.33 years. Majority (49.34%) belonged to age group of 60-70 years followed by 45.33% patients in the age group of 71-80 years. In a study done by Amit Bhasin et al, the mean age was found to be 70.51 years, majority of patients were in age group of 60 to 69 years, 52% were male and 42% were female. Other studies{amarneel (21), prakash (22), arathi (23)} also found similar results. However, in our study, majority of patients were female (51%) which is comparable with study by Shrivastava et al (24).

Easy fatigability was the most common symptom in our study present in 86% of patients followed breathlessness on exertion (4.67%), chest pain (4.67%), palpitation (3.33%) and vertigo (1.33%) in corroboration with Amit Bhasin et al (74%) and Prakash et al (88%) studies. In our study, normocytic anemia was the most common pattern in both sexes accounting for 58% followed by microcytic anemia (20%) and macrocytic anemia (14%). In Bhasin's study, normocytic anemia was commonest pattern (62%) followed by microcytic anemia (30%) and macrocytic anemia (6%). Prakash et al in their study found normocytic anemia (52%) as most common pattern, microcytic anemia (32%) and macrocytic anemia (16%). Tettamanti et al and Shrivastava et al also found normocytic anemia as most common pattern (73.2% & 78.05%). Thus the above studies are comparable with the present study but with a slightly higher percentage of normocytic anemia. However, in another study by Dr. C.A. Arathi et al, normocytic anemia contributed (42%), microcytic anemia (28%) and macrocytic anemia (19%). Hence, Dr. C. A. Arathi's study found a higher percentage of iron deficiency anemia than the present study.

For the purpose of comparison, we have considered dimorphic anemia under macrocytic anemia based on the presence of macrocytes in the peripheral blood picture.

Milman and Schultz-Larsen had shown that 2.4% of anaemic elderly had serum iron <15ng /ml (depleted iron stores), 3.5% had value <30 ng/ml (small iron stores), 94.1% had values >30 ng/ml(105). This difference in the population having iron deficiency in our study could be explained on the basis of decreased dietary iron intake in Indian population.

We observed that anemia of chronic disease was the most common cause of anemia in the elderly (26%), followed by malignancy (17.33%) and the third major cause being iron deficiency (16.67%) followed by anemia of chronic renal disease (14%). Vitamin B12 and folate deficiency were responsible for 7.3% of anemia in present study. Cause of anemia remained unexplained in 16.67% cases classified as Unexplained Anemia (UA). Similar results were observed in a study done by Ferrucci et al(34), where anemia of chronic inflammation contributed to 24.4% of cases, iron deficiency in 17.4% cases, vitamin B12 and folate efficiency in 10.5% and UA in 37.2% cases. Bhasin et al also found anemia of chronic disease (48%) as the commonest cause followed by iron deficiency anemia (30%). However, Bhasin et al (30%) and Prakash et al (24%) studies showed a higher percentage of iron deficiency anemia than the present study.

Renal disorders were commonest cause amongst anemia of chronic diseases (14%) based on renal function tests with serum creatinine values > 1.5mg/ml. Bhasin et al study also found similar results with a higher percentage (45.8%). Also, Jack and coworkers revealed anemia due to chronic renal diseases in 13.2% of patients.

In anemia of chronic disease, normocytic anemia was most common pattern. Sourabh R Shrivastava et al and various other studies also showed similar results, which may also be the cause for highest prevalence of normocytic anemia.

Iron deficiency anemia was the second most common cause of anemia diagnosed in 16.67% of patients. Tettamanti and guralnik et al have shown similar results. However other studies have shown a higher percentage. In iron deficiency anemia, we found chronic blood loss (52%) from gastrointestinal tract as most common cause.

Our study found 7.3% cases of megaloblastic anemia with 4.67% cases of vitamin B12 deficiency and 0.67% cases of folate deficiency and only one patient had both B12 and folate deficiency (0.67%). Jack M. Guralnik and co-workers revealed that 6.4% patients had folate deficiency only and 5.9% of the patients had B12 deficiency. Hence our study corroborates with the findings of this study.

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In our study, hematological malignancies were found in 12.67% cases and 4.67% of non-hematological malignancies (2 cases of carcinoma stomach, 2 cases of carcinoma colon, 1 case of oral cancer, 1 case of penile carcinoma and 1 case of carcinoma prostate). However, other studies such as Prakash et al (18%) and Dr.C.A.Arathi et al (9%) have reported slightly higher rates of hematological malignancies.

All patients with signs and symptoms of iron deficiency along with low ferritin levels (<15ng/ml), low serum iron (<60 µg/ml), reduced transferrin saturation (< 20%), and a high TIBC (> 450  $\mu$ g/ml) were investigated further. Fecal occult blood test was performed for all such patients and only 10 patients showed positive results. We evaluated the gastrointestinal system of all patients with IDA by upper gastrointestinal endoscopy and colonoscopy regardless of fecal occult blood loss. Upper gastrointestinal lesions were detected in 10 patients (32.26%) and lower gastro-intestinal lesions in 7 patients (22.58%). Remaining 14 patients (45.16%) showed a normal study. Bhasin et al study found an upper GI lesion in 78.6% of patients and a colonic lesion lesion in 29.4% of patients. We diagnosed total 5 cases (3.33%) of gastro-intestinal malignancies (3 gastric and 2colonic). Bhasin study reported 6.66% of patients with a gastrointestinal malignancy. Coban et al (25) and Gordan et al (26) in their study on endoscopic evaluation of iron deficiency anemia reported similar results. Therefore, various studies have reinforced the need for GI tract evaluation as blood loss through GI tract lesions contribute significantly in older adults.

In our study, 8 (5.33%) of total 150 cases had pancytopenia based on the complete hemogram and blood smear picture. Studies done by Bhasin et al, Dr. C.A. Arathi et al also have studied pancytopenia as one of the patterns of anemia and reported 2% and 11% cases respectively. Hence for the purpose of comparison, we have studied pancytopenia as a pattern of anemia. In our study, four out of eight cases (50%) were diagnosed with hematological malignancy (3 MDS, 1 multiple myeloma), one patient had aplastic anemia and remaining 3 had nutritional deficiencies (iron, vitamin B12).

The patients who could not be grouped under any of the etiologies were therefore classified as having 'Unexplained Anemia'. Increasingly, it has become recognized that approximately one third of the older adults do not have an obviously discernible cause of anemia upon an extensive evaluation. This anemia is generally mild (Hb from 9-12 g/dl, normocytic, and hypo-proliferative [low reticulocyte count]. Potential include low testosterone, occult explanations inflammation, reduced hematopoietic reserve with advancing age, inappropriately low serum EPO level, and myelodysplastic syndromes. In our study, there were 25 out of total 150 patients (16.67%) who had no significant underlying disorder to explain the cause for anemia. In our study 2.67% cases were MDS. Our study showed a lower percentage. However, Bhasin et al reported 2% cases of unexplained anemia.

## CONCLUSION:

While aging cannot be prevented, the complications of aging may be preventable or at least delayed which may prolong their independence and improve the quality of life of older people and at the same time minimize the management-related costs.

Normocytic anemia is the most common pattern and easy fatigability and pallor are commonest sign and symptoms. Most of the anemic elderly have an underlying treatable cause for anemia. Basic investigations should include Complete hemogram and Peripheral smear examination which are available everywhere. Bone marrow examination and upper GI endoscopy/colonoscopy should be reserved for selected cases.

## **TABLES/FIGURES:**

Age group(years)	Males		Females	Females		
	Ν	%	Ν	%		
60-65	23	31.51	20	25.98	C T	
66-70	11	15.07	20	25.97	Ľ	

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<b>71 75</b>	10	24.66	22	20.97
/1-/3	18	24.00	23	29.01
76-80	16	21.92	11	14.29
>80	5	6.85	3	3.9
Total	73	100	77	100

"Table1: Age and gender distribution of the study population".

NORMOCYTIC		MICROCYTIC		MACROCYTIC	
ANEMIA OF CHRONIC DISEASE (ACD)	29(33.3%)	ACD	5(16.7%)	ACD	4(28.57%)
CHRONIC KIDNEY DISEASE (CKD)	17(19.5%)	IRON DEFICIENCY ANEMIA	20(66.7%)	MEGALOBLASTIC ANEMIA	11(52.38%)
MALIGNANCY	14(16.1%)	UNEXPLAINED ANEMIA	5(16.67%)	MALIGNANCY	3(14.29%)
UNEXPLAINED ANEMIA	19(21.8%)	-	-	CKD	2(9.52%)
HERNIA	2(14.9%)	-	-	UNEXPLAINED ANEMIA	1(4.76%)
HYPOTHYROIDISM	2(14.9%)	-	-	-	-
IRON DEFICIENCY ANEMIA	4(4.6%)	-	-	-	-
<b>TOTAL(150)</b>	87		30		21

"Table 2: Cause distribution of patterns of anemia in study population"

PANCYTOPENIA	
Malignancy	4(50%)
Iron deficiency anemia	1(25%)
Megaloblastic anemia	2(30%)
Aplastic anemia	1(25%)
TOTAL	8(100%)

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"Table 3: Cause distribution of pancytopenia in study population"

STUDY	SUBJECT	IDA %	B12/FOLATE%	ACD	CKD	UA
Bhasin et al, 2011(20)	100	30	B12:3;B6:2	48	45.8	2
Prakash et al, 2015(22)	50	24	10	32	-	8
Guralnik, 2004(27)	2096	16.6	B12:5.9;B6:6.4	19.7	8.2	33.6
<b>Tabea et al,2014(28)</b>	255	65	-	62.1	-	-
Tettamanti, 2010(29)	8774	16	10.1	17.4	15	26.4%
Ferrucci et al, 2010(30)	582	17.4	10.5	24.4	10.5	37.2
Present Study	150	16.67	7.3	26	14	16.67

"Table 4: Common causes of anemia in elderly observed in different studies"

(IDA-Iron deficiency anemia, ACD- Anemia of chronic disease, CKD- Chronic kidney disease, UA-Unexplained anemia)

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