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# Clinical Study of Anemia in Geriatric Population in Tertiary Care Centre

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**ABSTRACT**
*Anemia is a major public health concern and problem among the elderly with associated high morbidity and mortality. Anemia in the elderly is strongly linked to severe complications, such as impaired physical functioning, multi-dimensional functional impairment, increased frailty risk, and increased frequency of hospital stays. Clinical study of Anemia in geriatric population with respect to occurrence and demography of Anemia including their socioeconomic status, to ascertain the type and cause of Anemia and, to establish a correlation between Anemia symptoms and severity. This were a prospective cross-sectional hospital based observational study conducted in a total of 102 patients aged above or equal to 60 years attending General medicine out-patient department or admitted in ward at Dr. D.Y. Patil hospital and research centre, Pune.Statistical analyses used were frequency, percentage, mean,standard deviation, and 'p' values. The associationbetween independent variables such as gender, aetiology, and Anemia was determinedusing the chi square or fisher exact test, with a p value of <0.05 at the 95 percentconfidence interval considered statistically significant. Among 102 study participants, mean age of $67.09\pm6.5$years with slight female preponderance, most common type of Anemia is normocytic normochromic (59%) followed by microcytic (28.4%), macrocytic (7.8%). The etiology encountered is as follows: chronic kidney disease (32.3%), Iron deficiency Anemia due to gastro-intestinal disorder (16.6%), Nutritional Anemia (13.7%), Liver disorder (9.8%), Multifactorial causes (8.8%), Rheumatoid arthritis (2.9%), Infectious causes (3.9%), Hypothyroidism (4.9%), malignant causes including acute myeloid leukemia, aplastic Anemia and multiple myeloma contributing to 0.9%. Anemia in elderly is a common problem which is underdiagnosed routinely, etiology of Anemia in significant fraction remains obscure. So, a systematic approach in diagnosis and evaluation of Anemia in elderly helps in better management and raise the standard of living.*
*Key words:Anemia,Hemoglobin, Iron deficiency, Diabetes Mellitus, Pancytopenia*

## INTRODUCTION

Anemia is a global health problem in the elderly because of the high prevalence and associated significant morbidity and mortality.[1][2]According to WHO guidelines, Anemia is defined as a haemoglobin (Hb) concentration of less than 12.0 g/dL in women and 13.0 g/dL in males. Men and women with Anemia were classified as having severe Anemia (Hb <8.0 g/dL), moderate Anemia (Hb 8.0–10.9 g/dL), or mild Anemia (Hb 11.0–12.9 g/dL for men and 11.0–11.9 g/dL for women).[3] Hb levels, on the other hand, decline with age and differ between ethnic groups. So far, the majority of older-age studies have used the WHO definition of Anemia.[4] Analyses of the National Health and Nutrition Examination Survey (NHANES) III and the Scripps-Kaiser databases in the United States have suggested higher reference values to define Anemia for white men, but have generally supported the validity of the WHO thresholds on the prevalence of Anemia.[4][5][6]

It is often mistaken for a natural part of ageing or a disease marker, it is commonly misdiagnosed and not reported to patients. The etiology of Anemia in the elderly is multifactorial, with many factors interacting in a complex way. Three types of Anemia exist in the elderly: Anemia of chronic disease , nutritional deficiency, and unexplained Anemia are all types of Anemia.[7] Chronic diseases and iron deficiency are the most common causes of Anemia in the elderly.[8] Unexplained Anemia of the elderly (UAE) is a real condition marked by a hypo proliferative normocytic Anemia that is not caused by malnutrition, Chronic kidney disease (CKD), or inflammatory disease, and in which the erythropoietin response to Anemia appears to be slowed.

Almost one-third of elderly people with Anemia have a nutrient deficiency as a contributing factor; the majority of such cases are the result of iron - deficiency Anemia, which includes chronic loss of blood, folate and vitamin b12 deficiency. Although food fortification has decreased the prevalence of folate deficiency, more than 10% of elderly people have borderline or low vitamin B12 levels. [9][10]

According to the literature, Anemia in the elderly is strongly linked to severe complications, such as impaired physical functioning, reduced functionality, multi - dimensional functional impairment, increased frailty risk, depression, cognitive decline, obstructive sleep apnea, frequent co-morbid conditions and hospital stays, and increased risk of mortality[11].

According to a study published in the Netherlands, community-dwelling people over the age of 85 who had Anemia had a greater 5-year mortality rate than those that have normal haemoglobin levels.[12]Chaves et al. also observed an increase in mortality linked with haemoglobin levels less than 110 g/L in a group of older women with mild-to-moderate physical impairment.[13] Apart from its relationship with mortality, Anemia has been found to have a detrimental effect on older adults' quality of life and physical functioning.[14][15][16]

Present study aims for clinical study of Anemia in geriatric population with respect to occurrence and demography of Anemia including their socioeconomic status, to ascertain the type and cause of Anemia, and to establish a correlation between Anemia symptoms and severity.

## MATERIAL AND METHODS

**Study design and population:**The current study was a prospective cross-sectional hospital based observational study conducted in a tertiary care centre from January 2021 to August 2021.A total of 102 patients above the age of 60 years attending General medicine out-patient department or admitted in ward at tertiary care centre were selected as study population.

**Inclusion and exclusion criteria**: Patients aged above or equal to 60 years irrespective of gender were included in the study.

Anemic patients aged less than 60 years, patients receiving or received chemotherapy and radiotherapy and patients who had undergone surgery during last 3 months were excluded from the study.

**Ethics:**Study was carried after clearance from ethical committee, purpose and benefit of study was explained to study subjects in a language they can understand and informed consent was obtained from them.Subjects fulfilling inclusion criteria were evaluated with detailed clinical history, physical and systemic examination and were subjected to investigations as per requirement. Data on the participants' socioeconomic status and medical history was obtained by means of a pretested structured questionnaire.

Patients were subjected to following investigations: Complete blood count including red blood cell indices, Vitamin B12 and folic acid, Liver function tests, Renal function tests, Serum Iron studies, USG abdomen, Urine routine, C- Reactive protein, Stool Routine and Microscopy, Upper GI endoscopy (if indicated), Colonoscopy (if indicated), Bone marrow examination (if indicated). All were conducted according to standard protocols.

Procedure: The CBC was determined using a spectrophotometer, electrical impedance method, volume conductivity scattering (VCS) and by automated hematologyanalyzer. Liver function and renal function tests were determined by turbometry, C-reactive protein by nephelometry, Serum Iron by ferene triazine, Vitamin b12 and folic acid by Chemiluminescent Microparticle Immuno Assay (CMIA) method. Red cell indices were used to morphologically classify Anemia, and the reference values in this study were MCV (80–100 fl), MCHC (31–35 percent), and MCH (27–32 pg). Serum vitamin b12 and folate levels were done in study participants of macrocytic and dimorphic Anemia group.

**Statistical analysis:** Frequency, percentage, mean,standard deviation, x2, and 'p' values were calculated using this software. The associationbetween independent variables such as gender, aetiology, and Anemia was determinedusing the chi square or fischer exact test, with a p value of <0.05 at the 95 percentconfidence interval considered statistically significant.

## RESULTS

**Demographic status**: In a study of 102 participants, age ranging between 60 to 85 years with a mean age of 67.09 ± 6.5 years. There was a slight female preponderance with male and female ratio of 0.9:1. In relation with socio-economic status, according to Modified Kuppuswamy scale, majority (48%) were in lower middle (III) class followed by upper lower (IV) class of 26.4%. (Discussed in table 2.)

**Table 1: Age group and gender distribution**

| Age group | Male | Female | Frequency | Percent |
|---|---|---|---|---|
| 60-65yrs | 25 | 30 | 55 | 53.9 |
| 66-70yrs | 10 | 12 | 22 | 21.5 |
| 71-75yrs | 8 | 7 | 15 | 14.7 |
| >75yrs | 5 | 5 | 10 | 9.9 |
| **Total** | **48** | **54** | **102** | **100.0** |

**Table 2: Socio-economic status and its relation to nutritional Anemia**

| Socio-economic status class | Frequency | Percent |
|---|---|---|
| Upper (I) | 2 | 2.0 |
| Upper middle (II) | 20 | 19.6 |
| Lower middle (III) | 49 | 48.0 |
| Upper lower (IV) | 27 | 26.4 |
| Lower (V) | 4 | 4.0 |

* Socio economic status class adopted from modified Kuppuswamy scale[17]Majority of study participants with nutritional Anemia were belonging to upper lower (IV) socio-economic status class.

**Clinical status**: The most frequently encountered symptom in study was fatigue of 93%, anorexia, and breathlessness on exertion were the next common symptoms.

On examination, pallor was present amongst all participants (100%), pedal edema (26.4%) and nail changes including platynychia and koilonychia (15.6%), tachycardia (14.7%), hepatomegaly (4.9%), glossitis (2.9%) and knuckle pigmentation (1.9%).

Associated co-morbidities in study participants were most frequent in diabetes mellitus (48%) followed by hypertension (31%), chronic liver disease (8.8%), ischemic heart disease (7.8%), hypothyroidism (4.9%), rheumatoid arthritis (2.9%), malignancy, infectious causes including HIV and tuberculosis were of 1.9%.

Co-morbidities were not found in 17.6% of study participants.

**Graph 1: Symptoms wise distribution of study participants**
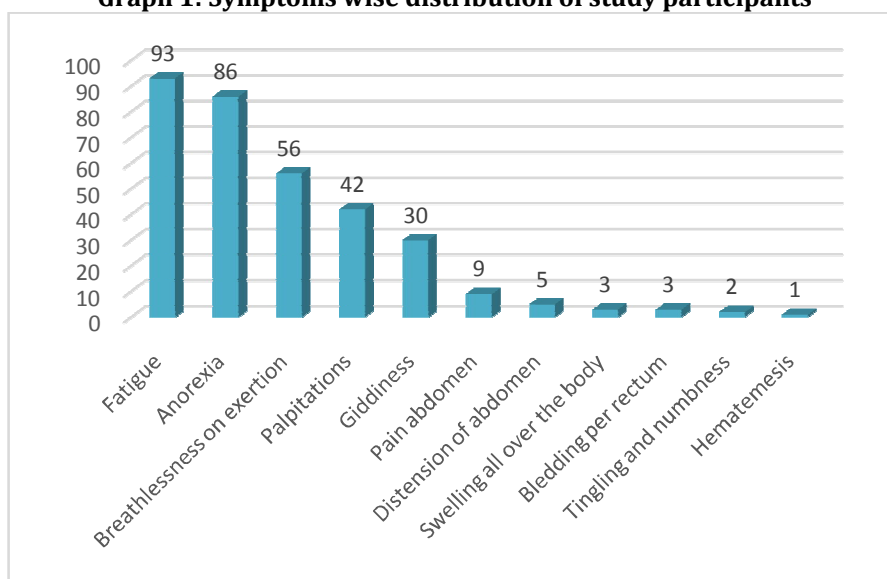


Dietary assessment is as following: In 102 study participants, majority of them (59) were consuming mixed diet (57.8%) i.e. vegetarian and non-vegetarian and remaining (43) were
consuming vegetarian diet (42.1%). Out of 43 study participants who were consuming vegetarian diet, 14 study participants (32.5%) presented with nutritional Anemia.

Laboratory status: The type of Anemia was determined based on red blood cell indices and peripheral blood smear (PBS). Most common type of Anemia was normocytic normochromic (59%) followed by microcytic and macrocytic Anemia.

**Table 3: Laboratory findings.**

| Test | Mean ± Standard deviation | Range |
|---|---|---|
| Haemoglobin (g/dl) | 8.48±1.5 | 3.4-10.7 |
| Total leucocyte Count (/µL) | 6791±2311.61 | 2000 -12400 |
| Platelet Count (/µL) | 3,07,245±1,09,041 | 7000 -7,20,000 |
| RBC Count ($10^6$/µL) | 3.15±0.70 | 1.41-4.97 |
| PCV (%) | 25.71±4.46 | 11.2-35.4 |
| MCV (in fl) | 85.28±9.70 | 64.5-120.9 |
| MCH (in pg) | 28.00±2.95 | 21.1-35.8 |
| MCHC (in g/dl) | 32.972±1.24 | 28.0-35.5 |
| RDW (%) | 16.75±6.64 | 10.5-44.2 |
| **Folate and vitamin B12** | | |
| S. Folate (n=11) | 6.03+4.28 | 2.1-15.5 |
| Vitamin B12 (n=13) | 187.58+150.09 | 83-556 |

**Table 4: Type of Anemia**

| Type of Anemia | PBS Findings | Frequency | Percent |
|---|---|---|---|
| Dimorphic | Macrocytic hypochromic | 1 | 1.9 |
| | Microcytic hypochromic | 1 | |
| Pancytopenia | Macrocytic | 2 | 2.9 |
| | Normocytic normochromic | 1 | |
| Macrocytic | Macrocytic | 8 | 7.8 |
| Microcytic | Microcytic hypochromic | 29 | 28.4 |
| Normocytic Normochromic | Normocytic normochromic | 60 | 59.0 |
| **Total** | | **102** | **100.0** |

**Etiological distribution:**Most frequentetiology was chronic kidney disease (CKD) in 32.3%, iron deficiency Anemia (IDA) due to gastro-intestinal (GI) disorder in 16.6% [including hemorrhoids (5%), chronic gastritis (3%), peptic ulcer disease (4%),hookworm infestation (1.9%), inflammatory bowel disease(0.9%), esophageal varices (0.9%), colorectal cancer(0.9%)], and nutritional Anemia in 13.7%.

**Chart 2: Etiology of Anemia**
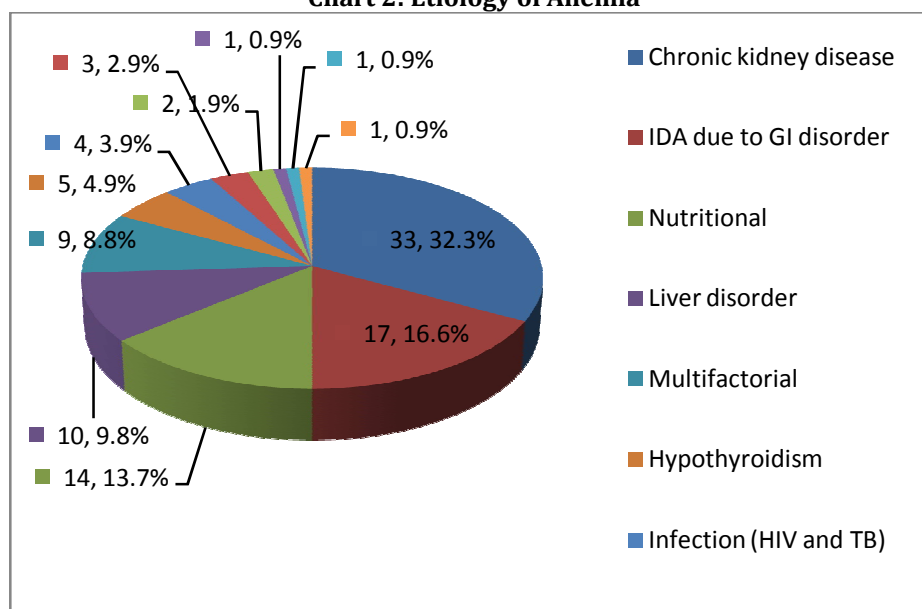


Upper GI endoscopy was performed in participants having iron deficiency Anemia and in participants of normocytic group who had stool occult blood positive. Out of 33, 16 participants` endoscopy revealed normal.

Colonoscopy was performed in 18 study participants, out of them 11 had normal findings.

Bone marrow examination was performed in 17 study participants with pancytopenia, Dimorphic Anemia and in selected patients with Normocytic Anemia. Three of them hadmalignant haematological conditions including acute myeloid leukemia, aplastic Anemia and multiple myeloma.

**Table 5: Upper GI endoscopy, Colonoscopy, Bone marrow examination among study participants**

| Upper GI endoscopy findings (n=33) | Frequency | Percent |
|---|---|---|
| Normal | 16 | 48.4 |
| Oesophageal varices | 10 | 34.5 |
| Antral gastritis | 03 | 10.3 |
| Atrophic gastritis | 02 | 6.9 |
| Gastric ulcer | 02 | 6.9 |
| **Colonoscopy findings (n=18)** | | |
| Normal | 11 | 61.2 |
| Haemorrhoids | 5 | 27.7 |
| Inflammatory bowel disease | 1 | 5.5 |
| Malignancy | 1 | 5.5 |
| **Bone marrow findings (n=17)** | | |
| Normal erythroid maturation | 06 | 35.2 |
| Micronormoblastic pattern | 05 | 29.4 |
| Megaloblastic pattern of maturation | 03 | 17.6 |
| Acute myeloid leukaemia | 01 | 5.8 |
| Hypoplastic marrow | 01 | 5.8 |
| Multiple myeloma | 01 | 5.8 |

The most common etiology being chronic kidney disease affecting all age groups and most of them were in between 60 to 65 years followed by iron deficiency Anemia due to gastrointestinal disorder and nutritional Anemia.

**Table 6: Age wise etiology of Anemia among study participants**

| Etiology of Anemia | Age group | | | | Total |
|---|---|---|---|---|---|
| | 60-65yrs | 66-70yrs | 71-75yrs | >75yrs | |
| Chronic kidney disease | 15 | 9 | 5 | 4 | 33 |
| IDA due to GI Disorder | 9 | 1 | 5 | 2 | 17 |
| Nutritional | 7 | 6 | 0 | 1 | 14 |
| Chronic liver disease | 10 | 2 | 0 | 0 | 12 |
| Multifactorial | 2 | 1 | 3 | 3 | 9 |
| Hypothyroidism | 4 | 0 | 1 | 0 | 5 |
| Chronic infection | 3 | 1 | 0 | 0 | 4 |
| Rheumatoid Arthritis | 2 | 1 | 0 | 0 | 3 |
| IDA due to unexplained cause | 1 | 0 | 1 | 0 | 2 |
| Acute Myeloid Leukaemia | 1 | 0 | 0 | 0 | 1 |
| Aplastic Anemia | 0 | 1 | 0 | 0 | 1 |
| Multiple myeloma | 1 | 0 | 0 | 0 | 1 |
| Total | 55 | 22 | 15 | 10 | 102 |

**DISCUSSION**

Anemia is one of the most common morbidities in people over the age of 60. According to current understanding, ageing is caused by a disruption in homeostasis. Hormones, immune regulating mechanisms, and oxidative stress/antioxidant equilibrium are all part of the complex signalling pathway that ensures homeostasis. Anemia can be caused by variations in any of them.Anemia in the elderly can cause more serious complications than in younger people, lowering their quality of life. Such negative outcomes can be avoided with early detection and treatment. Anemia, though common among the elderly, is frequently overlooked, especially during routine clinical examinations.[18] As a result, our goal was to look into the clinical profile of Anemia in geriatric patients at a tertiary care hospital.[19][20]

In our survey, the majority of patients (54) were female, and the majority of them (53.9%) were between the ages of 60 and 65. In a study conducted by Diggikar P et al., the gender distribution of study participants were females (55) and males (45).The age range was 60-85 years, with a mean age of 67.09±6.5 years. In a survey conducted by Shrivastava et al, the mean age of the study participants was 73.06 years, and in a study conducted by Prakash et al, the mean age of the study cohort was 66.65±6.43 years. Out of total 102 patients, 59 percent had normocytic Anemia, 28.4% had microcytic Anemia, 7.8% had macrocytic Anemia, 2.9 percent had pancytopenia, and 1.9 percent had dimorphic Anemia.  Our

findings are consistent with those of Shrivastava et al., Prakash KG *et al.*, Diggikar P *et al.*and Amit Bhasin *et al.*[21][22][23][20]

Anemia in the elderly is multifactorial in origin and is the result of a complex interaction of numerous factors. Although Anemia in the elderly is primarily caused by a gradual decline in the production of erythropoietin by the kidneys, the decline in Hb levels and subsequent Anemia in this age group should not be assumed to be a normal part of ageing and therefore should be appropriately investigated and managed. This is critical because studies have shown that approximately 50% of elderly people with Anemia have an iron deficiency, cobalamin deficiency, or chronic renal insufficiency.[24]

Chronic kidney disease (32.3%) was the most common etiology of Anemia among study participants across all age groups in our study. Followed by CKD, IDA (16.6%) and nutritional Anemia (13.7%) are the common causes of Anemia among study participants. Anemia of Chronic Inflammation (26%) was the most common cause of Anemia in the Ferrucci L et al study, followed by iron deficiency Anemia (24%) and hematological malignancies (18%), while B12 and folate deficiency was responsible for 10% of Anemias in the elderly. [18] Aplastic Anemia and hypothyroidism were both uncommon causes of Anemia.We couldn't find any significant difference in etiology and mean hemoglobin and other lab parameters value in male and female among study participants because of clustering of cases and small sample size.

In our study, financial constraints, lack of knowledge of consumption of iron rich foods and foods containing vitamin b12 and folic acid, lack of meat consumption, loneliness, and upper lower (Class IV) socioeconomic status are the factors that contribute to the development of nutritional Anemia.Untreated geriatric Anemia has been linked to an increased risk of death, a higher prevalence of co-morbid conditions, and decreased function.[25] In our study of anaemic geriatric participants most of them were having either one or more co-morbidities, most common were diabetes mellitus (48%), hypertension (30.3%), chronic liver disease (8.8%), ischemic heart disease (7.8%), rheumatoid arthritis (2.9%), chronic infections like HIV and tuberculosis (3.8%) and malignancy (0.9%).

Red blood cell production declines with age due to a decrease in the ratio of bone marrow to fat cells and a decrease in marrow response to erythropoietin stimulation. As a result, Anemia may be caused by old age.[26]In our study increase in age was not significantly correlated with hemoglobin level and RBC values. Through lab parameters we found that most of them (96%) had reduced RBC values and only iron deficiency Anemia related parameters were reduced among half of study participants. In a study conducted by Pathania A et al, an increase in age was found to be a significantly strong predictor of Anemia in the study population.[27] So, the Anemia could have been caused solely by biological factors, or it could have been caused by a lack of dietary iron as a result of advancing age, which needs to be investigated further.Moderate (71%) and severe Anemia (16%) were found to be more prevalent among study participants.[28]According to a study by Joshi I *et al.,* the majority of elderly patients with Anemia had moderate Anemia, accounting for 58.5 percent of all patients, while severe Anemia was found in 27.9%.[29] Diagnosis of Anemia in the geriatric age group, as well as knowledge of its pattern, which aids in the etiological diagnosis of Anemia and, ultimately, treatment.[30]

Limitations of the study: small sample size and observer bias were the limitations of the study.

## CONCLUSION

Anemia in elderly is a common problem which is underdiagnosed routinely, so a systematic approach in diagnosis and evaluation of Anemia in elderly helps in better management and raise the standard of living. For better management of geriatric patients, an intensive effort should always be made to reach an etiological diagnosis of Anemia. It is recommended that studies of Anemia in geriatric population should include a greater number of patients for better clinical approach.

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