ASSESSMENT OF PATTERNS OF ANEMIA IN GERIATRIC EGYPTIAN POPULATION

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Abstract

Background: Regardless of its root cause, anemia is a major health concern among the aged population. As a result of the additional difficulties it causes, anemia is more prevalent in the elderly population.

The aim of study: To provide an assessment of the prevalence and underlying causes of anemia in the elderly.

Methods and Subjects: Individuals aged 60 and up were recruited from the Internal Medicine Department at Kasr Al Ainy University Hospital for this cross-sectional analytical study. Patients receiving chemotherapy, radiation, or hematinics were also disqualified, as were those who had received a blood transfusion within the previous 12 weeks.

Results: The average age of participants was 68.54 years, with a standard deviation of 6.13 years; our study had a higher proportion of male participants than female participants (55.3%); normocytic anemia was the most common type of anemia (54.4%), followed by microcytic anemia (36.8%) then macrocytic anemia (8.8%); 57.9% of participants had severe anemia. Iron deficiency anemia accounted for 28.9% of cases, chronic illness anemia accounted for 20.2%, and leukemia accounted for 15.8% of cases among the 114 patients. Hemolytic anemia, thalassemia, aplastic anemia, and other benign hematological causes of anemia are more common in younger age groups. In contrast, elderly people frequently experience myelodysplasia and malignant hematological illnesses such myeloma, CML, and lymphoproliferative disorders. There was no discernible relationship among age and hemoglobin levels. **Conclusion:** normocytic anemia is the most common kind of anemia in the elderly, and more than half of the older population has severe anemia. Iron deficiency anemia is the most common cause of anemia in the elderly, followed by anemia caused by chronic disease.

Key Words: Anemia - Geriatric - Egyptian.

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INTRODUCTION

According to projections made by the World Health Organization (WHO), the proportion of the world's population that is 60 or older will increase from 12 percent in 2015 to 22 percent in 2050, from 900 million to 2 billion (**Girelli et al.)[(1)] .**

Age-related decline in hemoglobin (Hb) levels has been widely accepted in the past, leading to widespread use of the term anemia among the elderly (**Girelli et al.)[(1.2)] .**

Epidemiological studies have shown that most cases of anemia in the elderly are classified as mild, with hemoglobin levels (Hb) among 11 & 12 g/dl. This creates an inaccurate picture of anemia in the elderly as a minor condition, especially in the context of other diseases (**Barnett et al.)[(3)].**

When it comes to the elderly, anemia is linked to a number of negative outcomes, including diminished quality of life (**Sharma et al.) [(4)]**, increased likelihood of hospitalization and longer stay

(**Riva et al.) [(5)]**.

We now prefer the phrase "anemia in the elderly," which suggests looking for and maybe treating the underlying cause of low hemoglobin in an elderly case (**Girelli et al.)[(2)]**.

There are many potential causes of unexplained anemia in the elderly, and one suggestion is that certain cases are linked to the asymptomatic stages of myelodysplastic syndromes (MDS). Androgen deficiency, vitamin D deficiency, altered erythropoietin (EPO) balance, chronic low-grade inflammation (Inflammaging), age-related clonal hematopoiesis, and undiagnosed iron shortage are all possible causes of unexplained anemia (**Sahin et al.) [(6)]**.

Future trials on anemia correction in the elderly should be motivated by the impact of anemia on mortality (**Culleton et al.) [(7)]**. Our research aims to improve anemia treatment by improving diagnosis and identifying contributing factors.

PATIENTS AND METHODS

We recruited 114 older individuals from the internal medicine department, the outpatient clinic, and the wards at kasr Al Ainy university hospital for this cross-sectional analytical study on the prevalence and risk factors for anemia in the elderly.

Sample size was calculated by using Epi Info 7, software developed by Center for Disease Control & Prevention "CDC". The Calculated number was **114** geriatric participants based on the following; Confidence level 95%.

Expected prevalence of anemia among geriatrics is 17.5% and margin error of 7%, based on the results of the study conducted by (**Badawy** *et al.*) [8], about the prevalence of geriatric anemia in Egypt .

Inclusion criteria: elderly individuals aged 60 years & above with both sexes were involved.

Individuals who had received a blood transfusion in the preceding 12 weeks were not eligible for participation. People receiving treatments like chemotherapy, radiation, or hematinics were also excluded.

Methodology in details:

The following procedures were performed on every individual: Comprehensive physical, nutritional, and social history data. The purposes for which blood was drawn were:

Complete blood count with blood film for: Red blood cell count (RBCs), hemoglobin (Hb), and hematocrit; RBCs indices: Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), and Red cell distribution width diameter (RDW); Cell size, shape,and white blood cell count and platelet count.

Anemia was diagnosed when hemoglobin levels were less than 13 g/dl in men and 12 g/dl in women, as per the World Health Organization's criteria.

Anemia was graded from mild (Hb 10-11.9g/dl,12.9g) in females and males respectively to moderate (Hb 8-10g/dl) to severe (Hb 8 gm/dl) based on the individual's hemoglobin level.

Serum Iron, Total Iron Binding Capacity (TIBC), and Serum Ferritin levels were measured in all patients. Cases with dimorphic and macrocytic anemia, as well as those with a normocytic or microcytic blood picture who have no other known cause of anemia, had their folate and vitamin B12 levels tested. All patients had tests measuring their kidney function, such as blood urea, serum creatinine, and eGFR. Patients whose blood smears showed immature white cells or nucleated red cells, uncertain states of iron storage, and unexplained or unresponsive anemia underwent bone marrow tests (Aspirate+/- biopsy) under local anesthesia and in a completely sterile environment. When deemed necessary, the following further diagnostic procedures were carried out: (Radiological imaging; gastrointestinal endoscopy; tissue biopsy; thyroid function tests; lactate dehydrogenase (LDH); direct Coombs test and C-reactive protein (CRP).

Ethical Considerations

Ethical approval was secured from the Medical School at Cairo University.

After outlining the study's goals to each participant, informed consent was obtained.

Potential risks:

When obtaining a bone marrow aspirate, you may experience some discomfort or bleeding.

Perforation (tear in gut wall), hemorrhage, or response to sedation are rare but possible complications of a gastrointestinal endoscopy.

Blood loss, infection, or puncture wounds to adjacent tissue are among potential risks during a necessary tissue sample.

Statistical analysis

The data was organized and analyzed with SPSS 21 (Statistical Package for the Social Sciences). Quantitative and percentage descriptions of qualitative data were provided. Mean and standard deviation (SD) were used to represent numerical data. The Chi-square test was used to compare the categorical variables. For regularly distributed data, parametric tests were used. The significance level used was $P<0.05$.

RESULTS

Table (1): Demographic data of the studied patients

		Count	%
Age (years)	**60-65**	49	43.0%
	66 – 70	25	21.9%
	71 – 75	21	18.4%
	76 – 80	16	14.0%
	>80	3	2.6%
Sex	**Male**	63	55.3%
	Female	51	44.7%

This table showed that 49 patients out of 114 (43%) were at age ranging from 60 to 65 years, 25 cases (21.9 %) were at age ranging from 66 to 70 years, 21 cases (18.4%) ranging from 71 to 75 years, 16 cases (14%) ranging from 76 to 80 years, while 3 cases (2.6%) were above 80 years. 63 cases out of 114 (55.3%) were males, while 51 cases (44.7%) were females.

Table (2): Number and percentage of the studied patients according to type and severity of the anemia

		Count	%
Type of Anemia	**Microcytic (MCV < 80)**	42	36.8%
	Normocytic (MCV 80-100)	62	54.4%
	Macrocytic (MCV >100)	10	8.8%
Severity of Anemia	**Mild (hemoglobin 10 or more)**	14	12.3%
	Moderate (hemoglobin 8 to < 10)	34	29.8%
	Severe (hemoglobin <8)	66	57.9%

This table showed that Anemia characterization based on RBC indices revealed that normocytic anemia was the most common type, seen in 54.4% of cases followed by microcytic anemia (36.8%) and macrocytic anemia (8.8%). Anemia characterization based on hemoglobin level revealed that 57.9% of cases presented with severe anemia, followed by 29.8% with moderate anemia and 12.3% with mild anemia.
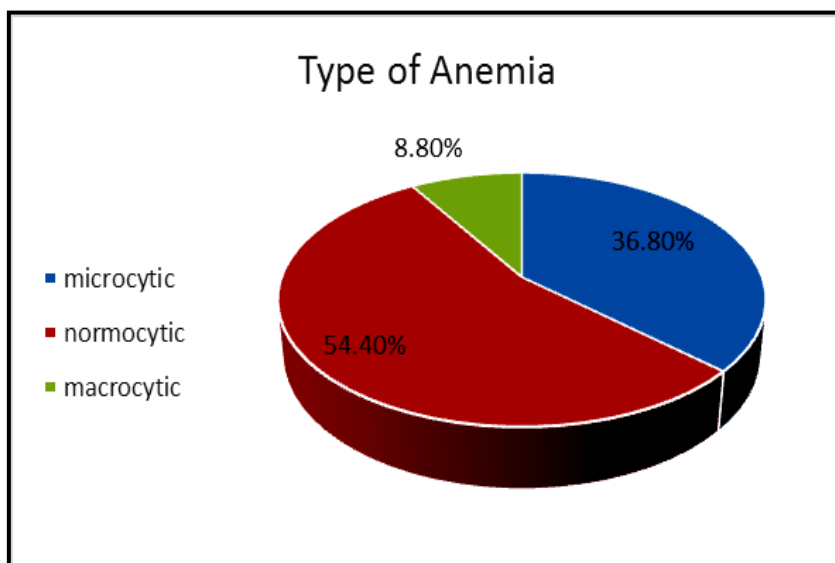

Figure (1): Pie chart of percentage of anemic patients according to its type
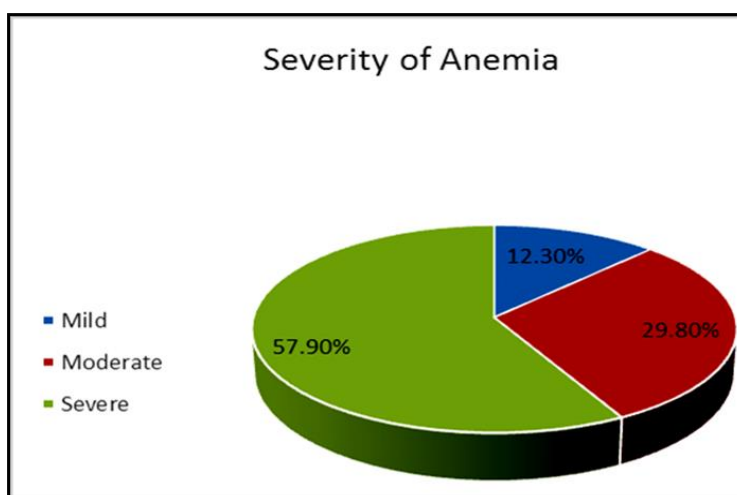

Figure (2): Percentage of anemic cases according to its severity.

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Table (3): Number & percentage of the studied cases according to the presented symptoms

		Count	%
Weight loss	**Yes**	**10**	**8.8%**
	No	**104**	**91.2%**
Vomiting	**Yes**	**7**	**6.1%**
	No	**107**	**93.9%**
Bony pains	**Yes**	**7**	**6.1%**
	No	**107**	**93.9%**
Anorexia	**Yes**	**6**	**5.3%**
	No	**108**	**94.7%**
Lower limbs swelling	**Yes**	**4**	**3.5%**
	No	**110**	**96.5%**
Sore throat	**Yes**	**3**	**2.6%**
	No	**111**	**97.4%**
Body swellings	**Yes**	**3**	**2.6%**
	No	**111**	**97.4%**
Oliguria	**Yes**	**2**	**1.8%**
	No	**112**	**98.2%**
Fracture	**Yes**	**2**	**1.8%**
	No	**112**	**98.2%**
Lower Limbs Weakness	**Yes**	**2**	**1.8%**
	No	**112**	**98.2%**
Convulsions	**Yes**	**1**	**0.9%**
	No	**113**	**99.1%**
Disturbed level of consciousness	**Yes**	**1**	**0.9%**
	No	**113**	**99.1%**
Yellowish sclera	**Yes**	**1**	**0.9%**
	No	**113**	**99.1%**

This table showed that 8.8% of cases complained from loss of weight, followed by vomiting and bony pains both seen in 6.1%, anorexia (5.3%), lower limbs swelling (3.5%), sore throat & body swellings both seen in 2.6%, Oliguria, fracture & lower limbs weakness (1.8% each one), and convulsions, disturbed conscious level & yellowish sclera (0.9% each one).
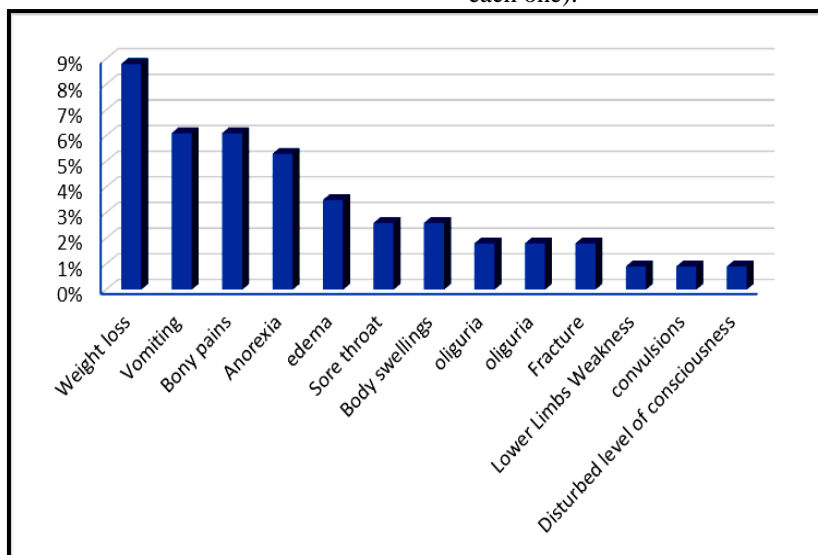

Figure (3): Bar chart of the percentage of patients according to the presented symptoms

Table (4): Number and percentage of the studied patients according to the presented symptoms

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		Count	%
Shortness of breath	**Yes**	51	44.7%
	No	63	55.3%
Fatigue	**Yes**	51	44.7%
	No	63	55.3%
Dizziness	**Yes**	30	26.3%
	No	84	73.7%
headache	**Yes**	20	17.5%
	No	94	82.5%
Palpitation	**Yes**	19	16.7%
	No	95	83.3%
Melena	**Yes**	11	9.6%
	No	103	90.4%
Fever	**Yes**	10	8.8%
	No	104	91.2%
Hematemsis	**Yes**	9	7.9%
	No	105	92.1%
Ecchymosis	**Yes**	8	7.0%
	No	106	93.0%
Bleeding per rectum	**Yes**	5	4.4%
	No	109	95.6%
Chest pain	**Yes**	4	3.5%
	No	110	96.5%
Gum bleeding	**Yes**	3	2.6%
	No	111	97.4%
Diarrhea	**Yes**	3	2.6%
	No	111	97.4%
Epistaxis	**Yes**	2	1.8%
	No	112	98.2%
Night sweating	**Yes**	2	1.8%
	No	112	98.2%

This table shows that easy fatigability and shortness of breath were the most common complaints, seen in 44.7% of patients followed by dizziness (26.3%), headache (17.5%), palpitation (16.7%), melena (9.6%), fever (8.8%), vomiting of blood (7.9%), ecchymosis (7%), bleeding per rectum (4.4%), chest pain (3.5%), bleeding gums (2.6%), diarrhea (2.6%), epistaxis (1.8%) and night sweats (1.8%).
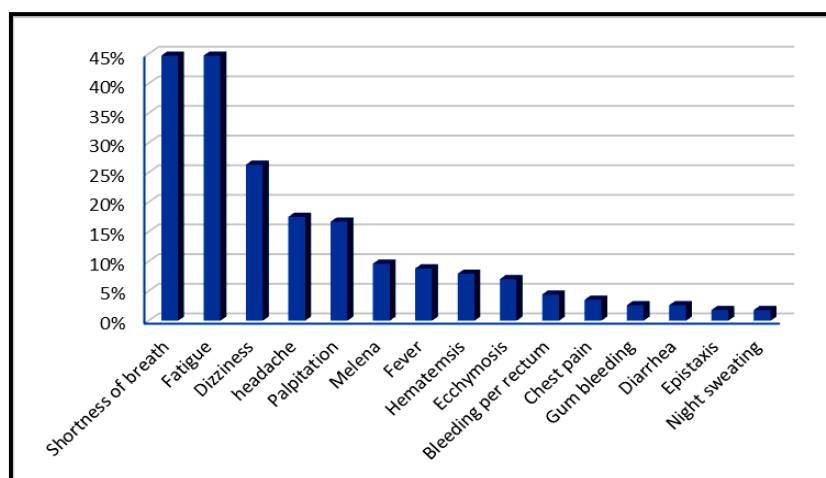

Figure (4): Bar chart of the percentage of studied patients according to the presented symptoms

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Table (5): Etiological classification of anemia in the studied cases, causes of each etiology and their number & percentages

Etiological Classification			Count	%
	Iron Defeciency Anemia	Gastritis	4	12.1%
		Peptic ulcer	4	12.1%
		Varices	4	12.1%
		Hiatus hernia	1	3.0%
		Arterio-Venous Malformation	5	15.2%
		piles	5	15.2%
		Cancer Colon	5	15.2%
		Cancer stomach	2	6.1%
		Nutritional	3	9.1%
	ACD (Anemia Of Chronic Disease)	Anemia Of Chronic Kidney Disease	19	82.6%
		Rheumatoid Arthritis (RA)	1	4.3%
		cancer prostate	2	8.7%
		HCC	1	4.3%
	Leukemia	Acute Myeloid Leukemia	9	50.0%
		Acute Lymphoblastic Leukemia	2	11.1%
		Chronic Lymphocytic Leukemia	7	38.9%
	MM (Multiple Myeloma)	Multiple Myeloma	12	100.0%
	Megaloblastic Anemia	vitamin B12 defciency	4	57.1%
		folate defeciency	3	42.9%
	Lymphoma	NHL	5	83.3%
		Hodgkin disease	1	16.7%
	MDS (Myelodysblastic Syndrome)	MDS	4	100.0%
	Hemolysis	SLE	1	20.0%
		Evan`s	1	20.0%
		Microangiopathic	1	20.0%
		Mechanical (valve disease)	1	20.0%
		Hypersplenism	1	20.0%
	MPNs (Myeloproliferative neoplasms)	CML	1	50.0%
		ET	1	50.0%
	Others	MTX toxicity	3	75.0%
		Warfarin overdose	1	25.0%

RA, Rheumatoid arthritis;   HCC, Hepatocellular carcinoma;
NHL, Non Hodgkin lymphoma;   MDS, Myelodysplastic syndrome;
SLE, Systemic lupus erythematosus;   CML, Chronic Myeloid leukemia;
ET, Essential thrombocytosis;   MTX , Methotrexat)

This table showed that among the 33 cases of IDA, gastritis, peptic ulcer and bleeding varices (each one was observed in 4 cases ~ 12.1%). Hiatus hernia in 1 case (3%), A-v malformations in 5 cases (15.2%), bleeding piles in 5 cases (15.2%), GI malignancies in 7 cases (21.3%) and nutritional IDA was seen in 3 cases (9.1%). Among the 23 cases of ACD, 19 cases (82.6%) due to CKD, a case (4.3%) due to chronic inflammatory condition (RA) and 3 cases (13%) due to malignancy (cancer prostate in 2 cases and HCC in one case). Out of 18 patients with leukemia, 9 cases (50%) were diagnosed as AML, 2 (11.1%) as ALL and 7 (38.9%) as CLL. 12 cases (10.5%) out of 114 have multiple myeloma.
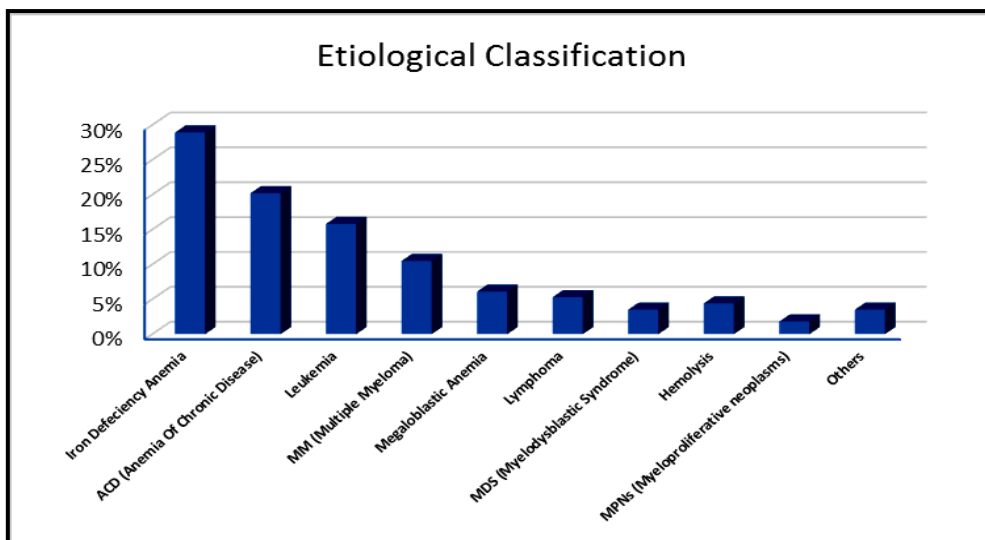
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Figure (5): Bar chart represents etiological classification of anemia and percentage of cases in each etiology.

Table (6): Demographic data of the studied patients in each etiological classification of anemia

		Iron Defeciency Anemia		ACD (Anemia Of Chronic Disease)		Leukemia		MM (Multiple Myeloma)		Megaloblastic Anemia		Lymphoma		MDS (Myelodysblastic Syndrome)		Hemolysis		MPNs (Myeloproli-ferative neoplasms)		Others	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	Count	%	N	%	N	%
Age years	**60-65**	14	42.4%	6	26.1%	6	33.3%	8	66.7%	7	100.0%	1	16.7%	1	25.0%	3	60.0%	1	50.0%	2	50.0%
	66 - 70	4	12.1%	7	30.4%	4	22.2%	2	16.7%	0	0.0%	2	33.3%	2	50.0%	2	40.0%	1	50.0%	1	25.0%
	71 - 75	11	33.3%	5	21.7%	3	16.7%	2	16.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	76 - 80	4	12.1%	2	8.7%	5	27.8%	0	0.0%	0	0.0%	3	50.0%	1	25.0%	0	0.0%	0	0.0%	1	25.0%
	>80	0	0.0%	3	13.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sex	**Male**	23	69.7%	5	21.7%	9	50.0%	7	58.3%	5	71.4%	5	83.3%	3	75.0%	3	60.0%	1	50.0%	2	50.0%
	Female	10	30.3%	18	78.3%	9	50.0%	5	41.7%	2	28.6%	1	16.7%	1	25.0%	2	40.0%	1	50.0%	2	50.0%

This table showed that IDA was commonly seen at the age ranging from 60 to 65 years (14 cases out of 33 ~ 42.4%) and more in males (23 cases ~69.7%). ACD was commonly seen at the age ranging from 66 to 70 years (7 cases out of 23 ~ 30.4%) and more in females (18 cases~ 78.3%).

Leukemia was commonly seen at the age ranging from 60 to 65 years (6 cases out of 18 ~33.3%) and has equal sex distribution. Multiple myeloma was commonly seen at the age ranging from 60 to 65 years (8 cases out of 12 ~66.7%) and more in males (7 cases ~58.3%).

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Table (7): Presentations of anemia according to severity (mild, moderate and severe) of each etiology in the studied patients

		IronDeficiency Anemia		ACD(Anemia Of Chronic Disease)		Leukemia		MM (Multiple Myeloma)		Megaloblastic Anemia		Lymphoma		MDS(Myelodysblastic Syndrome)		Hemolysis		MPNs (Myeloproliferative neoplasms)		Others	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	Count	%	N	%	N	%
Type of Anemia	Microcytic	29	87.9%	3	13.0%	3	16.7%	1	8.3%	0	0.0%	3	50.0%	1	25.0%	1	20.0%	1	50.0%	0	0.0%
	Normocytic	3	9.1%	20	87.0%	14	77.8%	11	91.7%	1	14.3%	3	50.0%	3	75.0%	2	40.0%	1	50.0%	4	100.0%
	Macrocytic	1	3.0%	0	0.0%	1	5.6%	0	0.0%	6	85.7%	0	0.0%	0	0.0%	2	40.0%	0	0.0%	0	0.0%
Severity of Anemia	Mild	1	3.0%	4	17.4%	2	11.1%	3	25.0%	0	0.0%	2	33.3%	1	25.0%	0	0.0%	1	50.0%	0	0.0%
	Moderate	7	21.2%	10	43.5%	8	44.4%	2	16.7%	1	14.3%	1	16.7%	0	0.0%	3	60.0%	0	0.0%	2	50.0%
	Severe	25	75.8%	9	39.1%	8	44.4%	7	58.3%	6	85.7%	3	50.0%	3	75.0%	2	40.0%	1	50.0%	2	50.0%

According to the data in the table, 25 of the 33 patients with IDA (74.8%) also suffered from severe anemia. Ten of the twenty-three patients with ACD (43.5%) had moderate anemia, and nine (39.1%) had severe anemia. Eight of the patients with leukemia (44.4%) were severly anemic, and the same number were moderately anemic. Severe anemia was found in 7 out of 12 patients with multiple myeloma (58.3%). Six of seven individuals with megaloblastic anemia (85.7%) had severe anemia. Lymphoma patients, at 50%, and MDS patients, at 75%, were found to have significant anemia. About two-thirds of patients with hemolysis presented with moderate anemia. The anemia in one MPNs patient was mild, while in the other it was severe. Half of patients with other causes of anemia (e.g warfarin overdose) presented with moderate anemia while the other half had severe one.

Table (8): Correlation between Age and (hemoglobin, iron, transferrin saturation, ferritin, creatinine and e. GFR)

		Age Y
Hemoglobin	Correlation Coefficient	0.034
	P value	0.718
	N	114
Iron	Correlation Coefficient	-0.110-
	P value	0.244
	N	114
Transferrin saturation	Correlation Coefficient	-0.054-
	P value	0.571
	N	114
Ferritin	Correlation Coefficient	-0.102-
	P value	0.281
	N	114
Creatinine	Correlation Coefficient	0.027
	P value	0.779
	N	114
Estimated GFR	Correlation Coefficient	-0.171-
	P value	0.069
	N	114

GFR, Glomerular Filtration Rate
This table showed that there was no significant correlation between age and hemoglobin, iron, transferrin saturation, ferritin, creatinine and estimated GFR.

Discussion
In the current research we enrolled 114 geriatric cases; The mean age of participants was 68.54 ±6.13 years, ranging (60 - 83 years); 43% were at age ranging from 60 to 65 years, 21.9 % were at age ranging (66- 70) years, 18.4% ranging (71 -75 years), 16 cases (14%) ranging (76-80) years, while (2.6%) were above 80 years.

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Our finding was inconsistence with (**Agravat et al.**) [9] report, as cases in the age group of 60-70 years were maximally affected, also with (**Talukdar et al.**) [10] report, where most of the participants (60.29%) were in the age group of 60-69 years.

The gender breakdown of our sample was slightly more male than female (55.3% male, 44.7% female).

Consistent with numerous other research, (**Agarwal et al.**)[11]; the Indian study indicated that males were more likely to be anemic (53%) than females (47%), and a similar gender-wise distribution was identified within the studies by (**Agravat et al., Gandhi et al.**)[9,12]

Normocytic anemia was found to be the most common type of anemia (54.4%; Anemia of Chronic Disease was the main cause), followed by microcytic anemia (36.8%; iron deficiency anemia was the main cause) and macrocytic anemia (8.8%; megaloblastic anemia was the main cause). Normocytic normochromic anemia was shown to be the most prevalent morphological form in the older population.

According to our data and the research of (**Talukdar et al.**) [10], the most common form of anemia in both male and female subjects was normocytic normochromic (74.73%), followed by microcytic hypochromic (18.77%) and macrocytic (6.5%).

In a study of people over the age of 60 with anemia, **Jain**[13] found that 64 percent had normocytic-normochromic anemia, 30.66 percent had microcytic hypochromic anemia, and 5.33 percent had macrocytic anemia.

Similar to our study normocytic normochromic anemia was found to be the commonest morphological pattern of anemia in the elderly population followed by microcytic anemia(**Dungca et al.**) [14].

Based on our data, we know that men are more likely to be diagnosed with IDA (69.7%), Multiple Myeloma (58.3%), and Megaloblastic Anemia (71.4%). However, ACD was more prevalent in females than males.

The prevalence of normocytic normochromic anemia was reported to be 76.19% among male patients and 72.85% among female patients in the study by (**Agravat et al.**) [9], whereas the prevalence of microcytic hypochromic anemia was 15.87% among male cases and 21.19% among female patients. Similar findings were found in a prior study by (**Amarneel and Sheth**) [15].

More over half of the individuals (57.9%) in this study had severe anemia, with the other participants having either moderate anemia (29.8%) or mild anemia (12.3%).

However, mild anemia was found to be the most common type by both (**Singh and Gaur**) [16] and (**Munesh et al.**) [17].

Our patients' most prevalent complaints were fatigue and shortness of breath (44.7%), followed by dizziness (26.3%), headache (17.5%), palpitation (16.7%), and melena (9.6%), along with other nonspecific symptoms.

Non specific symptoms were most commonly associated with anemia, followed by symptoms and signs of respiratory illness, gastrointestinal disease, cancer, nutritional disorders, hepatic and renal dysfunction(**Agravat et al.**)[9]

According to (**Emiroglu et al.,**)[18] iron deficiency anemia was the most common etiology of anemia (43%), followed by anemia of unknown etiology (37.4%) and anemia of chronic disease (17.3%). In the current study, IDA accounted for 28.9% of all cases of anemia, while ACD accounted for 20.2%.

Leukemia accounted for 15.8% of cases, multiple myeloma for 10.5%, and lymphoma affected 6 individuals (5.3%) in the current study. Two patients had MPNs (1.8%) and four had MDS (3.5%).

Ten (0.8%) of the people in the (**Agravat et al.**)[9] study had chronic myeloid leukemia, 0.4% had a lymphoproliferative disorder, and 0.4% had myelodysplastic syndrome.

Anemia and other malignant hematological illnesses affected 15.2% of the elderly individuals in the sample collected by(**Sharma et al.**) [4]

Consistent with the findings of (**Geisel et al**.) [19], who found no significant association between patient age and Hb values, we found no such relationship in the present study.

This contradicts the findings of a recent study by (**Guralnik et al.**) [20] which indicated a decline in Hb levels with increasing age.

Conclusion

Due to its great frequency and significant morbidity and mortality, anemia is a global health issue among the aged population. Improving this population's quality of life may depend in large part on accurate diagnosis and subsequent treatment. As for the causes of anemia in the elderly, we discovered that iron deficiency anemia was the most common, followed by anemia caused by chronic disease, and that males were more likely to be affected.

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