"PREVALENCE OF ANAEMIA IN GERIATRIC POPULATION-A ONE YEAR HOSPITAL BASED STUDY."

By

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LIST OF ABBREVIATIONS USED

WHO	-	World Health Organization
NHANES	-	National Health and Nutrition Examination Survey
IBD	-	Inflammatory Bowel Disease
RBC	-	Red Blood Cell
PNH	-	Paroxysmal Nocturnal Haemoglobinuria
ACD	-	Anaemia of Chronic Disease
IDA	-	Iron Deficiency Anaemia
EPO	-	Erythropoietin
MA	-	Macrocytic Anaemia
MHA	-	Microcytic Hypochromic Anaemia
DA	-	Dimorphic Anaemia
NNA	-	Normocytic Normochromic Anaemia
NHA	-	Normocytic Hypochromic Anaemia
MCH	-	Mean Corpuscular Volume
MCHC	-	Mean Corpuscular Haemoglobin Concentration
MCV	-	Mean Corpuscular Volume
RDW	-	Red Cell Distribution Width
TIBC	-	Total Iron Binding Capacity
I.V.	-	Intra Venous
FA	-	Folic Acid
FIGLU	-	Formiminoglutamic acid
IF	-	Intrinsic Factor

MDS	-	Myelodysplastic Syndrome
NAP	-	Neutrophil Alkaline Phosphatase
ALIP	-	Abnormal Localisation of Immature Precursors
PMF	-	Primary Myelofibrosis
HIV	-	Human Immunodeficiency Virus
CBC	-	Complete Blood Counts
MI	-	Myocardial Infarction

ABSTRACT

PREVALENCE OF ANAEMIA IN GERIATRIC POPULATION-A ONE YEAR HOSPITAL BASED STUDY

Background & Objectives: Anemia is a condition with decrease in the red blood cell population or hemoglobin levels less than the lower limit for that particular age and sex. It is a common problem in all age groups, more commonly in children and childbearing age women. Less literature is present about anemia in the elderly population. The definition as per the United Nations defines an 'elderly' person as someone who is equal to 60 years or above 60.

Census report of 2011 denotes the elderly population to be 8.1 % in India and the expected rise in population of the elderly is estimated to be 19% in the year 2050, which is of great worry.

The objective of this study was to study the prevalence of anaemia in geriatric population and to study the morphological types of anaemia in geriatric age group.

Materials and Methods: A total of 579 cases were included from January 2021 to December 2021 out of which 238 were anaemic. Venous blood was collected from the veins of the antecubital fossa in a EDTA vacutainer tube. Wedge-Method of making peripheral smear was used. Complete Blood Counts including indices were determined within six hours of collection using hematology analyzer.

Results: Majority of the patients belonged to age group 60-69 years followed by 70-79 years. Male predominance was observed amongst anemics. The prevalence of anemia was 41.11%. Hemoglobin(g/dL) in patients with anemia was >10 gm/dL and of moderate degree in majority of cases. Most frequent symptom was fatigue

followed by headache, dyspnea. Palpitations were frequent in cases of mild anemia. The most common etiology was anemia of chronic disease, mostly chronic kidney disease followed by iron deficiency anemia. The most common morphological type of anemia was Normocytic Normochromic anemia and Normocytic Hypochromic anemia, followed by Microcytic Hypochromic anemia.

Conclusion: The prevalence of anaemia in geriatric population is high, which is frequently of mild to moderate severity. Screening, preferably with structured programmes addressing the geriatric population for associated Chronic diseases and nutritional deficiencies, in hospitals as well as the community is recommended, so that corrective measures can be assured at an early stage and there can be decrease in the mortality and morbidity.

Keywords: anaemia, geriatric, prevalence, morphologic type of anaemia

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INTRODUCTION

Anemia is a phenomenon of decrease in the red blood cell population or hemoglobin of the body. It is a common problem in all age groups, more commonly in children and childbearing age women. Less literature is present about anemia in the elderly population.[1−4] The definition as per the United Nations defines an 'elderly' person as someone who is equal to 60 years or above 60. Anemia related to the geriatric population is of great concern because the mortality index and morbidity index remain high. In accordance with the WHO (World Health Organization), anemia prevalence in the elderly was found to be of the percentage of 23.9 which accounts to 164 million people across the planet.[5]

Census report of 2011 denotes the elderly population to be 8.1 % in India and the expected rise in population of the elderly is estimated to be 19% in the year 2050, which is of great worry.[6]

Aged population is a concern in the number and ratio of the elderly persons in every nation across the entirety of the global scenario. Structure of age, especially the presence of elderly in the population under observation is closely interconnected to the health care service usage. The reasoning behind this is that older people tend to have multiple illnesses and have higher incidence of loss of self-care and independent functioning, thus requiring expensive medical attention and social way of care.[5]

Reports of several sources have shown the prevalence of anemia to be higher in the geriatric population than the corresponding younger population. It is seen that there is deterioration in the hemoglobin levels proportional to the age of the individual, especially in the elderly population. Anemia is seen to be more prevalent after the age of 80 as seen in some of the studies.[7]

Decreased hemoglobin levels are seen to relate with underlying disease conditions and may help in diagnosis and early intervention.[8]

Anemia is observed to be a sign and not a symptomatic phenomenon and hence it is mandatory to evaluate the underlying disease. Confirmation of the type of anemia is at the most necessary to advance the investigation in a particular direction. Treatment can be given in accordance with the diagnosis and goes a long way in improving the life of the individual.[9,10]

National Health and Nutrition Examination Survey (NHANES)-III of World Health Organization (WHO) study gave us the prevalence to be 11% in men and 10.2 % in women in the world, which is a significant number.[10]

Anemia in the elderly is an under-diagnosed sign and is not notified to the patient since it is taken to be a consequence of aging and it is sadly not taken to be a disease marker. Studies of recent nature have questioned this negligent approach because anemia in elderly is relevant and is a burden and a great deterrent to the healthcare system and the country's resources .[11,12]

AIMS AND OBJECTIVES

1) To study the prevalence of anaemia in geriatric population.

2) To study the morphological types of anaemia in geriatric age group.

REVIEW OF LITERATURE

DEFINITION

According to WHO, which is the most used system worldwide, anemia is defined as hemoglobin level lower than **13g/ dl** in men and level lower than **12g/dl** in women.[13]

This criteria for men and women are based on studies which are old and included only patients who were less than 64 years old.[14–17]

The validation of the WHO definition can be questioned since the geriatric age group has not been considered to the full potential while defining the problem.[18] The other major drawback is that the defining population were 'healthy apparently'. Thus, the possibility of undetected or pathology which was latent was left behind. This bias might have lowered the 'normal' hemoglobin levels in the first place.[13]

The US Third National Health and Nutrition Examination Survey (NHANES III, 1988-1994) and the Scripps-Kaiser database had tried to put into inclusion, the study population of 70 to 80 years and proposed threshold levels of hemoglobin that had similarity to that of the WHO, thus giving a validation to the WHO criteria of Anemia.[19]

Izaks et al. have taken the effort to investigate the association of mortality and hemoglobin levels in the elderly (above 85 years of age) and they discovered that there was increased mortality as per the definition of WHO criteria. This demonstrated that the WHO criteria could allow to distinguish the group at risk from the group not at risk.[8]

Better the hemoglobin levels, better the outcomes of health were also demonstrated in recent studies.[20]

Chaves et al. made a description that higher hemoglobin levels in the elderly females were associated with better amount of mobility, and they proposed that hemoglobin cut off should be higher in elderly females. Another argument put forward was that the prevalence of anemia was higher in men who were elderly than in the postmenopausal women and this proved to be an argument that favors higher hemoglobin cut off in the elderly women. Currently, there was no strict consensus observed on an alternative WHO criteria for the same.[18]

PREVALENCE

The prevalence of anemia is seen to vary from study to study.

In a study done by Beghe et al. where nine studies were compared; it was found that the prevalence of the condition under study in individuals aged above 60 years, there was a variation of 2.9 % to 61% in men and in women it was found to be 3.3% to 41%.[20]

In a study done by Eisenstaedt et al., seven large studies were compared with a study population being individuals of 60 years and above; the prevalence was found to vary from 5.4 % to 48 % in men, and from 4.4 % to 48 % in females.[21]

In almost all the studies, males had a higher prevalence of anemia than females.[20]

Criteria used to define anemia in many of the studies had hemoglobin varying from 11g/dl to 14g/dl in men and 12 g/dl in women.[20–30]

There was a different prevalence noticed in the following settings:

1)Community setting

2)Outpatient clinics

3)Acute ward

The most common sources of anemia in the elderly that were hospitalized was found to be due to chronic disease or inflammatory processes and iron deficiency anemia.[25,30]

The variation in the prevalence indices seemed to vary due to the clinical settings from where the subjects were considered rather than the differences in diagnostic criteria.

The highest prevalence was found to be in nursing home patients and geriatric ward patients in a hospital-based setting.[20−30]

The prevalence was seen to be the highest in the oldest age among geriatric age group (greater than 85 years).

In a community dwelling setting, the geriatric age group anemia was found to be as low as 3 %.[20−30]

Table 1. WORLD HEALTH ORGANISATION (WHO) GRADING OF ANEMIA.[31]

Age/ Population	Normal	Mild	Moderate	Severe
to 59 months	>or= 11	10.9-10	9.9-7	Less than 7
5 to 11 years	>or= 11.5	11.4-11	10.9-8	Less than 8
12 to 14 years	>or=12	11.9-11	10.9-8	Less than 8
Females > or = to 15 years	>or=12	11.9-11	10.9-8	Less than 8
Pregnancy	>or=11	10.9-10	9.9-7	Less than 7
Males > or = to 15 years	>or=13	12.9-11	10.9-8	Less than 8

There are no defined classification systems, in particular, for grading anemia in geriatric population. Many studies have taken the World Health Organization (WHO) criteria for anemia in individuals greater than or equal to 15 years of age to evaluate anemia in geriatric population.[4,5,11,21]

RISK FACTORS

1) A diet lacking in Vitamins and minerals (Iron, Vitamin B12, Folate)- It can result from an imbalanced diet or certain health conditions or treatments.[4]
2) Intestinal disorders (Crohn's disease, Celiac disease)- Anemia in patients with IBD results mainly from **iron deficiency because of chronic blood loss from inflamed mucosa**.[32]
3) Chronic conditions (Cancer, Kidney Failure)- The kidneys produce less erythropoietin and thus there is production of a smaller number of red blood cells leading to anemia. Reduction in hepcidin is another mechanism.[12,33,34]
4) Family history (Inherited anemias, for example, sickle cell anemia)- germline mutations of the responsible genes coding for the structural components of RBCs.[35]
5) Infections- It is due to several factors. In a patient with malaria, the reason for anaemia is the destruction of red blood cells by the parasite. In parvovirosis, anaemia is secondary to the inhibition of medullary erythropoiesis caused by this virus.[36]
6) Alcoholism- **Alcohol impacts the production of red blood cells and reduces the number of precursor cells in the bone marrow**, resulting in fewer mature red blood cells created.[37]
7) Toxic chemicals (Arsenic, Nitrites, chromium, nickel salts). Example: In severe lead poisoning, there is an accumulation of good amounts of delta-aminolevulinic

acid (a compound with inherent neurotoxicity). Abnormalities of mitochondrial function in all cells of the body is seen.[38]

8) Medications (Anti-malarials, Penicllin, Dapsone)

- Some drugs bind RBC membrane. If conditions are optimal (eg, high enough drug concentration), circulating RBCs will be coated with drug. If the patient makes an IgG antibody to the drug the antibody will bind to the drug on the RBC and the macrophages can interact, leading to extravascular RBC destruction.[39]

9) Age- People over the age of 65 are at increased risk of anemia.[8,21]

10) Female gender-It is mainly seen in premenopausal age group due to loss of blood during periods.[40] Geriatric age group has only minor differences.[13]

11) Low socio-economic status- poor access to nutritious meals in poor households, increases the risk of anaemia.[41]

12) Smoking- predisposes to iron deficiency anemia by decreasing Vitamin C levels. Smoking is known to cause macrocytosis by altering Vitamin B12 and Folate levels.[42]

CLASSIFICATION OF ANEMIA

MORPHOLOGIC CLASSIFICATION.[36,43]

Anemia can be classified based on the hemoglobin concentration and the average size of the RBCs. Certain diseases are associated with certain size and hemoglobin concentration. The general categories that are included are:

1) Macrocytic Normochromic
2) Normocytic Normochromic
3) Microcytic hypochromic

Approach from Morphology point of view:

1) **Microcytic Hypochromic anemias** are often associated with defective globin synthesis. Serum Iron studies and electrophoresis for hemoglobin can be done to differentiate the causes.

2) **Macrocytic anemias** are usually in relation to hemolytic anemias, nuclear-cytoplasmic maturation defects and non-megaloblastic anemias. Megaloblastic anemias require search for neutrophils with hyper segmented lobules in the peripheral smear and lowered Vitamin B12 and folate levels. Non-megaloblastic anemias may have varied causes such as alcoholism, liver disease, shift Reticulocytosis in hemolysis or hemorrhage, hypothyroidism, aplastic anemia, obstructive jaundice, splenectomy, artifactual (hyperglycemia, cold agglutinins, leukocytosis) . Proper history, examination and tests need to be done in the direction of suspicion.

3) **Normochromic Normocytic anemias** have erythrocyte morphology which is normal. It is seen that hypo-proliferative anemias have a hypocellular marrow with M:E ratio (Myeloid: Erythroid ratio) which is normal to increased. Hemolytic anemias have a hypercellular marrow with a decrease seen in M:E ratio.[44]

FUNCTIONAL CLASSIFICATION.[36,43,45]

IN THE BONE MARROW:

i) Proliferation Defects-

   a) Damage to bone marrow (Chemicals, Radiation)

   b) Infiltration of the bone marrow (neoplastic, fibrous, granulomatous)

   c) Trophic basis (Malignancy, Aplastic anemia, Myelodysplasia, endocrine disorders, erythropoietin levels)

ii) Maturation Defects

a) Nucleus (VitaminB12, folate deficiency)

b) Cytoplasm (Iron deficiency, thalassemia)

IN THE PERIPHERAL BLOOD

i) Defects of survival

a) Hemorrhage (External, Internal)

b) Hemolytic process (Intrinsic, Extrinsic)

ETIOLOGICAL CLASSIFICATION.[43,44,45]

1. ANEMIAS DUE TO IMPAIRED RED CELL PRODUCTION

A) Deficiency of essential nutrients

-Iron Deficiency Anemia

-Vitamin B12, Folate deficiency

-Vitamin C deficiency

B) Deficiency of stem cell/erythroid precursor

-Aplastic Anemia

-Pure red cell aplasia

C) Miscellaneous

-Anemia of chronic disorders

-Marrow suppression due to drugs

2. HEMOLYTIC ANEMIAS DUE TO IMPAIRED RED CELL DESTRUCTION

A) Intracorpuscular defect

a) Hereditary

Enzyme deficiency

Membrane defect

Hemoglobin abnormalities

G-6-PD deficiency

Hereditary spherocytosis

Hereditary ovalocytosis

Hemoglobinopathies

-Thalassemia

-Sickle syndromes

-Hb D, E

b) Acquired

Paroxysmal Nocturnal Hemoglobinuria (PNH)

Secondary to liver disease

Infections

B) Extracorpuscular defect

-Immune Hemolytic anemia

-Fragmentation syndromes

-Hypersplenism

ETIOLOGY OF ANEMIA IN GERIATRIC POPULATION.[36,44,45]

1) **Dietary deficiency**
2) **Malabsorption-**
    a) Gluten induced enteropathy
    b) Atrophic gastritis
    c) Gastrectomy
3) **Increased Blood Loss**
    A) Gastrointestinal Causes
        a) Peptic ulcer

b) Hemorrhoids

c) Aspirin ingestion, NSAID intake

d) Ulcerative colitis

e) Hiatus Hernia

f) Amoebic Colitis

g) Hook worm infestation

h) Diverticulosis

i) Malignancies of stomach, colon

B) Urinary tract

a) Hematuria due to renal, bladder, prostatic lesions

b) Chronic dialysis

c) Paroxysmal Nocturnal Hemoglobinuria (PNH)

4) Decreased intake

a) Dietary deficiency in malnutrition and in vegetarians

5) Impaired Vit B12 absorption

a) Gastric -intrinsic factor deficiency

-in pernicious anemia

-in post gastrectomy patients

b) Intestinal

-Fish tapeworm infestation, competitive intake by parasites

-Small bowel bacterial overgrowth

-Malabsorption syndrome

-Ileal resection

-Crohn's disease

-Drugs-metformin

6) **Increased requirement**

   a) disseminated cancer

7) **Acquired hemolytic anemias**

   a) Immunohemolytic anemias

   b) Fragmentation syndromes

   c) Paroxysmal Nocturnal Hematuria

   d) Drugs and chemicals

   e) Thermal injury and infections

   f) Others (Celiac Disease, Vitamin E deficiency)

MOST COMMON CAUSES OF ANEMIA IN GERIATRIC POPULATION—[8,34,46]

1) **Anemia of Chronic disease (ACD)**
2) **Iron deficiency anemia (IDA)**
3) **Vitamin B12 and Folate deficiency anemia**
4) **Myelodysplasia**
5) **Anemia due to senescence**

In most of the community based out-patients, the etiology of anemia was seen to be of 'unexplained etiology'.[18,47]

In cases of 'unexplained etiology' in which no etiology of underlying disease was found, the anemia could be due to inadequate or inefficient diagnostic evaluation or due to the aging process itself, which remains as a hypothetical remark.[30,33,48,49]

I] ANEMIA OF CHRONIC DISEASE (ACD)

EPIDEMIOLOGY

Anemia of chronic disease is synonymously referred to as inflammation related anemia. This is the most common etiology for anemia in individuals above 60 years of age. It is estimated to be responsible for 30% to 45% of cases amongst patients who were admitted in the hospital.[12]

ETIOLOGY[36]

i]Malignancy (either hematological or solid tumors)

ii]Chronic or acute infections

-Viral

-Bacterial

-Parasitic

-Fungal

iii]Inflammatory disorders of chronic origin

iv]Autoimmune diseases

-Rheumatoid arthritis

-SLE

-Vasculitis

-Sarcoidosis

-Inflammatory bowel disease

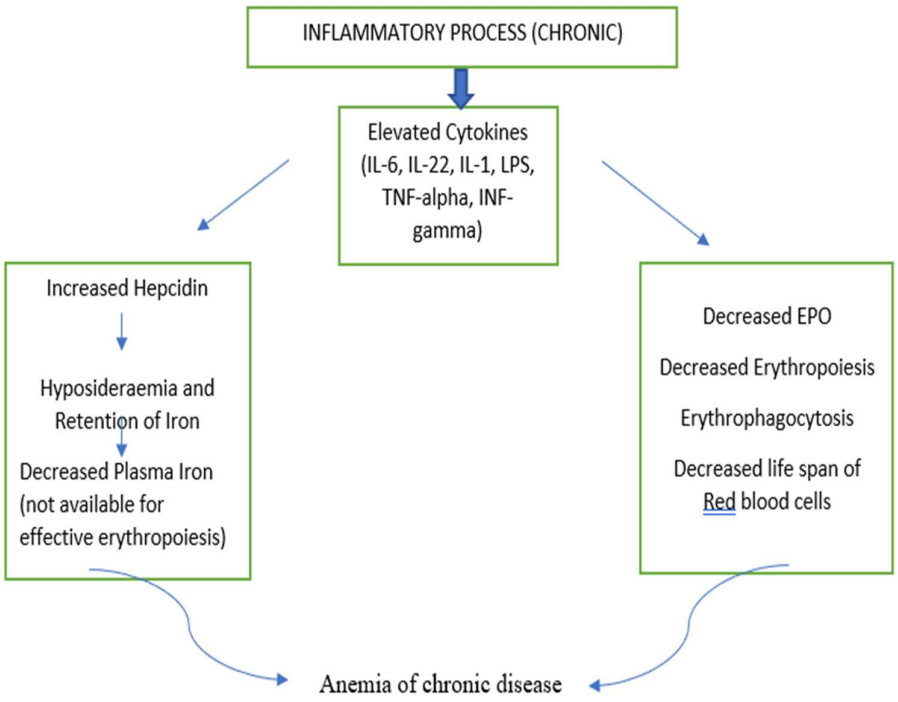
v]Malnutrition (protein or energy malnutrition)[33,34,47,48,49]

vi]Renal disease-Chronic Renal Failure

vii]Cardiac condition- Chronic heart failure

viii] Chronic Rejection after Solid Organ Transplantation

Pathogenesis[50–54]



IL-Interleukin; TNF-Tumor necrosis factor; INF-Interferon

It is of multifactorial origin.

Due to the presence of an inflammatory state, there is a substantial increase in pro-inflammatory cytokines like Tumor necrosis factor-alpha, Interleukins (1,6,10) and Interferon-gamma. These factors are observed to interfere with the iron homeostasis.

The pro-inflammatory cytokines stimulate a decreased of iron that is in the circulation which further inhibits erythropoiesis.

Also, Interleukin-1, Interferon-gamma and Tumor necrosis factor alpha reduce differentiation and proliferation of erythroid progenitor cells, thus directly inhibiting erythropoiesis.[33,34]

As an additional aspect, Tumor necrosis factor-alpha and Interferon-gamma is seen to act on inhibiting erythropoietin production which is by the kidneys. Impairment in

production of Erythropoietin by low hemoglobin levels has been seen due to inflammation.[47,50]

Interleukin-6 is stimulating Hepcidin production in the liver has been seen to have a role in anemia of chronic inflammation. It is since hepcidin leads to the internalization of transporter of iron i.e., ferroportin which inhibits release from the macrophages and from the duodenal enterocyte, of iron. The inhibition of release of iron from the duodenal enterocyte results in decrease of gastro-intestinal absorption of iron.[51]

It has been observed that by treating mice with hemojuvelin, a soluble recombinant, there is inhibition of IL-6 induced Hepcidin production. This might be of future research and therapeutic use.[51]

Anemia of chronic disease is usually seen to be

-mild to moderate

-normochromic or normocytic

-seen to be associated with low reticulocyte count.

Degree of anemia is proportional to the severity of the chronic disease.[33,34,47,48,49]

CLINICAL FEATURES

- Dyspnoea (shortness of breath)
- Fatigue
- Generalized weakness
- Headaches
- Decreased concentration
- Dizziness

- Reduced exercise tolerance.
- Features related to the underlying cause

LABORATORY PARAMETERS

Peripheral Smear Findings[43,48,52]

-Initially, shows normocytic normochromic blood picture. Later, shows microcytic hypochromic blood picture.

Other findings in ACD:

-Thrombocytosis (chronic haemorrhage)

-Toxic granules in severe sepsis

-Hyper segmented neutrophils in mixed nutritional deficiency or folate/B_{12} deficiency in cancers.

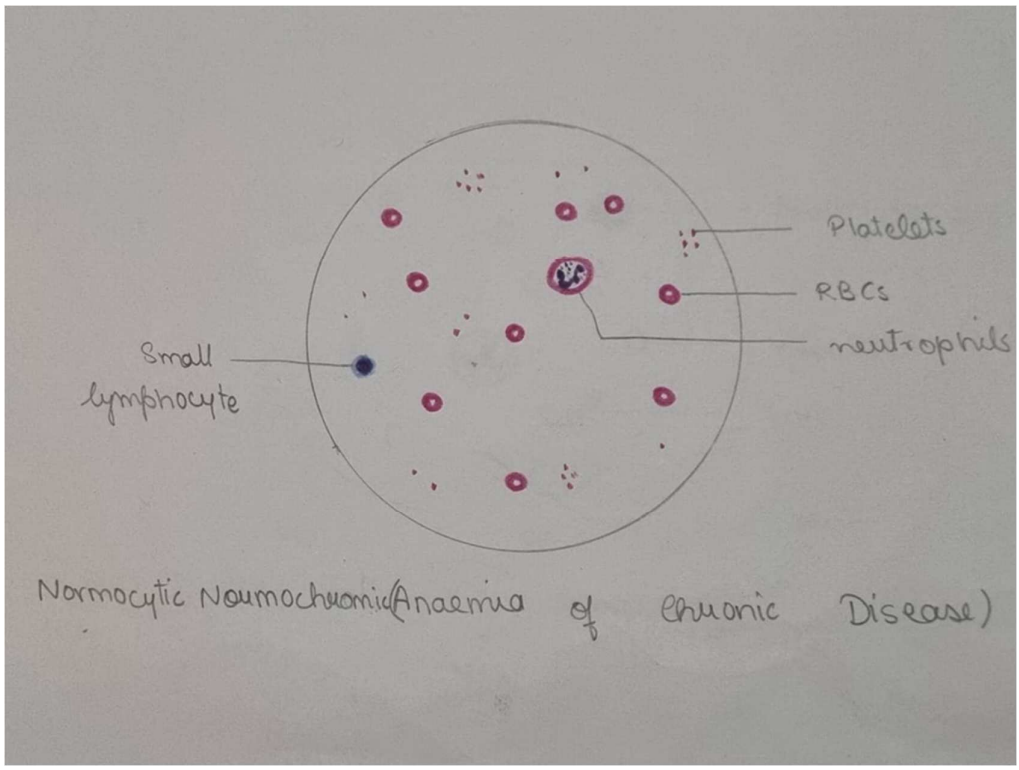


Fig.1.Normocytic Normochromic Anaemia seen in Anaemia of Chronic disease.

Complete Blood Counts[44]

-The haemoglobin is 8-9.5 g/dL (mild to moderate anaemia), does not drop usually below 6 g/dL. (Normal Haemoglobin – Greater than 12 g/ dL in females and 13 g/dL in males).

-Microcytic anaemia (MCV less than 80 femtoliters [fL])

-Normocytic anaemia (MCV 80 to 100 fL)

-MCH is low to normal (Normal: 29 +/- 2 picograms/ cell)

-MCHC is low to normal (Normal:34 +/- 2 g/ dl)

-Reticulocyte index is reduced (Normal is 0.5% to 2.5%)

Bone Marrow in ACD[33,34]

-Normoblastic Normocellular bone marrow. (Common finding)

-Reduced Erythropoiesis may be seen (Example. In kidney disease patients, Plasmodium infected patients etc.)

-Bone marrow infiltration in cases of malignancy

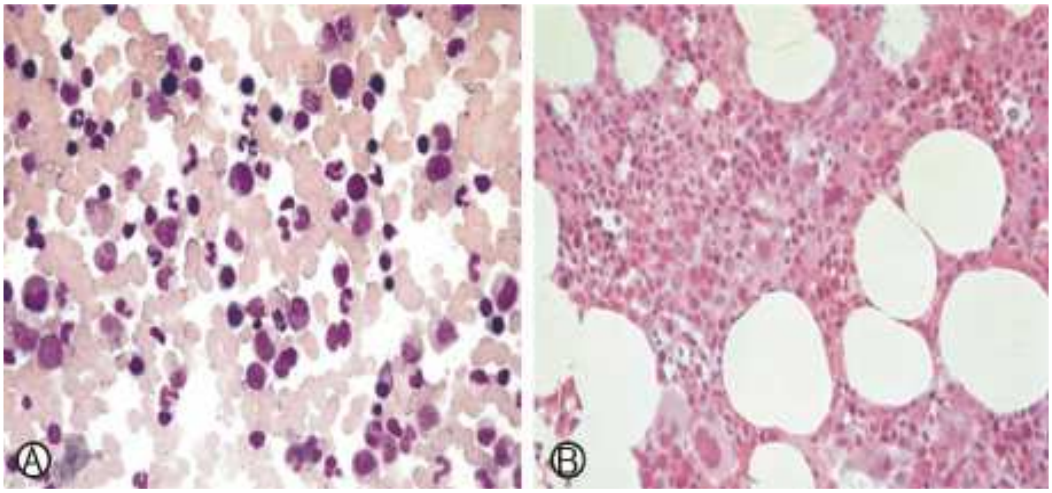


Fig 2. (A) Bone marrow aspiration smear shows normocellular marrow (Wright-Giemsa stain, ×400). (B) Bone marrow biopsy shows normal cellularity (H&E stain, ×200) .[53]

Biochemical Analysis[34,48,52]

a) low transferrin saturation (less than 15%)

Normal- 15-50%

b) low iron saturation (less than 60 mcg/ dL)

Normal- 60 – 170 mcg/ dL

c)low total iron binding capacity (less than 240 mcg/ dL)

Normal -240-450 mcg

d)low serum iron concentration- (less than 60 mcg/ dL)

Normal- 60-170 mcg/ dL

e) normal or elevated ferritin levels [12]

Normal- Men- 24-336 mcg/L, Women- 11-307 mcg/L

TREATMENT [52,54]

1) Treat underlying cause
2) Iron therapy
3) Red cell transfusion
4) Erythropoiesis stimulating agents
5) Targeting cytokines (ω-3 poly-unsaturated fatty acids)

Treatment of Anemia of chronic disease is by treatment of the underlying disease cause. Other way is to increase the Hemoglobin levels in the elderly by treating with recombinant Erythropoietin. It is seen to provide an improvement in:

i)cognition

ii)fatigue

iii)daily functioning.

It is seen that Erythropoietin is well tolerated in the elderly, but more studies are required to be ascertained about the same.[22,48,33]

Table 2. Serum levels that differentiate ACD from IDA.[55,56]

	ACD	IDA
Iron	↓	↓
Serum transferrin	↓	↑
Transferrin saturation	↓	↓
Ferritin	↑	↓
Soluble TfR	Normal	↑
Ratio of TfR to log ferritin	Low (<1)	High (>2)
Cytokine levels	↑	Normal

II] IRON DEFICIENCY ANEMIA

EPIDEMIOLOGY

It is a common occurrence in about 15 percent of cases of anemia in the hospitalized geriatric ward patients. It is found to be the second common cause of anemia in the geriatric population.[23]

Iron storage in an adult male[57]

Hemoglobin-2000-2500mg

Myoglobin and enzymes-400-500mg

Iron stores-500-1000 mg

Plasma Iron=2-3 mg

ETIOLOGICAL CLASSIFICATION[57−60]

1)Dietary deficiency

2)Malabsorption-

a) Gluten induced enteropathy

b) Atrophic gastritis

c)Gastrectomy

3) Increased Blood Loss

A) Gastrointestinal Causes

a) Peptic ulcer

b) Hemorrhoids

c)Aspirin ingestion, NSAID intake

d)Ulcerative colitis

e) Hiatus Hernia

f) Amoebic Colitis

g) Hook worm infestation

h) Diverticulosis

i) Malignancies of stomach, colon

B)Urinary tract

a) Hematuria due to renal, bladder, prostatic lesions

b) Chronic dialysis

c)PNH

CLINICAL FEATURES

Onset-Insidious

Fatigue

Growth and development are impaired.

Pica

Koilonychia/Platynychia

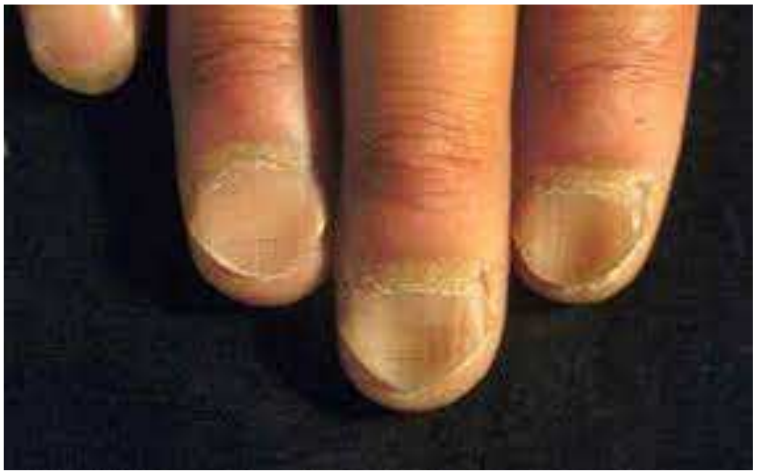


Fig.3.Spooning of nails (Koilonychia)[61]

Angular stomatitis

Glossitis

Pharyngeal webs-Plummer Vinson syndrome: IDA with dysphagia due to pharyngeal webs

Chronic atrophic gastritis

Reduced immune function

LABORATORY PARAMETERS

Peripheral blood findings

a) Microcytic hypochromic cells in peripheral smear

b) Reticulocyte count-normal to slight increase 1-3%

c) White cells-Total leucocyte count and differential count is normal

d) Platelets-are increased, more commonly in hemorrhage

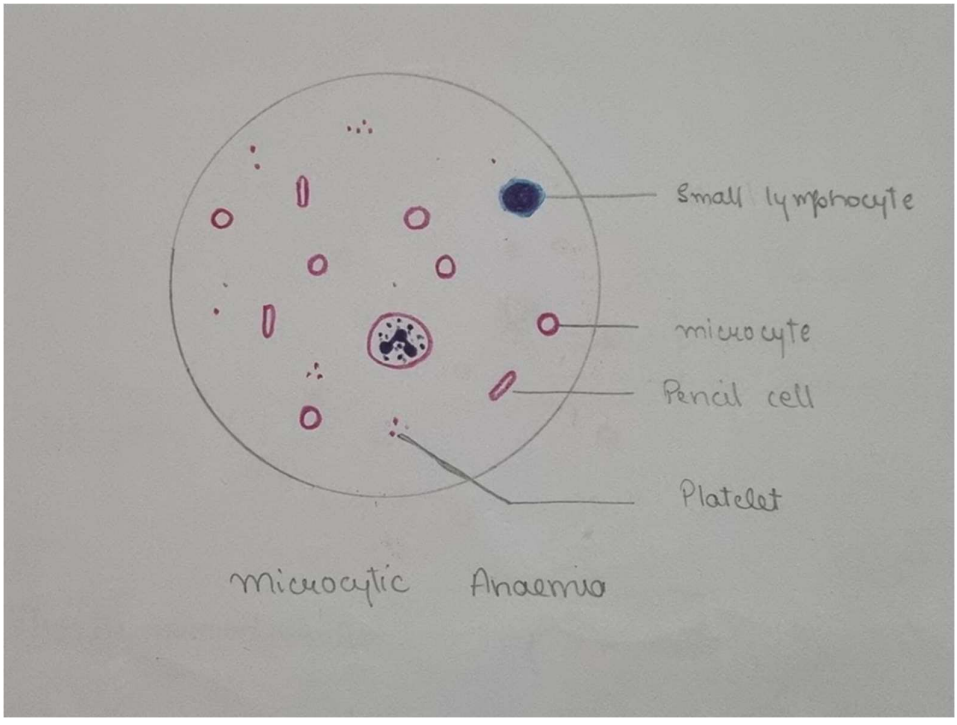


Fig.4.Microcytic anemia seen in Iron Deficiency Anemia

Complete Blood Counts (CBC)[51,57,59]

e) Hemoglobin-5-10 gm/dl. In India, it can go as low as 3gm/dl.

Normal Hemoglobin: Male- equal to or greater than 13 gm/ dl

Female- equal to or greater than 12 gm/ dl

f) Hematocrit-is low (10-30%)

Normal -Men-38.3-48.6 %

Women- 35.5-44.9%

g) Absolute values-

MCV<80 fL (Normal: 80-100 fl)

MCH<25pg (Normal: 29 +/- 2 picograms/ cell)

MCHC<27 gm/dl (34 +/- 2 g/ dl)

RDW>15.5 %(Normal- 12% -15%)

Bone marrow morphology and iron stores[52]

a) Hypercellular bone marrow

b) Erythroid hyperplasia 2:1 to 1:2

c) Micronormoblastic reaction-persistent basophilia and fraying of cytoplasmic borders that depicts lack of complete hemoglobinisation

d) Myelopoiesis is normal

e) Megakaryopoiesis is normal

f) Depleted bone marrow iron with Prussian Blue staining

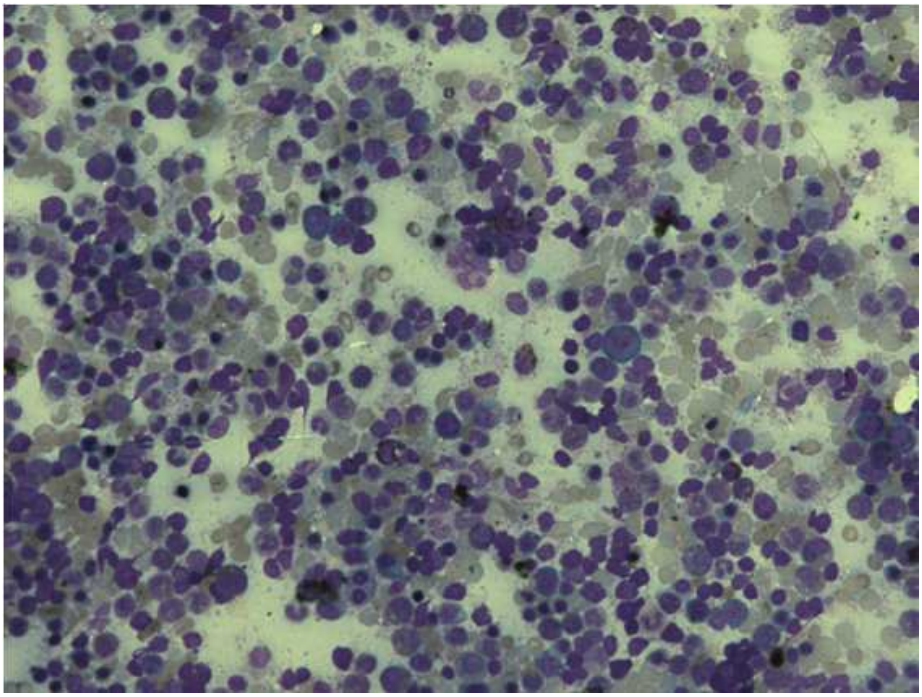


Fig. 5. Bone marrow aspirate smear showing micronormoblastic to normoblastic erythroid hyperplasia along with myeloid cells in different stages of maturation (× 200)[62]

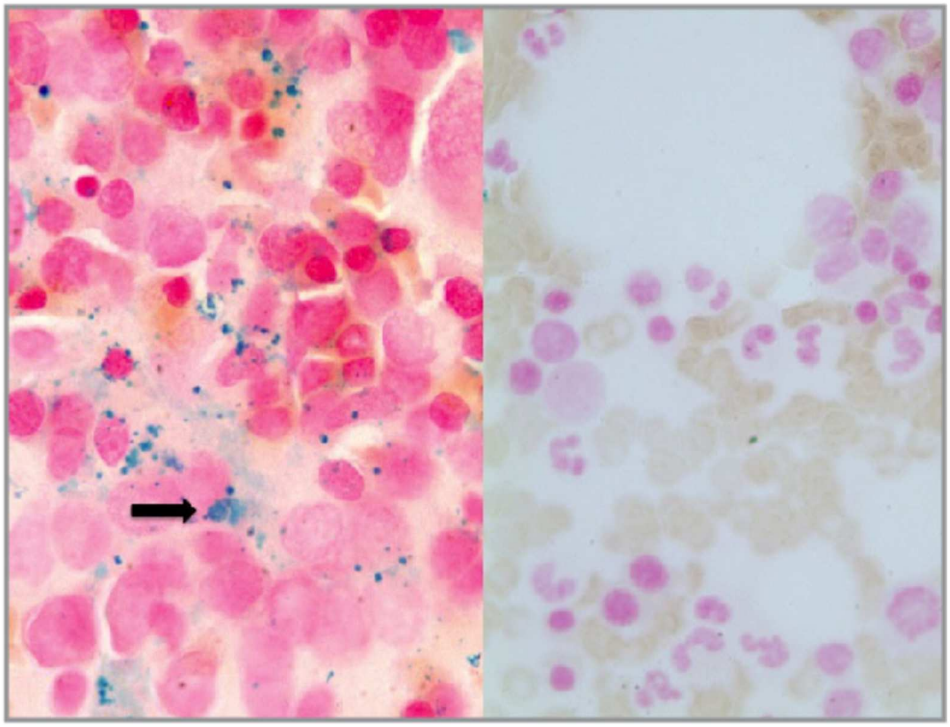


Fig.6.Prussian-blue staining of bone marrow aspiration. Normal iron stores (arrow) seen on left image and reduced on right image[63].

Biochemical Analysis [57,60]

a) Serum ferritin-<12micrograms/L indicates nil iron stores (Normal levels -50-300 micrograms/L)
b) Serum Iron-is reduced to 10-15 micrograms/dL (normal 50-150 micrograms/dL)
c) TIBC-reduced to 350-450 micrograms/dL (normal 310-340 micrograms/dL)
d) Transferrin saturation-<16% (normal 30-40%)
e) Serum Transferrin receptor assay-increased in IDA (normal -30 -50 micrograms/dl)
f) Reticulocyte hemoglobin content-reduced (normal-28-33 picograms/reticulocyte)
g) Erythrocyte zinc protoporphyrin-increases (normal 10-99mg/dl)

DIFFERENTIAL DIAGNOSIS

i)Sideroblastic anemia[64].

-Bone marrow produces ringed sideroblasts which is not seen in Iron deficiency anemia.

-Normal to high levels of iron

-Microcytic or Macrocytic morphology

ii)Anemia of chronic disorders-

The major difference between ACD and IDA is that in IDA there is an absolute lack (serum ferritin below 30 ng/mL) of iron.[65]

iii)Lead poisoning-

- History of consumption of lead
- Lead toxicity basophilic stippling of red blood cells

TREATMENT [34,49,52,59,70]

1)Oral iron therapy

Ferrous sulphate 200 mg containing 60 mg elemental iron,

Response to therapy is assessed by reticulocyte count on 7^{th} to 8^{th} day.

2)Parenteral Iron therapy

Iron-sorbitol is given as a single dose/weekly/daily.

I.V. iron sucrose can also be given.

III]VITAMIN B12 AND FOLATE DEFICIENCY ANEMIA

EPIDEMIOLOGY

Folate and cobalamin (Vitamin B12) deficiencies are commonly encountered in geriatric population and becomes more visible with rising prevalence with rising age. It is seen in 8 percent of patients admitted to geriatric wards.[55,66]

Clark et al. showed that after the age of 65 years, the prevalence was found to be of the measure of 5 to 10 % of Vitamin B12 deficiency while the other measure, that is, the risk of developing the same was found to be 10 to 20 %. Also, it was found that the prevalence of combined Vitamin B12 and folate deficiency was found to be 10%.[55,67]

As per the Framingham study, 12 percent was found to be the prevalence of Vitamin B12 deficiency in elderly living in the community. Folate deficiency was found to be less frequent in comparison.[68]

Pernicious anemia, the more classical entity, is less commonly seen.[25,69](15% to 25% of cases)

ETIOLOGY[22,67,68,]

Vitamin B12 deficiency

I]Decreased Dietary Intake-Nutritional deficiency (Ex. Vegans, infancy, breast feeding)

II]Impaired absorption

a) Gastric
    i) Inadequate proteolysis (ex. Atrophic gastritis, proton pump inhibitors)
    ii) Atrophy of gastric mucosa (ex. Pernicious anemia, gastrectomy)

b) Intestinal
    i) Disorders of B12 Metabolism (ex. Inborn errors)
    ii) Disorders of plasma cobalamin transport
    iii) Disorders of IF receptors, abnormal mucosal architectures (ex. Inflammatory bowel disease)
    iv) Pancreatic protease inadequacy (ex. Zollinger Ellison syndrome)
    v) Luminal B12 consumption

Vitamin B12 deficiency is less frequently due to insufficient dietary intake although some cases of malabsorption due to post-surgical event may be seen to have Vitamin B12 anemia. The most frequent association of Vitamin B12 deficiency is with food cobalamin malabsorption syndrome. Pernicious anemia, the more classical entity, is less commonly seen. (15% to 25% of cases)[25,69]

The cause of food cobalamin malabsorption is due to the inability to split the protein bound cobalamin in the food, thus making less amounts of free cobalamin, even though there is adequate intake. Standard Schillings test in these cases are found to be normal. It uses radioactive cobalamin.[68,70]

Food-cobalamin malabsorption is often caused by

- Atrophic gastritis

Associated or not associated with Helicobacter pylori, or to hypochlorhydria caused by long term use of proton pump inhibitors or H2-receptor antagonists, intestinal microbial proliferation, use of biguanides, alcoholism and gastric surgery.[68,70]

FOLATE DEFICIENCY

I] Decreased intake (Ex. Nutritional deficiency)

II]Abnormal Absorption (Ex. Celiac disease, Tropical Sprue)

III]Physiological, increased demands (Ex. Pregnancy, Infancy, hemolytic anemias)

IV]Drugs (Ex. Folate antagonists like methotrexate, Sulfasalazine, barbiturates)

V] Increased loss

Combined folic acid and B12 deficiency

i)Hemodialysis

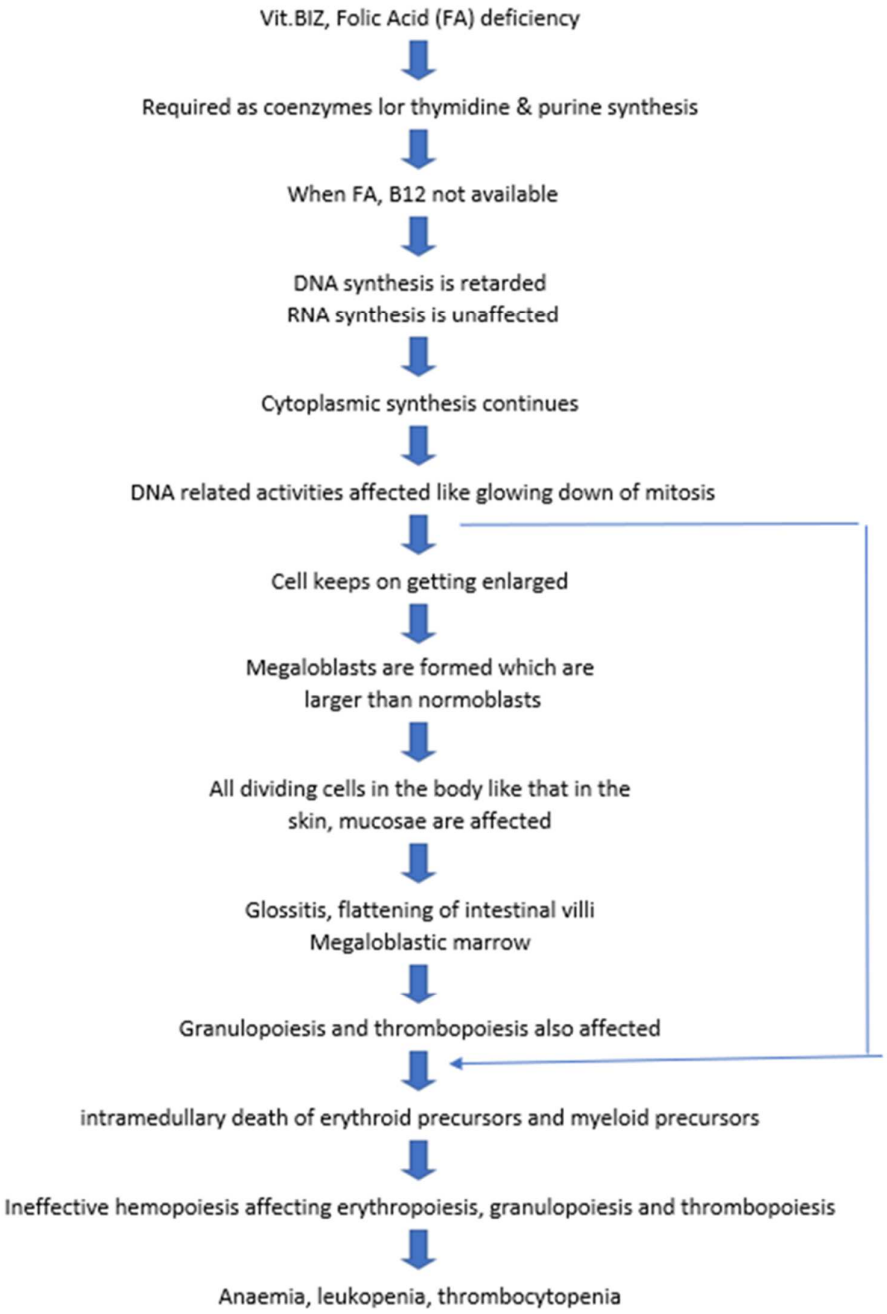
ii)Tropical sprue

iii)non-tropical sprue (gluten-sensitive enteropathy)

VI]Alcohol consumption

The anemia caused by both the deficiencies show Macrocytic anemia. It is found to be a result of stopping the proliferation of erythroid progenitor cells. Macrocytosis results in reduction of the lifespan of red blood cells, and this also is a contributing factor to anemia.[22,71]

PATHOPHYSIOLOGY[71,72]



Cause of neurological complications: Vitamin B12 deficiency causes accumulation of methyl malonic acid which is not converted to succinyl CoA. This leads to myelin breakdown resulting in neurological complications.[72]

CLINICAL FEATURES[72,73,74,75]

Common symptoms

1) All ages and both genders affected
2) Pallor-Insidious
3) CNS manifestations

   -Ataxia

   -Unsteadiness of gait

   -Altered sensorium
4) Peripheral neuropathy
5) Thrombosis
6) Fatigue
7) Headaches
8) Difficulty concentrating and mental impairment
9) Glossitis and angular cheilosis
10) Peripheral neuropathy
11) Muscle cramps and muscle weakness
12) Ataxia
13) Erectile dysfunction
14) Vision disturbances

Symptoms specific for Vitamin B12[68,72,73,74]

1)Subacute combined demyelination of posterolateral columns of spinal cord.

This consists of:

-Impaired perception of vibration and pressure, impaired perception of deep touch, paresthesia.

-Ataxia of dorsal column type

-Loss of deep muscle-tendon reflexes

-Pathological reflexes- Babinski, Rossolimo

2)Cold intolerance

3)Brittle nails

4)Dark circles around eyes

5) Knuckle pigmentation

LABORATORY FINDINGS [55,72,73,74,76]

Anemia caused by Vitamin B12 and/or folic acid is found to be morphologically of macrocytic and megaloblastic nature. Sometimes, it also presents as microcytic or even normocytic in the initial stages. [55] Folate and Vitamin B12 assays are useful to detect the presence of Vitamin B12/ Folate deficiency anemias.[77,78]

Peripheral smear findings

-Moderate to marked anisopoikilocytosis

-Macroovalocytes

-Macrocytes lack pallor

-Few tear drop cells and normocytes seen

-Evidences of dyserythropoiesis

-Basophillic stippling

-Cabot ring

-Howel Jolly bodies

- Hyper segmented neutrophils

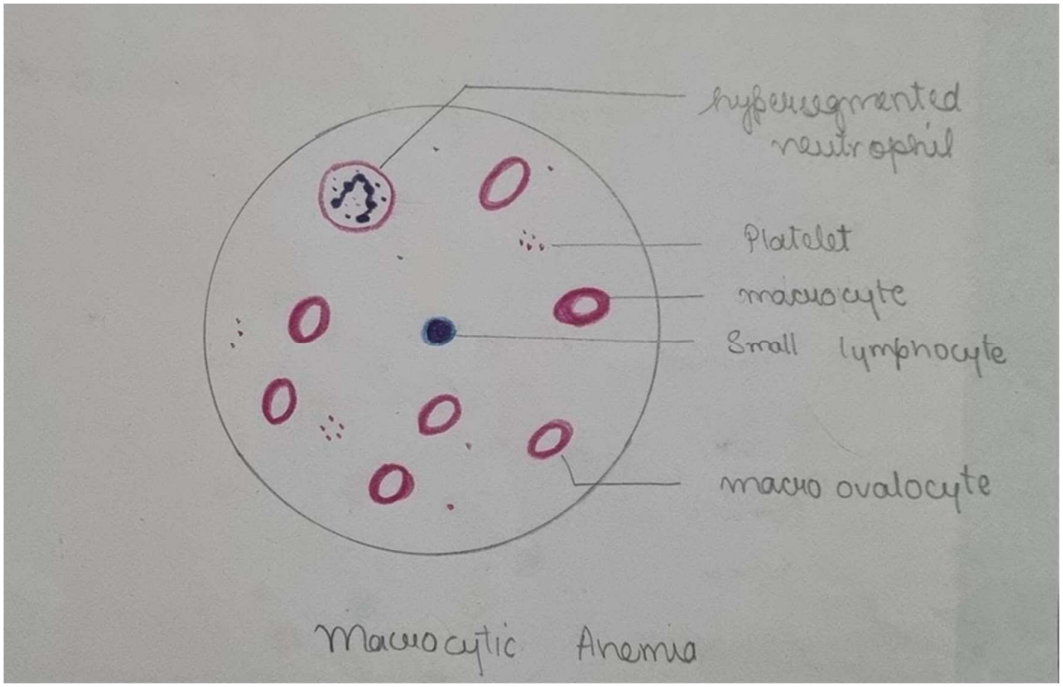


Fig.7. Macrocytic Anemia seen in a case of Vitamin B12 and Folate Deficiency

Complete Blood Counts[55,72]

a) Macrocytosis

MCV-110-130 fL (Normal: 80-100 fL)

MCH increased (Normal: 29 +/- 2 picograms/ cell)

MCHC is normal (34 +/- 2 g/ dl)

b) Hemoglobin-Decreased

Normal: Men- Equal to or more than 13 gm/ dL

Women-Equal to or more than 12 gm/ dL

c) Hematocrit-decreased

Normal: Men- 38.3-48.6 percent

Women- 35.5-44.9 percent

d) Reticulocyte count-normal to decreased

Normal -0.5%-2.5%

e) White cells-Normal to decreased

Normal range: 4500 – 11000 WBCs per microliter

f) Platelets-normal to decreased

Normal: 150,000-450,000 platelets per microliter

g) Pancytopenia-in a few cases

Bone marrow findings

a) Cellularity-Moderate to marked hypercellularity

b) M:E ratio: 1:1 to 1:6 due to erythroid hyperplasia

c) Megaloblastic Erythropoiesis

-Early forms

-Late Megaloblasts

-Dyserythropoiesis

d) Myelopoiesis

-Giant metamyelocytes and giant band forms

e) Megakaryopoiesis

Mild Reduction in the number of megakaryocytes.

Nuclear abnormalities are seen like hyper segmentation of the nucleus with open nuclear chromatin network that may result in thrombocytopenia due to ineffective thrombocytopoiesis.

Bone Marrow Iron is moderately increased

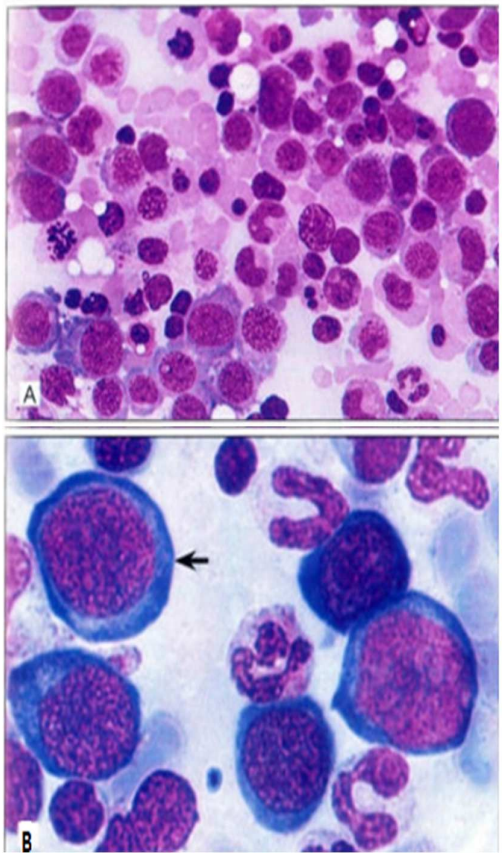


Fig. 8 Megaloblastic anaemia: Bone marrow aspirate smear showing A) marked erythroid hyperplasia, with reversal of M: E ratio. B) early megaloblasts (arrow) with larger size, sieve like nuclear chromatin and giant stab forms.[72]

Biochemical levels[72,73]

a) Serum Vitamin B12 levels

Decreased in Vitamin B12 deficiency (< 100 nanograms/L)

Normal levels-(160-900ng)

b) Serum folate levels

Decreased (Normal: 2.7 to 17 nanograms per milliliter)

c)Serum methyl malonic acid is increased (Normal-0.07-0.27 micromoles per liter)

Done to detect Vitamin B12 deficiency

d)Urinary excretion of methyl malonic acid is increased (Normal: 0.00-0.40 micromoles per milliliter)

Done to detect Vitamin B12 deficinecy

e) Formiminoglutamic acid test (FIGLU)[61,74]

In urine- excreted excessively in folate deficiency. (Normal: 0-1.5 mmol/ mol creatinine)

f) The Deoxy uridine Suppression Test

This test measures the integrity of the de novo pathways of DNA synthesis.

Normal: dU suppressed value- 1.4% to 8.6%

g) Schilling's test[72,75]

To distinguish megaloblastic anemia due to Intrinsic factor deficiency from Vitamin B12 deficiency

Interpretation

Normal levels:

Stage 1- Oral Vitamin B12 with intramuscular Vitamin B12

i)Normal result shows at least 10 % of radiolabeled Vitamin B12 over the first 24 hours

ii) In patients with pernicious anemia or impaired absorption, less than 10 % if the radiolabeled Vitamin B12 is detected in urine.

Stage 2- Vitamin B12 and intrinsic factor (IF)

i)After adding IF, if the urine excreted is normal, it confirms pernicious anemia.

ii) An abnormal result implies malabsorption

h) Serum homocysteine levels

Increased and may be associated with thrombosis of vessel.

Normal levels- 5-15 micromoles per liter

i) Serum Bilirubin-increased mildly due to intramedullary death of megaloblasts

Normal levels- 1.2 milligrams per deciliter for adults

j) Serum Iron-normal to increased

Normal levels- 60-170 micrograms per deciliter

k) Serum ferritin-normal to increased

Normal levels: For Men- 24-336 micrograms per liter

For Women- 11 to 307 micrograms per liter

DIFFERENTIAL DIAGNOSIS[72]

Non-megaloblastic macrocytosis

Seen in-

* Liver disease * Acute leukaemia * Myelodysplastic syndrome * Aplastic anaemia * Pure red cell aplasia * Hypothyroidism * Excessive alcohol intake * Reticulocytosis in haemolytic anaemias *Following cytotoxic drug therapy * Anticonvulsant drugs

Megaloblastic anemia due to vitamin B12 and folic acid

deficiency needs to be differentiated, from other causes of

macrocytosis without Vitamin B12/folate deficiency.

- MCV is usually 100-110 fl ((Normal: 80-100 fL)

-Low Red Cell Distribution Width. (Normal: 12 to 15%)

-The bone marrow reaction is normoblastic.

-Red cells are round in non-megaloblastic anemia but in Vitamin B12/FA deficiency, red cells are oval.

TREATMENT [68,73,74,75,76]

Vitamin B12 deficiency

1) Parenteral Vitamin B12

   1mg injection of hydroxycobalamine is given every week for five weeks

2) Oral Vitamin B12

   Vitamin B12 100 to 1000 micrograms

3) Folic acid

   1-5mg tablets

   Optimal hematological response-100 micrograms given daily

Treatment of Vitamin B12 deficiency can be with oral or parenteral administration of the same. In malabsorption syndromes of food-cobalamin, especially in the elderly, treatment with 100 micrograms per day has a lot of efficacies. In autoimmune anemias like pernicious anemia, oral therapy with up to 2000 micrograms daily is as effective as intramuscular routes. For treatment of deficiencies related to folate, dose of 1 to 5 milligrams per day. In most cases, 1 milligram per day will suffice.[56,77,78,79,80]

IV] MYELODYSPLASIA (Myelodysplastic syndrome (MDS)

This is an acquired disorder of clonal origin from the hematopoietic stem cell. It is said to affect all lineages, most commonly, the red blood cells.[81]

It is common at old age, the median being 72 years at the stage of diagnosis. The anemia in these cases is usually macrocytic with abnormalities in red cell shape. The appropriate diagnosis may be difficult to make, especially when it presents as normocytic anemia.[81]

EPIDEMIOLOGY[82]

Incidence: Disease of elderly.

<10% are younger than 50 years.

Incidence rates 1/100,000 population/ year.

Incidence rises to 1/1000 / years in > 60 years old.

Male slightly higher than female

ETIOLOGY [80,83]

i)Radiation

ii)Benzene

iii)Post chemotherapy

iv)Paroxysmal Nocturnal Dysplasia

v)Cytogenetic abnormalities

Mutations in N-ras, p-53,IRF-1 and Bcl-2

CLASSIFICATION [83,84]

1. Primary MDS
2. Secondary MDS-follows the etiologies mentioned above

CLINICAL FEATURES [81,82]

1) Age

   Mean age-65 years. In India, mean age of presentation is 45 years

2) Pallor-gradual onset
3) Splenomegaly
4) History of previous chemotherapy, radiation exposure
5) Bleeding manifestations
6) Infections-skin and respiratory infections due to neutropenias

HEMATOLOGICAL FEATURES

Peripheral smear findings [55,84]

1) Anemias

   -Mild to moderate

   -Macrocytic/ dimorphic type

   -Basophilic stippling

   -Howel Jolly bodies

   -Few nucleated red blood cells

2) White cells

   -Neutropenia with few blasts

   Neutrophil morphology

   -Band shaped nuclei (Pelger-Huet anomaly)

   -Hypo segmentation of nuclei. Cytoplasm is hypogranular.

   -Total leucocyte count is low to normal.

   -Eosinophils show eosino-basophilic granulation.

3) Platelets

   -Variable degree of thrombocytopenia

4) Neutrophil Alkaline Phosphatase (NAP) score

   Moderately to markedly decreased. (Normal:30-100)

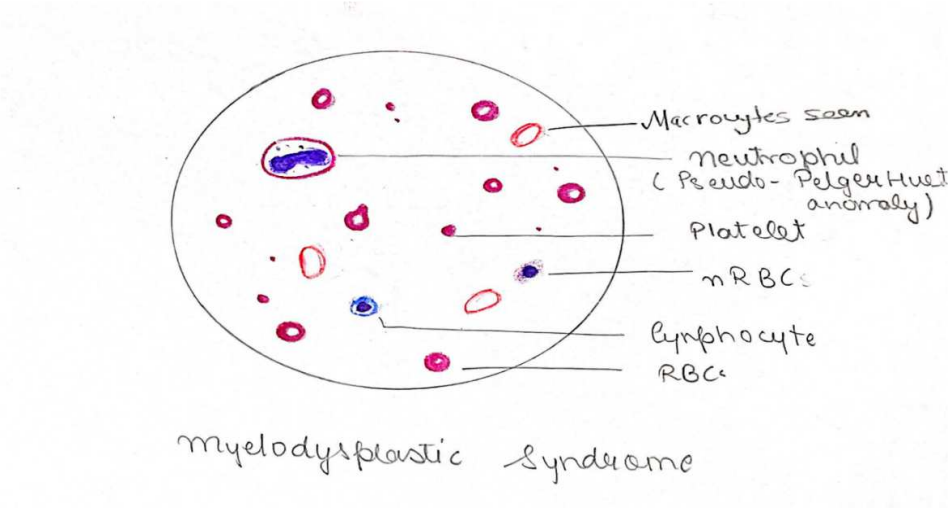


Fig.9 Peripheral smear in Myelodysplastic Syndrome showing Pseudo-pelger-huet anomaly and macrocytes.

Complete Blood counts[85,86]

MCV-Normal to increased. (Normal: 80-100 fL)

MCH is normal (Normal: 29 +/- 2 picograms/ cell)

MCHC is normal (Normal: 34 +/- 2 g/ dl)

BONE MARROW[80]

1) Hypercellularity-marrow is hypercellular
2) Dyserythropoiesis
3) Dysmyelopoiesis
4) Dysmegakaryopoiesis
5) Iron stores are increased
6) Bone marrow trephine Biopsy

-ALIP-Abnormal localization of immature precursors-clusters of blasts are present in central parts of marrow

-Micromegakaryocytes

-Megakaryocytic dysplasia. Some are seen in paratrabecular location.

-Increased apoptosis and angiogenesis.

Fig. 10- Bone Marrow aspiration showing Dyserythropoiesis

(Leishman stain, 100 x)[84]

DIFFERENTIAL DIAGNOSIS [87,88]

1) Nutritional deficiencies

   Deficiency of vitamin B12, folate, or copper, or zinc excess (mostly due to impaired copper absorption by excess zinc) should be excluded by clinical evaluation and lab testing.

2) Drugs and biologics – Examples of drugs and biologic agents associated with myelodysplasia include various chemotherapeutic agents, cotrimoxazole, mofetil, valproic acid, ganciclovir, tacrolimus or mycophenolate alemtuzumab, isoniazid, and granulocyte colony-stimulating factor.

   Dysplastic changes associated with medications may be seen in all three lineages on bone marrow examination and is accompanied by macrocytosis, reduced neutrophil lobulation, and cytopenias.

   Dysplastic changes are often reversible over a period of weeks after reduction or discontinuation of the offending medication.

Repeat bone marrow examinations is necessary to confirm the improvement in some cases.

3) Myelofibrosis – Mild to moderate bone marrow fibrosis is common in patients with MDS.

   A small percentage show marked fibrosis that is similar to that in patients with primary myelofibrosis (PMF).

   Both are associated with pancytopenia, but fibrotic MDS can be distinguished from PMF by the presence of significant dysplasia, diagnostic chromosomal abnormalities, lack of splenomegaly, and absence of mutations that are characteristic for PMF and other myeloproliferative neoplasms

4) Toxic exposures – Heavy metal exposure (eg, arsenic, lead, zinc) and excess alcohol should be excluded by clinical history and laboratory testing.

5) Infection – HIV infection is associated with dysplastic hematopoiesis and cytopenias; HIV infection should be excluded by serology.

   Dysplasia in people living with HIV infection results from medications, opportunistic infection, and/or a direct effect of Human Immunodeficiency Virus on hematopoietic progenitors.

   MDS in people living with HIV infection is more likely to have complex cytogenetics (including monosomy 7 and del(7q)) and is associated with shorter survival compared with non-HIV-infected patients

   Parvovirus B19 is often associated with reticulocytopenia, erythroblastopenia, and giant pronormoblasts.

TREATMENT[89]

Treatment protocols are supportive. What can be kept into consideration when relatively low levels of EPO (<100 IU/L) is present is treatment with growth factors and EPO. It is found to be of very less advantage when EPO levels are >500 IU/L.[80]

Total cure can only be achieved with allogenic stem cell transplantation. But the sad part is that geriatric patients are not eligible for this kind of therapy.[80]

Thalidomide analogues in oral form is shown to have good efficacy while treating Myelodysplasia, but their significant side effects like granulocytopenia and thrombocytopenia must be taken into account. The benefit to risk ratio is considered in geriatric population only in cases where there is deletion of the short arm of chromosome 5 ((del)5q-syndrome) .[84]

Table 3. Features suggestive of MDS[21]	
Clinical investigation	Laboratory tests
Constitutional symptoms	Cytopenias
Weight loss	Neutropenia
Fever of Unknown Origin	Thrombocytopenia
Night Sweats	Macrocytosis without nutritional deficiency
Splenomegaly, lymphadenopathy, Hepatomegaly	Monocytosis, basophilia
History of Chemotherapy	Abnormal circulating WBC or large platelets

V] OTHER CAUSES

Anemia in elderly can always have a scope of presenting in one of the classical forms of anemia. Some entities like intoxications, hemolysis and myeloproliferative neoplasms can occur at any given age. Suspect cases of MDS can always be looked into by studies for mutation in JAK 2 gene.[90]

VI] ANEMIA DUE TO SENESCENCE? (UNKNOWN CAUSES)

Even when there are hardcore diagnostic approaches undertaken, in 17 to 36 % of cases, the cause cannot be found. It might be explained that this phase might be subclinical early stages of MDS, IDA, ACD, or other occult diseases.[17,18]

The arguments laid out on why aging itself is an intrinsic factor for the development of anemia.

Firstly, there is an inadequate EPO response which is very disproportional to the level of hemoglobin.[91]

Secondly, it is thought to be due to senility-associated increase in the pro-inflammatory cytokines, even without any associated ongoing disease. The major cytokine to be considered is IL-6. IL-6 is considered to have the property of inhibiting erythroid cell proliferation of the progenitors, thus interfering with its ability in iron metabolism.[92,93]

So, in elderly, as stated above, there is a lower level of EPO than those with Iron deficiency anemia or younger subjects with anemia.

Thirdly, there is found to be a less hematopoietic reserve capacity in the elderly, which corresponds to the lower counts of erythroid progenitor cells. Hence, during hematopoietic stress, there is anemia since the deficit of red blood cells is not adequately replaced. It is also found that these progenitor cells of the elderly are not responsive that responsive to endogenous EPO.[11,27,94]

Even though senescence may be a cause for anemia itself, a thorough diagnostic workup has to be initiated before coming down to the unknown.[93]

Common symptoms in geriatric population with anemia:[25,29,36,51]

1) Increased falls
2) Reduced strength
3) Reduced physical performance
4) Reduced mobility
5) Impaired activities of daily living
6) Reduced cognition

Anemia and its symptoms like low levels of energy, generalized weakness and fatigue, bouts of dizziness, decline of physical strength, impaired performance and muscle weakness have been found to increase the risk of falls.[22,15,43]

Other symptoms include-

1)Fatigue

2)Dyspnea

3)Muscle weakness

4)Headache

5)Vertigo

6)Syncope

7)Palpitations

Anemia usually presents as symptoms which are nonspecific such as weakness and fatigue that usually attributable to senility rather than the disease process itself.[12]

Immobility, confusion, falls must be ruled out which can be causes my multiple factors. Polypharmacy and Poly-pathology are characteristic of geriatric patients. Poly-causes of anemia may be present which will mask the primary etiology and typical features.[13]

An example to the above is an association to iron and B12 deficiencies, which can present as normocytic normochromic anemia morphologically. But dehydration may mask the anemia and show an aberrantly normal hemoglobin level or mask the actual decrease.[9]

Even, like the above, musculoskeletal disease of chronic variety, will induce anemia but mask the symptomatology, because of reduced exercise tolerance and mobility.[14]

CLINICAL EVALUATION.[13,43]

HISTORY TAKING

- Should be done thoroughly to point out at the cause of anemia.

-Onset of symptoms

-an history of drug intake or exposure to chemicals (Any exposure to toxic substances)

-symptoms of glossitis, stomatitis (Vitamin B12, Folate deficiency)

-dietary history in relation to iron, vitamin b12, folate content and cooking of food

-stool, if bulky, is suggestive of malabsorption syndrome

CLINICAL EXAMINATION-

A) BLOOD PRESSURE- hypotension

B) PALLOR- conjunctival, tongue, skin

F) NAILS- platynychia/ koilonychia

I)Signs of infection, bleeding due to neutropenia/ thrombocytopenia

J) Tongue-glossitis

K) Angles of lips- stomatitis

SYSTEMIC EXAMINATION

CVS- Cardiac assessment for murmurs (ejection systolic murmur)/ rheumatic carditis

RS- tuberculosis, infections, bronchiectasis

GIT/ABDOMEN-Splenomegaly, Hepatomegaly

Genito-urinary- Kidneys for chronic renal disease

LAB INVESTIGATIONS.[13]

A) COMPLETE BLOOD COUNTS

ACD- The hemoglobin is 8-9.5 hm/dL. MCV, MCHC, MCH is normal to low. Hematocrit is normal to low.

IDA- Hemoglobin:5-10 gm/dL, Hematocrit is low, MCV, MCHC, MCH is low. RDW is normal to slightly increased.

Vitamin B12/ Folate deficiency- Hemoglobin is decreased. MCV, MCH is increased. MCHC is normal. Hematocrit is decreased.

Myelodysplasia- Hemoglobin is normal to decreased. MCV, MCH, MCHC is normal.

B) RETICULOCYTE COUNTS

ACD- Reticulocyte index is reduced.

IDA- Reticulocyte count is normal to increased.

Vitamin B12/ Folate deficiency- Reticulocyte count is normal to decreased.

Myelodysplasia- Reticulocyte count is normal to low.

C) PERIPHERAL BLOOD SMEAR

ACD- Normocytic Normochromic Blood picture. Later shows microcytic hypochromic anemia.

IDA- Microcytic Hypochromic cells seen.

Vitamin B12/ Folate deficiency- Moderate to marked anisopoikilocytosis. Macro-ovalocytes seen. Tear drop cells and normocytes. Evidences of dyserythropoiesis seen. Hypersegmented neutrophils present.

Myelodysplasia- Macrocytic/ dimorphic morphology of RBC's seen.Basophilic stippling. Howel Jolly bodies seen. Few nucleated RBC's seen.

D) LEUCOCYTE AND PLATELET EXAMINATION

ACD- Leucocyte-Total Count and differential: Normal.

Platelets-Normal

IDA- Leucocyte-Total Count and differential: Normal.

Platelets- increased.

Vitamin B12/ Folate deficiency-

Leucocyte-Total Count and differential: Normal to decreased.

Platelets- Normal to decreased.

Myelodysplasia- Total Count and differential: Normal to decreased.

Platelets- Normal to decreased.

E) TESTS FOR ERYTHROCYTE DESTRUCTION

F) BONE MARROW EXAMINATION

ACD- Normoblastic Normocellular Bone Marrow, Reduced erythropoiesis may be seen. (Example: in kidney diseases)

Bone marrow infiltration in cases of malignancy.

IDA- Hypercellular bone marrow. Erythroid hyperplasia. Micro normoblastic reaction

Vitamin B12/ Folate deficiency- Hypercellular bone marrow. Erythroid hyperplasia. Megaloblastic erythropoiesis.

Myelodysplasia-Hypercellular bone marrow. Dyserythropoiesis, Dysmyelopoiesis, Dysmegakaryopoiesis seen.

G) ***SERUM FERRITIN***- Decreased (Less than 12 micrograms/ L, Normal: 50-100 micrograms/L)

H) ***VITAMIN B12 LEVELS***- Decreased in Vitamin B12 deficiency. (Less than 100 nanograms/L, Normal: 160-900 nanograms/L)

I) ***FOLATE LEVELS***-Decreased (Normal: 2.7-17 nanograms /mL)

J) STOOL FOR OCCULT BLOOD/PARASITES

Complete blood count is the mostly widely used blood test performed and the information retrieved from this is of endless scope for hematological diseases. The interpretation of results remains unclear in the elderly at times. Indications of obtaining a CBC for screening a healthy population of geriatric age group population remains controversial because it is not economically feasible and the infrastructure and man-power to accomplish the same, is lacking. Doctors of geriatric medicine take geriatric anemia as an entity of pathologic interest where a disease process of significant but underlying nature can be found.[8] Physicians of the world have an agreement that Complete Blood Counts are necessary in all geriatric hospitalized population while a common consensus says that it might not be cost effective.[24] The significance of diagnosing anemia may be found in the therapeutic intervention and how effective therapy can annihilate anemia and the disease under consideration.[28]

Morphological analysis is like that done in younger adults. The basis is Mean Corpuscular Volume (MCV) and peripheral smear. Reticulocytosis and its index are low in majority of the cases in elderly. If it is increased, it means that there is

hemolysis or hemoglobinopathies or red cell membrane alteration or enzyme alteration.[7]

Diagnosis of anemia requires less invasive tests than the current methodology of using invasive tests like Bone marrow aspiration and biopsy. Although bone marrow may be a definitive test, the value of less invasive tests like iron stores for Iron deficiency anemia have been established. Invasive tests in the elderly should be used only when required when it is known that less invasive tests are available. For example, serum ferritin is the unsurpassed test for differentiating those with iron deficiency anemia with those that don't have the disease.[27]

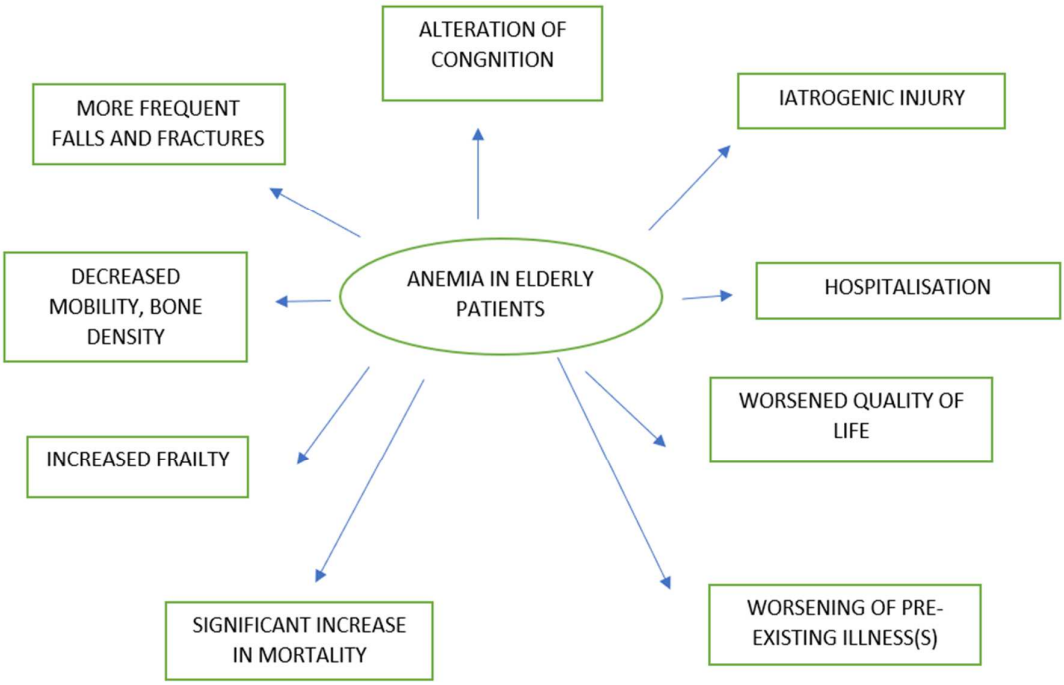
Inflammatory marker levels and their assessment needs to be done. Iron, cobalamin, folate deficiencies may require the determination of soluble transferrin receptor, methylmalonic acid and homocysteine levels in tedious cases.[16]

In anemia due to celiac disease, diagnosis may require anti-transglutaminase and anti-endomysial antibodies.

Anti-gliadine antibodies have less specificity and sensitivity. Bone marrow examination can only guide to MDS disease treatment which have del(5q-) syndrome. Karyotyping is mandatory to detect this syndrome. Hematological neoplasms and myeloproliferative syndrome suspected cases need to undergo a bone marrow for definitive diagnosis and treatment protocols.[8]

Endoscopy of the upper and lower gastrointestinal tract is required, especially in cases of Iron Deficiency Anemia. Meckel's diverticula need to be searched by isotopic examination.[12]

COMPLICATIONS OF GERIATRIC ANEMIA.[9,13,14,24,26,95]



Anemia appears to be a factor which is independent in the causation of mortality in the geriatric population and in the modern era.[8]

In a prospective study, which had a large sample size, Izaks and coworkers found a risk of mortality of 2.29 in men and 1.6 in women having anemia, in comparison to those that had normalcy in their hemoglobin in accordance with the WHO standard definition.[96]

Similar studies were done, and all came up to a single consensus that anemia did increase mortality.[4]

Cardiovascular disease patients, especially the ones with acute myocardial infarction and CHF, have a higher mortality. And inversely, anemia itself is found to cause left ventricular hypertrophy and diastolic dysfunction.[80,97,98]

Poor cognition is found to be associated with anemia and vice versa i.e., more cognitive impairment is seen in patients with lower hemoglobin levels.[2,8]

There is a huge impact of anemia in mobility and daily functioning and quality of life. Recurrent falls are seen in anemia in the elderly, and this may lead to fractures.[4]

There is decreased physical performance, loss of strength and disability.[4]

Even in hospitalized patients, the recovery rate was lower in anemic patients when compared to the non-anemic. An example was in a study done by Lawrence et al. who observed that better recovery rates after hip surgery were in patients with a higher hemoglobin level.[26]

Frailty and anemia are associated with each other like cotton and candy, and this is one of the characteristics of frailty.

One of the hall marks of frailty is increase in pro-inflammatory cytokines which is not only a contributing factor for causation of anemia but also for sarcopenia, cachexia and osteopenia which constitute the frailty phenotype.[33]

OUTCOMES OF LOW HEMOGLOBIN LEVELS IN GERIATRIC POPULATION.[26,96]

Low concentration of hemoglobin levels is seen to be associated with the following

a) Reduced quality of life

b) reduced functioning of the individual

c)depressive states

d)increased disability

e) reduced strength

All the above are irrespective of whether the individual person has a chronic disease or no. It was found that even mild levels of decrease in hemoglobin above the

WHO set threshold, were in association with decrease in quality of life in the aged population.[26]

FRAILTY

Frailty is related to the elderly and is defined as reduction in homeostatic reserves and acts as a clinical phenotype that is committed to advancing age and habituates to hostile outcomes. A definition by Fried and colleagues described it to be 'a state of physiologic rise of vulnerability of stressors that comes from decreased physiological resources and dysregulated physiologic systems. The parameters of frailty are considered to be of loss of weight, impairment of performance, sarcopenia, slowing of cognition and reduction of activity.[13]

Falls and fractures related to falls is a major public health problem in the aged. 30 % of the elderly who are 60 years and above fall once a year, at the least and 15% fall, at the least, twice a year. Falls are the major factors for causation of disability and need of admission to an institution with a high rate of mortality. Anemia is a major treatable risk factor for fractures and falls in the elderly population.[14]

It is an upcoming factor in the elderly with a series and variety of unpleasant outcomes like hospitalization or as severe as death itself. In comet investigation also, age was found to be linked to anemia and a very poorer outcome of sorts.[9]

For example, considering a disease of old age like heart disease, anemia is figured out to be an independent factor for mortality of long term after percutaneous coronary intervention. Also, anemia is linked to decline of physical performance. Negative impact is noted in the quality-of-life index. Muscular strength reduction is seen in the elderly.[9]

ANAEMIA AS AN INDICATOR OF MALNUTRITION IN ELDERLY

Anemia is also found to be an indicator of malnutrition in the elderly. Malnutrition also may be a factor contributing to anemia. So, it is a two-way situation where both factors affect each other. Malnutrition is especially found in hospital-based population of elderly. Parameters like cholinesterase, cholesterol, serum albumin, vitamin B12, transferrin saturation, absolute lymphocyte count are used as indicators of malnutrition.[24]

TREATMENT

The gravity of the situation is that even the mildest form of anemia has a worse outcome, especially in the elderly and hence needs to be worked up diagnostically in a decisive in-depth manner and treatment to be provided at the earliest in accordance with the underlying causes.[95,97]

Time and again, it has been stressed that transfusions to maintain a pre-determined threshold of hemoglobin is not up to the required standards. The benefits of the same have been said to no be of any use in any avenue of the betterment of the patient.[95,97]

Adding to the debts of the above, transfusions are also known to be associated with severe complications and adversities and hence the decision of transfusion should not be just merely taken by looking at the levels of hemoglobin. The only documented situation where transfusions are worthwhile is in acute MI in elderly patients with a hematocrit of above 30%.[95]

EPO treatment is largely advocated in the American society for anemia of chronic diseases and Myelodysplastic Syndromes but the same is not done in Belgium unless the hematocrit is below 35% and the GFR reduces to below 45 mL/min. But,

prior to these protocols, IDA and hemorrhage, which can be treated in a different style of approach, must be ruled out first.[98]

Caution is indeed needed because there is a high mortality in cancer patients who are on chemotherapy and receiving EPO. Similar mortality prospects are seen in patients who are on dialysis with an overt cardio-vascular condition and receiving EPO. Hence, after seeing these poor outcomes and over-usage of EPO as first line therapeutic in geriatric anemias, FDA has put restrictions on its usage.[99]

EPO should not be given to patients whose hemoglobin levels are above 10g/dL and should not yield levels above 12g/ dL.[13]

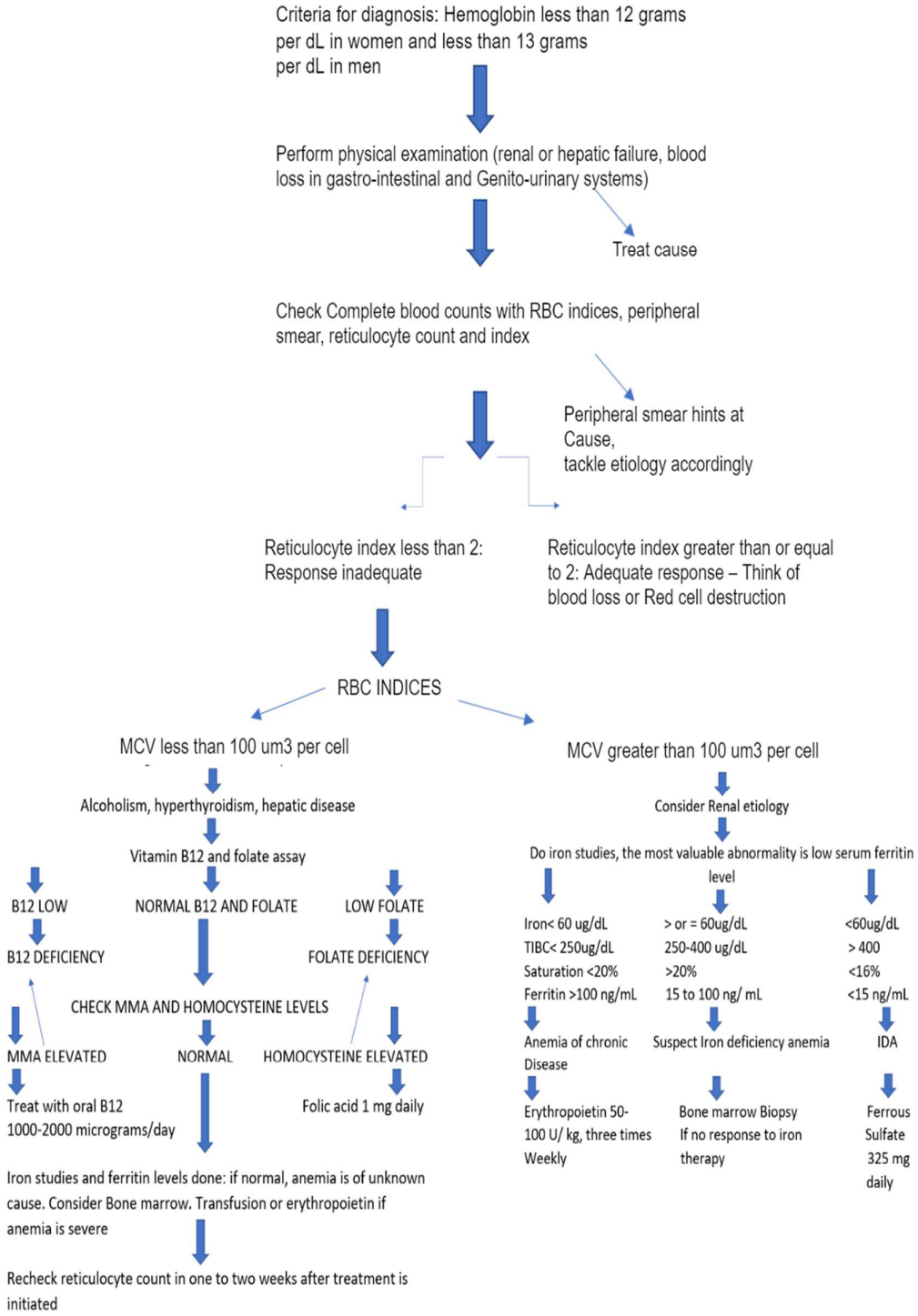
TABLE 4. OVERVIEW OF ANEMIA IN GERIATRIC AGE GROUP.[13]

MCV	<78 fL	78-100 fL	> 100 fL
Etiologies	Iron Deficiency Anemia Other causes: a) Chronic disease b) Sideroblastic anemia c)Lead poisoning	I]Acute causes (ex. AKI) II]Chronic disease a) Chronic inflammation b) Chronic kidney disease c) Simultaneous Iron and Folate deficiency d)Drugs e) Aplastic anemia f) Leukemias/Lymphoma g) Autoimmune disorders (Example: Crohn's disease) .[72] h)long term infections:	a) Folate deficiency b) Vitamin B12 deficiency c)Myelodysplastic syndrome d)Liver disease e) Pure red cell aplasia f)Hypothyroidism.[72] g)Excessive alcohol intake.[72] h)Reticulocytosis in haemolytic.[73] anaemias i)Following cytotoxic drug therapy.[73] j) Anticonvulsant drugs

		HIV/AIDS, Osteomyelitis	
Workup	Iron Transferrin Ferritin, Gastrointestinal investigations,	Identifying and treating disease in ACD and AI. For kidney disease. Ferritin, (serumTfR), folate, B12 levels. Review medication	Folate, Vitamin B12 levels Bone marrow (exclude 5q-) TSH, FT4 Liver enzymes, Liver imaging Review medication
Treatment	Treatment for cause and supplement iron	Treat underlying disease.	Vitamin B12 and folate supplements. Lenalidomide for 5q- L-thyroxine

(Hb< 13g/dl in men, <12g/dl in women (no dehydration))

APPROACH TO GERIATRIC ANEMIA.[30]



METHODOLOGY

The present study has been carried out at the Pathology Department of KAHER's Jawaharlal Nehru Medical College and Dr. Prabhakar Kore Hospital, Belagavi.

Study design: One year hospital based observational study.

Study period: 1 year prospective (January 1st, 2021 to December 31st, 2021)

Study population: Patients above 60 years of age including clinically diagnosed cases of anaemia, who have visited KAHER's Dr Prabhakar Kore Charitable hospital, Belagavi from 1st January 2021 to December 31st. 2021.

Inclusion criteria: Patients of both sexes

Patients above 60 years of age

Exclusion criteria: Patients with history of transfusion < 3 months.

Patients with history of bleeding disorders

Sample Size:

The minimum sample size based on prevalence size is

$$n=4pq/d^2$$

Where p is the percentage of Prevalence, q= (100-p) and "d" is the relative error.

With p=15%, q=85% and d=20% of p

Thus, the sample size comes up to approximately **575**.

Sampling procedure: Universal Sampling

After obtaining ethical clearance from the JNMC Institutional Ethics Committee on Humans Subjects Research, the participants were briefed about the study and informed consent was taken.

The data was collected using a pre-designed proforma. The information about the clinical parameters were taken from patients records.

Method of Collection: Venous blood was collected from the veins of the antecubital fossa. (Procedure-Annexure-IV) Blood, after collection, was delivered to an Ethylene Diamine Tetra-acetic Acid (EDTA) anticoagulant tube and is mixed with the anticoagulant thoroughly by inverting it several times. The collected sample is then sent to the hematology laboratory.

Wedge-Method of making peripheral smear was used. (Procedure-Annexure I) Peripheral smears were stained with Leishman's stain and were studied for morphology. (Procedure-Annexure VI)

Complete Blood Counts including indices were determined within six hours of collection using EDTA sample by the 3-part differential analyzer of the brand 'Tulip Group', model 'CounCell-23 Plus', (based on principle of Electronic Impedance) .The Complete Blood counts were obtained

Parameters studied were Hemoglobin, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC), Red Cell Distribution Width (RDW) and Hematocrit (Hct). The investigations carried out were complete hemogram with Red Blood Cell indices, peripheral smear in all cases and serum

ferritin, Vitamin B12 assays and serum Folate in cases (wherever possible) where anemia was detected.

Data analysis: The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data were presented as the means ± SD and as median with 25^{th} and 75^{th} percentiles (interquartile range). The following statistical tests were applied for the results:

1. The association of the variables which were quantitative in nature were analyzed using ANOVA.
2. The association of the variables which were qualitative in nature were analyzed using Chi-Square test. If any parameter had an expected value of less than 5 then Fisher's exact test was used.

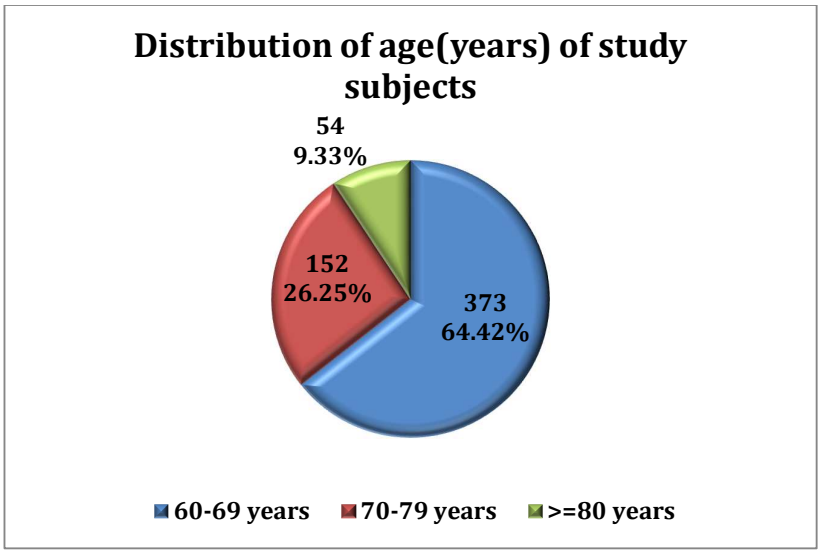
The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 25.0.

For statistical significance, p value of less than 0.05 was considered statistically significant.

RESULTS AND OBSERVATIONS

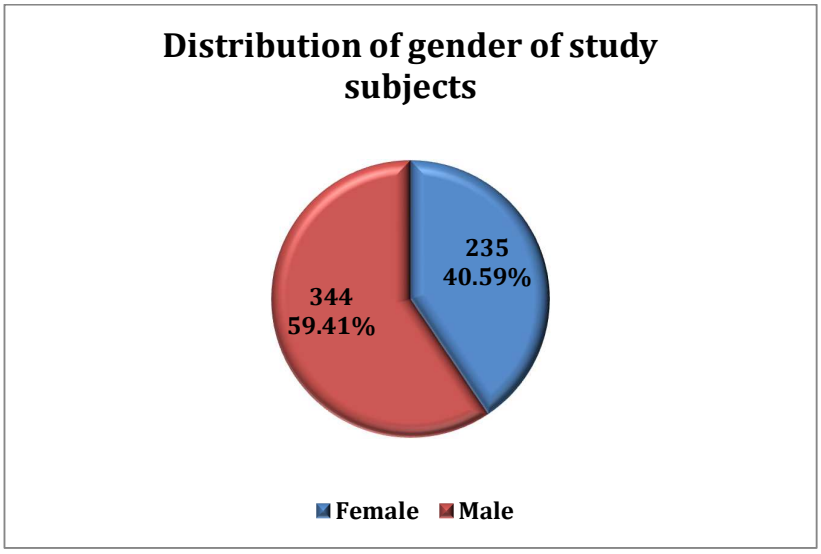
The study was conducted in Department of Pathology, Jawaharlal Nehru Medical College and Dr Prabhakar Kore Charitable Hospital, KAHER, Belagavi, Karnataka. Patients of age equal to or greater than 60 years were included in the study. Investigations like CBC, RBC indices, Peripheral Smear for blood picture were carried out and results are as follows.

Figure 11:-Distribution of age(years) of study subjects.



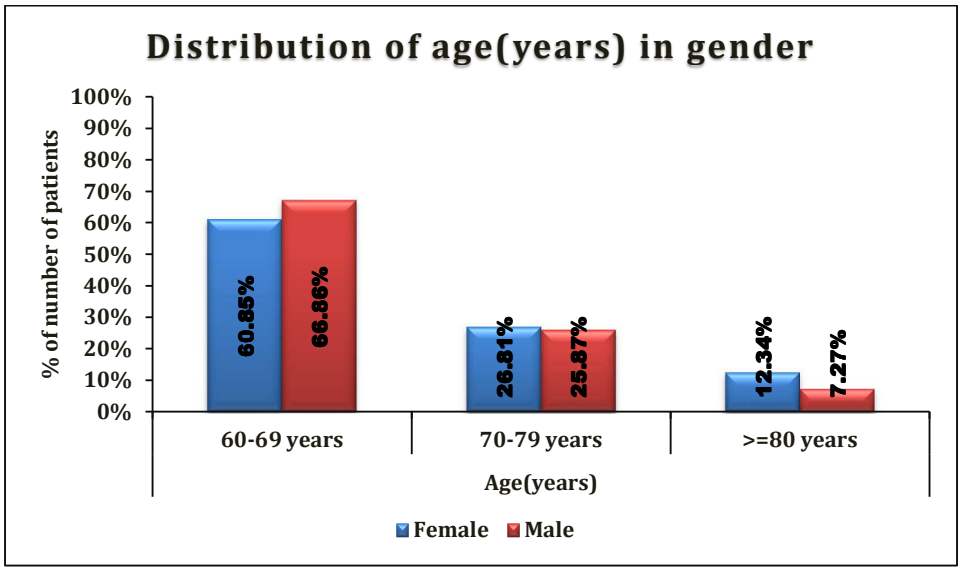
Majority (373, 64.42%) of the patients belonged to age group 60-69 years followed by 70-79 years (152, 26.25%)). Least frequency was observed in the age group >=80 years . (54, 9.33%).

Figure 12:-Distribution of gender of study subjects.



Males (344, 59.41%) were more frequent than females (235, 40.59%) in the study group. Males (142, 59.66%) were more frequently anemic as compared to females (96, 40.34%) amongst cases with anemia.

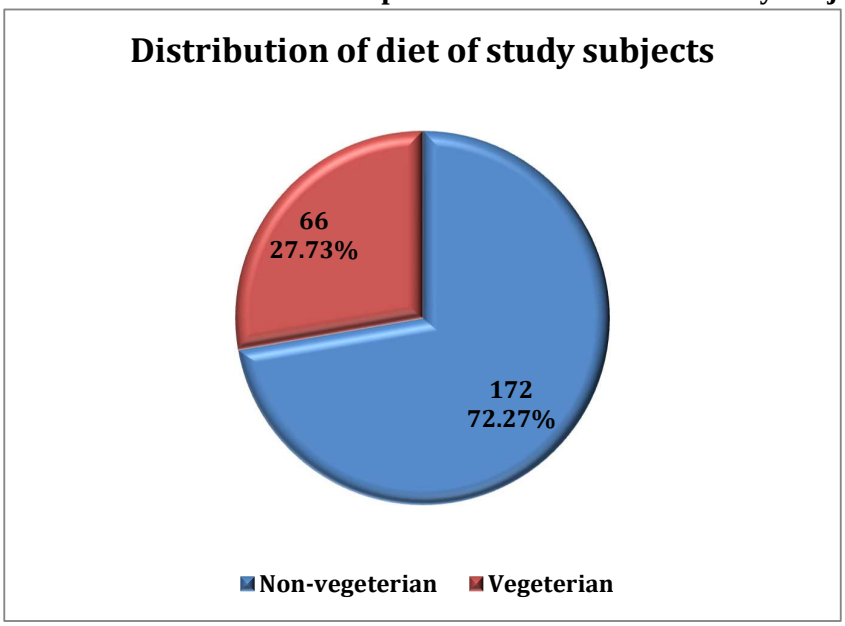
Figure 13:-Distribution of age(years) in gender.



n=344 males (60-69 years:230, 70-79 years:89, >=80 years:65), 235 females (60-69 years:143,70-79 years:63, >=80 years:29)

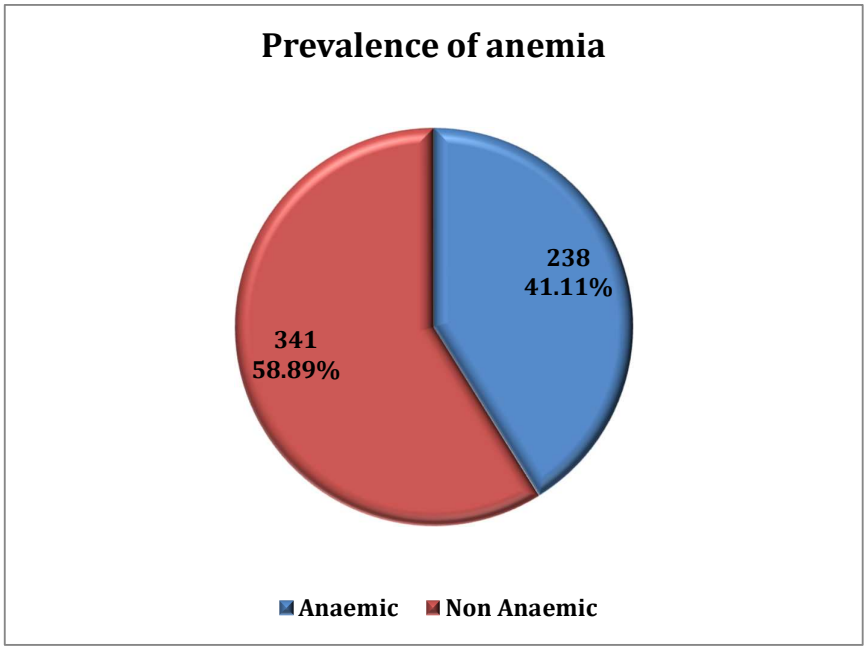
In present study, majority of Females (143, 60.85%) and Males (230,66.86%) belonged to age group 60-69 years followed by 70-79 years. Least frequency was observed in age group >=80 years.

Figure 14:-Distribution of diet of patients with anaemia of study subjects.



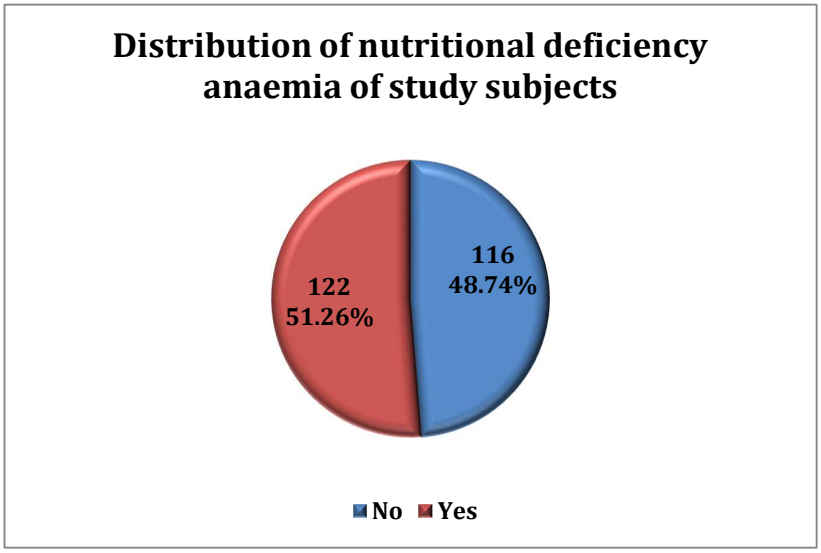
In majority (172,72.27%) of patients with anemia, dietary habit was non-vegetarian.

Figure 15:-Distribution of Anaemic/Non-Anaemic study subjects.



Out of 579 patients, 238 were anemic. Thus, the **prevalence** of anemia is **41.11%.**

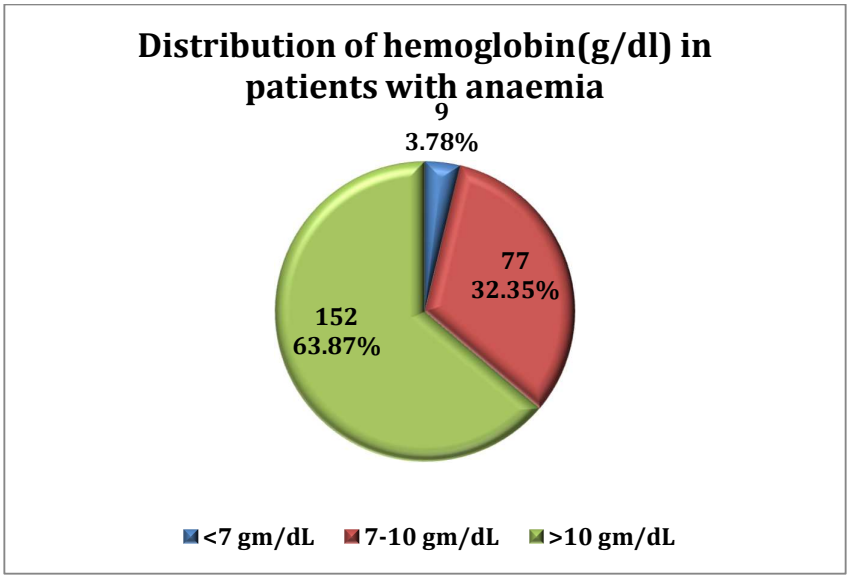
Figure 16:-Distribution of nutritional deficiency anaemia of study subjects.



Nutritional deficiency anaemia was present in 122 cases (51.26%).

Figure 17:-Distribution of Hemoglobin(g/dL) in patients with anaemia.

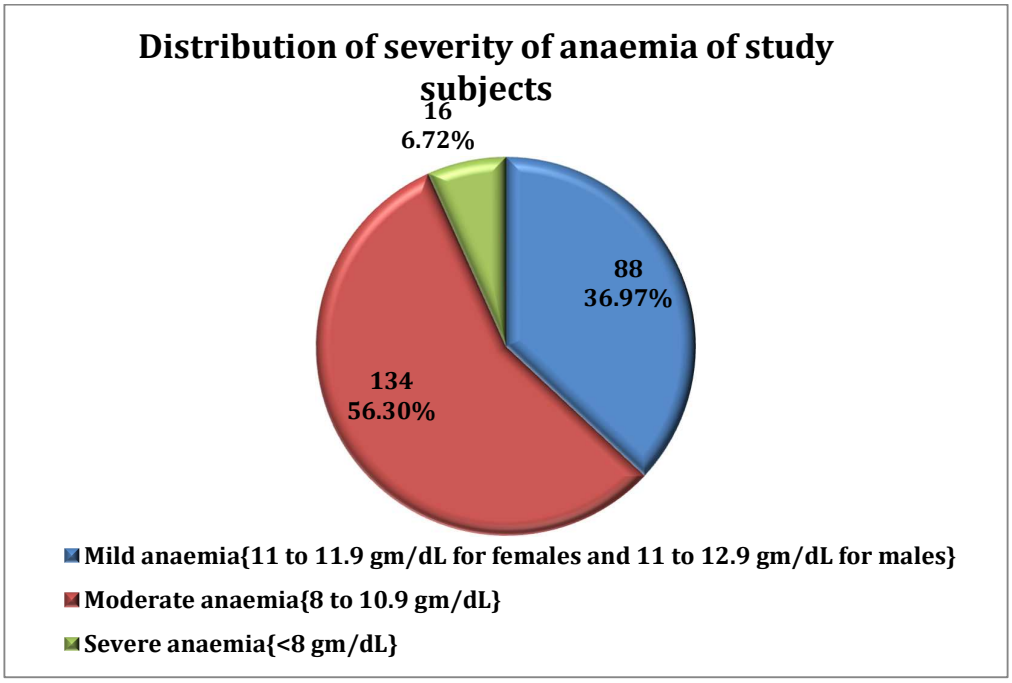
Anemia is defined as Hemoglobin levels less than 12 g/dl in females and less than 13 g/dl in males. The hemoglobin levels were distributed as greater than 10g/dl, 7-10 g/dl and less than 7 g/dl, respectively.



n=238 (<7 g/dl: 9, 7-10g/dl: 77, > 10g/dl: 152); Mean: 10.27+/-1.5, Median (25th -75th percentile): 10.6 (9.6-11.2), Range : 3.5-12.8

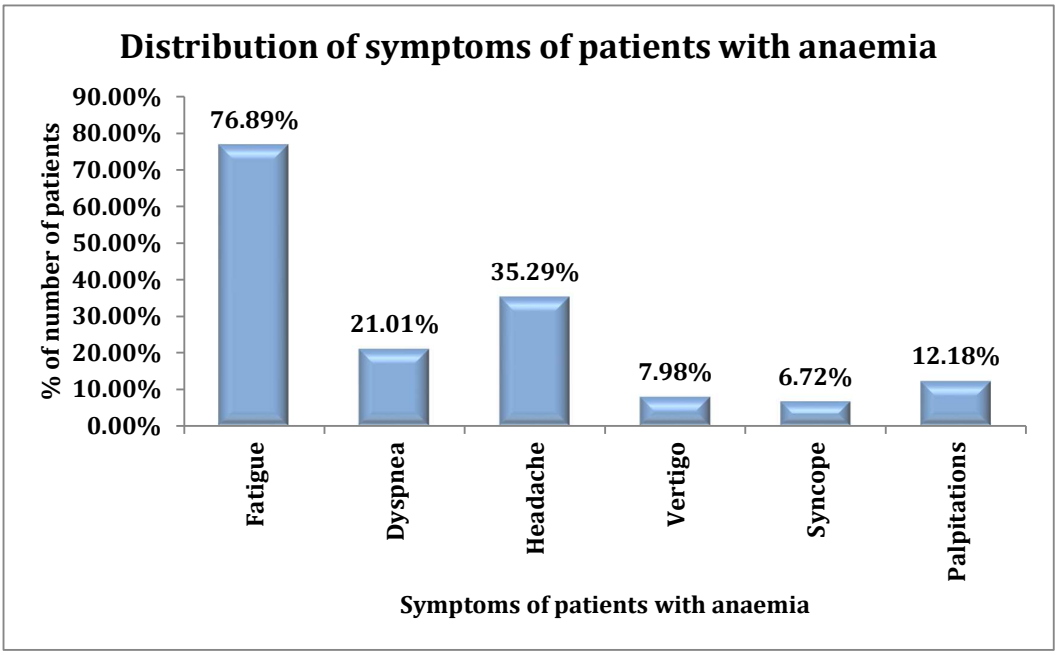
Hemoglobin(g/dL) in patients with anemia was >10 gm/dL in majority (152, 63.87%) of cases, followed by 7-10 gm/dL (77, 32.35%) .

Figure 18:-Distribution of severity of anaemia of study subjects. (WHO Criteria)



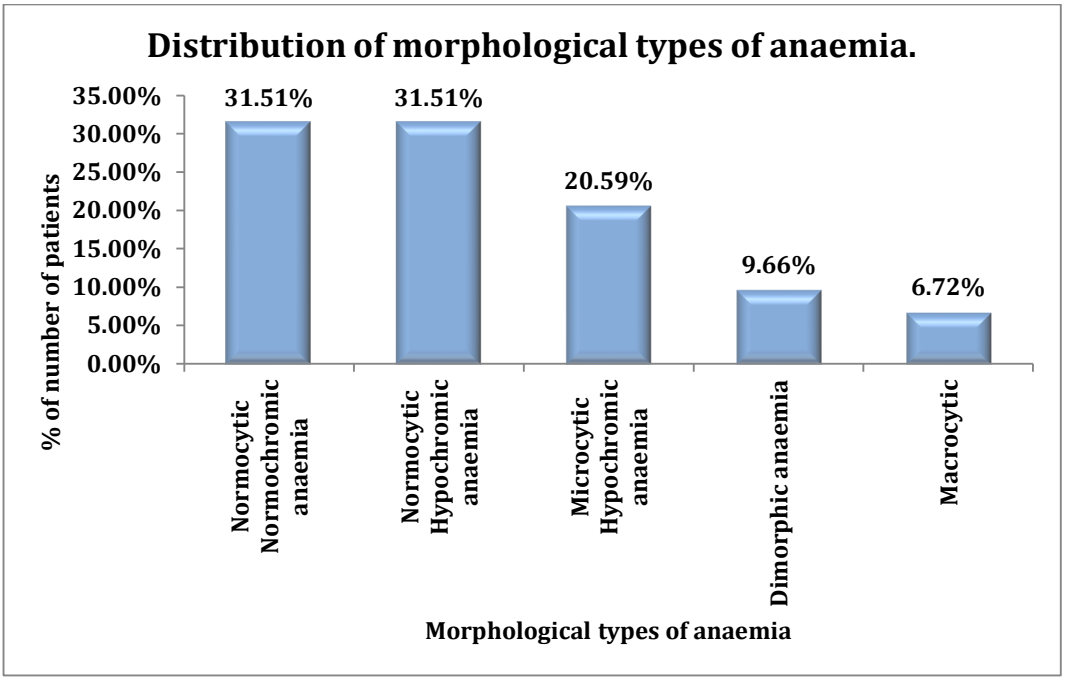
In majority (134, 56.30%) of patients, anaemia was moderate. Severe anemia was observed least frequently (16, 6.72%).

Figure 19:-Distribution of symptoms of patients with anaemia.



In majority (183,76.89%) of patients, most frequent symptom was fatigue followed by headache (84,35.29%), dyspnea (50, 21.01%), palpitations (29, 12.18%)) and vertigo (19,7.98%). The least frequent symptom was syncope (16,6.72%).

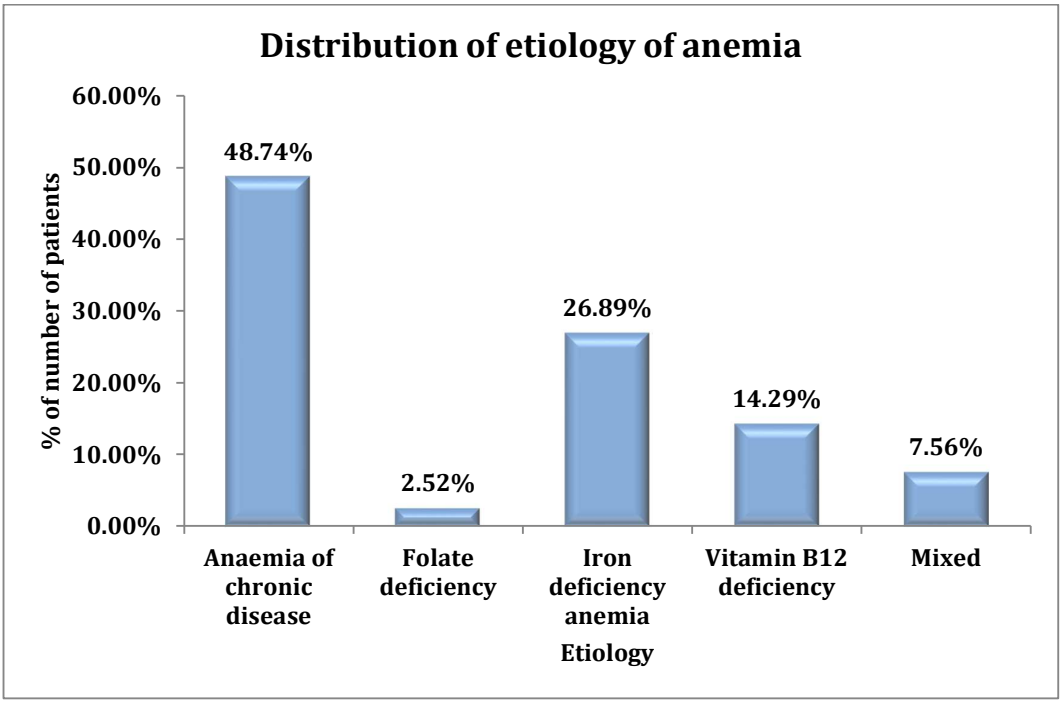
Figure 20:-Distribution of morphological types of anaemia.



n=238 (NNA: 75, NHA: 75, MHA: 49, DA: 23, Macrocytic: 16)

In majority (75, 31.51%) of patients, morphological type of anaemia was Normocytic Normochromic anaemia (NNA), Normocytic Hypochromic anaemia (NHA) each followed by Microcytic Hypochromic anaemia (MHA) (49, 20.59%) and Dimorphic anaemia (DA) (23, 9.66%). Morphological type of anaemia with least frequency was Macrocytic anemia (16, 6.72%).

Figure 21:-Distribution of etiology of anaemia



N=238 (Anemia of chronic disease:116, Folate deficiency:6, Iron deficiency anemia:64, Vitamin B12 deficiency: 34, Mixed:18)

In majority (116, 48.74%)) of patients, etiology was anaemia of chronic disease followed by iron deficiency anemia (6, 26.89%), Vitamin B12 deficiency (34, 14.29%) and mixed (18, 7.56%). The least frequent etiology was folate deficiency. (6, 2.52%).

In majority (35, 30.17%) of patients, the most frequent cause of anemia of chronic disease was chronic kidney disease (CKD) followed by cancer (28,24.14%), diabetes mellitus (16,13.79%). Other conditions associated with Anemia of Chronic disease were hypertension (11(9.48%)), Cerebro-vascular accident (CVA) (7,6.03%)), Acute Coronary Syndrome (ACS) (6, 5.17%), sepsis (6, 5.17%) and Chronic Liver Disease (CLD) (4, 3.45%). The least frequent condition associated was Lower respiratory tract infection (LRTI) in only 3 out of 116 patients (2.59%).

Table 5:-Descriptive statistics of RBC parameters of patients with anaemia.

RBC parameters of patients with anaemia	Mean ± SD	Median(25th-75th percentile)	Range
Hemoglobin	10.27±1.5	10.6(9.6-11.2)	3.5-12.8
RBC(10^{12}/L)	3.84 ± 0.84	3.86(3.36-4.297)	0.18-7.07
HCT(%)	32.8 ± 5.97	33.1(29.7-36)	11.5-53
MCV(fL)	86.22 ± 11.74	85.8(81.1-92.825)	28.3-117.3
MCH(pg)	27.82 ± 4.25	28.05(25.1-30.375)	16.9-39.4
MCHC(%)	31.91 ± 2.82	32(30.6-33.5)	11.7-37
RDW-CV(%)	14.85 ± 2.54	14(13.1-16.275)	11.7-25.2

Table 6:-Association of morphological type of anemia with age group.

Morphology	60-69 years(n=151)	70-79 years(n=58)	>=80 years(n=29)	Total	P value
Normocytic Normochromic anaemia	54 (35.76%)	17 (29.31%)	4 (13.79%)	75 (31.51%)	0.014*
Normocytic Hypochromic anaemia	46 (30.46%)	21 (36.21%)	8 (27.59%)	75 (31.51%)	
Microcytic Hypochromic anaemia	27 (17.88%)	13 (22.41%)	9 (31.03%)	49 (20.59%)	
Dimorphic anaemia	17 (11.26%)	5 (8.62%)	1 (3.45%)	23 (9.66%)	
Macrocytic	7 (4.64%)	2 (3.45%)	7 (24.14%)	16 (6.72%)	
Total	151 (100%)	58 (100%)	29 (100%)	238 (100%)	

* **Fisher's exact test**

Morphological type of anemia was compared with age groups.

Normocytic Normochromic Anemia, Normocytic Hypochromic anemia, Dimorphic anemia were significantly higher in 60-69 years and 70-79 years age group as compared to >=80 years. Microcytic Hypochromic was significantly higher in 70-79 and >= 80 years as compared to 60-69 years. Macrocytic anemia was significantly higher in >= 80 years as compared to 60-69 years and 70-79 years. Thus, with increase in age, Microcytic Hypochromic anemia and Macrocytic anemia were more frequently observed than the other types of anemia. The association between morphological type of anemia and age group was **statistically significant. (p value: 0.014)**

Table 7:-Association of etiology with age group.

Etiology	60-69 years(n=151)	70-79 years(n=58)	>=80 years(n=29)	Total	P value
Anaemia of chronic disease	76 (50.33%)	30 (51.72%)	10 (34.48%)	116 (48.74%)	0.421*
Folate deficiency	3 (1.99%)	3 (5.17%)	0 (0%)	6 (2.52%)	
Iron deficiency anemia	43 (28.48%)	12 (20.69%)	9 (31.03%)	64 (26.89%)	
Vitamin B12 deficiency	19 (12.58%)	9 (15.52%)	6 (20.69%)	34 (14.29%)	
Mixed	10 (6.62%)	4 (6.90%)	4 (13.79%)	18 (7.56%)	
Total	151 (100%)	58 (100%)	29 (100%)	238 (100%)	

* **Fisher's exact test**

Etiology of anemia was compared with age groups.

At age >= 80 years, Iron Deficiency anemia, Vitamin B12 deficiency anemia and mixed anemia were the most frequent. Anemia of chronic disease, folate deficiency was the most frequent in 70-79 years age group. However, the association between Etiology and Age group was **statistically insignificant**.

Table 8:-Association of symptoms with age group.

Symptoms	60-69 years(n=151)	70-79 years(n=58)	>=80 years(n=29)	Total	P value
Fatigue	116 (76.82%)	42 (72.41%)	25 (86.21%)	183 (76.89%)	0.355†
Dyspnea	34 (22.52%)	10 (17.24%)	6 (20.69%)	50 (21.01%)	0.703†
Headache	54 (35.76%)	19 (32.76%)	11 (37.93%)	84 (35.29%)	0.875†
Vertigo	13 (8.61%)	4 (6.90%)	2 (6.90%)	19 (7.98%)	0.938*
Syncope	12 (7.95%)	2 (3.45%)	2 (6.90%)	16 (6.72%)	0.54*
Palpitations	19 (12.58%)	6 (10.34%)	4 (13.79%)	29 (12.18%)	0.837*

*** Fisher's exact test, † Chi square test**

Distribution of symptoms were compared with age groups.

Dyspnea, Syncope, were most frequent in 60-69 years age group. Fatigue, headache, palpitations were most frequent in >=80 years age group. Vertigo was most frequent in both, 70-79 and >=80 years age group. The association between symptoms and age groups was **statistically insignificant.**

Table 9:-Association of morphological type of anemia with gender.

Morphology	Female(n=96)	Male(n=142)	Total	P value
Normocytic Normochromic anaemia	36 (37.50%)	39 (27.46%)	75 (31.51%)	0.124†
Normocytic Hypochromic anaemia	31 (32.29%)	44 (30.99%)	75 (31.51%)	
Microcytic Hypochromic anaemia	18 (18.75%)	31 (21.83%)	49 (20.59%)	
Dimorphic anaemia	4 (4.17%)	19 (13.38%)	23 (9.66%)	
Macrocytic	7 (7.29%)	9 (6.34%)	16 (6.72%)	
Total	96 (100%)	142 (100%)	238 (100%)	

† Chi square test

Distribution of morphological types of anemia were compared between female and male.

Normocytic Normochromic anemia, Normocytic hypochromic anemia and Macrocytic anemia were seen more frequently in females. Microcytic Hypochromic anemia and Dimorphic anemia were seen more frequently in males. However, the association of Morphological type of anemia with gender was **statistically insignificant**.

Table 10:-Association of etiology with gender.

Etiology	Female(n=96)	Male(n=142)	Total	P value
Anaemia of chronic disease	51 (53.13%)	65 (45.77%)	116 (48.74%)	0.871*
Folate deficiency	2 (2.08%)	4 (2.82%)	6 (2.52%)	
Iron deficiency anemia	24 (25%)	40 (28.17%)	64 (26.89%)	
Vitamin B12 deficiency	12 (12.50%)	22 (15.49%)	34 (14.29%)	
Mixed	7 (7.29%)	11 (7.75%)	18 (7.56%)	
Total	96 (100%)	142 (100%)	238 (100%)	

* **Fisher's exact test**

Distribution of etiology was compared between female and male.

Anemia of chronic disease as a cause was found to be most frequent in females. While, the other causes were more commonly observed in males. The association between etiology and gender was **statistically insignificant**.

Table 11:-Association of symptoms with gender.

Symptoms	Female(n=96)	Male(n=142)	Total	P value
Fatigue	70 (72.92%)	113 (79.58%)	183 (76.89%)	0.232†
Dyspnea	22 (22.92%)	28 (19.72%)	50 (21.01%)	0.552†
Headache	35 (36.46%)	49 (34.51%)	84 (35.29%)	0.757†
Vertigo	10 (10.42%)	9 (6.34%)	19 (7.98%)	0.255†
Syncope	6 (6.25%)	10 (7.04%)	16 (6.72%)	0.811†
Palpitations	10 (10.42%)	19 (13.38%)	29 (12.18%)	0.493†

† **Chi square test**

Distribution of symptoms was compared between female and male.

Dyspnea, Headache and Vertigo were most frequent in females. Fatigue, Syncope and Palpitations were more frequent in males. The association between symptoms with gender was **statistically insignificant**.

Table 12:-Association of age(years) and gender with anaemia.

Age(years)	Anaemic(n=238)	Non Anaemic(n=341)	Total	P value
60-69 years	151 (40.48%)	222 (59.52%)	373 (100%)	0.126†
70-79 years	58 (38.16%)	94 (61.84%)	152 (100%)	
>=80 years	29 (53.70%)	25 (46.30%)	54 (100%)	
Total	238 (41.11%)	341 (58.89%)	579 (100%)	
Gender	**Anaemic(n=238)**	**Non Anaemic(n=341)**	**Total**	**P value**
Female	96 (40.85%)	139 (59.15%)	235 (100%)	0.918†
Male	142 (41.28%)	202 (58.72%)	344 (100%)	
Total	238 (41.11%)	341 (58.89%)	579 (100%)	

† **Chi square test**

Distribution of age was compared with anemia.

Anemics were more frequent in >= 80 years. The association was found to be **statistically insignificant**.

Distribution of gender was compared to anemia.

Males were more frequently anemics than females. The association between gender and anemia was **statistically insignificant**.

Table 13:-Association of age(years) and gender with severity of anaemia.

Age(years)	Mild anaemia(n=88)	Moderate anaemia(n=134)	Severe anaemia(n=16)	Total	P value
60-69 years	56 (37.09%)	84 (55.63%)	11 (7.28%)	151 (100%)	0.292*
70-79 years	24 (41.38%)	29 (50%)	5 (8.62%)	58 (100%)	
>=80 years	8 (27.59%)	21 (72.41%)	0 (0%)	29 (100%)	
Total	88 (36.97%)	134 (56.30%)	16 (6.72%)	238 (100%)	
Gender	**Mild anaemia(n=88)**	**Moderate anaemia(n=134)**	**Severe anaemia(n=16)**	**Total**	**P value**
Female	31 (32.29%)	56 (58.33%)	9 (9.38%)	96 (100%)	0.252†
Male	57 (40.14%)	78 (54.93%)	7 (4.93%)	142 (100%)	
Total	88 (36.97%)	134 (56.30%)	16 (6.72%)	238 (100%)	

† Chi square test * Fisher's exact test

Distribution of age was compared with severity of anemia.

Mild anemia and severe anemia were most frequent in 70-79 years age group. Moderate anemia was most frequent in the >= 80 years age group. But, the association of age group and severity of anemia was **statistically insignificant.**

Distribution of gender was compared with severity of anemia.

Mild anemia was more frequently seen in males. Moderate and severe anemia was frequently seen in females. The association between gender and severity of anemia was **statistically insignificant.**

Table 14:-Association of Hemoglobin(g/dL) with age groups in patients with anaemia.

Hemoglobin(g/dL) in patients with anaemia	60-69 years(n=151)	70-79 years(n=58)	>=80 years(n=29)	Total	P value
<7 gm/dL	7 (4.64%)	2 (3.45%)	0 (0%)	9 (3.78%)	0.455*
7-10 gm/dL	43 (28.48%)	23 (39.66%)	11 (37.93%)	77 (32.35%)	
>10 gm/dL	101 (66.89%)	33 (56.90%)	18 (62.07%)	152 (63.87%)	
Mean ± SD	10.24 ± 1.64	10.27 ± 1.59	10.4 ± 0.89	10.27 ± 1.55	0.886‡
Median(25th-75th percentile)	10.6 (9.65-11.2)	10.7 (9.4-11.45)	10.5 (9.6-11.2)	10.6 (9.6-11.2)	
Range	3.5-12.8	5.3-12.7	8.7-11.9	3.5-12.8	

*** Fisher's exact test, ‡ ANOVA**

Distribution of Hemoglobin with age groups was compared.

Hemoglobin levels <7 gm/dL and >10 gm/dL is most frequently seen in 60-69 years age group. 7-10 gm/ dL is most frequent in 70-79 years age group. The association between Hemoglobin and patients with anemia is **statistically insignificant.**

Mean ± SD of Hemoglobin(g/dL) in patients with anaemia in 60-69 years was 10.24 ± 1.64, 70-79 years was 10.27 ± 1.59 and >=80 years was 10.4 ± 0.89. The association between these parameters is **statistically insignificant**.

Table 15:-Association of Hemoglobin(g/dL) in patients with anaemia with etiology.

Hemoglobin(g/dL) in patients with anaemia	Anaemia of chronic disease(n=116)	Folate deficiency (n=6)	Iron deficiency anemia(n=64)	Vitamin B12 deficiency(n=34)	Mixed(n=18)	Total	P value
<7 gm/dL	4 (3.45%)	1 (16.67%)	2 (3.13%)	0 (0%)	2 (11.11%)	9 (3.78%)	0.357*
7-10 gm/dL	38 (32.76%)	1 (16.67%)	22 (34.38%)	9 (26.47%)	7 (38.89%)	77 (32.35%)	
>10 gm/dL	74 (63.79%)	4 (66.67%)	40 (62.50%)	25 (73.53%)	9 (50%)	152 (63.87%)	
Mean ± SD	10.22 ± 1.61	9.8 ± 2.44	10.28 ± 1.4	10.66 ± 1.14	9.91 ± 1.94	10.27 ± 1.55	0.436‡
Median(25th-75th percentile)	10.7 (9.475-11.2)	10.55 (9.525-10.675)	10.3 (9.575-11.225)	11.1 (10.025-11.5)	10.05 (9.725-10.875)	10.6 (9.6-11.2)	
Range	3.5-12.7	5.3-12.5	5.5-12.8	7-12.5	5-12.6	3.5-12.8	

*** Fisher's exact test, ‡ ANOVA**

Distribution of Hemoglobin(g/dL) in patients with anemia was compared with etiology.

Folate deficiency, Mixed anemia and Vitamin B12 deficiency was the most frequent in patients with Hemoglobin <7 gm/dL, 7-10 gm/dL and >10 gm/dL, respectively. The association between Hemoglobin levels and etiology is **statistically insignificant.**

Mean ± SD of Hemoglobin(g/dL) in patients with anaemia in anaemia of chronic disease

was 10.22 ± 1.61, folate deficiency was 9.8 ± 2.44, iron deficiency anemia was 10.28 ± 1.4, vitamin B12 deficiency was 10.66 ± 1.14 and mixed was 9.91 ± 1.94. The association between these parameters is **statistically insignificant.**

Table 16: -Association of symptoms with severity of anaemia.

Symptoms	Mild anaemia(n=88)	Moderate anaemia(n=134)	Severe anaemia(n=16)	Total	P value
Fatigue					
No	21 (38.18%)	30 (54.55%)	4 (7.27%)	55 (100%)	0.911*
Yes	67 (36.61%)	104 (56.83%)	12 (6.56%)	183 (100%)	
Dyspnea					
No	70 (37.23%)	105 (55.85%)	13 (6.91%)	188 (100%)	0.967*
Yes	18 (36%)	29 (58%)	3 (6%)	50 (100%)	
Headache					
No	59 (38.31%)	83 (53.90%)	12 (7.79%)	154 (100%)	0.496†
Yes	29 (34.52%)	51 (60.71%)	4 (4.76%)	84 (100%)	
Vertigo					
No	80 (36.53%)	123 (56.16%)	16 (7.31%)	219 (100%)	0.602*
Yes	8 (42.11%)	11 (57.89%)	0 (0%)	19 (100%)	
Syncope					
No	81 (36.49%)	126 (56.76%)	15 (6.76%)	222 (100%)	0.841*
Yes	7 (43.75%)	8 (50%)	1 (6.25%)	16 (100%)	
Palpitations					
No	70 (33.49%)	124 (59.33%)	15 (7.18%)	209 (100%)	0.015*
Yes	18 (62.07%)	10 (34.48%)	1 (3.45%)	29 (100%)	

*** Fisher's exact test, † Chi square test**

Distribution of severity of anemia was compared to symptoms.

Mild anemics had a higher frequency of palpitations as a symptom. Hence, palpitations were more common in mild anemics. The association between palpitations and severity of anemia was **statistically significant. (p:0.015)**

Symptoms, other than palpitations, did not show any **statistically significant** association with severity of anemia.

Table 17: -Association of morphological type of anemia and etiological type of anemia with severity of anaemia.

Morphology	Mild anaemia(n=88)	Moderate anaemia(n=134)	Severe anaemia(n=16)	Total	P value
Normocytic Normochromic anaemia	38 (50.67%)	33 (44%)	4 (5.33%)	75 (100%)	0.0004*
Normocytic Hypochromic anaemia	27 (36%)	46 (61.33%)	2 (2.67%)	75 (100%)	
Microcytic Hypochromic anaemia	13 (26.53%)	32 (65.31%)	4 (8.16%)	49 (100%)	
Dimorphic anaemia	2 (8.70%)	15 (65.22%)	6 (26.09%)	23 (100%)	
Macrocytic	8 (50%)	8 (50%)	0 (0%)	16 (100%)	
Total	88 (36.97%)	134 (56.30%)	16 (6.72%)	238 (100%)	
Etiology	**Mild anaemia(n=88)**	**Moderate anaemia(n=134)**	**Severe anaemia(n=16)**	**Total**	**P value**
Anaemia of chronic disease	44 (37.93%)	63 (54.31%)	9 (7.76%)	116 (100%)	0.28*
Folate deficiency	1 (16.67%)	4 (66.67%)	1 (16.67%)	6 (100%)	
Iron deficiency anemia	21 (32.81%)	40 (62.50%)	3 (4.69%)	64 (100%)	
Vitamin B12 deficiency	18 (52.94%)	15 (44.12%)	1 (2.94%)	34 (100%)	
Mixed	4 (22.22%)	12 (66.67%)	2 (11.11%)	18 (100%)	
Total	88 (36.97%)	134 (56.30%)	16 (6.72%)	238 (100%)	

* **Fisher's exact test**

Morphological type of anemia was compared to the severity of anemia.

Mild, moderate and severe anemia were most frequently seen in Normocytic Normochromic anemia, Microcytic Hypochromic anemia and Dimorphic anemia respectively. The association of morphological type of anemia with severity of anemia was **statistically significant.(p value:0.0004)**

Etiology of anemia was compared to severity of anemia. Mild, severe anemia were most frequently seen in Vitamin B12 deficiency and folate deficiency, respectively. Moderate anemia was seen frequently in both, folate deficiency and mixed anemia. The association between etiology and severity of anemia is **statistically insignificant.**

Table 18:-Association of etiology with morphology.

Etiology	Normocytic Normochromic anaemia(n=75)	Normocytic Hypochromic anaemia(n=75)	Microcytic Hypochromic anaemia (n=49)	Dimorphic anaemia (n=23)	Macrocytic(n=16)	Total	P value
Anaemia of chronic disease	60 (80%)	40 (53.33%)	10 (20.41%)	5 (21.74%)	1 (6.25%)	116 (48.74%)	<.0001*
Folate deficiency	2 (2.67%)	2 (2.67%)	1 (2.04%)	1 (4.35%)	0 (0%)	6 (2.52%)	
Iron deficiency anemia	5 (6.67%)	22 (29.33%)	33 (67.35%)	3 (13.04%)	1 (6.25%)	64 (26.89%)	
Vitamin B12 deficiency	7 (9.33%)	9 (12%)	0 (0%)	8 (34.78%)	10 (62.50%)	34 (14.29%)	
Mixed	1 (1.33%)	2 (2.67%)	5 (10.20%)	6 (26.09%)	4 (25%)	18 (7.56%)	
Total	75 (100%)	75 (100%)	49 (100%)	23 (100%)	16 (100%)	238 (100%)	

* **Fisher's exact test**

Distribution of etiology was compared to morphological types of anemia.

Anemia of chronic disease was found to be frequently associated with Normocytic Normochromic Anemia, folate deficiency with Dimorphic anemia, Iron deficiency anemia with Microcytic anemia, Vitamin B12 deficiency with macrocytic anemia and Mixed anemia with Dimorphic anemia. The association between etiology and morphology was found to be statistically significant.

Table 19:-Association of anaemia of chronic disease with morphology.

Anaemia of chronic disease	Normocytic Normochromic anaemia(n=60)	Normocytic Hypochromic anaemia(n=40)	Microcytic Hypochromic anaemia(n=10)	Dimorphic anaemia (n=5)	Macrocytic(n=1)	Total	P value
ACS	3 (5%)	1 (2.50%)	2 (20%)	0 (0%)	0 (0%)	6 (5.17%)	<.0001*
Cancer	16 (26.67%)	11 (27.50%)	0 (0%)	1 (20%)	0 (0%)	28 (24.14%)	
CKD	22 (36.67%)	9 (22.50%)	2 (20%)	2 (40%)	0 (0%)	35 (30.17%)	
CLD	1 (1.67%)	3 (7.50%)	0 (0%)	0 (0%)	0 (0%)	4 (3.45%)	
CVA	3 (5%)	4 (10%)	0 (0%)	0 (0%)	0 (0%)	7 (6.03%)	
Diabetes mellitus	5 (8.33%)	7 (17.50%)	4 (40%)	0 (0%)	0 (0%)	16 (13.79%)	
Hypertension	6 (10%)	3 (7.50%)	1 (10%)	1 (20%)	0 (0%)	11 (9.48%)	
LRTI	1 (1.67%)	0 (0%)	1 (10%)	1 (20%)	0 (0%)	3 (2.59%)	
Sepsis	3 (5%)	2 (5%)	0 (0%)	0 (0%)	1 (100%)	6 (5.17%)	
Total	60 (100%)	40 (100%)	10 (100%)	5 (100%)	1 (100%)	116 (100%)	

* **Fisher's exact test**

Distribution of Anemia of Chronic Disease and morphological type of anemia was compared.

Patients with ACS were found to be frequently associated with Microcytic Hypochromic anemia, Cancer with Normocytic Hypochromic anemia, CKD with Dimorphic anemia, CLD with Normocytic Hypochromic anemia, CVA with Normocytic Hypochromic anemia, Diabetes mellitus with Microcytic Hypochromic anemia, Hypertension Dimorphic anemia, LRTI with Dimorphic anemia and sepsis with Macrocytic anemia. The association between Anemia of chronic disease and morphological type of anemia was **statistically significant.**

PHOTOMICROGRAPHS

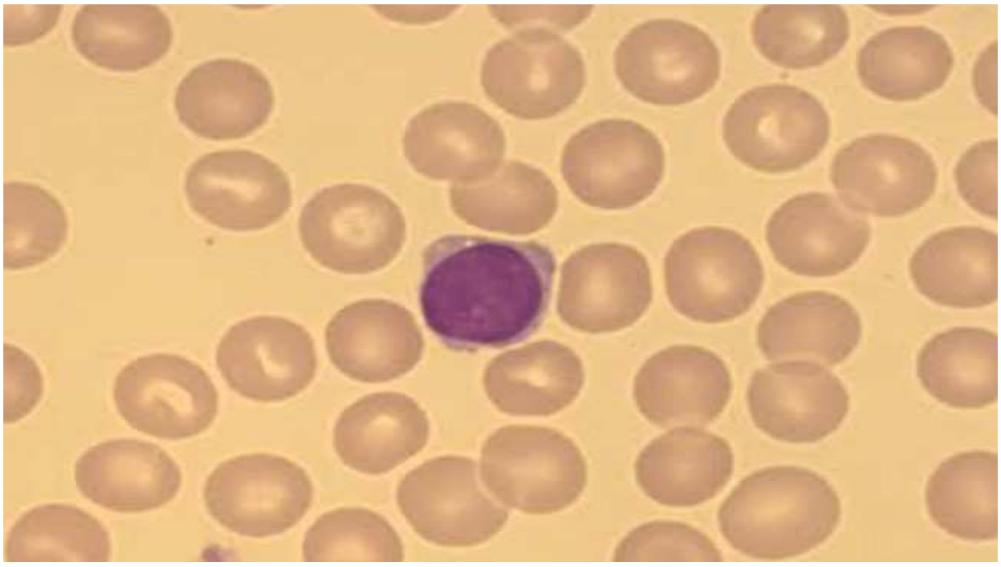


Figure A) Normocytic Normochromic Anemia. (Leishman stain;1000X).

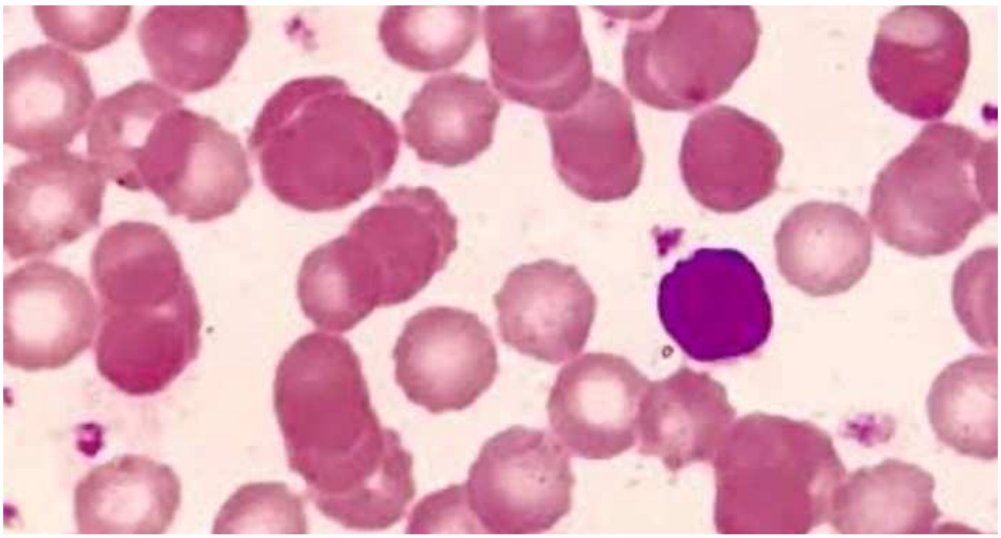


Figure B) Normocytic Hypochromic anemia. RBC's show increased central pallor. (Leishman stain ;1000X).

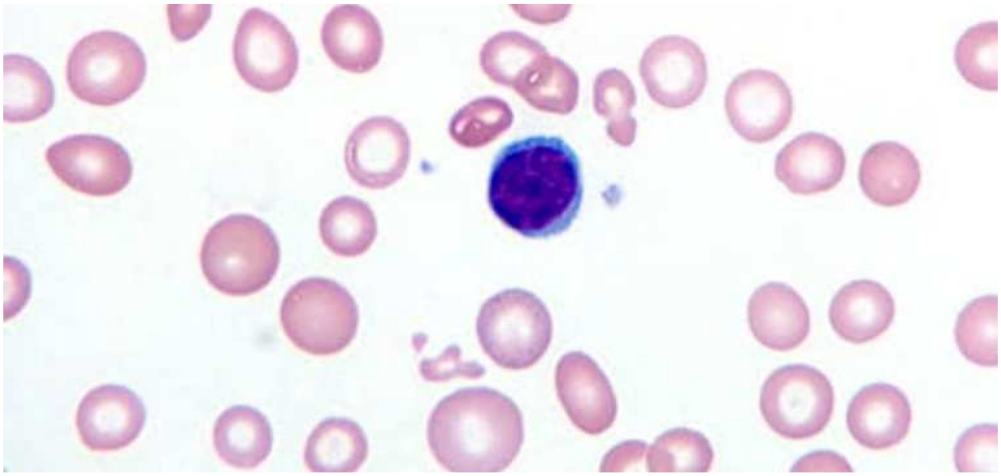


Figure C) Microcytic Hypochromic anemia. The red blood cells are smaller with increased central pallor. (Leishman stain ;1000X).

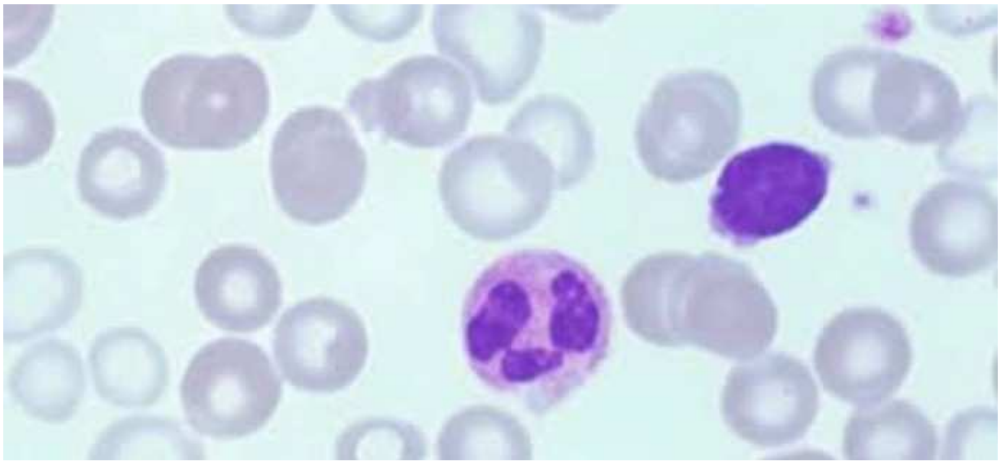


Figure D) Dimorphic Anaemia. Dual population of red blood cells are seen. Some of the RBC's show increased central pallor. (Leishman stain;1000X).

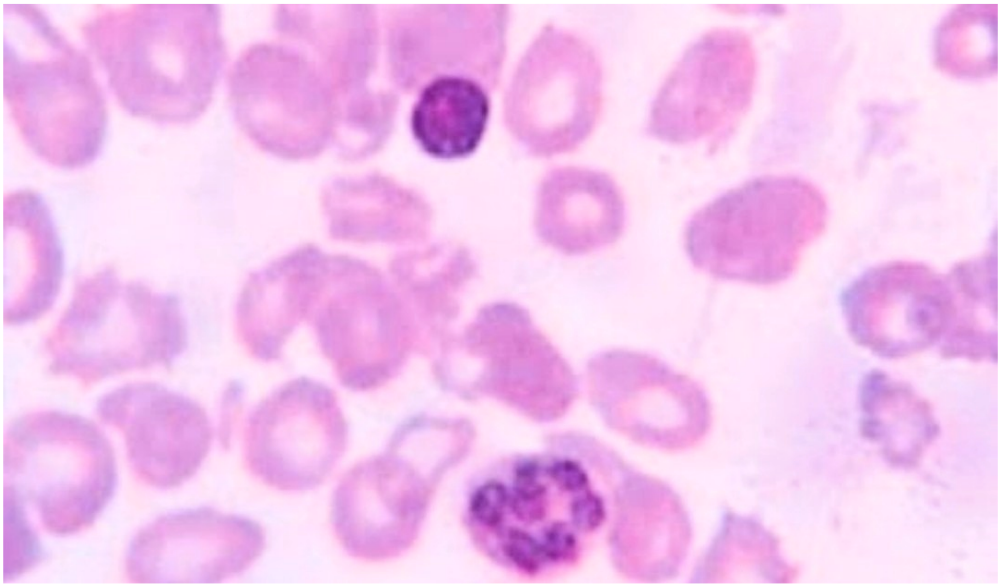


Figure E) Macrocytic anaemia. Macrocytic red blood cells and hyper segmented neutrophil are seen. (Leishman stain;1000X).

DISCUSSION

Anaemia is an entity consisting of a sundry of diseases. It is one of the commonest disorders of the blood found in clinical practice as well as laboratory investigations. It affects one-third of the population of the world[5].

Studying about anaemia in geriatric population is of grave importance as it is associated with many complications (e.g., falls, frailty) and deteriorates the quality of life. It also affects the working capacity of an individual due to decreased oxygen supply to organs and tissues.

Prevalence is seen to increase with increase in age[5]. Owing to its prevalence, which is high, it is necessary to classify and evaluate the aetiology of anaemia.

It needs to be diagnosed early because it can be easily missed since non-specific symptoms like weakness, fatigue, malaise is common, which can be attributed to ageing also.

In order to find out the prevalence of anaemia, which is our primary objective, and other parameters, we conducted a study on 579 study subjects.

Table 20. Number of study subjects and prevalence in different studies.

Study	Study Subjects	Prevalence
Chamba et al.[1]	156	79.5%
Haslam et al.[100]	185	26.2%
Dobariya et al.[101]	500	51.1%
Pathania et al.[102]	334	68.7 %
Melku et al.[103]	200	54.5%
Timiras et al.[28]	1024	12.01%
Denny et al. [2]	1744	24%
Argento et al.[104]	244	39.6%
Alsaeed et al.[105]	150	71.6%
Sahin et al.[106]	257	54.9%
Soni et al.[107]	550	67.07%
Present study	**579**	**41.11%**

The frequency of Study subjects and Prevalence were compared with various studies. The study subjects in the Present Study were comparable with a study done by Soni et al [107] , Argento et al[104] and Dobariya et al.[101]. Many of the studies had a lower sample size. Timiras et al.[28] and Denny et al.[2] had a higher sample size.

The prevalence rates of various studies listed were compared to the present study. Prevalence rate in our study was comparable with studies done by Argento et al.[104] and Dobariya et al.[101] Only in studies done by Timiras et al.[28] ,Denny et al.[2] and Haslam et al.[100], the prevalence was lower than the present study. Denny et al [2] and Timiras et al.[28] showed a lower prevalence due to the fact that they are community-based studies and the sample size was also higher compared to the rest of the studies.

The highest prevalence was observed in studies done by Chamba et al.[1] and Alsaeed et al.[105] which had a prevalence of 79 % and 71.6% , respectively. The high prevalence in these studies may be due to higher rates of communicable diseases and the lower socioeconomic status present in developing countries.

Table 21. Comparison of age distribution and the most frequent age group.

Study	**Mean age (in years)**
Penninx et al. [96]	74.3
Lucca et al.[108]	74.4
Bhasin et al. [10]	70.51
Styszynski et al.[109]	78.6
Munesh et al. [5]	68.43
Present Study	**67.89**
Study	**Age Group**
Munesh et al.[5]	60-69
Chamba et al.[1]	60-69
Tettamanti et al.[11]	60-69
Present Study	**60-69**

The Mean age of the present study (67.89) is in concordance with studies done by Munesh et al.[5] and Bhasin et al.[10]

The Present Study had the most frequent age group as 60-69, which was in league with Munesh et al. [5], Chamba et al. [1] and Tettamanti et al.[11]. This may be due to the fact that there is more population in the age group 60-69 and 70-79 as compared to >=80 years of age. The same explains the mean age in various studies which are less than 80 years of age.

Table 22. Comparison of gender distribution in cases with anaemia.

Study	Males	Females
Timiras et al. [28]	38.57%	61.43%
Joosten et al. [71]	39%	61%
Dharmarajan et al. [15]	45.85%	54.15
Brenda et al.[110]	51.9%	48.1%
Munesh et al. [5]	51%	49%
Chamba et al. [1]	60.9%	39.1%
Present Study	**59.66%**	**40.34%**

In the present study, Males were more than females which was comparable with various studies done by Munesh et al. [5], Chamba et al.[1]and Brenda et al. [110] The studies were done in different regions and hence may be the reason for variation.

Table 23. Comparison of Distribution of Nutritional Deficiency Anaemia

Study	Nutritional Deficiency Anaemia
Chamba et al.[1]	14.5%
Munesh et al.[5]	55%
Argento et al. [104]	36.4%
Present Study	**51.26%**

Distribution of Nutritional deficiency anaemia was comparable with the study done by Munesh et al. [5] It was slightly less in the study done by Argento et al. [104] Study done by Chamba et al.[1] showed a significantly lower frequency of nutritional anaemia which may be in concordance with the region, Tanzania, which has a high burden of communicable diseases and low socioeconomic statuses and lower hospital admissions.

Table 24. Comparison of Most frequent aetiology

Study	Frequent Aetiology
Munesh et al. [5]	Iron Deficiency Anaemia
Petrosyan et al. [111]	Anaemia of Chronic Disease
Dheeraj et al. [112]	Iron Deficiency Anaemia
Bhasin et al. [10]	Iron Deficiency Anaemia
Dobariya et al. [101]	Anaemia of Chronic Disease
Present Study	**Anaemia of Chronic Disease**

The Present study had Anaemia of Chronic Disease as the most frequent aetiological factor for anaemia followed by Iron deficiency anaemia, which was comparable with studies done by Petrosyan et al. [111] and Dobariya et al.[101] In our present study, Iron deficiency was the second most frequent aetiological factor. Iron deficiency anaemia

followed by Anaemia of chronic disease was seen in studies done by Dheeraj et al.[112], Bhasin et al.[10] and Munesh et al.[5] The frequency of Anemia of Chronic disease and Iron deficiency were comparable in all the studies.

Table 25. Comparison of most frequent type of severity of anemia

Study	Haemoglobin levels
Argento et al.[104]	Mild
Dobariya et al.[101]	Moderate
Nisha TR et al.[113]	Mild
Suma JK et al.[114]	Mild
Ramya et al.[115]	Mild
Joosten et al. [71]	Moderate
Present study	**Moderate**

The severity of anemia in our study was moderate anaemia in majority of the cases, which was comparable with Joosten et al. [71] and Dobariya et al. [101] Severe anaemia was seen to be more in the >=80 years age group in the above listed studies. This age-group had a lower frequency of participants. 60-69- and 70-79-years age group had more participants and mild and moderate anaemia was more prevalent in these groups. This may be the reason for higher frequency of less severe anaemia.

The Present Study had the most frequent symptom to be Fatigue, which was comparable with studies done by Dobariya et al. [101], Bhasin et al. [10] and Beghe et al. [20]

Table 26. Comparison of Distribution of Hemoglobin.

Study	Mean (Haemoglobin (g/dl))
Munesh et al. [5]	9.09
Hafiz F et al.[116]	8.1
Singhal S et al.[117]	9.24
Present study	**10.27**

The present study had a mean haemoglobin value which was comparable to studies done by Munesh et al. [5] and Singhal et al. [117]

Table 27. Comparison of RBC parameters (Mean)

Study	MCV	MCH	MCHC	RDW
Munesh et al. [5]	87.25	29.28	33.47	17.45
Styszynski [109]	90.55	30.1	32.9	15.32
Bhasin et al. [10]	86.27	30.33	32.55	15.2
Present study	**86.22**	**27.82**	**31.91**	**14.85**

The mean of RBC parameters of the present study is in concordance with studies done by Munesh et al. [5], Styszynski et al. [109] and Bhasin et al.[10] The mean RBC parameters (MCV, MCH, MCHC, RDW) were within normal range except RDW in the study done by Munesh et al.[5] which shows a slight increase which may be due to more number of Iron Deficiency Anaemia cases.

Table 28. Comparison of the most frequent Morphological type of anaemia.

Study	Morphology
Munesh et al. [5]	Microcytic Hypochromic
Styszynski et al.[109]	Normocytic Normochromic
Dobariya et al.[101]	Normocytic Normochromic
Izaks et al. [8]	Normocytic Normochromic
Bhasin et al. [10]	Normocytic Normochromic
Argento et al.[104]	Normocytic Normochromic
Present study	**Normocytic Normochromic and Normocytic Hypochromic**

The most frequent morphological type of anaemia, Normocytic Normochromic and Normocytic Hypochromic anaemia, in the present study was comparable with the morphologies found in studies done by Styszynski et al. [109], Dobariya et al.[101], Izaks et al.[8], Bhasin et al.[10] and Argento et al.[104] Munesh et al.[5] showed higher frequency of microcytic anaemia. In the above studies, except Munesh et al.[5], Anemia of chronic disease was most frequent aetiology of anaemia followed by Iron deficiency anemia. Iron deficiency was most frequent etiology in the study done by Munesh et al.[5]

CONCLUSION

The prevalence of anaemia in geriatric population is high, which is frequently of mild to moderate severity. This may be attributed to the fact that India is a third world country and has lower socio-economic conditions, higher nutritional deficits and a greater number of communicable diseases which lead to higher rates of hospitalization in the elderly.

Cases with fatigue and palpitations in geriatric population have to be screened for anaemia. Non-specific symptoms like weakness, fatigue and malaise are common and can be attributed to the aging process instead of anaemia. Such patients have to be screened for anaemia.

Anaemia of chronic disease, which had Normocytic Normochromic anaemia frequently and Iron deficiency anaemia, which had Microcytic Hypochromic anaemia most frequently were the most common aetiologies associated with anaemia in geriatric age group with increasing age. Hence, screening preferably with structured programmes addressing the geriatric population for associated Chronic diseases and nutritional deficiencies, in hospitals as well as the community is recommended, so that corrective measures can be assured at an early stage and there can be decrease in the mortality and morbidity.

LIMITATION

We have only considered patients who have visited the hospital, which can be compared to the tip of the iceberg. Community-based studies have to be undertaken to know the real problem scenario, especially in a third world country like India.

SUMMARY

Present study was a one-year hospital-based observational study conducted on 579 cases above 60 years of age.

The aim of the study was to study the prevalence of anaemia in geriatric population and to study the morphological types of anaemia in geriatric age group.

Significant findings in the study were as follows:

1. Majority (373, 64.42%) of the patients belonged to age group 60-69 years followed by 70-79 years (152, 26.25%).
2. Males (344, 59.41%) were more frequent than females (235, 40.59%) in the study group. Male predominance was observed amongst anemics,
3. Majority of Females (143, 60.85%) and Males (230,66.86%) belonged to age group 60-69 years followed by 70-79 years.
4. Out of 579 patients, 238 were anemic. Thus, the prevalence of anemia is 41.11%.
5. In majority (172,72.27%) of patients with anemia, dietary habit was non-vegetarian.
6. Nutritional deficiency anemia was present in 122 cases (51.26%).
7. Hemoglobin(g/dL) in patients with anemia was >10 gm/dL(152, 63.87%), and of moderate degree(134, 56.30%) in majority of cases.
8. Most frequent symptom was fatigue (183,76.89%) followed by headache (84,35.29%), dyspnea (50, 21.01%). Palpitations were frequent in cases of mild anemia.
9. The most common etiology was anemia of chronic disease (116, 48.74%)) mostly Chronic Kidney Disease(35, 30.17%), followed by iron deficiency anemia (6, 26.89%).

10. The most common morphological type of anemia was Normocytic Normochromic anemia (75, 31.51%) , Normocytic Hypochromic anemia (75, 31.51%) , followed by Microcytic Hypochromic anemia (49, 20.59%).
11. With increase in age(>=80 years), Microcytic Hypochromic anemia and Macrocytic anemia were more frequently observed which was statistically significant(p value:0.014)
12. Mild, moderate and severe anemia were most frequently seen in Normocytic Normochromic anemia, Microcytic Hypochromic anemia and Dimorphic anemia respectively. The association of morphological type of anemia with severity of anemia was statistically significant. (p value:0.0004)
13. Anemia of chronic disease was found to be frequently associated with Normocytic Normochromic Anemia, folate deficiency with Dimorphic anemia, Iron deficiency anemia with Microcytic anemia, Vitamin B12 deficiency with macrocytic anemia and Mixed anemia with Dimorphic anemia. The association between etiology and morphology was found to be statistically significant. (p value:<0.0001)
14. There was no statistically significant association between etiology and severity of anemia and hemoglobin levels; between age group and severity of anemia.
15. Anemics were more frequent in >= 80 years with mild anemia being common in males, moderate and severe anemia in females.
16. Normocytic Normochromic anemia, Normocytic hypochromic anemia and Macrocytic anemia were seen more frequently in females. Microcytic Hypochromic anemia and Dimorphic anemia were seen more frequently in males. However, the association of Morphological type of anemia with gender was statistically insignificant.

17. Iron Deficiency anemia and Anemia of chronic disease were the most frequent in >=80 years and 70-79 years age group, respectively.

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ANNEXURE I
INFORMED CONSENT

PREVALENCE OF ANAEMIA IN GERIATRIC POPULATION

Purpose of the study: You are being asked to enroll in this study as you are eligible for participation in this study. Routine blood test will be included in this study. The purpose of this study is to study the prevalence and cut-morphology of anemia in geriatric patients.

Procedure: During this study, your routine blood tests and other correlated tests will be done. The principal investigator of the study is **REG NO: BN0120007** under the guidance of Dr. _____.

If you agree to enroll yourself in this study, your blood reports and other correlated tests will be used for research purpose.

Risks and benefits: There are no risks involved in taking part in this study and benefit is we will be able to know a better way to manage geriatric anemia if it is found to be prevalent and it will be an eye-opener for the way anemia in >60 years of age group is perceived as and better management and outcomes will be the new norm.

Alternatives: Taking part in this study is voluntary. You may choose not to take part in this study or if you decide to take part now, you can later change your mind and withdraw from the study. The study doctor or sponsor may terminate your participation in this study anytime.

Privacy and confidentiality: All information collected about you during the course of this study will be kept confidential to the extent permitted by law. The code numbers will identify you in this research record. Information from this study will be published but your identity will be confidential in any publication. No information

about you or information provided by you during research will be disclosed to other without your written permission except:

1. In emergency to protect your rights and welfare.
2. If required by law.

Financial incentives for participation: You will not be paid / offered any gift / incentives for participating in this study.

Authorization to publish results: The results of this study would be forwarded to the KAHER, Belagavi as a part of requirement towards the completion of MD degree, review and publishing.

Questions: In case you have any questions related to the study in future you can contact:

1. REG NO: BN0120007, Department of Pathology, J.N. Medical College.
2. Dr. _____, Department of Pathology, J.N. Medical College.
3. If you have any queries about your rights as a study subject, you may call Dr. Roopa Bellad, Professor, Department of Paediatrics, Chairman of J.N. Medical College Institutional Ethical Committee of Human Subjects Research, Ph No- 9448113403, at J.N. Medical College, Belagavi

CONSENT STATEMENT

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any legal rights by signing this form. My signature below indicates that I have read, or it has been read to me, this entire consent form and have had all my questions answered.

In case of the queries during the study or in future you may contact following person.

Principal Investigator: REG NO: BN0120007

Guide **:** Dr. _____

Name of the participant:
(signature/thumbprint)

Name of the witness : (signature)

Name of the investigator:
(signature)

Date:

Address:

Phone no:

ತಿಳುವಳಿಕೆಯುಳ್ಳ ಒಪ್ಪಿಗೆ ಪತ್ರ

ಜೆರಿಯಾಟ್ರಿಕ್ ಜನಸಂಖ್ಯೆಯಲ್ಲಿ ರಕ್ತಹೀನತೆಯ ಹರಡುವಿಕೆ

ಅಧ್ಯಯನದ ಉದ್ದೇಶ:

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಅರ್ಹರಾಗಿರುವುದರಿಂದ ಈ ಅಧ್ಯಯನಕ್ಕೆ ಸೇರಲು ನಿಮ್ಮನ್ನು ಕೇಳಲಾಗುತ್ತದೆ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ವಾಡಿಕೆಯ ರಕ್ತ ಪರೀಕ್ಷೆಯನ್ನು ಸೇರಿಸಲಾಗುವುದು. ಜೆರಿಯಾಟ್ರಿಕ್ ರೋಗಿಗಳಲ್ಲಿ ರಕ್ತಹೀನತೆಯ ಹರಡುವಿಕೆ ಮತ್ತು ಕಟ್-ರೂಪವಿಜ್ಞಾನವನ್ನು ಅಧ್ಯಯನ ಮಾಡುವುದು ಈ ಅಧ್ಯಯನದ ಉದ್ದೇಶವಾಗಿದೆ.

ವಿಧಾನ:

ಈ ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ, ನಿಮ್ಮ ಮಗುವಿನ ಕ್ಲಿನಿಕಲ್ ಇತಿಹಾಸವನ್ನು ಗುರುತಿಸಲಾಗಿದೆ, ಹೆಮೋಲಿಟಿಕ್ ರಕ್ತಹೀನತೆಯ ಪ್ರಕಾರವನ್ನು ಪತ್ತೆಹಚ್ಚಲು ಹೆಮಟೊಲಾಜಿಕಲ್ ಮತ್ತು ಜೀವರಾಸಾಯನಿಕ ಪರೀಕ್ಷೆಗಳನ್ನು ಮಾಡಲಾಗುತ್ತದೆ. ಡಾ._____ (ಮಾರ್ಗದರ್ಶಿ) ಅವರ ಮಾರ್ಗದರ್ಶನದಲ್ಲಿ ಅಧ್ಯಯನದ ಪ್ರಮುಖ ತನಿಖಾಧಿಕಾರಿ REG NO: BN0120007

ನಿಮ್ಮ ಮಗುವನ್ನು ಈ ಅಧ್ಯಯನಕ್ಕೆ ದಾಖಲಿಸಲು ನೀವು ಒಪ್ಪಿದರೆ, ನಿಮ್ಮ ವರದಿಗಳನ್ನು ಸಂಶೋಧನಾ ಉದ್ದೇಶಕ್ಕಾಗಿ ಬಳಸಲಾಗುತ್ತದೆ

ಅಪಾಯ ಮತ್ತು ಪ್ರಯೋಜನಗಳು

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವಲ್ಲಿ ಯಾವುದೇ ಅಪಾಯಗಳಿಲ್ಲ ಮತ್ತು ಜೆರಿಯಾಟ್ರಿಕ್ ರಕ್ತಹೀನತೆ ಪ್ರಚಲಿತದಲ್ಲಿದೆ ಎಂದು ಕಂಡುಬಂದಲ್ಲಿ ಅದನ್ನು ನಿರ್ವಹಿಸಲು ಉತ್ತಮ ಮಾರ್ಗವನ್ನು ನಾವು ತಿಳಿದುಕೊಳ್ಳಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ ಮತ್ತು ಇದು ರಕ್ತಹೀನತೆ> 60 ವರ್ಷಗಳಲ್ಲಿ ಕಣ್ಣಿಗೆ ತೆರೆದುಕೊಳ್ಳುತ್ತದೆ. ವಯಸ್ಸಿನ ಗುಂಪನ್ನು ಗ್ರಹಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಉತ್ತಮ ನಿರ್ವಹಣೆ ಮತ್ತು ಫಲಿತಾಂಶಗಳು ಹೊಸ ರೂಗಿಯಾಗಿರುತ್ತದೆ.

ಪರ್ಯಾಯಗಳು:

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವುದು ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸದಿರಲು ನೀವು ಆಯ್ಕೆ ಮಾಡಬಹುದು ಅಥವಾ ನೀವು ಈಗ ಭಾಗವಹಿಸಲು ನಿರ್ಧರಿಸಿದರೆ, ನೀವು ನಂತರ ನಿಮ್ಮ ಮನಸ್ಸನ್ನು ಬದಲಾಯಿಸಬಹುದು ಮತ್ತು ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು. ಅಧ್ಯಯನದ ವೈದ್ಯರು ಅಥವಾ ಪ್ರಾಯೋಜಕರು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನಿಮ್ಮ ಭಾಗವಹಿಸುವಿಕೆಯನ್ನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಕೊನೆಗೊಳಿಸಬಹುದು.

ಗೌಪ್ಯತೆ

ಈ ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ನಿಮ್ಮ ಬಗ್ಗೆ ಸಂಗ್ರಹಿಸಲಾದ ಎಲ್ಲಾ ಮಾಹಿತಿಯನ್ನು ಕಾನೂನಿನಿಂದ ಅನುಮತಿಸುವ ಮಟ್ಟಿಗೆ ಗೌಪ್ಯವಾಗಿಡಲಾಗುತ್ತದೆ. ಈ ಸಂಶೋಧನಾ ದಾಖಲೆಯಲ್ಲಿ ಕೋಡ್ ಸಂಖ್ಯೆಗಳು

ನಿಮ್ಮನ್ನು ಗುರುತಿಸುತ್ತವೆ. ಈ ಅಧ್ಯಯನದ ಮಾಹಿತಿಯನ್ನು ಪ್ರಕಟಿಸಲಾಗುವುದು ಆದರೆ ಯಾವುದೇ ಪ್ರಕಟಣೆಯಲ್ಲಿ ನಿಮ್ಮ ಗುರುತು ಗೌಪ್ಯವಾಗಿರುತ್ತದೆ. ನಿಮ್ಮ ಲಿಖಿತ ಅನುಮತಿಯಿಲ್ಲದೆ ನಿಮ್ಮ ಬಗ್ಗೆ ಯಾವುದೇ ಮಾಹಿತಿ ಅಥವಾ ಸಂಶೋಧನೆಯ ಸಮಯದಲ್ಲಿ ನೀವು ಒದಗಿಸಿದ ಮಾಹಿತಿಯನ್ನು ಇತರರಿಗೆ ಬಹಿರಂಗಪಡಿಸಲಾಗುವುದಿಲ್ಲ:

1. ನಿಮ್ಮ ಹಕ್ಕುಗಳು ಮತ್ತು ಕಲ್ಯಾಣವನ್ನು ರಕ್ಷಿಸಲು ತುರ್ತು ಪರಿಸ್ಥಿತಿಯಲ್ಲಿ.
2. ಕಾನೂನಿನ ಪ್ರಕಾರ ಅಗತ್ಯವಿದ್ದರೆ.

ಭಾಗವಹಿಸುವಿಕೆಗೆ ಆರ್ಥಿಕ ಪ್ರೋತ್ಸಾಹ:

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನಿಮಗೆ ಯಾವುದೇ ಉಡುಗೊರೆ / ಪ್ರೋತ್ಸಾಹ ಧನ ನೀಡಲಾಗುವುದಿಲ್ಲ.

ಫಲಿತಾಂಶಗಳನ್ನು ಪ್ರಕಟಿಸಲು ಅಧಿಕಾರ:

ಈ ಅಧ್ಯಯನದ ಫಲಿತಾಂಶಗಳನ್ನು ಎಂಡಿ ಪದವಿ, ವಿಮರ್ಶೆ ಮತ್ತು ಪ್ರಕಟಣೆಯ ಪೂರ್ಣಗೊಳಿಸುವಿಕೆಯ ಅವಶ್ಯಕತೆಯ ಭಾಗವಾಗಿ ಬೆಳಗವಿಯ ಕಾಹೇರ್‌ಗೆ ರವಾನಿಸಲಾಗುತ್ತದೆ.

ಪ್ರಶ್ನೆಗಳು

ಭವಿಷ್ಯದಲ್ಲಿ ನೀವು ಅಧ್ಯಯನಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಹೊಂದಿದ್ದರೆ ನೀವು ಸಂಪರ್ಕಿಸಬಹುದು:

1. REG NO: BN0120007, ರೋಗಶಾಸ್ತ್ರ ವಿಭಾಗ, ಜೆ.ಎನ್. ವೈದ್ಯಕೀಯ ಕಾಲೇಜು.

2. ಡಾ. _____, ರೋಗಶಾಸ್ತ್ರ ವಿಭಾಗ, ಜೆ.ಎನ್. ವೈದ್ಯಕೀಯ ಕಾಲೇಜು.

3. ಅಧ್ಯಯನದ ವಿಷಯವಾಗಿ ನಿಮ್ಮ ಹಕ್ಕುಗಳ ಬಗ್ಗೆ ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಹೊಂದಿದ್ದರೆ, ನೀವು ಪೀಡಿಯಾಟ್ರಿಕ್ಸ್ ವಿಭಾಗದ ಪ್ರಾಧ್ಯಾಪಕ ಡಾ.ರೂಪಾ ಬೆಲ್ಲದ ಜೆ.ಎನ್. ವೈದ್ಯಕೀಯ ಕಾಲೇಜು ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿಯ ಮಾನವ ವಿಷಯಗಳ ಸಂಶೋಧನೆ, ಅವರನ್ನು ಕರೆ ಮಾಡಬಹುದು, ಪಿಎಚ್ ಸಂಖ್ಯೆ-9448113403, ಜೆ.ಎನ್. ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಬೆಳಗಾವಿ

ಒಪ್ಪಿಗೆಯ ಹೇಳಿಕೆ

ಕೆಳಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪುತ್ತೇನೆ. ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಹಿಂತೆಗೆದುಕೊಳ್ಳಬಹುದು. ಈ ಫಾರ್ಮ್ಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ ನಾನು ಯಾವುದೇ ಕಾನೂನು ಹಕ್ಕುಗಳನ್ನು ಬಿಟ್ಟುಕೊಡುತ್ತಿಲ್ಲ. ಕೆಳಗಿನ ನನ್ನ ಸಹಿ ನಾನು ಓದಿದ್ದೇನೆ, ಅಥವಾ ಅದನ್ನು ನನಗೆ ಓದಿದೆ, ಈ ಸಂಪೂರ್ಣ ಒಪ್ಪಿಗೆಯ ರೂಪ ಮತ್ತು ನನ್ನ ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿದೆ ಎಂದು ಸೂಚಿಸುತ್ತದೆ

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿ:

ಮಾರ್ಗದರ್ಶಿ:

ಭಾಗವಹಿಸುವವರ ಹೆಸರು: (ಸಹಿ / ಹೆಬ್ಬೆರಳು)

ಸಾಕ್ಷಿಯ ಹೆಸರು: (ಸಹಿ / ಹೆಬ್ಬೆರಳು)

ತನಿಖಾಧಿಕಾರಿಯ ಹೆಸರು: (ಸಹಿ)

ದಿನಾಂಕ:

माहितीपूर्ण संमती पत्र

जेरियाट्रिक लोकसंख्येमध्ये अशक्तपणाचा प्रसार

अभ्यासाचा उद्देश:
आपण या अभ्यासामध्ये सहभागास पात्र आहात म्हणून आपणास या अभ्यासामध्ये नावनोंदणी करण्यास सांगितले जाते. या अभ्यासात रुटीन रक्त तपासणीचा समावेश केला जाईल. या अभ्यासाचा उद्देश असा आहे की जेरीएट्रिक रूग्णांमध्ये अशक्तपणाचा प्रसार आणि कट-मॉर्फोलॉजीचा अभ्यास करणे.

प्रक्रियाः
या अभ्यासादरम्यान, आपल्या मुलाचा नैदानिक इतिहास नोंदविला जातो, हेमोलिटिक अनेमीयाच्या प्रकाराचे निदान करण्यासाठी हेमेटोलॉजिकल आणि बायोकेमिकल चाचण्या केल्या जातील. डॉ. _____ (मार्गदर्शक) यांच्या मार्गदर्शनाखाली REG NO: BN0120007 या अभ्यासाचे मुख्य तपासनीस आहेत. आपण या अभ्यासामध्ये आपल्या मुलाची नावनोंदणी करण्यास सहमती दर्शविल्यास, आपल्या अहवालाचा उपयोग संशोधनाच्या उद्देशाने केला जाईल

जोखीम आणि फायदे
या अभ्यासामध्ये भाग घेण्याचा कोणताही धोका नाही आणि फायदा म्हणजे जेरीएट्रिक अनिमियाचा प्रसार झाल्याचे दिसून आले तर आम्हाला त्यापेक्षा चांगला मार्ग जाणून घेण्यास सक्षम असेल आणि> 60 वर्षात अशक्तपणा ज्या प्रकारे झाला आहे त्या दृष्टीक्षेपासाठी तो डोळा उघडणार आहे. वयोगटातील लोकांना समजले जाते आणि चांगले व्यवस्थापन आणि निकाल नवीन मानदंड असतील.

विकल्पः
या अभ्यासामध्ये भाग घेणे ऐच्छिक आहे. आपण या अभ्यासामध्ये भाग न घेण्याची निवड करू शकता किंवा आपण आता भाग घेण्याचा निर्णय घेतल्यास आपण नंतर आपले मत बदलू आणि अभ्यासापासून दूर जाऊ शकता.

गोपनीयता
या अभ्यासाच्या दरम्यान आपल्याबद्दल संकलित केलेली सर्व माहिती कायद्याद्वारे परवानगी असलेल्या मर्यादेपर्यंत गोपनीय ठेवली जाईल. कोड नंबर आपल्याला या संशोधन रेकॉर्डमध्ये ओळखतील. या अभ्यासाची माहिती प्रकाशित केली जाईल परंतु आपली ओळख कोणत्याही प्रकाशनात गोपनीय असेल. आपल्याबद्दल किंवा संशोधनादरम्यान प्रदान केलेली माहिती किंवा इतर माहिती आपल्या लिखित परवानगीशिवाय इतरांना उघड केली जाणार नाहीः

1. आपत्कालीन परिस्थितीत आपले हक्क आणि कल्याण संरक्षित करण्यासाठी.
2. कायद्याने आवश्यक असल्यास.

सहभागासाठी आर्थिक प्रोत्साहनः
या अभ्यासामध्ये भाग घेण्यासाठी आपल्याला कोणतीही भेट / प्रोत्साहन दिले जाणार नाही.

परिणाम प्रकाशित करण्यासाठी अधिकृतताः
या अभ्यासाचे निकाल एमएडी पदवी, आढावा आणि प्रकाशन पूर्ण करण्याच्या आवश्यकतेचा भाग म्हणून काहेर, बेलागावीकडे पाठविला जाईल.

प्रशनावळी:
भविष्यात अभ्यासाशी संबंधित काही प्रश्न असल्यास आपण संपर्क साधू शकताः

1. REG NO: BN0120007 पथॉलॉजी विभाग, जे.एन. मेडिकल कॉलेज.

2. डॉ. _____, पथॉलॉजी विभाग, जे.एन. मेडिकल कॉलेज.

3. आपल्याकडे अभ्यासाचा विषय म्हणून आपल्या हक्कांबद्दल काही शंका असल्यास आपण डॉ. रूपा बेल्लद, प्रोफेसर, बाल रोगशास्त्र विभाग, मानवी विषय संशोधनाची संस्था नैतिक समिती, अध्यक्ष जे.एन. मेडिकल कॉलेज बेलागावी. कॉल करू शकता. फोन नंबर 9448113403,

संमती विधान

मी खाली स्वाक्षरी करून या अभ्यासात भाग घेण्यास स्वेच्छेने सहमत आहे. मी केव्हाही माघार घेऊ शकतो. या फॉर्मवर सही करून मी कोणतेही कायदेशीर हक्क सोडत नाही. खाली माझी स्वाक्षरी सूचित करते की मी हा संपूर्ण संमती फॉर्म वाचला आहे किंवा माझ्या कडून वाचविला गेला आहे आणि माझ्या सर्व प्रश्नांची उत्तरे दिली आहेत

प्रधान अन्वेषक:

मार्गदर्शन:

सहभागीचे नाव: (स्वाक्षरी / अंगठाचा ठसा)

साक्षीदाराचे नाव: (सही / अंगठाचा ठसा)

चौकशीचे नाव: (स्वाक्षरी)

तारीख:

ANNEXURE II

PROFORMA

PATIENT DETAILS

NAME-

AGE-

SEX-

IP NO-

DATE OF BIRTH-

NATIVE OF

ADMITTED ON-

CHIEF COMPLAINS-

1) Fatigue
2) Muscle Weakness
3) Headache
4) Vertigo
5) Syncope
6) Dyspnea
7) Palpitations
8) Dark or Red urine

HISTORY- (HOPI IN BRIEF)

-onset of symptoms-acute or insidious

-any history of drug intake, exposure to chemicals

-family history of similar disease

-occupation of patient

-symptoms of glossitis, stomatitis

-history of hematuria, hematemesis, tarry stools

-in women, history pertaining to blood loss during menstruation

-number of pregnancies

-dietary history in relation to iron, Vit b12, folic acid content, cooking of food

-fever

-history suggestive of jaundice

-pain in legs

-color of urine- dark yellow, high colored, cola colored

-history of bleeding tendencies in the form of petechiae, ecchymosis

-stool, if bulky, suggestive of malabsorption syndrome

PERSONAL HISTORY-

Sleep, Bowel habits, Consumption of alcohol, Smoking status

RISK FACTORS-

1) A diet lacking in Vitamins and minerals (Iron, Vitamin B12, Folate)
2) Intestinal disorders (Crohn's disease, Celiac disease)
3) Chronic conditions (Cancer, Kidney Failure)
4) Family history (Inherited anemias, for example, sickle cell anemia)
5) Infections
6) Alcoholism
7) Toxic chemicals (Arsenic, Nitrites, chromium, nickel salts)
8) Medications (Anti-malarials, Penicllin, Dapsone)

9) Age- People over the age of 65 are at increased risk of anemia
10) Female gender
11) Low socio-economic status
12) Malnutrition
13) Smoking- predisposes to iron deficiency anemia by decreasing Vitamin C levels. Smoking is known to cause macrocytosis by altering Vitamin B12 and Folate levels.

DIETARY HABITS –(VEG/NON-VEG)

PAST HISTORY- blood transfusion, abnormal blood examination

FAMILY HISTORY- congenital dyserythropoeitic anemia

CLINICAL EXAMINATION-

BLOOD PRESSURE- hypotension

PALLOR- conjunctival, tongue, skin

ICTERUS-

CYANOSIS-

CLUBBING-

NAILS- platynychia/ koilonychia

LYMPHADENOPATHY-

EDEMA-

Signs of infection, bleeding due to neutropenia/ thrombocytopenia

Tongue-glossitis

Angles of lips- stomatitis

SYSTEMIC EXAMINATION-

CVS- Cardiac assessment for murmurs (ejection systolic murmur)/ rheumatic carditis

CNS-

RS- tuberculosis, infections, bronchiectasis

GIT/ABDOMEN-Splenomegaly, Hepatomegaly

Genito-urinary- Kidneys for chronic renal disease

ANY OTHER SIGNIFICANT FINDINGS ON EXAMINATION-

CLINICAL DIAGNOSIS-

INVESTIGATIONS-

1-CBC

2-RBC IINDICES

3-RETICULOCYTE COUNT

4-PERIPHERAL SMEAR FOR BLOOD PICTURE

5-SERUM FERRITIN

6-VITAMIN B12

7-FOLATE

8-STOOL FOR PARASITE/OCCULT BLOOD (WHEREVER POSSIBLE)

9-BONE MARROW STUDIES (WHEREVER POSSIBLE)

10- ANY OTHER SIGNIFICANT INVESTIGATIONS

FINAL CLINICAL DIAGNOSIS-

TREATMENT-

FOLLOW UP-

ANNEXURE III

ETHICAL CLEARANCE CERTIFICATE

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed - to-be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
Website: http\\www.jnmc.edu
E-Mail : dome@jnmc.edu
Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ \25 **Date: 25/01/2021**

To.

REG NO: BN0120007

PG student in Pathology,
J. N. Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"PREVALENCE OF ANEMIA IN GERIATRIC POPULATION",** is ethical and justifiable.

The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Smita Sonoli)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Harsha Hegde)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

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ANNEXURE IV

VENOUS BLOOD COLLECTION

Kawthalkar Shirish M. Collection of Blood. Essentials of clinical pathology. Jayapee Brothers Medical Ltd; 2018. p179-182.

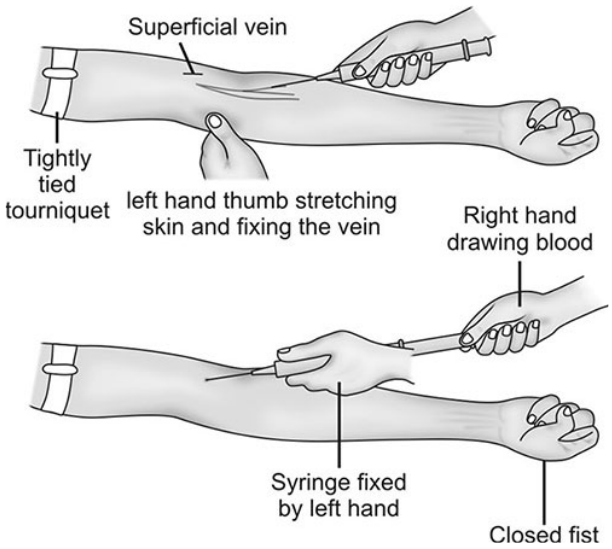
When multiple tests are to be done and larger quantity of blood is needed, anticoagulated venous blood should be obtained.

Method

1. Due to the ease of access, blood is best obtained from the veins of the antecubital fossa. A rubber tourniquet (18 inches long × 3/4 or 1 inch in adults and 12 inches × 1/8 inch in children) is applied to the upper arm. It should not be too tight and should not remain in place for more than two minutes. Patient is asked to make a fist so that veins become more prominent and palpable.
2. Venepuncture site is cleansed with 70% ethanol and allowed to dry.
3. The selected vein is anchored by compressing and pulling the soft tissues below the puncture site with the left hand.
4. Sterile, disposable needles and syringes should be used for venepuncture. Needle size should be 19- to 21-gauge in adults and 23-gauge in children. Venepuncture is performed with the bevel of the needle up and along the direction of the vein. Blood is withdrawn slowly. Pulling the plunger quickly can cause haemolysis and collapse of the vein. Tourniquet should be released as soon as the blood begins to flow into the syringe
5. When the required amount of blood is withdrawn, the patient is asked to open his/her fist. The needle is withdrawn from the vein. A sterile cotton gauze is

pressed over the puncture site. Patient is asked to press the gauze over the site till bleeding stops.

6. The needle is detached from the syringe and the required amount of blood is carefully delivered into the tube containing Ethylene Diamine Tetra-acetic Acid (EDTA) anticoagulant . If the blood is forced through the needle without detaching it, haemolysis can occur. Containers may be glass bottles or disposable plastic tubes with caps and flat bottom.
7. Blood is mixed with the anticoagulant in the container thoroughly by gently inverting the container several times. The container should not be shaken vigorously as it can cause frothing and haemolysis
8. Check whether the patient is feeling faint and bleeding has stopped. Cover the puncture site with an adhesive bandage strip. After use, disposable needles should be placed in a puncture-proof container for proper disposal. Recapping of needle by hand can cause needle-stick injury. The container is labelled. Time of collection should be noted on the label. Sample should be sent immediately to the laboratory with accompanying properly filled order form.



ANNEXURE V

PREPARATION OF BLOOD SMEAR (WEDGE METHOD)

Kawthalkar Shirish M. Blood Smear. Essentials of clinical pathology. Jayapee Brothers Medical Ltd; 2018. p200-212.

1)A small drop of blood (2-3 mm in diameter) is placed in the centre line about 1 cm away from one end of a glass slide (typical size of slide is 75 × 25 mm; thickness about 1mm) with a wooden stick or glass capillary.

2)Slide should be clean, dry, and grease-free. Blood sample may be venous (anticoagulated with EDTA) or capillary (finger prick). Better blood cell morphology is obtained if smear is made directly from a skin puncture.

3) If EDTA-anticoagulated venous blood is used, smear should be prepared and stained within 2 hours of blood collection. If venous blood collected in a syringe is used, the last drop of blood in the needle after withdrawing (or first drop while dispensing) should be used.

4) A 'spreader' slide is placed at an angle of 30° in front of the drop and then drawn back to touch the drop of blood. Blood spreads across the line of contact of two slides.

5) Smear is made by smooth, forward movement of the 'spreader' along the slide. The whole drop should be used up 1 cm before the end of the slide.

6)The length of the smear should be about 3 cm. The 'spreader' should not be raised above the slide surface till whole drop of blood is spread out.

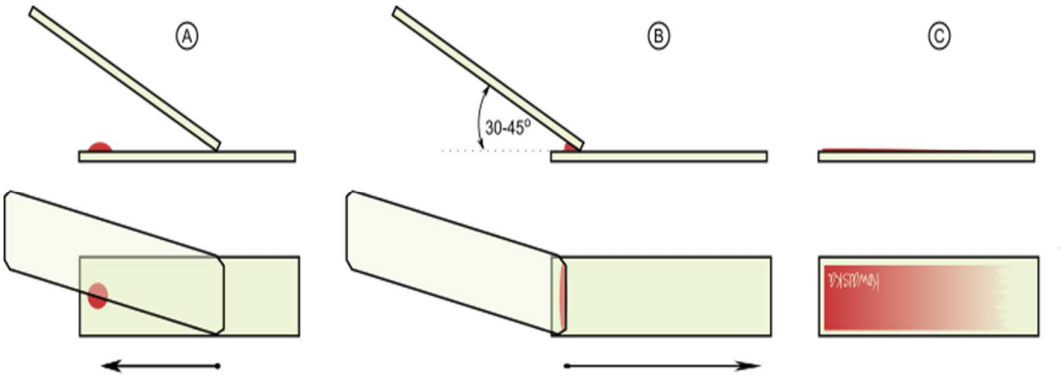
7) Smear is rapidly dried by waving it in the air or keeping it under an electric fan. Slow drying causes shrinkage artifact of red cells.

8) Patient's name or laboratory number and date are written (with a lead pencil, a permanent marker pen, or a diamond pencil) on the thicker end of the smear.

9) The smear is fixed immediately with absolute methyl alcohol (which should be moisture- and acetone-free) for 2-3 minutes in a covered jar (Absolute ethyl alcohol can also be used, but not methylated spirit as it contains water). Aim of fixation is to prevent washing off of the smear from the slide.

10)Following this, colour of the smear becomes light brown. This fixation is desirable even when Leishman stain is used which contains methyl alcohol. This is because Leishman stain may have absorbed moisture leading to poor fixation.

11)If methanol is contaminated with water, sharpness of cell morphology is lost and there is vacuolation of red cells. Methanol should be acetone-free since acetone washes out nuclear stain. (In many laboratories, slide is stained immediately after air-drying without prior fixation, and the results are satisfactory; however, if delay of >4 hours is anticipated between air-drying and staining, the slide should be fixed. If not, a background Gray-blue staining of plasma occurs)



ANNEXURE VI

LEISHMAN STAINING

Kawthalkar Shirish M. Blood Smear. Essentials of clinical pathology. Jayapee Brothers Medical Ltd; 2018. p200-212.

Reagents:

1. Leishman stain: William Boog Leishman, a British pathologist, modified the original Romanowsky method and devised a stain which is widely known as Leishman's stain. This consists of methylene blue and eosin dissolved in absolute methyl alcohol. Commercially available Leishman stain powder (0.6 gram) is mixed with water-free absolute methyl alcohol (400 ml). Prepared stain should be kept tightly stoppered in a brown bottle and stored in a cool, dark place at room temperature. Exposure to direct sunlight causes deterioration of the stain. After preparation, stain should be kept for 3-5 days before using since it improves the quality of the stain.
2. Buffered water (pH 6.8)

Method

1. Air-dry the smear and fix with methanol for 2-3

minutes.

2. Cover the smear with Leishman stain for 2 minutes.

3. After 2 minutes, add twice the volume of buffered

water and leave for 5-7 minutes. A scum of metallic

sheen forms on the surface.

4. Wash the stain away in a stream of buffered water.

Tap water can also be used for washing if it is not

highly alkaline or highly acid.

5. Wipe the back of the slide clean and set it upright in

the draining rack to dry.

6. Mount the slide in a suitable mounting medium (e.g.

DPX) with a clean and dry 25 × 25 mm coverslip.

A well-stained smear shows following features:

• Red cells: pink-red or deep pink

• Polychromatic cells (Reticulocytes): Gray-blue

• Neutrophils: Pale pink cytoplasm; mauve-purple

granules

• Eosinophils: Pale-pink cytoplasm; orange-red

granules

• Basophils: Blue cytoplasm; dark blue-violet

granules

• Monocytes: Gray-blue cytoplasm; fine reddish

(azurophil) granules

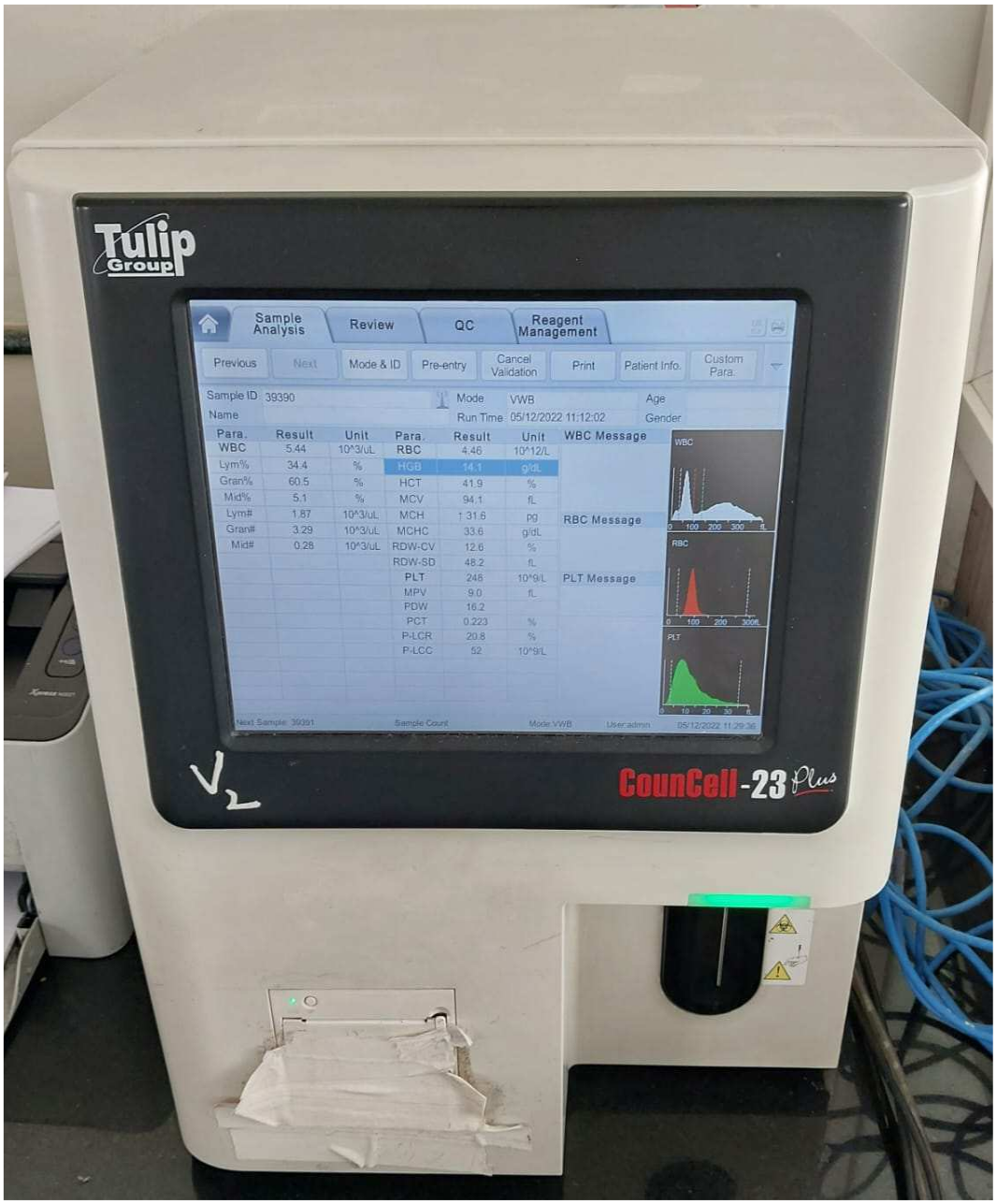
• Small lymphocytes: Dark blue cytoplasm

• Platelets: Purple

• Nuclei of all cells: Purple-violet

ANNEXURE VII

3-part differential analyzer of the brand 'Tulip Group', model 'CounCell-23 Plus'. (Based on principle of Electronic Impedance)



ANNEXURE VIII

KEY TO MASTER CHART

MORPHOLOGICAL TYPE OF ANAEMIA

NNA- Normocytic Normochromic Anaemia

NHA-Normocytic Hypochromic anaemia

MHA-Microcytic Hypochromic anaemia

DA-Dimorphic Anaemia

MA-Macrocytic Anaemia

SYMPTOMS

Fatigue-1

Dysnea-2

Headache-3

Vertigo-4

Syncope-5

Palpitations-6

DIET

Veg-V

Non-Veg-NV

AEITIOLOGY

ACD-Anaemia of chronic disease

IDA-Iron deficiency anaemia

VitB12-Vitamin B12 deficiency anaemia

FO-Folate Deficiency

MX-Mixed Deficiency

OTHERS

NL-Neutrophilic Leucocytosis

ANNEXURE IX

MASTERCHART

SR. No	Age	Gender	IP NO	MORPHOLOGICAL TYPE OF ANEMIA ON PS	Etiology	Symptoms	Diet	DIAGNOSIS ON PERIPHERAL SMEAR	RBC	HGB	HCT	MCV	MCH	MCHC	RDW-CV	RDW-SD
										Unit- %	Unit- %	Unit- fL	Unit- pg	Unit- g/dL	Unit- %	Unit- fL
									Result	Result	Result	Result	Result	Result	Result	Result
1	67	F	1089589	NNA	ACD	1,2,3	NV	NNA with leucopenia with thrombocytopenia	2.4	7	21.00	93.3	31.4	33.5	13.9	53.5
2	65	F	1089570					NBP	3.67	12	36.20	98.7	32.9	33.3	13.3	53.6
3	60	M	10899					NBP	2.96	13.7	29.60	99.8	35.4	35.4	12.9	52.2
4	71	M	1089562	MHA	ACD	1,2,4,6	NV	MHA	4.6	12	36.30	79	26.1	33.1	14.4	45.7
5	62	F	1089548	MHA	ACD	1	V	MHA	4.57	10	31.80	69.6	22	31.5	13.9	38.8
6	66	M	108825					NBP	4.49	13.1	38.50	85.8	29.1	33.9	14	48.7
7	62	M	1089537	NHA	ACD	2,6	NV	NHA	3.57	11.4	34.60	97	33	34.1	11.8	46.3
8	62	M	1085322					NBP	3.57	13.4	30.80	86.4	29	33.5	12.5	44.1
9	60	M	1089517					NBP	4.27	13.8	40.60	82	32	34	14.2	54.7
10	65	F	1089449	MA	ACD	1,2	V	macrocytic anemia	2.81	11.4	32.40	115.3	39.4	34.2	13.2	62.7
11	60	F	1089413	NNA	IDA	1,2,6	NV	NNA with relative lymphocytosis	3.89	11.6	34.80	89.3	29.9	33.5	13.1	47.4
12	78	M	1089506					NBP	3.57	13.2	37.60	105.3	37	35.1	14.7	63
13	60	M	1089488					relative lyphocytosis	4.91	15.6	45.70	93.1	31.7	34	13	49
14	61	F	1089403					NBP	4.51	14.3	44.00	97.5	31.8	32.6	13	51.5
15	60	M	1089486					erythrocytosis with leycocytosis	5.77	17.5	51.20	88.8	30.2	34.1	13.3	47.5
16	63	M	1089495					NBP	4.26	14.2	42.00	98.6	33.4	33.9	12.5	50.3
17	60	M	1089402					erythocytosis with NL	5.58	17.6	53.00	95	31.5	33.2	13.3	51.3
18	62	F	1089483					NBP	3.91	12.8	35.90	91.8	30.1	32.8	12.8	47.7
19	75	M	1089257					NBP	4.07	13.5	37.20	91.6	30.7	33.5	13.7	51
20	64	M	1086988					NBP	4.48	14	43.7	97.5	31.3	32	14.1	51.1
21	60	F	1086973					NL thrombocytopenia	4.2	13.4	39.50	94	31.9	33.9	18.6	63.7
22	62	M	1086942					eosinophilia	4.56	13.2	39.30	86.2	28.9	32.4	12.2	39.1
23	65	M	1086791	DA	ACD	1	NV	DA with NL WITH Thrombocytopenia	1.92	5	17.00	88.5	26	29.4	21.4	67.8
24	70	F	1086687					NBP	4.91	14.2	43.60	88.8	28.9	32.6	12.9	42.9
25	70	M	1086667	NHA	VITB12	1,3	NV	NHA	4.7	11.8	38.10	81.1	25.1	31	13	39.4
26	62	M	1086766	DA	ACD	1,2,5,6	NV	DA	5.34	10.1	36.40	68.2	18.9	27.7	18.4	44.8
27	71	M	1086806					NBP	3.18	13.4	27.90	87.7	28.9	33	16.9	55.1
28	66	M	8086742					NBP	7.07	13.7	41.10	88.2	29.4	33.3	11.5	37.7

29	69	F	1086770					NBP	4.75	12.5	40.70	85.7	26.3	30.7	13.7	44.1
30	65	F	1086603						3.24	12.5	26.80	82.5	29.2	35.4	15.5	51.9
31	66	M						NBP	5.87	16	49.70	84.8	27.2	32.1	14.1	47.9
32	60	F	1071791					Thrombocytopenia	3.05	12	29.10	95.6	32.9	34.3	11.8	45.9
33	72	F	107220	MHA	ACD	1	NV	MHA	5.06	10.8	35.60	70.4	21.3	30.2	13.7	38.6
34	60	M	162493					Thrombocytopenia	4.71	16.8	53.30	113.1	35.6	31.5	15.3	17.7
35	75	F	1072304	NHA	ACD	3	NV	NHA	3.39	10.7	32.50	96	31.5	32.8	13.1	51.3
36	80	F	1072383	MA	ACD	1	NV	Macrocytic anaemia	2.48	9.5	27.00	108.8	38.2	35.1	14.3	64.1
37	60	F	1071847					NL	3.61	13.7	31.10	86.1	26.9	31.3	14.7	51.4
38	60	F	1072595	NNA	IDA	1,2	NV	NNA WITH NL	4.14	11.4	36.30	87.8	27.5	31.3	13.7	48.8
39	62	F	1072268					Thrombocytopenia	3.68	12.4	28.00	76.1	25.5	33.6	13.9	39.3
40	72	F	1072220	MHA	FO	1,2	NV	MHA	5.12	10.7	35.40	69.2	20.9	30.2	14	38.8
41	65	F	1072711	MHA	MX	1	NV	MHA	4.64	11.8	36.30	78.2	25.4	32.5	14	40.5
42	70	F	1072700					Eosinophilia	3.86	14	41.00	88	30	34.8	11.9	41.8
43	70	F	1072696					NBP	4.64	12.5	37.50	80.8	26.9	33.3	12.3	36.8
44	70	M	1072661					Eosinophilia	4.72	14.4	42.00	89	30.5	34.3	12.8	42.9
45	66	M	1072678	NHA	IDA	1	NV	NHA with Leucocytosis	4.47	12.8	37.20	83.2	28.6	34.4	18.2	53.9
46	65	F	1070990	NHA	ACD	3,5,6	NV	NHA	3.74	11.7	36.20	96.5	31.1	32.2	12.7	50
47	80	F	1068145	NNA	ACD	2,4,6	V	NNA	3.96	10.7	33.60	87.5	27.6	31.6	15.6	55.3
48	65	F	1068175	NNA	ACD	1,3	NV	NNA with NL with thrombocytopenia	2.78	9.2	25.40	91.3	33.2	36.3	15.9	59.2
49	60	M	1063769					NBP	4.32	13.9	30.50	70.7	22.8	32.2	16.5	46.8
50	69	F	1068138					Lymphocytosis	4.67	13.6	42.20	90.3	29.1	32.2	13	47.6
51	71	M	1067616	MHA	ACD	1	NV	MHA	4.51	10.7	34.10	75.7	23.6	31.3	15.5	47.4
52	70	M	1068193					NL	4.61	14.2	45.00	97.7	30.7	31.4	12.9	51.1
53	65	M	1067527	NNA	ACD	1,3	NV	NNA	2.45	7	21.10	88.4	28.6	33.1	13	45.7
54	67	F	1065911	NNA	ACD	2,3	NV	NNA with thrombocytosis	3.16	9.6	28.70	90.9	30.2	33.3	14.6	54.1
55	60	F	1068365	NHA	ACD	1	NV	NHA with Thrombocytosis	3.89	10.1	32.80	84.4	26	30.8	12.9	44
56	66	F	1067392					NBP	3.59	14.1	33.00	91.8	29.8	32.5	13.2	49.1
57	60	F	1068415					NBP	4.39	12.6	39.50	89.9	28.8	32	13.2	48.3
58	78	M	1068434					Neutrophilia	4.89	13.4	41.50	84.9	27.3	32.2	14	48
59	63	M	1066769	NHA	IDA	1	NV	NHA with Thrombocytosis	3.32	11	32.40	97.5	33.3	34.1	12.1	47.9
60	63	F	1067072	NHA	IDA	1,3	V	NHA	3.91	10.1	31.70	81.1	25.8	31.8	13.6	44.8
61	78	F	6200373					Relative Lymphocytosis	3.83	12.3	38.20	99.9	32	32.1	12.6	51.4
62	71	F	1067002					NBP	4.21	12.3	38.70	92	29.3	31.8	12.5	46.5
63	65	F	1067016					Relative Lymphocytosis	4.52	13.1	39.90	90	29	32.9	12.5	44.8
64	63	F	1065790	NNA	ACD	1,2,5,6	NV	NNA	4.2	11.8	37.50	89.3	28.1	31.4	13	46.9
65	62	M	1065803	NHA	IDA	1	NV	NHA	3.28	10.1	31.00	94.6	30.8	32.6	18.4	70.8
66	70	F	1065793					NBP	4.2	12.8	40.00	95.2	30.4	31.9	13	50.5
67	70	F	1065767					NBP	4.14	12.5	40.00	96.6	30.2	31.3	14.8	58
68	70	M	1065800					NL	5.13	15.6	48.90	95.2	29.7	31.2	14.3	55.2
69	65	M	1065798	NNA	FO	1	NV	NNA with lymphocytosis	4.16	12.5	39.50	95.1	30.1	31.6	13.6	52.6
70	62	M	1065729					NL	4.55	14.8	45.10	99.2	32.5	32.7	13.1	52.9
71	72	F	1065789					NBP	3.83	12.1	37.70	98.3	30.3	30.8	12.5	53.5

72	61	M	106586	NNA	FO	1,3	V	NNA	4.45	10.6	34.90	78.5	23.8	30.4	14.1	44.5
73	65	M	1065702					NBP	3.55	13.8	41.20	116.1	38.8	33.4	14	66.6
74	70	F	1065707	NHA	ACD	3	V	NHA	3.7	9.8	31.70	85.8	26.6	31	13.5	46.9
75	69	M	1065648	DA	VITB12	1	NV	DA	4.03	10.1	33.10	82.2	25.1	30.5	17.2	57.2
76	67	M	1065715	NNA	ACD	1,3,6	NV	NNA	3.92	11.8	36.70	93.7	30	32	12.5	47.7
77	62	M	1065777	NHA	ACD	1,6	V	NHA	2.31	5.7	18.50	80.2	24.5	30.6	13.2	43.2
78	65	M	1065824					Leucocytosis	4.74	13.7	38.90	82	25.1	30.6	15	49.6
79	72	M	1065210	MHA	MX	1	NV	MHA	4.9	9.9	33.90	69.1	20.2	29.3	15.8	44
80	74	M	1085251					Neutrophilia	4.26	13.3	39.70	93.4	31.3	33.5	12.2	46.1
81	65	M	1065247	DA	VITB12	2,4	V	DA	4.86	9.8	35.20	72.5	20.2	27.8	18.5	53.9
82	60	M	1058856	NHA	IDA	4	NV	NHA	3.24	8.5	26.70	82.2	26.3	32	15.5	51.8
83	60	M	1064492	NNA	ACD	2,6	NV	NNA	4.36	12.3	37.10	85.1	28.2	33.1	14.1	48.5
84	63	F	1065116					NL	3.2	13.2	27.00	84.2	29.2	34.6	13.2	45.3
85	65	M	1065170	NNA	VITB12, FO	1,3	V	NNA	4	12.6	38.10	95.1	31.5	33.2	12.7	49.2
86	60	M	1065163					NBP	4.28	13.8	42.40	99.2	32.2	32.5	12.5	50.1
87	70	F	1065161					NBP	3.9	12.1	36.80	94.4	31	32.8	12.2	46.6
88	63	M	1065160	NHA	ACD	1,2,6	NV	NHA	3.96	12.5	38.00	95.9	31.5	32.8	12.5	48.6
89	76	M	1065191					Neutrophilia	4.03	14.6	37.50	93.1	31	33.3	13	49.2
90	75	M	1065198					NL	5	16	50.90	101.9	32.1	31.5	14.1	58.4
91	60	F	1065116	NHA	IDA	1,2,6	NV	NHA with NL with thrombocytosis	3.32	9.6	28.20	84.8	28.8	34	13.5	46.4
92	65	M	1065013					NBP	4.86	14.5	44.90	92.3	29.9	32.4	13.4	50.1
93	64	M	1064508					Neutrophilia	4.86	13.7	42.80	88.1	28.1	31.9	12.9	45.58
94	65	F	1064738					NL With thrombocytocis	4.58	13.2	39.20	85.6	28.9	33.7	12.3	42.5
95	60	M	1064570					NBP	4.8	14.2	36.40	75.8	22.9	30.1	14.7	45.1
96	70	M	1064545	MA	VITB12	1	V	Macrocytic anaemia	2.96	11.5	34.70	117.3	39	33.2	12.9	62.1
97	61	M	1064575						3.9	14.7	44.10	112.9	37.8	33.4	13	59.9
98	67	M	6183665					NL	5.09	15.4	48.10	94.5	30.3	32.1	14.5	55.4
99	75	M	1064430					NBP	4.19	13.3	40.40	96.5	31.8	32.9	12.8	50.1
100	64	M	1064231					Leucocytosis with eosinophilia	3.9	13.1	33.20	85.4	28.6	33.5	13.4	46.3
101	63	M	1064292					NL	4.79	16	49.60	103.6	33.5	32.3	13.5	56.6
102	60	M	1063977	NNA	ACD	1	NV	NNA with NL	2.73	9	25.10	91.9	33.1	36	11.8	44.4
103	60	F	1064321	NNA	ACD	1,4	NV	NNA	4.5	11.5	42.60	82	30	35	13	53.5
104	67	F	529216					NBP	3.91	12.4	37.10	94.7	31.6	33.4	12.4	47.7
105	71	M	1063535	DA	MX	1	V	DA WITH NL with thrombocytosis	3.16	5.3	18.10	57.2	16.9	16.9	17.1	38.8
106	65	F	1063737					NL	5.32	13.8	43.30	61.3	26	32	13.7	44.8
107	65	F	1063490	NNA	VITB12	3	V	NNA	3.94	11.7	34.80	88.3	29.7	33.6	13.6	48.6
108	65	F	1066343					NBP	3.38	12.1	36.00	106.4	35.9	33.7	13.7	59.6
109	62	M	1063358					NBP	3.2	14.5	27.20	85	29.6	34.8	18.3	63.1
110	60	M	1063366					NBP	4.19	13.1	37.60	89.7	31.2	34.7	12.6	45.8
111	60	F	1063165	NHA	ACD	1,3	NV	NHA with NL	2.75	8.3	23.50	85.5	30.4	35.5	16.6	57.7
112	70	F	1062963					thrombocytosis	4.81	14.5	43.10	89.5	30.2	33.8	13.3	48
113	65	M	1063704					Relative Lymphocytosis	5.02	15.4	48.20	96.1	30.6	31.9	13.5	52.7
114	60	F	1062767	MHA	ACD	1,4	V	MHA with neutrophilia	3.85	10.7	31.80	82.5	27.8	33.7	13.5	45.2

115	78	F	1062936	NNA	ACD	3	NV	NNA with thrombocytosis	3.34	10	29.00	86.9	30	34.5	12.1	42.4
116	61	M	1063095	NHA	ACD	3	NV	NHA with neutrophila	3.15	8	24.90	78.9	25.3	32.1	13.8	44.2
117	61	F	1063118					NBP	3.91	15.1	33.30	85.1	28	32.9	14	48.4
118	60	M	1063029	NNA	IDA	1	NV	NNA	3.36	10.9	32.20	95.8	32.4	33.8	12.6	49.2
119	71	M	1063039					NBP	4.53	15.9	46.70	103.2	35.2	34.1	13.2	55.4
120	70	M	1062949					Leucocytosis	5.03	14.3	44.90	89.2	28.4	31.8	14.3	51.5
121	70	F	1062854	NNA	VITB12	1	V	NNA	3.8	11.7	36.80	96.9	30.7	31.7	12.8	50.5
122	76	F	1062920					Leucocytosis	4.99	12.2	38.60	77.3	23.9	30.9	14.9	46.5
123	72	F	1062900					NBP	4.97	12.8	41.70	83.9	25.7	30.7	14.9	50.6
124	71	M	1062913					NL	4.76	14.6	45.5	95.7	30.6	32	12.8	49.7
125	62	F	1062912					Relative Lymphocytosis	4.08	12.4	39.10	95.9	31.4	31.7	13.3	51.9
126	61	M	1062849					Leucocytosis	5	15.3	47.90	95.8	30.6	32	13.8	53.8
127	61	M	1060083	NHA	IDA	1	NV	NHA	4.01	11.2	34.40	85.7	27.9	32.6	13.9	48.2
128	60	M	5038382					NBP	4.54	13.5	38.80	85.5	27.6	32.2	13.3	46
129	67	M	1062734					NBP	4.84	13.3	42.50	87.9	27.5	31.3	13.2	46.8
130	70	M	1062253	NHA	IDA	1	NV	NHA with thrombocytosis	0.18	12.2	36.50	92.1	30.9	33.5	13.1	48.8
131	78	M	1062193					NL	4.74	13.7	40.30	85	28.9	33.9	13.9	47.6
132	62	F	1062380					NBP	4.06	12.8	38.40	94.5	31.6	33.4	13.7	52.9
133	76	F	1062393	MHA	ACD	1	NV	MHA	3.3	7.7	24.10	73.1	23.3	31.9	14.8	43.8
134	62	M	1062391					NL	4	13.3	38.90	97.3	33.3	34.3	12.5	49.6
135	65	M	1062366					NBP	4.55	14	41.20	90.4	30.7	34	12.6	46.3
136	63	M	1062457					NL	5.15	18.1	53.10	103.7	35.2	34	13	54.6
137	68	F	1062413	NNA	ACD	1	NV	NNA	3.71	11.3	33.80	91	30.3	33.3	12.9	47.7
138	60	M	1062344					NBP	4.74	13.6	40.50	85.4	28.7	33.6	13.2	45.6
139	65	M	1061548	DA	IDA	1	V	DA with NL	4.09	8.8	27.90	68.1	21.5	31.5	16.6	45.4
140	65	F	1061856	NNA	ACD	3	NV	NNA	3.68	11.4	33.60	91.3	31.1	34.1	13.1	48.4
141	90	M	1062126					NL	2.76	13.7	27.00	37.9	34.1	34.9	14.8	59.2
142	61	M	1050886	NNA	ACD	1,3	NV	NNA with leucocytosis	3.74	10.8	32.10	85.9	28.8	33.6	15.7	54.8
143	75	F	1050670					NBP	4.04	12.9	37.60	93	31.9	34.3	14.1	53.5
144	70	F	1049434	NNA	IDA	1	NV	NNA with thrombocytosis	2.54	8.4	22.80	89.8	33	36.8	15	54.7
145	72	M	1050302					NL with thrombocytopenia	4.71	15.7	45.00	95.5	33.4	35	12.5	48.1
146	68	F	1050723					NBP	4.8	13.9	43.30	90.2	29	32.2	13.1	48
147	68	M	1050845	NNA	IDA	1	NV	NNA with NL	3.53	10.7	31.30	88.7	30.2	34.1	12.3	44.2
148	61	M	1050834					NBP	5.41	16.6	51.90	96	30.6	31.9	14.3	55.6
149	65	M	1050870					Relative neutrophilia with thrombocytopenia	5.53	17.5	52.00	94.1	31.6	33.6	14	53.3
150	69	M	1049851					NL	4.22	13.3	38.70	91.8	31.5	34.3	13.7	50.7
151	82	F	1049801					NL	4.06	12.3	35.30	87.1	30.4	34.9	13.1	46.4
152	64	F	1050529					NBP	4.79	14.10	41.4	86.3	29.4	34	11.7	40.7
153	80	M	1050543					NL	4.28	14.5	41.10	96	33.8	35.2	12.5	48.7
154	63	M	1049749					NL with thrombocytopenia	3.98	13.1	38.20	96.1	33	34.3	13	50.9
155	67	F	1050217	MHA	IDA	1,3	NV	MHA with neutrophilia	2.8	5.5	19.50	69.6	19.6	28.2	16.6	42.4
156	71	M	1050099					Thrombocytopenia	6.39	17.3	54.40	85.1	27.1	31.8	16.7	48.2

157	60	F	1049852	NNA	ACD	2	V	NNA	1.7	5.2	14.00	83.9	30.4	36.3	16.6	57
158	67	M	1047558	DA	ACD	1	NV	DA	3.45	9.4	36.30	105.4	27.2	25.9	17	67
159	67	F	1050122					NL	5.56	16.5	51.40	92.4	29.7	32.1	13.7	44.9
160	70	M	1050190					NBP	4.36	13.8	43.70	100	31.6	31.6	13.1	49.2
161	76	F	1049487	NNA	ACD	1,3	NV	NNA	4.22	10	41.40	99	32	34	16.6	50
162	60	F	104985	NHA	ACD	1	NV	NHA with NL	1.46	3.5	11.50	78.8	24	30.4	20.1	58.6
163	64	M	1049797					NBP	4.27	13.8	37.60	88.1	30	34	11.9	39.3
164	80	M	1049792					Thrombocytopenia	4.14	13.6	38.80	93.7	30.4	32.5	13.4	46.7
165	60	F	1049501					Thrombocytopenia	5.06	13.1	39.60	78.3	25.9	33	14.7	46.4
166	73	M	1049502					NL	4.44	14.6	41.80	94.3	32.8	34.8	13.2	50.1
167	70	F	1049496	NNA	VITB12	1	V	NNA	3.91	11.3	35.90	91.8	31.5	31.5	13.1	44.5
168	60	M	1049148	DA	VITB12	1,3	V	DA with NL	4.96	11.1	35.60	71.8	22.4	31.2	20.3	51.7
169	65	M	1049491	NNA	IDA	3,2	NV	NNA with Leucopenia with thrombocytopenia	3.9	11.2	33.00	84.6	28.5	33.6	15.6	48.5
170	70	F	1049434	NNA	ACD	1	NV	NNA with thrombocytopenia	3.08	9.1	28.30	28.3	32.2	29.5	17	55.6
171	65	F	1048951					NL	4.6	13.6	39.40	85.7	29.6	34.5	12.3	38.8
172	72	M	1049493					Thrombocytopenia	4.8	14.6	43.10	103.1	34.9	33.9	13.7	52
173	60	F	1049417					NBP	4.15	12.3	37.60	90.6	29.6	32.7	12.3	40.6
174	64	M	1049396					NBP	4.15	13	36.00	90	32	30	12	42
175	60	F	1049314	NHA	IDA	1	NV	NHA with thrombocytopenia	3.86	10.7	35.90	93	27.7	29.8	16.6	57.5
176	60	M	1049299	NNA	ACD	3	V	NNA with eosinophilia	4.29	12.1	35.50	82.8	28.2	34.5	11.7	35.4
177	63	F	1049284					NBP	4.82	12.5	40.00	83	25.9	31.3	13	40.4
178	75	M	1049228					NBP	5.61	16.4	49.50	88.2	29.2	33.1	13.2	42.8
179	70	F	1048670	DA	ACD	1,2	NV	DA	3.59	11.1	36.80	102.5	30.9	30.2	18.1	67
180	69	M	1049243	DA	ACD	2	NV	DA	3.48	7.2	26.70	76.7	20.7	27	25.2	70
181	64	M	1056882					NBP	4	14	32.00	82	27	30	17	45
182	67	M	1049220					NBP	4.69	13.6	42.20	90	29	32.2	12.4	41.6
183	65	F	1049263	MHA	IDA	1	NV	MHA with NL with thrombocytosis	5.9	11.4	37.50	64.7	19.7	30.4	15	34.2
185	63	M	1049261	MHA	MX	1	V	MHA	4.61	10.3	34.40	74.6	22.3	29.9	16.5	44.6
186	76	M	1049014		MX			NL	5.42	14	44.00	81.2	25.8	31.8	19.2	51.6
187	62	M	1049559	NHA	ACD	3	NV	NHA with NL	5.18	11.9	42.60	82.2	23	27.9	16.5	50.1
188	70	M	1049167	NNA	ACD	1,3	NV	NNA with NL	4.04	11.2	36.50	90.3	27.7	30.7	13.5	45.5
189	85	M	1058444					NBP	4	13.2	35.00	75	25	32	17	40
190	76	M	1047591					NBP	4.26	13.2	39.40	92.3	31	33.6	14.5	54.4
191	73	M	1049082					Eosinophilia	4.04	13.4	38.10	94.3	33.2	35.2	12.6	43.3
192	65	M	1098654					NBP	5	14	35.00	90	32	33	12	40
193	60	M	1049167					Eosinophilia	5.37	14	44.50	82.9	26.1	31.5	12.9	40
194	85	M	1056826					NL	4.6	14	30.00	90	32	33	12	42
195	62	F	1049151					Eosinophilia	5.03	14.1	41.50	83.5	28	34	12.4	37.7
196	68	M	1049122					NL	4.87	14	42.60	87.5	28.7	32.9	12.4	40.2
197	64	M	1048864					NBP	5.22	14.2	45.60	87.2	27.1	31.1	13.3	46.7
198	70	M	1046869					NL with thrombocytopenia	5.07	16.2	49.20	97	31.9	32.9	14	55
199	71	F	1048594	NHA	ACD	1	NV	NHA	3.89	9.8	32.40	83.3	25.2	30.2	13.9	42.3

200	75	M	1048624					Eosinophilia	4.59	13.9	38.90	84.7	30.3	35.7	13.3	41
201	70	M	1046869					NL withThrombocytopenia	5.21	15.8	46.10	88.5	30.2	34.3	13.6	44.7
202	62	M	1047763					NBP	4.71	14.6	44.50	94.5	31	32	12.4	44.4
203	60	M	1048628					NL	5.35	13.1	44.60	83.4	24.5	29.4	14.7	45.2
204	64	M	5163809	NNA	ACD	4	NV	NNA with NL	3.25	8.1	27.20	83.7	24.8	29.6	14.9	43
205	60	F	1128856	NNA	ACD	1	V	NNA	3.75	10.8	35.50	94.7	28.8	30.4	16.8	54.2
206	67	M	1131377					NBP	4.13	13.1	39.90	96.6	31.7	32.8	13.6	48.4
207	60	M	113748					NBP	5.32	15	45.00	85.7	28.2	32.9	13.3	42.1
208	80	F	6662843	NNA	VITB12	3	NV	NNA	3.65	10.3	32.90	99	28.2	31.3	13.3	44.7
209	67	M	3316345	MHA	IDA	1	NV	MHA	4.38	8.7	30.60	69.9	19.6	28.4	17.1	43.9
210	68	M	1129762					NBP	5.22	15.3	45.60	87.4	29.3	33.6	13.4	42.9
211	66	F	1131410					Leucocytosis	5.12	12.7	41.30	80.7	24.8	30.8	14	41.6
212	75	F	1131220	NHA	IDA	1,2	NV	NHA	3.65	9.6	31.00	84.9	26.3	31	18.1	53.3
213	60	F	1130789					NBP	4	13	36.50	91.1	29.2	32	13.4	49.7
214	67	F	1130180					NBP	4.2	12	35.00	90	28	31	13.5	52
215	60	M	1129718	MHA	IDA	1	V	MHA with Eosinophilia	5.37	12.2	43.30	80.6	22.7	28.2	21.3	61
216	65	M	1131293					NBP	5.39	14.1	47.00	87.2	26.2	30	13.6	43.4
217	68	F	11311144					NBP	5	13	32.00	82	29	31.3	12	32
218	60	F	1130761					Lymphocytosis	4.34	13.1	40.20	92.7	30.3	32.7	13.6	51.1
219	68	M	1130614					NBP	4.28	13.9	41.30	96.5	30.1	31.2	12.7	45.3
220	78	F	1130637					NBP	5	13	42.00	95	32	31.9	13	35
221	60	M	1127711	MHA	IDA	1,3	NV	MHA	3.92	9.1	28.40	72.4	23.2	32	20.2	58.6
222	60	M	5625021					NBP	4.31	13.1	37.40	86.4	29	32.4	13.2	46.2
223	63	M	11230883					NBP	4.1	13	34.00	85	30	32	14	38
224	70	M	1129700					Leucopenia with thrombocytopenia	4.71	13.1	40.70	85	32	33	13	37
225	68	M	1128134	NNA	ACD	1,5,6	V	NNA with NL with thrombocytopenia	3.68	10.9	34.00	82	29	32	14	34
226	60	M	1130539	MHA	IDA	2	NV	MHA with NL with thrombocytopenia	4.14	11.9	38.10	68	26	28.2	13	32
227	87	F	1129954	NHA	VITB12	1	V	NHA with leucocytosis	3.51	10.5	31.40	89.4	29.7	33.3	12.8	46.5
228	64	F	1130606					NBP	4.2	13	32.00	82	33	32	13.1	42
229	65	F	1130319					NBP	4.48	13	40.00	89.2	29.1	32.6	13.1	47.2
230	63	F	1130752					NBP	4.5	12.3	35.00	82	27	33	14	45
231	83	F	1123867	MHA	IDA	1,3,5,6	NV	MHA	4.7	8.7	28.20	67.7	20.8	30.6	19.8	53.7
232	65	M	1114876					NBP	4.45	13.8	39.50	58.6	28.9	32.6	16.5	59.1
233	64	M	1126515	NNA	ACD	1	NV	NNA with Lymphocytosis with Eosinophilis	2.78	9.1	25.70	92.2	32.7	35.5	14.2	53.5
234	60	M	1125639						3.85	13.2	33.00	85.6	29.1	34	15.2	52.5
235	60	M	1129484	MHA	IDA	1	NV	MHA	3.2	9.4	28.60	89.4	29.3	32.7	13.1	47.8
236	62	M	1276556	NHA	ACD	3	NV	NHA with thrombocytopenia	3.31	8.8	27.10	81.7	26.7	32.6	14.6	48.3
237	63	F	1130669	NNA	ACD	1	NV	NNA with Lymphocytosis	4.04	11	34.60	85.6	27.2	31.8	13.2	41.4
238	68	M	1130575					NBP	5.11	14.8	45.40	89	29	32.5	12.6	41.2
239	61	F	2454587					NL	3.57	12.7	34.70	97.1	32.9	33.9	12.7	50.7

240	71	F	1128987					Eosinophilia	3.73	12.1	35.60	95.5	32.4	33.6	12.3	37.8
241	61	M	1130613					NL with thrombocytosis	5.36	15	46.30	86.6	28	32.3	13.5	42.4
242	65	M	1130659					Leucocytosis with eosinophilia	3.98	13	33.90	85.3	26.8	31.4	13.4	48.3
243	75	M	112873					Neutrophilia	4.53	13.2	41.10	90.8	21.1	32	14.4	52.8
244	86	M	1129341	MHA	IDA	1	NV	MHA	4.55	9.4	29.70	85.2	20.7	31.5	14.2	37.1
245	73	M	1130633					NBP	4.36	13.4	39.30	90.1	30.7	34.1	12.2	40.7
246	65	F	1128856	NHA	ACD	1,3	NV	NHA with leucocytosis	3.8	9.7	29.10	95.3	31.7	33.2	14.7	57.2
247	90	F	1128747	NHA	ACD	1	V	NNA with Eosinophilia	3.55	11.2	35.70	100	31.4	31.3	13.9	56.9
248	70	M	1126398	NHA	ACD	1	NV	NHA with Eosinophilia	3.61	9.3	31.00	85.9	25.8	30	13.7	43.2
249	89	F	6367074	NHA	ACD	3,1	V	NHA with NL	3.85	9.5	29.80	77.3	24.6	31.6	17.8	55.7
250	62	F	1130784					NBP	4.38	13	40.30	92.1	29.7	32.3	13.4	50.2
251	80	F	1130059	MHA	IDA	1,2	NV	MHA with leucocytosis	4.29	10.8	32.70	69	25	28	12.9	47.8
252	64	F	1128115	NHA	IDA	1	NV	NHA with neutrophila	3.51	11.2	35.00	99.6	31.8	31.9	15.2	62
253	66	M	1130683	NHA	VITB12	1,3	NV	NHA with neutrophila and thrombocytopenia	3.72	10.4	30.00	80.6	28	34.7	12.9	38.7
254	67	F	1120276					NL	4	12.9	32.00	82	32	34	13	35
255	70	M	1112345	NHA	VITB12	1	V	NHA	4.2	11.1	31.00	83.9	26	29.4	14	34
256	60	M	2341123					NL	5.1	13.6	28.30	82	28.7	32	13.2	32.1
257	67	M	1129154	NNA	ACD	1	NV	NNA with NL	4.12	10.6	32.00	83	29	31	13.4	34.8
258	72	M	1234765					NBP	4.2	13.1	33.00	82	32	34	12	32.6
259	65	F	1127804	MA	MX	1	V	Macrocytic anemia	4.2	10.9	32.00	106	33	36	13	33.7
260	72	F	112879					NL	4.3	13.4	31.20	82	32	40	14.3	32
261	68	F	1129388					NL	3.65	12.9	32.40	83.7	34.1	38.5	13.9	31.7
262	62	F	123987					NBP	4.81	14.5	43.10	89.5	30.2	33.8	13.3	48
263	65	M	1128633					NBP	5.02	15.4	48.20	96.1	30.6	31.9	13.5	52.7
264	72	M	1122200					NBP	3.85	13.9	31.80	82.5	27.8	33.7	13.5	45.2
265	64	M	1129401	DA	VITB12	1,3	V	DA	3.34	10	29.00	86.9	30	34.5	22	42.4
266	60	M	1129498					NNA with NL	3.15	13.2	24.90	82	30	32.1	13.8	44.2
267	65	M	1129413	NNA	ACD	1	NV	NNA with Leucopenia with thrombocytopenia	3.91	11	33.30	85.1	28	32.9	14	48.4
268	89	M	1129887	DA	IDA	1	V	DA	3.36	10.9	32.20	95.8	32.4	33.8	21.7	49.2
269	81	M	512477					NBP	4.53	15.9	46.70	103.2	35.2	34.1	13.2	55.4
270	76	M	1126500	NNA	ACD	6	NV	NNA	5.03	11.2	44.90	89.2	28.4	31.8	14.3	51.5
271	79	F	1128412					NBP	3.8	13.2	36.80	96.9	30.7	31.7	12.8	50.5
272	84	F	1129399	MHA	IDA	1	NV	MHA	4.99	11.9	38.60	77.3	23.9	30.9	14.9	46.5
273	67	F	1129430					NBP	4.97	13.2	41.70	83.9	25.7	30.7	14.9	50.6
274	83	M	1129498					Leucocytosis	4.76	14.6	45.5	95.7	30.6	32	12.8	49.7
275	69	M	1189448					NBP	4.08	13.6	39.10	95.9	31.4	31.7	13.3	51.9
276	72	F	1128959					NBP	5	15.3	47.90	95.8	30.6	32	13.8	53.8
277	77	M	1123926	NNA	ACD	1,3	NV	NNA with NL	4.01	11.2	34.40	85.7	27.9	32.6	13.9	48.2
278	82	M	1123436					NBP	4.54	13.3	38.80	85.5	27.6	32.2	13.3	46
279	75	M	1129507	NNA	ACD	1	NV	NNA	4.84	11.1	42.50	87.9	27.5	31.3	13.2	46.8
280	87	M	1129421					Neutrophilia	0.18	13.6	36.50	92.1	25.2	33.5	13.1	48.8
281	62	F	1129521					NL	2.24	14.2	21.00	93.3	31.4	33.5	13.9	53.5
282	68	M	1127199	NNA	VITB12	1	V	NNA with NL	3.67	12	36.20	98.7	32.9	33.3	13.3	53.6
283	84	F	1129400					NBP	2.96	13.6	29.60	99.8	26	35.4	12.9	52.2

284	88	M	1120908					NBP	4.6	14.2	36.30	79	26.1	33.1	14.4	45.7
285	66	M	1129511					NBP	4.57	13.9	31.80	82	34	38	13.9	38.8
286	69	M	1129428					NL	4.49	15.2	38.50	85.8	29.1	33.9	14	48.7
287	73	M	1129549	NNA	ACD	1	NV	NNA with NL	3.4	11.8	34.60	97	33	34.1	11.8	46.3
288	69	F	1129529					NBP	3.57	16.2	30.80	86.4	29	33.5	12.5	44.1
289	77	F	1128626					Leucocytosis	4.27	13.8	40.60	82	32	34	14.2	54.7
290	73	M	1127246					Leucocytosis	2.81	14.2	32.40	115.3	39.4	34.2	13.2	62.7
291	68	F	1129161	NNA	ACD	3	NV	NNA	3.89	11.6	34.80	89.3	29.9	33.5	13.1	47.4
292	60	F	1352778					NNA	3.57	13.2	37.60	105.3	37	35.1	14.7	63
293	63	F	1129123	NNA	ACD	1,5	NV	NNA	4.91	10.7	45.70	93.1	31.7	34	13	49
294	72	F	1126754					Thrombocytopenia	4.51	14.3	44.00	97.5	31.8	32.6	13	51.5
295	81	F	1129456	MA	MX	3	V	Macrocytic anemia	5.77	9.8	51.20	104	30.2	34.1	13.3	47.5
296	65	F	1120525	MA	VITB12	1	NV	Macrocytic anemia	4.26	11.2	42.00	107	33.4	33.9	12.5	50.3
297	79	F	1129441	MHA	IDA	2	NV	MHA with NL	5.58	10.8	53.00	65	24	27.2	13.3	51.3
298	65	F	1120447					NBP	3.91	13.4	35.90	91.8	30.1	32.8	12.8	47.7
299	61	F	136200					NBP	4.07	13.5	37.20	91.6	30.7	33.5	13.7	51
300	72	F	1119765					Leucopenia	4.48	14	43.7	97.5	31.3	32	14.1	51.1
301	68	F	1129507					NBP	4.2	13.4	39.50	94	31.9	33.9	18.6	63.7
302	87	M	1129560						4.56	13.1	39.30	86.2	28.9	33.2	12.2	39.1
303	69	F	1129765					NL	1.92	15.5	17.00	88.5	26	29.4	21.4	67.8
304	60	M	2025578					NBP	4.91	14.2	43.60	88.8	28.9	32.6	12.9	42.9
305	62	F	1129081					Lymphocytosis	4.7	13.7	38.10	81.1	25.1	31	13	39.4
306	65	M	22112802	MA	VITB12	1,3	V	Macrocytic anemia	5.34	10.1	36.40	105	34	37	18.4	44.8
307	72	M	1129654	NHA	FO	1	NV	NHA	3.18	9.2	27.90	87.7	25	33	16.9	55.1
308	78	M	1129866	DA	MX	2	NV	DA	7.07	10.2	41.10	88.2	29.4	33.3	21	37.7
309	81	F	1129659						4.75	16.1	40.70	85.7	28.7	30.7	13.7	44.1
310	67	M	1123987	NHA	VITB12	2	V	NHA with leucocytosis	3.24	9.5	26.80	82.5	25.2	35.4	15.5	51.9
311	61	M	1129624	DA	VITB12	1	NV	DA with NL	5.87	9.2	49.70	84.8	27.2	32.1	22.7	47.9
312	68	M	1129876						3.05	14.3	29.10	95.6	25	28.2	11.8	45.9
313	88	F	1129635	NHA	ACD	1	NV	NHA	5.06	10.8	35.60	82	21.3	30.2	13.7	38.6
314	61	F	129329					NBP	4.71	16.8	53.30	113.1	35.6	31.5	15.3	17.7
315	64	M	1236787					NBP	3.39	14.7	32.50	96	31.5	32.8	13.1	51.3
316	65	F	1123887					NL	2.48	16.5	27.00	108.8	38.2	35.1	14.3	64.1
317	61	F	1129707					Neutrophilia	3.61	14.2	31.10	86.1	26.9	31.3	14.7	51.4
318	70	F	1129624					NL	4.14	14.4	36.30	87.8	27.5	31.3	13.7	48.8
319	69	F	1129634					Neutrophilia	3.68	15.5	28.00	86	25.5	33.6	13.9	39.3
320	72	F	1189678					NBP	5.12	13.6	35.40	82	24.2	30.2	14	38.8
321	60	F	1129679					NBP	4.64	14.2	36.30	82	27.5	32.5	14	40.5
322	81	F	1298698					NBP	3.38	13.7	32.00	81.9	28.2	32.1	13.8	31
323	62	F	1128295	NHA	IDA	1,2	V	NHA	4.64	11.5	37.50	80.8	25.4	33.3	12.3	36.8
324	84	F	1129373					NBP	4.72	14.4	42.00	89	30.5	34.3	12.8	42.9
325	66	M	128645					NBP	4.47	13.2	37.20	83.2	28.6	34.4	18.2	53.9
326	64	M	1129866	MA	VITB12	1	V	Macrocytic anemia	3.74	11.7	36.20	105.8	31.1	32.2	12.7	50
327	65	F	1129865					Leucopenia	3.96	13.8	33.60	87.5	27.6	31.6	15.6	55.3
328	73	F	1128976					Neutrophilia	2.78	13.2	25.40	91.3	33.2	36.3	15.9	59.2
329	87	M	234655	MA	MIX	1	NV	Macrocytic anemia	4.32	9.6	30.50	106.5	33	35	16.5	46.8

330	64	M	1298654	MHA	IDA	1,3	NV	MHA with thrombocytosis	4.67	10.8	42.20	68	20	26	13	47.6
331	66	M	1876308					NBP	4.51	13.6	34.10	83	28	31.3	15.5	47.4
332	63	M	1129699	NNA	ACD	1,3	NV	NNA	4.61	11.1	45.00	97.7		31.4	12.9	51.1
333	70	F	1128966	DA	VITB12	3	NV	DA with NL	2.45	7	21.10	88.4	28.6	33.1	25	45.7
334	67	F	1129739	MA	MIX	1	NV	Macrocytic anemia	3.16	9.6	28.70	104.2	30.2	33.3	14.6	54.1
335	68	F	1126899	NHA	IDA	1,2	NV	NHA	3.89	10.1	32.80	84.4	25	30.8	12.9	44
336	78	F	1129693					NBP	3.59	13.4	33.00	91.8	29.8	32.5	13.2	49.1
337	67	M	1129902	NHA	ACD	1,3	NV	NHA	4.39	11.6	39.50	89.9	25.2	30.1	13.2	48.3
338	71	M	1128646					NL	4.89	13.4	41.50	84.9	27.3	32.2	14	48
339	62	M	1238765					Leucocytosis	3.83	14.1	37.70	98.3	30.3	30.8	12.4	53.5
340	65	M	1127857	NHA	ACD	1,2	V	NHA	4.45	10.6	34.90	82	23.8	30.4	14.1	44.5
341	73	M	1129937					NBP	3.55	13.8	41.20	116.1	38.8	33.4	14	66.6
342	66	F	1129792	NNA	ACD	3,4	V	NNA	3.7	9.8	31.70	85.8	26.6	31	13.5	46.9
343	78	M	1128216	NHA	IDA	1	NV	NHA	4.03	10.1	33.10	82.2	25.1	30.5	17.2	57.2
344	70	M	1129516	NNA	ACD	1	NV	NNA	3.92	11.8	36.70	93.7	30	32	12.5	47.7
345	68	M	1139434					NBP	2.31	13.6	18.50	80.2	27	30.6	13.2	43.2
346	82	M	1129272	NHA	IDA	1	NV	NHA with leucocytosis	4.74	11.9	38.90	82	25.1	30.6	15	49.6
347	89	F	1120835					NBP	4.9	16.9	33.90	69.1	20.2	29.3	15.8	44
348	75	M	1129817					NBP	4.26	13.3	39.70	93.4	31.3	33.5	12.2	46.1
349	69	M	1129334	MHA	IDA	1	V	MHA	4.86	9.8	35.20	72.5	20.2	27.8	18.5	53.9
350	83	F	1129795					Lymphocytosis	4.4	13.2	32.80	85	30	32.7	12	44
351	60	M	1119449					erythocytosis with NL	5.58	17.6	53.00	95	31.5	33.2	13.3	51.3
352	71	M	1120661	MHA	IDA	1,3	NV	MHA	4.6	12	36.30	79	26.1	33.1	14.4	45.7
353	65	F	1116226					NL	5.32	13.8	43.30	61.3	26	32	13.7	44.8
354	60	F	1120964					NL thrombocytopenia	4.2	13.4	39.50	94	31.9	33.9	18.6	63.7
355	70	F	1120970					NBP	4.91	14.2	43.60	88.8	28.9	32.6	12.9	42.9
356	71	M	1120848	NHA	IDA	1,3	NV	NHA	3.18	9.2	27.90	87.7	28.9	33	16.9	55.1
357	66	M	1466789					NBP	5.87	16	49.70	84.8	27.2	32.1	14.1	47.9
358	60	F	1120949					NL	3.61	14.5	31.10	86.1	26.9	31.3	14.7	51.4
359	70	F	1120791					NBP	4.64	12.5	37.50	80.8	26.9	33.3	12.3	36.8
360	80	F	1120980					NBP	3.96	13.6	33.60	87.5	27.6	31.6	15.6	55.3
361	70	M	10681954					NL	4.61	14.2	45.00	97.7	30.7	31.4	12.9	51.1
362	66	F	10673987	NNA	VITB12	1,3	NV	NHA	3.59	10.7	33.00	91.8	29.8	32.5	13.2	49.1
363	63	F	1120203	NHA	IDA	1,3,4,6	NV	NHA	3.91	10.1	31.70	81.1	25.8	31.8	13.6	44.8
364	70	F	1120898					NBP	4.2	12.8	40.00	95.2	30.4	31.9	13	50.5
365	72	F	1118963					NBP	3.83	12.3	37.70	98.3	30.3	30.8	15.5	53.5
366	69	M	6587676	DA	IDA	1,2	NV	DA	4.03	10.1	33.10	82.2	25.1	30.5	17.2	57.2
367	65	M	1121023					Leucocytosis	4.74	14.2	38.90	82	25.1	30.6	15	49.6
368	60	M	1121117	NHA	ACD	2,5,6	NV	NHA	3.24	8.5	26.70	82.2	26.3	32	15.5	51.8
369	70	F	1121143					NBP	3.9	12.1	36.80	94.4	31	32.8	12.2	46.6
370	60	F	1121027	NHA	ACD	1	NV	NHA with NL with thrombocytosis	3.32	9.6	28.20	84.8	28.8	34	13.5	46.4
371	71	M	1121054	DA	FOLATE	1	V	DA WITH NL with thrombocytosis	3.16	5.3	18.10	57.2	16.9	16.9	17.1	38.8
372	62	F	120999					Relative Lymphocytosis	4.08	12.4	39.10	95.9	31.4	31.7	13.3	51.9
373	70	M	1120984	NHA	ACD	3	NV	NHA with	0.18	12.2	36.50	92.1	30.9	33.5	13.1	48.8

								thrombocytosis								
374	76	F	112559	MHA	IDA	1	NV	MHA	3.3	7.7	24.10	73.1	23.3	31.9	14.8	43.8
375	63	M	1121151					NL	5.15	18.1	53.10	103.7	35.2	34	13	54.6
376	72	M	1120997					NL with thrombocytopenia	4.71	15.7	45.00	95.5	33.4	35	12.5	48.1
377	65	M	1121049					Neutrophilia with thrombocyopenia	5.53	17.5	52.00	94.1	31.6	33.6	14	53.3
378	67	F	1121173	MHA	IDA	1	NV	MHA with neutrophilia	2.8	5.5	19.50	69.6	19.6	28.2	16.6	42.4
379	63	F	6491321					NBP	4.82	12.5	40.00	83	25.9	31.3	13	40.4
380	67	M	1120305					NBP	4.69	13.6	42.20	90	29	32.2	12.4	41.6
381	70	M	1121259	NNA	ACD	1,3	V	NNA with NL	4.04	11.2	36.50	90.3	27.7	30.7	13.5	45.5
382	60	M	1121119					Eosinophilia	5.37	14	44.50	82.9	26.1	31.5	12.9	40
383	70	M	112099					NL with thrombocytopenia	5.07	16.2	49.20	97	31.9	32.9	14	55
384	65	M	1122681					NBP	4.71	14.6	44.50	94.5	31	32	12.4	44.4
385	60	M	1122914					NBP	5.32	15	45.00	85.7	28.2	32.9	13.3	42.1
386	60	M	1123510					Leucocytosis	5.12	13.7	41.30	80.7	24.8	30.8	14	41.6
387	60	M	1121380	NHA	IDA	1	V	NNA with NL	3.85	9.5	29.80	77.3	24.6	31.6	17.8	55.7
388	60	M	1123585	NHA	IDA	1,3	NV	NNA with neutrophila and thrombocytopenia	3.72	10.4	30.00	80.6	28	34.7	12.9	38.7
389	67	M	1123823	NNA	ACD	1	NV	NNA with NL	4.12	10.6	32.00	83	29	31	13.4	34.8
390	68	F	876553					NL	3.65	12.9	32.40	83.7	34.1	38.5	13.9	31.7
391	70	M	1124122					NBP	2.96	14.8	29.60	99.8	26	35.4	12.9	52.2
392	67	M	1123488	NNA	ACD	1,2,5,6	NV	NNA with NL	3.4	11.8	34.60	97	33	34.1	11.8	46.3
393	60	M	1124306					Leucocytosis	2.81	14.2	32.40	115.3	39.4	34.2	13.2	62.7
394	75	M	1120661	NNA	ACD	1,3	NV	NNA	4.91	10.7	45.70	93.1	31.7	34	13	49
395	74	M	1123427	MA	VITB12	3	V	Macrocytic anemia	4.26	11.2	42.00	107	33.4	33.9	12.5	50.3
396	62	M	117262	NHA	ACD	2,3	NV	NHA	5.06	10.8	35.60	82	21.3	30.2	13.7	38.6
397	65	M	1123214					NL	2.48	16.5	27.00	108.8	38.2	35.1	14.3	64.1
398	75	M	1123222	NHA	ACD	1,2,4	NV	NHA with Neutrophilia	3.68	9.4	28.00	86	25.5	33.6	13.9	39.3
399	62	M	1234323	NHA	VITB12	1	V	NHA	4.64	11.5	37.50	80.8	25.4	33.3	12.3	36.8
400	68	F	1127977					NBP	4.47	13.2	37.20	83.2	28.6	34.4	18.2	53.9
401	68	F	1130428					NL	3.65	12.9	32.40	83.7	34.1	38.5	13.9	31.7
402	64	M	1130234					NBP	3.85	13.9	31.80	82.5	27.8	33.7	13.5	45.2
403	65	F	1126345	NNA	ACD	4	NV	NNA with Leucopenia with thrombocytopenia	3.91	11	33.30	85.1	28	32.9	14	48.4
404	79	F	1124193					NBP	3.8	13.2	36.80	96.9	30.7	31.7	12.8	50.5
405	65	M	1129272					NBP	5.39	14.1	47.00	87.2	26.2	30	13.6	43.4
406	70	F	1130059					NBP	4.28	12.9	41.30	96.5	30.1	31.2	12.7	45.3
407	64	M	1130216					NBP	4.1	13	34.00	85	30	32	14	38
408	60	M	1126515	NNA	ACD	1,3,2	NV	NNA with NL with thrombocytopenia	3.68	10.9	34.00	82	29	32	14	34
409	87	F	1129645	NHA	IDA	1,2	NV	NHA with leucocytosis	3.51	10.5	31.40	89.4	29.7	33.3	12.8	46.5
410	60	F	1130458	NHA	ACD	3,4	NV	NHA	4.8	11.5	43.80	85	30	35	14	53.5
411	65	F	1130456					NL	5.32	13.8	43.30	61.3	26	32	13.7	44.8
412	60	M	1130250					NBP	4.19	13.1	37.60	89.7	31.2	34.7	12.6	45.8
413	70	F	1128111					thrombocytosis	4.81	14.5	43.10	89.5	30.2	33.8	13.3	48
414	78	F	112812	NNA	ACD	4,6	NV	NNA with	3.34	10	29.00	86.9	30	34.5	12.1	42.4

								thrombocytosis								
415	60	M	1130118	NNA	ACD	1,3	NV	NNA	3.36	10.9	32.20	95.8	32.4	33.8	12.6	49.2
416	74	M	1123987					Leucocytosis	5.03	14.3	44.90	89.2	28.4	31.8	14.3	51.5
417	71	M	1130183					NL	4.76	14.6	45.50	95.7	30.6	32	12.8	49.7
418	61	M	1129200					Leucocytosis	5	15.3	47.90	95.8	30.6	32	13.8	53.8
419	70	F	1130089					NNA with thrombocytosis	0.18	12.2	36.50	92.1	30.9	33.5	13.1	48.8
420	80	F	1130059					NBP	4.06	12.8	38.40	94.5	31.6	33.4	13.7	52.9
421	63	F	1128049					NL	5.15	18.1	53.10	103.7	35.2	34	13	54.6
422	65	M	1127898					NBP	3.68	13.4	33.60	91.3	31.1	34.1	13.1	48.4
423	70	F	1049434	NNA	VITB12	1	V	NNA with thrombocytosis	2.54	8.4	22.80	89.8	33	36.8	15	54.7
424	60	M	6654994	MHA	ACD	3	NV	MHA	2.96	10.5	29.60	99.8	35.4	35.4	12.9	52.2
425	72	M	1129638	NHA	ACD	1,3,6	NV	NHA	3.57	11.8	34.60	97	33	34.1	11.8	46.3
426	62	M	1128632					NBP	3.57	13.2	37.60	105.3	37	35.1	14.7	63
427	68	M	1130137					erythrocytosis with leycocytosis	5.77	17.5	51.20	88.8	30.2	34.1	13.3	47.5
428	62	M	1130271					NBP	3.91	13.8	35.90	91.8	30.1	32.8	12.8	47.7
429	70	M	1130309					NBP	4.7	14.6	38.10	81.1	25.1	31	13	39.4
430	70	F	1130101					NBP	7.07	13.7	41.10	88.2	29.4	33.3	11.5	37.7
431	60	M	1130307					Thrombocytopenia	3.05	13	29.10	95.6	32.9	34.3	11.8	45.9
432	80	F	1072383	MA	VITB12	1,3	NV	Macrocytic anaemia	2.48	9.5	27.00	108.8	38.2	35.1	14.3	64.1
433	78	F	1130303					Neutrophilia	4.89	13.4	41.50	84.9	27.3	32.2	14	48
434	78	M	6595820					Relative Lymphocytosis	3.83	13.3	38.20	99.9	32	32.1	12.6	51.4
435	62	M	1130307	NHA	ACD	1	NV	NHA	3.28	10.1	31.00	94.6	30.8	32.6	18.4	70.8
436	65	M	1130339	NNA	ACD(CKD)	4,1	NV	NNA with lymphocytosis	4.16	12.5	39.50	95.1	30.1	31.6	13.6	52.6
437	65	M	1130342					NBP	3.55	13.8	41.20	116.1	38.8	33.4	14	66.6
438	69	F	1130321	DA	VITB12	1	V	DA	4.03	10.1	33.10	82.2	25.1	30.5	17.2	57.2
439	72	M	1128613	NHA	IDA	1,3	NV	MHA	4.9	9.9	33.90	69.1	20.2	29.3	15.8	44
440	60	F	1130301	NHA	ACD	2,5	NV	NHA	3.24	8.5	26.70	82.2	26.3	32	15.5	51.8
441	60	F	1113992					NBP	4.28	13.8	42.40	99.2	32.2	32.5	12.5	50.1
442	75	F	1130401					NL	5	16	50.90	101.9	32.1	31.5	14.1	58.4
443	64	M	1064508					Neutrophilia	4.86	13.7	42.80	88.1	28.1	31.9	12.9	45.58
444	65	M	1125569	MA	VITB12	1,6	V	Macrocytic anaemia	2.96	11.5	34.70	117.3	39	33.2	12.9	62.1
445	88	F	1064292					NL	4.79	16	49.60	103.6	33.5	32.3	13.5	56.6
446	65	F	1125748					NL	5.32	13.8	43.30	61.3	26	32	13.7	44.8
447	60	M	6631934					NBP	4.19	13.1	37.60	89.7	31.2	34.7	12.6	45.8
448	60	M	7126836	MHA	IDA	1	NV	MHA with neutrophilia	3.85	10.7	31.80	82.5	27.8	33.7	13.5	45.2
449	81	M	1063029	NNA	ACD	3	NV	NNA	3.36	10.9	32.20	95.8	32.4	33.8	12.6	49.2
450	75	F	1127169	NNA	ACD	1	NV	NNA with thrombocytosis	2.54	8.4	22.80	89.8	33	36.8	15	54.7
451	61	F	1127012					NBP	5.41	16.6	51.90	96	30.6	31.9	14.3	55.6
452	67	M	1125256					NL	4	13.9	32.00	82	32	34	13	35
453	63	F	1127379					NL	4.12	14.1	32.00	83	29	31	13.4	34.8
454	65	F	6635879					NL	3.65	12.9	32.40	83.7	34.1	38.5	13.9	31.7
455	64	M	1127453	DA	MX	1,3	V	DA	3.34	10	29.00	86.9	30	34.5	22	42.4
456	65	F	1126403	NNA	ACD	4	NV	NNA with Leucopenia	3.91	11	33.30	85.1	28	32.9	14	48.4

								with thrombocytopenia								
457	64	M	1127509	NNA	ACD	1,3,5	NV	NNA	5.03	11.2	44.90	89.2	28.4	31.8	14.3	51.5
458	67	M	1127079					Neutrophilia	2.78	13.2	25.40	91.3	33.2	36.3	15.9	59.2
459	88	M	1128068	MA	VITB12	1,3	V	Macrocytic anemia	3.16	9.6	28.70	104.2	30.2	33.3	14.6	54.1
460	65	F	1267897					NBP	3.67	12	36.20	98.7	32.9	33.3	13.3	53.6
461	65	M	1128125	MHA	IDA	1	NV	MHA	4.6	12	36.30	79	26.1	33.1	14.4	45.7
462	84	M	1122560						3.57	15.2	34.60	97	33	34.1	11.8	46.3
463	80	M	1128107	MA	VITB12	1,3	V	macrocytic anemia	2.81	11.4	32.40	115.3	39.4	34.2	13.2	62.7
464	60	F	1478987					relative lyMphocytosis	4.91	15.6	45.70	93.1	31.7	34	13	49
465	60	M	1298765					erythrocytosis with leycocytosis	5.77	17.5	51.20	88.8	30.2	34.1	13.3	47.5
466	64	F	1086985					NBP	4.48	14	43.70	97.5	31.3	32	14.1	51.1
467	65	M	1086795	DA	MX	1	NV	DA with NL WITH Thrombocytopenia	1.92	5	17.00	88.5	26	29.4	21.4	67.8
468	71	M	1987557	NHA	ACD	5	NV	NHA	3.18	9.2	27.90	87.7	28.9	33	16.9	55.1
469	65	F	6640378						3.24	12.5	26.80	82.5	29.2	35.4	15.5	51.9
470	73	F	6640872					Eosinophilia	3.86	14	41.00	88	30	34.8	11.9	41.8
471	65	F	1128321						3.74	13.1	36.20	96.5	31.1	32.2	12.7	50
472	60	F	1138413	MHA	IDA	1,3	V	MHA	4.32	9.6	30.50	70.7	22.8	32.2	16.5	46.8
473	60	F	1128297	NNA	ACD	5	V	NNA	2.45	7	21.10	88.4	28.6	33.1	13	45.7
474	60	F	1127247					NBP	3.59	13.7	33.00	91.8	29.8	32.5	13.2	49.1
475	72	M	1123194	NHA	ACD	2	NV	NHA	3.91	10.1	31.70	81.1	25.8	31.8	13.6	44.8
476	65	F	1265467					Relative Lymphocytosis	4.52	13.1	39.90	90	29	32.9	12.5	44.8
477	62	M	1128161	DA	MX	1	NV	DA	4.03	10.1	33.10	82.2	25.1	30.5	17.2	57.2
478	75	M	1128025	NHA	IDA	5,6	V	NHA with Leucocytosis	4.74	11.9	38.90	82	25.1	30.6	15	49.6
479	65	M	1128147	DA	VITB12	4	NV	DA	4.86	9.8	35.20	72.5	20.2	27.8	18.5	53.9
480	77	F	1128047					NL	3.2	15.7	27.00	84.2	29.2	34.6	13.2	45.3
481	63	M	1128248	NHA	VITB12	1,3	V	NHA	3.96	12.5	38.00	95.9	31.5	32.8	12.5	48.6
482	75	M	1064436					NBP	4.19	13.3	40.40	96.5	31.8	32.9	12.8	50.1
483	60	M	1126345	NNA	ACD	1,2	NV	NNA with NL	2.73	9	25.10	91.9	33.1	36	11.8	44.4
484	67	M	1128230					NBP	3.91	13.4	37.10	94.7	31.6	33.4	12.4	47.7
485	63	M	1128254	NNA	ACD	1,5	NV	NNA	3.94	11.7	34.80	88.3	29.7	33.6	13.6	48.6
486	65	M	1126600					NBP	3.67	13.1	36.20	98.7	32.9	33.3	13.3	53.6
487	67	M	1128358	MHA	IDA	1,3	NV	MHA	4.6	12	36.30	79	26.1	33.1	14.4	45.7
488	71	M	1128395	NHA	MX	2,6	V	NHA	3.57	11.8	34.60	97	33	34.1	11.8	46.3
489	80	M	1124315	MA	VITB12	1,2	V	macrocytic anemia	2.81	11.4	32.40	115.3	39.4	34.2	13.2	62.7
490	65	M	6425100					relative lyMphocytosis	4.91	15.6	45.70	93.1	31.7	34	13	49
491	60	M	1128179					erythrocytosis with leycocytosis	5.77	17.5	51.20	88.8	30.2	34.1	13.3	47.5
492	62	F	1125650	NHA	ACD	1,3	NV	NHA with leucocytosis	3.51	10.5	31.40	89.4	29.7	33.3	12.8	46.5
493	63	M	1125256					NBP	4.5	13.3	35.00	82	27	33	14	45
494	61	M	1128410	NHA	ACD	1	V	NHA	3.85	11.2	33.00	85.6	29.1	34	15.2	52.5
495	60	M	1128487	NNA	ACD	4,6	NV	NNA with Lymphocytosis	4.04	11	34.60	85.6	27.2	31.8	13.2	41.4
496	65	M	1117939					NL with thrombocytosis	5.36	15	46.30	86.6	28	32.3	13.5	42.4
497	75	M	1128534	MHA	IDA	1	NV	MHA	4.55	9.4	29.70	85.2	20.7	31.5	14.2	37.1
498	90	F	1131472	NHA	MX	1,2,6	NV	NNA with Eosinophilia	3.55	11.2	35.70	100	31.4	31.3	13.9	56.9

499	62	M	5625021	NNA	ACD	2,5	NV	NNA with leucocytosis	3.83	11	37.70	98.3	30.3	30.8	12.4	53.5
500	73	M	1131715					NBP	3.55	13.8	41.20	116.1	38.8	33.4	14	66.6
501	65	M	1120975					NBP	5.52	14.5	46.00	83.3	26.3	31.5	13.5	41.4
502	65	M	1120971					NBP	5.18	14.5	44.60	86.2	28	32.5	13	41.6
503	75	M	1120976					NBP	4.25	13.3	41.10	87	32	36	12.3	38
504	63	M	1118027					NL	4.52	13	41.90	92.3	28.9	31.1	14.4	54.2
505	60	M	1121261					NBP	4.99	13.5	42.80	85.8	27.1	31.5	13.1	42.1
506	64	M	1121226	MHA	IDA	1	NV	MHA	4.04	10.2	34.40	74	25.2	29.7	16.1	51
507	65	M	1121046					NBP	3.57	13.2	27.80	80.1	24.2	30.2	16.2	47.3
508	84	M	1120490					Eosinophilia	5.32	15	45.60	85.7	28.2	32.9	13.3	42.1
509	78	M	1131051					NBP	5.02	12.9	39.80	79.3	25.7	32.4	12.5	36.5
510	91	F	1121885	MHA	MX	1,3	V	MHA with eosinophilia	4.27	9.7	32.50	76.1	22.7	29.8	17.1	47.8
511	68	M	1118787					NBP	4.5	13.2	43.30	80.6	22.7	28.2	21.3	61.2
512	69	M	1121183					NBP	4.25	13.3	33.00	82	32	33.4	12	32
513	60	F	1122684					Neutrophilia	4.53	13.2	41.80	90.8	29.1	32	14.4	52.8
514	70	M	1120974					Eosinophilia	3.61	14.2	31.00	85.9	25.8	30	13.7	43.2
515	62	M	1122721					Leucocytosis	3.51	13.7	31.40	89.4	29.7	33.3	12.8	46.5
516	60	F	1122440	NNA	ACD	1	NV	NNA with lymphocytosis with eosinophilia with thrombocytosis	4.2	10.9	28.00	92.3	32.7	35.5	14.2	53.5
517	65	M	1123392					NBP	5.2	14.8	33.10	86	32.1	35.2	14	39.2
518	85	F	1122166					NL	4.18	13.2	40.40	96.5	31.5	32.6	13.9	54.5
519	71	F	1123172					NBP	3.87	12.9	36.00	82.8	32.1	33.9	12.4	37.8
520	60	M	1132056	MHA	MX	1	NV	MHA with NL	3.91	10.8	34.00	74	27.6	31.8	12.6	40.8
521	61	M	1126515	NHA	ACD(DM)	1	V	NHA with lymphocytosis with thrombocytosis	3.13	9.1	27.90	89.1	29.1	32.6	17.4	56.1
522	65	M	1129883					NBP	5.52	14.5	46.00	83.3	26.3	31.5	13.5	41.4
523	85	M	1131213	MHA	IDA	1,3	NV	MHA with neutrophilia	4.3	8.8	28.90	67.2	20.5	30.4	20.8	50.2
524	66	M	1120009					NBP	5.06	14	43.40	85.8	27.7	32.3	12.2	39.1
525	60	M	1132109					NBP	3.7	13.4	40.10	82	28	32.1	13.1	37
526	65	M	1132186					NBP	5.18	14.5	44.60	86.2	28	32.5	13	41.6
527	68	M	1132175					NBP	5.22	13.3	42.30	81	25.5	31.4	14	42.2
528	63	M	6640904					NBP	4.95	13.5	43.00	86.9	26.9	30.9	11.1	38.4
529	65	F	1132183	NNA	ACD	1,3	NV	NNA	3.68	11.1	36.00	97	30.2	30.8	13.2	49.1
530	75	M	1128718					NBP	4.25	13.3	41.10	87	32	36	12.3	38
531	88	M	1131454	NHA	ACD	1,3	V	NHA with thrombocytopenia	3.46	10.3	31.50	91.1	29.8	32.4	13.3	45.3
532	80	F	1131067	MHA	IDA	1	NV	MHA	3.97	11.3	34.00	87.7	28.5	32.5	12.8	41.1
533	64	F	1130606	DA	MX	1,2	V	DA with NL with thrombocytopenia	3.79	9.8	33.70	88.9	25.9	29.1	23.6	78.6
534	63	M	1129848					NL	4.52	13	41.90	92.3	28.9	31.1	14.4	54.2
535	62	F	1131444					Leucocytosis	3.49	12.3	33.20	95.1	29.5	31	14.4	51.1
536	70	M	1131192	MHA	ACD	1	NV	MHA with NL	4.45	11.9	36.90	82.9	26.7	32.2	12.8	38.9
537	74	M	6663053	NHA	ACD	1,3	NV	NHA	4.85	12.7	40.80	84.1	26.2	31.1	13.4	41.9
538	60	F	1131492					NBP	4.99	13.5	42.80	85.8	27.1	31.5	13.1	42.1
539	68	M	1128134	MHA	IDA	1,2,3,6	V	MHA with NL with Thrombocytosis	3.58	9.5	32.40	90.5	26.5	29.3	13.8	46.5

540	60	M	1130339					NBP	5.2	14.8	33.10	86	32.1	35.2	14	39.2
541	74	F	1131608	NHA	VITB12	3	NV	NHA with NL	4.14	11.7	36.00	97	28.2	32.5	12	42.2
542	64	M	1123794	MHA	IDA	1	NV	MHA	4.04	10.2	34.40	74	25.2	29.7	16.1	51
543	60	F	1131704					Thrombocytopenia	4.44	12	33.90	76.3	27	35.4	18.1	55.5
544	69	M	1109773					NL	4.18	13.2	40.40	96.5	31.5	32.6	13.9	54.5
545	67	M	1129712	NNA	ACD	1,3	NV	NNA with thrombocytosis	3.73	10.4	33.60	90.1	27.9	31	14.6	47.4
546	60	M	1131222					Leucocytosis with thrombocytopenia	4.88	14.7	45.20	92.6	30.1	32.5	14.4	50.1
547	67	F	1130636					Leucocytosis wuth lymphocytosis	4.18	12	37.70	90.2	28.7	31.8	12	40.3
548	65	M	1129919	NHA	ACD	1	NV	NHA	3.57	8.4	27.80	80.1	24.2	30.2	16.2	47.3
549	62	M	1131389					Eosinophilia	5.38	15	47.30	87.9	27.9	31.7	14.4	47.3
550	72	M	1131451	MHA	IDA	1,3	NV	MHA with eosinophilia	4.46	9.9	33.30	74.7	22.2	29.7	16.4	44.7
551	60	F	1128856	NHA	ACD	3	NV	NHA	3.75	10.8	35.50	84.7	28.8	30.4	16.8	54.2
552	60	M	1131404					Eosinophilia	5.32	15	45.60	85.7	28.2	32.9	13.3	42.1
553	80	F	6662843					NHA with Neutrophilia	3.65	12.3	32.90	90.1	28.2	31.3	13.3	44.7
554	70	M	1131377					Eosinophilia	4.13	13.1	39.90	96.6	31.7	32.8	13.6	48.4
555	65	M	1126403					NNA	3.54	13.9	32.40	91.5	28	30.6	13.8	46
556	60	F	1131051					NBP	5.02	12.9	39.80	79.3	25.7	32.4	12.5	36.5
557	65	F	1131157	NHA	ACD	3	NV	NHA with eosinophilia	3.52	10.6	34.30	97.4	30.1	30.9	15.1	54.6
558	68	M	1131099	MHA	IDA	1.6	NV	MHA	4.78	11.4	34.50	34.5	23.8	33	13.2	34.5
559	60	M	1131124	MHA	IDA	1,2	NV	MHA with eosinophilia	4.27	9.7	32.50	76.1	22.7	29.8	17.1	47.8
560	62	F	395448	MHA	IDA	1	V	MHA with NL	4.77	11.1	36.50	76.5	23.3	30.4	16.3	46.5
561	67	M	1131102					Eosinophilia with thrombocytopenia	4.37	13.1	42.60	97.5	30	30.8	18.9	64.4
562	60	M	1129718						4.5	13.2	43.30	80.6	22.7	28.2	21.3	61.2
563	61	M	1131055					NBP	4.83	13.3	41.60	86.1	27.5	32	14.3	46.1
564	75	F	1124932					NBP	4.18	12.9	39.90	95.5	28.5	29.8	15	53
565	68	F	6400025	NHA	IDA	1,3	NV	NHA	3.8	10.6	32.00	84.2	27.9	33.1	14.3	44.3
566	63	F	1130669	NNA	ACD	1,2,6	NV	NNA with lymphocytosis	4.04	11	34.60	85.6	27.2	31.8	13.2	41.4
567	62	M	113064					NBP	4.25	13.3	33.00	82	32	33.4	12	32
568	60	M	1129718	MHA	IDA	1,3,2	NV	MHA	4.15	10	32.60	78.6	24.2	30.8	18	57.8
569	86	M	1129341	MHA	ACD	1	NV	MHA	4.56	9.4	29.70	65.2	20.7	11.7	14.2	37.1
570	75	M	1128732					Neutrophilia	4.53	13.2	41.80	90.8	29.1	32	14.4	52.8
571	68	M	1130575					NBP	5.11	14.8	45.50	89	29	32.5	12.6	41.4
572	90	F	1128747	NNA	ACD	1,4	NV	NNA with Eosinophilia	3.55	11.2	35.70	100.4	31.4	31.3	13.9	56.9
573	70	M	1126398	NHA	ACD	2,4	V	NHA with Eosinophilia	3.61	9.3	31.00	85.9	25.8	30	13.7	43.2
574	80	M	1130059	MHA	ACD	1,2,5,6	NV	MHA with Leucocytosis	3.59	10.8	32.70	91.1	30.2	33.3	12.9	47.2
575	65	F	1128856	NNA	ACD(LRTI)	3	NV	NNA with leucocytosis	3.6	9.7	29.10	95.3	33.7	31.2	14.7	57.2
576	60	M	1125639	NHA	VITB12	1,3	V	NHA	3.85	11.2	33.00	85.6	29.1	34	15.2	52.5
577	67	F	1129954	NHA	FO	2,3	V	NHA with leucocytosis	3.51	10.5	31.40	89.4	29.7	33.3	12.8	46.5
578	73	F	1130633					NBP	4.36	13.4	39.30	90.1	30.7	34.1	15.5	40.7
579	68	M	1126515					NBP	4.2	13.2	28.00	92.3	32.7	35.5	14.2	53.5
580	60	M	1128134					NBP	3.88	13.8	34.00	87	32.3	28.7	14.7	48.3