"STUDY OF PREVALENCE & PATTERN OF ANEMIA AMONG PREGNANT WOMEN IN THEIR FIRST TRIMESTER IN RURAL POPULATION (FIELD PRACTICE AREA) OF SHRI B M PATIL MEDICAL COLLEGE, VIJAYAPURA DISTRICT, KARNATAKA, INDIA."

By

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Dissertation submitted to

BLDE (DEEMED TO BE UNIVERSITY), Vijayapura, Karnataka

In partial fulfilment of the requirements for the award of the degree of

DOCTOR OF MEDICINE IN PATHOLOGY

Under the guidance of

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LIST OF ABBREVATIONS USED

EDTA ----------Ethylene Diamine Tetra Acetate.

SD----------Standard Deviation

WHO----------World Health Organization

CBC----------Complete blood count

RBC----------Red Blood Cell

WBC----------White Blood Cell

Hb----------Hemoglobin

Hct---------- Hematocrit

MCV----------Mean Corpuscular Volume

MCH----------Mean Corpuscular Hemoglobin

MCHC----------Mean Corpuscular Hemoglobin Concentration

RDW----------Red cell Distribution Width

CV---------- Coefficient of variation

IDA----------Iron deficiency anemia

ANC----------Antenatal clinic

DIMORPHIC Anemia----------Dimorphic anemia

MACROCYTIC Anemia----------Macrocytic anemia

MCHC Anemia----------Microcytic hypochromic anemia

NCNC Anemia---------- Normocytic normochromic anemia

NCHC Anemia---------- Normocytic hypochromic anemia

NCNC Smear---------- Normocytic normochromic smear

ABSTRACT

Background:

India has always been a country with a high prevalence of anemia. The prevalence of anemia among pregnant women in India to be around 49.7 %. In Karnataka, Pregnant women age 19-49 years are anemic - In rural 48.7% according to national family health survey.

Objective:

To assess the prevalence & pattern of anemia among pregnant women in their first trimester in rural population (field practice area) of Shri B M Patil Medical College, Vijayapura district.

Materials and Methods:

The study was conducted on pregnant women in their first trimester attending antenatal clinic at rural health training centre, primary health centre, anganwadi mother and child health clinic of field practice area of Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura district. The study period was from 1st December, 2018 to 30th May, 2020. Total 200 ANC cases were recruited and studied. Detailed history of the included pregnant women were be elicited. Complete blood count were measured by Sysmex XN-1000 and peripheral blood smears were studied.

Results:

Overall prevalence of anemia among pregnant women was found to be (53%). The prevalence of mild, moderate and severe anemia were 38 (35.9)%, 60 (56.6)% and 08 (7.5)% respectively. Among 106 anemic pregnant women, common pattern of anemia was microcytic hypochromic 58 (54.7%). Also 31 cases (29.24%) had normocytic normochromic anemia, 8 cases (7.55%) had macrocytic anemia, 6 cases (5.66%) had normocytic hypochromic anemia, and 3 cases (2.83%) had dimorphic anemia.

Conclusion:

A high prevalence of anemia in first trimester pregnant women indicates that the anemia continues to be a major public health problem in rural area. It needs intervention for its control and prevention through better awareness, counselling and health education and treatment intervention at early period of pregnancy. Thus this study will help in planning and implementation of the policy for prevention of anemia & thus better fetal and maternal outcome.

Key Words: Prevalence, Pregnancy, Pattern, Anemia, Rural.

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INTRODUCTION

WHO has defined Anemia as "A condition in which the number of red blood cells (and consequently their oxygen carrying capacity) is insufficient to meet the body's physiologic needs".[1] Hemoglobin is needed to carry oxygen and if you have too few or abnormal red blood cells, or not enough hemoglobin, there will be a decreased capacity of the blood to carry oxygen to the body's tissues.[1]

According to WHO, prevalence of iron deficiency anemia is about 18% in developed countries and 35-75% (Average 56%) in developing countries. [1]

Prevalence of anemia in South Asian countries is the highest in the world. WHO estimates that even among South Asian countries, India has always been a country with a high prevalence of anemia. The prevalence of anemia among pregnant women in India to be around 49.7 %.[1] In Karnataka, Pregnant women age 19-49 years are anemic. In rural it is 48.7% according to national family health survey.[2]

WHO further divides anemia in pregnancy into mild anemia (hemoglobin 10-10.9 g/dl), moderate anemia (hemoglobin 7.0-9.9 g/dl) and severe anemia (hemoglobin < 7 g/dL).[1]

Iron deficiency anemia is the most common nutritional deficiency anemia in pregnant women.[3] The reasons for anemia in pregnant women are increase demand during pregnancy, deficient intake or absorption of iron, parasitic infestation or blood loss due to any reason. [4]

There is evidence that severe anemia increases perinatal morbidity and mortality by causing low birth weight and high incidence of preterm delivery, intrauterine growth retardation.[5]

In India, anemia is directly or indirectly responsible for 40% of maternal deaths. There is 8 to 10-fold increase in maternal mortality rate (MMR) when the Hb level falls below 5 g/dl. [6]

Wang C et al [7], Study showed that low hemoglobin concentration in first trimester predicts the preterm birth of the baby.

So early detection and prompt management of anemia in pregnancy can lead to decrease in maternal and perinatal mortality and morbidity.

Hence this study was done to find out the prevalence, pattern & severity of anemia among pregnant women in their first trimester in the rural population.

AIMS AND OBJECTIVES

To assess the prevalence & pattern of anemia among pregnant women in their first trimester in rural population (field practice area) of Shri B M Patil Medical College, Vijayapura district.

REVIEW OF LITERATURE

Anemia is defined as a reduction of the total circulating red cell mass below normal limits.[8] Anemia reduces the oxygen carrying capacity of the blood, leading to tissue hypoxia. [8,9]

A hemoglobin level of less than 11.0 g/dl is considered as the cut-off for diagnosis of anemia in pregnant women, as per the WHO.[1]

Anemia in pregnancy – Anemia during pregnancy is a major public health problem throughout the world, particularly the developing countries. [9]
Prevalence of anemia in pregnant women in India (Rural) is among the highest in the world. [2, 9]

According to Indian council of Medical Research criteria (ICMR) anemia was classified: [10,11]

• Mild anemia- 10-10.9gm/dl • Moderate anemia- 7.1-10gm/dl • Severe anemia- 4-7gm/dl

• Very severe anemia - < 4gm/dl

Major factors responsible for high prevalence of anemia among pregnant women are following.[6]

1. Inadequate dietary iron, folate intake due to low vegetable consumption, perhaps low B12 intake.
2. Poor bioavailability of dietary iron from the fibre and phytate rich Indian diets.
3. Blood loss due to infection. Example- Malaria and hookworm infestations.

Poor iron content in routine diet consumed by the young child contributes further to the prevalence of anemia in childhood, with the onset menstruation and accompanying blood loss, further rise in the prevalence and severity of anemia, early marriage and pregnancy at young age aggravate the problem, resulting in poor iron stores in pregnant women.

Women with mild anemia in pregnancy have decreased capacity, may go through pregnancy without any adverse consequences. Women with moderate and severe degree of anemia are risk of severe complications. Significant rise in perinatal mortality rate occurs when maternal hemoglobin level fall below 11gm/dl. [8]

Adverse effect of anemia in pregnancy may be highly risky for both mother and her child. So main aim of screening for anemia in pregnancy is to avoid the adverse effect that are associated with it.

Prevalence of anemia in women [2] (According to NFHS-4)

The demographics of anemia are well known and similar in many published reports. According to different criteria the prevalence of anemia in women is as follow:

Age:

According to NFHS-4 survey the highest incidence (54.1%) is in 15-19 years age women followed by (53.1%) in 20-29 years age group women. Anemia also occur in women with advanced age. [2]

Rural status:

According to NFHS-4 (2015-16) in India, survey that rural pregnant women population has higher prevalence rate of anemia i.e. 52.1% as compared to urban population i.e. 45.7%. [2]

Literacy status:

NFHS-4 study provides information that anemia is more prevalent in illiterate (no schooling) women 56.4%, while it is 48.7% prevalent in women who have completed their secondary school studies. [2] (12 or more years complete)

Religion:

According to NFHS-4 survey the incidence of anemia was observed in 53.7% Hindu population and 50.6% Muslim population. [2]

Socioeconomic status:

According to NFHS-4 survey, the disease has been reported to be more prevalent in low socioeconomic status women 58.7%, while in higher socioeconomical class women had 48.2% prevalence. [2]

According to WHO, prevalence of iron deficiency anemia is about 18% in developed countries and 35-75% (Average 56%) in developing countries. About one third of the global population (over 2 billion) is anemic. [1]

Figure 1: Prevalence of anemia of women reproductive age percentage

Worldwide, it is estimated that anemia contributes to 20% of maternal deaths directly and indirectly to 40% of all maternal deaths [12] . Among these, about half of the global maternal deaths occur in South Asian countries out of which 80% is contributed by India. [1]

Survey-4 (NFHS-4) (2015–2016), 50% pregnant women in India were anemic, [2] indicative that the condition is of severe public health significance. [13]

Anemia also causes changes in the immune status of the pregnant women. Hb levels below 11 g/dl are associated with a fall in the Band T lymphocyte count. This immunodepression in anemic women renders them more susceptible to infection, leading to increased morbidity. [6]

Screening for anemia in pregnancy is to avoid the adverse effects that are associated with it is the main aim of study. Apart from this, in pregnancy screening for anemia is useful for a variety of other reasons. It may be also helpful to collect baseline data on prevalence and severity and pattern of anemia in a given population, and to assess the effects of supplementation with iron tablets, oral anti-helminthic or anti-malarial prophylactics treatment. At primary care level, diagnosis of anemia can help decide whether referral is necessary for more detailed investigation and treatment. [14]

Consequences of the adverse effects of anemia in pregnancy may be highly risky for both the mother and her child. [15]

Classification of anemia by MCV : (Table 1) [16]

Microcytic, hypochromic	Normocytic, normochromic	Macrocytic
MCV <80 fl	MCV 80–95 fl	MCV >95 fl
MCH <27 pg	MCH ≥27 pg	Megaloblastic: vitamin B12 or folate deficiency Non-megaloblastic: alcohol, liver disease, myelodysplasia, aplastic anemia, etc.
Iron deficiency	Many haemolytic anemias	
Thalassaemia Anaemia of chronic disease (some cases) Lead poisoning Sideroblastic anemia (some cases)	Anemic of chronic disease (some cases)	
	After acute blood loss Renal disease Mixed deficiencies Bone marrow failure (e.g. post -chemotherapy, infiltration by carcinoma, etc.)	

- **MCH - mean corpuscular haemoglobin, MCV - mean corpuscular volume.**

CLASSIFICATION OF ANEMIA BY ETIOLOGY (TABLE 2) [8,17,22] :

MECHANISM	EXAMPLES
BLOOD LOSS	
Acute	Injuries (Trauma) Childbirth Gastrointestinal (GI) bleeding Surgery
Chronic	Heavy menstrual bleeding Ulcers in the stomach or small intestine Cancer or polyps in GI tract Kidney tumors Bladder tumors
DEFICIENT ERYTHROPOIESIS	
Microcytic	Iron deficiency Iron-transport deficiency (iron refractory iron deficiency anemia [IRIDA] Iron utilization defect (inherited sideroblastic anemia) Anemia of chronic disease Sideroblastic anemia Thalassemia Lead poisoning

Normochromic-normocytic	Anemia of chronic inflammation, infection, or cancer Kidney disease (Renal failure) Endocrine failure (hypothyroidism, hypopuitarism) Bone marrow failure (Pure red-cell aplasia, aplastic anemia, infiltration) Acute blood loss Malnutrition Myelodysplasia, Myelophthisis Polymyalgia rheumatica and giant cell arteritis
MECHANISM	**EXAMPLES**
Macrocytic	Vitamin B12 deficiency Folate deficiency Malabsorption (eg, tropical sprue) Alcohol use disorder Liver disease Copper deficiency Myelodysplasia
Immune-mediated injury of progenitors	Aplastic anemia Pure red cell aplasia

MECHANISM	EXAMPLES
Membrane alterations, Congenital	Hereditary elliptocytosis Hereditary spherocytosis Hereditary stomatocytosis Hereditary xerocytosis Neuroacanthocytosis
Metabolic disorders (inherited enzyme deficiencies)	Embden-Meyerhof pathway defects Glucose-6-phosphate dehydrogenase (G6PD) Deficiency Pyruvate kinase deficiency
Hemoglobinopathies	Thalassemia (beta, beta-delta, and alpha) Sickle cell disease (Hb S) Hemoglobin C disease Hemoglobin E disease Hemoglobin S-C disease Hemoglobin S–beta-thalassemia disease Unstable hemoglobins
Inherited genetic defects	Fanconi anemia Thalassaemia defects
EXCESSIVE HEMOLYSIS DUE TO INTRINSIC RBC DEFECTS	
Membrane alterations, acquired	Acquired stomatocytosis Hypophosphatemia

EXCESSIVE HEMOLYSIS DUE TO EXTRINSIC RBC DEFECTS	
Reticuloendothelial hyperactivity with splenomegaly	Hypersplenism
Immunologic abnormalities	Cold agglutinin disease Drug-induced Paroxysmal cold hemoglobinuria Thrombotic thrombocytopenic purpura (TTP) hemolytic uremic syndrome (HUS) Disseminated intravascular coagulation (DIC) Warm antibody hemolytic anemia
Infection	Malaria Clostridial sepsis Babesiosis Ebstein Barr virus (EBV) infection Parvovirus B19 infection
Mechanical injury	Cardiac valvular disease (defective cardiac valves) Foot strike hemolysis Marathon running Karate chopping
Drugs	Phenazopyridine (Pyridium) Ribavirin Cephalosporins

INCREASED RED CELL DESTRUCTION	
Acquired genetic defects	Paroxysmal nocturnal hemoglobinuria
Antibody-mediated destruction	Hemolytic disease of the new born Transfusion reactions
Membrane lipid abnormalities	Abetalipoproteinemia Severe hepatocellular liver disease
Toxic or chemical injury	Snake venom Spider bites Lead poisoning
DECREASED RED CELL PRODUCTION	
Nutritional deficiencies	Iron deficiency anemia B12 and folate deficiencies
Inflammation-mediated iron sequestration	Anemia of chronic disease
Erythropoietin deficiency	Renal failure Anemia of chronic disease
Primary hematopoietic neoplasms	Acute leukemia Myelodysplasia Myeloproliferative disorders
Space-occupying marrow lesions	Metastatic neoplasms Granulomatous disease
Unknown mechanisms	Endocrine disorders Hepatocellular liver disease

Complete blood count: (CBC)

CBC identifies several different parameters and can provide a great deal of information. The fundamental parameters of CBC that include Hb concentration, Hct, Total leucocyte count, Differential leucocyte count, RBC, MCV, MCH, MCHC, RDW and platelet count using an automated 5-part differential hematology analyzer (SYSMEX XN-1000) which plays an important role in the diagnosis, treatment, and monitoring of the anemic patient. [18,19]

Hemoglobin concentration: (Hb)

'A Hb level of less than 11.0 g/dl is considered as the cut-off for diagnosis of anemia in pregnant women, as per the WHO'[1]. Determination of Hb is a part of CBC. [19,26] Decreased Hb levels are found in anemia. [20]

The reference value of Hb is 13.5 ±2.0 gm/dl in adult females. [21]

Hematocrit: (Hct)

'Hematocrit (Hct) word, also called packed cell volume (PCV), means "to separate blood".
Hct decreases in the physiologic hydremia of pregnancy. Hematocrit ≤ 30% means that the patient is severely anemic. [22,31]

The reference value of Hb is 40.0 ±5 % in adult females. [23,24]

Red blood cell count: (RBC)

Red blood cell count has been recognized as the most efficient classical measurement in the differential diagnosis of microcytic anemia. [25]

The reference value of RBC is 3.6-4.8 X 10^{12}/ L in adult females. [19,25]

Red cell indices:

The hemoglobin content and size of erythrocytes (red blood cell indices), based on population averages, have traditionally been used to assist in the differential diagnosis of anemia.[22]

Mean corpuscular volume (MCV):

MCV has been used to guide the diagnosis of anemia in patients (testing patients with microcytic anemia for iron deficiency or thalassemia and those with deficiency of folate or vitamin B12 in macrocytic anemia). [23]

The reference value of MCV ± 2 SD is 90 ± 9 fl in adults. [27,28]

MCV < 80 fl – Microcytic anemia
MCV – 81-99 fl – Normocytic anemia
MCV > 100 fl – Macrocytic anemia

Mean corpuscular hemoglobin (MCH):

This parameter is affected by both hypochromia and microcytosis, it is least sensitive as MCV in detecting iron deficiency states. [24] MCH is the average amount of hemoglobin in a single red cell.

The reference value of MCH is 27-32 pg in adults. [27]

An increase of MCH is associated with macrocytic anemia; a decrease of MCH is associated with microcytic anemia.

Mean corpuscular hemoglobin concentration (MCHC):

MCHC is obtained by dividing hemoglobin value by packed cell volume and expressed in grams/dl or grams/liter. It refers to concentration of hemoglobin in 1 liter or 1 dl of packed red cells. [19]
The reference value of MCHC is 33 ± 3 g/dL in adults. [27]

If MCHC is normal, red cell is normochromic, and if low (MCHC < 30 g/dL), red cell is hypochromic. [18]

Blood indices in different anemia (Table 3) [19,28,33]:

Blood indices	**Normal**	**IDA (Iron deficiency anemia)**	**Vitamin B12 and folate deficiency**
MCV= PCV / RBC (fl)	80-100 fl	< 80 fl	> 100 fl
MCH= Hb% / RBC (pg)	27-32 pg	< 27 pg	> 32 pg
MCHC = Hb% / PCV (g/dl)	30-35 g/dl	< 30 g/dl	32-35 g/dl

Peripheral blood smear : (PS)

Peripheral smear – PS (peripheral blood film; PBF) can provide important additional information about red cell morphology (size, shape of RBCs) in anemia and are easily prepared manually using Leishman stain examined for morphology. These features help in characterising different pattern of anemia. [28]

The hematology laboratory usually examines a peripheral smear if the patient's indices are abnormal (unless there has been no major change from previous CBCs). If an underlying blood disorder is suspected, a film should be requested. [22,29] Visible changes in shape, cell diameter, and hemoglobin content can be used to distinguish both macrocytic and microcytic cells from normocytic/normochromic RBCs. [28,30]

Peripheral blood smear findings for the diagnosis of different types anemia-

In normocytic amenia, peripheral blood smear demonstrates predominantly red cells of normal size are termed as normocytic. MCV value – 81-99 fl in normocytic anemia.

In microcytic hypochromic anemia :

Red cells are microcytic hypochromic with poikilocytosis showing few cigar/pencil-shaped red cells. Microcytosis in red cells in the peripheral smear is recognized by their size is smaller than the nucleus of small lymphocytes. Hypochromia is recognized by central pallor being more than l/3rd the diameter of the cell, In severe anemia, central pallor becomes 2/3rd to 3/4th of the cell and only peripheral rim of hemoglobin is seen (pessary/ring cells). [27, 28]

In macrocytic anemia, peripheral blood smear demonstrates predominantly macrocytic red cells with anisopoikilocytosis showing characteristic features hypersegmented neutrophils and macro-ovalocytes. Dyserpthropoiesis features like Howell-Jolly bodies, 8-shaped Cabot ring, basophilic stippling, nuclear budding, and irregular nuclei can also be seen. [28,29]

While in dimorphic anemia, peripheral blood film demonstrates dual population microcytic hypochromic red cells and macrocytic red cells. It is due to vitamin B12, folic acid, and iron deficiency. In such cases, MCV may not be high but may be normal to slightly low. [28]

Red blood cell distribution width (RDW):

Red blood cell distribution width (RDW) is an index of variation in sizes of red cells, variation in cell volume within red cell population. [19] It indicate degree of anisocytosis is calculated by RBC histogram. [21,32]

RDW-CV is the ratio of the width of the red blood cell distribution (RDW) curve at 1 SD divided by MCV (Figure 2). Normal range : RDW-CV = 13 ± 1%.

RDW-SD is measured by calculating the width at the 20% height level of the red blood cell size distribution histogram. Normal range : RDW-SD = 42 ± 5 fl. [18,22,30]

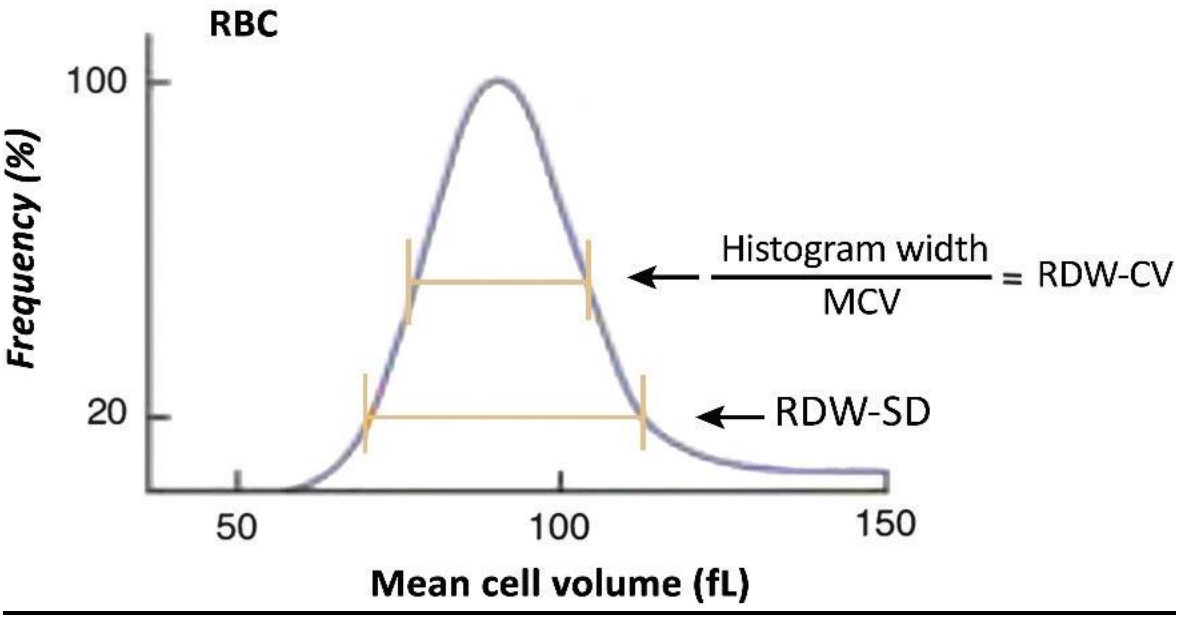


Figure 2: Red blood cell distribution width (RDW). Automated counters provide measurements of the width of the red blood cell distribution curve. RDW-CV is calculated from the width of the histogram at 1 SD from the mean divided by MCV. [21]

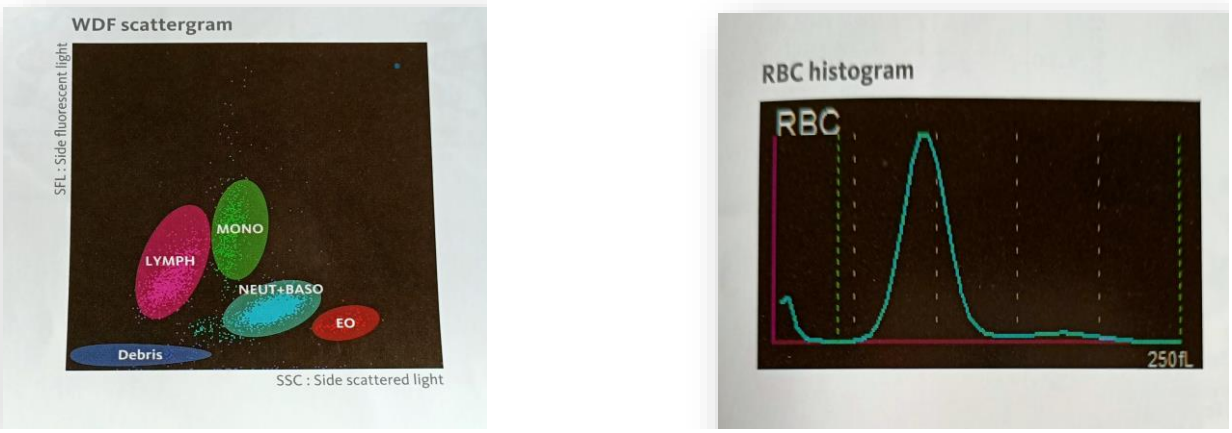


Figure 3 : WBC Differential scattergram and RBC Histogram

The figure of WBC differential scattergram (WDF) and histogram (RBC), by Automated Hematology Analyzer (Sysmex XN-1000).

Review of other studies –

Abel R et al [34] in 2001, studied that 56.6% of pregnant women were anemic in their first trimester. The mean Hb was 10.7 g/dl. During the first trimester there were no women with severe anemia.

Virender P. Gautam et al [35] in 2002, in their study on pregnant women found that prevalence of severe anemia was significantly higher in those with age >25 years, educated till high school or less, nuclear family, no history of abortions and birth interval of >36 months.

Noronha JA et al [36] in 2008, found that prevalence of anemia was 50.1% among pregnant women. The prevalence of anemia was 57.7% among ante-natal women who were in the age group of 17-21 years. This indicates that early marriage predisposes the risk for occurrence of anemia in pregnancy.

L. Jin et al [37] in 2010, revealed prevalence of anemia in 1st trimester of pregnancy was 29.6% and increased from first to third trimester. The prevalence of anaemia was higher in rural area's women with less education and in women with higher gravidity or parity.

Lokare P et al [5] in 2012, found overall prevalence of anemia among pregnant women was 87.21%. Factor such as level of education of women and their husband, religion, socioeconomic status associated with prevalence of anemia in pregnancy.

Srinivasa Rao P et al [38] in 2013, revealed that 93.26 % of pregnant women were anemic. Anemia in 1st trimester of pregnancy was endemic and microcytic hypochromic anemia is most common in this region. Among them, 73.07% had mild anemia, 20.19 % had moderate anemic & none had severe anemia. Prevalence of anemia in that study was very high.

Rajamouli J et al [9] in 2016, found prevalence of anemia 58.36% including mild, moderate & severe anemia. Highly significant factors association was found with the mother's age, education, socio-economic status, parity and dietary habits.

Suryanarayana R et al [26] in 2016, found high prevalence 64% of anemia among pregnant women. Among them, 27% were mildly, 34% moderately, and 3% severely anemic. The mean hemoglobin 10.3 ± 1.53 g%. Anemia predominantly observed among below poverty line families 59.4% compared with above poverty line families 5.4%.

Tyagi N et al [39] in 2016, revealed prevalence of anemia in 1st trimester of pregnancy was 84.4%, and microcytic hypochromic 42% is most common pattern of anemia. Out of the anemic cases 60.30% were moderately anemic.

Kundap R et al [40] in 2016, found iron deficiency anemia prevalence was 54% in primigravida and the prevalence increased as gravida status increased. Iron deficiency anemia was statically significantly associated with social status, residence, literacy level, dietary habits, monthly income.

Rawat K et al [41] in 2016, was found 48.4% prevalence of anemia among pregnant women. Most common morphological type was microcytic hypochromic anemia 51% followed by normocytic normochromic anemia 32%. The percentages of mild, moderate and severe anemia were 35.1%, 51.3% and 13.4% respectively.

Nair M et al [42] in 2016, found that prevalence of anemia among pregnant women was 65.1% of which 32.8% were moderately anemic, 29.79 % mildly anemic, 2.1% severely anemic. Women with severe anemia was associated with increased risks of PPH, low birthweight, small-for-gestational age babies and perinatal death.

Mangla M ,Singla D[43] in 2016, found significantly high prevalence of anemia 98% among the pregnant women in rural areas of India. The mean hemoglobin level found to be 8.8 gm%. Number of ANC visits in present pregnancy and whether the pregnant female had taken iron folic acid prophylaxis also were very significant variables in the determination of prevalence and severity of anemia.

Cheema H et al [44] in 2016, found high prevalence of anemia 65.6% in pregnant women, also observed higher prevalence of anemia in last trimester of pregnancy as compared to 1st and 2nd trimester of pregnancy.

Latha K et al [45] in 2016, found prevalence of anemia 64% among pregnant mothers attending antenatal clinic at primary health centre. About 52% of the women had no knowledge on the importance of consuming iron rich nutritious diet during pregnancy.

Seema BN et al [46] in 2017, studied prevalence of anemia was 96.5% among the pregnant females. Out of these 22.47% had mild anemia, 56.30% had moderate anemia, 14.98% had severe anemia and 2.73% very severe anemia according to ICMR classification of anemia. The average age of pregnant women was 23.5 years, ranging between 18 and 40 years. The mean hemoglobin level was found to be 8.95.

Prashanth D et al [47] in 2017, studied prevalence of anemia among pregnant women attending antenatal clinics in rural field practice area was 72.5% in Belagavi, shows a much higher burden of anemia.

Acheampong K et al [48] in 2018, studied overall prevalence of anemia was 51.0%. The severities of all diagnosed anemia cases were mild (60.8%) to moderate (39.2%). Severe anemia was not found in any cases. Also revealed that, the mean with ± standard deviation of hemoglobin value was 10.9±1.3 (95% [confidence interval] =10.7–11.1).

Mehrotra M et al [49] in 2018, was observed anemia in 50.9% of the sample. Prevalence and severity of anemia decreased with increasing educational level and increasing gestational age, and increased with increasing gravidity.

Shridevi et al [50] in 2018, revealed prevalence of anemia in pregnant women of rural Telangana was about 20%. Age-wise, majority 58.3% of the patients were between 21 to 25 years. Gravida more than 2 were more 66.6% when compared to lower parity. Majority pregnant women 56.6% suffered with moderate degree of anemia. Morphologically, microcytic hypochromic type i.e., iron deficiency anemia was the most common.

Finkelstein JL et al [51] in 2020, observed 30% of women were anemic (Hb < 11.0 g/dl), 23% had iron deficiency anemia at their first prenatal visit. IDA (Iron deficiency anemia) was associated with higher risk of low birth weight, and preterm birth. The prevalence of anemia and iron deficiency was high early in pregnancy and associated with increased risk of adverse pregnancy and infant outcomes.

MATERIALS AND METHODS

Source of data :

Field practice area (antenatal clinic at rural health training centre, primary health centre, anganwadi mother and child health clinic) of Shri B.M Patil Medical College, Hospital and Research Centre.

Study period: 1st December, 2018 to 30th May, 2020.

Methods of collection of data :

Sampling design: Simple random sampling was adopted to choose sample from the population with information of pregnant female in the village, according to our inclusion criteria.

Detailed history of the included pregnant women were elicited. Under all aseptic precautions, 2 ml of venous blood samples were collected in ethylene diamine tetra acetic acid vacutainer and immediately analyzed for a complete blood count, using an automated 5-part differential hematology analyzer (SYSMEX XN-1000) and a peripheral smear were prepared from same sample with Leishman stain examined for morphology.

Hemoglobin level of less than 11.0 g/dl was considered for diagnosis of anemia in pregnant women. [1]

Figure 4 : Automated Hematology Analyzer (Sysmex XN-1000)

Table 4: The reference values for the studied hematological parameters are as follows:[52]

S. No.	HEMATOLOGICAL PARAMETERS	REFERENCE RANGE
1.	Hb	13.5 ±2.0 gm/dl
2.	HCT	40.0 ±5 %
3.	MCV	86.0 ±9.0 fl
4.	MCH	29.0 ±4.0 pg
5.	MCHC	34.0 ±3.0 gm/dl
6.	Platelets	1.5-4.5 lakh/µl
7.	RDW-SD	42.5 ±3.5 fl
8.	RDW-CV	12.8 ±1.2 %
9.	Total leucocyte count	4500-11000/cumm
10.	Differential leucocyte count	*N (40-75%), L (25-40%), M (2-8%), E (1-6%), B (0-1%)

*N- Neutrophil, L- Lymphocyte, M- Monocyte, E- Eosinophil, B- Basophil.

Sample Size:

With anticipated prevalence of anemia as 58.7% [9], 95% confidence level and margin of error of ±7%, a sample size of 200 subjects was allow the study of prevalence & pattern of anemia among pregnant women in their first trimester in rural population (field practice area) of Shri B M Patil Medical College, Vijayapura district.

By using statistical formula: $n = \frac{Z^2 x\ p\ x\ (1-p)}{d^2}$

n= sample size

Z= statistics for 95% level of confidence

p= expected prevalence or proportion.

d= margin of error

Hence, a minimum of 200 cases was included in the study.

Statistical analysis:

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean± standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. Chi-square (χ^2) test was used for association between two categorical variables.

The formula for the chi-square statistic used in the chi square test is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

The subscript "c" are the degrees of freedom. "O" is observed value and E is expected value. C= (number of rows-1)* (number of columns-1)

The difference of the means of analysis variables between more than two independent groups was tested by ANOVA and F test of testing of equality of Variance.

ANOVA

Source	d.f.	SS	MS	F
Treatment	$a-1$	SS_{treat}	$\frac{SS_{treat}}{a-1}$	$\frac{MS_{treat}}{MS_{error(a)}}$
Error (a)	$N-a$	$SS_{error(a)}$	$\frac{SS_{error(a)}}{N-a}$	
Time	$t-1$	SS_{time}	$\frac{SS_{time}}{t-1}$	$\frac{MS_{time}}{MS_{error(b)}}$
Treat x Time	$(a-1)(t-1)$	$SS_{treat\ x\ time}$	$\frac{SS_{treat\ x\ time}}{(a-1)(t-1)}$	$\frac{MS_{treat\ x\ time}}{MS_{error(b)}}$
Error (b)	$(N-a)(t-1)$	$SS_{error(b)}$	$\frac{SS_{error(b)}}{(N-a)(t-1)}$	
Total	$Nt-1$	SS_{total}		

The sources of the variation include treatment; Error (a); the effect of Time; the interaction between time and treatment; and Error (b). Error (a) is the effect of subjects within treatments and Error (b) is the individual error in the model. All these add up to the total.

Bivariate correlation analysis using Pearson's correlation coefficient (r) was used to test the strength and direction of relationships between the interval levels of variables.

If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analyzed using SPSS software v.23 (IBM Statistics, Chicago, USA) and Microsoft office 2007.

Inclusion criteria: Pregnant women of rural area attending antenatal clinic (ANC) in their first trimester at rural health training centre, primary health centre, anganwadi mother and child health clinic of field practice area of Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura were be included in the study.

Exclusion criteria:

- Pregnant women who has received oral/parenteral iron supplementation within the last 3 months.
- Pregnant women who has received blood transfusion within the last 3 months.

RESULTS

The study was conducted on pregnant women attending antenatal clinic at rural health training centre, primary health centre, anganwadi mother and child health clinic of field practice area of Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura district. The study period was from 1st December, 2018 to 30th May, 2020. Hematological analysis was done in the Department of Pathology.

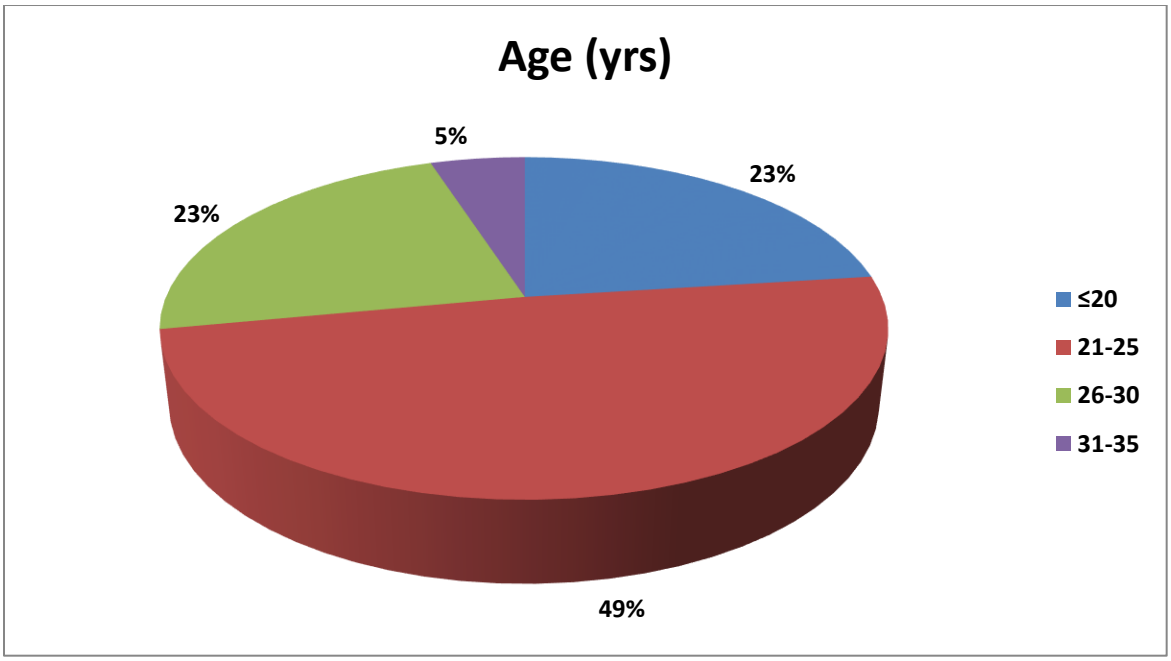
A total of 200 pregnant women in their first trimester were included in this study. The observations and results of the study are as follows.

I - Distribution of Cases according to age

Table : 5

Age (yrs)	N	Percentage
≤20	46	23
21-25	98	49
26-30	46	23
31-35	10	5
Total	200	100

Figure : 5



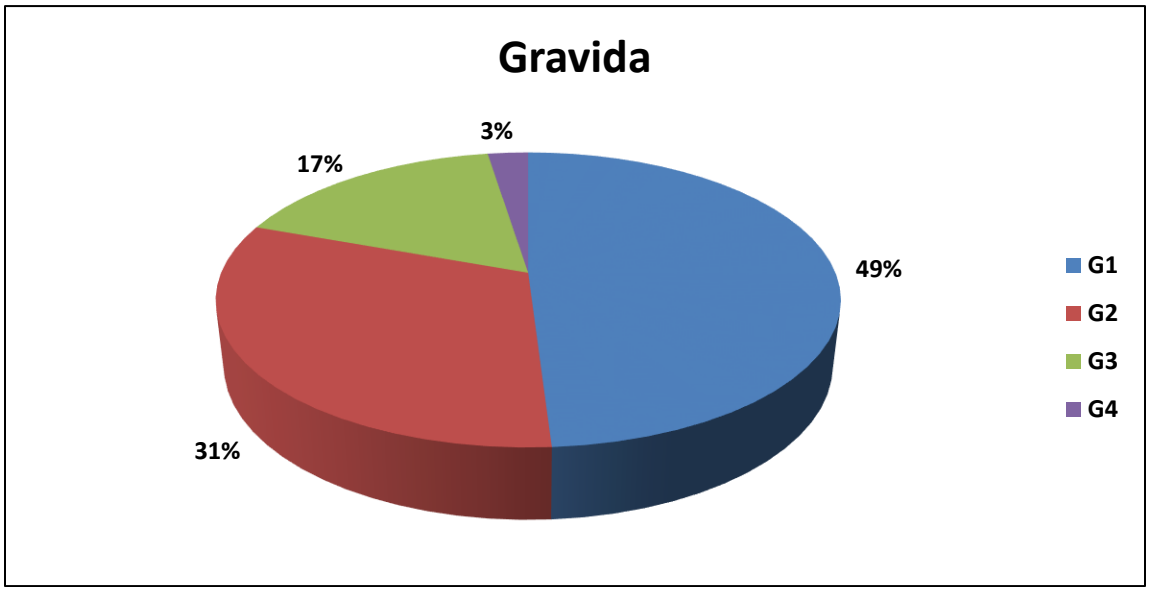
The majority of pregnant women 98 (49%), in this study were in the age group 21-25 years. 46 (23%), were less than 20 years of age, 46 (23%), were in the age group 26-30 years, and 10 (5%) were in the age group 31-35 years of age.

II- Distribution of Cases according to Gravida

Table : 6

Gravida	N	Percentage
G1	98	49
G2	63	31.5
G3	34	17
G4	5	2.5
Total	200	100

Figure : 6



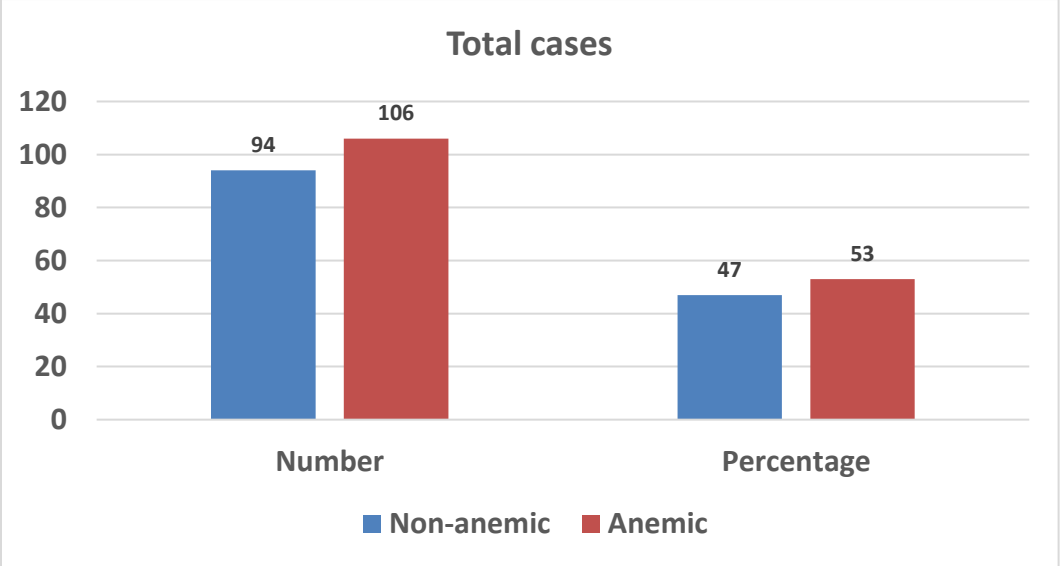
98 (49%) women were primigravida. 63 (31.5%) women were gravida two, 34 (17%) were gravida three, 5 (2.5%) were gravida four.

III- Distribution of Total cases- (Prevalence of anemia)

Table : 7

Cases	Number	Percentage
Non-anemic	94	47
Anemic	106	53
Total	200	100

Figure : 7



Among 200 total cases , 106 cases were anemic and 94 cases were non anemic.

In present study, prevalence of anemia was found to be 53%.

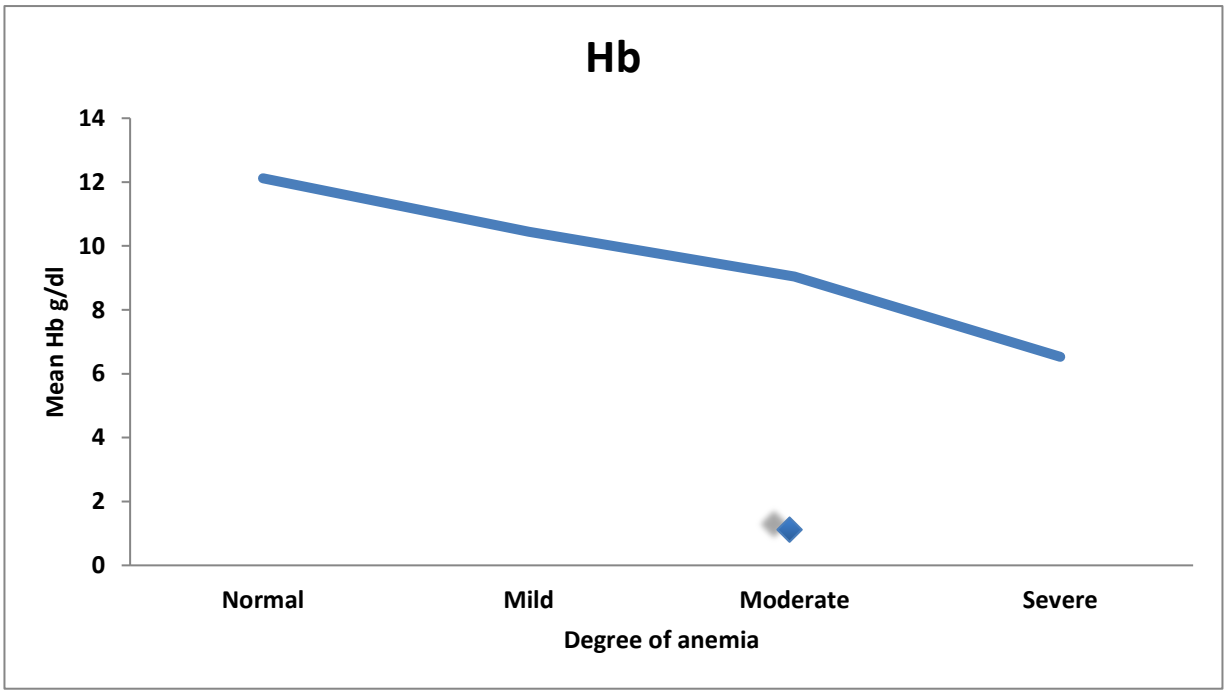
IV- Mean Hb according to Degree of Anemia

Table : 8

Parameters	Degree of Anemia				p value
	Normal	Mild	Moderate	Severe	
Mean Hb (g/dl)	12.12±0.78	10.45±0.27	9.04±0.77	6.53±0.44	<0.001*

Note: * significant at 5% level of significance (p<0.05)

Figure : 8



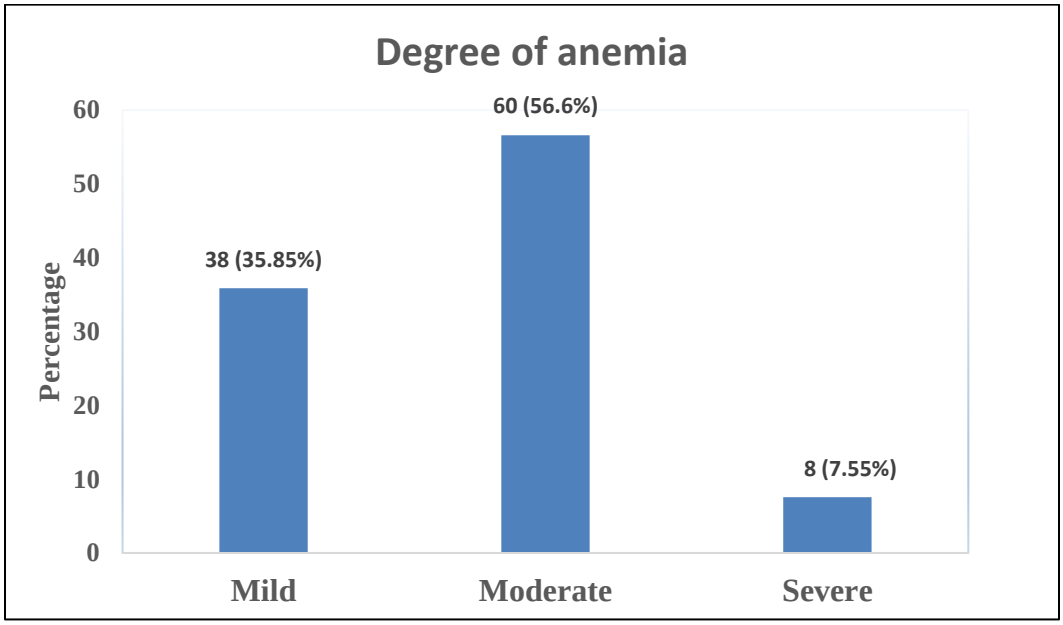
In this study Mean Hb level in mild, moderate and severe degree of anemia were 10.45g/dl, 9.04g/dl, 6.53g/dl respectively.

V- Distribution of Cases by degree of Anemia

Table : 9

Anemia	N	Percentage
Mild	38	35.85
Moderate	60	56.60
Severe	8	7.55
Total	106	100

Figure : 9



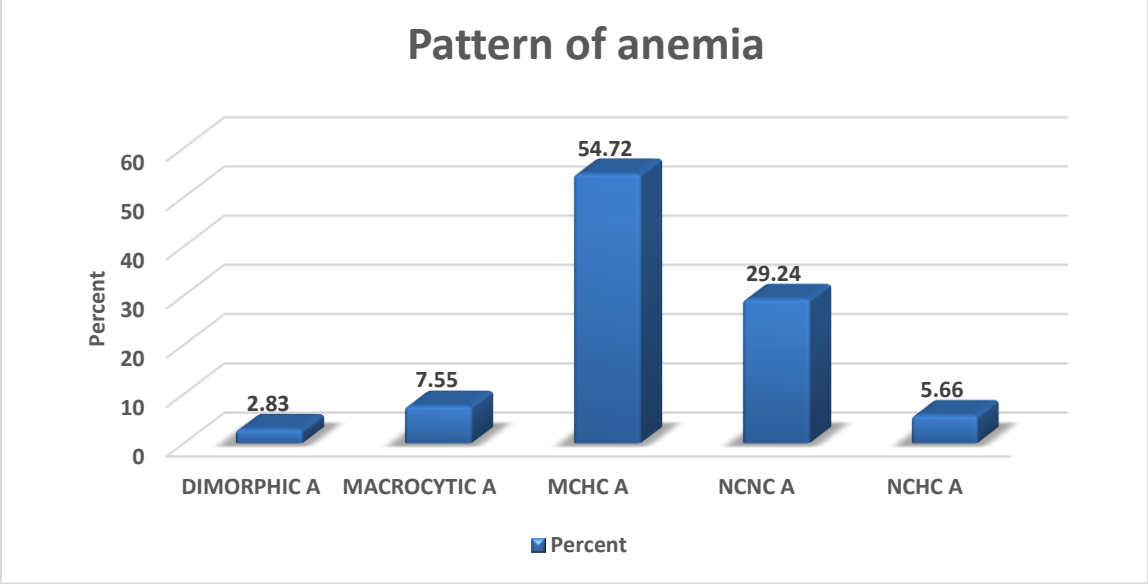
38 (35.85) pregnant women had mild anemia, 60 (56.6%) had moderate anemia, and 8 (7.55%) had severe anemia.

VI- Distribution of Cases by pattern of anemia

Table : 10

Type of Anemia	N	Percentage
DIMORPHIC Anemia	3	2.83
MACROCYTIC Anemia	8	7.55
MCHC Anemia	58	54.72
NCNC Anemia	31	29.24
NCHC Anemia	6	5.66
Total	106	100

Figure : 10



In all 200 ANC cases, 106 cases were anemic and 94 cases were non anemic.

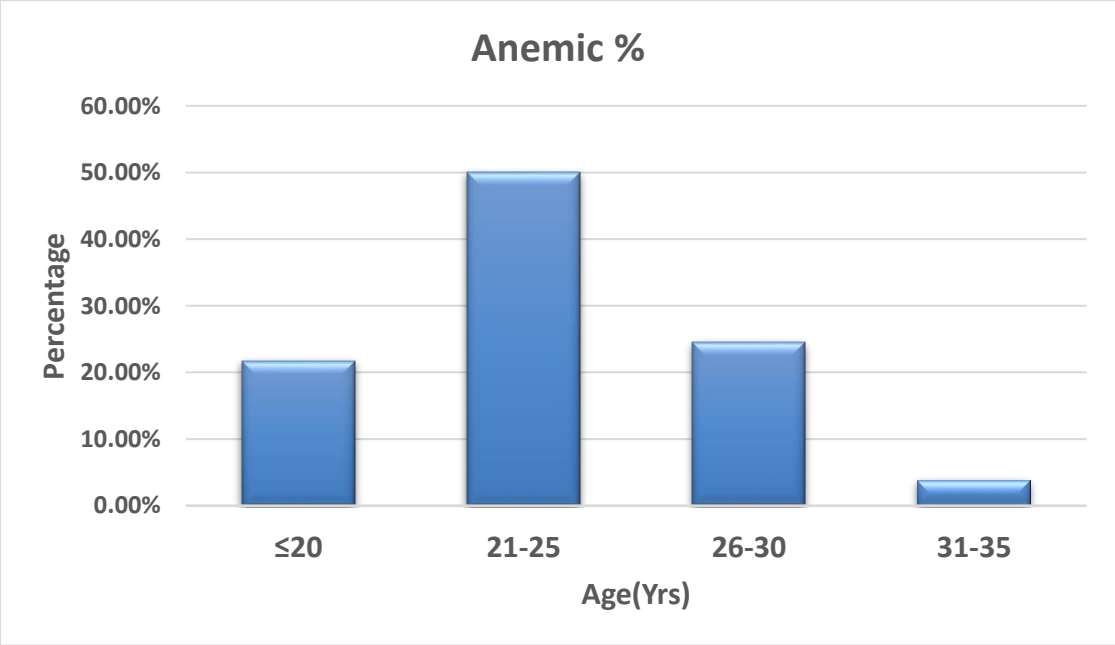
Out of 106 anemic cases, 58 cases (54.72%) had microcytic hypochromic pattern of anemia, 31cases (29.24%) had normocytic normochromic anemia, 8 cases (7.55%) had macrocytic anemia, 6 cases (5.66%) had normocytic hypochromic anemia, and 3 cases (2.83%) had dimorphic anemia.

VII- Percentage of anemia at different age group

Table : 11

Age (yrs)	Anemic %
≤20	21.7%
21-25	50%
26-30	24.5%
31-35	3.8%

Figure : 11



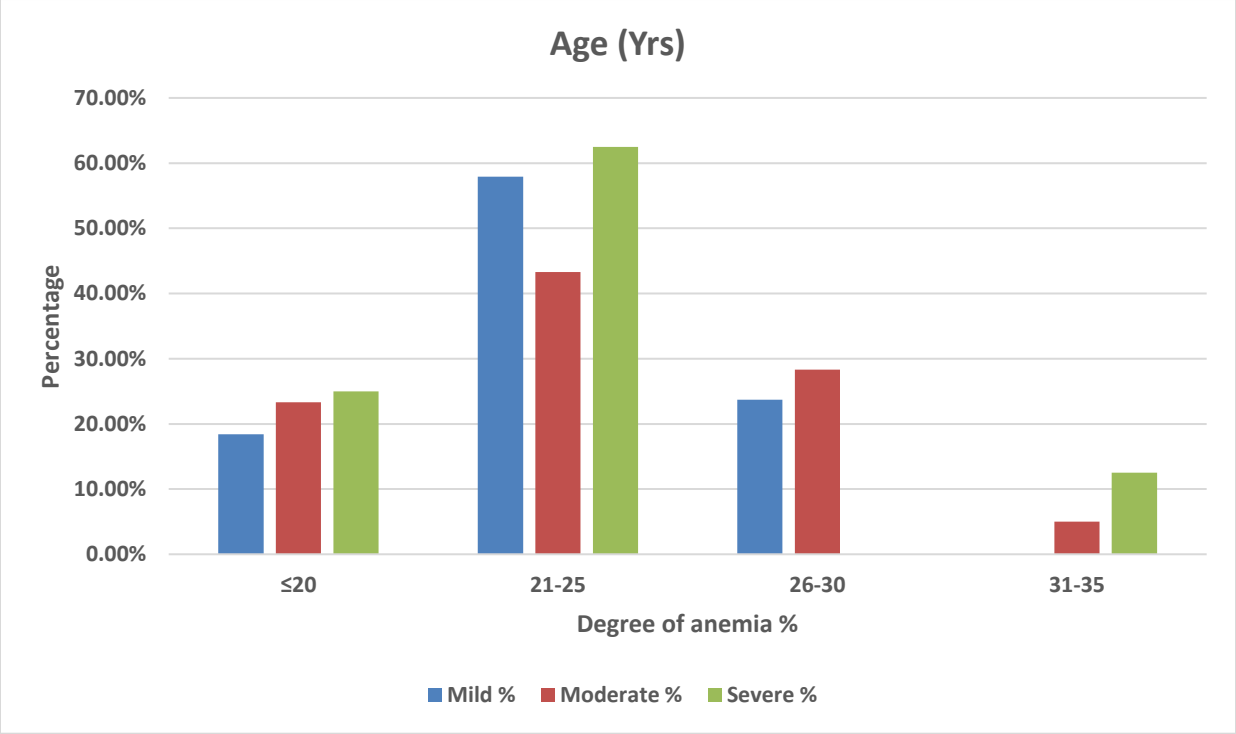
Study shows, higher prevalence of anemia 53 (50%) were in the age group 21-25 years, 26 (24.5%) were in the age group 26-30 years, 23 (21.7%) were in the age group ≤ 20 years, 4 (3.8%) were in the age group 31-35years.

VIII - Distribution of Age according to degree of anemia

Table : 12

Age (Yrs)	**Mild anemia %**	**Moderate anemia %**	**Severe anemia %**
≤20	18.4	23.3	25
21-25	57.9	43.3	62.5
26-30	23.7	28.3	0
31-35	0	5	12.5

Figure : 12



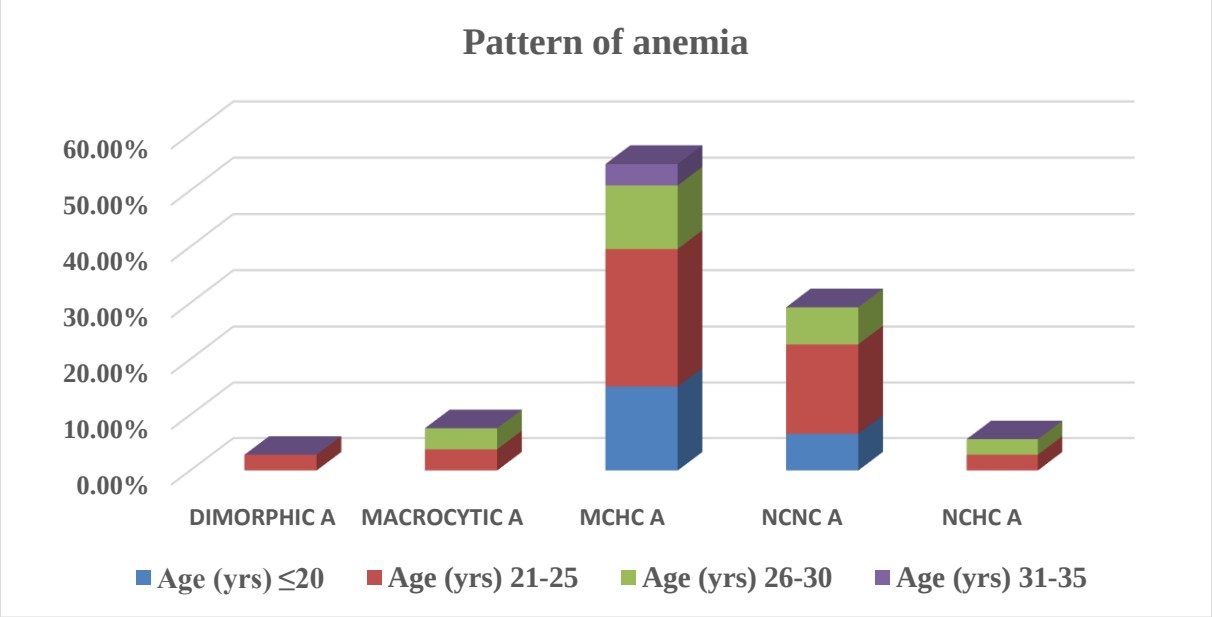
In all age group ≤20 to 31-35 yrs moderate degree of anemia were common.

IX- Distribution of Age according to morphological pattern of anemia

Table : 13

Pattern of Anemia	Age (yrs)								p value
	≤20		21-25		26-30		31-35		
	N	%	N	%	N	%	N	%	
DIMORPHIC Anemia	0	0.0%	3	2.83%	0	0.0%	0	0.0%	0.175
MACROCYTIC Anemia	0	0.0%	4	3.8%	4	3.8%	0	0.0%	
MCHC Anemia	16	15.1%	26	24.5%	12	11.3%	4	3.8%	
NCNC Anemia	7	6.6%	17	16.04%	7	6.6%	0	0.0%	
NCHC Anemia	0	0.0%	3	2.83%	3	2.8%	0	0.0%	
Total	23	21.7%	53	50%	26	24.5%	4	3.8%	

Figure : 13



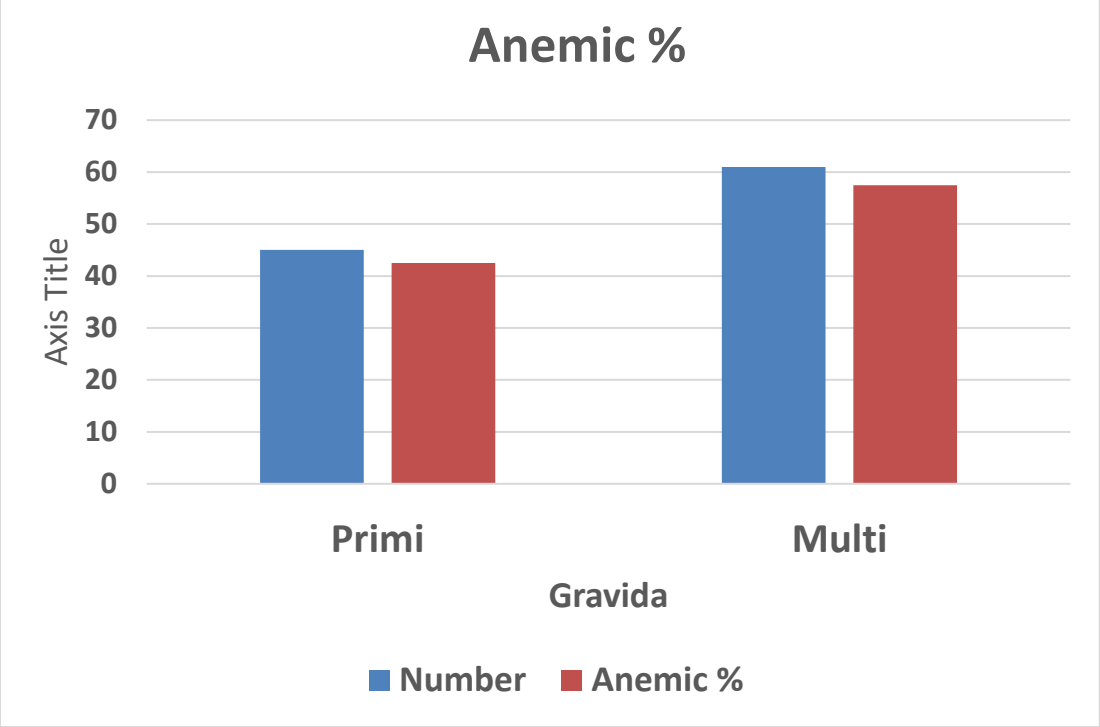
The majority of anemic pregnant women, 53 (50%), in this study were in the age group 21-25 years. Anemic pregnant women of age group ≤20 to 31-35 years, commonest pattern of anemia were microcytic hypochromic.

X- Percentage of anemia at different gravida

Table :14

Gravida	Number	Anemic %
Primi	45	42.5%
Multi	61	57.5%

Figure : 14



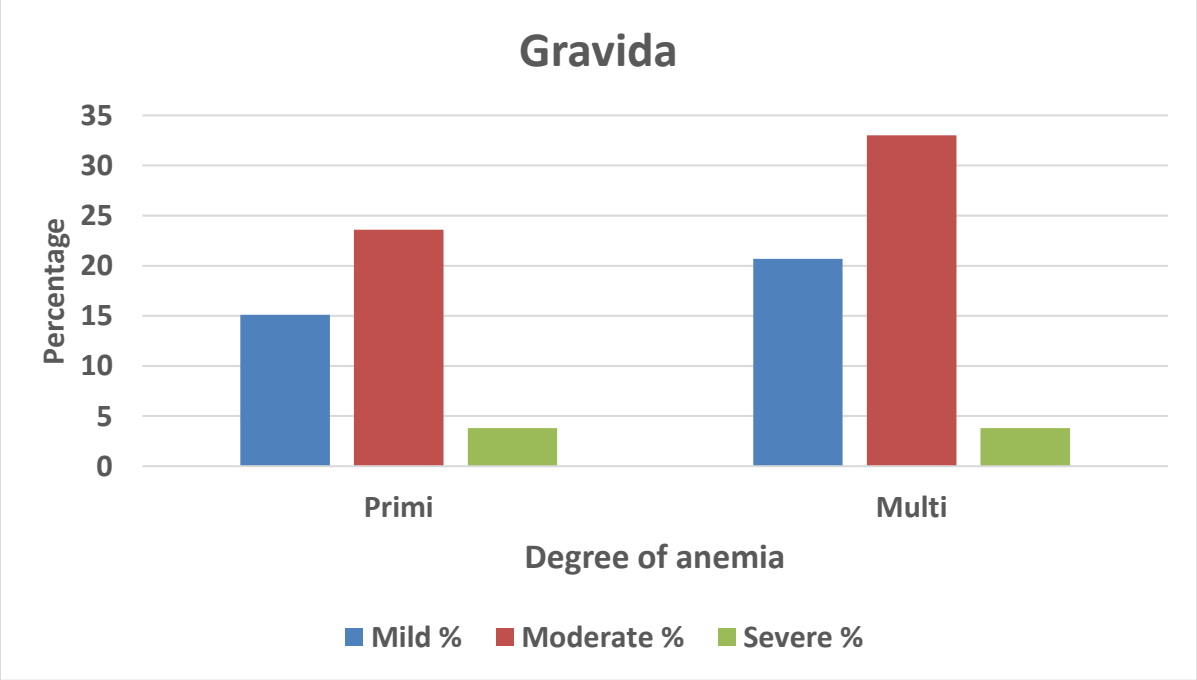
Study shows, higher prevalence of anemia 61 (57.5%) in multigravida as compared with primigravida 45 (42.5%).

XI- Degree of anemia at different gravida

Table : 15

Gravida	Mild Anemic %	Moderate Anemic %	Severe Anemic %
Primi	15.1	23.6	3.8
Multi	20.7	33	3.8

Figure : 15



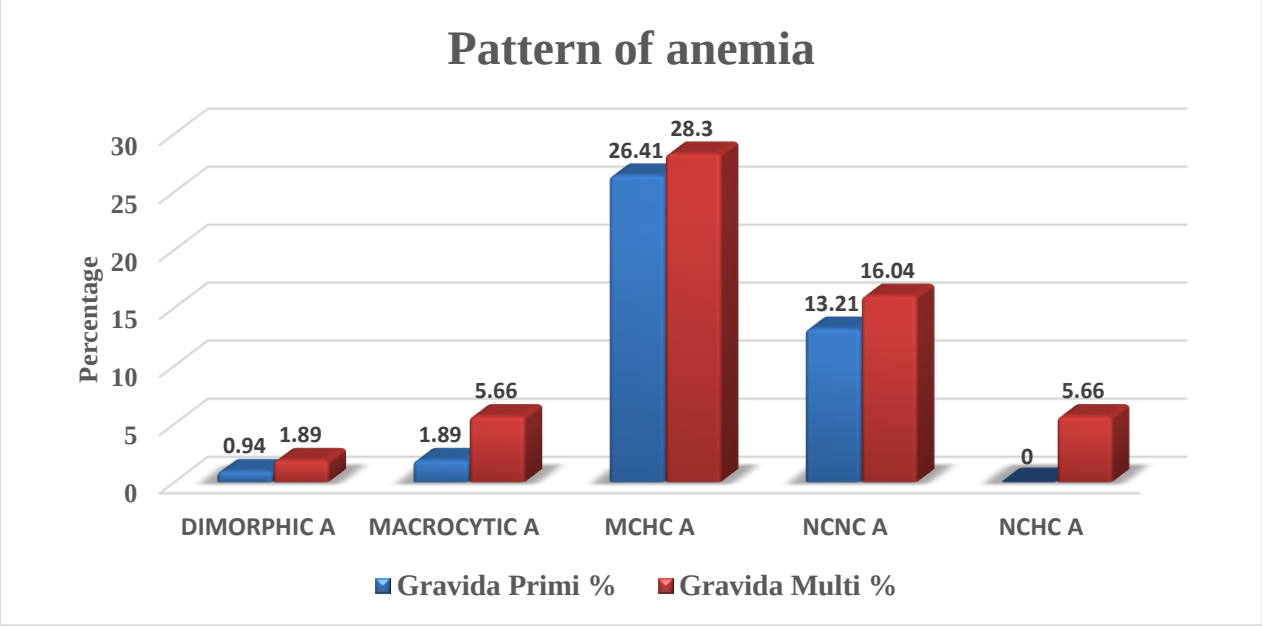
Study shows, that both primigravida & multigravida had higher prevalence of moderate degree of anemia as compare with mild and severe degree of anemia.

XII- Pattern of anemia in different gravida

Table : 16

Pattern of Anemia	Gravida				p value
	Primi		Multi		
	N	%	N	%	
DIMORPHIC Anemia	1	0.94	2	1.89	0.098
MACROCYTIC Anemia	2	1.89	6	5.66	
MCHC Anemia	28	26.41	30	28.3	
NCNC Anemia	14	13.21	17	16.04	
NCHC Anemia	0	0	6	5.66	
Total	45	42.45	61	57.55	

Figure : 16



Study shows, in all (106) anemic pregnant women 45 (42.45%) cases were primigravida and & 61 (57.55%) cases were multigravida and in both, commonest pattern of anemia were microcytic hypochromic.

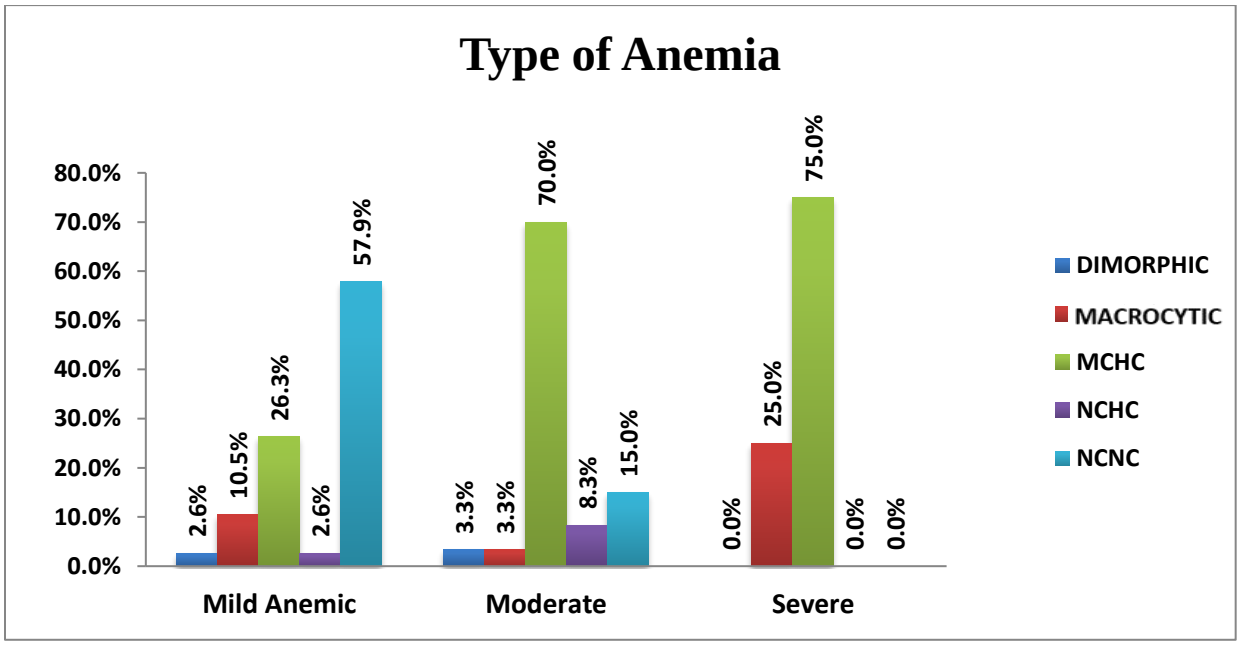
XIII- Distribution of cases by Degree & Pattern of anemia

Table : 17

Peripheral Smear	Mild Anemic		Moderate		Severe		Total anemic		p value
	N	%	N	%	N	%	N	%	
DIMORPHIC Anemia	1	2.6%	2	3.3%	0	0.0%	3	2.8%	<0.001*
MACROCYTIC Anemia	4	10.5%	2	3.3%	2	25.0%	8	7.5%	
MCHC Anemia	10	26.3%	42	70.0%	6	75.0%	58	54.7%	
NCHC Anemia	1	2.6%	5	8.3%	0	0.0%	6	5.7%	
NCNC Anemia	22	57.9%	9	15.0%	0	0.0%	31	29.2%	
Total	38	100.0%	60	100.0%	8	100.0%	106	100.0%	

Note: * significant at 5% level of significance (p<0.05)

Figure : 17



The majority of pregnant women, 58 (54.7%), in this study had microcytic hypochromic type of anemia. Out of that 58 cases, 10 (9.4%) pregnant women had mild anemia, 42 (39.6%) had moderate anemia, and 6 (5.7%) had severe anemia.

XIV- Descriptive statistics of selected parameters of cases

Table : 18

Descriptive Statistics	Min	Max	Mean	SD
Age(yrs)	19	34	23.9	3.7
Hb	5.5	14.2	10.7	1.7
RDW	11.8	33.3	15.6	2.8
MCV	53.5	110.5	81.8	11.1
MCH	14	38.2	26.1	4.4
MCHC	22.1	36.8	31.8	2.5
RBC	1.44	5.42	4.1	0.5
HCT	15.6	45.2	33.5	4.4
Gravida	1	4	1.7	0.8
Parity	0	3	0.6	0.7
POG	7	12	9.3	1.6

In the present study, the age of the study population ranged from 19 years to 34 years with a mean of 23.9 years (SD = 3.7). The Hb level ranged from 5.5 g/dl to 14.2 g/dl, with a mean value of 10.7 g/dl (SD = 1.7). The RDW ranged from 11.8% to 33.3%. The mean value of RDW was 15.6% (SD = 2.8). The MCV ranged from 53.5 fl to 110.5 fl, with a mean value of 81.8 fl (SD = 11.1). The MCH ranged from 14 pg to 38.2 pg, with a mean value of 26.1 pg (SD = 4.4). The MCHC ranged from 22.1 g/dL to 36.8 g/dL, with a mean value of 31.8 g/dL (SD = 2.5). The RBC count ranged from 1.44 million/cu mm to 5.42 million/cu mm. The mean value of RBC count was 4.1 million/cu mm (SD = 0.5). The value of Hct ranged from 15.6% to 45.2%, with a mean value of 33.5% (SD = 4.4).

The gravida status ranged from 1 to 4, with a mean value of 1.7 (SD = 0.8). The parity status ranged from 0 to 3, with a mean value of 0.6 (SD = 0.7). The gestation period ranged from 7 weeks to 12 weeks, with a mean value of 9.3 weeks (SD = 1.6).

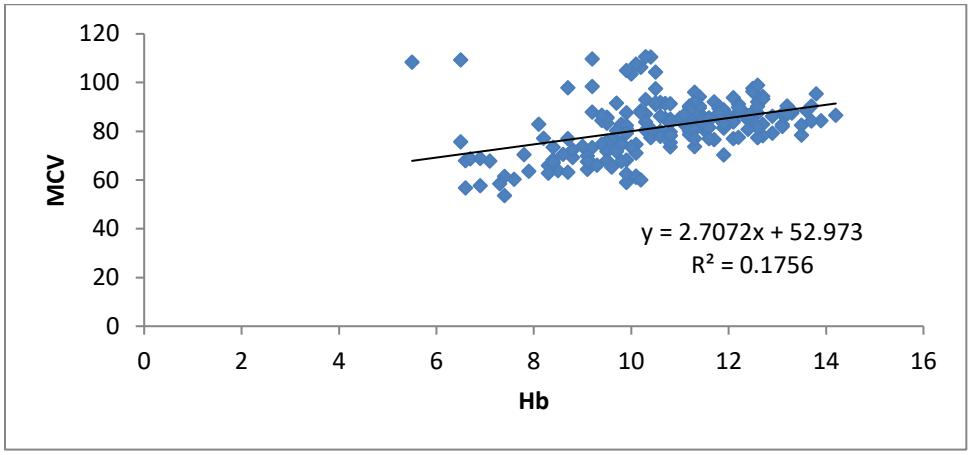
XV- Pearson Correlation (Scatter plot) of Hb with MCV and MCH

Table : 19

Pearson Correlation of Hb with	MCV		MCH	
	r value	p value	r value	p value
	0.419	<0.001*	0.596	<0.001*

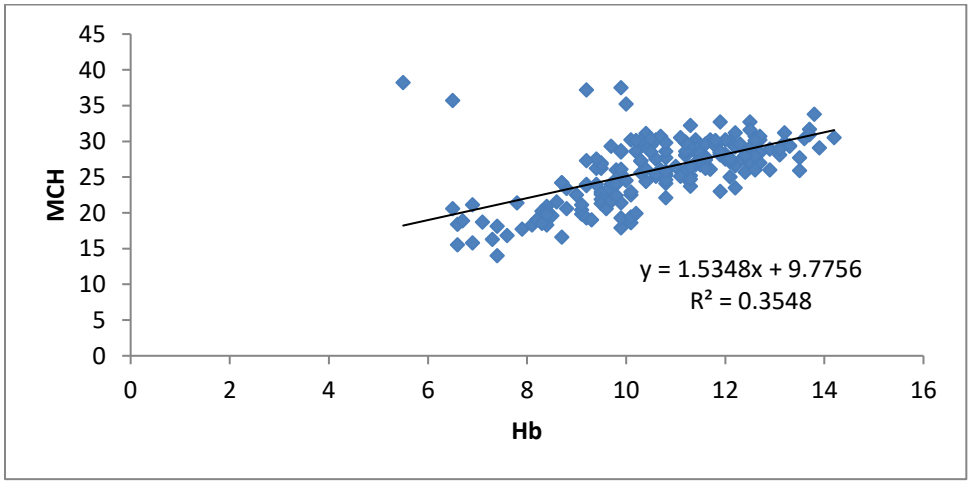
Note: * significant at 5% level of significance (p<0.05)

Figure : 18



There is significant correlation (r = 0.419) between change in the value of MCV and Hb level.

Figure : 19



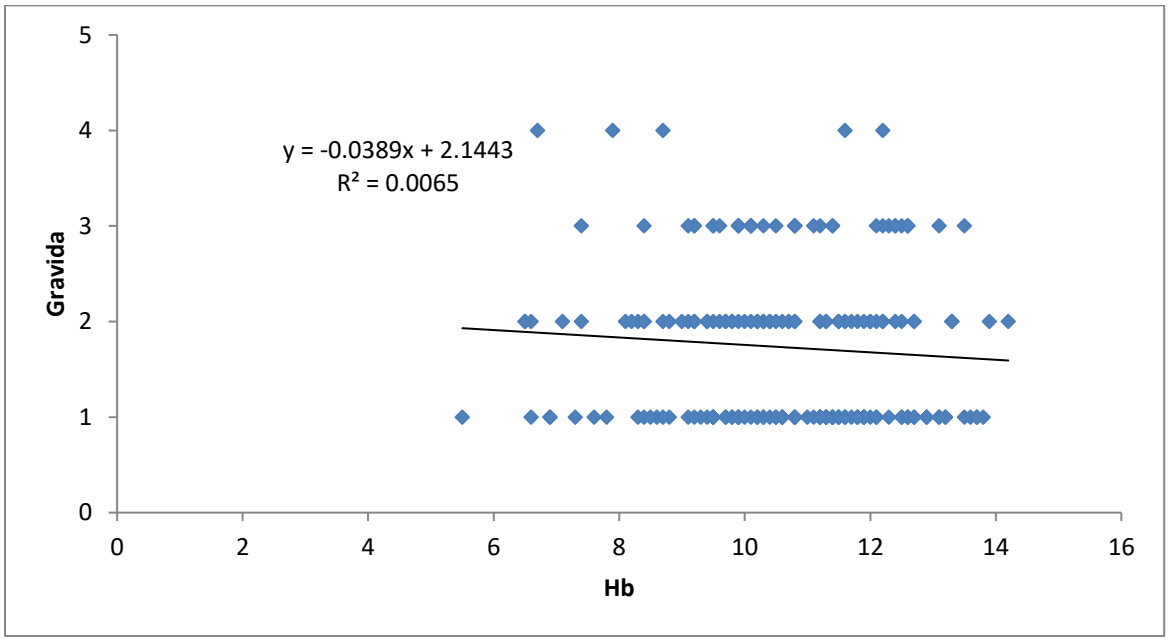
There is significant correlation (r = 0.596) between change in the value of MCH and Hb level.

XVI - Correlation and scatter plot between Hb and Gravida

Table : 20

Hb	Gravida	
	r value	p value
	-0.081	0.256

Figure : 20



Note: *significant at 5% level of significance

Hemoglobin level of pregnant women seemed to have a negative correlation with gravida. ($r = -0.081$, $p = 0.256$).

Other observations in the present study : (Result)

Religion:

The majority of pregnant women 167 (83.5%), in this study were Hindu, 33 (16.5%) were Muslim. In total anemic cases, it was observed that 88 (83%) pregnant women (Hindu) had anemia, 18 (17%) pregnant women (Muslim) had anemia.

Dietary pattern:

Showed that vegetarian group suffered with high prevalence of anemia (81.1%) as compared with mixed diet (18.9%).

Occupation:

Our study shows high prevalence of anemia (97.2%) among housewife's and agricultural working women as compared with employed women (2.8%).

Education:

Among the education category, majority of pregnant women suffering with anemia were illiterates (51.0%), followed by primary school (37.7%), secondary school (8.5%), and graduates/PG's (2.8%).

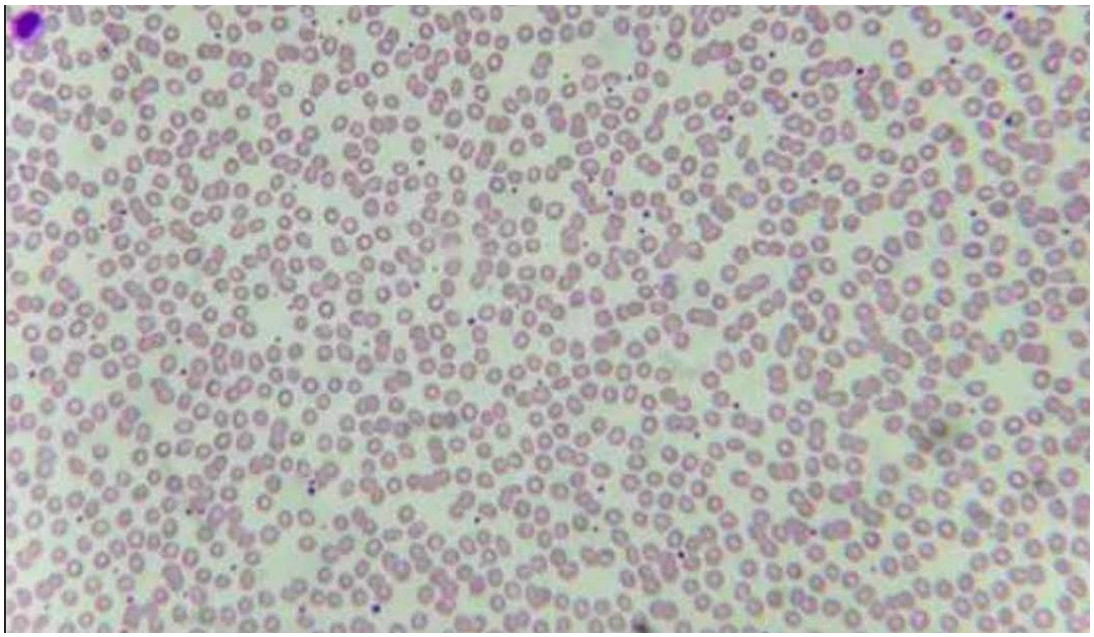


Figure 21 : Photomicrograph of peripheral smear (P.S) showing normocytic normochromic pattern of anemia (40x).

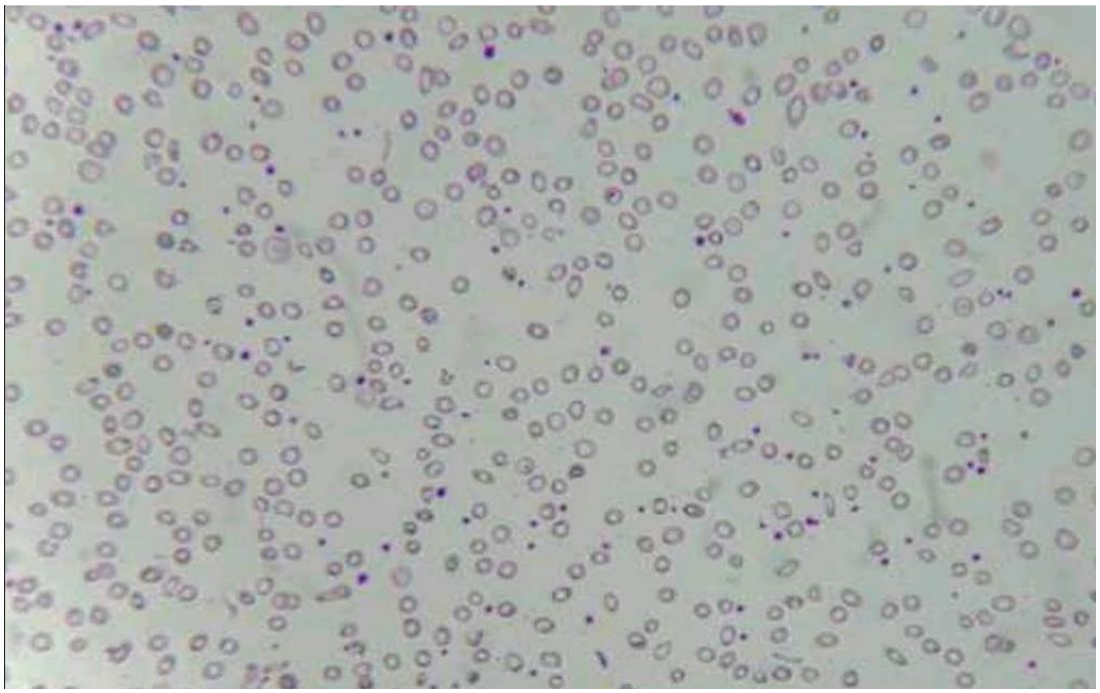


Figure 22 : Photomicrograph of peripheral smear (P.S) showing microcytic hypochromic pattern of anemia (40x).

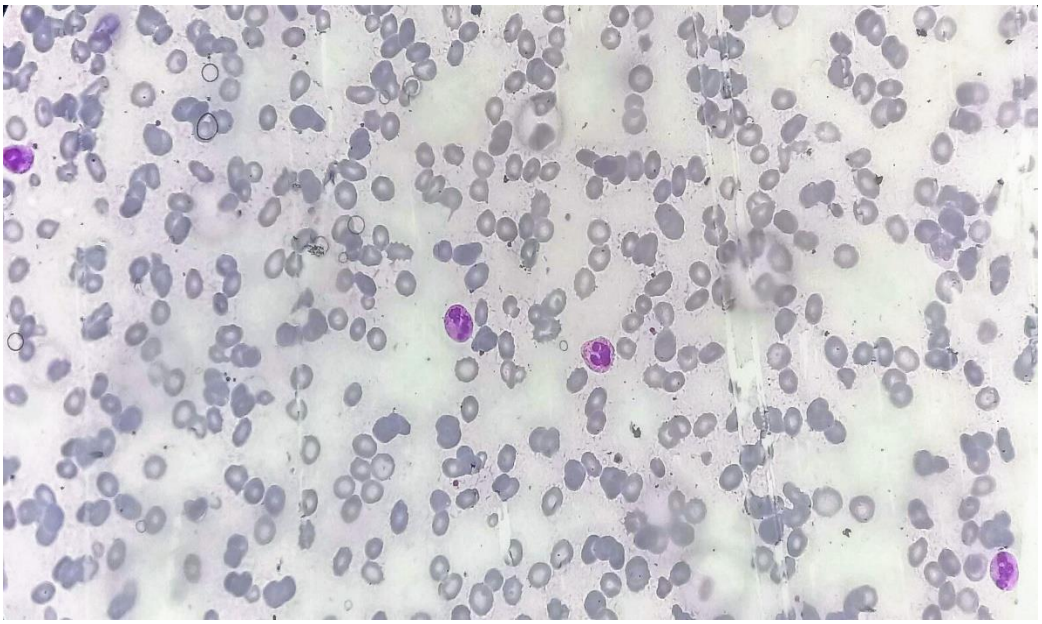


Figure 23 : Photomicrograph of peripheral smear (P.S) showing macrocytic pattern of anemia (40x).

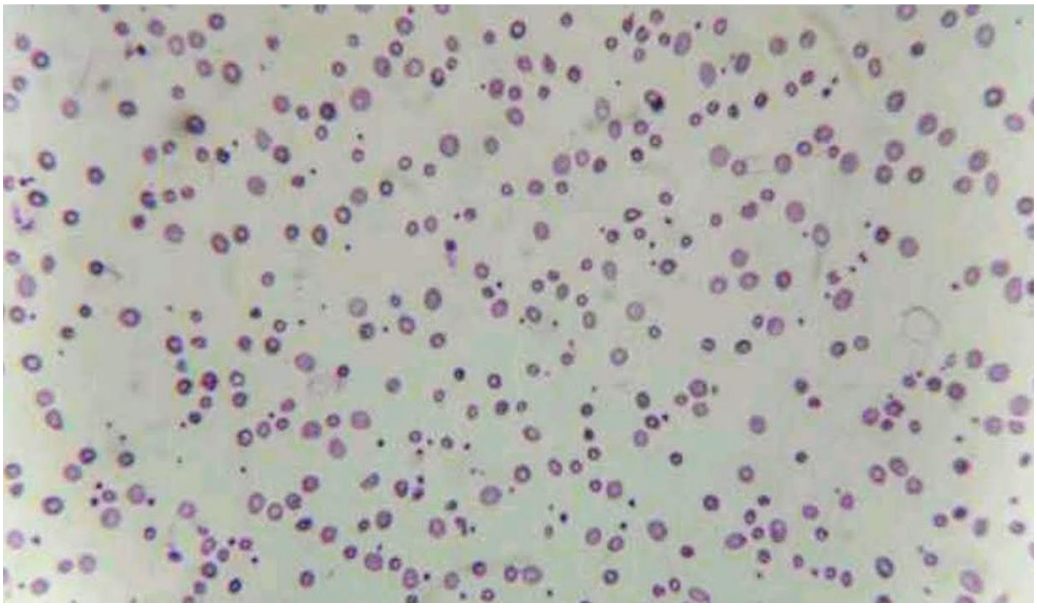


Figure 24 : Photomicrograph of peripheral smear (P.S) showing dimorphic pattern of anemia (40x).

DISCUSSION

The prevalence of anemia among pregnant women in their first trimester in the rural population (field practice area) of Shri B M Patil Medical College, Vijayapura during the period: 1st December 2018 to 30th May 2020 was high (53%) among 200 study subjects, and common pattern of anemia was microcytic hypochromic.

Similar reports from WHO shows that up to 56% [1] of all women living in developing countries are anemic. The National Nutritional Anemia Prophylaxis Programme (NNAPP) was initiated in 1970 with the aim to reduce the prevalence of anemia to 25 percent.[54] The observations were compiled, results statistically analysed, and discussed in comparison with previous other studies.

Prevalence of anemia in study subjects compared to other studies:

Table : 21

Studies	Prevalence of anemia %
Present study	53
Abel R et al [34]	56.6
Rajamouli J et al [9]	58.3
Acheampong K et al [48]	51
Babita B et al [53]	55.5
Nair M et al [42]	65.1
Mehrotra M et al [49]	50.9
Suryanarayana R et al [26]	64
Rawat K et al [41]	48.4
Noronha JA et al [36]	50.1
Tyagi N et al [39]	84.4
Srinivasa Rao P et al [38]	93.3

The prevalence of anemia in the present study was high i.e. 53%. A similar study was done on pregnant women in their first trimester, in rural Vellore district & Rajasthan (India), registered a prevalence 56.6% by Abel R et al 34 and 55.5% by Babita B et al 53 respectively. As compared with the other studies done by Rajamouli J et al 9 had a prevalence of anemia 58.3% in (Telangana) districts of India, Acheampong K et al 48 51%, Nair M et al 42 65.1%, Mehrotra M et al 49 50.9%, Suryanarayana R et al 26 64%, Rawat K et al 41 48.4%, Noronha JA et al 36 50.1%. Our findings are consistent with the above studies.

Study done by Srinivasa Rao P et al [38] shows that prevalence of anemia among pregnant in their first trimester was very high i.e. 93.3%. Studies of Toteja G S et al [55] 84.9% in 16 districts of India, Umesh Kapil et al [56] 78.8% in Delhi slum area and Tyagi N et al [39] 84.4% also had very high prevalence of anemia. The main operational constraints identified in these studies were: inefficient and irregular supply of supplements, procurement and distribution of supplements, low accessibility and utilization of antenatal care by pregnant women, inadequate training and motivation of frontline health workers, inadequate counselling of mothers and low compliance by the intended beneficiaries with the supplementation regimen. [38]

Pattern of anemia:

One of the objectives of this study was to assess the pattern of anemia among pregnant women.
In our study, peripheral smear of the pregnant women showed microcytic hypochromic anemia in majority of anemic cases 58 (54.72%), which is the most common pattern of anemia seen in cases of iron deficiency. Our study also had 31(29.24%) normocytic normochromic anemia, 8 (7.55%) had macrocytic anemia , 6 (5.66%) had normocytic hypochromic anemia, and 3 cases (2.83%) had dimorphic anemia. Dimorphic anemias, which were seen in few cases, are a result of combined iron, vit B-12 and folic acid deficiencies.

Pattern of anemia (%) in study subjects compared to other studies:

Table : 22

Studies	MCHC anemia	NCNC anemia	Macrocytic anemia	NCHC anemia	Dimorphic anemia
Present study	54.7	29.3	7.5	5.7	2.8
Tyagi N et al [39]	42	28	7	0	23
Rawat K et al [41]	51	32	4	0	13
Mehrotra M et al [49]	86	11	1	1	1
Babita B et al [53]	47.6	35.7	7.2	0	9.5

Study done by Rawat K et al [41] who observed that 51% cases with microcytic hypochromic anemia and 32% cases had normocytic normochromic anemia, 13% had dimorphic anemia and 4% had macrocytic anemia. Other studies done by Bivalkar NY et al [57] who had 55.4% microcytic hypochromic anemia, Tyagi N et al [39] observed that microcytic hypochromic anemia comprised 42%, Maka SS et al [58] showed 82% cases of microcytic hypochromic anemia, Mehrotra M et al [49] found that majority 86% of the pregnant women had microcytic hypochromic anemia, and Sitalakshmi V et al [10] had 88% % cases of microcytic hypochromic anemia.

In our study, majority of the pregnant women had high prevalence 58 (54.7%) of microcytic hypochromic anemia as compared with other pattern of anemia. Out of that 58 cases, 10 (9.4%) pregnant women had mild anemia, 42 (39.6%) had moderate anemia, and 6 (5.7%) had severe anemia, there were significant correlation between morphological pattern and degree of anemia (p value <0.001).

In our study we also found that, anemic pregnant women of age group ≤20 to 31-35 years, commonest pattern of anemia were microcytic hypochromic. Subgroup analysis revealed that there was significant change in values of MCV, MCH, MCHC, RDW, RBC and HCT with each morphological pattern of anemia, showed significant correlation with the each morphological pattern of anemia. The above subgroup correlations were statistically significant at 5% level of significance. (p value <0.001) In our study, we found that the significant correlation between change in values of mean Hb and degree of anemia (p value <0.001). Similar findings were noted in studies done by Srinivasa Rao P et al. [38]

In our study, we found that the correlation coefficients (r) between change in level of Hb and change in values of MCV, MCH, and MCHC was (r = 0.419, p value <0.001), (r = 0.596, p value <0.001), (r = 0.631, p value <0.001) respectively. These correlations were statistically significant at 5% level of significance.

Degree of anemia:

Analysis of the degree of anemia among the study subjects showed that most of the pregnant women had 60 (56.6%) moderate anemia, followed by 38 (35.9%) mild degree of anemia, only 8 cases (7.5%) with severe anemia.

Degree of anemia (%) in study subjects compared to other studies:

Table : 23

Studies	Mild anemia (%)	Moderate anemia (%)	Severe anemia (%)
Present study	35.9	56.6	7.5
Rajamouli J et al [9]	39.5	51.6	8.9
Nair M et al [42]	46.1	50.7	3.2
Mehrotra M et al [49]	48.75	48.75	2.5
Tyagi N et al [39]	32.5	60.3	7.2

Similar studies done by Rajamouli J et al [9], Nair M et al [42] , Mehrotra M et al [43] and Tyagi N et al[39] findings were noted as per **Table 23**. Majority of the pregnant women had high prevalence of moderate degree anemia as compared with mild and severe degree of anemia. These findings are consistent with our study.

Somewhat similar results have been reported in a study conducted in a rural Indian population. In which severe anemia was observed to be 18%, mild anemia in 43.6%, and moderate anemia in 47.6% of patients Ahmad et al.[59] In another study, Farzana et al [60] observed in study amongst pregnant women, 52% moderate, 36% were mildly anemic, and 12% severe anemic.

Analysis of subgroup revealed that values of MCV, MCH, MCHC, RDW, RBC and HCT changed significantly in pregnant women with severe degree of anemia when compared to the pregnant women with moderate and mild degree of anemia. There was a corresponding decrease in the values of MCV, MCH and MCHC associated with decrease in Hb level.

Present study also shows, majority of anemic pregnant women, 53 (50%), in this study were in the age group 21-25 years (mild 20.8 %, moderate 24.5 %, severe 4.7 %). Study done by Rajamouli J et al [9] shows similar finding. In present study it was observed that higher prevalence of anemia 57.5% in multigravida and 42.5% in primigravida. Similar findings were noted in studies done by Seema BN et al [46] , Rajamouli J et al [9] and Suryanarayana R et al. [26] Present study also shows that, in both primigravida & multigravida anemic pregnant women commonest pattern of anemia were microcytic hypochromic.

CONCLUSION

Anemia in pregnancy continues to be a common, severe and major public health problem throughout the world, particularly the developing countries like India. In spite of, National Nutritional Anemia Prophylaxis Programme (NNAPP), no marked improvement has been noticed in the prevalence of anemia in pregnant women.

This study reveals that there is a high prevalence of anemia with the majority having moderate anemia and most of the anemia was microcytic anemia so screening for anemia in the first trimester gives us information regarding the prevalence & pattern of anemia.

Therefore, efforts should be done not only to correct anemia but also to prevent it. This is possible with better awareness (knowledge regarding anemia), health education of females in society, periodic supplementation, good nutrition, proper antenatal care, and counselling of women of the risks of anemia in pregnancy. All practitioners handling obstetrics cases should be motivated for prescribing iron preparations and a balanced diet with good compliance especially in the first trimester of pregnancy for better fetal & maternal outcomes.

SUMMARY

The study was conducted on pregnant women attending antenatal clinic at rural health training centre, primary health centre, anganwadi mother and child health clinic of field practice area of Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura district. Study period was from 1st December, 2018 to 30th May, 2020.

Total 200 ANC cases were recruited and studied. Detailed history of the included pregnant women was elicited. Hematological analysis was done in the Department of Pathology. Complete blood count that included Hb, HCT, RBCs, MCV, MCH, MCHC and RDW were measured by Sysmex XN-1000 and peripheral smear were prepared from same sample with Leishman stain examined for morphology.

Overall prevalence of anemia among pregnant women in their first trimester in rural population was found to be 53%. Most of the pregnant women in this study were young females, 98 (49%), in the age group of 21 to 25 years. Majority of the pregnant women had moderate degree of anemia.

Morphologically, more than half 58 (54.72%) of the anemic pregnant women had microcytic hypochromic pattern of anemia. This pattern of anemia is characteristically seen in cases of iron deficiency. Factors such as mother's age, gravida status, residence (rural), education (literacy level), social status, dietary habits were found to be associated with the prevalence of anemia in pregnancy. There were significant correlation between change in values of mean Hb and morphological pattern with degree of anemia.

It was found that change in Hb level had statistically significant relationship with changes in values of MCV, MCH, and MCHC. There was also significant correlation between the values of MCV, MCH, MCHC , RDW, RBC and HCT with the degree of anemia. All study parameters showed significant correlation with each morphological pattern of anemia. We also found that high RDW and low MCV were the characteristic changes of IDA (Iron deficiency anemia) in pregnancy.

The limitations of this study were that other parameters such as Serum iron, serum ferritin, total iron-binding capacity (TIBC), Serum Folic Acid, and Vitamin B12 assays were not performed.

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ANNEXURE-I

B.L.D.E (Deemed to be University)
SHRI.B.M.PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH CENTRE
VIJAYAPUR – 586103

IEC/NO:286/2018
17-11-2018

INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 13-11-2018 at 03-15 PM scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has accorded Ethical Clearance.

Title : Study of prevalence & pattern of anemia among pregnant women in their first trimester in rural population (Field practice area) of Shri.B.M.Patil Medical College, Vijayapura District, Karnataka,India.

Name of P.G. Student : Dr Vipin Gupta.
Department of Pathology.

Name of Guide/Co-investigator: Dr.Surekha.B.Hippargi, Professor of Pathology.

DR RAGHAVENDRA KULKARNI
CHAIRMAN
Institutional Ethical Committee
BLDEU's Shri B.M. Patil
Medical College,BIJAPUR-586103.

Following documents were placed before E.C. for Scrutinization:

1) Copy of Synopsis/Research Project
2) Copy of informed consent form.
3) Any other relevant documents.

ANNEXURE-II

B.L.D.E. UNIVERSITY,
SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE,
VIJAYAPUR-586103

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____ ,S/O D/O W/O _____,aged____years, ordinarily resident of _____do hereby state/declare that Dr. _____

of Hospital has examined me thoroughly on _____ at _____ (place) and it has been explained to me in my own language that I am suffering from _____ disease (condition) and this disease/condition mimic following diseases . Further Doctor informed me that he/she is conducting dissertation/research titled _____under the guidance of Dr _____requesting my participation in the study. Apart from routine treatment procedure, the pre-operative, operative, post-operative and follow-up observations will be utilized for the study as reference data.

Doctor has also informed me that during conduct of this procedure like adverse results may be encountered. Among the above complications most of them are treatable but are not anticipated hence there is chance of aggravation of my condition and in rare circumstances it may prove fatal in spite of anticipated diagnosis and best treatment made available. Further Doctor has informed me that my participation in this study help in evaluation of the results of the study which is useful reference to treatment of other similar cases in near future, and also I may be benefited in getting relieved of suffering or cure of the disease I am suffering.

The Doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than me or my legal hirer except for academic purposes.

The Doctor did inform me that though my participation is purely voluntary, based on information given by me, I can ask any clarification during the course of treatment / study related to diagnosis, procedure of treatment, result of treatment or prognosis. At the same time I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time from the study but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment, I the undersigned Shri/Smt _____ under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of patient:

Signature of doctor:

Witness: 1.

2.

Date:

Place

ANNEXURE-III

PROFORMA FOR STUDY

CASE Date

Demographic Details:

Name: Age : OPD / IPD No :

Religion: Laboratory number: G P L A D

Occupation**:** Education:

Diet: Residence **:**

Chief complaints:

History of present illness:

General physical examination:

Clinical diagnosis:

Hematological investigations:

Parameters	**Value**
Hb	
HCT	
RBC count	
MCV	
MCH	
MCHC	
RDW(CV)	
Platelet Count	
Total leucocyte count	
Differential leucocyte count	

Peripheral smear examination-

RBCs:

WBCs:

Platelets:

IMPRESSION:

KEY TO MASTER CHART

Hb	Hemoglobin (g/dL)
RDW	Red cell distribution width (%)
MCV	Mean corpuscular volume (fl)
MCH	Mean corpuscular hemoglobin (pg)
MCHC	Mean corpuscular hemoglobin concentration (g/dL)
RBC	Red cell count (million/cu mm)
HCT	HCT %
G	Gravida
P	Para
L	Living
A	Abortions
D	Deaths
POG	Period of gestation (weeks)
PS	Peripheral smear
MCHC anemia	Microcytic hypochromic anemia
Dimorphic anemia	Dimorphic anemia
Macrocytic anemia	Macrocytic anemia
NCNC anemia	Normocytic normochromic anemia
NCHC anemia	Normocytic hypochromic anemia
NCNC smear	Normocytic normochromic smear

MASTER CHART

S.No.	Date	Name	Age	Lab. No.	Hb	RDW	MCV	MCH	MCHC	RBC	HCT	G	P	L	A	D	POG	PS
1	10-12-2018	Jyoti.S	28	227030	10.8	15.1	73.5	24.1	32.8	4.52	33.2	2	1	1	0	0	9	MCHC A
2	14-12-2018	Heena.M.P	20	230417	6.9	22.2	57.6	15.8	27.5	4.36	25.1	1	0	0	0	0	8	MCHC A
3	14-12-2018	Sakina	28	230419	10.1	16.4	74.6	22.5	30.1	4.49	33.5	3	2	2	0	0	9	MCHC A
4	14-12-2018	Apsana.M	22	230420	10.3	12.4	92.9	29.3	31.5	3.52	32.7	2	1	1	0	0	10	NCNC A
5	14-12-2018	Sujata	19	230422	12	13.5	84.9	27.5	32.4	4.36	37	1	0	0	0	0	11	NCNC S
6	14-12-2018	Mahalaxmi	24	230423	11.2	13.8	85.7	28.1	32.8	3.98	34.1	2	1	1	0	0	12	NCNC S
7	14-12-2018	Reshma	22	230424	12.7	13.2	94.3	30.2	32	4.21	39.7	2	1	1	0	0	7	NCNC S
8	14-12-2018	Heena.N.P	25	230425	11.4	15.4	94.2	30.2	32	3.78	35.6	3	2	2	0	0	8	NCNC S
9	14-12-2018	Shahin.I.H	22	230426	11.7	13.5	92	30.2	32.8	3.88	35.7	2	1	1	0	0	9	NCNC S
10	14-12-2018	Asama.Z	22	230427	9.8	14.1	82.8	26	31.4	3.77	31.2	2	1	1	0	0	10	NCHC A
11	14-12-2018	Manasuya	24	230429	12.1	14	93.8	30	32	4.03	37.8	2	1	1	0	0	11	NCNC S
12	14-12-2018	Ambika	19	230430	9.5	13.2	85.8	27	31.5	3.52	30.2	1	0	0	0	0	10	NCNC A
13	14-12-2018	Shahin.M.P	25	230431	11.4	12.8	89.6	29.7	33.1	3.84	34.4	3	1	1	1	0	11	NCNC S
14	14-12-2018	Shantabai	28	230432	12.3	15.9	87.1	27.3	31.4	4.5	39.2	3	2	2	0	0	12	NCNC S
15	14-12-2018	Vidhyashri.A.A	22	230434	11.3	13.7	96	32.2	33.5	3.51	33.7	1	0	0	0	0	8	NCNC S
16	14-12-2018	Nasarin	22	230435	11.2	14.3	90.4	29.9	33	3.75	33.9	1	0	0	0	0	11	NCNC S
17	11-01-2019	Salma.S.P	25	7902	12.5	13.9	87.7	29.1	33.2	4.3	37.7	2	1	1	0	0	8	NCNC S
18	11-01-2019	Shahin.L.D	20	7904	10.6	14.1	79.9	25.1	31.5	4.22	33.7	1	0	0	0	0	9	NCNC A
19	11-01-2019	Dayamawwa	19	7906	11.5	12.7	84.7	26.7	31.5	4.31	36.5	1	0	0	0	0	7	NCNC S
20	11-01-2019	Surekha	19	7907	10.5	14.4	97.4	30.1	30.9	3.49	34	1	0	0	0	0	8	NCNC A
21	11-01-2019	Sabiya	20	7908	12.9	13.3	79.2	26	32.8	4.96	39.3	1	0	0	0	0	9	NCNC S
22	11-01-2019	Savitri	20	7910	11.2	15.1	80	24.9	31	4.49	35.9	1	0	0	0	0	8	NCNC S
23	11-01-2019	Nafisa	20	7912	11.8	13.8	90.2	29.6	32.8	3.99	36	1	0	0	0	0	9	NCNC S
24	11-01-2019	Sana	20	7914	10.4	20.1	77.4	24.4	31.5	4.68	36.2	1	0	0	0	0	10	MCHC A
25	11-01-2019	Afrin	20	7915	11.4	13.6	84.3	26.7	31.7	4.27	36	1	0	0	0	0	10	NCNC S
26	11-01-2019	Vidhyashri.C.P	22	7916	12.5	14	82.8	26.8	32.4	4.66	38.6	1	0	0	0	0	11	NCNC S
27	11-01-2019	Ayesha.M.S	22	7917	10.5	16.1	91	29.4	32.3	3.57	32.5	1	0	0	0	0	9	NCNC A
28	11-01-2019	Neelamma	20	7918	8.4	20.1	73.4	20.9	28.5	4.02	29.5	1	0	0	0	0	7	MCHC A
29	11-01-2019	Munera	21	7919	11.4	14.6	83.2	27	32.4	4.23	35.2	1	0	0	0	0	8	NCNC S
30	11-01-2019	Renuka.S.K	22	7920	10.2	14.1	88.4	28.6	32.5	3.57	31.4	2	1	1	0	0	10	NCNC A
31	11-01-2019	Shrifabee.D.T	26	7921	10.3	16	87.1	27.2	31.2	3.79	33	2	1	1	0	0	11	NCNC A
32	22-01-2019	Gouri pooja	24	14612	10.8	14.6	83.8	27.7	33	3.94	33	1	0	0	0	0	8	NCNC A
33	22-01-2019	Pooja.N.W	20	14921	8.6	18.2	70.5	21.5	30.5	4	28.2	1	0	0	0	0	7	MCHC A
34	15-02-2019	Sujata.H.M	22	31997	11.4	14.4	87.3	28.5	32.7	4	34.9	1	0	0	0	0	7	NCNC S
35	15-02-2019	Jaslim.M.N	22	31998	11.9	13.9	84.6	28.2	33.3	4.22	35.7	1	0	0	0	0	10	NCNC S
36	15-02-2019	Renuka.Y.J	22	31999	12.6	11.8	92	30.7	33.3	4.11	37.8	1	0	0	0	0	9	NCNC S
37	15-02-2019	Nasreen.H.S	20	32000	10.6	13.2	91.8	30.2	32.9	3.54	32.5	1	0	0	0	0	9	NCNC A

38	15-02-2019	Shilpa.P.N	22	32001	10.7	12.7	91.4	30.7	33.6	3.48	31.8	2	1	1	0	0	8	NCNC A
39	15-02-2019	Laxmirani.M	22	32002	13.2	11.9	90.3	29.8	33	4.43	40	1	0	0	0	0	8	NCNC S
40	15-02-2019	Shantamma	19	32003	9.5	16.9	75.9	22.9	30.2	4.15	31.5	1	0	0	0	0	7	MCHC A
41	15-02-2019	Heena kousar	22	32004	6.6	21.3	56.7	15.5	27.4	4.25	24.1	2	1	1	0	0	9	MCHC A
42	15-02-2019	Minaz.I.P	22	32005	10.7	16.1	85.2	26	30.5	4.12	35.1	2	1	1	0	0	8	DIMORPHIC A
43	15-02-2019	Marium.J.G	26	32006	12.2	16.3	91.1	29.2	32	4.18	38.1	2	1	0	0	0	9	NCNC S
44	15-02-2019	Shanta.M.U	21	32007	9.9	14.9	81	25.4	31.4	3.89	31.5	1	0	0	0	0	8	NCNC A
45	15-02-2019	Vijaylaxmi.S.M	20	32008	9.7	16.2	76.3	22.3	29.2	4.35	33.2	1	0	0	0	0	10	MCHC A
46	15-02-2019	Mahabooba	25	32009	9.7	25	91.5	29.3	32	3.31	30.3	2	1	0	0	0	10	DIMORPHIC A
47	15-02-2019	Mayakka	20	32010	11.3	14.5	80.8	25.2	31	4.48	36.2	1	0	0	0	0	8	NCNC S
48	15-02-2019	Khajabee	24	32011	13.3	13.8	87.4	29.4	33.6	4.53	39.6	2	1	1	0	0	12	NCNC S
49	15-02-2019	Shahin.A.N	22	32012	10.6	14.6	86.2	27.5	31.9	3.85	33.2	2	1	1	0	0	11	NCNC A
50	15-02-2019	Haminbee.B.A	21	32014	10.8	15	79.7	25.2	31.6	4.29	34.2	1	0	0	0	0	8	NCNC A
51	15-02-2019	Jahsin.banu	21	32015	7.6	20.3	60.2	16.8	27.9	4.52	27.2	1	0	0	0	0	8	MCHC A
52	21-02-2019	Mayamma.S	26	35683	10	18.2	103.5	35.2	34	2.84	29.4	2	1	1	0	0	9	MACRO A
53	21-02-2019	Kavita	20	35862	9.1	18	64.3	19.8	30.8	4.59	29.5	1	0	0	0	0	8	MCHC A
54	25-03-2019	Bharati.B.N	23	57473	9.5	16.5	83.2	26.2	31.5	3.63	30.2	1	0	0	0	0	7	NCNC A
55	25-03-2019	Sahubai. C	28	57476	12.5	14.6	97.6	32.7	33.4	3.82	37.4	3	1	1	1	0	8	NCNC S
56	25-03-2019	Anjali	24	57495	11.4	13.4	90.4	29.6	32.8	3.85	34.8	1	0	0	0	0	7	NCNC S
57	18-04-2019	Renuka pujari	27	74464	8.3	17.7	65.9	20.2	30.7	4.1	27	2	1	1	0	0	8	MCHC A
58	18-04-2019	Kavita rathod	25	74483	9.7	16.5	80.2	24	29.8	4.05	32.5	2	1	1	0	0	9	NCHC A
59	20-04-2019	Vaishali.K	21	75585	11.2	13.2	78.7	25.9	32.9	4.32	34	1	0	0	0	0	8	NCNC S
60	25-04-2019	Basamma.N	25	78580	9.6	14.9	76.1	23	30.2	4.18	31.8	2	1	1	0	0	9	MCHC A
61	26-04-2019	Vaishali.R	24	79476	12.6	16	87.5	28.7	32.8	4.39	38.4	1	0	0	0	0	10	NCNC S
62	27-04-2019	Shila.Uppar	20	79908	11.6	12.3	85.1	27.8	32.7	4.17	35.5	1	0	0	0	0	7	NCNC S
63	27-04-2019	Priya.H	30	80044	11.8	15	89.3	29.4	33	4.01	35.8	2	1	1	0	0	8	NCNC S
64	30-04-2019	Meenori.Telagi	22	81959	8.5	15.1	63.8	19.6	30.7	4.34	27.7	1	0	0	0	0	8	MCHC A
65	14-05-2019	Jaitubee.A.J	24	91953	10.3	14.4	80.4	25.6	31.8	4.03	32.4	1	0	0	0	0	12	NCNC A
66	14-05-2019	Arpita	26	91954	9.2	20.5	98.4	24	24.4	3.83	37.7	3	2	2	0	0	9	NCHC A
67	14-05-2019	Pooja.V.B	25	91555	12.5	14.4	96.2	31.6	32.9	3.95	38	1	0	0	0	0	11	NCNC S
68	14-05-2019	Kulsuma	23	91956	8.1	20.3	82.8	18.3	22.1	4.43	36.7	2	1	1	0	0	11	NCHC A
69	14-05-2019	Yasmin.B.P	25	91957	9.1	17.5	69.8	20.4	29.2	4.47	31.2	2	1	1	0	0	8	MCHC A
70	14-05-2019	Savitri.G.K	25	91958	11.6	13.5	85.5	27.6	32.3	4.2	35.9	2	1	1	0	0	12	NCNC S
71	14-05-2019	Sangeeta	22	91959	10.2	15.2	106.2	28.6	26.9	3.57	37.9	1	0	0	0	0	10	MACRO A
72	14-05-2019	Jaitun.M.D	25	91960	9.5	19.9	75.1	22.6	30.1	4.21	31.6	3	2	1	0	1	12	MCHC A
73	14-05-2019	Kusuma.S.L	28	91961	8.4	19.7	66.8	20.2	30.2	4.16	27.8	2	1	1	0	0	10	MCHC A
74	14-05-2019	Chinnamma	28	91962	9.9	14.1	87.6	28.5	32.6	3.47	30.4	2	1	1	0	0	11	NCNC A
75	27-05-2019	Laxmi	23	101029	13.6	11.9	88.4	30.4	34.4	4.47	39.5	1	0	0	0	0	11	NCNC S
76	27-05-2019	Kavya.R.B	21	101086	11	15.9	85.3	26.5	31.1	4.15	35.4	1	0	0	0	0	7	NCNC S
77	27-05-2019	Kavita	20	101089	9.4	15.8	84.4	26.2	31	3.59	30.3	1	0	0	0	0	10	NCNC A
78	27-05-2019	Sharada	26	101113	13.9	13.1	84.3	29.1	34.5	4.78	40.3	2	1	1	0	0	10	NCNC S
79	27-05-2019	Sharanamma	21	101253	6.5	21.6	75.6	20.6	27.2	3.16	23.9	2	1	1	0	0	10	MCHC A

80	27-05-2019	Geeta.S.I	27	101271	9.2	15.9	109.7	37.2	33.9	2.47	27.1	3	2	2	0	0	9	MACRO A
81	27-05-2019	Sruti.Bidanur	19	101286	6.6	18.4	67.9	18.4	27.2	3.58	24.3	1	0	0	0	0	8	MCHC A
82	30-05-2019	Prema.K	25	103235	8.7	33.3	63.2	16.6	26.2	5.25	33.2	2	1	1	0	0	9	MCHC A
83	30-05-2019	Jyoti.H	22	103294	11.3	14.8	91.9	29.4	29.4	3.84	35.3	1	0	0	0	0	12	NCNC S
84	30-05-2019	Chitra	24	103359	13.3	14	88.3	29.3	33.3	4.54	40.1	2	1	0	0	0	8	NCNC S
85	30-05-2019	Shivamma	20	103375	11.2	15	89.9	29.8	33.1	3.76	33.8	1	0	0	0	0	7	NCNC S
86	30-05-2019	Laxmi	27	103427	12.7	12.9	93.2	30.7	32.9	4.14	38.6	2	1	1	0	0	11	NCNC S
87	30-05-2019	Shridevi	30	103526	12.2	14.7	87.8	26.6	30.3	4.58	40.2	3	1	1	1	0	10	NCNC S
88	30-05-2019	Vijaydurga	30	103538	8.4	19	68.3	18.3	26.8	4.6	31.4	3	1	1	1	0	12	MCHC A
89	01-06-2019	Savita.V.A	22	104687	11.9	13.6	81.3	28.5	35	4.18	34	1	0	0	0	0	9	NCNC S
90	04-06-2019	Saroja.T	24	106591	9.2	17.2	66.5	19.3	29	4.77	31.7	2	1	1	0	0	10	MCHC A
91	04-06-2019	Prema	26	106730	11.5	12.6	85.4	29.4	34.4	3.91	33.4	2	1	1	0	0	12	NCNC S
92	04-06-2019	Vaishali.H	25	106756	11.1	14.3	82.6	25.1	30.3	4.43	36.6	1	0	0	0	0	11	NCNC S
93	04-06-2019	Sweta.R.B	25	106767	10.4	16.1	81	26.1	32.2	3.99	32.3	2	1	1	0	0	8	NCNC A
94	04-06-2019	Kalpana.P.J	25	106778	9.3	20.8	66.1	19	28.8	4.89	32.3	1	0	0	0	0	12	MCHC A
95	04-06-2019	Shweta.H	19	106836	11.5	16.5	80.6	26.9	33.3	4.28	34.5	1	0	0	0	0	7	NCNC S
96	04-06-2019	Nirmala.I.B	24	106965	10.1	16.7	107.6	30.2	28	3.68	39.6	3	1	1	1	0	10	MACRO A
97	04-06-2019	Shridevi.S.H	25	106966	10.1	16.2	61.1	18.6	30.5	5.42	33.1	3	2	2	0	0	8	MCHC A
98	04-06-2019	Basamma.N.K	30	106967	8.7	17.4	97.8	24.2	24.8	3.59	35.1	4	2	2	1	0	11	NCHC A
99	04-06-2019	Laxmi.R.M	22	106968	10.4	15.6	110.4	31.1	28.2	3.66	40.4	2	1	1	0	0	7	NCNC A
100	04-06-2019	Shantabai.B.W	25	106969	9.5	16.8	71.7	21.9	30.5	4.34	31.1	2	1	1	0	0	9	MCHC A
101	04-06-2019	Bauramma.R.C	28	106970	10.5	16.2	104.3	28.5	27.3	3.68	38.4	3	1	1	1	0	11	MACRO A
102	04-06-2019	Sunanda.N.P	28	106971	10.8	15.8	85	22.1	26	4.88	41.5	3	2	2	0	0	12	NCHC A
103	04-06-2019	Pavitra.M.J	21	106973	10.3	17.5	110.5	30.1	27.2	4.09	45.2	1	0	0	0	0	10	NCNC A
104	04-06-2019	Geeta.M.M	25	106974	8.4	19.7	67.4	19.7	29.3	4.26	28.7	2	1	1	0	0	9	MCHC A
105	04-06-2019	Bharati.Y.N	20	106975	7.8	15.4	70.4	21.4	30.4	3.65	25.7	1	0	0	0	0	8	MCHC A
106	04-06-2019	Savitri.C.V	25	106976	6.5	18.6	109.2	35.7	32.2	3.06	23.9	2	1	1	0	0	8	MACRO A
107	04-06-2019	Kaveri.K.A	25	106977	12.4	15.1	84.7	25.7	30.3	4.83	40.9	3	2	2	0	0	9	NCNC S
108	04-06-2019	Kamakshi.S.H	22	106978	13.1	16.4	87.1	28.1	32.3	4.66	40.6	1	0	0	0	0	10	NCNC S
109	04-06-2019	Gouramma	20	106979	12.6	15.4	98.9	28.5	28.8	4.42	43.7	1	0	0	0	0	8	NCNC S
110	04-06-2019	Jyoti	22	106981	8.2	18.8	77.1	19	24.6	4.32	33.3	2	1	1	0	0	8	MCHC A
111	13-06-2019	Laxmi	22	113339	9.5	16.9	85.4	26.8	31.4	3.55	30.3	1	0	0	0	0	10	DIMORPHIC A
112	19-07-2019	Anita.G	27	140051	12.1	14.1	76.9	25	32.5	4.84	37.2	3	1	1	1	0	8	NCNC S
113	19-07-2019	Shefaly.A	22	140136	12.1	15.6	84.1	27.1	32.3	4.46	37.5	1	0	0	0	0	9	NCNC S
114	19-07-2019	Hamida	30	140243	9.9	18	59	17.9	30.3	3.54	32.7	3	2	1	0	1	11	MCHC A
115	20-07-2019	Ambaramma	32	140939	12.2	15.7	77.5	23.5	30.3	5.2	40.3	4	3	2	0	1	12	NCNC S
116	20-07-2019	Jayashree.N	25	140965	10.8	13.4	78.1	25.4	32.5	4.25	33.2	2	1	1	0	0	7	NCNC A
117	20-07-2019	Priyanka.K	22	141018	12.9	12.9	86.1	28.9	33.6	4.46	38.4	1	0	0	0	0	8	NCNC S
118	20-07-2019	Basamma.M	32	141113	6.7	17.9	68.7	18.9	27.5	3.55	24.4	4	2	2	1	0	10	MCHC A
119	20-07-2019	Sakkubai	30	141172	13.5	13.6	82.5	27.7	33.6	4.87	40.2	3	1	1	1	0	11	NCNC S
120	20-07-2019	Rakamabai.K	32	141175	7.9	19.2	63.5	17.7	27.8	4.47	28.4	4	2	2	1	0	12	MCHC A
121	20-07-2019	Shreedevi	31	141184	9.1	17.4	67.5	21.1	31.3	4.31	29.1	3	2	2	0	0	9	MCHC A

122	14-08-2019	Ayesha.nadaf	25	160721	11.6	14	84.4	29.6	35	3.92	33.1	2	1	1	0	0	12	NCNC S
123	14-08-2019	Annapurna.C	22	160848	12.3	18.7	88	29.6	33.6	4.16	36.6	1	0	0	0	0	7	NCNC S
124	14-08-2019	Aishwarya.N	21	160862	10.8	17.2	75.4	24.6	32.6	4.39	33.1	1	0	0	0	0	8	MCHC A
125	14-08-2019	Bhagyashree.B	21	161021	5.5	20.3	108.3	38.2	35.3	1.44	15.6	1	0	0	0	0	9	MACRO A
126	15-08-2019	Maheshwari.C	19	161442	11.5	14.3	84.8	28.3	33.3	4.07	34.5	1	0	0	0	0	10	NCNC S
127	15-08-2019	Shammu.M	28	161556	7.1	21.2	67.8	18.7	27.6	3.79	25.7	2	1	1	0	0	9	MCHC A
128	16-08-2019	Savita.Naik	24	162196	11.9	14.9	86.4	28.4	32.9	4.19	36.2	1	0	0	0	0	8	NCNC S
129	16-08-2019	Rajshree.W	19	162245	13.2	11.9	87	31.2	35.9	4.23	36.8	1	0	0	0	0	7	NCNC S
130	08-09-2019	Kiruthiga.V	21	179227	13.7	12	90.3	31.7	35.1	4.32	39	1	0	0	0	0	8	NCNC S
131	08-09-2019	Nafisa.K	19	179241	12.7	14.8	78.1	27	34.6	4.7	36.7	1	0	0	0	0	12	NCNC S
132	08-09-2019	Rekha	29	179263	9.5	21.2	68	21.3	31.3	4.47	30.4	3	1	1	1	0	11	MCHC A
133	09-09-2019	Yasmeen.K	27	179790	13.1	12.5	82.7	29	35	4.52	37.4	3	1	1	1	0	7	NCNC S
134	09-09-2019	Shashikala.S.M	31	179816	11.2	14	82.3	28	34	4	32.9	3	2	2	0	0	12	NCNC S
135	09-09-2019	Manjula. B	22	179832	8.8	18.1	69.2	20.6	29.7	4.28	29.6	1	0	0	0	0	9	MCHC A
136	09-09-2019	Gurudevi.K	21	179950	9.8	15.5	75.1	24.7	32.9	3.97	29.8	1	0	0	0	0	7	MCHC A
137	09-09-2019	Sana. Kousar	20	179987	9.9	13.9	82.3	28.7	34.9	3.45	28.4	1	0	0	0	0	10	NCNC A
138	09-09-2019	Gurubai.L	30	180127	9.9	14.6	79.2	26.1	33	3.79	30	3	2	2	0	0	9	NCNC A
139	07-10-2019	Momina.D.D	20	200249	9.8	14.3	74.5	24	32.2	4.08	30.4	1	0	0	0	0	9	MCHC A
140	11-10-2019	Preeti.B	32	200469	12.4	14.3	86.4	28.6	33.2	4.33	37.4	3	2	2	0	0	8	NCNC S
141	11-10-2019	Geeta	22	202675	12.7	14.4	82.8	28.4	34.3	4.47	37	1	0	0	0	0	7	NCNC S
142	12-10-2019	Kaveri.S	20	203276	10.6	14	77.8	25.4	32.6	4.18	32.5	1	0	0	0	0	11	MCHC A
143	14-10-2019	Mahadevi.K	28	204372	9.9	16.3	104.9	37.5	35.7	2.64	27.7	3	2	2	0	0	12	MACRO A
144	14-10-2019	Rekha.T	27	204395	12.2	15.9	89.8	31.2	34.8	3.91	35.1	2	1	1	0	0	8	NCNC S
145	14-10-2019	Bouramma.Y	21	204515	11.9	15.8	88.7	32.7	36.8	3.64	32.3	1	0	0	0	0	11	NCNC S
146	14-10-2019	Geeta.A	26	204558	9	15.7	73.8	22.5	30.5	4	29.5	2	1	1	0	0	12	MCHC A
147	14-10-2019	Lalabi.P	25	204596	10.2	13	87.6	30.1	34.3	3.39	29.7	2	1	1	0	0	12	NCNC A
148	14-10-2019	Priyanka	29	204609	12	14.8	86.1	30.2	35.1	3.97	34.2	2	1	1	0	0	9	NCNC S
149	11-11-2019	Nagamma.S.D	19	222728	11.3	16	73.7	23.7	32.3	4.75	35	1	0	0	0	0	12	NCNC S
150	11-11-2019	Asma.H.J	23	222729	10.5	14.6	91.6	30.3	33.1	3.46	31.7	2	1	1	0	0	11	NCNC A
151	11-11-2019	Ashwini.S.B	24	222730	12	13.3	84.5	28.2	33.3	4.26	36	2	1	1	0	0	10	NCNC S
152	11-11-2019	Reshma.H.J	26	222731	12.6	15.3	90.2	30.1	33.3	4.19	37.8	3	2	2	0	0	8	NCNC S
153	11-11-2019	Mayakka.P.K	28	222732	10.8	11.8	83.6	28.6	34.2	3.78	31.6	3	1	1	1	0	9	NCNC A
154	11-11-2019	Kashibai.A.K	20	222733	11.6	12.9	85.1	27.8	32.7	4.17	35.5	1	0	0	0	0	7	NCNC S
155	11-11-2019	Ayesha.B.B	23	222734	8.3	19.8	62.8	18.5	29.4	4.49	28.2	1	0	0	0	0	8	MCHC A
156	11-11-2019	Savitri.V.J	26	222735	10.8	14	91.2	29.8	32.7	3.62	33	3	1	1	1	0	12	NCNC A
157	20-12-2019	Bhavana.K	26	247023	11.5	17.2	82.1	27.4	33.4	4.19	34.4	2	1	1	0	0	9	NCNC S
158	20-12-2019	Suchitra.K	32	247112	9.6	15.2	65.2	20.6	31.7	4.65	30.3	3	1	1	1	0	9	MCHC A
159	20-12-2019	Netra.M	21	247141	9.9	20.3	68.2	21.4	31.2	4.62	31.7	1	0	0	0	0	8	MCHC A
160	20-12-2019	Saraswati.D	25	247161	11.2	13.7	80.9	28.6	35.3	3.92	31.7	2	1	1	0	0	10	NCNC S
161	27-12-2019	Sufiya.M	28	250950	12.6	15.1	77.3	26	33.7	4.84	37.4	3	2	2	0	0	12	NCNC S
162	27-12-2019	Yasmeen	24	251045	8.8	13.9	72.3	23.4	32.4	3.76	27.2	2	1	1	0	0	12	MCHC A
163	28-12-2019	Ayisha.K	22	251496	8.7	14.4	76.9	24.2	31.5	3.59	27.6	1	0	0	0	0	9	MCHC A

164	28-12-2019	Umashree.G	19	251501	10.8	14.3	78.2	25.8	33	4.18	32.7	1	0	0	0	0	8	NCNC A
165	28-12-2019	Kashibai.J	24	251769	11.9	13.4	81.4	28.1	34.5	4.24	34.5	1	0	0	0	0	11	NCNC S
166	04-02-2020	Akshta.K	19	21158	11.8	17.9	85.3	29.4	34.5	4.01	34.2	1	0	0	0	0	9	NCNC S
167	04-02-2020	Rajeshri	28	21192	11.9	14	70.3	23	32.7	5.18	36.4	2	1	1	0	0	10	NCNC S
168	04-02-2020	Savita.H	20	21261	7.3	18.6	58.4	16.3	28	4.47	26.1	1	0	0	0	0	8	MCHC A
169	07-02-2020	Geeta.H	28	22956	14.2	12.4	86.5	30.5	35.2	4.66	40.3	2	1	1	0	0	8	NCNC S
170	07-02-2020	Reshma.M	20	23052	9.9	18	62.5	19.3	30.8	5.14	32.1	1	0	0	0	0	7	MCHC A
171	08-02-2020	Hulagemma	19	23553	9.2	14.8	73.3	23.8	32.5	3.86	28.3	1	0	0	0	0	8	MCHC A
172	08-02-2020	Laxmibai	19	23563	11.7	14.4	76.6	26.1	34.1	4.48	34.3	1	0	0	0	0	10	NCNC S
173	08-02-2020	Anita.H	24	23636	13.8	13.6	95.3	33.8	35.5	4.08	38.9	1	0	0	0	0	8	NCNC S
174	08-02-2020	Purnima.B	23	23645	10.1	18.3	61.6	19.4	31.5	5.21	32.1	1	0	0	0	0	12	MCHC A
175	08-03-2020	Gouri.U	20	42440	12.1	12.6	83.8	27.6	32.9	4.39	36.8	1	0	0	0	0	7	NCNC S
176	08-03-2020	Sudha.H	25	42459	10.1	16.7	71	22.9	32.3	4.41	31.3	2	1	1	0	0	8	MCHC A
177	08-03-2020	Geeta.T	25	42460	13.5	14.3	78.4	25.9	33	5.22	40.9	1	0	0	0	0	8	NCNC S
178	08-03-2020	Bhavya.K	30	42462	10.3	12.8	83.8	27.3	32.6	3.77	31.6	3	1	1	1	0	9	NCNC A
179	08-03-2020	Sandya.T	19	42467	9.7	16.6	71.7	21.6	30.1	4.49	32.2	1	0	0	0	0	7	MCHC A
180	08-03-2020	Bhagya.K	34	42468	11.6	15	81.6	27.4	33.6	4.23	34.5	4	3	2	0	1	10	NCNC S
181	08-03-2020	Tara.H	34	42470	12.6	13.6	81.6	27.9	34.2	4.51	36.8	3	1	1	1	0	10	NCNC S
182	08-03-2020	Vaishali.N	28	42471	11.6	14.8	76.9	26.2	34.1	4.42	34	1	0	0	0	0	8	NCNC S
183	08-03-2020	Ashwini.K	29	42472	9.4	17.1	86.5	27.5	31.8	3.42	29.6	2	1	1	1	0	10	NCNC A
184	08-03-2020	Shrilaxmi.K	25	42473	9.2	17	87.8	27.3	31.1	3.37	29.6	2	1	1	1	0	9	NCNC A
185	08-03-2020	Sushila.M	25	42475	12.4	13.8	80.8	28	34.6	4.43	35.8	2	1	1	1	0	7	NCNC S
186	08-03-2020	Sushmita.T	20	42476	13.1	12.3	81.9	28.9	35.2	4.54	37.2	1	0	0	0	0	8	NCNC S
187	08-03-2020	Anuradha.T	19	42478	11.2	13	88.3	29.8	33.7	3.76	33.2	1	0	0	0	0	7	NCNC S
188	17-03-2020	Laxmi.D	22	47002	6.9	17.7	68.8	21.1	30.7	3.27	22.5	1	0	0	0	0	12	MCHC A
189	17-03-2020	Simabanu.S	24	47018	7.4	22.5	53.5	14	26.2	5.27	28.2	2	1	1	0	0	11	MCHC A
190	17-03-2020	Vijayalaxmi.B	30	47149	9.4	14.9	74.7	24	32.2	3.91	29.2	2	1	1	0	0	12	MCHC A
191	17-03-2020	Bismilla.G	22	47155	11.9	13.7	83.2	28.5	34.3	4.17	34.7	1	0	0	0	0	10	NCNC S
192	17-03-2020	Priyanka.A	20	47162	13.7	12.1	84.2	30.9	36.7	4.43	37.3	1	0	0	0	0	11	NCNC S
193	07-04-2020	Vidyashree.B	26	54298	9.8	17.4	67.6	22.4	33.1	4.38	29.6	2	1	1	0	0	7	MCHC A
194	07-04-2020	Bhagyashri.T	22	54316	10	15.9	73.5	24.5	33.3	4.08	30	1	0	0	0	0	10	MCHC A
195	23-04-2020	Zareena	25	58881	11.3	12.6	80.6	26.4	32.8	4.28	34.5	2	1	1	0	0	7	NCNC S
196	11-05-2020	Meghana	32	62079	11.1	12.8	86.8	30.5	35.1	3.64	31.6	3	2	2	0	0	12	NCNC S
197	11-05-2020	Shruti.H	20	62296	10.2	15.5	60	19.9	33.1	5.13	30.8	1	0	0	0	0	8	MCHC A
198	11-05-2020	P.Lavanya	30	62337	11.3	15.8	77	24.7	32.1	4.57	35.2	2	1	1	0	0	10	NCNC S
199	11-05-2020	Roshanbee.B	30	62342	7.4	18.9	61.4	18.1	29.5	4.09	25.1	3	1	1	1	0	12	MCHC A
200	11-05-2020	Jyoti.H	20	62356	11.8	13	87.5	30.1	34.4	3.92	34.3	1	0	0	0	0	8	NCNC S