

# Study of the Prevalence and Pattern of Anaemia in Unmarried Anaemic Females Aged (15-30 Years)

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Received: 05 Oct 2019/ Revised: 29 Nov 2019/ Accepted: 02 Jan 2020

## ABSTRACT

**Background:** Anemia is one of the most usual causes of malnutrition and around 30% of the world populations are suffering from Anemia. Infants, pre-school children, adolescents, and particularly women are at greatest risk of developing anemia. About 56% of pregnant women in developing countries and 18% in the developed countries are anemic. The estimated prevalence of anemia in non-pregnant women is 43% in developing country and 12% in developed countries.

**Methods:** A Prospective cross sectional observational study consisting of total 100 cases of anaemia was underlined to study the prevalence and pattern of anaemia in unmarried females age group between 15-30 years. A pre-tested and pre-designed performa was used to collect the information on socio-demographic characteristics like age, family size, family type, educational status, parental educational status, monthly family income, history of worm infestation, history of intake of iron supplements and dietary history, and body mass index (BMI). The systematic examination included cardiovascular system (CVS), respiratory system (RS), per abdomen (PA) and central nervous system (CNS).

**Results:** The prevalence of anemia was slightly higher in unmarried women of age 21 years and 82% were vegetarians and 18% among non-vegetarians. Total 43 women had a BMI of 18.5–24.9 or above. Anemia was high in lower class family, nearly half, 52 women belong to the family had monthly income of less than 10 thousand. Maximum cases of anemia had Hb% levels in the range of 10.1–11.0 g%. Out of 100 cases, 19 were of normocytic normochromic type; 67 were of microcytic hypochromic type and 14 were of macrocytic type.

**Conclusion:** Anemia is, thus impediment to individual and National development. With the focus on the health of women in general and the adolescent girl in particular, the picture of anemia seen is alarming. The study results indicated that the anemia prevalence rate was specifically higher in unmarried female's age group between 15 to 30 years. With the fluency of study in terms of peripheral blood smear, 19% cases of normocytic normochromic anemia, 14% cases of macrocytic anemia and 67% of cases of microcytic anemia (most of them iron deficiency anemia) was observed.

**Key-words:** Adolescence, Anaemia, CKD, Hemoglobin concentration, Prevalence

## INTRODUCTION

Anaemia is one among the foremost common causes of malnutrition and around 30% of the world populations are suffering from Anemia. Approximately 56% of pregnant women in developing countries and 18% in the developed countries are anaemic <sup>[1]</sup>.

The estimated prevalence of anaemia in non-pregnant women is 43% in developing country and 12% in developed countries, respectively <sup>[1]</sup>.

Numerous factors, like sex, age, residential altitude, smoking behaviour, pregnancy status influence, and hemoglobin concentration <sup>[2]</sup>. Additionally to being a medical condition, anemia is an important socioeconomic issue given its association with diminished physical and cognitive productivity <sup>[3]</sup>. A complex interplay of political, ecological, social, and biological factors determines the prevalence and distribution of anemia in a population <sup>[4]</sup>. Previous surveys have documented several potential causes of

### How to cite this article

Dudwe R, Singh N. Study of the Prevalence and Pattern of Anaemia in Unmarried Anaemic Females Aged (15-30 Years). SSR Inst. Int. J. Life Sci., 2020; 6(1): 2469-2479.



Access this article online

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anaemia among women including rural residency [4], younger age [5], pregnancy status [6,7], lower nutritional status [5], repeated childbearing [8], lactation/ breast feeding [5,6], poor access to nutritional supplements during pregnancy [5], and exposure to household violence [9]. Additionally, helminth infection [10] and malaria [11] found to be important causes of anemia. Furthermore, anaemia was found to be associated with immunologic disease progression and increased risk of AIDS-related death [12]. On the contrary, the use of hormonal contraceptives was shown to cause a potential protective effect against anaemia [13].

Women have extra requirements of iron supplements upon puberty to menopause due to physiological requirements, including menstruation, pregnancy and lactation (to some extent). For this extend, women of reproductive age get to suffer from iron deficiency even in developed countries throughout their reproductive years [14,15]. During adolescence, the spurt growth required additional amount of iron, and for the girl, there's furthermore requirement of iron due to regular menstrual loss.

The prevalence of anaemia increases during growth and development when there is an increased need for an iron-rich diet [16,17]. More than 30% of patients admitted to hospitals in developed nations are reported to be anemic, and this rate was known to be higher in developing countries and among women [17].

The factors responsible for the high prevalence of anaemia are varying consistent with geographical location. Iron deficiency is by far the one of the important causes of nutritional anaemia in public health terms. The prevalence of anaemia is alarmingly high in India due to (I) low dietary intake of iron (<20 mg/day) and folic acid intake (<70 mg/day); (II) poor bioavailability of iron (3–4% only) in phytate and fiber-rich Indian diet; and (III) chronic blood loss due to infection such as malaria and hookworm infestations, (IV), when bodily requirements of iron increase, or in cases of excessive blood loss [18,19].

The poor intake of folate during haemolysis associated with malaria can exacerbate the anaemic state. *Plasmodium falciparum* malaria is a major contributing factor to severe anaemia in the primigravida [20]. Anaemia also caused due to deficiency of vitamin B12, vitamin A, as well as zinc however the amount of these deficiencies in the region has not been determined.

HIV/AIDS is ranked high as determinant of anaemia in women and its prevalence is increasing in women of reproductive age [21,22]. Opportunistic infections and dietary deficiencies in AIDS patients are associated with anaemia. Also, an independent effect of HIV infection on haemoglobin concentration that is not associated with concurrent infection or dietary deficiency has been demonstrated [23].

## MATERIALS AND METHODS

**Study design-** The study was scheduled to be completed in the time duration from Jan 2018 to Jun 2019. Data for this study was obtained from indoor wards and outdoor wards of Department of Medicine, G. R. Medical College, Gwalior, Madhya Pradesh, India. A prospective cross sectional observational study consisting of total 100 cases of anaemia with abdominal pain underlined to study was to examine the study of the prevalence and pattern of anaemia in unmarried females aged (15–30 years).

**Inclusion Criteria-** Young, unmarried anaemic females in age group range of 15–30 years.

**Exclusion Criteria-** Critically ill patients.

**Data collection technique and Tools-** A pre-tested and pre-designed performa was used to collect the knowledge on socio-demographic characteristics like age, educational status, family size, family type, monthly family income, parental educational status, history of worm infestation, history of intake of iron supplements and dietary history, BMI. The systematic examination included CVS, RS, PA and CNS. The lab investigation included Complete Blood Count (CBC) with Peripheral Smear, Hematological Indices [Mean Corpuscular Volume (MCV), Mean Corpuscular Hb (MCH), and Mean Cell Hemoglobin Concentration (MCHC)], Reticulocyte Count, and Stool for occult blood and RFT, 24 hour Urine for Protein, Urine R/M and Ultrasonography Abdomen. For interpretation of anaemia, the cut-off point for hemoglobin level taken as 12 g/dl. The severity of anaemia was graded as mild (10–11.9 gm/ dl), moderate (7–7.9 gm/dl) and severe (<7.0 gm/dl). In our study, we were supplement hematinics to correct anaemia and treat other causes of anaemia.



**Statistical Analysis-** The data collected was transferred to a pre-designed classified table, which was according to our study. The data analysis was done to draw the valid references. Statistical analysis of data collected will be done by finding mean values, standard deviation, frequency and Chi square test using SPSS version 25.0 software.

## RESULTS

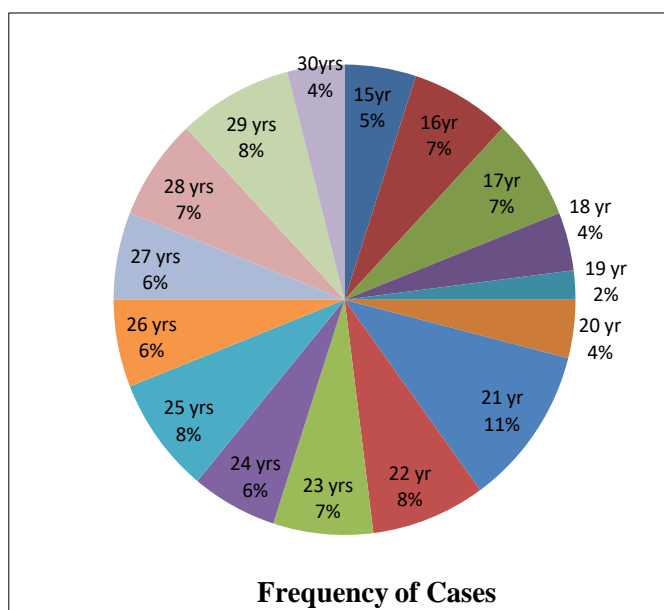
The data for this study was collected from 100 unmarried females, who were anemic. It was organized as follows;

descriptive information of the study variables, analysis of factors associated with anaemia and final multivariate analysis summarizing the prevalence and pattern of anaemia among unmarried women aged between 15 years to 30 years women. The results were presented in tables and graph forms.

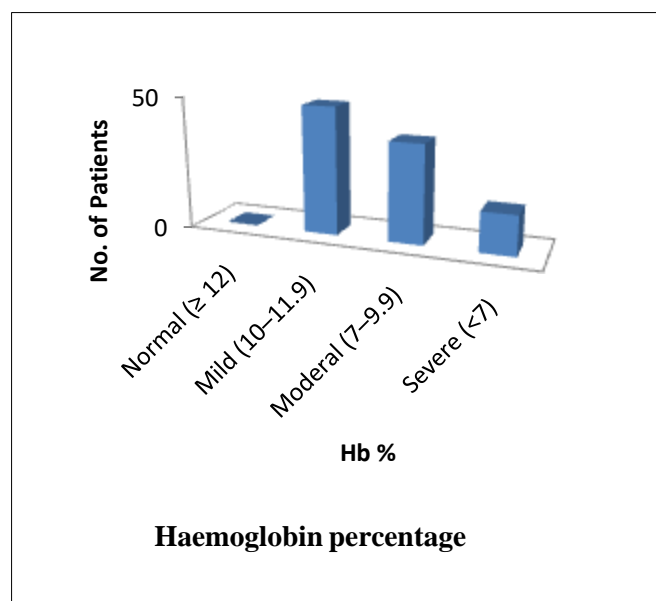
**Prevalence of anaemia by age-** The prevalence of anaemia was slightly higher in unmarried women of age 21 years. The mean age was 22.74 years (Table 1 and Fig. 1).

**Table 1:** Parent's age distribution, frequency and mean value

S. No.	Age	No. of Cases	Mean age±SD
1.	15 years	5	
2.	16 years	7	
3.	17 years	7	
4.	18 years	4	
5.	19 years	2	
6.	20 years	4	
7.	21 years	11	
8.	22 years	8	
9.	23 years	7	22.74±4.46
10.	24 years	6	
11.	25 years	8	
12.	26 years	6	
13.	27 years	6	
14.	28 years	7	
15.	29 years	8	
16.	30 years	4	



**Fig. 1:** Age distribution and frequency of unmarried anaemic women aged between 15 to 30 years



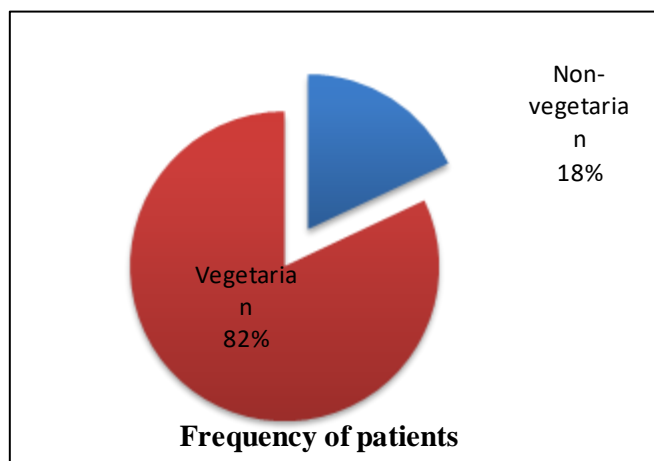
**Fig. 3:** Severity of anaemia among unmarried anaemic women aged between 15–30 years

**Prevalence of anaemia by diet-** In general, the prevalence of anaemia was found lower in those, who had taken non-vegetarian diet. The prevalence of anaemia among vegetarians was 4.5 times higher as compared to non-vegetarians. In studied cases, the prevalence was 82% among vegetarians and 18% among non-vegetarians (Table 2 and Fig. 2).

**Table 2: Prevalence of anaemia by type of diet in unmarried women aged between 15-30 years**

S. No.	Diet type	Patients (%)
1.	Vegetarian	82
2.	Non-vegetarian	18

**Prevalence of anaemia on the basis of different variables-** Forty three women had a BMI of 18.5–24.9 or above. Regarding the educational level of the cases 23, 49 and 19 attended primary, secondary and tertiary level of education, respectively. Total 13 women belong to the small family (up to 3 members), 62 belong to medium family and 25 women belong to a large family. The prevalence of anaemia was high in lower class family, nearly half, 52 women belong to the family had monthly income of less than 10 thousand. 28 women belong to the family had monthly income between 11 thousand to 30 thousand. Twelve women belong to the family had monthly income between 31 thousand to 50 thousand. Eight women belong to the family had monthly income above 50 thousand. The prevalence of anaemia decreases as the educational status of parents increases in rural area. Worm infection was predicted in 14 cases. The iron supplements were taken only by 29 women.



**Fig. 2:** Frequency of anaemia by type of diet in unmarried women aged between 15–30 years

**Table 3:** Prevalence of anaemia in unmarried women’s aged between 15 to 30 years on the bases of different variables

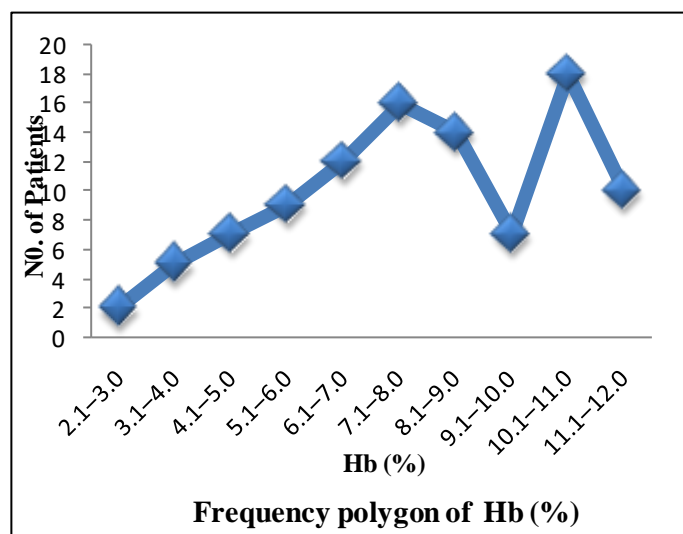
Variables	No. of patients
<b>BMI</b>	
<18.5	39
18.5–24.9	43
>24.9	18
<b>Educational status</b>	
None	9
Primary level	23
Higher level	49
Tertiary level	19
<b>Family type (Class)</b>	
Low	52
Middle	39
High	9
<b>Family size</b>	
Small Family (Up to 3 Members)	
Medium Family (4–6 Members)	13
Large Family( ≥ 7 Members)	62
	25
<b>Monthly family income</b>	
<10 thousand	52
11 thousand to 30 thousand	28
31 thousand to 50 thousand	12
>50 thousand	8
<b>Parents educational status</b>	
<b>FATHER</b>	
Primary	77
Middle	32
High School	9
<b>MOTHER</b>	
Primary	59
Middle	20
High School	3
<b>History of worm infection</b>	
Present	21
Absent	79
<b>History of iron supplements taken</b>	
Yes	14
No	71

**Prevalence of anaemia among patients at various ranges of hemoglobin percentage-** Maximum cases of anemia had Hb% levels in the range of 10.1–11.0 g% and 7.1–8.0%; followed by 8.1–9.0 g%, 6.1–7.0 g%, 11.1–12.0 g%, 5.1–6.0 g% and 4.1–5.0 g%, 9.1–10.0 g% respectively, whereas minimum cases of anemia had Hb% levels in the

range of 2.1–3.0 g%. The mean value for Hb% was 8.90±1.68.

**Table 4:** Frequency of anaemic patients at various ranges of hemoglobin percentage

S. No.	Hb (%)	No. of cases	Mean±SD
1.	2.1–3.0	2	
2.	3.1–4.0	5	
3.	4.1–5.0	7	
4.	5.1–6.0	9	
5.	6.1–7.0	12	100±5.05
6.	7.1–8.0	16	
7.	8.1–9.0	14	
8.	9.1–10.0	7	
9.	10.1–11.0	18	
10.	11.1–12.0	10	



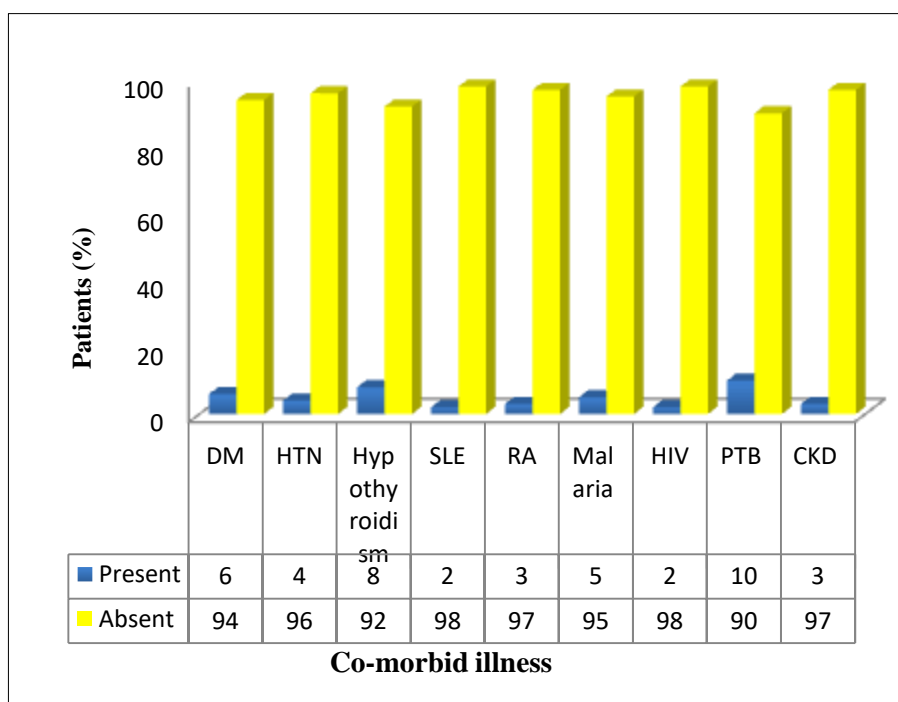
**Fig. 4:** Frequency polygon of hemoglobin percentage in unmarried anaemic women aged between 15 years to 30 years

**Prevalence of co-morbid illness-** Diabetes Mellitus (DM) was present in 6% cases, where as HTN was present only in 4% of cases. Hypothyroidism was present in 8% of cases and only 2% cases were suffering from SLE. RA was present only in one case, malaria infection was present in 3% cases, 2% cases were identified with HIV infection whereas PTB was present in 10% cases. CKD was identified only in 3% cases.

**Table 5:** Prevalence of co-morbid illness in anaemic unmarried women aged between 15 to 30 years

S. No.	Co-morbid illness	Patients	Patients (%)
1.	DM	Present	6
		Absent	94
2.	HTN	Present	4
		Absent	96
3.	Hypothyroidism	Present	8
		Absent	92
4.	SLE	Present	2
		Absent	98
5.	RA	Present	3
		Absent	97
6.	Malaria Infection	Present	5
		Absent	95
7.	HIV Infection	Present	2
		Absent	98
8.	PTB Infection	Present	10
		Absent	90
6.	CKD	Present	3
		Absent	97

DM= Diabetes Mellitus, HTN= Hypertension, SLE= Systemic lupus erythematosus, RA= Rheumatoid Arthritis, PTB= Pulmonary tuberculosis, CKD= Chronic kidney disease



**Fig. 5:** Frequency of co-morbid illness among cases

**Peripheral smear-** Out of 100 cases, 19 were of Normocytic normochromic type (NCNC) type; 67 were of Microcytic hypochromic (MCHC) type and 14 were of Macrocytic type (MA) type.

**Table 6:** Morphological classification of anemia of unmarried anemic female patients based on peripheral blood smear

S. No.	Peripheral Blood Smear	Total No. of Cases
1.	NCNC	19
2.	MCHC	67
3.	MA	14

NCNC- Normocytic normochromic type, MCHC- Microcytic hypochromic, MA- Macrocytic type

## DISCUSSION

The present study, included 100 unmarried anaemic women cases between 15 years to 30 years, attending Department of Medicine, G. R. Medical College & J.A. Group of hospitals Gwalior, Madhya Pradesh, India. This discussion, analysis data obtained from the study and compared it to obtained previous studies done with similar objectives in mind.

Overall, anaemia prevalence was found more in 21 yr old age of adolescent. Anaemia prevalence of more than 40% has been defined as a problem of severe public health significance by WHO <sup>[1]</sup> for epidemiological mapping. There were two peaks in iron deficiency anaemia i.e. 21–22 yrs and 29–30 yrs, suggesting the majority of patients with iron deficiency anaemia. As per WHO classification, the majority of the subjects suffered from mild anaemia (48%). While 37% and 15% suffered from moderate and severe anaemia, respectively. Similar results were reported by CMS Rawat *et al.* <sup>[24]</sup> as well as Varma *et al.* <sup>[25]</sup>, where they noted high incidence of mild to moderate anaemia. In this study, 37% of anaemic subjects had low MCV with high RDW, suggestive of probably iron deficiency.

Prevalence of anaemia when analyzed by socio-economic factors showed that education of parents, family type, supplements of iron and socio-economic status was associated significantly with anaemia. The similar studies were done by Rawat <sup>[24]</sup> and Verma *et al.* <sup>[25]</sup> supported our findings. This may be because of better availability of high quality food with better socio economic status and better understanding of the needs

of the adolescent girls by the parents. Since majority, 80% of the participants had monthly income of less than 30 thousand; the high prevalence of anaemia during this study was mostly associated with the low socioeconomic status of the women, which have an impact on their nutritional status and health seeking behavior <sup>[26]</sup>. Women in low socio-economic classes are likely to be poorly educated and sometimes have financial constraints. These women cannot afford good health services or they could not have access to health services. The result was that they suffered the deleterious effects of poor nutrition, HIV, chronic infections and worm infestations.

The prevalence of anaemia was more in the cases prefer vegetarian food. Bioavailability of iron from cereals and vegetables was low because of the presence of phytates, oxalates and tannins. Although no assessment of dietary intake was made, the diet in the study area was predominantly of cereals and vegetables. This type of diet provides low amounts of bioavailable iron because of the high content of iron absorption inhibitors, such as phytate and polyphenols <sup>[1]</sup>. The typical Indian diet is based on cereals and pulses, which contain more than 40% of total phosphorus as phytates and vegetables and plant food contain oxalates, which interfere with absorption of food iron inspire of high dietary intake.

BMI is the most practical and widely used tool to determine an individual's body fat mass. As per WHO BMI charts 2007, the subjects were classified, and it was observed that women falling into the category of <3<sup>rd</sup> to 15<sup>th</sup> percentile had a high prevalence of anaemia. This is inconsistent with the study conducted by Kannani and Poojara <sup>[27]</sup>.

This study revealed that the risk of developing anaemia was significantly more among women who did not take iron and folic acid supplements compared to those who took these supplements. This finding was in line with other previous studies such as Ethiopia (Kefyalew and Abdulahi <sup>[28]</sup>); Abel Gebre and Afework Mulugeta <sup>[29]</sup>), Uganda (Sam *et al.* <sup>[30]</sup>), Nigeria (Nwizu *et al.* <sup>[31]</sup>), Vietnam (Fujimori *et al.* <sup>[32]</sup>) and India (Thirukkanesh and Zahara, <sup>[33]</sup>, Khan *et al.* <sup>[34]</sup> and Aikawa *et al.* <sup>[35]</sup>), which indicated that lack of iron supplementation among the most significant risk factors for developing countries.

Lower personal income, an incomplete secondary school education, food insecurity and the status of being single were associated with iron deficiency while employed

women had a better overall iron status than non-working women. Similar results have been reported elsewhere [36]. However, since many of these characteristics may be age related factors, their real influence on iron status must be precisely studied, considering the confounding effect of age.

Successful management of anaemia depends on reliable means for detecting anaemia, assessing its severity and monitoring response to treatment. Screening for anaemia in women is useful for a variety of reasons. It may help to collect baseline data on the prevalence of anaemia and severity in a given population. Recently, the WHO colour scale was validated and found to be useful in tropical field conditions (Van den Broek *et al.* [37]), and its advantage over clinical signs confirmed by Ingram and Lewis [38]. Provision of these essential facilities motivates women to attend the clinic, and also may improve compliance with treatment. A study by Koblinsky [36], women diagnosed as anaemic found supplementation more acceptable. Testing would promote a better understanding of anaemia by women.

Malaria causes severe anaemia. In this study, we found that the prevalence of anaemia was significantly higher, and the mean haemoglobin significantly lower in women with a positive malaria test. These findings were consistent with other studies given by Brabin and Piper [20]; and Shulman *et al.* [39]. In addition, they were also iron-deficient. However, HIV-positive women have also increased susceptibility to malaria.

The HIV prevalence was smaller among unmarried women. HIV-infected women are at an increased risk of anaemia, and severe anaemia (Antelman *et al.* [40]; Van den Broek *et al.* [23]). The increased risk of anaemia is thought to be associated with a higher degree of severity of the disease. However, in populations with a high risk of exposure to infectious diseases, particularly malaria, the vicious cycle of infections, impaired immunity and anaemia may result in a stronger association between HIV infection and anaemia already at an earlier stage of the disease. 70% of people with AIDS are anaemic, and AIDS, TB and related infections are ranked by as major determinants of anaemia in reproductive age women by UNICEF, [22]. A study given by Zucker *et al.* [41] showed that severely anaemic women of reproductive age were significantly more likely to be HIV-positive.

Infections interfere with iron absorption and uptake in the bone marrow and thus contribute to anaemia. Most

likely sites of sub-acute and chronic infections could be in the urinary tract and in the respiratory tract, including TB. Van den Broek and Letsky [42] showed that infections were common among both HIV-positive anaemic and negative anaemic women. Tatala *et al.* [43] reported in 1998 that Hookworm is prevalent for anaemia and contributes to anaemia in various groups of the population including women and children. In the anaemic women studied, the presence of hookworm was associated with severe anaemia.

The contribution of hookworm to anaemia is dependent on hookworm load. However, in the context of a poor diet and low body iron stores, light to moderate hookworm infection is sufficient to cause anaemia. Stoltzfus *et al.* [44] concluded that women of reproductive age are susceptible to anaemia because their iron stores are inadequate in hookworm endemic areas. 52% of cases with moderate to severe anaemia among studies cases women were attributed to hookworm. Hookworm control is therefore an essential component of anaemia control that could be achieved through community education on sanitary practices and also periodic deworming of groups vulnerable for anaemia, especially school girls given by UNICEF [45]. De-worming of women has been shown to significantly increase the beneficial effects of iron supplementation on Hb concentration and iron status by Atukorala *et al.* [45].

The anaemia of CKD was generally normocytic normochromic. The presence of microcytosis reflects iron deficiency and aluminium excess, whereas macrocytosis reflects vitamin B<sub>12</sub> or folate deficiency and/or erythropoietin therapy, shifting immature and large reticulocytes into the circulation by Inoka *et al.* [46].

## CONCLUSIONS

With the focus of health of women in general and the adolescent girl in particular, the scenario of anemia is alarming. On the basis of data gathered in our study in unmarried anemic females, in terms of severity mild anemia was observed in 48% cases, moderate anemia was observed in 37% cases and severe anemia was observed in 15% cases. Anemia is thus impediment to individual and national development. With the fluency of study in terms of peripheral blood smear, 19% cases of normocytic normochromic anemia was observed, 14% cases of macrocytic anemia was observed and 67% of cases of microcytic anemia (most of them iron deficiency anemia) was observed.





To prevent anemia at a low cost, it is recommended to provide women with relevant information and well-planned interactive educational programs. We believe that further, more comprehensive studies with more subjects would make a considerable contribution to the knowledge base in this field.

#### CONTRIBUTION OF AUTHORS

**Research concept-** Dr. Neelima Singh

**Research design-** Dr. Neelima Singh

**Supervision-** Dr. Neelima Singh

**Materials-** Dr. Rahul Dudwe

**Data collection-** Dr. Rahul Dudwe

**Data analysis and Interpretation-** Dr. Neelima Singh

**Literature search-** Dr. Neelima Singh

**Writing article-** Dr. Rahul Dudwe

**Critical review-** Dr. Neelima Singh

**Article editing-** Dr. Rahul Dudwe

**Final approval-** Dr. Neelima Singh

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