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Original Research Article

PREVALENCE OF ANEMIA IN PREGNANCY IN WOMEN ATTENDING ANTENATAL CLINIC IN KABWATA, LUSAKA, ZAMBIA

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Abstract: Anemia in pregnancy is regarded as a major risk factor for pregnancy complications.The aim of this study was to determine the prevalence of anemia during pregnancy in all pregnant women attending antenatal clinic at Kabwata Clinic in Lusaka, Zambia. Anemia was determined by hemoglobin estimation using a full blood count automated machine (pocH-100i), and the study was conducted over a period of 3 months. A prevalence rate of 32.8% of anemia in pregnancy was found and the most common was the microcytic hypochromic type.Anemia in pregnancy was found to be associated with the stage of the pregnancy and was most common during both the second and third trimesters. No correlation was found between maternal age, parity and anemia in pregnancy and the mean Hb level in pregnant women was found to be 11.3g/dl. In conclusion there is high prevalence of iron deficiency anemia in pregnancy women attending antenatal clinic at Kabwata clinic in Zambia

Key words: Anemia, Antenatal clinic, Pregnancy, Hemoglobin,

Introduction: Anemia is a condition where there is lower-than-normal number of red blood cells or quantity of hemoglobin resulting in diminished capacity of the blood to carry oxygen. Anemia in pregnancy can be due to many factors but the most common cause is iron deficiency [1]. Iron deficiency anemia is a condition characterized by low levels of iron in the body which results in a reduction is the number of circulating red blood cells. Iron deficiency anemia among pregnant women is a worldwide problem which is more pronounced in developing than developed countries[2].According to WHO anemia is defined as Hb level of <11 g/dl, mild with Hb of 10–10.9 g/dl, moderate with Hb of 7–10 g/dl and severe with Hb of <7 g/dl. Pregnant women are particularly vulnerable to iron deficiency because of the increased circulatory and metabolic demands imposed by pregnancy involving a growing placenta, fetus, and maternal tissues, coupled with associated dietary risks such that even in health iron-

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sufficient women this extra demand drives them into a state of iron deficiency[3]. Other conditions that can cause iron deficiency anemia include poor dietary intake or malabsorption, of nutrients,chronic blood loss from worm infestations, gastrointestinal ulcers and acute blood loss as a result of ectopic pregnancy, antepartum haemorrhage, abortions, injuries and internal bleeding. In malaria endemic parts of the world, malaria infection tends to be severe in pregnancy and itcan cause hemolysis of red cells. Hemolytic anemia in the background of iron deficiency can worsen the outcome of the pregnancy. In anemic state the oxygen carrying capacity of blood diminishes and this can have adverse effects on both maternal and fetal wellbeing [4]. What has been show by others is that the prevalence of preterm delivery, small for gestational age, and low birth weight is higher in women with anemia during the 1st trimester and the risk depends on the severity of the hemoglobin deficit[5, 6]. Severe anemia is also associated with serious maternal complications such as cardiac failure, hemorrhage, infections and placental complicationslike abruptio placenta[7].Although iron deficiency is the most common form of nutritional anemia in pregnancy other nutritional deficiencies can also give rise to anemia. Megaloblastic anemia can be due to both folate deficiency and vitamin B_{12} deficiency. Folate, is a B vitamin which is needed by the body to produce new cells, including healthy red blood cells. During pregnancy, women need extra folate. But sometimes they don't get enough from their diet. When that happens, the body can't make enough normal red blood cells to transport oxygen to tissues throughout the body. Folate deficiency can directly contribute to certain types of birth defects, such as neural tube abnormalities (spina bifida) and low birth weight.The body also needs vitamin B_{12} to form healthy red blood cells. Vitamin B_{12} is necessary for the regeneration of active form folate. When a pregnant woman doesn't get enough vitamin B_{12} from her diet active form of folate cannot be regenerated; hence the similarities in the presentation of vitamin B_{12} and folate deficiency. Vitamin B_{12} is basically of animal origin and strict vegetarians are always at risk of developing vitamin B_{12} deficiency. In iron deficiency anemia red blood cells are small (Low MCV or microcytic) and appear pale in the centre (Low MCHC or hypochromic) and some become abnormally shaped and size. The trace on the machine shows increased red blood cell distribution width (RDW).

In folate or vitamin B_{12} anemia there is decreased red blood cell count and hemoglobin, increased MCV and MCH but normal MCHC. There is also evident variation in size and shape of the red blood cells. In addition to the above hematological findings there are also some biochemical and bone marrow test that are carried out to confirm diagnosis whenever there is doubt.

Our aim was to determine the prevalence of anemia and its severity at Kabwata clinica dn whether this anemia was associated with parity, gestation and age.

Materials and Methods: This was a cross sectional descriptive study conducted at Kabwata Clinic. Kabwata is one of the main townships in Lusaka the capital city of Zambia. The target population consisted of all pregnant women attending antenatal clinic (ANC) at Kabwata clinic. The study group comprised women aged between 16 and 45 years, attending ANC at Kabwata Clinic irrespective of parity.Pregnant women with chronic conditions, such as cancer and cirrhosis, were excluded. In addition, those on certain medications, such as anti-retroviral drugs for HIV infection, chemotherapy drugs for cancer and other conditions, were also excluded. Altogether 201 samples were collected. About 5ml venous blood samples from the antecubital veins were put in EDTA vacutainer blood collection tubes and transported to the laboratory immediately. The blood samples were analysed using pocH-100i, an automated full blood count (FBC) machine. The Hb levels

obtained were recorded and correlated to age, gestation age and parity. All specimens were considered potentially positive for infectious agents and were therefore handled carefully and disposed according toNational Laboratory Guidelines for disposal of body fluids.

From the full blood count done on the samples, only the Hb, MCV and MCH were the parameters of interest. The prevalence and classifications of anemia were then determined using the Hb, MCV and the MCH values. Participant information collected which included age, gestation age and parity was analysed using SPSS Version 16.0. Graph Pad Prism version 6.0 was also used to determine the association of thesevariables to anemia in pregnancy. A *p* value of <0.05 was considered significant. Microsoft Excel 2010 was used for generating the graphs.

Permission to carry out the study was sought from the study site (Kabwata Clinic) and also from the ethics committee at University of Zambia School of Medicine Research Ethics Committee (UNZASOMREC) and this was granted. There was no direct contact with the study individuals and all the samples used were collected for routine antenatal screening. Parity, age, gestational age and all other clinical details were obtained from the antenatal cards and study individuals were given research numbers unrelated to the patient laboratory numbers thus keeping their identity unknown.

Results: The calculated sample size was 400 but only 201 pregnant women were involved in this study and this was due to the shortage of the pocH 100i reagents and poor antenatal attendance by the pregnant women. The parameters of interest i.e. Hb, MCV and the MCH together with the other information collected were recorded. Of the201 pregnant women 92, 98 and 11 were in the age range 16-25, 26-35 and 36-45 respectively (**fig. 1**);20,134 and 47 were in their first, second and third trimesters respectively (**fig. 2**)and 80 pregnant women had parity of 0, 52 had parity of 1, 33 had parity of 2, 21 had parity of 3, 9 had parity of 4, 2 had parity of 5, another 2 had parity of 6 and the remaining 2 had parity of 7 (**fig. 3**). A total of 66 had their Hb levels less than 11g/dl while 135 had their Hb levels above or equal to 11g/dl, therefore the prevalence rate of anemia in the pregnant women attending ANC at Kabwata clinic was found to be 32.8% (**fig. 4**), using a cut off level of Hb<11 g/dl (WHO) and the mean Hb of the pregnant women was found to be 11.3g/dl. A significant correlation was established between the gestational stage and anemia in pregnancy (**table 1**) and anemia was found to be most common during the second and the third trimesters (**fig.5**). Most anemic women had a mild form of anemia and the most common morphological type was microcytic hypochromic.(**figs.6,7 and table 2**).

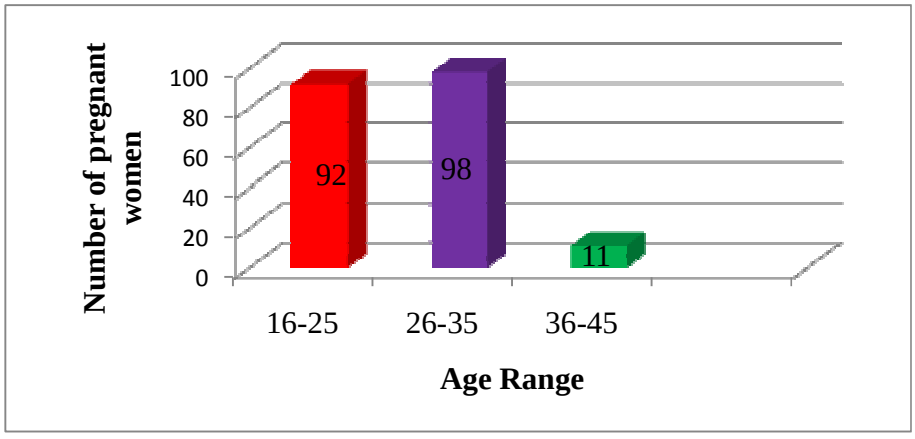

Figure 1: Distribution of Maternal Age. This shows the distribution of the sample (n=201) according to the maternal age of the pregnant women.

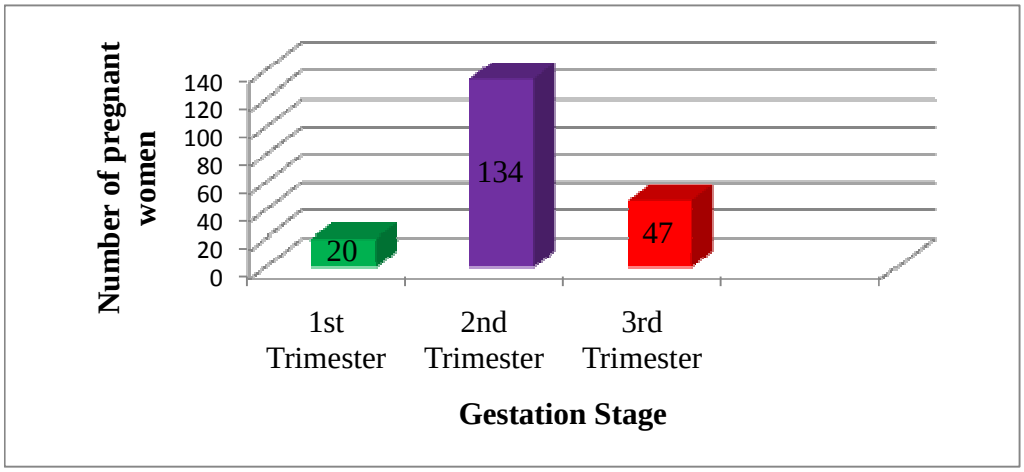

Figure 2: Distribution of Gestation Stage. More than half (66.7%) of the total (201) of the pregnant women were in their second trimester.

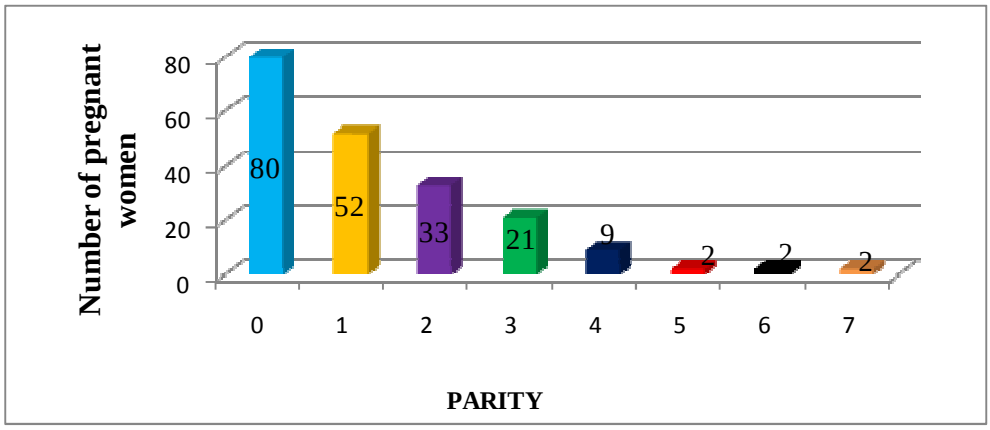

Figure 3: Distribution of Parity. 80 of the all pregnant women had no children and the remaining 121 had parities of 1, 2, 3, 4, 5, 6 or 7.

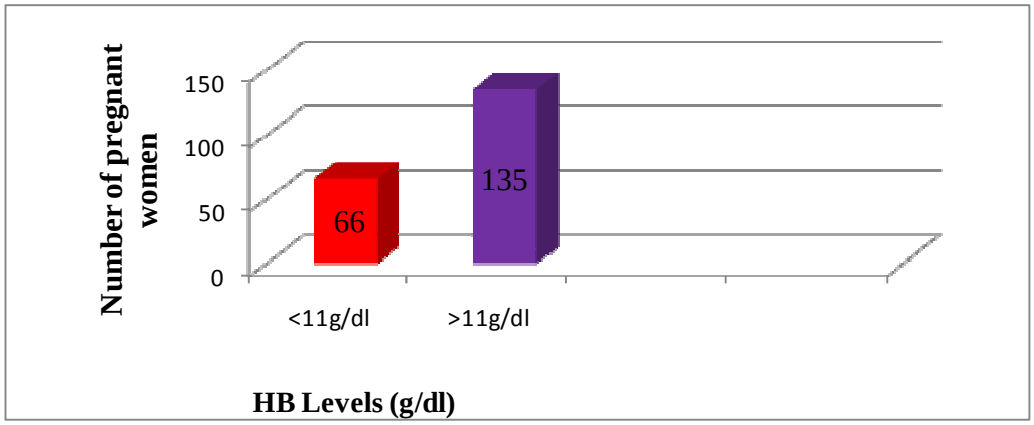

Figure 4: Distribution of Hb levels. This shows the distribution of all pregnant women according to their Hb levels in g/dl. Hb levels less than 11g/dl were considered anaemic.

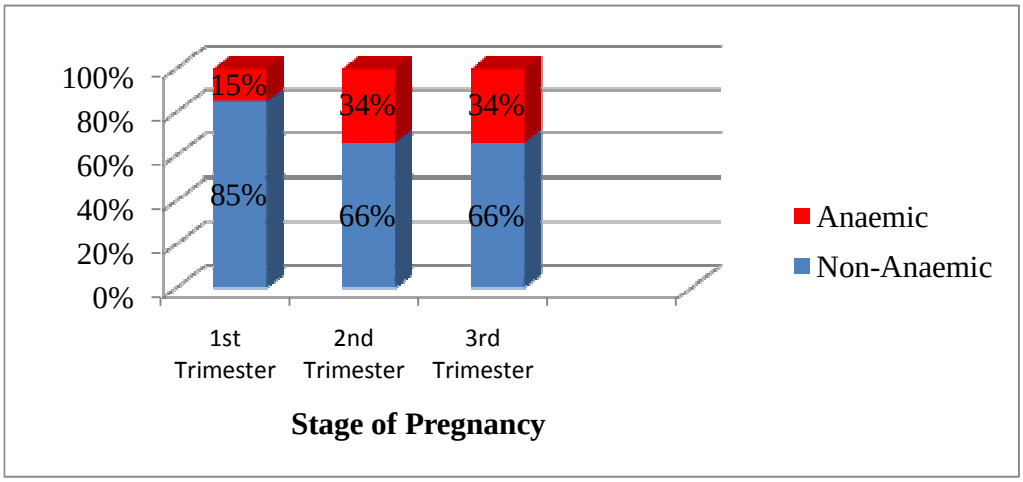

Figure 5: Stage at which anemia is most common. Of the total 201 samples; 3, 46 and 16 were anaemic in the first, second and third trimesters respectively

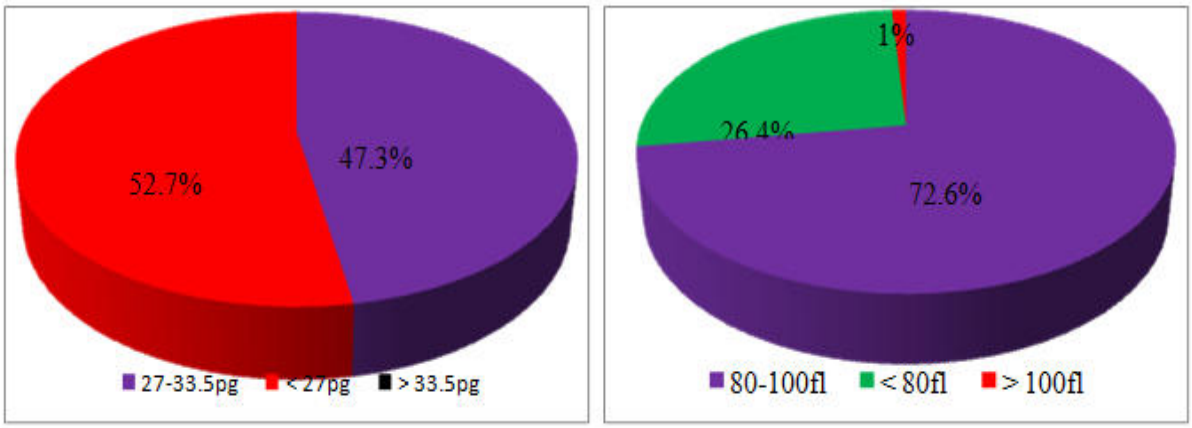

Figure 6: Anemia classifications according to MCH (left) and MCV (right). Normal range for MCH is 27-33.5pg, Values lower than the normal range suggests hypochromic anemia. The normal range for MCV is 80fL-100fL; values lower or higher suggest microcytic or macrocytic anemia respectively.

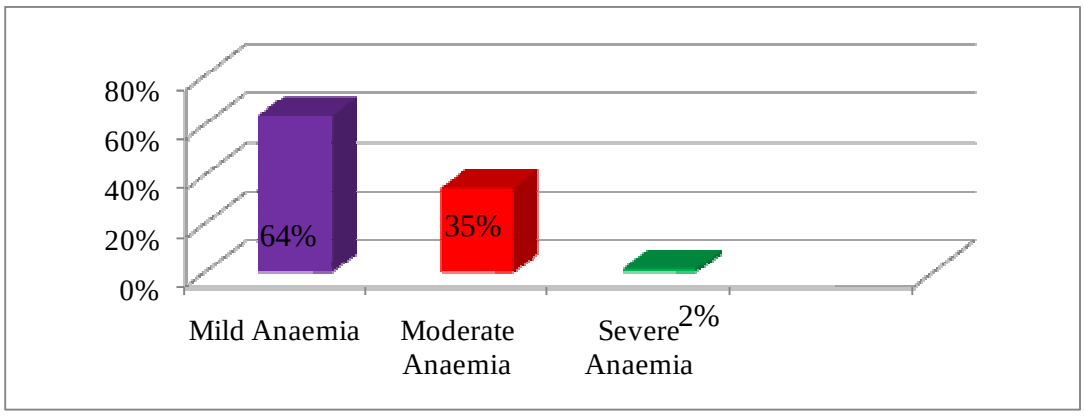

Figure 7: Anemia severity among anaemic pregnant women (n=66). Hb levels of 10 to 10.9 g/dl indicate mild anemia, 7 to 9g/dl indicate moderate anemia and < 7 g/dl indicate severe anemia

Table 1: Factors Affecting Anemia in Pregnancy.

Variables	Anaemic (<11g/dl)	Non-Anaemic (>11g/dl)	Total	P value
Gestation Stage: 1st 2nd 3rd	 3 46 17	 17 88 30	 20 134 47	0.0068**S**
Maternal Age 16-25 26-35 36-45	 33 29 4	 59 69 7	 92 98 11	0.7369 **NS**
Parity 0-5 6-10	 64 2	 133 2	 197 4	0.3621 **NS**

S : Significant Correlation **NS :** Non Significant Correlation

Table 2: Distribution of Morphologic Type Anemia Among the Pregnant Women

Morphologic type of cells	Anaemic n (%)	Non-Anaemic n (%)	Total n (%)
Microcytic hypochromic (MCV < 80fl, MCH < 27pg)	31(47%)	21 (16%)	52 (26%)
Normocytic normochromic (MCV and MCH normal)	18 (27%)	72 (53%)	90 (45%)
Macrocytic normochromic (MCV > 100fl, MCH {27 pg< MCH < 33.5 pg})	0 (0%)	2 (1%)	2 (1%)
Other combinations	17 (26%)	40 (30%)	57 (28%)
Total	66 (33%)	135 (67%)	201 (100%)

Discussion: The prevalence of anemia in pregnancy found in this study (32.8%) is in line with what has been documented in studies carried out in Ethiopia (33.2%), Jordan (34.7%) and Malaysia (35%) [8-10]. In contrast, studies conducted in Trinidad and Tobago in West Indieshad lower prevalence rates of 15.3%[11]. The World Health organization estimates that in industrialized countries the prevalence of anemia in pregnancy is about 23%and in non industrialized countries its about 52% with a range of about35–75%[12]. The differences in prevalence may be due to variations in socio-economic and educational status between the populations in the study areas. Prevalence rates may also differ due to the quality of health education and care given at health institutions during ANC follow-up. Variations in environmental factors may play a significant part also as reported in India where it was shown that exposure to smoke from biomass fuel resulted in increased prevalence of anemia in pregnancy[13]. Additionally, it could be due to the variation of the method used in Hb level

determination. The standard method (Fluid based system hematology analyser) ia what was employed in our study, but other studies employed the Sahli's technique which had been reported to be less satisfactory under operational circumstances chiefly because of dilution problems involved in the use of ordinary manual pipettes and subjective bias during visual comparison[14]. In our study, mild anemia was the most common with 63.6%, followed by moderate anemia with 34.8% and the remaining 1.5% of the anaemic pregnant women had severe anemia. This is consistent with reports from some studies in Ethiopia and Jordan; but in contrast other studies conducted in Kenya and in Ethiopia showed moderate anemia as the most common [8]. This study tried to demonstrate the common morphological characteristics of anemia among the pregnant mothers. Of the total (66) anaemic pregnant women, 47% had microcytic hypochromic anemia, followed by normocytic normochromic type with 27% and the remaining 26% had other ill-defined morphological type. What was also observed was that there was no anemic patient with red cell changes suggestive of either folate or vitamin B_{12} deficiency. The high prevalence of microcytic hypochromic anemia is suggestive of iron deficiency although anemia of chronic diseases can give rise to a similar hematological picture. Although individuals with chronic medical conditions were excluded there is still a possibility that a small number were recruited by mistake. The prevalence of normocytic normochromic anemia followed that of microcytic hypochromic anemia. In the context of pregnancy this in to be expected because of dilution of blood in later stages of pregnancy by greater increase in plasma volume relative to increase in red cell volume. In addition to increased nutritional demand by the growing fetus hemodilution may in part explain why in our study most cases of anemia were found in the second and third trimester. It could also simply be due to the fact that only 20 of the pregnant women in the study were in their first trimester and the rest in second and third. In addition, there is a possibility that some could have had malaria which they recovered from before recruitment and that the hemolysis as a result of malaria could have given the normochromic normocytic picture seen in this study. The overall prevalence of anemia in pregnancy in our findings was basically lower than in many non industrialized countries. This is most likely due to a robust program by the Ministry of Health of supplying pregnant women with iron tablets and folic acid to take routinely during pregnancy and malaria prophylaxis.

In our study we found no association between anemia and age or between anemia and parity. This is in line with what has been reported before that age and parity were insignificant with no association to anemia[15],[16]. The lack of association between anemia and parity in our study is rather surprising because the greater the number of children the less interval there is to recover the baseline nutrient levels increasing the risk of anemia in subsequent pregnancieswhich has been shown elsewhere[17-19]. In fact in a study done in Nigeria anemia was found to be higher in primegravida who were mostly of young age group than multigravida[20]. Our result on association between parity and anemia could have been different from the expected because of a small number of multiparous women we were able to recruit and from this small group the absolute number of anemic women was also small. Perhaps this can also explain why in the Nigerian study prevalence of anemia was much higher in prigravidas than multigravidas because they had many more primegravidas than multigravidas in their study group and the numbers of anemic was more from the larger group as compared to the smaller group.

Conclusion: The overall prevalence of anemiain pregnance at Kabwata clinic was 32.8% and the majority of the cases were of the mild type. Morphologically, the most predominant type of anemia was microcytic

hypochromic anemia followed by normocytic normochromic anemia. The present study has shown a statistically significant association between anemia in pregnancy and gestational age asanemia was most common during the second and the third trimesters. This prevalence of anemia in pregnancy underlines the need for a control and preventive program in antenatal clinics.

Limitations of Study

Many pregnant women preferred to start their ANC visits in the second or even in the third trimesters which meant limited data on first trimester analysis. During the study, there was a shortage of reagents for the pocH 100i, which made it impossible to attain the intended sample size (400). Only 201 samples were processed within the time frame allocated for the study. Whereas a diagnosis of anemia in pregnancy could be easily made, no further tests were carried out to confirm the cause of anemia. The impression of iron deficiency was made on the basis of reduced red blood cell volume and reduced mean cell hemoblobin from the machine. Microscopic examination of blood smears and some biochemical tests should have been carried out to confirm iron deficiency but for the limitation of resources and time.

In conclusion anemia in pregnancy at Kabwata ANC in Lusaka, Zambia is still a major health problem even though the prevalence is generally better than other non-industrialized countries and the commonest cause is iron deficiency

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