Global Scientific JOURNALS

GSJ: Volume 11, Issue 5, May 2023, Online: ISSN 2320-9186
www.globalscientificjournal.com

# ASSESSMENT OF PREVALENCE OF ANAEMIA AND ITS ASSOCIATED FACTORS AMONG PREGNANT WOMEN RECEIVING ANTENATAL CARE IN FEDERAL MEDICAL CENTRE OWERRI, IMO STATE, NIGERIA.

**BY**

**[1]Ezejindu C.N, [2]Philip, V.C,[3]Onyemachi P.E.N.**

**[1]Department of Public Health, Faculty of Allied Health Sciences, David Umehi Federal University of Health Sciences Ebonyi State, Nigeria.**

**[2]Department of Public Health, Faculty of Health Sciences, Abia State University, Uturu, Abia State, Nigeria.**

**[3]Department of Community Medicine, Abia State University Uturu, Abia State.**

***Corresponding author. E-mail:** ezejinducosmas@gmail.com.



## Abstract

Anaemia is one of the most common nutritional deficiency diseases observed globally and affects more than 1.62 billion (25%) people of the world's population, of which 56 million are pregnant women. This study was carried out to assess the prevalence and its associated factors of anaemia among pregnant women receiving antenatal care in Federal Medical Centre (FMC) Owerri. This is a cross sectional study carried out in Federal Medical Centre (FMC). The Haemoglobin level and intestinal parasitic infections in pregnant women were assessed and a structured questionnaire was used to collect the socio-demographic data together with their haemoglobin level. The prevalence of anaemia from a total of 200 pregnant women was 48 (24%) who were in the second and third trimesters. In this study, anaemia was significantly associated with urban dwellers. Here, it was

discovered that secondary education and above among pregnant women reduce the risk of being anaemic during pregnancy.

**Key words: Assessment, prevalence, anaemia, associated, antenatal.**

## Introduction

Anaemia during pregnancy is a public health problem especially in developing countries and is associated with adverse outcomes in pregnancy. World Health Organization (WHO) has defined anaemia in pregnancy as the haemoglobin (Hb) concentration of less than 11g/dl (Black, Victora & Walkeretal, 2013).

Anaemia is one of the most common nutritional deficiency diseases observed globally and affects more than 1.62 billion (25%) people of the world's population, of which 56 million are pregnant women. Anaemia is a major public health problem affecting all ages of the world's population, its highest prevalence being among children aged <5 years and pregnant women (Balarajan, Ramakrishnan, Ozaltin, Shankar & Subramanian, 2011).

Anaemia during pregnancy is considered severe when haemoglobin concentration is <7 g/dl, moderate when it is between 7 and 9.9 g/dl and mild when it is 10–11 g/dl (Akhtar & Hassan, 2012). Anaemia during pregnancy is a major cause of morbidity and mortality of pregnant women in developing countries and has both maternal and fetal consequences. It is estimated that anaemia causes >115,000 maternal and 591,000 perinatal deaths globally per year (Salhan, Tripathi, Singh & Gaikwad, 2012).

Global data shows that 56% of pregnant women in low and middle income countries (LMIC) have anaemia. The prevalence of anaemia is highest among pregnant women in Sub-Saharan

Africa (SSA) (57%), followed by pregnant women in Southeast Asia (48%), and lowest prevalence (24.1%) was found among pregnant women in South America (Black, Victora & Walkeretal, 2013).

In developing countries, the cause of anaemia during pregnancy is multifactorial and includes nutritional deficiencies of iron, folate, and vitamin $B_{12}$ and also parasitic diseases, such as malaria and intestinal parasitic infections. The relative contribution of each of these factors to anaemia during pregnancy varies greatly by geographical location, season, and dietary practice. In sub-Saharan Africa, iron and folate deficiencies are the most common causes of anaemia in pregnant women (Toteja, Singh & Dhillon, 2006).

Anaemia has a variety of contributing factors, including nutritional, genetic, and infectious disease factors; however, iron deficiency causes 75% of anaemia cases. Iron deficiency anaemia affects the development of a country by decreasing the cognitive development of children and the productivity of adults (Vivek, Halappanavar, Vivek, Halki, Maled, Deshpande, 2012).



Anaemia in pregnancy is associated with risk of preterm birth and low birth weight babies. Preterm and LBW are still the leading causes of neonatal deaths in developing countries like Tanzania contributing to 30% of the deaths. It has also been associated with increased risk of intrauterine deaths (IUFD), low APGAR score at 5minutes, and intrauterine growth restriction (IUGR) which is a risk for stunting among children of less than two years (Msuya, Hussein, Uriyo, Sam & Stray, 2011).

**Physiology of Anaemia in Pregnancy**

The plasma volume starts to increase at about 6 weeks of pregnancy in a healthy woman. The increase disproportionately greater than the corresponding changes on the red cell mass, accounts for the physiologic fall in the Hb concentration during pregnancy. As a

consequence, there is a significant reduction in arterial-venous oxygen extraction at the heart and an important increase of the oxygen-carrying capacity of the pregnant woman, despite the fall in the Hb level. The increase in plasma volume is about 1,250 ml at term, a total increase of about 48% above the non-pregnant state. This is the result of an initial rapid rise, followed by a slower rise after the 30th week of pregnancy. Several studies demonstrate the positive correlation between the weight of the new born and the increase in the plasma volume. It seems that the increase in plasma volume is an indication of normal growth of the foetus and one of the hallmarks of a successful pregnancy. As regards the red cell mass, it also increases although, in contrast to the plasma volume, it does so more slowly. The total increase is about 18% or 250 ml at term. After stimulation with iron supplements, however, the red cell mass may reach 400ml—a total increase of about 30% compared with the non-pregnant state. Similar to the plasma volume, the increased red cell mass is linked to foetal growth, although probably to a lesser degree.

**Causes of Anaemia in Pregnancy**

Because of the normal physiologic changes in pregnancy that affect the haematocrit and certain other parameters, such as haemoglobin, reticulocytes, plasma ferritin, and unsaturated iron-binding capacity, diagnosing true anaemia, as well as determining the aetiology of anaemia, is challenging. The most common anaemia's are iron-deficiency anaemia and folate deficiency megaloblastic anaemia. This anaemia's are more common in women who have inadequate diets and who are not receiving prenatal iron and folate supplements. Other less common causes of acquired anaemia in pregnancy are aplastic anaemia and haemolytic anaemia. In addition, anaemia's such as thalassemia and sickle cell disease can have an impact on the health of the mother and foetus. As was stated above, the most frequent causes of true or absolute anaemia are nutritional deficiencies. Frequently, these deficiencies are multiple, and the clinical presentation may be complicated by attendant infections, generally

poor nutrition, or hereditary disorders such as hemoglobinopathies (Baker, 1983). However, the fundamental sources of nutritional anaemia embody insufficient intake, inadequate absorption, increased losses, expanded requirements, and insufficient utilization of hematopoietic nutrients. Approximately 75% of all anaemia's diagnosed during pregnancy are due to iron deficiency. Significant deficiency of iron leads to characteristic hypochromic; microcytic erythrocytes on the peripheral blood smear (Baker, 1983).

## MATERIALS AND METHODS

### Study Design

A cross-sectional study was conducted at Federal Medical Centre Owerri Imo State.

### Study Population

The study participants were pregnant women who visited Federal Medical Centre Owerri Imo State for antenatal care. Those who were pregnant and fulfilled the inclusion criteria were enrolled in the study. Each participant was recruited only once on their first visit during the study period.



### Sample Size and Sampling Procedures

A total of 200 pregnant women were enrolled in this study. Sample size was estimated using the general formula for single population proportion, with the following assumptions: anaemia prevalence (P) confidence level, and 5% marginal error.

This gave us a sample size of 200. All pregnant women who voluntarily agreed to participate in the study were included. Pregnant women receiving therapy for anaemia or who were not able to respond to the questionnaire due to illness or unwilling to participate in the study were excluded.

**Data Collection**

After obtaining informed written consent, the following information was collected immediately, history of socio-demographic data, nutritional, obstetric and gynaecological data, and clinical conditions were collected, followed by a physical exam. A hemoglobinometer (Hemo-Cue HB 201+ analyser, SETEMA Limited PLC, Ängelholm, Sweden) was used to determine the haemoglobin concentration from a capillary blood sample collected from the fingertip of each pregnant woman aseptically using a sterile single use disposable lancet. This was done by trained and experienced laboratory technicians. The necessary safeguards were applied during blood collection. A drop of blood was allowed to enter the optical window of the micro cuvette through capillary action after discarding the first drop of blood. The micro cuvette was then placed into the cuvette holder for photometric determination of the haemoglobin level.



Stool specimens were collected in a clean and labelled container from the study participants. A portion of the stool was processed with a direct microscopic technique to detect intestinal parasites immediately. Two trained medical laboratory technologists examined the samples microscopically, first with a 10× and then with a 40× objective, for helminth eggs, larvae, and cysts of protozoan parasites.

**Data Processing/analysis**

The data were entered, cleaned, and analysed with the SPSS statistical software version 25 (IBM Corp., Armonk, NY, USA). Summary statistics such as frequencies and percentages were computed. A 95% confidence interval (CI) and a *p*-value of $<0.05$ were considered statistically significant.

**Ethical Consideration**

Ethical approval was obtained from Abia State University ethical committee and a permission letter was obtained from the Chief Medical Director Federal medical centre Owerri Imo State before going ahead with the study. The voluntary nature of participation and the right to withdraw at any time were emphasized, and written informed consent was obtained from every participant. Confidentiality was maintained throughout the collection and processing of the specimens and each study participant was informed about the objective of the study

## RESULT

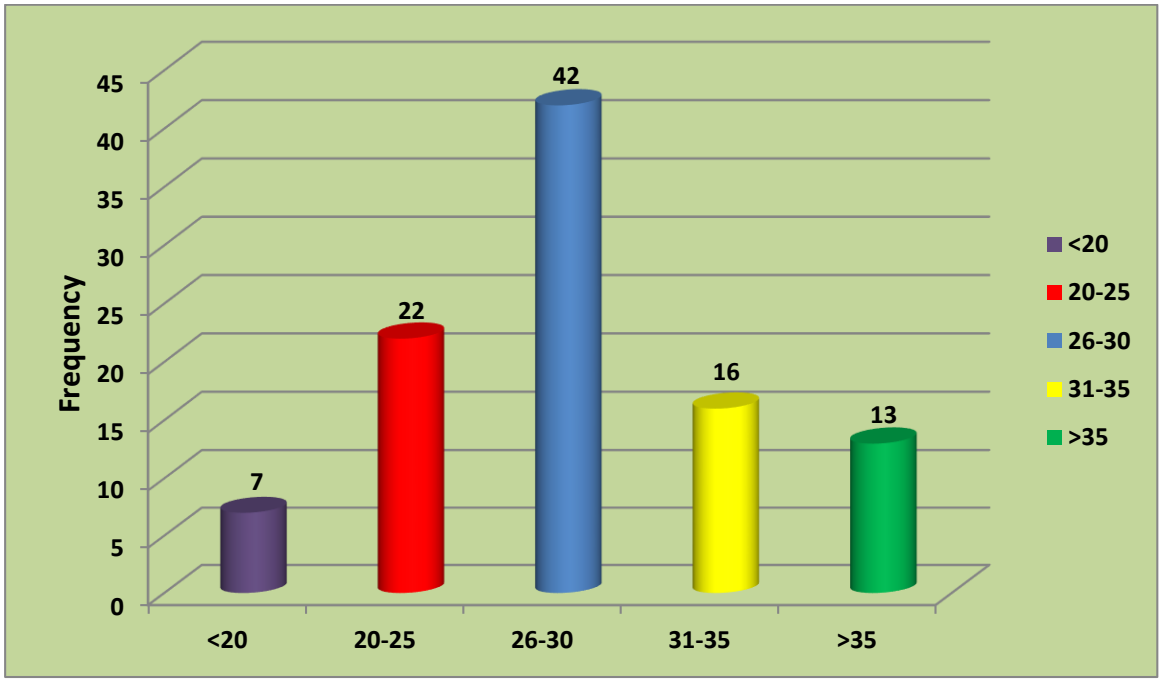


**Figure 1: Age range of the respondents**

**Table 1: Socio-demographic Data of Participants**

| Variables | Number *(n-200)* | Percentage |
|---|---|---|
| **Age (years)** | | |
| <20 | 14 | 7% |
| 20-25 | 44 | 22% |
| 26-30 | 84 | 42% |
| 31-35 | 32 | 16% |
| >35 | 26 | 13% |
| **Residence** | | |
| Urban | 162 | 81% |
| Rural | 38 | 19% |
| **Marital status** | | |
| Married | 176 | 88% |
| Divorced | 8 | 4% |
| Widowed | 6 | 3% |
| Separated | 10 | 5% |
| **Educational Qualification** | | |
| Illiterate | 10 | 5% |
| Primary | 48 | 24% |
| Secondary | 56 | 28% |
| Tertiary | 86 | 43% |
| **Religion** | | |
| Christian | 180 | 90% |
| Muslim | 2 | 1% |
| Traditionalist | 18 | 9% |
| **Occupation** | | |
| House wife | 68 | 34% |
| Civil service | 36 | 18% |
| Trading | 56 | 28% |
| Farming | 40 | 20% |
| **Monthly Income** | | |
| <30.000 | 42 | 21% |
| 30.000-50.000 | 104 | 52% |

| | | |
|---|---|---|
| <50.000 | 54 | 27% |

A total of 200 pregnant women participated in the study. A lot of the respondents were within the age range of 26.-30 with 42%, followed by the age range 20-25 with 22%. Those within the age range 31-35 were 16%, <35 were 13% while <20 was the least 7%. A lot (81%) of the respondents were urban dwellers while 19% were rural dwellers. Majority (88%) of the participants were married followed separated with 5%. Those divorced were 4% while widowed were 3%. Among the participants, 43% had tertiary degrees followed by 28% with secondary certificates. Those with primary school certificate were 24% while illiterates were the least 5%. Christians were 90% followed by traditionalist 9% while Muslim was 1%. Majority 34% of the respondents were house wife, traders were 28%, and farmers were 20% while the least were civil servants 18%. Among the participants, 52% earn 30.000-50.000 in a month. Those who earn above 50.000 were 27% while 21 earn less than 30.000 monthly (table 1).



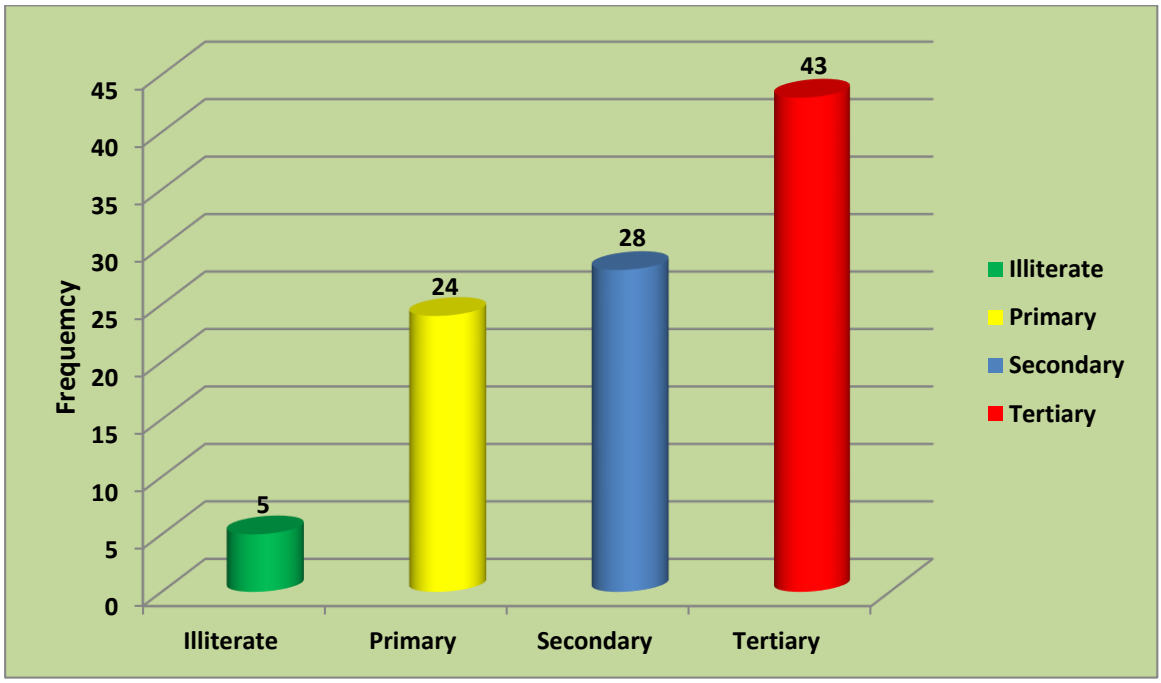

**Figure 2: Educational background of the respondents**

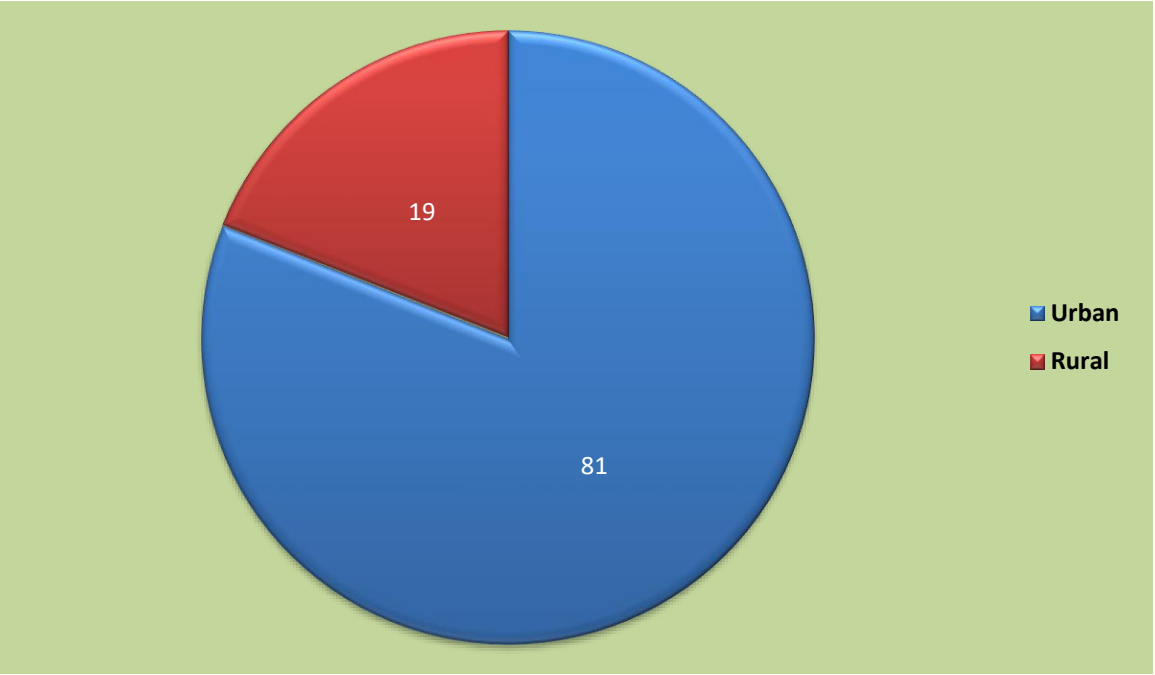


**Figure 3: Resident of the Participants.**



**Table 2: Obstetric Factors of the Study Participants**

| Obstetric Factors | Number *(n-200)* | Percentage |
|---|---|---|
| **Number of deliveries** | | |
| No birth | 60 | 30% |
| <2 | 42 | 21% |
| 2-5 | 95 | 47.5% |
| >5 | 3 | 1.5% |
| **Birth Interval** | | |
| Primigravida | 58 | 29% |
| <18 months | 8 | 4% |
| >18 months | 134 | 67% |
| **Contraceptives use** | | |
| Yes | 158 | 79% |
| No | 42 | 21% |
| **Vaginal bleeding during pregnancy** | | |

| | | |
|---|---|---|
| Yes | 12 | 6% |
| No | 188 | 9% |

Among the study participants, 98 (49%) had had more than two deliveries previously, 60 (30%) never had any delivery while 42 (21%) had delivery less than 2. About 134 (67%) of the study participants had a birth interval of >18 months between the pregnancies, 58 (29%) were primigravida while 8 (4%) had birth interval <18 months. Also 158 (79%) had a prior history of contraceptive use before becoming pregnant while 42 (21%) had no history of contraceptives. 188 (94%) never had any vaginal bleeding during pregnancy while 12 (6%) had history of vaginal bleeding (table 2).

**Table 3: Medical Factors of the Study Participants**

| Medical Factors | Number *(n-200)* | Percentage |
|---|---|---|
| **Previous medical illness** | | |
| Yes | 68 | 34% |
| No | 132 | 66% |
| **Diagnosis of previous medical illness** | | |
| Malaria | 36 | 18% |
| Intestinal parasitosis | 72 | 36% |
| Others | 92 | 46% |
| **If answer is others specify** | | |
| Gastritis | 30 | 32.6% |
| Dental problem | 20 | 21.7% |
| Appendicitis | 18 | 19.6% |
| Pneumonia | 14 | 15.2% |
| Urinary tract infection | 10 | 10.9% |
| **Current malaria attack** | | |
| Yes | 48 | 24% |

| | | |
|---|---|---|
| No | 152 | 76% |

According to the participants who had previous medical illness 132 (66%) had no previous medicals illness while 68 (34%) had medical illness. Based on diagnosis of previous medical illness, 92 (46%) had other disease conditions outside malaria and intestinal parasitosis, 72 (36%) had intestinal parasitosis while 36 (18%) had malaria. Among the participants, 152 (76%) had current malaria attack while 48 (24%) had no current malaria attack (table 3).

**Table 4: Physical Findings of the Study Participants**

| Variable | Number (*n-200)* | Percentage |
|---|---|---|
| **Physical Finding** | | |
| < 36 | 64 | 32% |
| 36-37.2 | 134 | 67% |
| >37 | 2 | 1% |
| **Pulse Rate (b/m)** | | |
| <60 | 4 | 2% |
| 60-100 | 196 | 98% |
| **Blood Pressure (mmHg)** | | |
| <90 | 1 | 0.5% |
| 90/60-140/90 | 196 | 98% |
| >140/90 | 3 | 1.5% |
| **Colour of Conjunctiva** | | |
| Pallor | 20 | 10% |
| Normal | 180 | 90% |
| **Gestational age (weeks)** | | |
| <14 | 10 | 5% |

| | | |
|---|---|---|
| 14-28 | 128 | 64% |
| 29-42 | 58 | 29% |

Statistics of the physical finding showed that 134 (67%) had temperature within 36-37.2oc, 64 (32%) had <360c while a few 2 ((1%) had >370c

The pulse rate of the participant was 60-100 for 196 (98%) while 4 (2%) had <60. According to the blood pressure of the participants, 196 (98%) had 90/60-140/90, 3 (1.5%) had >140/90 while 1 (0.5%) had <90. Among the participants, 180 (90%) had normal conjunctiva while 20 (10%) had pallor. A lot 128 (64%) of the participants had gestational age within 14-28, 58 (29%) were 29-42 while 10 (5%) had gestational age <14 (table 4).

**Table 5: Nutritional Habit of Study Participants**

| Nutritional factors | Number *(n-200)* | Percentage |
|---|---|---|
| **Eating animal products** | | |
| Daily | 12 | 6% |
| Every other day | 62 | 31% |
| Weekly | 68 | 34% |
| Every 2 weeks | 34 | 17% |
| Once a month | 24 | 12% |
| **Eating green vegetables** | | |
| Daily | 14 | 7% |
| Every other day | 60 | 30% |
| Weekly | 92 | 46% |
| Every 2 weeks | 18 | 9% |
| Once a month | 16 | 8% |

According to the dietary habit of the participants, 68 (34%) eat animal product weekly, followed by those who eat it every other day 62 (31%). Those who take it every 2 weeks were 34 (17%), once a month was 24 (12%) while 12 (6%) eat it daily. More so, the participants who eat green vegetables weekly were 92 (46%), followed by 60 (30%) who eat it every other day. Those who take every week were 18 (9%), once a month were 16 (8%) while 14 (7%) eat vegetables daily.

**Table 6: Laboratory Results of Study Participants**

| Laboratory results | Number *(n-200)* | Percentage |
|---|---|---|
| **Haemoglobin (gm/dl)** | | |
| <7 | 0 | 0% |
| 7-9.9 | 16 | 8% |
| 10-10.9 | 32 | 16% |
| 11-17 | 152 | 76% |
| **Stool examination** | | |
| Hook worm | 12 | 6% |
| Ascarias lumbericoid | 4 | 2% |
| Enterobius vermicularis | 5 | 2.5% |
| No ova or parasite | 179 | 89.5% |
| **HIV serostatus** | | |
| Positive | 2 | 1% |
| Negative | 198 | 99% |



A total of 48 (24%) participants had haemoglobin concentration levels of <11 g/dl, 21 (10.5%) had intestinal parasitic infections, and 2 (1%) were positive for HIV.

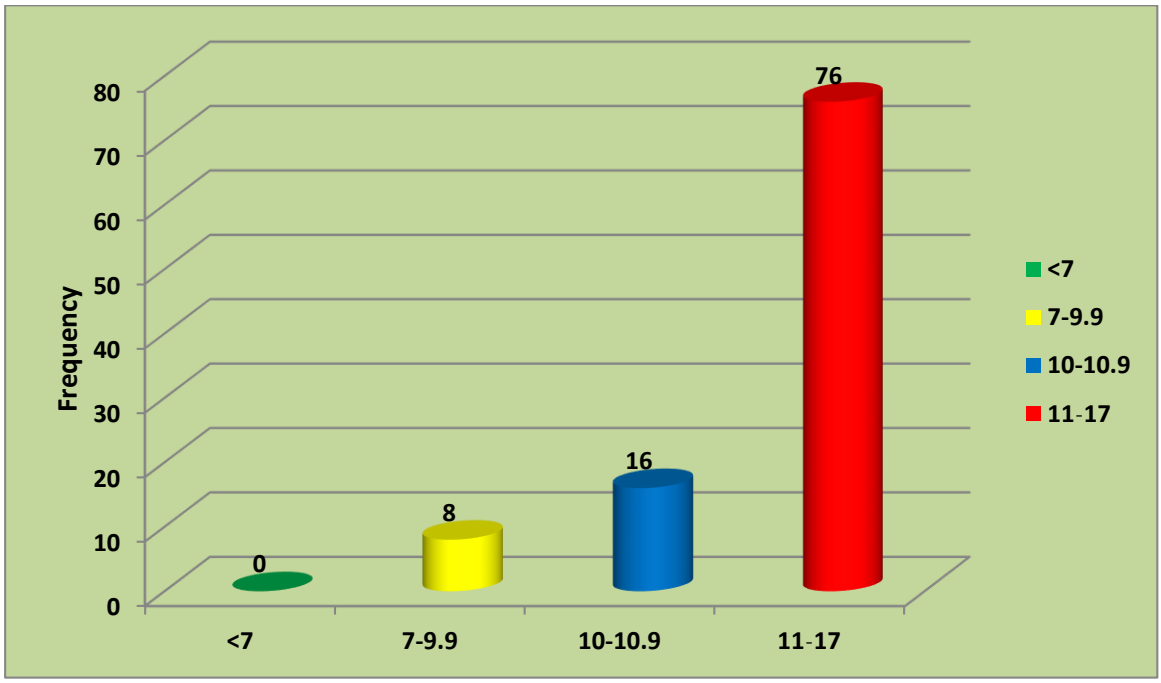


**Figure 4: Haemoglobin level of children.**

## DISCUSSION

Anaemia in pregnancy is a common problem in most developing countries and a major cause of morbidity and mortality. It has negative impacts on the health of the foetus and of the mother. The present study was carried out to determine the prevalence and associated risk factors of anaemia among pregnant women receiving antenatal care at Federal medical centre Owerri. The overall prevalence of anaemia in this study was 24%,

This is consistent with the studies of Van Bogart, (200), who discovered the prevalence of anaemia in pregnancy to be 30.2%. It is also in line with the studies of Mart, Carvajal, Peña-Martí, Comunian & Muñoz, (2002) who stated that anaemia in pregnancy was (19.7%). This was also in line with the study of Jamal & Rebecca, (2009) in Southern Ethiopia to be 29%. Also Alem, Enawgaw, Gelaw, Kena, Seid & Olkeba, (2013) studies found 21.6% in their own studies. The prevalence of anaemia in pregnancy in this study is lower than the previously reported from India (84.9%) (Toteja, Singh & Dhillon, 2006). Also lower than the studies Dim & Onah (2007) that discovered the prevalence of anaemia among pregnant women in Enngu south eastern Nigeria to be 40.4%.

The findings of this study were not in agreement with the World Health Organization 2005 report, which stated that the highest proportion of individuals affected by anaemia were in Africa in both pregnant and non-pregnant women of childbearing age (Jin, Yeung & Cogswell, 2010). The possible reason for the lower prevalence of anaemia in the current study might be differences in the study area (geographical variation) and administration of iron supplements in health facilities, which is helpful in reducing anaemia during pregnancy, antenatal counselling and good antenatal care by skilled workers and compliance of the pregnant women in making sure that they eat the essential food during pregnancy.

In this study majority of the anaemic pregnant women 48 (24%) were of the mild 16% type (haemoglobin 10-10.9 g/dl), followed by those with moderate 8% anaemia (7-9.9g/dl) and 0% severe anaemia (haemoglobin <7g/dl). A similar report for Pakistan stated that the majority of the cases were of mild anaemia (75.0%) and a few of moderate anaemia (14.8%) and severe anaemia (0.7%) (Baig-Ansari, Badruddin & Karmaliani, 2008). Also, a study in India in 2010 also showed that the majority (50.9%) had moderate anaemia, with mild type of anaemia accounting for 30.17% and severe anaemia for 18.9%, respectively (Vijaynath, Jitendra, Ramesh & Abhishek, 2010).

Women who had secondary or higher education were less likely to be anaemic compared to their counterparts. Education has been reported to reduce the risk of being anaemic in several studies. Educated pregnant women have better income and eat nutritious food and hence do not get nutritional anaemia. A study in Ethiopia also reported higher prevalence of anaemia among pregnant women who had no education (Melku, Addis, Alem & Enawgaw, 2014)..



Secondary and higher education had been associated with several other good maternal and child outcomes like higher frequency of exclusive breastfeeding, attending for antenatal care visits for more recommended visits, utilization of skilled attendance during delivery, and health care seeking when the children have pneumonia or malaria. Women education and empowerment are not within health sector and there is a need for multi-sectorial collaboration in combating anaemia and other maternal health problems (WHO, 2011).

Over the years, the government has strengthened the antenatal care (ANC) services and every pregnant woman is given iron supplementation to combat anaemia, deworming, malaria prophylaxis and mosquito nets. Nowadays pregnant women have to take malaria prophylaxis and deworms in front of the health care provider. This increases the uptake of medication and hence prevents anaemia that can be caused by mosquitoes or helminthics. The prevalence of

anaemia during pregnancy has been reported by other researchers to range from 32% to 62.2% (Adam, Khamis & Elbashir, 2005).

## Recommendation

There should be on-going health education about effects of anaemia especially among women with low education and population of adolescent women and women of reproductive age in general.

## Conclusion

The overall prevalence of anaemia was low in our study, and this might be a result of the on-going strategy concerning primary health care in Federal Medical Centre Owerri, which seems well planned and implemented by skilful workers.

## REFERENCES

Adam,I., Khamis, A.H., & Elbashir,M.I. (2005). "Prevalence and risk factors for anaemia in pregnant women of eastern Sudan," Transactions of the Royal Society of Tropical Medicine and Hygiene; 99 :(10): 739–743.

Akhtar M, & Hassan I. (2012). Severe anemia during late pregnancy. *Case Report Obstetric Gynecolology*; 2012:3.

Alem, M., Enawgaw, B., Gelaw, A., Kena, T., Seid, M., & Olkeba, Y. (2013). Prevalence of anaemia and associated risk factors among pregnant women attending antenatal care in Azezo Health Centre Gondar town, Northwest Ethiopia. *Journal Interdisciplinary Histopathology*; 1(3):137–144.

Baker, S.J. (1983). Nutritional anaemia's. Part 2: Tropical Asia. *Clinical Haematology*; 10: 843.

Baig-Ansari, N., Badruddin, S.H., & Karmaliani, R. (2008). Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. *Food Nutrition Bulletin*; 29:132–139.

Balarajan, Y., Ramakrishnan, U., Ozaltin, E., Shankar, A.H., & Subramanian, S.V. (2011). Anaemia in low-income and middle-income countries. *Lancet*; 378(9809):2123–2135.

Black, R.E., Victora, C.G., & Walkeretal, S.P. (2013) "Maternal and child under nutrition and overweight in low-income and middle income countries, *Lancet;* 382:427–451.

Dim, C.C., & Onah, H.E.(2007). The prevalence of anemia among pregnant women looking in Enngu south eastern Nigeria. *Medical General Medicine*; 9(3):11.

Jamal, H.A., & Rebecca, P.S.(2009). Iron deficiency anaemia is not a rare problem among women of reproductive ages in Ethiopia. *BMC Blood Disorders*; 9:7.

Jin, L., Yeung, L.F., & Cogswell, M.E. (2010). Prevalence of anaemia among pregnant women in South-East China, 1993–2005. *Public Health Nutrition*; 13(10):1511–1518.

Mart, Carvajal, A., Peña-Martí, G., Comunian, G., & Muñoz, S. (2002). Prevalence of anaemia during pregnancy: results of Valencia (Venezuela) anaemia during pregnancy study. *Arch Latinoam Nutrition;*. 2052(1):5– 11.

Melku, M., Addis, Z., Alem, M., & Enawgaw, B. (2014). "Prevalence and predictors of maternal anemia during pregnancy in Gondar, Northwest Ethiopia: an institutional based crosssectionalstudy,"*Anemia*, vol, Article ID 108593, 9 pages.

Salhan, S., Tripathi, V., Singh R., & Gaikwad, H.S. (2012). Evaluation of hematological parameters in partial exchange and packed cell transfusion in treatment of severe anemia in pregnancy. *Anaemia;* 60, 58-62.

Singh, P., & Dhillon, B.S. (2006). Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. *Food Nutrition Bulletin*; 27(4):311–315.

Toteja, G.S., Singh. P., & Dhillon, B.S. (2006). Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. *Food Nutrition Bulletin*; 27(4):311–315

Van Bogart, L.J.(2006). Anaemia and pregnancy outcomes in a South African rural population. *Journal Obstetric Gynaecology*; 26 (7):617–619.

Vijaynath, Jitendra, Ramesh, P., & Abhishek, P. (2010). Prevalence of anemia in pregnancy. *Indian Journal Applied Basic Medical Science.* ; 12:23–35.

Vivek, R.G., Halappanavar, A.B., Vivek, P.R., Halki, S.B., Maled, Deshpande, P.S. (2012). Prevalence of anemia and its epidemiological. *Deter Pregnant Women*;5(3):216–223.

Msuya,S.E., Hussein,T.H., Uriyo,J., Sam, N.E., & Stray, B. (2011). Pedersen, "Anaemia among pregnant women in northern Tanzania: prevalence, risk factors and effect on perinatal outcomes. "Tanzania *Journal of Health Research*,vol.13,no.1,pp. 33–39,2011.

World Health Organization, Iron deficiency anaemia: assessment, prevention and control: a guide for programme managers, 2001.