

Anaemia in Pregnancy in an African Setting after Preventive Measures

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Abstract

Background: Anaemia in pregnancy is a public health issue in developing countries because of its high prevalence and its maternal and perinatal bad outcomes. It affects 24.8% of the world population and 67.6% of the population in sub-Saharan Africa. In Burkina Faso, anaemia prevalence is estimated at 68.3%. In Burkina, preventive measures for anaemia in pregnancy have been implemented by the ministry of health to reduce its burden. This study aimed to assess the epidemiological, clinical and the outcomes of anaemia in pregnant women at OUAHIGOUYA REGIONAL HOSPITAL. Findings will be used to strengthen the preventives measures for anaemia in pregnancy. **Methods:** A cross-sectional descriptive and analytical study was conducted during a four-month period from October, 28th, 2014 to February, 28th, 2015. pregnant women with haemoglobin level below 11 g/dL was considered anaemic according to WHO criteria, and who are willing to participate and who were admitted at the obstetrics and Gynecology department of the REGIONAL HOSPITAL of OUAHIGOUYA. **Results:** Four hundred eighty three pregnant women were anaemic out of eight hundred eighty three women hospitalized. The prevalence of maternal anaemia was 54.7% with significant monthly variations. The mean age was 24.7 ± 6.6 years. The women without non-salary occupation (housewives and pupils) represented 90.1%. A past medical history of haemoglobin defects (6.6%), twin pregnancies (6.0%), malaria (23.6%) bleeding during pregnancy (20.3%) were the most frequent. Monitoring the pregnancy was effective in 91.1% of women. The mean haemoglobin level was 8.8 ± 2.1 g/dL. The outcome was marked with 1.7% and 18.9% maternal and perinatal death respectively. The most common contributory factors were: Occupational status, number of prenatal visits, length of treatment with iron and folic acid, history of malaria, history of haemorrhage and brachial perimeter low ($p < 0.05$). **Conclusion:** Maternal

anaemia is a major health issue at the OUAHIGOUYA REGIONAL HOSPITAL in Northern Burkina Faso. Maternal and perinatal outcomes could be improved by reinforcing the preventive measures but also by improving the nutritional status and the living conditions of pregnant women.

Keywords

Anaemia, Pregnancy, Maternal and Perinatal Outcomes

1. Background

Anaemia is a major cause of morbidity and mortality worldwide [1] [2] [3]. It affects 24.8% of the world population and 67.6% of the population in sub-Saharan Africa. [4] In Burkina Faso, the prevalence of anaemia is estimated at 68.3% [5]. Anaemia in pregnancy is of particular interest because of its high prevalence and its association with maternal and perinatal complications [6] [7] [8]. In Burkina, preventive measures have been implemented in pregnant women to reduce the burden of this disease, including routine daily supplementation with 60 mg/400 mcg iron + folic acid from the first day of pregnancy until the 45th day after delivery; systematic deworming with mebendazole 100 mg: 1 tablet × 2/day for 3 days or 500 mg single dose; prevention of malaria through intermittent preventive treatment with sulfadoxine-pyrimethamine associated with the use of insecticide-treated nets and counselling for a rich and balanced diet. It is in that context that a study was undertaken to assess the epidemiological and, clinical features of anaemia in pregnancy as well as its maternal and perinatal outcomes in a regional hospital in Burkina Faso.

2. Methods

The study was conducted in the department of obstetrics and gynaecology of OUAHIGOUYA REGIONAL HOSPITAL in the Northern part of Burkina Faso. It is a forty bed department where all women admitted are screened for anaemia.

It was a cross sectional descriptive and analytical study from 28 October 2014 to 28 February 2015.

Based on WHO definition of anaemia in pregnancy all pregnant women who had a haemoglobin level below 11 g/dL were included in the study if they had voluntarily given their consent to participate.

For each patient data were collected on sociodemographic characteristics, clinical and biological features of anaemia, nutritional status by measuring the mid upper arm circumference (MUAC), management of anaemia and maternal and neonatal outcomes.

These women were followed from the time of their hospitalization to their discharge on the 6th day postpartum.

Patients discharged before the 6th day postpartum were contacted by phone to obtain information about the mother and her newborn health status.

Data entry and analysis were performed using Epi Info 7 software version 7.1.5.0 and Excel 2013. The results were presented as percentages for categorical variables and as mean with extremes for quantitative variables. Chi-square test with a degree of significance of 0.05 was used as a statistical test.

3. Results

During the study period 483 pregnant women out of 883 who were admitted were anemic, giving a prevalence rate of 54.7%.

The mean age of patients was 24.7 ± 6.6 years (range 14 to 44 years). The 15-20-year-old age group accounted for 27.9% of the cases. Mean parity was 1.9 ± 2.2 , the higher parity was 12 and 37.1% of women were primiparous. Women admitted in the 3rd trimester of pregnancy accounted for 83.8%. Women reside in the health district of Ouahigouya catchment area in 67.5% of cases. Women without a personal source of income represented 90.1%; those who were uneducated 54.2%, and those living in couple 94.7%.

The mean number of antenatal visits was 2.7 ± 1.4 with a maximum of 6 and 31.7% of patients completed the recommended minimum of four antenatal visits.

The socio-demographic characteristics of the women are summarized in **Table 1**.

Antimalarial chemoprophylaxis with sulfadoxine-pyrimethamine (SP) during pregnancy was taken by 90.3% of patients. The number of SP doses received by patients ranged from 1 to 5 with a mean of 1.8 ± 0.7 . At the time of the study patients who received the recommended minimum of 3 doses of SP represented

Table 1. Socio-demographic characteristics of the patients (n = 483).

Variables	Number	Percentage
Age (years)		
Under 20	136	28.1
20 - 30 years	213	44.1
30 - 40 years	125	25.9
Over 40 years	9	1.9
Parity		
Nulliparous	179	37.1
Primiparous	93	19.3
Pauciparous	113	23.4
Multiparous	73	15.1
Large multiparous	25	5.1
Number of prenatal consultations conducted		
0 prenatal consultation	43	8.9
1 prenatal consultations	68	14.1
[2 - 4 prenatal consultations]	219	45.3
[4 - 6 prenatal consultations]	153	31.7

12.4%.

The majority of the patients (96.8%) were on anti-aniaenemic chemoprophylaxis using a combination of e iron-folic acid tablet, systematic deworming with albendazole or mebendazole was taken by patients for a mean of 13.5 ± 8.0 weeks with a maximum of 32 weeks. Systematic deworming was effective in 30.3% of patients. It was a deworming using albendazole (72.0%) or mebendazole (28.0%).

MUAC measures varied from 18 to 38 cm with an average of 24.1 ± 2.9 cm and 14.6% of patients had a MUAC less than 22 cm.

The main symptoms reported by the patients were asthenia in 17.8% of cases, vertigo in 15.3% of cases and dyspnea in 6% of cases. On clinical examination pallor of the conjunctiva was found in 15.9% of cases, fever in 10.3% of cases (in relation to an origin of malaria anaemia) and peripheral oedema in 3.1% cases.

The mean hemoglobin level was 8.8 ± 2.1 g/dL with a range of 2.1 to 10.6 g/dL. Severe anemia accounted for 14.7% of cases (hemoglobin less than 7 g/dL).

MCV ranged from 54.7 to $118 \mu\text{m}^3$ with a mean of $82.1 \pm 9.8 \mu\text{m}^3$. The mean MCHC found was 31.1 ± 1.9 g/dL with a range of 25.4 and 36.4 g/dL.

Anemia was associated with the sole thrombocytopenia in 14.7% of cases; it was associated with leucopenia and thrombocytopenia, which is pancytopenia in 2.3% of cases.

The main causes of anemia in this study were malaria in 43 (8.9%) cases, hemoglobinopathies in 32 (6.6%) of cases, and per partum hemorrhage in 31 (6.4%) of cases (placenta previa in 15 cases and abruption placenta in 11 cases).

Blood transfusion was indicated in 79 (16.4%) of cases and it was possible in 67 patients.

Iron-folic acid was prescribed for 227 (47%) patients.

The outcomes have been established for 407 patients out of 483; 28 patients were lost to follow up, thirty six still had an on-going pregnancy at the end of the study and 12 gave birth in another facility or were referred to another hospital of higher level.

The mean number of days of hospitalization was 4.2 ± 4.9 with a maximum of 35 days and the readmission rate was 3.3%

The mode of delivery was vaginal delivery in 69.5% (262/377) of cases and caesarean section in 30.5% of cases (115/377).

The main maternal morbidities observed were slow progress of labour due to inefficient uterine contractions, postpartum infection, per partum and post-partum haemorrhage (**Table 2**).

Seven maternal deaths were recorded giving a death rate of 1.7%. These maternal deaths occurred during pregnancy in 3 cases and in the postpartum period for 4 cases. The main causes of deaths were:

- 1 case of decompensated haemolytic anaemia in a hemoglobinopathy SC patient.
- 1 case of severe anaemia with severe preeclampsia, ionic disorders and oe-

dematous-ascites syndrome.

Regarding cases of postpartum death, these were:

- 1 case of severe anaemia due to severe malaria neurological form in a positive HIV patient
- 1 case of severe anaemia with sepsis (prolonged major hyperthermia, coma)
- 2 cases of severe anaemia with haemorrhagic shock in the context of lack of blood products.

Fetal and neonatal outcomes are summarized in **Table 3**.

Abortion occurred in 27 (6.6%) cases, premature birth in 64 cases (15.8%), low birth-weight in 57 (14.1%); neonatal distress in 23 cases (5.7%), neonatal infection in 21 (5.2%) cases and 3 babies (0.7%) were born with a birth defect.

Intra uterine death occurred in 35 cases (8.6%), Stillbirths in 56 cases and 23 cases of early neonatal death; the perinatal mortality was 189 per 1000 births.

Risk factors associated with anaemia are shown in **Table 4**.

The proportion of anaemia (mild, moderate, or severe) was higher among women with no income source than among women with a source of income with a statistically significant difference ($p = 0.0128$).

The proportion of severe anaemia was higher among women who had fewer antenatal visits than those who did more (at least 4 visits with a statistically significant difference ($p = 0.0099$)).

It is the same among in patients who received less than 3 months supplementation iron, folic acid than among those who benefit for at least three months with a statistically significant difference ($p = 0.0139$).

Table 2. Main morbidities observed (n = 407).

Maternal morbidities	Number	Percentage
Slow progress of labour	149	36.6
Postpartum infection	68	16.7
Perpartum hemorrhage	31	7.6
Postpartum hemorrhage	21	5.2

Table 3. Fetal and neonatal outcomes (n = 403).

Fetal and neonatal outcomes	Effective	Percentage
Abortion	27	6.6
Low birth weight	57	14.1
Prematurity	64	15.9
Fetal death in utero	35	8.7
Neonatal distress	23	5.7
Neonatal infection	21	5.2
Abnormalities*	3	0.7

*spina bifida + hydrocephalus; spina bifida + hydrocephalus + club feet; anencephaly.

Table 4. Risk factors associated with the severity of anaemia.

		Severity						p
		Mild		Moderate		Severe		
		n	%	n	%	n	%	
Having a source of income	Yes	39	81.2	7	14.6	2	4.2	p = 0.0128
	No	262	60.2	104	23.9	69	15.9	
Number of antenatal visits	0 visit	27	62.8	9	20.9	7	16.3	p = 0.0099
	1 visit	31	45.6	19	27.9	18	26.5	
	2 - 3 visits	136	62.1	49	22.4	34	15.5	
	≥4 visits	107	69.9	34	22.2	12	7.8	
	<1 month	41	52.6	20	25.6	17	21.8	
Duration of IFA treatment	1 - 2 months	92	60.5	30	19.7	30	19.7	p = 0.0139
	≥3 months	165	66.3	60	24.1	24	9.6	
History of malaria	Yes	61	53.5	27	23.7	26	22.8	p = 0.0138
	No	240	65.0	84	22.8	45	12.2	
Bleeding history	Yes	52	53.1	24	24.5	22	22.4	p = 0.0328
	No	249	64.7	87	22.6	49	12.7	
MUAC	<22 cm	33	47.8	17	24.6	19	27.5	p = 0.0042
	≥ 22	258	64.0	93	23.1	52	12.9	

The proportion of severe anaemia was as high in patients with a history of malaria or bleeding in pregnancy as in those who did not, with a statistically significant difference with respectively $p = 0.0138$ and 0.0328 .

Also this proportion was higher among malnourished women (MUAC < 22 cm) than who were not with a statistically significant difference ($p = 0.0042$).

4. Ethics Consideration

Participation to the study was preceded by an informed consent given by each patient.

Confidentiality of individual data was ensured at all stages of the study especially in collecting and analysing data through the use of individual and anonymous collection forms.

5. Discussion

In this study, the prevalence of anaemia in hospitalized pregnant women was 54.7% which is lower than the prevalence of 68% found by the Burkina Faso 2004 Demographic and Health Survey (5). A lower prevalence was reported by Nikiema L. [9] in Ouagadougou the capital city of Burkina Faso.

However WHO has reported a similar prevalence of 55.5% at the global level [10]. Various prevalence rates were also reported in other African countries, 56% by Yao K. J. [11] in Abidjan, Ivory Coast, 48% by Dop M.C. [12] in Lomé,

Togo and 46.2% by Suega K. [13] in Bali, Indonesia, 43.2% by Jutch F.D. [14] in Yaoundé, Cameroon.

This disparity in the prevalence of anaemia in pregnancy is probably a reflection of methodological differences between these various studies; some studies have been conducted in the general population and others in pregnant women attending antenatal clinics or in women admitted in hospitals.

Young and nulliparous women made a significant percentage of the study population. Being a young pregnant woman is often associated with early marriage in our context. Other authors like Dop *et al.* in Lome and Nilkiema L. *et al.* in Ouagadougou had already made the same observation [9] [12].

The relationship between parity and anaemia in pregnancy is still a matter of debate. In some African countries, high parity is not a risk factor for anaemia or iron deficiency [4] [15] [16] [17]. Primiparity is not of anaemia risk factor contrary to observations made in many countries, including Côte d'Ivoire and Nigeria; in these countries, anaemia in primiparous women is primarily due to malaria infection which was assessed by the presence of parasites (smear or thick film) or according to the levels of specific antibodies [17] [18]. These results differ from those of some authors who consider multiparas as risk groups [19].

Literacy level in the study population was low as the majority was illiterate (54.2%) similar to what was found by Nikiema L. [9], who found that 55.3% of women were illiterate or had a primary school level. Suega K. [13] found that a negative correlation between education level and maternal anaemia which corroborates our hypothesis.

The majority of our patients (90.1%) had not a source of income. The same results were found by Nikiema L. *et al.* [9] in Ouagadougou, Burkina Faso which was 83.3% of women without employment. These figures confirm the poverty of our populations, because almost all of our patients have not an income-generating activity (farmers, housewives, pupils/students). There was a significant increase in the severity of anaemia in terms of professional status. These results show that the contribution of nutritional factors is important in our context because these women do not always have the means to ensure adequate and appropriate diet.

In Burkina Faso like in many developing countries anaemia prophylaxis in pregnant women is implemented through prenatal care using systematic supplementation and early diagnosis.

In this study 8.9% of the patients received no antenatal care and only 31.7% attended the minimum of 4 antenatal consultations recommended by WHO at the time of the study. Similar rate was reported by Koffi N.M. [20] in Cote d'Ivoire. There was significant relationship between the number of prenatal visits and the severity of anaemia and also between the occurrence of anaemia and the number of prenatal visits as found by Nikiema L. [9]. Thus pregnancy monitoring through antenatal visits in health facilities is important for a healthy pregnancy and a favorable outcome. The low rate of four antenatal visits seen in

this study as in national reports [21] is a reflection of the numerous barriers (social and cultural as well as poor service quality) that women face in accessing health services.

If 90.3% of the women have received sulfadoxine pyrimethamine it should be noted that only 12.4% have received the recommended three doses. Access to systematic deworming for intestinal parasites was also low at 30.3%.

According to the value of MUAC (< 22 cm), 14.6% of the patients had malnutrition or emaciation, with a significant relationship between MUAC and severity of anaemia. Nikema L. [9] found a malnutrition rate of 25.4% but did not find a link between MUAC and the occurrence of anaemia using a cut-off of 23 cm. MUAC gives a relatively reliable estimate of muscle mass. The reduction of muscle mass is one of the most striking mechanisms of adaptation to insufficient energy intake that sign the malnutrition. MUAC seems the most appropriate indicator for the risk of “death”. Nutritional education is an important component of prenatal care. However the northern region of Burkina Faso is plagued by a chronic food shortage linked linked to rainfall deficit which worsens malnutrition in pregnant women.

A lower prevalence (6.1%) of severe anaemia was reported in this study than by Demmouche in Algeria [19].

Maternal mortality was 1.7%. The causes of these maternal deaths are attributable to the decompensation of anaemia, postpartum haemorrhage, infections and above all the crucial lack of blood products.

In our series, fetal complications were represented by abortion in 6.6% of cases. However the frequency of abortions could have been underestimated in this study because some cases of early abortion have not been taken into account.

Fetal and neonatal complications were observed in 36.2% cases type prematurity (15.9%) of intrauterine fetal death (8.7), neonatal distress (5.7%) and neonatal infection (5.2%).

These figures differ from those of Nikiema L. [9] that found 2.5% of stillbirths and 24.3% of severe intrauterine growth retardation (below the 10th percentile).

The high rate of complications observed in our study, is related on the one hand that the OUAHIGOUYA REGIONAL HOSPITAL is a reference center and thus mainly receives the severe cases and on the other hand to the difficulties of taking care in particular the lack of labile blood products.

6. Limitations

This study has some limitations: Selection bias may have resulted from the type of sampling as women hospitalized during pregnancy do not represent the total population of pregnant women.

Another limitation could be the dating of pregnancies in a context where the last menstrual period (LMP) is not always accurate and early ultrasound dating is often missing.

7. Conclusion

Anaemia is common among pregnant women admitted at Ouahigouya regional hospital in Burkina Faso with poor outcomes implementing anaemia preventive measures in pregnancy at scale could reduce the burden of the disease and improve both maternal and neonatal outcomes.

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Availability of Data and Materials

The data in paper and electronic are available and can be publicly available when needed.

Authors' Contributions

Sawadogo T.P. Zamané H. and Sawaogo Y. participated in the study design, patients recruitment, data collection and analysis, and the writing of this article.

Ouedraogo A. supervised the recruitment, writing and editing of the article.

All authors have read and approved the final version of the manuscript.

Competing Interests

The authors declare that they have no competing interests.

Consent for Publication

We obtained a verbal authorization of the participations to a possible publication under the condition of the anonymity.

Ethics Approval & Consent to Participate

This study was conducted under the supervision of THE UNIVERSITY OUAGA I PROFESSOR JOSEPH ZERBO KY, medical school. We obtained the approval of the Chief executive officer of the REGIONAL HOSPITAL of OUAHIGOUYA after approval of the Medical Establishment Commission which acts as an ethics committee at the local level. A private space was secured and the respondent's informed verbal consent was obtained before the interview.

A translation in local language is made for illiterates.

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Abbreviations

MCV: mean corpuscular volume; MCHC: mean corpuscular haemoglobin concentration; RH, regional hospital