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Anemia and Pregnancy at the Gabriel Touré Teaching Hospital in Bamako, Mali

Abdoulaye Sissoko[1*], Aminata Kouma[2], Mamadou Sima[3], Fatoumata Korika Tounkara[4], Seydou Fane[1], Amadou Bocoum[1], Moussa Bagayogo[1], Boulaye Diawara[1], Aly Badara Traore[1], Amadou Coulibaly[1], Ibrahim Konate[1], Belco Tamboura[1], Laye Diakite[1], Dramane Fomba[1], Ibrahima Teguete[1], Youssouf Traore[1]

[1]Centre Hospitalier Universitaire Gabriel TOURE, Bamako, Mali
[2]Centre Hospitalier Universitaire Boubacar Sidi SALL, Kati, Mali
[3]Centre Hospitalier Universitaire Point G, Bamako, Mali
[4]Université Laval-CHAU Hôtel-Dieu de Lévis, Lévis, Canada
Email: *asissoko65@yahoo.fr

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Abstract

Introduction: Anemia and its complications in pregnant women are among the main causes of admission to the department of gynecology-obstetrics at CHU Gabriel Touré. **Methods:** We conducted a cross-sectional study from January 1, 2006 to December 31, 2016. We included all women with anemia and a hemoglobin level of less than 11 g/dL. Logistic regression with SPSS software was used to analyze factors influencing maternal-fetal death. Results: We recorded 33,938 births of which 4980 women were anemic, or 14.7%. Women aged 35 and over, out-of-school women and multiparous women were the most represented risk factors. The main cause of anemia in our context was iron deficiency anemia in 34.3% of cases followed by blood plunder 25.84% and hemolysis 10.11%. Only 40% of anaemic women had at least one prenatal consultation (Antenatal care: ANC). Maternal comorbidities were a provider of maternal and fetal death. **Conclusion:** The coverage of ANC was low among women with anaemia. The focus must be on NPC among women in our context.

Keywords

Anemia, Pregnancy, Prognosis, Maternal, Fetal

1. Introduction

Anemia during pregnancy is defined by the WHO as a hemoglobin level of less than 11 g/dl [1]. Anemia is a ubiquitous public health problem affecting both de-

veloped and developing countries with major human health consequences [2].

According to the World Health Organization (WHO), 25% of the world's population is affected by this condition [3]. This is a very common situation in developing countries where it affects between 30 and 80% of pregnant women [4] [5]; In industrialized countries, only 10% of pregnant women are affected [3] [6]. Studies in Mali have shown that 30% to 65% of pregnant women are anaemic [7] [8]. In Mali, according to the national statistics of the demographic and health survey sixth edition, the prevalence of anemia is higher among pregnant women aged 15 - 49 (69%) than those who are breastfeeding (62%), severe anemia 4% and 52% in urban areas and 67% in rural areas.

The main cause of these anemias is martial deficiency [6] [9], hence the WHO recommendation for iron supplementation during pregnancy [9]. There is low uptake of pregnant women in dietary supplementation programs offered during prenatal consultation (ANC) [10]. The reasons for poor compliance of pregnant women are varied, but one of them is the feeling expressed by them that a prolonged treatment with unpleasant side effects is useless, even though they do not feel sick at all [10] [11]. The role of malaria in anaemia during pregnancy in tropical Africa, 70 to 80% of pregnant women in malarial areas are anemic [12].

Combination of anemia and pregnancy increases morbidity and maternal-fetal mortality [13] [14].

We initiated this study to assess the status of the disease, and to improve management and prevention in the gynecology-obstetrics department of the Teaching Hospital (CHU) Gabriel Touré in Bamako, Mali.

2. Methods

Our study was carried out in the obstetric gynecology department of the Gabriel Touré Teaching Hospital of Bamako, Mali, which is a 3rd level structure of the health pyramid of the country receiving evacuations from the district but also those coming from the interior of the country.

All patients (pregnant and parturient with anemia) with anemia were included in our study regardless of the age of pregnancy, with a hemoglobin level of less than 11g/dL and patients received in the immediate postpartum for complication of anemia that was treated in the department.

We conducted a cross-sectional study of all admissions that can be direct or referred/evacuated in obstetrics for the period from January 1, 2006 to December 31, 2016. We included in our study all patients with a hemoglobin level of less than 11g/dl during the period of gravudo-puerperal care that was carried out in the department. Not all women who do not have anemia during pregnancy and women with no information on hemoglobin levels were included. We performed our work by analyzing a database of obstetric admissions which contains more than 700 variables. Including the parturient's identity, sociodemographic profile, family history, medical-surgical, gynecologic, obstetric, the course of her pregnancy in the first trimester, the second trimester, the third trimester and its com-

plications, the course of her delivery, its complications related to childbirth, her route of delivery, her deliveries and its complications, the parameters of the newborn and, in pediatric reference, the cause of death, the period of death of the newborn and the number of days of hospitalization. The data were collected through obstetric records, hospitalization records, mother-child health records, birth records, surgical reports and maternal death. Data was entered and analyzed on SPSS software. Frequencies were estimated using descriptive statistics. Statistical differences were evaluated by the Pearson khi-square test. Factors influencing maternal death as well as those influencing perinatal death were analyzed by logistic regression. This was a purely scientific work on the obstetric records constituting our database, and we took the necessary steps to anonymize all these records before data capture and analysis. Thus, in no case was it possible to identify a study participant. This database has been approved by the ethics committee of the Faculty of medecine and odonto-stomatology of Bamako Mali to make scientific publications.

For the operative definition we defined and classified anemia according to blood count data as follows:

(1) Anemia during pregnancy: is defined by the WHO as a hemoglobin level of less than 11 g/dL.

(2) Severe anemia: defined as a hemoglobin level of less than 7 g/dL.

(3) MGV: Mean globular volume. Its normal value is 75 - 95 fl.

(4) ACHC: Average corpuscular hemoglobin content. Its normal value is 27 - 32 pg/cell.

(5) CHMC: Average corpuscular hemoglobin concentration. Its normal value is 32 - 36 g/dl or %.

(6) Hypochromic microcytic anemia: Anemias in which MGV < 75fl and ACHC < 27 pg/cell.

(7) Hypochromic normocyte anemia: MGV between 75fl and 95fl and ACHC < 27 pg/ cell.

(8) Hypochromic Macrocytic Anemia: VGM 95fl and ACHC < 27 pg/cell.

(9) Normochromic microcytic anemia: Anemias in which VGM < 75fl and normal ACHC.

(10) Normochromic normocyte anemia: Are anemias characterized by VGM between 75fl and 95fl and normal ACHC.

(11) Normochromic Macrocytic Anemia: These are anemias characterized by a VGM 95fl and normal ACHC.

3. Results

3.1. Prevalence

During the study period, we recorded 43,081 obstetrics admissions, including 5465 cases of anemia, 12.7% prevalence (5465/43,081). The prevalence of anemia in all 33,938 births was 14.7% (n = 4980/33,938) and anemia pregnant women who did not give birth 5.3% (485/9143). We observed a decrease in the annual fre-

quency of anemia during the study period. This decrease was statistically significant $p < 0.001$ as shown in Figure 1 below.

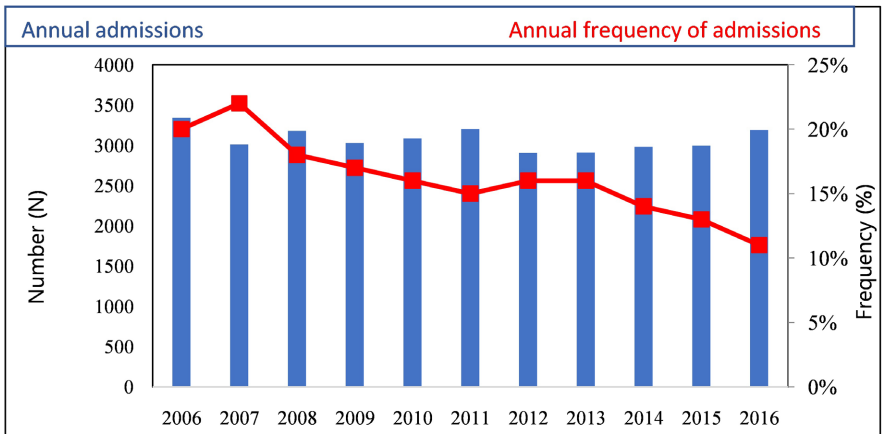

Figure 1. Annual evolution of anemia in parturient women.

3.2. The Profile of Patients

According to the sociodemographic characteristics, we observed that 22.7% (1240/5465) were adolescents (19 years), women aged 35 and over 11.6% (635/5465) and 65.7% (3590/5465) for women aged 20 – 34 were anemic during pregnancy. Women living alone accounted for 39.65% (2167/5465), out of school 60.6% (3312/5465), Housewives 72.7% (3974/5465). For women referred with or without emergency, 62.6% (3420/5465) were referred to the same way as 37.4% (2045/5465) of the self-referrers.

Regarding the history, there were multipares and large multipares in 28% of cases (1530/5465) a similar trend in multigestes and large multigestes. The inter reproductive interval below 12 months was 37.9% (1123/2965), from 12 months to 24 months 42.5% and 19.6% for those over 24 months. Antenatal care was not performed in 62.4% of cases (3410/5465) and multiple pregnancy in 1.6% (88/5465). Clinically the main functional signs were dizziness, dyspnea, palpitations, asthenia, headache and lipothymia.

Among the general signs, body mass index was less than 18.5 kg/m2 in 9.6% of cases; the physical signs were lower limb edema 88.5% and conjunctival pallor 70.6%. For biology according to the average corpuscular hemoglobin content, hypochromic anemia (<27pg) in 72.4% and normochromic (27 pg) in 27.6% of cases. The type of hypochromic microcytic anemia was the most frequent with 52.2% of cases; whereas the microcytic type normochromic was 17.5%.

Overall anemia was severe in 69.9% and moderate 19.2% and light 10.9% of cases. Blood transfusion was performed in 38.3% of women with hemoglobin < 7 g/dL, 33.6% with a hemoglobin level between 7 to 10 g/dl and 4.1% of cases with a hemoglobin level greater than or equal to 10 g/dl.

3.3. Risk Factors

Depending on the type of anemia, the different risk factors are shown in Table 1.

Women aged 35 and over were represented in the microcytic hypochromic and normochromic anemia group (>10%). A higher proportion of out-of-school women were in the normochrome macrocytic anemia group (68%), while no difference was observed in other types of anemia. In the microcytic anemia group hypochromic and normochromic, more than 14% of women were multiparous.

Table 1. Frequency of risk factors by type of anemia.

Explanatory variables	Hypochromic microcytic anemia	Hypochromic normocyte anemia	Hypochromic macrocytic anemia	Normochrome microcytic anemia	Normocyte anaemia enormochromic	Normochrome macrocytic anemia
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
	2853	1049	56	956	526	25
Age in years						
< 20	539 (18.9)	291 (27.7)	27 (48.2)	205 (21.4)	162 (30.8)	16 (64.0)
20 - 34	1956 (68.6)	648 (61.8)	24 (42.9)	639 (66.8)	315 (59.9)	8 (32.0)
35 and more	358 (12.6)	110 (10.5)	5 (8.9)	112 (11.7)	49 (9.3)	1 (4.0)
Out-of-school						
Yes	1736 (60.9)	609 (58.1)	25 (44.6)	605 (63.3)	329 (62.6)	8 (32.0)
No	1117 (39.2)	440 (41.9)	31 (55.4)	351 (36.7)	197 (37.4)	17 (68.0)
Single woman						
Yes	1156 (40.5)	391 (37.3)	27 (48.2)	357 (37.3)	213 (40.5)	9 (36.0)
No	1697 (59.5)	658 (62.7)	29 (51.8)	599 (62.7)	313 (59.5)	16 (64.0)
Parity						
Primipara	581 (20.4)	309 (29.5)	43 (76.8)	244 (25.5)	157 (29.9)	13 (52.0)
Paucipara	1857 (65.1)	613 (58.4)	13 (23.2)	571 (59.7)	308 (58.6)	10 (40.0)
Multipara	415 (14.6)	127 (12.1)	0 (0.0)	141 (14.8)	61 (11.6)	2 (8.0)
Birth interval months						
< 12	1033 (36.2)	412 (39.3)	31 (55.4)	351 (36.7)	185 (35.2)	12 (48.0)
12 – 24	1281 (44.9)	463 (44.1)	19 (33.9)	439 (45.9)	254 (48.3)	10 (40.0)
24 and more	539 (18.9)	174 (16.6)	6 (10.7)	166 (17.4)	87 (16.5)	3 (12.0)
ANC						
Yes	1044 (36.6)	425 (40.5)	13 (23.2)	360 (37.7)	204 (38.8)	9 (36.0)
No	1809 (63.4)	624 (59.5)	43 (76.8)	596 (62.3)	322 (61.2)	16 (64.0)

3.4. Causes of Anemia

According to Figure 2 below, 34.28% of the cases of anemia were due to iron and folic acid deficiency, blood spoliation in 29.77%, nutritional insufficiency in 25.84% and hemolysis in 10.11% of cases.

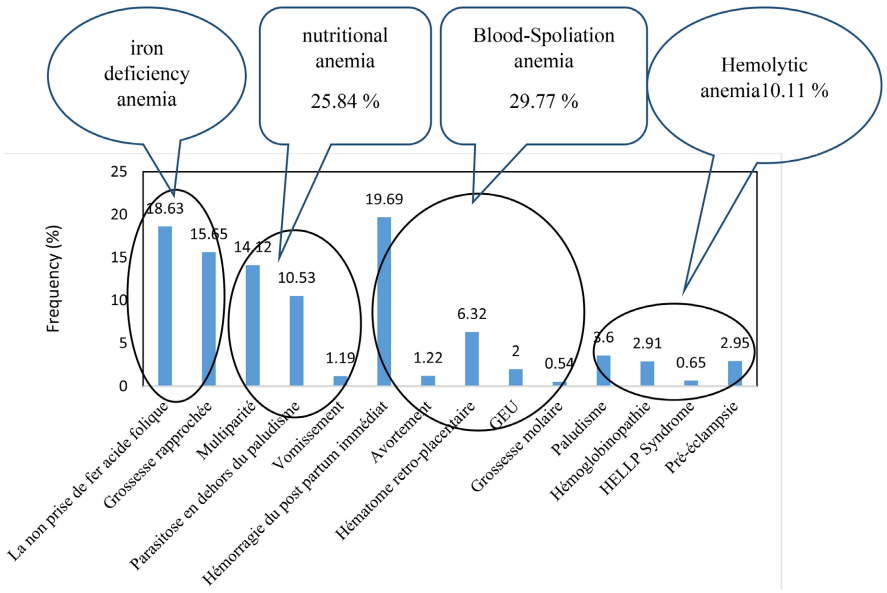

Figure 2. The etiological factors of obstetric anemia.

3.5. Prognostic Maternal

The main maternal complications observed in our study were hemorrhagic shock 39.1%, abruptio placentae 14.9% and acute lung edema 10.1%, the weight gain deficit 9.6%, Heart failure 7.1%, septic shock 3.6%, abortions 2.9%, thromboembolic accident 2% and eclampsia 1.8% of cases. Maternal comorbidities were associated with a high risk of death in anemic women.

The factors influencing maternal death are presented in Table 2 below. The risk of death in anemic mothers was 97 times higher in those with a hemoglobin level below 7 g/dL. Anemic women who had a blood transfusion had a higher death rate of OR_a = 127.92. The death rate was 3 times higher in women with anemia who had abortions.

Table 2. Factors influencing maternal mortality in anemic women admitted to teaching hospital Gabriel Touré according to the logistic regression model.

Variables	Unadjusted OR [95% CI)	P-Value	OR_a [95% CI]	P-Value
Age in years				
< 20	1.00	–	1.00	–
20 - 34	0.85 [0.70 – 1.04]	0.109	0.97 [0.75 – 1.27]	0.844
35 and more	0.76 [0.58 – 0.99]	0.040	068 [0.48 – 0.97]	0.027
Level of haemoglobin				
<7 g/dL	96.02 [45.53 – 202.47]	<0.0001	127.92 [60.08 – 272.38]	<.0001
>7 g/dL	1.00	–	1.00	–
Blood transfusion				
Yes	40.92 [30.47 – 54.94]	< .0001	51.70 [37.87 – 70.58]	< .0001
No	1.00	–	1.00	–

Continued

Abortion				
Yes	1.28 [0.65 – 2.4]	0.476	3.01 [1.03 – 8.74]	0.0433
No	1.00	–	1.00	–
Cardiac insufficiency				
Yes	1.68 [1.29 – 2.18]	<0.0001	1.39 [0.95 – 2.03]	0.089
No	1.00	–	1.00	–
Endometritis				
Yes	1.19 [0.91 – 1.56]	0.207	1.40 [0.96 – 2.04]	0.079
No	1.00	–	1.00	–
Abruptio placentae				
Yes	0.98 [0.79 – 1.22]	0.852	1.42 [1.01 – 2.00]	0.044
No	1.00	–	1.00	–
Eclampsia				
Yes	0.74 [0.38 – 1.43]	0.364	3.35 [1.23 – 9.10]	0.018
No	1.00	–	1.00	–
High blood pressure				
Yes	1.01 [0.85 – 1.20]	0.892	1.33 [1.02 – 1.74]	0.034
No	1.00	–	1,00	–

OR = Odds Ratio; OR_a = Odds Ratio Ajusted.

3.6. Prognostic Fetal

During the 11 years of the study, we identified 1004 macerated stillbirths, 925 fresh stillbirths and 209 perinatal deaths (Figure 3). The overall perinatal mortality rate was estimated at 429.32 ‰.

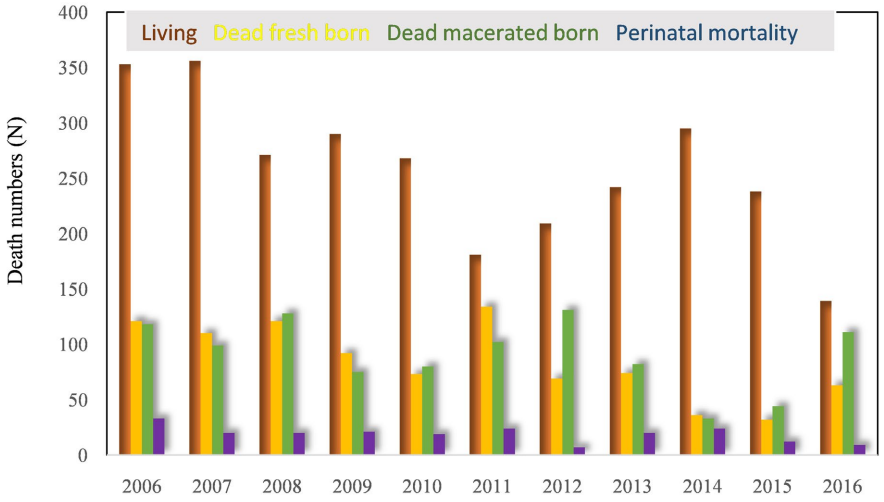

Figure 3. Perinatal mortality by year.

The factors influencing neonatal death are presented in Table 3 below. The rate of dead babies macerated was multiplied by 12.46 in anemic mothers with abruptio placentae; by 4.35 in severe pre-eclampsia; while pre-eclampsia was not associated with fresh stillbirths. Anemic mothers with uterine rupture had a higher rate of dead-born macerates (OR_a = 1.74; 95% CI: 1.07 – 2.83). Hypotrophy was a provider of macerated stillborn and fresh stillborn in our study with OR_a of 6.80 (95% CI: 5.22 – 8.87) and OR_a = 34.07 (95% CI: 22.53 – 51.51), respectively.

Table 3. Factors influencing neonatal mortality in anemic mothers according to the multivariate logistic regression model.

Variables	Macerated Stillborn OR_a [95% CI]	P-Value	Stillborn Fresh OR_a [95% CI]	P-Value
Severe pre-eclampsia				
Yes	4.35 [3.38 – 5.60]	<0.0001	0.44 [0.32 – 0.61]	<0.0001
No	1.00	–	1.00	–
Abruptio placentae				
Yes	12.48 [10.31 - 15.11]	<0.0001	0.89 [0.74 – 1.04]	0.219
No	1.00	–	1.00	–
Uterine rupture				
Yes	1.74 [1.07 – 2.83]	0.025	0.82 [0.48 -1.39]	0.460
No	1.00	–	1.00	–
Hypotrophy Fetal				
Yes	6.80 [5.22 – 8.87]	<.0001	34.07 [22.53 - 51.51]	<0.0001
No	1.00	–	1.00	–
Fetal asphyxia				
Yes	0.91 [0.74 – 1.12]	0.36	1.14 [0.95 – 1.37]	0.159
No	1.00	–	1.00	–
Fetal malformations				
Yes	1.16 [0.66 – 2.05]	0.60	1.66 [1.01 – 2.74]	0.047
No	1.00	–	1.00	–

4. Discussion

Our study found the following main findings: a prevalence of 14.7%, more than 60% of women did not have a prenatal consultation. Maternal comorbidities were the main factors influencing the risk of maternal death as well as perinatal death in women with anemia. Our prevalence is lower compared to that reported in the African literature which could be due to the difference of population studied [7] [15]-[21]. Only 40% of anemia women have completed, related to access to adequate care, socio-cultural barriers and religious beliefs and delays in the implementation of ANC, as medical culture remains very weak in our developing countries. What could be the cause of lack of iron supplementation? The low coverage is similar to that reported in the literature of developing countries and varies from

country to country [22].

The main cause of anemia was iron deficiency in the literature the main causes are malnutrition (iron, folic acid and vitamin deficiencies), infections such as malaria and hemoglobin abnormalities [14] [23]-[26]. The World Health Organization recommends prenatal supplementation of 30 mg to 60 mg of iron per day [9] [27] [28]. This supplementation could reduce the risk of anemia during pregnancy by 20% to 50% [14] [29], 39% risk of mother transfusion and 96% risk of severe anemia after delivery [30] and increased chance of surviving maternal hemorrhage [31]. Iron supplementation during ANC increased birth weight by 31 g and decreased the risk of low birth weight by 19% [32] [33].

We also observed that one in three women with anemia had an inter-reproductive interval of less than 12 months. Pregnancy increases iron needs [34] [35]. Pregnancy with a short birth interval could therefore lead to iron deficiency anemia [36]. The appropriate time after each pregnancy for recovery and replenishment of nutrient reserves is 2 to 5 years [37]-[39].

Factors influencing the risk of maternal death were dominated by maternal comorbidities, hemorrhagic contexts requiring blood transfusion (abortion, abruptio placentae), eclampsia and high blood pressure. The relationship between low hemoglobin and maternal mortality is well established in the literature [40], about 1 to 5% of maternal deaths are related to retro placental hematoma [41] [42].

Like the mother, we observed a poor perinatal prognosis in case of maternal comorbidities and anemia. Indeed, severe pre-eclampsia, abruptio placentae and uterine rupture were strongly associated with a high risk of stillbirth [43] [44].

5. Conclusion

Severe anemia during pregnancy was significantly associated with high maternal-fetal morbidity and mortality. Anemia was of the microcytic type secondary to iron deficiency. Regular obstetric follow-up combined with proper iron supplementation can significantly reduce the serious consequences of anemia in pregnancy.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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