

# Maternal anaemia in West and Central Africa: time for urgent action

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## Abstract

*Objective:* To review the prevalence, severity and determinants of anaemia among women in West and Central Africa (WCA) and raise awareness among policy makers and programme planners in the region.

*Design:* Systematic descriptive review of data in the public domain of the ORC Macro MEASURE Demographic and Health Surveys, national nutrition surveys, oral and technical communications at regional meetings, studies published in scientific journals, and WHO and UNICEF databases.

*Setting:* West and Central Africa region.

*Subjects:* Women of childbearing age.

*Results:* The prevalence of anaemia among pregnant and non-pregnant women is higher than 50% and 40%, respectively, in all countries. Within countries, this prevalence varies by living setting (rural *v.* urban), women's age and education. Across countries, socio-economic and climatic differences have no apparent association with the prevalence of anaemia among women. Several factors contribute either alone or jointly to the high rates of maternal anaemia in this region. These include widespread nutritional deficiencies; high incidence of infectious diseases; low access to and poor quality of health services; low literacy rates; ineffective design, implementation and evaluation of anaemia control programmes; and poverty.

*Conclusions:* Addressing the multiple causes and minimizing the consequences of anaemia on maternal and child health and development in WCA require integrated multifactorial and multisectoral strategies. This also calls for unprecedented, historical and stronger political will and commitment that put adolescent girls and maternal health at the centre of the development agenda.

## Keywords

Women

Anaemia

Urgent action

West and Central Africa

Maternal anaemia continues to be a major barrier to women's health, social development and economic growth, especially in the developing world. The WHO estimates that, globally, anaemia affects 42% (56.4 million) of pregnant women and 30% (468.4 million) of non-pregnant women (including adolescent girls). In Africa, 57% (17.2 million) of pregnant women and 48% (70 million) of non-pregnant women (including adolescent girls) are anaemic<sup>(1)</sup>. In Sub-Saharan Africa, and more particularly in the West and Central Africa Region (WCAR),<sup>†</sup> high rates of

anaemia continue unabated in women throughout their reproductive years. In WCAR, according to WHO classification, the prevalence of anaemia among women of reproductive age is of severe public health significance; i.e. at any point in time at least 40% of women (15–49 years old) are anaemic<sup>(1)</sup>.

These high rates represent significant constraints for achieving some of the Millennium Development Goals such as eradicating hunger and poverty (Goal 1), reducing child mortality (Goal 4) and improving maternal health (Goal 5). The adverse consequences of maternal anaemia include fatigue, decreased work capacity and poor pregnancy outcomes such as preterm birth, low birth weight, and increased risk of maternal death both during delivery and the postpartum period<sup>(2,3)</sup>. Even though

<sup>†</sup>Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Democratic Republic of the Congo, C te d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone and Togo.

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iron/folic acid (IFA) supplementation for pregnant women is policy in all countries of WCAR, programme implementation has been very irregular; and therefore the prevalence of anaemia among women in this region remains unacceptably high.

In recognition of the failure of such programmes globally, with a few exceptions, the international community recently endorsed a set of guidelines for the integrated control of anaemia<sup>(4)</sup>. The effective implementation of these guidelines is essential, especially in areas where the prevalence of anaemia is known to be a public health problem and the causes of anaemia are multiple and coexist. However, this integrated strategy is seldom considered in the training curricula of health professionals or implemented by the health systems in most countries.

The objective of the present paper is to review the extent, severity and determinants of anaemia among women (pregnant, lactating and non-pregnant) in the countries of WCAR, and hence to inform policy makers and programme planners in the region about the consequences of anaemia on child and maternal survival and development, and the feasibility of sound policy and programme actions for the control of anaemia among women of reproductive age.

## Materials and methods

Data presented in the current paper were obtained from the public domain of the ORC Macro MEASURE Demographic and Health Surveys (DHS) website using its STATcompiler program, national nutrition surveys, oral and technical communications at regional meetings held in West and Central Africa, a PubMed search for studies published in scientific journals, WHO and UNICEF databases, and through collaborators.

More specifically, all countries with a national anaemia survey were identified. The final report of the most recent DHS was scrutinized for information on: the prevalence of anaemia (measured by HemoCue<sup>®</sup>) in pregnant (Hb < 11 g/dl), lactating, non-pregnant/non-lactating women (Hb < 12 g/dl), women's nutritional status and intake of micronutrient supplements, and women's use of prenatal care services and commodities for malaria control. In addition, the proceedings of regional meetings organized by the WHO on anaemia control were used, as appropriate, and unpublished reports were obtained from collaborators. Finally, a thorough search was conducted on UNICEF and WHO databases and on PubMed using combinations of the following keywords: 'anaemia', 'iron deficiency', 'pregnancy', 'hookworm', '*Schistosoma haematobium*', 'malaria', '*Plasmodium falciparum*' and country names. This search was limited to 15 years, i.e. between 1993 and 2008. The data obtained were tabulated or presented in charts to show the results. We provide a personal analysis of the data reported and discuss their policy and programmatic implications for the region.

## Results

### *Prevalence of maternal anaemia in West and Central Africa Region*

Fifteen of the twenty-four countries in WCAR have conducted a national survey or a demographic and health survey (DHS) that includes the assessment of Hb concentration in women. These are: Benin, Burkina Faso, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal and Sierra Leone. Table 1 summarizes the data available on anaemia in women in those countries. For other countries of the region without a national survey or a DHS, but with regionally representative data, the most recent WHO estimates<sup>(1)</sup> are shown in Table 2.

The prevalence of anaemia among pregnant women (Hb < 11 g/dl) was greater than 50% in all countries, with the highest rates observed in Benin, Gambia, Mali and Senegal (>70%) and the lowest in Cameroon (51%). Gambia, Mali and Senegal had the highest prevalence of severe anaemia (Hb < 7 g/dl) among pregnant women (~5%).

The prevalence of anaemia in non-pregnant women (lactating and non-pregnant/non-lactating) was also high in all WCA countries (>40%) but remained consistently lower than the prevalence among pregnant women.

Within countries, the prevalence of anaemia among women varied by living setting (rural *v.* urban), women's age, education and parity. These variation correlates differed between countries. For example, women living in rural areas were often more affected, except in Benin. Anaemia prevalence was higher among non-educated women in Burkina Faso and Mali but not in Benin, Ghana and Cameroon. With respect to age, anaemia was more frequent among 15–19-year-old women in Ghana, 20–39-year-old women in Benin, 25–29-year-old women in Cameroon and 35–39-year-old women in Burkina Faso and Mali. In addition, anaemia prevalence was higher among women with one child in Cameroon and Mali whereas this was observed among women with two or three children in Burkina Faso and six or more children in Ghana and Benin.

### *Determinants of maternal anaemia in West and Central Africa Region*

The high prevalence of anaemia described above is reflective of the large extent of nutritional deficiencies (micronutrient and macronutrient), malaria and helminth infections, women's reproductive life (high parity and short birth intervals) and limited access, poor quality and utilization of prenatal health services.

Fe deficiency is the most common cause of anaemia worldwide, and very likely a primary cause of maternal anaemia in WCAR. However, in this region, the extent of Fe deficiency and its contribution to anaemia in women is not well documented. To our knowledge, there are no

**Table 1** Prevalence (%) of maternal anaemia (age group: 15–49 years) in West and Central Africa countries with national or Demographic and Health Surveys

	Benin	B. Faso	Cameroon	CAR*	Congo	DR Congo	Gambia*	Ghana	Guinea	Liberia*	Mali	Niger	Nigeria*	Senegal	S. Leone
Survey year	2006	2003	2004	1999	2005	2007	1999	2008	2005	1999	2006	2006	1993	2005	2008
Pregnant women ( <i>n</i> )	364	441	535	330	–	524	401	351	387	199	580	627	318	352	281
All anaemia	75.0	68.3	50.9	54.8	–	60.0	75.1	70.0	69.4	62.1	73.4	61.5	66.7	70.6	62.3
Mild	30.4	30.6	18.8	–	–	24.6	–	23.4	27.3	–	24.5	30.8	–	25.7	36.9
Moderate	42.4	35.4	31.4	–	–	32.7	–	40.0	38.2	–	43.6	28.0	–	39.8	24.0
Severe	2.2	2.3	0.7	–	–	2.7	5.0	6.6	4.0	–	5.2	2.7	–	5.1	1.4
Lactating mothers ( <i>n</i> )	959	1504	1199	–	–	1511	–	1004	387	–	1643	1662	–	1086	993
All anaemia	58.9	52.5	43.6	–	–	52.1	56.0	61.8	55.1	–	63.1	42.5	–	59.8	44.9
Mild	44.2	39.2	33.1	–	–	36.5	–	43.9	37.8	–	42.1	32.1	–	42.4	35.4
Moderate	13.7	12.2	10.0	–	–	14.9	–	16.2	14.5	–	18.5	9.2	–	16	8.8
Severe	1.0	1.1	0.4	–	–	0.7	2.0	1.7	2.8	–	2.6	1.2	–	1.4	0.7
Non-pregnant/non-lactating ( <i>n</i> )	1803	2326	3350	2396	–	2655	572	3392	2251	1376	2519	2019	1859	3001	2092
All anaemia	59.9	51.7	44.5	49.8	–	51.9	59.1	56.6	49.6	58.0	59.5	43.5	62.0	57.5	43.1
Mild	43.3	38.4	34.4	–	–	36.9	–	38.8	35.3	–	41.0	31.8	–	37.0	32.1
Moderate	15.7	12.5	9.0	–	–	14.0	–	16.1	11.5	–	16.2	10.4	–	17.4	10.3
Severe	0.9	0.9	1.0	–	–	1.0	–	1.6	2.8	–	2.3	1.4	–	3.2	0.6
All groups ( <i>n</i> )	3126	4271	5084	2726	3266	4690	973	4747	3888	1575	4742	4308	2177	4439	3366
All anaemia	61.3	53.7	44.9	–	57.0	52.9	–	58.7	53.3	–	62.7	45.8	–	59.1	45.2
Mild	42.1	37.8	32.5	–	41.3	35.4	–	38.8	35.3	–	39.1	31.8	–	37.4	33.5
Moderate	18.2	14.7	11.6	–	14.9	16.4	–	17.9	15.1	–	20.8	12.5	–	18.8	11.0
Severe	1.1	1.1	0.9	–	0.8	1.1	–	2.0	2.9	–	2.8	1.5	–	2.9	0.7

B. Faso, Burkina Faso; CAR, Central African Republic; DR Congo, Democratic Republic of the Congo; S. Leone, Sierra Leone.

All anaemia (Hb < 11.0 g/dl for pregnant women and < 12.0 g/dl for non-pregnant women); mild anaemia (Hb = 10.0–10.9 g/dl for pregnant women and 10.0–11.9 g/dl for non-pregnant women); moderate anaemia (Hb = 7.0–9.9 g/dl); severe anaemia (Hb < 7.0 g/dl).

Source: Demographic and Health Surveys and \*WHO estimates (WHO, 2008).

**Table 2** Prevalence of maternal anaemia (age group: 15–49 years) in West and Central Africa countries without Demographic and Health Surveys but regionally representative data

	Cape Verde	Chad	Côte d'Ivoire	Equatorial Guinea	Gabon	Guinea-Bissau	Mauritania	ST and Principe	Togo
Pregnant women									
All anaemia (%)	41.3	60.4	55.1	41.7	46.2	57.7	52.7	40.4	50.2
95% CI	15.7, 72.6	28.1, 85.6	24.2, 84.5	13.6, 76.5	17.0, 78.3	25.9, 84.2	22.8, 80.7	15.3, 71.8	21.1, 79.2
Non-pregnant/non-lactating									
All anaemia (%)	32.5	52.4	47.4	38.4	36.7	52.9	50.4	26.2	38.4
95% CI	12.8, 61.0	24.9, 78.6	21.5, 74.8	15.8, 67.4	15.1, 65.3	25.3, 78.9	23.6, 76.9	9.5, 54.4	15.5, 68.0

ST and Principe, Sao Tome and Principe.  
 All anaemia (Hb <11.0 g/dl for pregnant women and <12.0 g/dl for non-pregnant women).  
 Source: WHO estimates (WHO, 2008).

nationally representative data on the prevalence of Fe deficiency among women of childbearing age in WCAR, except in the Gambia where low ferritin values, i.e. <10 µg/l, were observed in 26% of pregnant women<sup>(5)</sup>. Most often the prevalence of anaemia (Hb < 11 g/dl) is used as a proxy for Fe deficiency among pregnant women.

In the absence of national data, we report the results of localized research studies published in the scientific literature that describe approximately the extent of Fe deficiency in some countries and portray the big picture of the problem in the region. Table 3 summarizes the major findings of those studies<sup>(6–10)</sup> (also J Kate, unpublished results). It shows that Fe deficiency is prevalent as expected. It also shows that the deficiency is not limited to pregnant women.

Multiple micronutrient deficiencies also are likely common in the selected countries. This is evidenced by the high prevalence of anaemia (a proxy for Fe deficiency) and the frequent reporting of night blindness (a proxy for vitamin A deficiency) among women in these countries. The reported prevalence of night blindness varies from 6.0% in Cameroon to 17.8% in Guinea (Table 4). The highest prevalences are observed in rural areas where the majority of women live. In addition, widespread self- and culturally imposed food restrictions and economic constraints limit dietary diversification in this region. In Mali, for example, 45% of pregnant women are subject to food restrictions<sup>(11)</sup>.

The prevalence of chronic energy deficiency as defined by low BMI (BMI < 18.5 kg/m<sup>2</sup>) among women in the selected countries of WCAR varied from 7% in Cameroon to 21% in Burkina Faso. Burkina Faso and Mali (13%) had the highest rates among the countries presented. In all of these countries, the prevalence of low BMI is higher among younger women (15–19 years old), those without any education and in rural areas.

The effect of all of these nutritional factors on anaemia in women is exacerbated by poor reproductive health and socio-cultural conditions and by the frequency and endemicity of chronic infections and inflammations caused by infectious diseases and worms.

As in other African regions, malaria contributes significantly to the high prevalence of anaemia observed in WCAR, especially among pregnant women. For example, in Mali, during the dry season, a period of low transmission, malaria was found in 11% of pregnant women cared for in a community health centre<sup>(11)</sup>. The disease was associated with anaemia in pregnant women<sup>(12)</sup> and contributed 32% of anaemia cases in this population<sup>(11)</sup>. In Gabon, the presence of *P. falciparum* in peripheral blood was highly associated with anaemia (OR = 2.38, 95% CI 1.4, 4.05, *P* < 0.001)<sup>(13)</sup>. In Nigeria, *P. falciparum* was observed in 27% of pregnant women of whom 60% were anaemic<sup>(14)</sup>. In Ghana, *P. falciparum* was found in 63% of pregnant women tested and malaria was a major determinant of pregnancy anaemia<sup>(15)</sup>. In the Democratic Republic of the Congo, malaria was associated with pregnancy anaemia in

**Table 3** Prevalence of iron deficiency (serum ferritin or serum iron <12 µg/l) in women in selected countries of West and Central Africa

Source	C. Ivoire	Chad	DR Congo	Gambia	Ghana	Mali	Nigeria
	Asobayire <i>et al.</i> <sup>(20)</sup>	Pruhal <i>et al.</i> <sup>(6)</sup>	Kuvibidila <i>et al.</i> <sup>(7,8)</sup>	National Nutrition Agency <sup>(5)</sup>	Mockenhaupt <i>et al.</i> <sup>(15)</sup>	Diallo <i>et al.</i> <sup>(9)</sup> Ayoya <i>et al.</i> <sup>(11)</sup>	Isah <i>et al.</i> <sup>(10)</sup>
Pregnant women							
%	–	67	52–59	26	5–46	13–37	25–48
<i>n</i>	–	112	203/166	234	530	209/190	95
Non-pregnant women							
%	41–63	31	–	–	–	–	54
<i>n</i>	406	114	–	–	–	–	68

C. Ivoire, Côte d'Ivoire; DR Congo, Democratic Republic of the Congo.

**Table 4** Prevalence of night blindness during the last pregnancy among women in selected countries of West and Central Africa

Survey year	Benin	B. Faso	Cameroon	DR Congo	Ghana	Guinea	Mali	Niger	Nigeria	Senegal
	2006	2003	2004	2007	2008	2005	2006	2006	2003	2005
Night blindness ( <i>n</i> )	10 521	7428	5303	5473	2099	4447	9087	6300	3911	6927
Reported (%)	12.5	13.0	6.0	14.1	14.1	17.8	16.2	12.5	7.7	12.7
Adjusted (%)	2.3	7.2	0.9	4.0	1.7	2.8	6.0	6.6	2.2	2.0
Urban ( <i>n</i> )	3742	1055	2451	2189	844	1075	2601	974	1144	2689
Reported (%)	9.6	8.1	5.1	10.1	11.8	13.2	11.7	8.1	5.6	10.8
Adjusted (%)	1.3	2.9	0.8	4.1	1.4	2.0	3.5	2.1	0.9	1.3
Rural ( <i>n</i> )	6779	6373	2852	3284	1255	3372	6486	5326	2767	4238
Reported (%)	14.1	13.8	6.9	16.7	15.6	19.2	17.9	13.3	8.5	13.9
Adjusted (%)	2.9	7.9	1.0	3.8	1.9	3.1	7.0	7.4	2.7	2.5

B. Faso, Burkina Faso; DR Congo, Democratic Republic of the Congo.  
Source: Demographic and Health Surveys.

40% of cases<sup>(16)</sup>. In Cameroon, 37.0% of the anaemia cases in pregnant women were associated with maternal malaria parasitaemia while 37.3% were associated with placental malaria parasitaemia<sup>(17)</sup>. In Senegal, the incidence of malaria attacks was, on average, 4.2 times higher during pregnancy than before<sup>(18)</sup>. In Burkina Faso, malaria infection was diagnosed in 29% of pregnant women attending antenatal care clinics<sup>(19)</sup>. In four different regions of Côte d'Ivoire where malaria is endemic, a study showed a prevalence of Fe deficiency and Fe deficiency anaemia in women of 41–63% and 20–39%, respectively<sup>(20)</sup>.

The risk of anaemia associated with malaria appears to vary with season. For example in Mali, the risk of anaemia among infected pregnant women is higher during the dry season than during the rainy season (OR = 3.43, 95% CI 1.09, 10.07). This is likely because pregnant women infected at the end of the rainy season carried their latent infection during the full course of the dry season. This risk also varies with the stage of pregnancy and age, the primigravidae and the youngest women being the groups most at risk of malaria and anaemia<sup>(17,21)</sup>.

In WCAR, helminth infections are widespread. Among the worm infections, hookworm and schistosomiasis are those most known to cause anaemia in man. However, in WCAR, data on their contribution to anaemia in women of childbearing age are lacking or limited. Studies in Mali showed that 8% and 23% of urban pregnant women had hookworm and *S. haematobium*, respectively. In this

setting, hookworm and *S. haematobium* infections contributed 10% and 13%, respectively, of the anaemia in women attending a community health centre in Bamako<sup>(11)</sup>. In the Democratic Republic of the Congo, anaemia associated with intestinal parasitism (hookworm and *Ascaris* spp.) was found in 9% of pregnant women<sup>(16)</sup>. In Gambia, hookworm was the cause of anaemia in the majority of cases in non-pregnant adult women<sup>(22)</sup>. In Nigeria, hospital-based studies documented hookworm in 14% of pregnant women<sup>(23)</sup>. In Ghana, a study found that 7% of women were infected with *S. haematobium*<sup>(24)</sup>.

### **Programmes for the control of maternal anaemia in West and Central Africa Region**

Supplementation with IFA is a national policy widely adopted among WCAR countries to address anaemia during pregnancy (prevention and treatment). Most often IFA tablets (60 mg of Fe and 400 µg of folate) are prescribed for pregnant women within health facilities from first contact to delivery or 2 months thereafter. These tablets should be taken daily. In spite of this, a large proportion of women (more than 50% in some countries) do not take Fe supplements during pregnancy (Table 5). The percentage of women not receiving any Fe tablet during the pregnancy period is often almost two or three times higher in rural than urban areas and is higher among women without any education. The reasons for not taking Fe supplements are numerous. However, the most important one is the shortage

**Table 5** Percentage of women who received vitamin A capsules in the postpartum period and iron + folic acid supplement intakes among mothers in some countries of West and Central Africa

Country	Survey year	n	Women who received postpartum vitamin A capsules (%)			n	Number of days Fe tablets/syrup were taken during pregnancy (%)				
			Urban	Rural	Total		None	<60	60–89	90+	Don't know/missing
Benin	2006	10 521	43.8	40.2	40.1	9891	13.5	16.8	11.8	52.9	6.2
Burkina Faso	2003	7428	26.1	14.8	16.4	7297	30.4	35.4	9.7	10.3	14.1
Cameroon	2004	5303	34.2	23.0	28.2	4710	25.5	15.4	8.0	46.5	4.6
Chad	2004	–	–	–	–	3372	70.5	21.4	0.8	1.4	5.9
DR Congo	2007	5473	38.2	23.3	29.3	5473	51.8	37.9	1.4	1.7	7.2
Ghana	2008	2099	63.8	58.0	60.4	2099	12.6	28.2	10.1	41.5	7.6
Guinea	2005	4447	50.9	27.0	32.8	4447	24.6	21.3	12.4	32.6	9.2
Liberia	2007	3928	79.3	52.6	61.5	3928	12.4	42.7	13.7	13.6	17.6
Mali	2006	9087	61.3	33.1	41.2	8857	38.4	26.5	8.5	18.2	8.4
Niger	2006	6300	33.4	20.2	22.2	5981	54.6	21.1	8.6	14.0	1.8
Nigeria	2003	3911	33.0	14.1	19.6	3751	39.8	25.2	5.4	21.2	8.5
Senegal	2005	6927	36.8	21.2	27.3	6705	9.2	24.1	13.2	39.7	13.7

DR Congo, Democratic Republic of the Congo.

Source: ORC Macro, MEASURE DHS STATcompiler, <http://www.measuredhs.com>, 25 April 2009.

of Fe tablets<sup>(25–29)</sup>, a recurrent problem in almost all countries of WCAR because of logistic problems (storage capacity and timely supplies). The shortage may result in limited availability of and accessibility to low-cost Fe tablets for women. For example, studies in Mali reported that Fe tablets are often not available within health services<sup>(11)</sup> (VM Aguayo, unpublished results). There are also other factors contributing to poor compliance such as inadequate or lack of counselling about potential side effects and how to manage them (VM Aguayo, unpublished results).

Additional approaches for addressing micronutrient deficiencies – and anaemia indirectly – among women are implemented in the region. Vitamin A (60 000 µg; 200 000 IU), an important micronutrient known to play a key role in erythropoiesis, is recommended in the early postpartum period along with the promotion of vitamin A-rich foods throughout the life cycle. However, even for women delivering in health clinics, the majority do not get vitamin A capsules let alone those delivering at home (Table 5). This is more pronounced in rural areas and among women with no schooling. Similarly, the consumption of vitamin A-rich foods is often greater in urban than rural areas and lower among women with no education. Large-scale food fortification programmes have advanced greatly in the last 5 years in the region. For example, vitamin A fortification of cooking oil (in at least eight countries) and flour fortification with IFA (in one country) are currently being implemented to combat micronutrient deficiencies and anaemia.

Malaria control is being promoted as a complementary approach to IFA supplementation for controlling pregnancy anaemia, among other adverse outcomes, in malaria-endemic areas, hence in WCAR. Until recently, weekly administered chloroquine was the first-line drug for malaria prevention during pregnancy in this region. This policy changed swiftly in several countries (Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Mali, Niger, Nigeria, Sierra

Leone, Senegal and Togo) in favour of the intermittent preventive treatment using sulfadoxine–pyrimethamine (IPT/SP) because resistance to chloroquine became rampant. Nevertheless, the use of IPT/SP was extremely low at the time the surveys were conducted (Table 6). In general, preventive malaria chemotherapy was sought more by women in urban areas and those with the highest education level.

Long-lasting insecticide-treated nets, now considered to be the most powerful malaria control tool developed since the advent of indoor residual spraying and chloroquine, were also an important component of national malaria control strategies in WCAR.

The control of helminths is another complementary and cheap strategy to IFA supplementation for controlling anaemia. The landscape of control of helminths has changed quite considerably in several countries in the region (including in Burkina Faso, Mali, Niger and Sierra Leone) with the advent and rapid extension of integrated control programmes for Neglected Tropical Diseases. These programmes potentially have a considerable impact on anaemia. However, nationally representative data on the control of helminths in WCAR women are lacking to our knowledge.

## Discussion

The rates of anaemia among women of reproductive age, and especially among pregnant women, in countries of WCAR as reported in a DHS or a national survey are unacceptably high. This is supported by findings from small-scale studies showing that maternal anaemia is a problem that is not limited only to the region's countries with nationally representative data.

Challenges have been reported in ensuring sufficient reliability and accuracy when the HemoCue technique is used to assess Hb levels. The major factors behind those

**Table 6** Use of antimalarial drugs by pregnant women in selected counties of West and Central Africa

Country and year of survey	<i>n</i>	Percentage who took antimalarial during pregnancy	Percentage who took IPT/SP during pregnancy	Percentage who took 2+ doses of IPT/SP during pregnancy	Percentage who received IPT/SP during ANC visit	Percentage who took 2+ doses of IPT/SP after an ANC visit
Burkina Faso, 2003	4201	64.0	0.3	0	–	–
Cameroon, 2004	2472	56.5	0.7	–	–	–
Ghana, 2008	1178	65.4	58.2	45.5	56	43.7
Guinea, 2005	2614	69.9	6.4	3.6	2.9	2.5
Mali, 2006	5663	59.1	16.1	11.2	6.0	4.0
Niger, 2006	3918	47.3	0.5	0.5	0.4	0.4
Nigeria, 2003	2447	25.0	1.3	1.1	0.8	0.7
Senegal, 2005	4391	83.3	21.4	38.6	9.2	11.9

IPT/SP, sulfadoxine–pyrimethamine; ANC, antenatal care.

Source: ORC Macro, MEASURE DHS STATcompiler, <http://www.measuredhs.com>, 7 July 2009.

challenges have been shown to be related to sample collection and analysis techniques. There is global evidence showing that the HemoCue method gives highly accurate results<sup>(30)</sup> and provides an adequate estimate of population anaemia prevalence<sup>(31)</sup>. DHS follow comprehensive procedures for ensuring rigorous sample collection and analysis developed for use of the HemoCue<sup>(32)</sup>, use various quality control measures and have strong training and supervision components. It is therefore our opinion that the data quality in these surveys is satisfactory and allows a good comparability over time and among countries in WCAR.

Interestingly, WCAR is a region where socio-economic and climatic differences have no apparent association with the prevalence of anaemia during pregnancy across countries. Anaemia proportions are quite similar between the Sahel countries (especially the landlocked ones) supposedly more at risk and the non-Sahel countries with better access to foods and better availability of prenatal health services. This strongly suggests an urgent need for better understanding the local causes of anaemia in these countries, and also for sound public health programmatic and budgetary strategies with appropriate targeting, implementation, monitoring and evaluation in this region.

In terms of targeting, nutrition-related programmes need to focus on and reach the priority groups to achieve the desired results (children under 2 years of age, adolescent girls, and pregnant and lactating women). Adolescent girls represent a particularly important group because nutritional deficiencies at this age have far-reaching implications. Anaemic adolescent girls are more likely to be future anaemic adult mothers. They often have lower pre-pregnancy weight, lower pregnancy weight gain, are at a higher risk of death from haemorrhage at delivery and are more likely to deliver low-birth-weight newborns, thereby perpetuating the vicious cycle of poor nutrition, growth and development. Unfortunately, adolescent girls have been neglected so far by policy makers and programme planners in WCAR.

As reported in the previous section, the prevalence of anaemia among women in WCAR is greater than the

threshold of 40% suggesting that Fe deficiency is likely a severe public health problem at the population level. This is because of chronically inadequate dietary Fe intake in this region caused by poor consumption of animal-source foods. Physiological demands for this essential element imposed by fetal needs and maternal blood volume expansion during pregnancy heighten these inadequate Fe intakes. Furthermore, the absorption of dietary Fe and the utilization of endogenous and exogenous Fe are also influenced adversely by common states of chronic infection and inflammation caused by parasites, which are prevalent in WCAR.

The contribution of vitamin A deficiency to anaemia has been documented. In WCAR, many pregnant women, especially those living in rural areas, suffer from night blindness, a clinical sign of vitamin A deficiency. Indeed, the adjusted prevalence of night blindness among pregnant women in some countries of WCAR is greater than the cut-off point of 5% indicating that vitamin A deficiency is a public health problem in a population. In a study in rural Gambia, Bates *et al.*<sup>(33)</sup> showed that women's plasma retinol levels are significantly lower than those observed in a group of pregnant and lactating women living in the UK. In addition, plasma retinol is significantly higher among pregnant and lactating Gambian women supplemented with 650 µg vitamin A daily<sup>(34)</sup>.

Parasitic infections (malaria, hookworm and schistosomiasis) clearly play an important role in the occurrence and severity of anaemia among women in WCAR. This assertion is based on the existing evidence from small-scale studies in the region and on the abundant and compelling literature showing that regular parasite control reduces anaemia in women of reproductive age<sup>(4)</sup>. Therefore, the findings reported previously and those of the global research agenda on the benefits of malaria control and deworming for women strongly suggest that appropriate measures should be taken urgently by policy decision makers and programme implementers in collaboration with researchers and civil societies to address parasites in all countries of the region. Malaria control strategies during pregnancy are well defined and commonly

implemented. Deworming is possible and feasible because anthelmintic therapy is efficacious, inexpensive, and safe to administer to pregnant women<sup>(35–37)</sup>. This could be done through systematic treatment of pregnant women for intestinal and urinary parasites during prenatal care visits in their second or third trimester, and through mass campaign distributions of anthelmintics to women of childbearing age following WHO recommended dosages. Such a programmatic strategy, in addition to its enormous impact on the health and survival of both pregnant women and their babies, will position the region to meet the Millennium Development Goals in several ways<sup>(4)</sup>.

The effectiveness of ongoing control programmes for anaemia in the region is seriously hindered by inadequate supply and distribution systems; absence or scarcity of scientific and programmatic information; poor compliance with supplements (when available); inadequate or lack of counselling on the supplementation; low or non-existence of Fe-fortified foods; absence of systematic diagnosis and treatment procedures for helminth infections during antenatal care services; lack of appropriate knowledge by health providers about anaemia; and lack of or insufficient political commitment. The lack of political commitment explains the absence of harmonized reproductive health and nutrition procedures and guidelines for anaemia control in countries. It also is characterized by weak health systems that are not capable of implementing policies and guidelines when they exist (no laboratories, not enough qualified and motivated staff, and no supplies).

Because Fe tablets are distributed to women during their visits to prenatal care clinics, this inherently predisposes those not attending the health centres to be left out. This distribution system limits proper supplementation because women must make multiple visits to the centres to get the recommended number of tablets, which is unlikely in most situations. The health centres also are not always available particularly in rural areas, thus systematically excluding many women from receiving the tablets. Even when health centres exist, women's financial constraints and/or dependency on their husbands can be other barriers to attendance and access to Fe supplements.

Information on the effectiveness of anaemia programmes is scarce or difficult to find because of the lack of well-established monitoring and evaluation systems. In addition, programme implementers report many constraints and few successes of large-scale experiences have been reported. Furthermore, operations research, which is necessary to understand how to overcome practical barriers for successful implementation of programmes, is often neglected.

Good access to and utilization of family planning services to reduce parity and increase birth intervals is crucial for women to maintain health and replenish stores of Fe and other minerals and vitamins between pregnancies. Such utilization and access are, unfortunately,

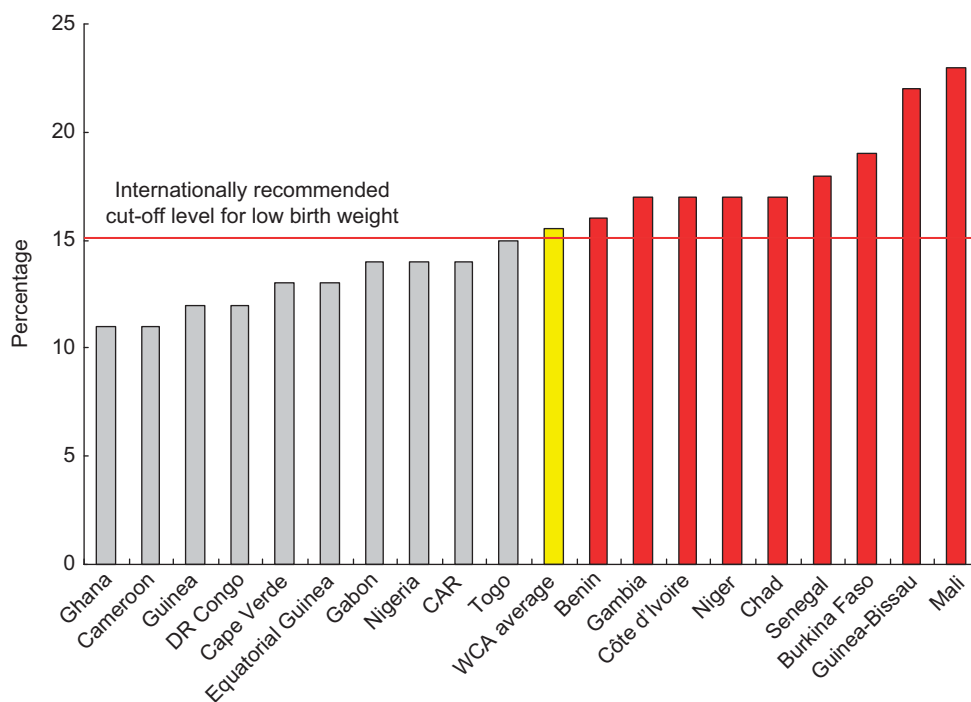
not the norm in the countries included in the present paper. This clearly suggests a strong collaboration need between nutrition and women's reproductive health services. The available data show that women in urban areas and those with formal education seek more family planning services. This is probably because they are more exposed to messages and marketing spots emphasizing the benefits of these services; they understand those benefits; they are more empowered to control their own bodies; and they face less stigma and cultural pressure. Furthermore, their socio-economic status may allow them an easier access to various contraceptive methods. This highlights the need for adjusting and/or strengthening current strategies (information, education, communication, distribution, access) to reach the maximum of women, and more particularly the underprivileged.

The above underscores that the problem of anaemia among women in WCAR is complex and addressing it effectively undoubtedly requires multifactorial and multi-sectoral approaches. This integrated approach should appropriately use the window of opportunity that prenatal care visits offer. Failing to do so will undermine the development of the region and exacerbate anaemia consequences on maternal and child health, survival and well-being.

The costs of anaemia on maternal health are indeed enormous. Anaemia during pregnancy (and childbearing age) places affected women at greater risk of pre- and postpartum ill health. It lowers their resistance to infections<sup>(38)</sup>, increases their morbidity and mortality<sup>(39–41)</sup> and reduces their work performance and productivity<sup>(42)</sup>. The mortality impact of maternal anaemia is important and increases with lower Hb levels. For example, the risk of death for women with Hb at 3–4 g/dl ranges from 10 to 30%; and there is a continuous relationship between maternal mortality and Hb concentration in the range of 5–12 g/dl<sup>(43)</sup>. This risk applies to most pregnant women because the great majority of them have Hb levels in this range. From policy and programmatic points of view, this is of public health significance because it shows that mild and moderate anaemia, not just severe anaemia, are important to women's health.

Anaemia also has been associated with greater risk of preterm delivery and low birth weight<sup>(44)</sup>, thus likely explaining in part the magnitude of low birth weight in the region (Fig. 1). Figure 1<sup>(45)</sup> shows that the prevalence of low birth weight is high and confirms that many of the region's countries exceed the internationally recommended cut-off levels of low birth weight (incidence rate >15%) which should trigger public health actions. Population-wide interventions aimed at preventing low birth weight at term (including anaemia control) are therefore urgently required because this condition also contributes substantially to child morbidity and mortality, poor growth and cognitive development, and chronic diseases later in life. For example, recent evidence from Niger shows that prenatal multiple micronutrient supplements





**Fig. 1** (colour online) Estimates of the incidence of low birth weight in West and Central Africa (WCA; DR Congo, Democratic Republic of the Congo; CAR, Central African Republic); there are no estimates for missing countries of the region. Source: UNICEF & WHO<sup>(45)</sup>

have a significantly higher impact on birth weight than IFA alone<sup>(46)</sup>.

Anaemia alters mother–child interactions and is strongly associated with mothers' depression, fatigue, stress and cognitive functioning during the postpartum period. Anaemic mothers are usually more 'negative' towards their babies, engage less in goal setting and are less 'responsive' to their infants<sup>(47)</sup>. They also appear to be more anxious, stressed, tired and depressed after delivery<sup>(48)</sup>.

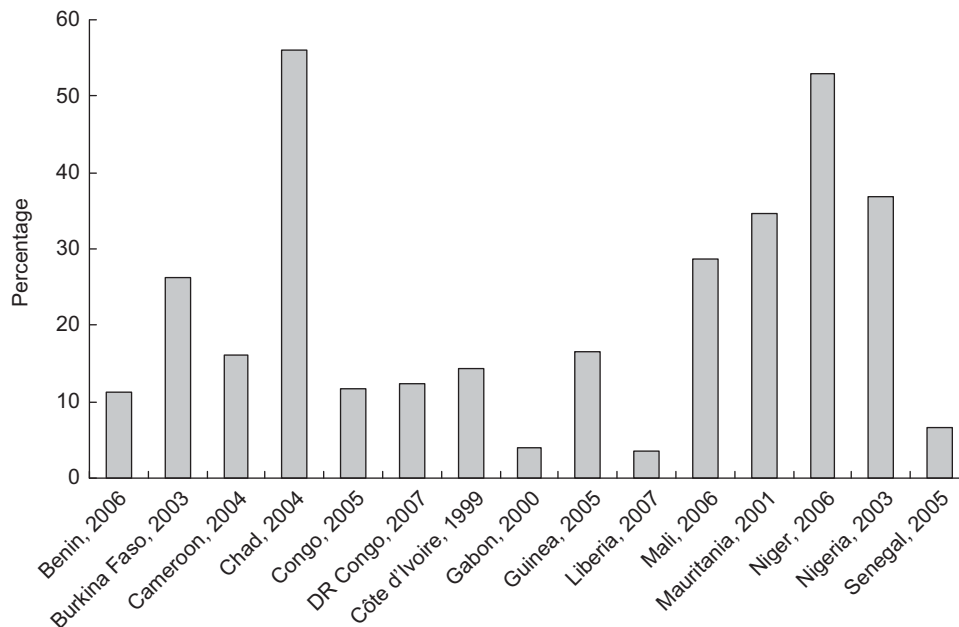
The public health consequences of maternal anaemia on child outcomes are also very high. Evidence is available that anaemic mothers are more likely to give birth to anaemic infants. Infants born to anaemic mothers experience more growth faltering and are developmentally delayed in hand–eye movement and overall cognitive quotient<sup>(47)</sup>. They also are at higher risk for intra-uterine fetal death<sup>(44)</sup>, long-lasting adverse effects on auditory and visual system functioning<sup>(49)</sup> and poor behavioural outcomes, which are only partially irreversible unless corrected early<sup>(50,51)</sup>.

The persistently high rates of anaemia among women in WCAR and the consequences of anaemia described above could be partly prevented if the quality of prenatal care services is improved. Unfortunately, the region is characterized by a limited availability of health centres, especially in rural areas, a lack of well-qualified and sufficient health workers, and a scarcity of good diagnosis capabilities. This is worsened by the majority of women's financial constraints to seek antenatal care even where it can be provided. Therefore, it is not surprising that the DHS document striking rates of low and late attendance,

poor accessibility and utilization of health clinics by women in several countries (Fig. 2) that unquestionably result in low coverage and poor quality of antenatal care.

Furthermore, there is a lack of adequate and effective strategies to reach women not in contact with health services during pregnancy, hence a need to expand coverage through outreach antenatal care while ensuring quality of the essential package provided. Expanding coverage requires the training of a critical mass of community health workers or volunteers and an increased supply and availability of Fe supplements at each level of the health system. It also requires a community-based distribution system of the supplements by health workers or volunteers and private sector sales by drug vendors and small shops. The existing family planning extension channels can be used to this end. This activity should be done together with the promotion of other services addressing anaemia, such as large-scale food fortification programmes, modern family planning methods to delay and space births, control of malaria and other parasites, and improvement of dietary intake.

A promising approach in the fight against anaemia during pregnancy is the focused antenatal care, which offers an opportunity for strong interpersonal communication component including nutrition counselling. Some of the countries in WCAR are piloting this approach and are actively promoting additional ways of reducing blood loss at delivery among women, which include early initiation of breast-feeding, exclusive breast-feeding and active management of the third stage of delivery.



**Fig. 2** Percentage of women with no antenatal care during pregnancy in selected countries of West and Central Africa (DR Congo, Democratic Republic of the Congo). Source: ORC Macro, MEASURE DHS STATcompiler, <http://www.measuredhs.com>, 16 July 2009

Another promising approach is the use of multiple micronutrients during pregnancy. For example, in Mali, women had better adherence to the multiple micronutrient supplements and a more positive perception about the benefits to their health and that of their newborns than they did for Fe<sup>(46,52)</sup>. In Niger, multiple micronutrients and Fe were both effective in reducing low birth weight but the multiple micronutrients had slightly more positive effects on this outcome<sup>(46)</sup>. In both countries, data show that compliance (irrespective of the supplement) was high even with minimum but adequate and easily understandable information and counselling during prenatal care services<sup>(46,52)</sup>.

There are currently unprecedented windows of opportunity and a great potential to improve these prenatal care services. For example, the essential nutrition actions are well defined and commonly known in the region. This represents an excellent opportunity for governments and their development partners to support health services to strengthen the nutrition activities already offered in their service packages, and include those missing. Among the latter is the addition to the current preventive package (Fe + antimalarial) of anthelmintics (albendazole and/or praziquantel). The available WHO recommendations and guidelines on the use of anthelmintic chemotherapy for women of reproductive age (including pregnant women) represent powerful tools in the hands of health professionals and programme managers that can be used and adapted to the prevailing regional, national and local contexts and the resources available, to build the anthelmintic component of an integrated strategy to prevent or address anaemia among women.

The West African Health Organization lately engaged in major activities aimed at reducing anaemia (and Fe

deficiency) by 20% by 2010 in the countries of the Economic Community of West African States through an integrated approach. This offers an important institutional support and an additional opportunity for leveraging resources and implementing the strategy in the region.

## Conclusion

The prevalence of moderate to severe maternal anaemia in WCAR is extremely high and varies little among countries. The causes of anaemia among women of childbearing age in this region are multiple and likely interlinked; therefore the consequences of anaemia on maternal and child health, survival and development are probably enormous. Programmes for controlling maternal anaemia in the region have shown significant limitations and need substantial improvements. We believe that the control of anaemia among adolescent girls should be given special attention, and an integrated multisectoral intervention approach recognizing and addressing together the multiple causes of maternal anaemia should be implemented urgently. It is possible and feasible to make progress; however, this calls for unprecedented, historical and stronger political will and commitment that put maternal health at the centre of the development agenda.

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