Prevalence of anaemia in pregnancy in a regional health facility in South Africa

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Background. Anaemia is a major global health problem affecting an estimated 42% of pregnant women worldwide. There is a paucity of South African (SA) data on anaemia in pregnancy, despite the fact that parasitic infections are endemic and the nutritional status of sections of the population is poor.
Objective. To determine the prevalence of anaemia among antenatal attendees in a regional hospital in Durban, SA.
Methods. This was a cross-sectional prospective study in a regional health facility in an urban setting serving a population of low socioeconomic status. Venous blood samples to perform a full blood count were obtained from antenatal attendees at their first clinic visit.
Results. Two thousand pregnant women were studied; the mean (standard deviation) age and gestational age at booking was 27.6 (7.6) years and 21.7 (7.1) weeks, respectively. Eight hundred and fifty-four (42.7%) were anaemic (haemoglobin (Hb) levels <11 g/dL). The majority (81.4%) were mildly anaemic. There were five (0.6%) cases of severe anaemia (Hb <7 g/dL). The prevalence of anaemia was significantly higher in HIV-positive compared with HIV-negative pregnant women (71.3% v. 28.7%; $p<0.0001$). The common morphology was normochromic normocytic (n=588, 68.9%).
Conclusion. The prevalence of anaemia was 42.7%. In the majority (81.4%) the anaemia was mild and normocytic and normochromic (68.9%). Anaemia is a common problem among antenatal attendees in an SA urban population.

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Anaemia is a common condition globally and is associated with adverse events in pregnancy.[1-3] The World Health Organization (WHO) estimates that about 56% of pregnant women in low- and middle-income countries (LMICs) and 23% in high-income countries are anaemic. Most cases of anaemia in women are due to iron deficiency. Anaemia is associated with substantial health and economic cost implications in LMICs.[1-3]

Iron deficiency in pregnancy is probably due to the fact that iron stores are inadequate and insufficient to meet the increased requirements in pregnancy. Iron-deficiency anaemia has been associated with an increased risk of stillbirths, low-birth-weight babies, intrauterine growth restriction, neonatal sepsis and maternal mortality.[4]

The Saving Mothers Report (2010 - 2013)[5] found that 40% of maternal deaths in South Africa (SA) were associated with anaemia, despite the fact that micronutrients (prophylactic iron, folic acid and multivitamins) are provided routinely throughout pregnancy. It is plausible that the anaemia associated with maternal mortality may be due to poor adherence in taking prophylactic micronutrients and to the poor overall nutritional status of the population.

There is a paucity of data on anaemia among SA pregnant women, among whom there is high prevalence of HIV infection. HIV is associated with a high prevalence of anaemia in sub-Saharan Africa.[6] A study in SA by Van Bogaert[7] found a prevalence of anaemia of 19.7% in a rural population. Prevalences reported from African countries indicate varying rates,[8-10] probably reflecting differing sizes of study populations, geographical area (rural or urban), rates of parasitic infestation and levels of education.

Objective

To determine the prevalence of anaemia at the first antenatal visit in a cohort of black SA women attending a regional hospital in an urban setting.

Methods

Ethical clearance and regulatory permission was obtained from the University of KwaZulu-Natal Biomedical Research Ethic Committee (BE 306/12) and from the Regional Hospital Administration. A cross-sectional prospective study over a 2-year period (2012 - 2014) was performed in a regional hospital in Durban, SA, serving a population with largely low socioeconomic status. Written informed consent was obtained from consecutive women registering for antenatal care and the relevant demographic and clinical data were collected in a structured format. The standard practice at the study site was to perform a full blood count at the first antenatal visit and to repeat the investigation at between 34 and 36 weeks' gestational age. All women regarded as low risk attended for prenatal care on four occasions at least during the pregnancy, while women who had 'risk' features were seen more frequently.

Anaemia was defined as a haemoglobin (Hb) concentration of <11 g/dL (WHO definition[1]). All women received prophylactic iron therapy (oral ferrous sulphate 200 mg) and folic acid 5 mg daily. If anaemia was present, therapeutic doses of iron (oral ferrous sulphate 200 mg 3 times a day) and folate 5 mg daily were prescribed with instruction on appropriate nutritional intake. This management was standard clinical practice at the study site.

The Hb levels were arbitrarily divided into the following groups: (*i*) >11 g/dL; (*ii*) 10 - 10.9 g/dL (mild anaemia); (*iii*) 7 - 9.9 g/dL (moderate anaemia); and (*iv*) ≤7 g/dL (severe anaemia). Gestational

age was calculated taking into account the last menstrual period, an ultrasound dating scan and the symphysis-fundal height measurement.

Statistical analysis

Data were entered into a computer database using Microsoft Excel software and imported on SPSS (version 22) for analysis. A *p*-value of <0.05 was considered statistically significant.

Results

Fig. 1 shows the prevalence, grades and types of anaemia. Eight hundred and fifty-four (42.7%) were anaemic. The majority (81.4%) were mildly anaemic, whereas 18.0% were moderately anaemic. There were five (0.6%) cases of severe anaemia (Hb ≤7.0 g/dL). The prevalence of anaemia at booking was significantly higher in HIV-positive than in HIV-negative pregnant women (609 (71.3%) v. 245 (28.7%); $p<0.0001$).

Table 1 shows the relevant clinical data; most women were young (mean (standard deviation (SD)) age 27.6 (7.6) years) and of low parity. The mean gestational age at the booking visit was 24 weeks.

Table 2 shows the demographic and obstetric data of the anaemic antenatal attendees. The data include HIV status of all participants. Six hundred and nine of the 845 with anaemia were HIV-infected.

Table 3 shows the clinical characteristics and severity of anaemia; 124 (14.5%) anaemic patients were <19 years of age and 111 (13.0%) were aged >35 years. Six hundred and one primigravidas and 302 grand multiparas were included in the study. Anaemia was recorded in 197 primiparas and 111 grand multiparas, giving a prevalence of 32.7% and 36.8%, respectively.

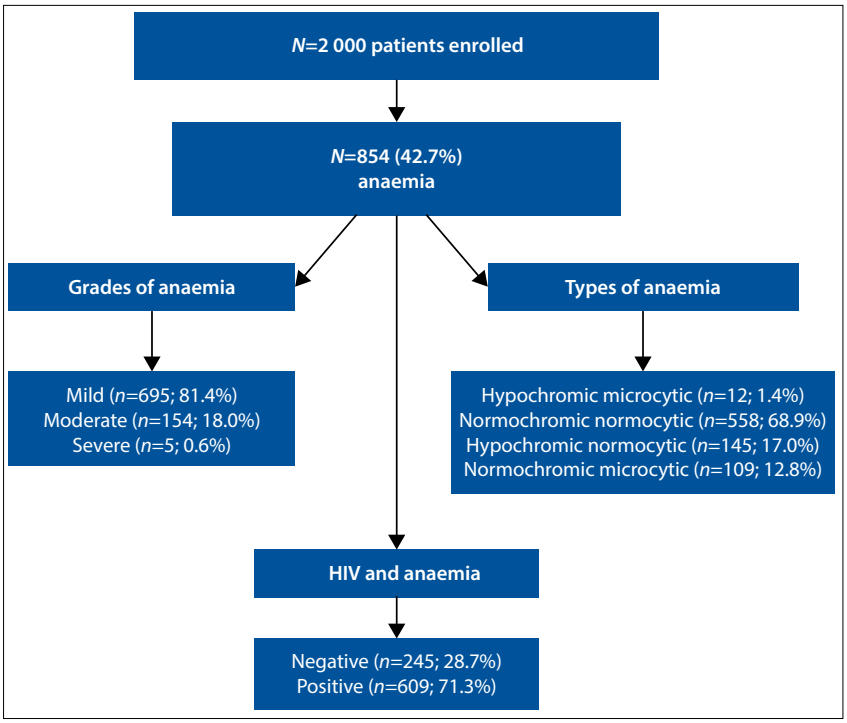

Fig. 1. Prevalence, grades and types of anaemia in the study population.

Table 1. The clinical data of all participants at recruitment

Variable	Total (*N*=2 000)	Anaemic (*N*=854)	Normal (*N*=1 146)	*p*-value	95% CI
Age (years)					
Mean (SD)	27.6 (7.6)	24.7 (6.2)	30.2 (4 .2)	0.006	0.0153 - 0.0947
Range	19 - 45	19 - 28	25 - 45		
Age groups, *n* (%)					
≤19	356 (17.8)	124 (14.5)	232 (20.2)	0.001	0.0231 - 0.0909
20 - 24	377 (18.9)	133 (15.6)	244 (21.3)	0.001	0.0223 - 0.0917
25 - 30	670 (33.5)	295 (34.5)	375 (32.7)	0.3	−0.0238 - −0.0598
31 - 34	361 (18.1)	191 (22.4)	170 (14.8)	0.001	0.0419 - 0.1101
≥35	236 (11.8)	111 (13.0)	125 (10.9)	0.16	−0.0085 - 0.0485
Parity, *n* (%)					
0	601 (30.1)	197 (23.1)	404 (35.3)	0.001	0.0814 - 0.1626
1 - 4	1 097 (54.9)	546 (63.9)	551 (48.0)	0.001	0.1049 - 0.1931
≥5	302 (15.1)	111 (13.0)	191 (16.7)	0.03	0.0015 - 0.0645
Gestational age (weeks, 1st visit)					
Mean (SD)	24 (2.24)	21.7 (7.1)	26.4 (5.3)	0.01	0.0089 - 0.0851
Range	16 - 32	16 - 32	28 - 30		
HIV status, *n* (%)					
Positive	943 (42.2)	609 (71.3)	334 (29.1)	0.001	0.4267 - 0.5622
Negative	1 057 (52.8)	245 (28.7)	812 (70.9)	0.001	0.4431 - 0.6231

Discussion

The prevalence of anaemia in pregnancy at the first antenatal visit in our study cohort of 2 000 pregnant women was 42.7%, a result that is consistent with prevalence rates of 40.0% in Kenya,[8] 38.2% in Ethiopia[9] and 47.4% in Tanzania.[10] Our sample size was large and confirms that anaemia is a common health problem in an SA setting. There are several factors responsible for the high prevalence of anaemia in LMICs such as SA: socioeconomic deprivation, malnutrition, high incidences of malaria and HIV infection, hookworm infestation, high numbers of grand multiparas, late booking, and inadequate child spacing because of lack of family planning.

Recently there have been reports of differences in Hb levels based on racial groups. One of these studies found that mean Hb levels were lower in non-Caucasian than Caucasian pregnant populations from 27 gestational weeks until term.[11] Furthermore, lower Hb levels have been described for population groups such as African Americans (−1 g/dL), Vietnamese (−1 g/dL) and women in Greenland (−1 g/dL).[12] Our patients were black South Africans of low socioeconomic status.

Variations in Hb concentrations obviously require the establishment of reference levels

Table 2. Demographic and obstetric data of women with anaemia v. HIV status

Variable	Total (*N*=854)	HIV +ve (*N*=609)	HIV –ve (*N*=245)	*p*-value	95% CI
Age (years), mean (range)	27.6 (14 - 45)	26.5 (14 -40)	27.4 (18 - 45)	0.3	−0.0566 - 0.0746
Parity, median (range)	2 (1 - 6)	1 (1 - 2)	2 (1 - 6)	0.2	−0.0067 - 0.0267
Gestation at booking (weeks), median (range)	22 (17 - 34)	22 (18 - 34)	22 (18 - 34)	1	−0.0614 - 0.0614

Table 3. Clinical data and severity of anaemia

Variables	Total (*N*=854)	Mild anaemia (Hb 10 - 10.9 g/dL) (*N*=695)	Moderate anaemia (Hb 7 - 9.9 g/dL) (*N*=154)	Severe anaemia (Hb <7 g/dL) (*N*=5)	*p*-value	95% CI
Age groups, *n* (%)						
≤19	124 (14.5)	90 (12.9)	34 (22.1)	0 (0.0)	0.003	0.0304 - 0.1536
20 - 24	133 (15.6)	107 (15.4)	26 (16.9)	0 (0.0)	0.6	−0.0485 - 0.0785
25 - 30	295 (34.5)	259 (37.3)	36 (23.4)	0 (0.0)	0.001	0.0559 - 0.221
31 - 34	191 (22.4)	153 (22.0)	37 (24.0)	1 (20.0)	0.5	−0.0527 - 0.0927
≥35	111 (13.0)	86 (12.4)	21 (13.6)	4 (80.0)	0.6	−0.046 - 0.07
Parity, *n* (%)						
0	197 (23.1)	153 (22.0)	44 (28.6)	0 (0.0)	0.07	−0.0077 - 0.1397
1 - 4	546 (63.9)	496 (71.4)	49 (31.8)	1 (20.0)	0.001	0.3123 - 0.4797
≥5	111 (13.0)	46 (6.6)	61 (39.6)	4 (80.0)	0.001	0.2721 - 0.3879
HIV status, *n* (%)						
Negative	245 (28.7)	189 (27.2)	54 (35.1)	2 (40)	0.5	-0.0519 - 0.0431
Positive	609 (71.3)	506 (72.8)	100 (64.9)	3 (60)	0.6	-0.0451 - 0.0532

for pregnant populations in SA. This may be logistically difficult, however, given the diversity of the population and the geographical nature of SA, with a sizeable population living at high altitudes. It has been reported that factors such as altitude of residence, genetics and nutrition have an impact on Hb levels.[8-10] While smoking behaviour also influences Hb concentrations, our study population is known to have low smoking rates (3.0% – unpublished departmental statistics).

In our study, the mean gestational age was 21 weeks. It is known that fluctuations in Hb levels occur by trimester as a result of maternal and fetal physiological demands. It is therefore suggested that a 1.0 g/dL decrease takes place between the first and third trimester of pregnancy, with Hb concentrations decreasing by a further 0.5 g/dL in the second trimester.[13] Although we defined anaemia according to WHO recommendations for practical reasons in our setting, we did not take into account trimester-adjusted Hb cut-off levels. As shown in Table 3, 34.7% had Hb levels of between 10 g/dL and 10.9 g/dL, while 8.0% had an Hb level <10 g/dL.

Hb concentrations have also been reported to be affected by age. Jamaican girls between the ages of 13 and 14 years have low Hb levels (−1.0 g/dL from normal).[13] In our study, 124 women who were aged <19 years had mild or moderate anaemia. Age-related anaemia in pregnancy in our setting needs further investigation.

HIV infection has been reported to be associated with anaemia, either independently or due to antiretroviral medications such as zidovudine. A recent report by Nandlal *et al.*[14] states that anaemia is a common finding in HIV-infected pregnant women. In our study, a high prevalence of anaemia (71.3%) was observed in HIV-infected patients, 2.5 times higher than in those who were uninfected (Table 3). We did not investigate the prevalence of anaemia in the HIV-infected women.

Anaemia is reported to be strongly associated with maternal mortality,[2,5] with severe anaemia also increasing the risk of perinatal mortality.[4] This association obviously needs more detailed investigation because anaemia in LMICs is underpinned by malaria, parasitic infections such as bilharzia, and poor nutrition.

Our study demonstrates that the common morphology of anaemia among pregnant women was normochromic normocytic (in 68.9%), 1.4% having hypochromic microcytic anaemia. Although we did not do iron studies to establish iron status, it has been reported that only 50% of cases of anaemia in pregnant women are responsive to oral iron.[14] There is a view that a universal approach of prophylactic iron therapy may neglect untreated diseases and universal therapeutic iron therapy may be inappropriate.[15]

It should be noted that our study was conducted in a regional hospital and that the majority of pregnant women were urban residents. The prevalence of anaemia in the population as a whole could well have been underestimated. A large community-based study needs to be done to determine the prevalence of anaemia in the general population.

Conclusion

The prevalence of anaemia at the first antenatal visit is high and a major health issue at the study site in Durban. There is a need to strengthen our healthcare system to ensure a definitive diagnosis so that appropriate counselling and treatment can be provided in early pregnancy.

References

1. World Health Organization. Micronutrient deficiencies: Iron deficiency anaemia. 2008. http://www.who.int/nutrition/topics/ida/en/ (accessed 15 November 2015).
2. Balarajan Y, Ramakrishnan U, Özaltin E, Shankar AH, Subramanian SV. Anaemia in low-income and middle-income countries. Lancet 2011;378(9809):2123-2213. [http://dx.doi.org/10.1016/S0140-6736(10)62304-5]
3. De Benoist B, McLean E, Egli I, Cogwell M, eds. Worldwide Prevalence of Anaemia 1993-2005. WHO Global Database on Anaemia. Geneva: World Health Organization, 2008.
4. Bodeau-Livinec F, Briand V, Berger J, et al. Maternal anemia in Benin: Prevalence, risk factors, and association with low birth weight. Am J Trop Med Hyg 2011;85(3):414-420. [http://dx.doi.org/10.4269/ajtmh.2011.10-0599]
5. National Committee for Confidential Enquiries into Maternal Deaths. Saving Mothers 2010-2013: Fourth Report of Confidential Enquiries into Maternal Deaths in South Africa. Pretoria: Department of Health, 2013.
6. Ouédraogo S, Koura GK, Accrombessi K, Bodeau-Livinec F, Massougbodji A, Cot M. Maternal anemia at first antenatal visit: Prevalence and risk factors in a malaria-endemic area in Benin. Am J Trop Med Hyg 2012;87(3):418-424. [http://dx.doi.org/10.4269/ajtmh.2012.11-0706]
7. Van Bogaert LJ. Anaemia and pregnancy outcomes in a South African rural population. J Obstet Gynecol 2006;25(7):617-619. [http://dx.doi.org/10.1080/01443610600902901]
8. Siteti MC, Namasaka SD, Ariya OP, Injete SD, Wanyonyi WA. Anaemia in pregnancy: Prevalence and possible risk factors in Kakamega County, Kenya. Sci J Pub Hlth 2014;2(3):216-222.
9. Melku M, Addis Z, Meseret A, et al. Prevalence and predictors of maternal anemia during pregnancy in Gondar, Northwest Ethiopia: An institutional based cross-sectional study. Anemia 2014 (2014), Article ID 108593. [http://dx.doi.org/10.1155/2014/108593]
10. Msuya SE, Hussein TH, Uriyo J, et al. Anaemia among pregnant women in northern Tanzania: Prevalence, risk factors and effect on perinatal outcomes. Tanzan J Health Res 2011;13(1):33-39. [http://dx.doi.org/10.4314/thrb.v13i1.60881]
11. Harm SK, Yaser MH, Walters JH. Changes in haematological indices in Caucasian and non-Caucasian pregnant women in the United States. Kor J Hematol 2012;47(2):136-141. [http://dx.doi.org/10.5045/kjh.2012.47.2.136]
12. Lynch S. Indicators of the iron status of populations: Red blood cell status parameters. In: Assessing Iron Status of Population: Report of Joint WHO/CDC Technical Consultation on the Assessment of Iron Status at a Population Level. WHO/Centers for Disease Control and Prevention. Geneva: WHO, 2004.
13. Nestle P. Adjusting Haemoglobin Values in Program Surveys. Washington, DC: INACG, 2002.
14. Nandlal V, Moodley D, Grobler A, et al. Anaemia in pregnancy is associated with advanced HIV disease. PLoS One 2015;9(9):e106103. [http://dx.doi.org/10.1371/journal.pone.0106103]
15. Steven GA, Finucane MM, De-Regi LM, et al. Global, regional and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant women for 1995-2011: A systematic analysis of population-representative data. Lancet Global Health 2013;1(1):e16-e25. [http://dx.doi.org/10.1016/S2214-109X(13)70001-9]

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