# An investigation into the incidence and nature of Anaemia in pregnant African women

BY

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## Introduction

Anaemia is known to be prevalent among African women of the childbearing age groups in South and Central Africa, and it has been suggested by Davidson (1964) that iron deficiency is the commonest cause. The most likely causes of iron deficiency are dietary deficiency, and excessive loss due to childbearing and menstruation. Howard (1966), found that only 2,1 per cent. of 98 African schoolgirls aged 12½-17½ years had haemoglobin values less than 11 grams per 100 ml., with a mean value of 12,9. He found that parasitic infestations did not appear to be a major contributory cause of anaemia in his series. He remarked that these figures were in close agreement with those found by Beet (1949) in European school children. Donald (1964) states that in one series of women attending a Glasgow antenatal clinic, less than 50 per cent. of patients had a haemoglobin value greater than 10G per cent., at their first visit. Accordingly an investigation into the incidence and nature of anaemias in African women attending Harare Hospital seemed relevant, especially as most patients come from the lower socio-economic groups.

## Methods

175 pregnant women attending professorial antenatal clinics for the first time during their current pregnancy were investigated. Their ages ranged from 16-45 years, their parities from 0-11, and the period of gestation from 16-38 weeks. They were questioned about all previous pregnancies, menstrual history and past medical and surgical history with special reference to any excess blood loss, blood transfusions, operations and abnormal pregnancy states such as abortion and ectopic pregnancy.

Using plastic disposable syringes, 12 ml of blood was withdrawn from each patient, 2 ml of which was placed in a plastic tube containing sequestrene as anticoagulant, for haemoglobin, haematocrit and blood film examinations, and 10 ml of which was placed in a plastic test tube containing no anticoagulant. Plastic syringes and tubes were used since it has been shown that they are virtually iron-free.

The haemoglobin was estimated by a photometric cyanmethaemoglobin technique, and the packed cell volume (PCV) determined using a microhaematocrit centrifuge. By dividing the haemoglobin value in grams per cent. by the PCV, the mean corpuscular haemoglobin concentration per cent. was calculated (MCHC).

A thin blood film was made and stained with Leishman's stain. The red and white blood cell series were examined for any abnormality, with special reference to the changes of iron deficiency, hypochromic anaemia and macrocytic anaemia.

The serum iron was determined using a tripyridyl photometric technique. The serum iron of 10 male medical students was determined and the values obtained ranged from 90 to 150 $\mu$g per 100 ml., that is, within normal limits (50-150 $\mu$g.)

Haemoglobin value and serum iron value histograms were constructed. All patients were then divided into parity groups, and mean values for the haemoglobin, MCHC, and serum iron were calculated. The patients were then classified into 6 groups according to their haemoglobin, MCHC, and serum iron values, and blood film appearances.

*Group I* Patients with haemoglobin values over 10 G. per 100 ml., MCHC over 28 G.% serum iron values over 50 $\mu$g per 100 ml., and a normal blood film.

*Group II* Patients with haemoglobin values over 10 G., normal MCHC., and blood film, but with serum iron less than 50 $\mu$g/100 ml.

*Group III* Patients with haemoglobin under 10 G./100 ml., MCHC less than 28 G%, evidence of hypochromic anaemia on the blood film, and a low serum iron (less than 50 $\mu$g%.)

*Group IV* Patients with haemoglobin under 10 g%, MCHC less than 28 G.%, evidence of hypochromic anaemia on the film, but with a serum iron above 50 $\mu$g/100 ml.

*Group V* Patients with haemoglobin under 10 g., normal MCHC, evidence of both hypochromic and macrocytic anaemia on the film and a low or low-normal serum iron, (all cases below 60 $\mu$g%).

*Group VI* Patients with a low haemoglobin, normal MCHC, evidence of macrocytic anaemia on the film, and a normal to high serum iron, (all cases had a value above 80 $\mu$g%).

## RESULTS

(a) *Haemoglobin distribution*:

| | Frequency (0 10 20 30 40 50 60) | Percent of total. |
|---|---|---|
| Less than 10 G % | 20 | 11,4 |
| 10-10,9 G % | 27 | 16,0 |
| 11-11,9 G % | 49 | 28,1 |
| 12-12,9 G % | 56 | 31,4 |
| 13-13,9 G % | 20 | 11,4 |
| 14-14,9 G % | 3 | 1,7 |

Mean haemoglobin = 11,6 G %
11,4 % have values below
10 G %

(b) Serum iron distribution:

| Serum Iron in μg % | Frequency (0 10 20 30 40) | Percent of total |
|---|---|---|
| Less than 30 | 8 | 4,8 |
| 30-49 | 27 | 16,1 |
| 50-69 | 33 | 19,6 |
| 70-89 | 40 | 23,8 |
| 90-109 | 27 | 16,1 |
| 110-129 | 25 | 14,8 |
| 130-149 | 4 | 2,4 |
| 150+ | 4 | 2,4 |

Mean serum iron=81 μg %
20,9% have values below 50 μg%

(c) Average values by parity:—

| Parity | Haemoglobin | MCHC | Serum Iron (μg%) | No. in sample |
|---|---|---|---|---|
| 0 | 11,7 | 30,0 | 84 | 44 |
| 1 | 11,7 | 30,0 | 80 | 27 |
| 2 | 11,9 | 30,7 | 71 | 20 |
| 3 | 11,8 | 30,4 | 77 | 17 |
| 4 | 11,5 | 30,1 | 86 | 16 |
| 5 | 11,6 | 30,0 | 73 | 16 |
| 6 | 11,3 | 30,0 | 76 | 19 |
| 7 | 11,3 | 30,5 | 86 | 11 |
| 8 | 10,3 | 30,3 | 70 | 3 |
| 9 | 12,2 | 32,1 | 53 | 1 |
| 11 | 10,3 | 27,8 | 112 | 1 |
| Total | 11,6 | 30,2 | 81 | 175 |

(d) Classification by groups:

| | | No. in group | per cent. of total |
|---|---|---|---|
| Group I | (Normal values) | 129 | 73,2 |
| Group II | (Normal but iron low) | 26 | 15,5 |
| Group III | (Hypochromic, iron low) | 5 | 3,0 |
| Group IV | (Hypochromic, iron normal) | 6 | 3,3 |
| Group V | (Mixed anaemia, iron low) | 6 | 3,3 |
| Group VI | (Macrocytic, iron normal) | 3 | 1,7 |

## DISCUSSION

The haemoglobin histogram shows that 20 patients (11,4 per cent.) had a haemoglobin value less than 10 grams per 100 ml. This compares favourably with Scott's findings in Glasgow, and is no worse than values found in other studies of pregnant women in Britain. The value of 10 G% was chosen to make an adequate allowance for physiological haemodilution in pregnancy, and this value seems to be fairly widely accepted in obstetrics. Of the 20 anaemic patients 11 had hypochromic anaemia, 6 had mixed hypochromic and macrocytic, and 3 had pure macrocytic anaemia. Thus 17 (9,7 per cent.) had evidence of hypochromic anaemia and 9 (5,1 per cent.) some evidence of possible folic acid deficiency.

The serum iron histogram shows that 35 (20,9 per cent.) patients, or approximately one in every five, had a serum iron below 50 μg%. The limits of normal in European patients are taken as 50 and 150 μg% (100 μg% ± 2 standard deviations). It is interesting to note that only 9 out of 35 patients with low serum iron values had significantly low haemoglobin values, although the average was lower than for the whole sample (10,9 G% — not statistically significant). 5 out of 8 patients with a serum iron of less than 30 μg%, however, had a haemoglobin less than 10 G, with an average of 9,3 G (statistically significantly lower than the mean for all patients, 11,6 G%). Where serum iron values fell below 20 μg% all patients had a low haemoglobin value as well (average 7,8 G%). Thus while there is a general correlation between low serum iron and low haemoglobin values, it does not automatically follow that a patient with a low serum iron will be anaemic, or that a patient who is not anaemic has an adequate serum iron. This finding is consistent with the view that haemoglobin levels are maintained in preference to other iron stores in iron deficiency.

In the histories taken there was a remarkable lack of positive findings such as menorrhagia, abortions or ectopic pregnancy among those women found to be anaemic. Among those who had had such complications, the incidence of anaemia was no greater than that for the group as a whole. The abortion rate for all pregnancies in the women of the samples was 3,3 per cent., surprisingly lower than the expected 10-20 per cent. This may reflect a decreased tendency for those who abort to become pregnant again, or merely an increased interest in maintaining pregnancies in those women who attended this antenatal clinic.

In view of the high incidence of iron deficiency found in pregnant African women in this series, prophylactic iron therapy for every woman attending antenatal clinics would seem justified, regardless of the haemoglobin level found. Only four out of the series had a serum iron greater than 150 μg%, so that the chances of iron overload do not seem to be very high. Since about 1 in 20 patients had either a mixed deficiency or a macrocytic anaemia, prophylactic folic acid

would appear to be indicated in those who are anaemic, especially as pernicious anaemia is very rare in African women of child bearing age. Serum folate determinations in a similar series would be most helpful in evaluating the true incidence of folic acid deficiency.

Contrary to what might have been expected, mean values for the haemoglobin, MCHC, and serum iron did not differ significantly on statistical analysis of the parity groups. Perhaps this is due to an average interval between pregnancies of 18 months to two years in the African multiparae in this series, or to a high dietary iron intake.

## Summary

(1) An account of an investigation into haemoglobin, MCHC and serum iron values in 175 African women attending Harare Hospital Antenatal Clinic for the first time in the current pregnancy is given.

(2) The mean haemoglobin for the group was 11,6 G%. 11,4% of the patients had values less 10 G%. 6,3 per cent. had evidence of hypochromic anaemia, 1,7 per cent macrocytic anaemia, and 3,3 per cent. had a mixed anaemia. The mean MCHC was 30,2 per cent.

(3) The mean serum iron was 81 $\mu$g per 100 ml. 20,9 per cent had levels below 50 $\mu$g %.

(4) There was no significant difference in haemoglobin, MCHC and serum iron values between groups of women of differing parity.

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## References

Davidson, L. A. G. (1964). *C. Afr. J. Med.* **10**, 96. March, 1964.

Howard, J. K. (1966). *C. Afr. J. Med.* **12**, 231. December, 1966.

Donald, I. (1964). *Practical Obstetric problems.* Lloyd-Luke.