The Incidence of Iron Deficiency in Pregnant White Women in Johannesburg*

P. JACOBS, SHIRLEY LICHTIGFELD AND T. H. BOTHWELL, MRC Iron and Red Cell Metabolism Unit, Department of Medicine, University of the Witwatersrand AND SELMA KRAWITZ, Department of Haematology, School of Pathology of the University of the Witwatersrand and South African Institute for Medical Research, Johannesburg

SUMMARY

Blood tests were carried out on 313 White women who had not had any previous therapy and who were attending an antenatal clinic in Johannesburg for the first time. The stage of pregnancy varied from late in the first trimester to near term. There was a steady but modest fall in the mean haemoglobin level with advancing pregnancy. There was a concomitant drop in the mean serum iron concentration and a rise in mean total iron-binding capacity. Only 14 subjects had haemoglobin levels below 11 g/100 ml; 5 were in the second trimester and 9 in the third. In 11 it was due to iron deficiency and in 3 to thalassaemia minor.


It has long been recognized that there is a reduction in the level of haemoglobin and packed cell volume during normal pregnancy. In the majority of patients haemodilution is the major reason for these changes; the plasma volume expands relatively rapidly during the first trimester and may be 40% above normal in the second half of pregnancy. There is also an acceleration in the rate of erythropoiesis associated with an increased level of plasma erythropoietin, with the result that the mean red cell mass is increased by about 18% at term. Superimposed on these physiological events, there may be a reduction of haemoglobin synthesis due to restriction of essential nutrients, especially iron and folate. In Western countries iron deficiency is the most common cause of anaemia in pregnancy. The reason is simple; daily iron requirements during the latter part of pregnancy are greater than can be supplied by the diet. As a consequence, iron must be withdrawn from the body’s stores to supply the needs of the foetus and an expanding red cell mass. However, such stores are often depleted or even absent in young women, so that anaemia is a common occurrence during pregnancy. It is for this reason that iron tablets are given prophylactically to pregnant women in many centres.

Laboratory confirmation of iron deficiency is obtained by the demonstration of hypochromic and microcytic red cells, an elevation in the free erythrocyte protoporphyrin and a fall in the serum iron concentration with elevation of the unsaturated iron-binding capacity. It should be appreciated that the synthesis of transferrin is accelerated during pregnancy, so that an elevation in total iron-binding capacity alone cannot be taken as evidence of diminished body iron stores. The diagnosis of iron deficiency can be confirmed by the demonstration of absent iron stores in suitably stained preparations of bone marrow. At the same time it must be appreciated that the mobilization of storage iron is a physiological phenomenon during pregnancy, with the result that marrow stores are scanty or absent in most women by the end of pregnancy.

MATERIAL AND METHODS

The study was performed during a single 4-week period on 413 consecutive new admissions, irrespective of the period of gestation, to the antenatal clinic of the Queen Victoria Maternity Hospital. This hospital serves the White community in Johannesburg. At presentation a full medical and obstetric examination was performed and venous blood was collected, without venous occlusion, between 0900 and 1000 hours. Further blood samples were obtained on subsequent visits from those individuals found to be anaemic. Haemoglobin was determined by the oxyhaemoglobin method and packed cell volume using a microhaematocrit technique; stained blood films were also examined. Serum iron levels were measured by the method of Bothwell and Finch and unsaturated iron-binding capacities by the method of Herbert and co-workers. Where indicated sternal marrow was aspirated to evaluate storage iron.

Iron deficiency anaemia was arbitrarily defined as a haemoglobin level below 11 g/100 ml, together with a reduction in the serum iron level, an elevation in the unsaturated iron-binding capacity and absent storage iron in the bone marrow.

RESULTS

Of the 413 patients in the study, 100 (24.2%) were excluded from the analysis because important information was missing. The expected date of delivery was not recorded in 35, the blood count in 19, and the serum iron in 46. The distribution of these patients throughout the group was examined and appeared to be random, so that their exclusion is considered unlikely to have biased the results. The remaining 313 subjects were
divided into groups, according to the duration of pregnancy at the time of the first visit to the clinic.

The mean haemoglobin concentration in those patients seen at 12 weeks or earlier was 14.5 g/100 ml and this fell slowly to a mean of 12.5 g/100 ml by the 32nd week (Fig. 1). The mean value in the 14 subjects who were seen at 34 weeks or later was 13.1 g/100 ml. Of the 37 patients in the first trimester, only 3 had haemoglobin levels between 11 g and 13 g/100 ml and in none was it below 11 g/100 ml. The haemoglobin concentration was between 11 g and 13 g/100 ml in 41 of the 207 patients in the second trimester; in a further 5 it was below 11 g/100 ml. The remaining 69 patients were in the third trimester. Twenty-four had haemoglobin levels between 11 g and 13 g/100 ml and 9 subjects had values below 11 g/100 ml.

There were thus 14 patients in the second and third trimesters with haemoglobin concentrations below 11 g/100 ml. The blood smears in 3 of them showed anisopoikilocytosis, punctate basophilia, hypocromia and target cell formation; the serum iron levels were normal and marrow iron stores were adequate. The diagnosis of thalassaemia minor was confirmed by the finding of increased levels of Hb A₂ on cellulose acetate electrophoresis. The remaining 11 subjects fulfilled all the criteria for a diagnosis of iron deficiency anaemia. One of them was admitted during the 37th week of pregnancy with a haemoglobin of 9 g/100 ml, and was given a blood transfusion before an emergency Caesarean section. A second patient did not respond to treatment and was found not to be taking her iron tablets. In the remaining 9 patients there was a satisfactory rise in haemoglobin levels on oral iron therapy and a figure of 12 g/100 ml or more was achieved in all of them before parturition.

The mean serum iron level was approximately 150 µg/100 ml in the first trimester and 100 µg/100 ml in the third trimester (Fig. 2); the corresponding mean figures for total iron-binding capacities were 350 µg/100 ml and 470 µg/100 ml respectively (Fig. 3). The mean percentage saturation of circulating transferrin thus fell from 43% to 21%. In only 19 was it below 15%, which is the level at which lack of available iron becomes a serious limiting factor in erythropoiesis.²⁴

The incidence of significant iron deficiency found in this study was low, in spite of the fact that the majority of White subjects attending the hospital are drawn from the lower socio-economic groups. Haemoglobin values were above 11 g/100 ml in all except 14 subjects. Eleven of them were iron-deficient and the remaining 3 were suffering from thalassaemia minor. In addition, it should be stressed that no one in the series exhibited severe anaemia. Iron nutrition in the group studied was thus considerably better than has been reported in a number of other countries.¹⁹ The reasons for these differences are not clear. No detailed dietary inquiries
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1 900 metres. The most complete are those of Metz and

were carried out, but the findings suggest that the meat

intake of the group must have been relatively high.

This contention is based on the finding that meat is

not only a major source of available iron in the diet,

but also on the fact that its presence potentiates the

absorption of iron in vegetable foodstuffs. 16

The question arises as to whether a group such as the

one presently studied requires any form of prophylactic

treatment during pregnancy. The results of a previous

investigation conducted in White subjects living in

Johannesburg showed that supplementation with folic

acid and vitamin B12 did not significantly increase

the mean haemoglobin and haematocrit values. 3 The present

findings suggest that iron nutrition is also adequate in

the more vulnerable women, but also ensures that

all women enter the puerperium in a state of iron

nutrition at least as good as at the start of pregnancy.

One practical point warrants stressing. If iron is given

prophylactically the amounts required are not large;

Scott et al. 17 have shown that a daily dose of 30 mg

ferrous iron given during the latter half of pregnancy

is sufficient to meet physiological needs.

There was one interesting sidelight to the study. The

discovery of 3 subjects with the thalassaemia trait under­

lines the fact that people of Mediterranean extraction

now make up a significant segment of the Johannesburg

population. The recognition of such subjects is important,

since iron supplementation is not usually required.

Evidence of thalassaemia can often be found on the

blood film, with punctate basophilia, hypochromia and

target cell formation being of particular importance.

The combination of these morphological features in the

presence of a normal or even raised serum iron level

is an important diagnostic pointer to the condition.

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Squamous Carcinoma of the Endometrium

REPORT OF A CASE ASSOCIATED WITH SQUAMOUS METAPLASIA OF THE ENDOMETRIUM AND A CALCIFIED SUBMUCOUS LEIOMYOMA

J. J. VAN DER WALT, M.MED. (PATH.), P. B. MARCUS, M.B. CH.B., J. J. DE WET, F.R.C.O.G., RICHENDA FRY, M.B. CH.B., AND ANNE LINDER, M.B. CH.B., Department of Anatomical Pathology, Tygerberg Hospital and University of Stellenbosch, Tievlei, CP

SUMMARY

A case of primary squamous carcinoma of the corpus uteri in an 81-year-old woman is presented as the eleventh documented case of this condition. The tumour appeared to have arisen in a zone of squamous metaplasia forming part of the bed of a calcified submucous leiomyoma. The rigid criteria for the diagnosis of this tumour are noted.


Squamous carcinoma of the endometrium is a rare malignancy and before it can be diagnosed, certain rigid criteria have to be met. These were originally formulated by Fluhmann and are as follows:
1. There must be no evidence of past or present squamous carcinoma of the uterine cervix.
2. There must be no coexisting endometrial adenocarcinoma.
3. There must be no continuity between the endometrial cancer and the squamous epithelium of the cervix.

Fluhmann accepted only 5 cases as fitting his criteria. Two further cases were described by Wahi and Jain and by Chu et al. Peris et al. published another case and reviewed the literature. The diagnostic criteria formulated by the latter authors excluded Fluhmann's criterion that there must be no coexisting endometrial adenocarcinoma and as a result their list of 25 cases published up to 1958 includes tumours which contained both squamous and columnar malignant elements. Subsequent to this, 2 further cases were reported by Mazzella and Barnett. Barnett, using Fluhmann's original criteria, accepted only 10 cases of this entity as adequately documented. The case we report in this article fulfils all Fluhmann's original criteria.

CASE REPORT

A White multiparous widow, aged 81 years, presented with a single episode of vaginal bleeding of 2 weeks' duration. The menopause had occurred when she was 48 and there was nothing noteworthy in either her past or family history. Her general condition was remarkably good in view of her age. Vaginal examination, however, showed active bleeding from the uterine cavity and an atrophic vagina. The cervix was healthy, the uterus small and mobile and the adnexae normal on palpation.

Cytological smears taken from the ectocervix showed a background of haemolysed blood, mucus and proteinaceous debris. Numerous pleomorphic, keratinized squamous cells with hyperchromatic nuclei, showing a coarse, irregular chromatin distribution, were seen lying loosely as well as in sheets, and sheets of squamous cells lacking nuclei were also seen. The cytological diagnosis was that of a severe keratinized dysplasia, with overlying hyperkeratosis and a severe chronic inflammatory reaction. Malignancy, it was felt, could not be excluded.

At this stage the patient was examined under anaesthesia and a fractional dilatation and curettage was performed. Cytological smears were again taken from the...