UNDIAGNOSED IRON DEFICIENCY IN WOMEN OF REPRODUCTIVE AGE

A Review of the Literature and the Results of a Pilot Screening Survey

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SUMMARY: Iron deficiency in women of reproductive age is reviewed. The results of a pilot screening study are presented and it is concluded that a more extensive study would be unrewarding.

Introduction

Much has been written in recent years on the subject of pre-symptomatic diagnosis, its place in the spectrum of medical care, its value and the problems it has raised. The wave of initial enthusiasm has now given place to a more critical approach which poses basic questions of technique, definition and value.

It is generally agreed that the iceberg concept of disease is correct, and all workers in the field follow the concepts of Acheson and his co-workers (1963) on the desirable characteristics of any tests to be used and the diseases amenable to this type of investigation. The disorders must have wide prevalence, be of medical importance and there must be effective treatment. The tests must be sensitive, specific and of general acceptability.

Iron deficiency anaemia and its investigation appears to fulfil all these criteria except perhaps that of medical importance and in some surveys wide prevalence (*vide infra*). Since 1930 numerous studies have been conducted to ascertain the prevalence of iron deficiency anaemia in women of reproductive age. None are directly comparable to our study, but they do give the background against which it is set.

Prevalence studies

Between 1930 and 1943 Davidson and his co-workers carried out surveys in North East Scotland. Their subjects were from the poorest sections of the community and their criteria of anaemia were levels of haemoglobin of less than 85 per cent Haldane; 16 per cent of adolescent girls and 45 per cent of adult women, were found to be anaemic. The Medical Research Council (1945) carried out studies throughout the community and found an incidence only slightly lower than described by Davidson and his colleagues.

Kilpatrick (1961) in a survey in Wensleydale, took a haemoglobin of 81 per cent as the lower limit of the normal range and found that the incidence of anaemia in a group of 151 women, 15-54 years of age, was 22.5 per cent. Using Kilpatrick's criteria, the Medical Research Council Unit in Cardiff in 1966 reported an 11.6 per cent incidence of anemia in 1,245 women (World Medicine, 1968). Elwood et al (1967) in the Rhondda Fawr area of South Wales, found in two groups of women, both with an age range of 20-64 years, an incidence of 3.4 per cent of 920 and 7.2 per cent of 180 tested.

Screening surveys

Many local authorities have in the last four years, organised screening clinics of

varying type and scale. The figures which they have produced apply only to a very selected group of women sufficiently health-conscious to attend for the test, one of a battery to be carried out.

Donaldson and Howell (1965) working in Rotherham, examined 2,743 men and women; 178 had haemoglobin levels below 85 per cent, 159 of them women. The incidence among women alone was not stated. Burn (1967) in Salford found an incidence of haemoglobin below 90 per cent in 37.4 per cent of 1174 women of age 15-49 years. His findings are detailed in Table I.

Table I
Haemoglobin levels in women of reproductive age, Salford 1967

Haemoglobin (Haldane) Per cent	Age in years				Totals	
	15-19	20-29	30-39	40-49	Numbers	Per cent
90 and over	65	197	204	270	736	62.6
75 to 89	46	120	98	114	378	32.2
60 to 74	4	14	19	19	56	4.8
Under 60	—	1	—	3	4	0.4
Totals	115	332	321	406	1174	100.0

Both the above groups of figures are concerned with iron deficiency anaemia. However, in the early stages of iron deficiency a normal haemoglobin may co-exist with much reduced marrow haemosiderin and low serum iron and saturation of iron binding capacity. Beutler, Larch and Gurney (1960) studied a group of 44 women complaining of chronic fatigue. All had haemoglobin levels over 81 per cent but showed evidence of iron deficiency by the above criteria. In a double-blind trial, patients given oral iron improved much more than those given a placebo and some showed a rise in haemoglobin levels. Fielding, O'Shaughnessy and Brunstrom (1965) using a differential ferrioxamine test to assess iron stores found 33 per cent of a group of apparently healthy women, with normal haemoglobin levels, had no significant iron stores. He emphasised that if these women had any increased demand for iron, as in pregnancy, they would develop iron deficiency anaemia very quickly. An earlier report by Allaire and Campagna (1961) had shown that this does occur. Elwood et al (1967) failed to substantiate this work.

It is also of interest that Elwood and Wood (1966) and Elwood et al (1967) failed, in representative samples, to find a significant association between haemoglobin levels and the classical symptoms of anaemia. More importantly, from a screening point of view, they failed to find any significant association between a rise in haemoglobin levels, with iron therapy, and any change in symptoms. Cochrane (1967) who directed the above researches has understandably become sceptical as to the value of screening in iron deficiency anaemia. His arguments have been further reinforced by the lack of serious underlying conditions discovered by these surveys.

Aetiology

The three factors probably responsible for a high incidence of iron deficiency anaemia are dietary intake, menstrual loss and repeated pregnancy.

A woman of reproductive age has a body iron of 4 to 5 grammes and her average

daily loss is 1.0 to 2.5 milligrammes (Israels, 1963). The National Food Survey Committee (1963) showed that the mean daily intake of iron varied in different types of household from 11 to 18 milligrammes per day, giving a daily absorption of 0.6 to 1.5 milligrammes. The national average consumption of 14.2 milligrammes per day varied little from region to region, but the dietary intake fell progressively with the number of children in the household. In families of 4 or more children, the average daily intake was 11.2 milligrammes. Other factors of importance are the great differences in the availability of iron from different foodstuffs (Moore, 1964), the decreased absorption when meals of large bulk are taken and great individual variations of absorption.

Clinical questioning concerning menstrual loss is also well recognised as being of limited value. The Consumer Association in 1964 showed that the power of different brands of sanitary towels to absorb blood varied from 1.4 milligrammes to 71 milligrammes. Studies of normal women have given figures for average loss per period as:—50, 25, 35 milligrammes respectively (Barer and Fowler, 1936; Baldwin, Whalley and Pritchard, 1961; Jacobs, Kilpatrick and Withey, 1965).

The net loss of iron due to pregnancy varies from nil up to 965 milligrammes; the loss of the larger amounts reduces body stores. If pregnancies follow in quick succession there is no time for these stores to be replenished, and the loss becomes cumulative (Jacobs, Kilpatrick and Withey, 1965).

Pilot screening test for iron deficiency

A proportion of the patients in a general practice was screened for iron deficiency anaemia and, over the same period, a group of pregnant women from the same practice was investigated in order to discover if deficiency in iron stores was revealed by the extra demands of pregnancy.

The practice survey

The practice contained 1,650 women between the ages of 15-50 years, 167 of whom were tested (approximately 10 per cent). Most of this population were dependants of The Durham Light Infantry, The Prince of Wales's Own Regiment of Yorkshire and The Green Howards, predominantly of social class III and IV (Registrar General's classification) from northern urban backgrounds.

Method

Women seen in the surgery from January to March 1968, inclusive, were asked to participate in the survey providing they were not pregnant, not less than six months post partum, and not presenting with clinical syndromes which might be associated with anaemia.

The majority of the test group were mothers accompanying their children, the second largest single group were seeking prescriptions for oral contraceptives and the remainder represented a wide range of ill health. Only two of 169 women, asked to co-operate, refused.

A simple gravimetric method, using a copper sulphate solution of a specific gravity such that a drop of blood, which failed to sink, represented a haemoglobin below 85 per cent Haldane, was the screening method used (Ministry of Labour, 1964). Four of the five cases detected by this method were confirmed by a Haldane estimation on venous

blood and shown to have a hypochromic anaemia; the fifth refused venepuncture. None of the patients gave a history of abnormal blood loss. Each was treated with ferrous sulphate tablets 200 milligrammes four times daily for one month and the haemoglobin rechecked at the end of this time (Fry, 1961).

Results

The representative character of the group tested is illustrated in Table II, the incidence of anaemia is shown in Table III and the results of one month's treatment with iron in Table IV.

Table II
Age structure of practice and test group

Age group years	Practice (1650 Women)	Test Group (167 Women)
	Per cent in age group	Per cent in age group
15-19	3	9
20-24	35	34
25-29	22	26
30-34	17	12
35-39	12	11
40-44	7	3
45-49	2	4
50	2	1

Table III
Incidence of anaemia

Age group (years)	Number tested	Cases of anaemia	Haemoglobin (per cent)
15-19	15	—	—
20-24	57	2	84*
25-29	44	1	84
30-34	20	1	82
35-39	19	—	—
40-44	5	—	—
45-49	6	1	54
50	1	—	—
Totals	167	5	

*One patient refused venepuncture.

Table IV
Haemoglobin levels before and after treatment with oral iron

Case	Before treatment Haldane (per cent)	After treatment Haldane (per cent)
1	84	95
2	84	91
3	82	91
4	54	68*

*Case 4 took the tablets for only two weeks.

The overall incidence of anaemia was 3 per cent. None of the four cases treated complained of symptoms of iron intolerance after treatment, two patients reported increased energy and zest for living, the others felt no subjective change.

The pregnant women survey

Haemoglobins at the first antenatal clinic visit of 100 women were analysed. Ages ranged from 15-39 years.

Seventy per cent Haldane is usually taken as the lower limit of haemoglobin concentration resulting from the physiological hydraemia of pregnancy. By this criteria only 3 per cent of our patients were anaemic and all of these were first seen between 22 and 24 weeks gestation. The incidence of iron deficiency anaemia in pregnancy has varied greatly between various studies. Examples are given in Table V.

Table V
Incidence of iron deficiency anaemia in pregnancy

Author	Year	Centre	Incidence (per cent)
Scott and Govan	1949	Glasgow	17.6
Scott	1961	Glasgow	14.4
Doyle and McGrath	1954	Dublin	31.4
Fullerton, Mair and Unsworth	1944	Aberdeen	3.9
Giles and Burton	1960	Stoke	66.0

Discussion and conclusion

The incidence of iron deficiency anaemia in the group studied was 3 per cent. No other types of anaemia were detected. It was noted that many women in this practice are taking oral contraceptives and it is possible that this contributed to the low incidence of iron deficiency.

No evidence was found of deficient iron storage; indeed, the incidence of iron deficiency anaemia in pregnancy of 3 per cent is well below most published figures as Table V shows. Not only is it low but all cases occurred, not early in pregnancy as would be expected if iron stores were deficient, but towards the end of the second trimester.

It is of interest that during the three months' period no patient presented to the writer with the classical symptoms of iron deficiency, although his partner saw two. Using Fry's figures, this practice should see about 21 cases of clinical anaemia per year; an informed estimate gives about 8 as the actual number seen.

This pilot survey indicates a good state of iron nutrition in the practice. It would be wasteful of time, money and effort to attempt screening on a larger scale.

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