Haemoglobin A₂ level in pregnancy

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SYNOPSIS The haemoglobin A₂ level was measured in 217 pregnant and 137 non-pregnant patients. Twenty-eight patients were reinvestigated at least six weeks after delivery.

There was no significant difference in the mean haemoglobin A₂ level in pregnancy ($2.4 \pm 0.8\%$) and the mean haemoglobin A₂ level in the non-pregnant controls ($2.3 \pm 0.6\%$).

In all anaemic patients whose A₂ level was raised in pregnancy the level remained elevated after delivery.

A raised haemoglobin A₂ level is usually considered to be an important diagnostic feature of the β -thalassaemia trait (Huehns, 1967) but it has recently been questioned whether this also applies to pregnancy (Weatherall, 1965).

Okçuoğlu (1965) considered that the level of haemoglobin A₂ was raised due to pregnancy. Minnich (1969), using a different method, found that haemoglobin A₂ levels were unchanged throughout pregnancy.

Haemoglobin A₂ levels have been measured as part of a survey on anaemia in pregnancy in Malta (Benster, Cauchi, Grech, and Agius, 1969), and in view of the controversy as to whether pregnancy affects the haemoglobin A₂ level our results on haemoglobin A₂ levels in pregnancy are being reported.

Methods

Quantitative estimations of the haemoglobin A₂ level were carried out by paper electrophoresis using the technique of Black, Miller, and Wan (1966). A haemolysate was prepared containing 10 g/100 ml. From this 100 μ l was pipetted onto

strips of Whatman no. 3 paper and electrophoresis was carried out in Tris-EDTA-boric acid buffer (pH 8.9) at 170 V for 20 hours. The bands containing the haemoglobin A₂ and haemoglobin A were eluted separately in 2 ml and 20 ml of Drabkin's solution respectively. The optical density was then estimated at 540 m μ using a Beckmann DB spectrophotometer. The haemoglobin A₂ was expressed as a percentage of the total haemoglobin.

Haemoglobin concentrations were estimated by the cyanmethaemoglobin method (Dacie and Lewis, 1963).

Patients

The haemoglobin A₂ level and haemoglobin concentration were measured in 217 patients attending for routine antenatal care in the third trimester of pregnancy.

The A₂ level was compared with that of 100 adult male blood donors and 35 age- and sex-matched controls who were attending for post-natal examination at least six weeks after delivery. These were considered as representing the non-pregnant population.

Of the 217 pregnant patients, 28 were reinvestigated at least six weeks after delivery. These comprised eight patients who had had a raised A₂ level in pregnancy and 20 with a normal A₂ level.

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This enabled patients to be used as their own controls.

Results

The mean haemoglobin A₂ level in pregnancy was 2.4 ± 0.8 %. This level did not show any significant variation with haemoglobin concentration, as may be seen from Table I.

The mean haemoglobin A₂ level in 100 adult males was 2.3 ± 0.7 % and in 35 postnatal patients 2.3 ± 0.5 %. There was no significant difference between the mean haemoglobin A₂ level in pregnant patients and non-pregnant controls.

The results in the 28 patients who were investigated both during pregnancy and at least six weeks after delivery are shown in Table II. The haemoglobin A₂ level was considered elevated if above 3.7 %. This figure was calculated from the mean plus 2 standard deviations of the non-pregnant controls. In eight of these patients the haemoglobin A₂ level was raised in pregnancy. Six of these were anaemic (mean haemoglobin concentration 10.4 g/100 ml) and two had normal haemoglobin concentrations. In the six anaemic patients the haemoglobin A₂ level remained raised after delivery. In the two non-anaemic patients the raised haemoglobin A₂ level found during pregnancy was not seen after delivery.

	Hb Concentration (g per 100 ml blood)						Total
	<10	10-10.9	11-11.9	12-12.9	13-13.9	14+	
Mean Hb A ₂ ± SD (%)	2.4 ± 1.2	2.4 ± 0.7	2.3 ± 0.7	2.4 ± 0.6	2.3 ± 0.9	2.6 ± 0.6	2.4 ± 0.8
Number of patients	11	30	51	68	40	17	217

Table I Total haemoglobin concentrations and haemoglobin A₂ levels in pregnancy

	Antenatal		Postnatal	
	Mean Haemoglobin Concentration (g per 100 ml)	Mean Haemoglobin A ₂ (%)	Mean Haemoglobin Concentration (g per 100 ml)	Mean Haemoglobin A ₂ (%)
Normal	12.8 (20) ¹	2.3 (20)	13.4 (20)	2.3 (20)
Elevated	10.4 (6)	4.5 (6)	11.2 (6)	4.9 (6)
Elevated in pregnancy only	14.0 (2)	4.3 (2)	14.1 (2)	2.2 (2)

Table II Haemoglobin concentration and haemoglobin A₂ level in patients investigated both antenatally and postnatally

¹No. of patients in brackets.

Discussion

Thalassaemia is not restricted to the Mediterranean region. Although it is more common in certain areas, patients have been reported from almost all parts of the world (Huehns, 1967).

The diagnosis of thalassaemia in pregnancy is important as the management is entirely different from that of the more common iron-deficiency anaemia. Parenteral iron, though very effective for proven iron deficiency, is contraindicated in a patient with thalassaemic anaemia and adequate iron stores.

Although the haemoglobin A₂ level is only one of the criteria for diagnosing the β-thalassaemia trait, it is probably the most reliable single investigation, and it is therefore important to assess the effect of pregnancy on the haemoglobin A₂ level.

In the present survey it was found that the mean haemoglobin A₂ levels in pregnant and non-pregnant patients were not significantly different. In patients whose haemoglobin A₂ was raised in pregnancy, the level remained raised postnatally in all who were anaemic. The significance of the raised haemoglobin A₂ level in pregnancy in the two non-anaemic patients is not very clear. It is possible that pregnancy may have been responsible, but this seems unlikely in view of the close similarity in the mean A₂ levels found in the pregnant patients and the non-pregnant controls. Although the number of patients followed up was small, the results suggest that the haemoglobin A₂ level is of value in the diagnosis of thalassaemic anaemia in pregnancy.

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