PROBLEMS OF THE INCIDENCE OF IRON DEFICIENCY ANAEMIA IN PREGNANT WOMEN UNDER PAKISTANI CONDITIONS

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Abstract

Eighty pregnant women were subjected to haematological and biochemical studies at different stages of pregnancy. The average total erythrocyte count was 4.5 millions/mm^3 in case of non-pregnant women. Microcytosis was observed in 12.5%, microcytosis and hypochromia in 6.3%, and frank macrocytosis in 10% of erythrocytes. Significant differences were observed in pregnant and non-pregnant women with respect to haemoglobin concentration, plasma iron and TIBC. There was no correlation between age, weight and anaemia in pregnant women. Of 80 pregnant women, only 19% showed the evidence of anaemia with haemoglobin levels less than 11 gm/ (JPMA 30: 5, 1980).

Introduction

Anaemia may be characterized by low level of haemoglobin in the blood. It may result from a low production or from an increased loss or destruction of red cells. These possibilities can be attributed to the loss of function of blood forming tissues or from acute or chronic haemorrhage or because of toxic factors and enzyme deficient erythrocytes which cause haemolysis (Holly 1958). One of the major causes of anaemia in pregnancy is iron deficiency. Anaemia in pregnancy can be caused by one of the factors like haemorrhage, increase destruction or suppression of bone marrow- The anaemias can be either magalo-blastic caused by folic acid or vitamin B12 deficiency or more commonly microcytic hypochromic caused by iron deficiency (Ben-stead and Theobald, 1952).
In Pakistan about 36 per cent of the rural and 56 per cent of the urban population suffers from anaemia. Seventysix per cent rural and 100 per cent urban pregnant and lactating mothers have been reported to have low or deficient level of haemoglobin (Annonymous 1970). The physiological stress may aggravate nutritional deficiencies which may lead to dietary imbalance and thus adversely influence the course and outcome of pregnancy, foetal growth, health and growth of the infant (W.H.O. Tech. Rep., 1965). The object of the present investigation was to study the extent of anaemia induced due to iron deficiency at different stages of pregnancy in the women of various ages and weights.

Material and Methods

Eighty pregnant women were grouped according to age and weight into the following four groups: (a) women of 16-19 years of age weighing 80 - 100 lbs, (b) 20 - 25 years of age weighing 101 - 120 lbs, (c) 26 - 30 years of age weighing 121 - 140 lbs, (d) 31-40 years of age weighing 140 - 200 lbs. Each group was studied during the three different stages of pregnancy i.e. 1 - 3, 4 - 6 and 7 to 9 months. Eight non-pregnant married women were separately grouped as controls.
Statistical Analysis
The data of blood values was grouped according to the stages of pregnancy and was analysed

statistically (Steel and Torrie, 1960).

Results and Discussion

Average blood values of 80 pregnant and 8 non-pregnant women have been described in Table I.

Table I: Average blood values of pregnant and non-pregnant women as affected by the duration of pregnancy.

Duration of pregnancy (months)	No. of subjects	Total erythrocyt count (millions /cmm^3)	Haemoglobin concentration (gm/100ml)	Packed cell volume (ml/100 ml)	Plasma iron (ug/100ml	Total iron binding capacity serum /ug/100ml)	Mean Corpuscular haemoglobin (yyg)	Mean corpuscular volume (c/u)	Mean corpuscular haemoglobin concentration %	Blood pressure (mm of Hg)
1-3	27	4.370	12.35	39	131	331	28.1	89.00	31.4	114/75
4-6	25	4.280	12.07	38	123	394	28.6	88.00	31.0	119/78
7-9	28	4.150	11.90	37	116	450	27.8	88.00	31.2	117/78
Non pregnant	8	4.462	12.96	40	139	364	29.1	89.96	32.5	125/74

The average total erythrocytes count in the first trimester of pregnancy was slightly lower than that observed in the non-pregnant women (4.4 against 4-5 millions/ mm*)- Since the normal range of erythrocytes is 4.2 to 5.4 million/mm3 so the observed values appear to be within the normal range. As the pregnancy advanced, the counts further decreased and approached a value of 4.2 millions/mm^3 during the last trimester following a similar trend as reported by Hunter (1960). The higher values observed during present investigation can be attributed to the iron therapy received by the subjects during pregnancy. Analysis of variance indicated no significant differences amongst the values. It was observed that the haemoglobin concentration was 12.35, 12.07 and 11.90 gm/100 ml in the 1st, 2nd and 3rd trimester respectively, whereas in cases of non-pregnant women the

Haematological and Biochemical Findings

Estimation of haemoglobin was performed according to the method of Wong (1928). Plasma iron was determined using atomic absorption spectrophotometer (Rodgerson and Heifer, 1966) and total iron binding capacity according to the method of Peter and Ross (1956).

The red blood count was done by the method of Wintrobe (1967) and packed cell volume was determined using microhaemato-crit centrifuge (Hamre 1940). The blood smears were prepared from the venous blood and stained by the method of Wintrobe (1967).value was 12.96 gm/100 ml. These values are within the normal range of 12-15 gm/100 ml as reported by Decie (1950) and also indicated in the WHO report (1965) where 11 gm/100 ml values were for anaemic patients during pregnancy. The values for plasma iron were 131, 123, 116 ug/100 ml in contrast to the non-pregnant women where the value was 139 ;ug/100 ml. There was a significant difference during the last trimester. It was also observed that values for packed cell volume did not show any significant variation with the advance of pregnancy. The values for packed cell volume in non-pregnant women were between 37 to 47 ml/100 ml (Ramsay 1958), while in pregnant women, the values exhibited a gradual decrease to 37 ml/100 ml as the pregnancy to the last trimester. According to Hunter (1960) anaemia is present when haematocrit falls below 37 ml/100 ml. The packed cell volume, therefore, does not indicate the state of anaemia. However, this may be regarded as a border line state which may have resulted in anaemia if iron therapy was not given.

The values for mean corpuscular haemoglobin, mean corpuscular volume and mean corpuscular haemoglobin concentration were lower in the pregnant women as compared to non-pregnant women. The plasma iron content in the pregnant as well as non-pregnant women lie well within the normal range as reported by Ramsay (1958). The total iron binding capacity (TIBC) in non-pregnant women

was 364 ug/100 ml as has previously been reported by Cartwright and Wintrobe (1967). The TIBC during 1st trimester was 331 ug/100 ml whereas a progressive rise to 450 ug/100 ml was noticed in the last trimester of pregnancy. Bothwell and Finch (1962) reported that it was rate to find the values below 250 or above 400 ug/100 ml in non-pregnant women. They have also observed that during pregnancy TIBC of serum was. usually increased to 400 ug/100 ml by the 5th month and 500 ug/100 ml by the 8th month of pregnancy. Mean corpuscular haemoglobin, mean corpuscular volume and mean corpuscular haemoglobin concentration were lower in the pregnant as compared to non-pregnant women and the values decreased as the pregnancy advanced. The blood pressure in the pregnant women was 114/75, 119/78 and 117/78 mm of Hg in the 1st, 2nd and 3rd trimester, respectively in contrast to the non-pregnant group where the value was 125/74 mm Hg. The erythrocyte morphology revealed microcytosis in 12.5 per cent, micro-cytosis and frank hypochromia in 6.2% and macrocytosis in 10%. The remaining cases, however, exhibited a normal erythrocyte morphology.
The analysis of variance did not reveal any significant variation in haemoglobin concentration in different age and weight groups

Table II:Average blood values of women according to weight groups as affected by the duration of pregnancy.

Weight groups (pounds)	Duration of pregnancy (months)	R.B.C. count (millions /mm^3)	Hb concentration (gm/100 ml)	P.C.V. (ml/100 ml)	Plasma iron (µg/100ml)	TIBC of serum (µg/100ml)	M.C.H. (µµg)	M.C.V. (cµ)	M.C.H.C. (%)
80-100	1-3	3.00	12.5	40	131	353	28.2	89.3	31.5
	4-6	4.16	12.0	37	120	432	29.0	87.4	31.6
	7-9	4.40	12.4	40	124	450	28.1	90.0	31.0
	Control	4.30	12.5	39	135	356	29.2	90.2	32.6
101-120	1-3	4.53	12.8	40	136	316	28.2	88.9	31.7
	4-6	4.20	12.3	38	123	397	29.4	91.2	32.2
	7-9	4.07	11.2	36	105	466	27.5	89.0	30.7
	Control	4.73	13.6	42	146	377	28.7	89.4	32.2
121-140	1-3	4.28	12.3	39	129	210	28.7	91.7	31.5
	4-6	4.36	12.4	39	125	374	28.3	87.8	31.5
	7-9	4.08	11.5	36	115	446	28.6	89.5	31.5
141-200	1-3	4.13	11.5	37	124	374	27.8	89.2	31.0
	4-6	4.32	12.4	38	123	392	28.4	88.0	31.7
	7-9	4.25	11.9	38	119	429	27.9	88.0	31.3

NOTE:-
R.B.C. Count : Red blood corpuscles or Total erythrocyte count million/mm^3.
Hb concentration: Haemoglobin concentration gm/100 ml.
P.C.V.: Packed cell volume ml/100 ml.
TIBC of serum: Total iron binding capacity of serum µg/100 ml
M.C.H: Mean Corpuscular haemoglobin µµg.
M.C.V. Mean Corpuscular volume cµ.
M.C.H.C.: Mean Corpuscular haemoglobin concentration %.

Table III: Average blood values of pregnant and non-pregnant women as affected by the duration of pregnancy.

Age groups (years)	Duration of pregnancy (months)	R.B.C. count (million/mm^3)	Hb concentration (gm/100 ml)	P.C.V. (ml/100ml)	Plasma iron (µg/100 ml)	TIBC of serum (µg/100ml)	M.C.H. (µµg)	M.C.V. (c µ)	M.C.H.C. (%)
16-19	1-3	4.40	12.5	38	132	330	28.4	86.0	32.8
	4-6	4.15	11.4	36	114	470	27.4	86.0	31.0
	7-9	4.50	12.8	40	128	415	28.3	89.0	31.6
	Control	4.20	12.5	38	132	365	29.9	90.6	33.1
20-25	1-3	4.55	12.7	41	139	310	27.8	89.0	31.5
	4-6	4.31	12.4	39	125	411	28.8	89.0	31.8
	7-9	4.25	11.9	38	120	435	28.1	89.0	31.3
	Control	4.53	13.1	40	142	350	28.9	88.1	33.1
26-30	1-3	4.41	12.4	40	130	331	28.1	90.0	31.5
	4-6	4.30	12.3	36	123	395	25.7	89.0	31.5
	7-9	4.00	10.9	36	109	469	27.4	88.5	30.9
	Control	4.57	13.1	42	141	377	28.7	91.4	31.4
31-40	1-3	3.95	11.4	36	121	372	28.8	91.3	31.3
	4-6	4.11	13.4	37	120	424	23.5	89.6	31.6
	7-9	4.22	14.6	38	116	456	27.5	89.0	30.8

It is shown in Table II and III that the blood values are independent of the age and weight of the women (r = 0.0242) and age and weight are not the influencing factor for blood values during pregnancy. The results reported in Table II and III indicate that out of 80 pregnant women, only 19% have exhibited the evidence of anaemia with haemoglobin levels less than 11 mg/l00ml.in the haemoglobin concentration and plasma iron contents between the pregnant and non-pregnant women. The haemoglobin concentration did not decrease significantly upto six months of pregnancy when compared with non-pregnant cases. There was however, a significant decrease in haemoglobin levelsduring the last trimester. It was also observed that values for packed cell volume did not show any significant variation with the advance of pregnancy. The values for packed cell volume in non-pregnant women were between 37 to 47 ml/100 ml (Ramsay 1958), while in pregnant women, the values exhibited a gradual decrease to 37 ml/100 ml as the pregnancy to the last trimester. According to Hunter (1960) anaemia is present when haematocrit falls below 37 ml/100 ml. The packed cell volume, therefore, does not indicate the state of anaemia. However, this may be regarded as a border line state which may have resulted in anaemia if iron therapy was not given.

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