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A DETAILED STUDY OF ANAEMIA IN PREGNANCY IN CAMA & ALBLESS HOSPITALS

by

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The commonest condition met with in practice all over the world is "Anaemia". The obstetrician comes across anaemia more often than the physician as it is a physiological process in mild degrees, which becomes pathological if left undetected and untreated.

Though anaemia is prevalent all over the world, in India, which consist of 80% of villages where the majority of the people are ignorant of the haemopoetic principles of diet, the incidence is considered to be high.

The incidence of anaemia is so intimately connected with the socio-economic and dietetic habits in a community, that large differences in severity and incidence are bound to occur in a country like India.

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In our hospital class of patients all of whom belong to the lower socio-economic group anaemia is common and often precedes pregnancy. The aggravating factors are repeated pregnancies at short intervals, bleeding episodes during pregnancy or labour, diet poor in iron content and worm infestation, especially hookworm, round worm and amoebiasis.

Material and Method

The incidence of anaemia is difficult to estimate in the absence of any uniform standard laid down regarding the normal range of haemoglobin levels in pregnancy.

To have a standard, we estimated haemoglobin, packed cell volume and serum iron levels of 30 non-pregnant women and 50 normal pregnant women belonging to the same age and socio-economic group.

From Table I it is seen that in non-pregnant women the average haemo-

globin was 12.58 gms%, average packed cell volume 34.21%, average serum iron 102.3 mcg. and average red blood cells 4.43 million/cmm.

Table II shows that the average haemoglobin was 11.26 gms%, average packed cell volume 32.39% average serum iron 105.32 mcg. and average red blood cells 3.72 million/cmm in normal pregnant women (50 cases).

The reason for these lower figures is difficult to determine whether due to inadequate intake, absorption or utilisation during pregnancy, foetal needs or because of rapid and repeated pregnancies.

Table III shows that the average haemoglobin in the present series was 11.26 gms% which is slightly higher than that of others. This might be due to the varying dietetic habits and environmental factors in various parts of our country.

TABLE I

Showing the values in non-pregnant women—30 cases

Haemoglobin (Hb.) in gms. %		Packed cell volume (P.C.V. %)		Serum Iron (mcgm.)	
Hb.	No. of patients	P. C. V.	No. of patients	S. Iron	No. of patients
11.1—12	7	31—35	18	71—90	4
12.1—13	22	36—40	12	91—110	12
13.1—14	1	41—45	—	110—130	14
Average	12.58	34.2	—	102.3	—
Average	Red Blood Cell (R.B.C.)	4.43 million/c.m.m.			

TABLE II

Values in pregnant women—50 cases

Haemoglobin (gms%) (Hb)		Packed cell volume (P. C. V. %)		Serum Iron (mcgm.)	
Hb.	No. of cases.	P. C. V.	No. of cases	S. Iron	No. of cases
9.1—10	—	21—25	—	31— 70	—
10.1—11	22	26—30	11	71— 70	20
11.1—12	28	31—35	39	91—110	12
12.1 and over	—	35—45	—	111—130	15
				131—150	3
Average	11.26	32.39		105.32	
Average	R. B. C. (Red Blood Cell)	3.72 million /c.m.m.			

TABLE III

Showing the standard of red blood cell (RBC) and haemoglobin (hb) levels laid down by various authors from different parts of India as compared with the present series

Authors	Year	Hb. in gms. %	RBC in million Cmm
Napier et al	1941	10.75	4.12
Ghosh et al	——	10.51	4.17
Khotari and Bende	1953	10.76	4.14
Menon	1965	10.10	3.50
Present series	1967	11.26	3.72

With the above figures as standard, the incidence of anaemia in Cama and Albless Hospitals antenatal clinic is as follows and is compared to the figures given by Benjamin *et al* in 1966. Total attendance in the antenatal clinic of Cama and Albless Hospitals (1967) 7,420

Total number of antenatal registered patients of the Queen's Hospital centre (Benjamin *et al* 1966) 1,052.

Table IV shows that 67.32% of the patients attending the antenatal clinic were anaemic, of which 44.29% belong to the moderate and severe group and 23.03% to the mild variety. Benjamin *et al* (1966) keeping the standard of haemoglobin as 12 gms% and over for normal pregnant women found 71.9% of anaemia in Queen's Hospital centre. Of this 71.9%, the percentage of mild degree of anaemia was 49.1% while that of moderate and severe was 22.8%. It is obvious that in our patients the severe types of anaemia occurred in more than double the number than in Benjamin's series.

TABLE IV

Table showing the incidence of Anaemia

Hb. in gms. (Haemoglobin)	No. of patients	Severity	Percentage	Present series	Benjamin et al
Below 4 gms	50				
4.1—5.5	196	Severe	9.78		
5.6—6.5	480			44.29	22.8
6.6—7.5	2560	Moderate	34.51		
7.6—9.5	1709	Mild	23.03	—23.03	49.1
9.6—11					
	4995			67.32	71.9

From this above group, a random sample of 156 patients were selected for the purpose of detailed study. Their haemoglobin, packed cell volume, red blood cell, serum iron, peripheral smear, routine stool and urine examinations were carried out.

Of these 156 patients 28 were dropped out from the study for the following reasons:

Sensitive to iron	10
Irregular attendence	12
Delivered before completing the treatment	6
Total	28

Of the 10 patients who were sensitive to iron carbohydrate com-

pound, 2 patients had nausea and vomiting, 2 had joint pains, 3 had severe pain at the site of injection and they refused further injections, one had giddiness and 2 had palpitation.

The incidence of various types of anaemias in the 128 patients studied is as follows,

	Number	Percentage
Iron deficiency anaemia ..	120	93.75
Dimorphic ..	4	3.12
Megaloblastic ..	3	2.34
Refractory ..	1	0.79

Table V shows the serum iron values in these 128 patients as compared to the control group. The serum iron level in the control group was 105.32 mcg.; in the iron deficiency group it was 52.6 mcg.; in the megaloblastic group it was 65.2 mcg.; while in the refractory group it was 44.5 mcg. From this it will be seen that there is a marked fall in the serum iron level, almost to half the normal, in the iron deficiency anaemia group in this series.

Routine stool and urine examinations were carried out in all these patients. Of the 128 patients, 32 had round worms, 20 had hookworms, 6 had entamoeba histolytica, mixed infestation was present in 17 patients and nothing abnormal was detected in 53 cases. Repeated stool examination using the concentration method would have revealed many more infections.

A routine urine examination of all these patients revealed an acute urinary tract infection in only 2 cases. Though the ideal method of urine analysis would be counting bacteria in the urine we did not have this facility.

The importance of dietary proteins in the red cell formation has been recognised largely through the classical work of Whipple and his associates. Reissmann (1964) showed that in protein deficiency there was rather marked hypochromia with normal erythrocyte count.

The estimation of plasma proteins was carried out in 60 of these 128 patients. Total proteins and its various fractions were estimated by chemical and electrophoretic methods.

TABLE V

Showing Serum Iron values in different types of Anaemias

Serum Iron (mcgm.)	Control group	Iron deficient group	Megaloblastic	Refractory
30—50	—	40	1	1
51—70	—	74	2	—
71—90	20	6	4	—
91—110	12	—	—	—
111—130	15	—	—	—
131—150	3	—	—	—
Total No. of patients	50	120	7	1
Average	105.32	52.6	65.2	44.5

Of these 60 cases, 10 showed clinical evidence of hypoproteinaemia. For the purpose of control plasma proteins were estimated in 30 normal non-pregnant and 50 normal pregnant women.

The non-pregnant level was 7.43 gms% and the level in normal pregnant women was 6.98 gms%. There was a slight decrease in the total proteins in the patients having iron deficiency anaemia alone which was 6.66 gms%, whereas there was a marked fall in patients showing evidence of hypoproteinaemia which was 4.63 gms% as seen in Table VI.

The results of the present series are compared with values of plasma proteins by various authors (tables VII, VIII). From these tables it is seen that the average normal pregnant value of 6.98 gms% and non-pregnant value of 7.43 gms% in the present series corresponds to that found by various authors.

There were 10 patients in this

TABLE VI

Plasma proteins values

Type of Patients	Total Proteins Gms %	Alb.	Glob.	Globulin fractions Alpha-1	Alpha-2	Beta	Gamma	No. of patients
Normal non-pregnant	7.43	4.15	3.28	0.41	0.72	0.99	1.16	30
Normal pregnant	6.98	2.99	3.99	0.37	0.71	1.01	0.90	50
Pregnancy with anaemia	6.66	2.73	3.93	0.21	0.49	0.92	1.11	50
Pregnancy with hypoproteinaemia	4.63	1.82	2.81	0.32	0.59	0.92	0.98	10

TABLE VII

Plasma protein values of various authors, Normal—non-pregnant

Authors	Total.	Alb.	Glob.	Alpha-1	Alpha-2	Beta	Gamma
Browne	7.10	4.21	2 89	0.35	0.68	0.94	0.84
Mack et al	7.75	4.33	3.32	0.34	0.64	0.95	1.39
Purandare	7.76	4.50	2.26	0.19	0.32	0.81	1.86
Menon	7.19	3.78	3.41	0.30	0.67	0.98	1.46
Present series	7.43	4.15	3.28	0.41	0.72	0.99	1.16

TABLE VIII

Plasma protein values of various authors, Normal-pregnant

Authors	Total	Alb.	Glob.	Alpha-1	Alpha-2	Beta	Gamma
Browne	6.48	2.83	3.59	0.59	1.03	1.31	0.65
Mack et al	6.84	3.09	3.75	0.44	0.85	1.27	1.19
Purandare	6.70	2.90	3.73	0.27	0.50	0.98	1.98
Menon	6.46	2.44	4.02	0.29	0.88	1.22	1.43
Present series	6.98	2.99	3.99	0.37	0.71	1.01	0.90

series who showed evidence of hypoproteinaemia. They were given a high protein diet and protein supplements. The results before and after treatment are shown in the following table.

Table IX shows that the pre-treatment plasma protein value of 4.63 gms% had increased to 5.83 gms% after treatment. Since the number of patients studied was very small it is difficult to come to a conclusion at this preliminary stage.

TABLE IX

Plasma proteins in hypoproteinaemia—before and after treatment

Nature	Total	Alb.	Glob.	Alpha-1	Alpha-2	Beta	Gamma
Before treatment	4.63	1.82	2.81	0.32	0.59	0.92	0.98
After treatment	5.83	2.41	3.42	0.47	0.81	1.02	1.12

As seen in the photograph (Fig. 1) in some instances the electrophoretic profile showed the presence of one more band between the point of application and the globulin band, a preglobulin band which is significant of pregnancy.

Treatment

All these 128 patients were given intramuscular iron therapy in the form of iron carbohydrate compound with folic acid. A test dose of 0.5 cc. was given intramuscularly into the gluteal region, following which a dose of 2 cc. was given daily if no untoward symtoms occurred. Each 2 cc ampoule contained 100 mg of iron carbohydrate and 10 mg of folic acid. For the purpose of this study a total of 10 injections was given (1000 mg of iron and 100 mg of folic acid) to each patient. The selected patients belonged to 1st, 2nd, 3rd trimesters of pregnancy. The results are shown in the following tables.

Table X shows that the average haemoglobin before treatment was 6.84 gms%. After treatment it was 9.68 gms% which rose to 10.41 gms%, 11.02 gms% and 11.08 gms% after two weeks, four weeks and post-partum respectively. The average rise in haemoglobin was one gram% per week.

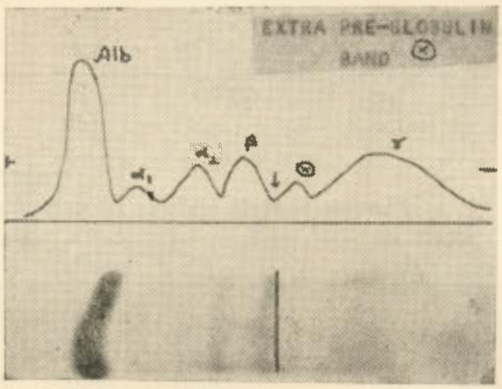

Fig. 1

Table XI shows the packed cell volume values in the same patients before and after treatment. The average packed cell volume before treatment was 21.57% and after treatment 27.77%. It rose to 28.93% after two weeks, 30.76% after four weeks and 31.5% post-partum.

TABLE X

Table showing haemoglobin values before and after treatment

Hb. in gms. % (Haemaglobin)	Before treatment	After treatment	After two weeks	After four weeks	Post-partum
4.0—5.0	18	—	—	—	—
5.1—6.0	20	1	—	—	—
6.1—7.0	28	5	—	—	—
7.1—8.0	34	13	3	—	1
8.1—9.0	18	25	10	2	4
9.1—10.0	1	45	25	9	13
10.1—11.0	—	21	55	21	38
11.1—12.0	—	10	17	44	50
Average	6.84	9.63	10.41	11.02	11.08

TABLE XI

Packed cell volume (P.C.V.) values

P. C. V. (Packed cell volume)	Before treatment	After treatment	After two weeks	After four weeks	Post-partum
10—15	11	—	—	—	—
16—20	35	7	3	1	—
21—25	68	25	16	8	4
26—30	6	60	41	23	41
31—35	—	28	50	34	61
Average	21.57	27.77	28.93	30.76	31.50

The serum iron level was 52.67 mcg. before treatment which is almost half normal value. It was 88.48 mcg. after treatment. The normal level was achieved after 2 to 4 weeks. The value at two weeks after treatment was 102.75 mcg and after four weeks 112.5 mcg. There was a further rise post-partum which was 116.4 mcgs. in the present series (Table XII).

Table XIII shows the red blood cell values in the present series.

A similar rise in the red blood cell count was noted. The pre-treatment value of 2.44 cmm rose to 3.21 cmm after treatment. After two weeks it

TABLE XII

Serum iron values

Serum Iron (mcgm.)	Before treatment	After treatment	After two weeks	After four weeks	Post-partum
30—50	33	—	—	—	—
51—70	70	6	—	—	—
71—90	17	56	33	26	11
91—110	—	47	58	29	33
111—130	—	9	18	14	49
131—150	—	2	1	7	13
Average	52.67	88.48	102.75	112.5	116.4

TABLE XIII
Red blood cell (R.B.C.) values

R. B. C. in million Cmm	Before treatment	After treatment	After two weeks	After four weeks	Post-partum
1.0—2.0	22	4	—	—	—
2.1—3.0	86	35	17	6	4
3.1—4.0	12	74	82	59	85
4.1—5.0	—	7	11	11	17
Average	2.44	3.21	3.66	3.77	3.99

was 3.66 cmm after four weeks 3.77 cmm and 3.99 cmm after delivery.

Anaemic patients are more prone to intranatal complications. Of the 128 patients studied, 106 patients delivered under our supervision. During this period of study there were 65 patients who were admitted as emergency cases in severely anaemic condition having had no treatment for their anaemia. Table XIV shows the complications in treated and untreated patients.

Blood transfusion was required in 61.5% of the untreated group whereas none of the patients in the treated group required blood transfusion. There was a higher incidence of forceps delivery, ante-partum haemorrhage and post-partum haemorrhage in the untreated group, being 9.2%, 9.2% and 3% respectively, whereas in the treated group the forceps delivery was 1.9%, while ante-partum haemorrhage and post-partum haemorrhage occurred only in 0.91% of the patients.

The incidence of prematurity was 40% in the untreated group and 10% in the treated group. Of the 26 premature deliveries in the untreated group two were due to syphilis, six to ante-partum haemorrhage and in the remaining 18 the cause was unknown. Of the 11 premature births in the treated group 2 were due to syphilis, 1 due to toxaemia and in the remaining 8 patients no cause was found for the prematurity. There were 2 stillbirths in the untreated group of which 1 was due to accidental haemorrhage and in one the cause was unknown. The stillbirth in the treated group was due to syphilis.

TABLE XIV
Table showing complications in treated and untreated groups

Complications	Untreated (65 patients)		Treated (106 patients)	
	Number	Percentage	Number	Percentage
Blood transfusion	40	61.5	—	—
Forceps delivery	6	9.2	2	1.9
Ante-partum haemorrhage	6	9.2	1	0.91
Post-partum haemorrhage	2	3.0	1	0.91
Premature delivery	26	40.0	11	10.1
Still births	2	3.0	1	0.91
Neonatal deaths	8	12.3	2	1.90

Along with toxaemia, anaemia holds pride of place in premature births. From these figures it will be seen that anaemia alone was responsible for a high rate of premature births. The complications of labour are much higher in the untreated group than in those patients treated during pregnancy for anaemia.

Anaemia still remains one of the major causes of maternal mortality (Table XV). There were three deaths out of 65 patients in the untreated groups giving an incidence of 4.6%, whereas there was no death in the treated group. The total maternal mortality during this period of study was 3.2/1000 (16 deaths in 5,097 deliveries). Anaemia was responsible for 18.75% of the total deaths.

TABLE XV

Table showing maternal mortality

Group	Total No. of patients	Maternal mortality	Mortality rate
Untreated	65	3	4.6%
Treated	106	—	—

Mortality caused by anaemia is an avoidable factor provided pregnant women have proper antenatal care as seen above.

Discussion

Anaemia is one of the most common conditions met with in the pregnant women. This was noted in 67.32% of women attending the antenatal clinic of the Cama & Albless Hospitals, Bombay. Iron deficiency anaemia accounted for 93.75% of the cases and megaloblastic anaemia for 2.34%. According to Holly (1966) 95% of anaemia is caused by iron deficiency. Menon (1964) from Madras and A. Das have reported that in their series, 60% and 39.8% respectively belonged to the dimorphic group, though in this series only 3.12% were found to be dimorphic anaemias.

Since the majority of women enter pregnancy with partially or completely depleted iron reserves, the prophylactic use of iron has been advocated by most workers. Iron therapy not only prevents iron deficiency, but also reduces the incidence of megaloblastic anaemias.

Low socio-economic states are frequently attended by malnutrition, anaemia and folic acid deficiency (Hibbard 1964). Where, in a pregnant woman, the intake of folic acid is inadequate or where the folate metabolism is faulty, the tissues that suffer most are those of the trophoblast, the foetus, the maternal bone-marrow and the mucosa of the maternal alimentary tract. Hibbard found that defective folate metabolism or deficient intake of folic acid is concerned in the aetiology of abruptio placenta and certain cases of abortion and foetal malformation. The body stores of folic acid and its derivatives are not extensive and symptoms of deficiency occur within several months of dietary deficiency. Benjamin *et al* (1966) found the demand of folic acid by the rapidly developing foetus overwhelming.

The results of a study by Chanarin *et al* (1965) strongly suggest

that iron deficiency in pregnancy may produce a secondary deficit of folic acid. There has been some argument as to the justification of placing the pregnant women on prophylactic iron and folic acid. The main argument against the routine use of folic acid is that it may mask incipient cases of true Addisonian pernicious anaemia and may precipitate sudden and rapid onset of neurological manifestations of this disease. Benjamin *et al* (1966) found this argument insignificant as in their studies they had a high incidence of combined iron and folic acid deficiencies (39.2%), while true pernicious anaemia was rare (1:66,000 deliveries).

Iron carbohydrate compound together with folic acid was given by intramuscular injection to 128 patients whose haemoglobin values ranged from 4 to 9 gms%. One hundred and twenty patients with iron deficiency anaemia responded well to treatment, with an average rise in haemoglobin of 1 gm% per week. All patients had a feeling of well-being during treatment. Side-effects were minimal. Eight patients did not respond, and were later found to have other types of anaemia, 4 dimorphic, 3 megaloblastic and 1 refractory anaemia. One hundred and six patients thus treated were delivered and all complications were found to be reduced. All patients treated with iron and folic acid reached labour with normal or slightly lower than normal haemoglobin values. Blood transfusions have been used in iron deficiency anaemias. They provide little iron to the pool of body iron and may result in dangerous reactions and therefore should be reserved for the severely anaemic patients during labour and delivery. In no patient in this series was a blood transfusion given, while in an emergency group of anaemic patients 61.5% needed blood transfusion.

Anaemia is also one of the largest causes of maternal deaths, claiming 20 to 25% of the total maternal mortality (Masani, 1968). Krishna Menon (1965) states that in Madras State, 20% maternal deaths are due to anaemia and another 20% have an associated factor. In the present study the total maternal mortality during the period of study was 3.2/1000 and anaemia was responsible for 18.75% of the deaths. All these anaemia deaths were in emergency admissions. There was no death in the series under study.

Summary

1. The incidence of anaemia in patients attending the antenatal clinic of the Cama and Albless Hospitals was 67.32%, of which 93.75% had iron deficiency anaemia and 2.34% megaloblastic anaemia.

2. A random sample of 158 patients was selected for the purpose of detailed study.

3. A standard value was obtained by estimating haemoglobin, packed cell volume, serum-iron and plasma proteins in normal non-pregnant and normal pregnant women of the same age and socio-economic status.

4. Worm infestation was found in 58.8% on routine stool examination.

5. All patients under trial were given intramuscular injections of iron carbohydrate compound, 100 mg., together with 10 mgs of folic acid daily for 10 days.

6. An average rise of 1 gm% per week was obtained.

7. The use of iron with folic acid has been discussed.

8. Minimal complications during labour were seen in the treated group and these were compared to an emergency group admitted during the period under study.

9. Routine haemoglobin estimation on the first and subsequent visits will detect the developing anaemia and response to treatment.

10. The response to treatment in these anaemic patients was very satisfactory. There was no need for blood transfusion, and all patients reached labour with normal haemoglobin values, thus reducing the incidence of complications. It is suggested that since the incidence of anaemia is so high in our hospital class of patients, all patients attending the antenatal clinic should have prophylactic iron and folic acid therapy.

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