

BLOOD IN PREGNANCY

BY

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So far very few studies have been reported on the normal blood values of pregnant women in India. Uptil now such studies have been reported only from Calcutta, Bombay, Patna and Assam. No such studies have yet been reported from any part of Madhya Pradesh. Hence this work was undertaken to determine the various haematological values amongst the pregnant women in Nagpur. India being such a vast country with different dietetic habits, climates, parasitic infestations, etc., it was felt that a study of this nature may help to demonstrate the existence or otherwise of any differences between the haematological values of pregnant women of Nagpur as compared with those of other regions. Also it was thought that the small number studied in this work will add to the numbers already studied in other regions and thus help to give us a better concept of haematological standards of pregnant women of India as a whole.

Material. An unselected group of 115 women attending the antenatal clinic at the Daga Memorial Hospital, Nagpur, was studied. The blood was examined on the first prenatal visit in order to exclude those patients who had been prescribed any haematinics during their previ-

ous visits. Most of the patients attending this clinic belong to the poor or the lower middle class.

Age, parity, income and occupation of the earning members of the family, total number of family members, history of anaemia in previous pregnancies, history of any other previous illnesses and the nature of the diet as well as symptoms of any present illness were recorded in every case. A thorough physical examination was carried out and exact period of gestation was determined in all the patients.

For the sake of comparison the haematological values of 50 healthy non-pregnant women were also determined. Fifteen of these were the hospital ward ayahs and sweepers and 35 were the hospital nurses, combined group representing a cross section somewhat similar to that attending our antenatal clinic.

All the patients who complained of any symptoms besides slight oedema of ankles, or showed any physical evidence of any acute or chronic disease, or had bad obstetric history suggestive of syphilis, as well as those patients who had haemoglobin value of below 10 grammes per 100 c.c. and/or packed red cell volume of below 30 per cent were excluded while calculating the mean of various determinations. Altogether thirty-

seven patients had to be excluded on the above criteria and so the mean values were calculated on the remaining 78, apparently normal pregnant women. Five of these 78 cases had slight oedema of ankles.

Method. All the estimations were carried out on the venous blood within three hours of the collection of the blood sample. Haemoglobin was determined by the alkaline haematin method of Clegg and King using a two celled photo-electric colorimeter. Plasma proteins were determined by the copper sulphate method of Phillips Van Slyke et al.

The corpuscular volume was determined by using Wintrobe's haematocrit tubes which were centrifuged at 3000 r.p.m. for 30 minutes. Red cell count was done in the usual manner by using the Neubauer Counting Chamber, Thoma diluting pipette and Gower's diluting fluid. The mean corpuscular volume and the mean corpuscular haemoglobin concentration were calculated according to Wintrobe's formulae.

Results. Our findings along with the findings of other workers in India and abroad are given in Tables I and II.

The mean erythrocyte count of our series (pregnant) compares favourably with the ones reported by the other workers from Boston and Edinburgh as well as from different parts of India, excepting from the one reported by Napier and Billimoria for Assam coolies. Their figures are somewhat higher than ours. The mean corpuscular volume of our series is somewhat higher than that

reported from Bombay or Calcutta, but somewhat lower to the one reported from Edinburgh and Boston and definitely higher than that reported from Assam. Our mean value for haemoglobin is more or less similar to that reported by Upadhyay and by Rath et al., but definitely higher than that reported by other workers. This difference may be due to the different methods employed by them. Roscoe and Donaldson had used the Haldane Haemoglobinometer while Upadhyay as well as Ghosh et al had used the Hellige Haemoglobinometer. Rath et al had used the oxyhaemoglobin method using the photo-electric colorimeter similar to ours. Here it may be mentioned that our haemoglobin values for the non-pregnant women compare quite favourably with those reported by Davies et al for the non-pregnant women in Britain. The method and apparatus employed by these workers was similar to ours. In their series 39.4% and in our series 30% of the cases showed a haemoglobin value of over 14 grammes, 69.2% of their cases and 66% of our cases had haemoglobin value of above 13 grammes. 88.5% of their cases and 84% of our cases had haemoglobin value of above 12 grammes. 11.5% of their cases and 16% of our cases had haemoglobin value of 12 grammes or less. 5.7% of their cases and 6% of our cases had haemoglobin value of less than 11 grammes per 100 c.c.

Table II shows that the mean haemoglobin value of our series of non-pregnant women is somewhat lower to that reported from Patna and Madras but slightly higher than

TABLE I
Blood Picture of Normal Pregnant Women in India and abroad.

| Nature of cases | Present study | | Ghosh et al, 1948, Calcutta | Napier & Billimoria, 1937, Assam | Kothari and Bhende, 1950, Bombay | Roscoe & Roscoe & Donaldson, Donaldson, 1946, 1946, Edinburgh Edinburgh | | Rath et al., 1950, Boston, America |
|------------------------------------|--------------------------|----------------------|-----------------------------------|---|---|--|--------|---|
| | Apparently normal | Apparently normal | | | | Normal | Normal | |
| No. of cases | 78 | 51 | 359 | 40 | 19 | 20 | 20 | 21 |
| Erythrocyte count | 4.17 3-5 (Range) | 4.08 | 4.17 ± 0.56 | 4.65 ± 0.62 | .. | 4.15 | 4.15 | 4.17 (3.47-4.57) |
| Cell volume | 35.3 30-45.8 (Range) | .. | 32.78 ± 5.06 | .. | 30-39 (Range) | 37.0 | 36.4 | 36.7 (33-42.3) |
| Haemoglobin in grms. | 12.4 10-16.3 (Range) | 12.5 | 10.51 ± 1.56 | 10.70 ± 1.60 | 10-13.1 (Range) | 11.5 | 11.3 | 12.7 (11.6-14.2) |
| Mean corpuscular volume | 85.3 69-102 (Range) | 89.65 | 81.3 ± 7.87 | 72.10 | 84.12 | 88.5 | 88.1 | 89 (78-98) |
| Mean corpuscular HB concentration. | 35.2 | .. | 31.61 ± 2.5 | 32.60 | 33.21 | 31.0 | 31.1 | 34 |
| Plasma proteins in grms. | 6.732 5.6-7.7 (Range) | 6.752 | .. | .. | .. | .. | .. | .. |

TABLE II
Blood Picture of Normal Non-Pregnant Women in India and abroad.

| | Prtsent study. Nagpur | Sokhey, 1938, Bombay | Singh, Kapoor and Singh, 1953, Punjab | Napier & Dasgupta, 1941, Calcutta | Sankaran and Rajagopal, 1938, Madras | Upadhyay, 1944, Patna | Wintrobe, 1933, America |
|-----------------------------------|--------------------------|----------------------------|--|--|--|-----------------------------|-------------------------------|
| No. of cases | 50 | 101 | 100 | 128 | 62 | 86 | |
| Erythrocyte count | 4.7 | 4.47 ± 0.33 | 4.55 ± 0.04 | 4.615 ± 0.409 | | 4.7 | 4.8 ± 0.6 |
| Cell volume | 38.48 | .. | 41.6 ± 2.7 | .. | | .. | 42.0 ± 5.0 |
| Haemoglobin in grms. | 13.28 | 12.99 ± 1.10 | 13.09 ± 0.86 | 12.63 ± 1.01 | 13.73 ± 0.93 | 13.519 | 14.0 ± 2.0 |
| Mean corpuscular volume | 82.0 | 85.53 | 92.23 ± 5.04 | 86.82 ± 7.28 | | 83.9 | 87.5 ± 5 |
| Mean corpuscular HB concentration | 34.68 | 32.86 | 31.47 ± 0.511 | 31.57 ± 1.76 | | .. | 34 ± 2 |
| Plasma proteins in grms. | 7.3 | .. | .. | .. | | 7.06 | .. |

that reported from Punjab, Bombay and Calcutta. All our values are lower than those reported by Wintrobe in America.

pectively. The distribution of cases according to the monthly per capita income of their family members is shown in Table VI.

TABLE III
Distribution of Cases by Month of Pregnancy.

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|-------------------------|---|---|---|---|---|---|----|----|----|-------|
| No. of normal patients | — | 1 | 4 | 4 | 9 | 8 | 15 | 19 | 18 | 78 |
| No. of anaemic patients | — | — | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 20 |

TABLE IV
Distribution of Cases by Parity

| Parity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Above | Total |
|-------------------------|----|----|---|---|---|---|---|---|---|-------|-------|
| No. of normal patients | 27 | 18 | 7 | 8 | 5 | 5 | 2 | 5 | 1 | 0 | 78 |
| No. of anaemic patients | 3 | 5 | 4 | 2 | 2 | 1 | 2 | 1 | 0 | 0 | 20 |

TABLE V
Distribution of Cases by Age

| Age in years | 16 - 20 | 21 - 25 | 26 - 30 | 31 - 35 | 36 - 40 | Total |
|-------------------------|---------|---------|---------|---------|---------|-------|
| No. of normal patients | 31 | 29 | 10 | 8 | — | 78 |
| No. of anaemic patients | 8 | 8 | 4 | — | — | 20 |

TABLE VI
Distribution of Cases according to the per capita, per month income of their family members

| Income P.C. P.M. in rupees | Between 0-10 | Between 11-20 | Between 21-30 | Above 30 | Unknown | Total |
|----------------------------|--------------|---------------|---------------|----------|---------|-------|
| No. of normal patients | 15 | 30 | 16 | 16 | 1 | 78 |
| No. of anaemic patients | 7 | 3 | 8 | 2 | — | 20 |

The distribution of cases by month of pregnancy, by parity and by age is shown in Tables III, IV and V res-

From Table III it can be seen that 47% of our patients were more than 7 months pregnant, while in Fergu-

son's series only 27% of the cases were above 30th week of their pregnancy. 66% of our cases were more than 6 months pregnant. This shows the tendency of our women to come to the antenatal clinics in the later months of their pregnancy. This is an important point to be kept in view while planning for prophylaxis of anaemias of pregnancy. This calls for a large scale propaganda amongst our womenfolks, to stress the need of their coming to the antenatal clinics early in their pregnancies.

Table IV shows the increased tendency amongst our women to come to the antenatal clinics during their first pregnancies. 34% of our subjects were primiparae.

About 77% of the women belonged to the age group 15-25 years. None were below 15 years. 78% of the patients belonged to the per capita per month income groups of below rupees thirty. This shows that the vast majority of our subjects belonged to the lower economic strata of society.

Incidence of Anaemia. There is no unanimity of opinion as to who is anaemic in pregnancy. The variable physiological changes in blood during pregnancy preclude the use of normal haematological standards of non-pregnant women. Although there is an actual increase in the red cell mass during pregnancy the haematocrit, haemoglobin and red cell count all show a steady decline as pregnancy advances because of the disproportionate increase in plasma volume. This increase in plasma volume is most variable and

so there is considerable variation in the degree of fall in the values of haematocrit, haemoglobin and red cell count. Hence the exact degree of decline in these values cannot be predicted in an individual case. A mean decline in venous haematocrit from 39.4% to 32.0% or of 15% has been reported by Caton et al. Because of this variation, several standards have been suggested for deciding who is anaemic in pregnancy. A haematocrit of 30% to 33% and haemoglobin level of 10 to 11 grammes per 100 c.c. have been suggested as minimum figures. Haematocrit reading of 30% and a haemoglobin level of 10 grammes per 100 c.c. were considered as appropriate minimum figures in this study. Anyone with a haematocrit reading of below 30% and/or a haemoglobin value of below 10 grammes per 100 c.c. was considered anaemic. On this basis 20 cases, i.e. 17% of the cases, were anaemic. Various haematological values of these anaemic cases are shown in Table VII above. Sixteen of these patients had a packed cell volume of below 30% as well as a haemoglobin value of below 10 grammes per 100 c.c. Four had a packed cell volume just below 30% with haemoglobin values of just above 19 grammes. Two had haemoglobin values of below 10 grammes with a packed cell volume of 30%. One had haemoglobin value of below 10 grammes with a packed cell volume of 32%. Only ten of these anaemic women complained of some symptoms. But only six of these complained of symptoms suggestive of anaemia. Of course most of these cases were only

TABLE VII
Haematological Findings of Anaemic Patients

| Reg. No. | Erythrocyte count | Cell volume | Haemoglobin in grms. | Mean corpuscular volume | Mean corpuscular HB concentration | Plasma proteins in grms. | Symptoms | Signs |
|----------|-------------------|-------------|----------------------|-------------------------|-----------------------------------|--------------------------|---|--|
| 2 | 4.2 | 28.0 | 9.5 | 70 | 33.8 | 7 | .. | .. |
| 5 | 4.3 | 27.5 | 9.5 | 64 | 34.5 | 7 | .. | .. |
| 7 | 3.3 | 26.0 | 9.8 | 80 | 35.5 | .. | nil | nil |
| 20 | 4.0 | 32.0 | 9.6 | 80 | 30.0 | .. | Weakness & easy fatiguability | nil |
| 22 | 4.8 | 30.0 | 8.6 | 62 | 28.6 | .. | Palpitation & weakness & mucous membranes | Slight pallor of skin. |
| 27 | 3.1 | 24.0 | 8.8 | 79 | 36.6 | 5.8 | Diarrhoea | do |
| 43 | 4.5 | 29.8 | 9.3 | 66 | 31.2 | 6.8 | Poor appetite | nil |
| 46 | 3.6 | 29 | 10.2 | 80 | 35.1 | 7.0 | nil | nil |
| 48 | 3.3 | 29 | 11.0 | 87 | 37.9 | 6.2 | nil | nil |
| 51 | 4.5 | 30 | 9.7 | 69 | 32.3 | 7.0 | nil | nil |
| 52 | 3.2 | 28 | 10.8 | 87 | 38.5 | 6.4 | nil | nil |
| 54 | 4.3 | 28 | 9.4 | 65 | 33.0 | 6.2 | Diarrhoea off and on | nil |
| 55 | 3.16 | 29 | 10.1 | 91 | 34.8 | 6.2 | Weakness | nil |
| 58 | 3.1 | 23.5 | 7 | 75 | 30 | 6.2 | Weakness & easy fatiguability | Pallor of skin & mucous membranes |
| 82 | 3.68 | 22.0 | 6.1 | 60 | 27.7 | 6.5 | Weakness | do |
| 83 | 4.08 | 24.5 | 7.9 | 60 | 32.2 | 7.2 | do | do |
| 93 | 4.3 | 29.0 | 8.4 | 67 | 29.0 | 6.3 | nil | nil |
| 97 | 3.85 | 29.0 | 9.3 | 79 | 32.0 | 6.2 | nil | nil |
| 101 | 2.9 | 29.5 | 9.8 | 102 | 33.2 | 6.5 | Backache, burning micturition | nil |
| 105 | 1.4 | 13.2 | 4.8 | 94 | 36.3 | 5.6 | Weakness & easy fatiguability, dyspnoea on exertion | General anasagea, dilated heart & haemic murmurs |

mildly anaemic. Only three cases were moderately anaemic and one severely anaemic.

Ninety per cent of the anaemic patients belonged to income groups of below rupees thirty, per capita,

per month (Table VI) confirming that the anaemia is a disease of poverty. Forty-four per cent of the anaemic patients were vegetarian and 56% were non-vegetarian. But many of these non-vegetarian pa-