

STUDY OF ERYTHROCYTE SEDIMENTATION RATE AND BLOOD CHEMISTRY IN NORMAL PREGNANCY

by

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Introduction

It is widely known that the erythrocyte sedimentation rate changes during pregnancy, but the references on the subject are few in Indian literature in relation to different trimesters of pregnancy. Similarly, there have been difference of opinion regarding the normal haematological values in pregnancy.

The present investigation therefore was undertaken to study the normal levels of erythrocyte sedimentation rate and some important chemical constituents of blood in the different trimesters of pregnancy, which may be of utility in judging the progress of pregnancy and deciding the clinical abnormalities during pregnancy.

Material and Methods

One hundred and fifty women free from any clinical disorder attending the antenatal clinic in the Obstetric Department of the Medical College & Hospital, Nagpur, were selected for the present study. Twenty-five healthy non-pregnant women were studied for normal control values. Fifty pregnant women

out of the one hundred and fifty were studied throughout their term of pregnancy and some of them were also studied during puerperium. The progress of pregnancy was judged by the weight gain and blood pressure records throughout the pregnancy.

Fifteen to twenty ml. of venous blood of these selected cases was collected in oxalated and dry sterile bottles.

Oxalated blood sample was subjected to the following haematological examinations in control group, in pregnant women in the different trimesters of pregnancy and during 1st week of puerperium.

Haemoglobin percentage, total red blood cell count and total leucocyte count were estimated by standard techniques. Erythrocyte sedimentation rate was estimated by Wintrobe's method. The same tube was centrifuged at the rate of 3000 r.p.m. for half an hour and the packed cell volume was recorded. Erythrocyte sedimentation rate values were corrected for anaemia by the chart of Whitby and Britton (1963).

The clear serum was subjected to the following analysis. The total serum proteins, serum albumin and serum globulin were estimated by standard techniques (Oser 1965). Serum cholesterol estimation was based on method of (Sackett King 1959). Fibrinogen was estimated

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Received for publication on 5-8-1972.

by method of Cullen and Vanslyke for separation of fibrinogen, the quantitative being done by a modified Biuret method (Nath 1970).

Results and Comments

The mean value of erythrocyte sedimentation rate was 10 mm/1st hour. in non-pregnant control group, 21 mm/1st hour. in the 1st trimester, 30 mm/1st hour in the 2nd trimester, 33 mm/1st hour in the 3rd trimester and 24 mm/1st hour in postpartum group. It is observed that the rise in erythrocyte sedimentation rate during pregnancy was gradual with highest values in the third trimester. In the 1st week of puerperium the values were lower than those of the third trimester, but higher than those of the controls and the first trimester. (Table I). On statistical analysis it has been seen that the difference in erythrocyte sedimentation rate values between controls and the first trimester of pregnancy is statistically significant. Similarly, a statistically significant rise in erythrocyte sedimentation rate is noted between the 1st and the 2nd trimesters of pregnancy. In the third trimester of pregnancy, though there is a rise in the erythrocyte sedimentation rate, the rise is not statistically significant. Similarly, there is a fall in erythrocyte sedimentation rate in the postpartum subjects, but the difference is insignificant at 1% level and is significant at 5% level (Table II). Rami *et al* (1962) found a statistically significant rise in erythrocyte sedimentation in the third trimester. They have explained it on the basis of the "Physiological anaemia" of pregnancy in these women as most of the cases in the 3rd trimester had a lower haemoglobin value as compared to those in the 1st or the 2nd trimesters. However, in the present study, the ery-

TABLE I
Haematological Observations in Different Trimesters of Pregnancy and Puerperium

	Normal Controls		First Trimester		Second Trimester		Third Trimester		Post Partum	
	Mean	± S.D.	Mean	± S.D.	Mean	± S.D.	Mean	± S.D.	Mean	± S.D.
Haemoglobin gm. %	11.4	± 1	9.7	± 0.59	9.4	± 0.53	9.6	± 0.77	9.8	± 0.67
T.R.B.C. m/C.mm.	4.1	± 0.13	3.87	± 0.49	3.87	± 0.21	3.86	± 0.26	3.78	± 0.40
T.W.B.C./mm.	5132	± 14.2	6500	± 11.95	6300	± 11.44	6700	± 12.73	5910	± 7.54
P.C.V. %	39	± 1.28	35	± 2.60	32	± 2.86	35	± 2.54	34	± 1.84
E.S.R. mm/1st hr.	10	± 1.33	21	± 5.57	30	± 8.48	33	± 9.08	24	± 7.54
T.S. Protein gm %	6.3	± 0.63	5.4	± 0.16	5.5	± 0.12	5.4	± 0.11	5.4	± 1.58
S. Albumin gm %	4.3	± 0.2	3.1	± 0.40	3.2	± 0.11	3.2	± 0.11	3.2	± 0.67
S. Globulin gm %	2.0	± 0.25	2.3	± 0.14	2.3	± 0.40	2.2	± 0.26	2.2	± 0.17
S. Cholesterol mgm %	140	± 5.92	148	± 4.08	152	± 17.63	180	± 14.03	165	± 4.12
Fibrinogen gm %	0.30	± 0.04	0.48	± 0.26	0.53	± 0.01	0.55	± 0.04	0.40	± 0.01

TABLE II
Changes in E.S.R. in Different Trimester of Pregnancy. Test of Significance

Item between	Diff. in Mean	S.E. of difference	2 SED	Remarks
Control and First Trimester	11	0.83	1.66	Significant at 1% level
First and Second Trimester	9	1.43	2.86	Significant at 1% level
Second and Third Trimester	3	1.76	3.52	Insignificant
Third Trimester and Post-Partum	9	2.12	4.24	Insignificant at 1% level, but, significant 5% level

throcyte sedimentation rate is altered in the different trimesters of pregnancy, though the values of erythrocyte sedimentation rate are presented after correction for anaemia. In different trimesters of pregnancy in the primipara and multipara it is observed that there is greater rise in erythrocyte sedimentation rate in the first trimester in multipara as compared to rise in primipara. However, there is a progressive rise in erythrocyte sedimentation rate in primipara in different trimesters and in the multipara a rise in subsequent trimesters is gradual. This may possibly be due to the fact that in the multipara the body reaction to the state of pregnancy is sudden and body immediately accommodates to the change. However in primipara there is a body reaction to the changed condition but the body does not accommodate itself to the changed circumstances and so the reaction is continued in the second trimester (Table III).

As for haemoglobin, the value was 11.4 gm% in normal controls, 9.7 gm% in the first trimester, 9.4 gm% in the second trimester, 9.6 gm% in the third trimester and 9.8 gm% in the postpartum subjects. The total red blood cell

TABLE III
Mean E.S.R. in Different Trimesters of Pregnancy in Primipara and Multipara

	Primipara	Multipara
	Mean \pm S.D.	Mean \pm S.D.
1st Trimester	17.0 mm \pm 4.979	22.7 mm \pm 6.006
2nd Trimester	29.0 mm \pm 7.252	27.0 mm \pm 7.87
3rd Trimester	33.7 mm \pm 5.866	35.3 mm \pm 6.044

count was 4.1 m/cmm in normal controls, 3.87 m/cmm in the first trimester, 3.87 m/cmm in the second trimester, 3.86 m/cmm in the third trimester and 3.87 m/cmm in the postpartum subjects. (Table I). It is observed that there is no significant change in haemoglobin percentage and red blood cell count in different trimesters of pregnancy. These results are in keeping with the observations of other workers. (Rami *et al* 1962; Ghosh *et al* 1948; Kothari *et al* 1950). Further it is seen that there is no significant correlation between red blood cells and erythrocyte sedimentation rate. This is because all the erythrocyte sedimentation values are expressed after correction for anaemia.

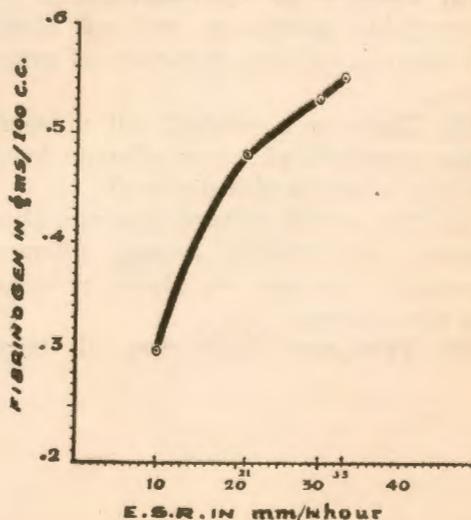
As for blood chemistry, total serum protein level was 6.3 gm% in normal control group, 5.4 gm% in the first trimester, 5.5 gm% in the second trimester, 5.4 gm% in the third trimester and 5.4 gm% in the post partum subjects. Serum albumin level was 4.3 gm% in normal controls, 3.1 gm% in the first trimester, 3.2 gm% in the second trimester, 3.2 gm% in the third trimester and 3.2 gm% in the postpartum subjects. Serum globulin level was 2.0 gm% in normal controls, 2.3 gm% in the first trimester, 2.3 gm% in the second trimester, 2.2 gm% in the third trimester and 2.2 gm% in the postpartum subjects (Table I).

It is observed that there is a gradual fall of total proteins and albumin level and rise in globulin level. However, the fall is not statistically significant. Kothari *et al* (1950) have estimated only total protein values in the third trimester. However, they have not done any serial studies in the other trimesters for total serum proteins, serum albumin and serum globulin.

The serum cholesterol level was 140 mgm% in the non-pregnant control group, 148 mgm% in the first trimester, 152 mgm% in the second trimester, 180 mgm% in the third trimester and 165 mgm% in the postpartum subjects. The overall picture of serum cholesterol concentration during different trimesters of pregnancy shows progressive rise to term. (Table I). Ghosh *et al* (1948) reported hypercholesterolaemia developing early in pregnancy and persisting throughout the period with the highest mean value at term. Fibrinogen level was 0.30 gm% in normal non-pregnant controls, 0.48 gm% in the first trimester, 0.53 gm% in the second tri-

mester, 0.55 gm% in the third trimester and 0.40 gm% in the postpartum subjects. It is observed that the fibrinogen level rises till term with a little fall in postpartum period. (Table I). This observation tallies well with the observation of Bhattacharya *et al* (1961). Rami *et al* (1962) have suggested that the main cause of elevated erythrocyte sedimentation rate in normal pregnancy is the change in fibrinogen content of the blood, hypovolaemia and anaemia. Analysing the data in the present study it was found that the rise in erythrocyte sedimentation rate and fibrinogen levels in different trimesters of pregnancy is statistically insignificant at 5% level but is significant at 10% level, ($t = 2.996$). This shows that the fibrinogen level affects the erythrocyte sedimentation rate values to some extent which is depicted in the curve diagram (Fig. 1).

• CURVE DIAGRAM SHOWING CORRELATION BETWEEN ERYTHROCYTE SEDIMENTATION RATE AND FIBRINOGEN DURING DIFFERENT PHASES OF PREGNANCY.



Graph I

Summary

A study of the erythrocyte sedimentation rate and some important chemical constituents of blood in the different trimesters of pregnancy is presented for hundred and fifty women, free from any clinical disorder, attending the antenatal clinic at Medical College and Hospital, Nagpur.

(1) It is observed that the rise in erythrocyte sedimentation rate during pregnancy is gradual with highest values in the third trimester. In the first week of puerperium the values are lower than those of the third trimester but higher than those of the controls and the first trimester. The values of erythrocyte sedimentation rate are presented after correction for anaemia.

(2) The rise in erythrocyte sedimentation rate in the first trimester is more in multipara as compared to the rise in primipara. There is a progressive rise in erythrocyte sedimentation rate in primipara in different trimesters and in multipara a rise in subsequent trimesters is gradual.

(3) There is no significant change in haemoglobin percentage and red blood cell count in different trimesters of pregnancy.

(4) There is a gradual fall of total serum proteins and serum albumin level and rise in serum globulin level.

(5) The overall picture of serum cholesterol concentration during different trimesters of pregnancy shows progressive rise to term.

(6) Fibrinogen level rises till term

with a little fall in the postpartum period. The fibrinogen level affects the erythrocyte sedimentation rate values to a limited extent.

Acknowledgement

The authors are grateful to the Dean for his interest, to Dr. S. C. Sen, Professor of Physiology, Corporation Medical College, Nagpur, for his criticism and suggestions and to Shri R. D. Mujumdar for the statistical analysis.

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