

# SERUM PROTEIN PROFILE IN NORMAL PREGNANCY AND IN RELATION TO PARITY

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**Summary :** Forty pregnant females of third trimester and their twenty non-pregnant controls were screened for Hb%, PCV and serum protein differentials in relation to parity. Paper electrophoresis method revealed significant rise in mean levels of serum  $\alpha_1$ ,  $\alpha_2$  and  $\beta$ -globulins in pregnant females as compared to non-pregnant controls, which may be due to the rise in pregnancy-associated-proteins. Radial immunodiffusion method revealed rise in mean serum IgM level with increasing parity, whereas a decrease in mean serum IgG level was observed which might be due to the placental membrane-transfer and/or decreased IgG synthesis. Haematological investigations revealed decreased Hb% and PCV which may have been caused both due to increased demand of nutrients as well as by haemodilution, associated with water retention during pregnancy.

**Key words :** serum proteins  
pregnancy

immunoglobulins  
parity

## INTRODUCTION

Alterations in serum protein levels are known to occur during the course of normal pregnancy (1-4). However, conflicting results have appeared in literature regarding the levels of serum immunoglobulins (1,2) and  $\alpha_2$ -globulins (2,5,6). Rise in serum IgG and IgM levels have been observed in several studies (1,2,7), while a few have described a constant (4, 8) or even a decreased (11) level. Regarding serum IgA levels, most studies have described no change (1,2,4,7,8) but quite a few have shown a slight rise (2) or a fall during pregnancy (9). Similarly, rise (6) as well as decrease (2) in serum  $\alpha_2$ -globulin levels have been described. All the investigators have found a decrease in serum albumin (2,4,6) and rise in  $\alpha_1$  and  $\beta$ -globulin (2, 6) levels with advancement of pregnancy.

No change in serum IgG (2, 8), IgA (2, 8) and IgM (10) in relation to increasing parity of mother has been described. On the contrary, a study (7) has described rise in IgG and decrease in IgA with increasing parity.

TABLE I : Haemoglobin and PCV in control and parity groups.

Groups	Mean $\pm$ S.D. Hb (gm%)	PCV (cc%)
Non-pregnant (n=20)	9.8 $\pm$ 1.6	38.5 $\pm$ 2.4
1st pregnancy (n=14)	8.9 $\pm$ 1.1	33.2 $\pm$ 2.8
3rd pregnancy (n=13)	*8.2 $\pm$ 1.4	*32.7 $\pm$ 4.7
5th pregnancy (n=3)	*8.4 $\pm$ 1.5	*33.3 $\pm$ 3.8
More than 36 weeks pregnancy (n=10)	*8.1 $\pm$ 1.2	*35.0 $\pm$ 4.5

\*significant difference when compared with non-pregnant females (P < 0.05)

*Biochemical findings* : Results of total serum proteins revealed higher mean values, in normal non-pregnant females when compared with 1st and 3rd pregnancy groups as well as in 3rd trimester group having 25th to 28th weeks of pregnancy.

Serum albumin estimations revealed higher mean values in non-pregnant females as compared to different parity groups. Lowest mean value was obtained in mothers with 3rd pregnancy. The mean value of serum albumin was lowest in 10 females with 33rd to 36th weeks of pregnancy and highest value was obtained in 10 females having >36 weeks of pregnancy. Moreover, significant differences were obtained between 3rd trimester groups (29th to 32nd weeks Vs 33rd to 36th weeks of pregnancy, Table II).

Results of  $\alpha$ -globulins revealed significantly higher mean values in all the groups of pregnant females when compared with mean value of non-pregnancy control subjects. No significant differences could however be found in results of  $\alpha_1$ -globulins between different parity groups. The highest mean value was observed at 29th to 32nd weeks of pregnancy. When  $\alpha_1$ -globulins were compared between different groups of 3rd trimester (Table II) also provided no significant differences.

Results of  $\alpha_2$ -globulins revealed significantly higher mean values in all the groups of pregnant females when compared with mean control value. However, no significant difference was observed in results of  $\alpha_2$ -globulins between different parity groups. The

TABLE II : Serum protein differentials in relation to parity and third trimester groups.

Serum proteins	Non-pregnant control (n=20)	Parity groups		Mean $\pm$ S.D. 5th (n=13)	Third trimester pregnancy			
		1st (n=14)	3rd (n=13)		25-28 wks (n=10)	29-32 wks (n=10)	33-36 wks (n=10)	>36 wks (n=10)
Total proteins (gm%)	7.85 $\pm$ 0.4	*7.3 $\pm$ 0.61	*7.5 $\pm$ 0.96	7.75 $\pm$ 0.97	*7.35 $\pm$ 0.94	7.5 $\pm$ 0.69	7.5 $\pm$ 0.68	7.5 $\pm$ 0.68
Albumin (gm%)	3.96 $\pm$ 0.55	*3.30 $\pm$ 0.37	*3.07 $\pm$ 0.97	*3.37 $\pm$ 0.57	3.26 $\pm$ 0.67	*3.35 $\pm$ 0.31	3.02 $\pm$ 0.88	3.4 $\pm$ 0.60
$\alpha_1$ -Globulin (gm)	0.33 $\pm$ 0.12	*0.47 $\pm$ 0.12	0.50 $\pm$ 0.10	*0.44 $\pm$ 0.09	*0.48 $\pm$ 0.06	*0.49 $\pm$ 0.13	0.45 $\pm$ 0.12	0.46 $\pm$ 0.11
$\alpha_2$ -Globulin (gm%)	0.56 $\pm$ 0.17	*0.84 $\pm$ 0.23	0.81 $\pm$ 0.26	*0.82 $\pm$ 0.14	*0.77 $\pm$ 0.17	*0.77 $\pm$ 0.1	0.97 $\pm$ 0.31	0.80 $\pm$ 0.19
$\beta$ Globulin (gm%)	0.83 $\pm$ 0.24	*1.16 $\pm$ 0.21	1.37 $\pm$ 0.32	*1.33 $\pm$ 0.25	*1.21 $\pm$ 0.21	1.16 $\pm$ 0.19	1.52 $\pm$ 0.24	1.24 $\pm$ 0.20
IgG (I.U./ml)	117.8 $\pm$ 4.32	*105 $\pm$ 10.87	*101 $\pm$ 6.64	107 $\pm$ 9.16	*106 $\pm$ 12.34	100 $\pm$ 6.56	108 $\pm$ 9.44	*102 $\pm$ 5.39
IgM (I.U./ml)	133.5 $\pm$ 17.12	137 $\pm$ 10.32	136 $\pm$ 13.78	*148 $\pm$ 15.34	125 $\pm$ 18.5	139 $\pm$ 12.75	138 $\pm$ 12.59	138 $\pm$ 9.78
IgA (I.U./ml)	166 $\pm$ 15.34	158 $\pm$ 9.19	166 $\pm$ 20.70	164 $\pm$ 13.97	161 $\pm$ 12.85	154 $\pm$ 12.36	166 $\pm$ 14.37	168 $\pm$ 20.25

\* P &lt; 0.05

mean value of  $\alpha_2$ -globulin was constant from 25th to 32nd weeks of pregnancy. At 33-36th weeks of pregnancy mean value of  $\alpha_2$ -globulin increased further and peak level was obtained.

Results of  $\beta$ -globulins revealed significantly higher mean values in all the groups of pregnant females when compared with mean control level. Mean  $\beta$ -globulins level was the highest in mothers of 3rd pregnancy. Significant difference was observed between 1st and 3rd pregnancies. The highest peak mean value of  $\beta$ -globulins was observed at 33-36th weeks of pregnancy and differences between successive weeks of pregnancy were all significant (Table II).

*Immunological findings* : Results of serum IgG estimation revealed significantly lower mean values in all the pregnancy groups when compared with mean control value. The mean IgG value was lowest in mothers with 3rd pregnancy. No significant differences could be found between results of IgG between different parity group (Table II).

Results of mean serum IgG levels were significantly lower in all the groups of 3rd trimester pregnancy when compared with control mean value (Table II).

Results of serum IgM estimations revealed significantly higher mean values in mothers with 5th pregnancy when compared with mean control level. Mean value of IgM in mothers with 5th pregnancy was also significantly higher when compared with mean levels of 1st and 3rd pregnancy (Table II). Results of serum IgM revealed higher mean values in 29-32nd weeks, 33-36th weeks and more than 36 weeks of pregnancy, when compared with mean control level. Mean value of IgM rose from 25-26th weeks group to 28-32nd weeks of pregnancy groups, afterwards mean values remained practically constant upto the term of pregnancy.

IgA levels did not show any difference between different parity groups or between different groups of 3rd trimester.

## DISCUSSION

The interesting finding of this study was the detection of relatively lower levels of mean Hb% and PCV in multiparous mothers as compared to prima-gravidae. This observation suggests that multiple pregnancies may lead to deficiencies in trace metals (Fe, Cu, etc.) and vitamins (folic acid, B<sub>12</sub> and others). Consequently, multiple pregnancies may lead to nutritional anaemia. Moreover, lowering of mean Hb% and PCV with advancement of pregnancy may have been caused due to increased demand for nutrients as well as due to haemodilution.

Another important finding of this study was the detection of increased levels of  $\alpha_1$ ,  $\alpha_2$  and  $\beta$ -globulins during normal pregnancy. Similar rise has been observed in an earlier study (15). Rise in  $\alpha_1$ -globulin may be due to increased production of  $\alpha_1$ -feto-protein (APP) which is known to perform immunoregulatory functions (16). Several pregnancy-associated proteins (PAP), e.g. human placental lactogen (hPL), pregnancy-associated plasma protein (PAPP)-A are known to move in  $\alpha_2$  range (17). Both of these (hPL & PAPP-A) are synthesized by syncytiotrophoblast of placental tissue (18,19). It is believed that hPL regulates foetoplacental transfer of nutrients (20), while PAPP-A regulates the tonicity of blood vessels.

Highest mean  $\beta$ -globulin level was detected during 3rd pregnancy and this rise could have been due to the production of several PAP, e.g. Shwangers proteins (SP1), PAPP-B and/or placental protein (PP)-5. SP1 is probably the first PAP which makes its appearance in maternal serum just after ovulation (21) and its level increases with increase in placental mass and its maximum concentration is obtained near-term (22). Similarly, maximum level of PAPP-B is also detected near-term. Increased coagulability of blood during pregnancy may be due to rise in another protein-PP5 (23).

Another interesting finding of this study was the detection of lower levels of IgG in sera of pregnant mothers. Pregnancy is known to be associated with placental membrane transfer of IgG and physiological haemodilution. Both these factors might have contributed to this fall.

Results of estimation of IgM revealed significantly higher mean values in sera of mothers with 5th pregnancy when compared to other groups. On the contrary, earlier worker(8) had found decreasing IgM levels with rise in parity.

Serum IgA estimation revealed insignificant differences in various parity-groups which suggests that inspite of physiological haemodilution, no change occurs in serum IgA concentration, this observation suggests that during pregnancy, increased IgA synthesis occurs which is masked due to water-retention.

Thus the results of this study suggest that changes in serum protein occur during pregnancy which may play a significant role in growth and survival of developing foetus.

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