

The complements and immunoglobulins in different media of healthy pregnant women and in pregnant women with increased blood pressure

B. ROSIĆ - V. ŠULOVIĆ - N. JUŽNIĆ - B. LAZAREVIĆ
D. MILAČIĆ - M. VIDANOVIĆ

Summary: We have determined the levels of complement C 3, C 4 and immunoglobulin G, M, A in mothers' and cord blood serum. Parallely properdin factor B and immunoglobulin G tests were done in urine samples. All estimations were performed on Immunochemistry Analyzer "Beckman". The investigations were made on 30 healthy pregnant women and 30 with arterial hypertension at the end of third trimester.

In the mothers' serum C 3 was not significantly changed. In the cord blood of healthy pregnant women it was 0.69 g/L. (SD 0.12) and in those with hypertension 0.38 g/L. (SD 0.15), which means significantly decreased. Complements C 4 was not significantly increased in mothers' and cord blood serum. Properdin factor B was significantly increased in mothers' and cord blood serum (healthy pregnant women in serum 0.38 g/L., SD 0.07; with hypertension 0.48 g/L., SD 0.15; while in the cord blood serum of healthy women it was 0.14 g/L., SD 0.06; and hypertensive it was 0.22 g/L., SD 0.10). The same parameter was significantly decreased in the urine of healthy subjects 3.94 mg/L., SD 1.91; and in the hypertensive too, 2.42 mg/L., SD 0.90.

The IgG level was significantly increased in the urine of healthy pregnant women 4.42 mg/L., SD 2.24; with hypertension 6.64 mg/L., SD 3.61.

IgM was not significantly changed in mothers' and cord blood serum.

IgA was significantly increased in the cord blood serum of healthy mothers', 0.02 g/L., SD 0.01, with hypertension 0.12 g/L., SD 0.05.

Key words: complements; immunoglobulins; hypertension; pregnancy.

Arterial hypertension is a serious condition, whose occurrence during pregnancy requires special treatment during the whole period of pregnancy. The most frequent cause is essential hypertension (80-85%), with significant genetic predisposition, as a consequence of changes in the adrenal cortex and mineralocorticoids. Re-

cent investigations prove that the disturbance is at the level of mediators in the system renin - angiotenzin II, aldosterone and catecholamines with changes of sodium and potassium ion levels.

The wide use of contraceptives has brought attention to a new type of hypertension, which is a consequence of the administration of oral contraceptives and depends on the renal pressor system. The estrogen component of these drugs increase the level of angiotensinogen, and al-

though renin itself is not always increased, an increase of angiotensin occurs. When a patient stops taking oral contraceptives, components of the renal pressor system return to normal levels and hypertension disappears.

Many Authors believe that arterial hypertension is the symptom which has the worst effect on the fetoplacental unit. Changes found in hypertension, consist of endarteritis and spasm of the small arteries, the flow in the intervillous compartments is slower, which causes disturbances in the fetoplacental circulation, and hypoxia of the fetus. If the insufficiency of the placenta and latent hypoxia of the fetus are proved, there is indication for the termination of pregnancy before term. (1, 2, 3, 4).

Thaler and 5 co-workers found that obese women suffer twice as often from hypertension during pregnancy than those with normal weight. Published data show that among fat women 50% have high blood pressure and in 10% proteinuria and preeclampsy occurs.

In the Royal Hospital College in London Griffin *et al.* (6), followed 102 pregnant women (in the third trimester) of whom 55 had high risk pregnancy as a consequence of high blood pressure. Therefore, he came to the conclusion that younger fetuses are more susceptible to hypoxia, while the fetus in the third trimester has higher reserves and is more capable of overcoming slight hypoxia. The same was proved by the experimental work of Genbačev and Šulović (7).

Realizing the importance of arterial hypertension in pregnancy, we decided to investigate the values of the most important specific proteins of complements and immunoglobulins during pregnancy.

MATERIAL AND METHODS

The investigations were made on two groups of pregnant women. In the first group we had 30 healthy pregnant women between 23 and 31

years of age with normal blood pressure during the entire pregnancy. In the second group we had the same number of patients aged between 25 and 33 years, with high blood pressure during the entire pregnancy, but without other complications. From both groups blood samples were taken at the end of the third trimester. We evaluated complement C3 and C4 as well as properdin factor B. We also determined IgG, IgM and IgA. Complements C3, C4 and immunoglobulins IgM, and IgA were determined in the mothers' serum and umbilical cord blood serum, and properdin factor B and IgG in urine too.

The method applied was laser nephelometry, done by Immunochemistry Analyzer-Beckman. The statistical parameters we used were Student-t test and correlation analyses.

RESULTS

Table 1 shows the values obtained for complements C3, C4 and properdin factor B.

From Table 1 we can see that in the sera of healthy pregnant mothers the value for C3 was 1.38 g/L., SD 0.38, while those with hypertension 1.37 g/L., SD 0.19. The values for the same parameter in the umbilical cord blood serum of the first group was 0.69 g/L., SD 0.12, while in the second 0.38 g/L., SD 0.15. A decrease in umbilical cord blood serum is obvious, so we assume that it is a consequence of disturbance of blood flow in the uteroplacental and fetoplacental circulation. This means that arterial hypertension is a dominant symptom which has caused the blood flow disturbance (8).

The values for complement C4 were slightly increased in the sera of women with arterial hypertension (healthy pregnant women 0.25 g/L., SD 0.08, with arterial hypertension 0.34 g/L., SD 0.13), and with no changes in umbilical cord blood serum.

Investigating the values of complement C3 and C4 (according to the trimester) in healthy pregnant women Cauchi (9) found a slight increase in the third trimester.

Table 1. - Levels of C3, C4 and properdin factor B in healthy pregnant women and with increased blood pressure.

Sample		Healthy pregnant women N/30			Pregnant women with increased blood pressure N/30			
		\bar{x}	SD	KV	\bar{x}	SD	KV	
C 3	Material serum	g/L	1.38	0.38	28.10	1.37	0.19	14.30
	Umbilical cord blood serum	g/L	0.69	0.12	18.20	0.38	0.15	41.10
C 4	Material serum	g/L	0.25	0.08	32.30	0.34	0.13	40.40
	Umbilical cord blood serum	g/L	0.11	0.03	33.10	0.12	0.04	39.00
PFB	Material serum	g/L	0.38	0.07	20.20	0.48	0.15	32.70
	Umbilical cord blood serum	g/L	0.14	0.06	43.10	0.22	0.10	45.50
	Urine	mg/L	3.94	1.91	48.60	2.42	0.90	37.40

In the mothers sera we found a significant increase for properdin factor B (healthy pregnant women 0.38 g/L., SD 0.07, with hypertension 0.48 g/L., SD 0.15), as well as in umbilical cord blood serum (healthy mothers 0.14 g/L., SD 0.06; with hypertension 0.22 g/L., SD 0.10), while in urine we had a significant decrease (healthy pregnant women 3.94 mg/L., SD 1.91, with hypertension 2.42 mg/L., SD 0.90).

Table 2. - Correlation coefficient (r) for C3, C4 and properdin factor B in different body fluids.

SAMPLE	Healthy pregnant women N/30		Pregnant women with increased blood pressure N/30		
	r	Sig.	r	Sig.	
C3	Material serum-				
	Umbilical cord blood serum	0.12	N.S.	0.01	N.S.
C4	Material serum-				
	Umbilical cord blood serum	0.54	p<0.05	0.42	N.S.
PFB	Material serum-				
	Umbilical cord blood serum	0.05	N.S.	0.17	N.S.
	Urine	0.37	N.S.	0.10	N.S.

Table 2 presents the value for the coefficient of correlation - r.

From Table 2 we see that there is a significant correlation between mothers serum and umbilical cord blood serum for complement C 4. 0.54 p<0.05, healthy pregnant women.

On Table 3 values for immunoglobulins are presented.

From Table 3 we could see that in mothers sera and umbilical cord blood serum there were no statistically significant changes for IgG, while in the urine we found a significant decrease. In the urine of healthy pregnant women 4.42 g/L., SD 2.24; and in those with hypertension 6.64 g/L., SD 3.61. So, there was a slight decrease for IgG in umbilical cord blood (healthy subjects 10.12 g/L., SD 1.49; with hypertension 9.21 g/L., SD 0.96), while the concentrations of other immunoglobulins in the same samples was significantly increased (healthy pregnant women in umbilical cord blood IgM - 0.26 g/L. SD 0.22; IgA 0.02 g/L., SD 0.01, with hypertension IgM - 0.42 g/L., SD 0.21, IgA - 0.12 g/L., SD 0.05).

It may be, according to Williams⁽¹⁰⁾ a consequence of the mothers enzymatic

Table 3. - Levels of IgG, IgM and IgA in healthy pregnant women and those with increased blood pressure.

	Sample	Healthy pregnant women N/30			Pregnant women with increased blood pressure N/30		
		\bar{x}	SD	KV	\bar{x}	SD	KV
IgG	Maternal serum g/L	9.05	1.27	14.20	9.13	1.28	14.10
	Umbilical cord blood serum g/L	10.12	1.49	14.80	9.21	0.96	10.50
	Urine mg/L	4.42	2.24	50.70	6.64	3.61	54.40
IgM	Maternal serum g/L	1.53	0.53	35.00	1.46	0.76	52.20
	Umbilical cord blood serum g/L	0.26	0.22	82.90	0.42	0.21	50.60
IgA	Maternal serum g/L	1.84	0.67	36.70	1.66	0.53	31.50
	Umbilical cord blood serum g/L	0.02	0.01	44.20	0.12	0.05	41.70

mechanism which pumps IgG into the fetal circulation (and which is increased especially before term), so that mothers can prepare the child for the first days of its life until it is capable of producing its own IgG. Others believe that the increase of IgG is a consequence of hemoconcentration or a tendency to concentrating the equilibrium between mothers serum and umbilical cord blood serum, or maybe some other still unknown factors.

Table 4. - Correlation coefficient (*r*) for IgG, IgM and IgA in different body fluids.

SAMPLE	Healthy pregnant women N/30	Pregnant women with increased blood pressure N/30
IgG	Maternal serum- Umbilical cord blood serum	0.52 p<0.05
	Maternal serum- Urine	0.15 N.S.
		0.57 p<0.05
IgM	Maternal serum- Umbilical cord blood serum	0.07 N.S.
		0.50 p<0.05
IgA	Maternal serum- Umbilical cord blood serum	0.15 N.S.
		0.40 N.S.

In Table 4 the values for the coefficient of correlation - *r* for immunoglobulins are presented.

From Table 4 we can see a significant correlation for IgG between mothers serum and umbilical cord blood serum (0.52 p<0.05) healthy pregnant women and with hypertension (0.57 p<0.05).

There is a significant correlation for IgM between mothers serum and umbilical cord (0.50 < p<0.05) in pregnant women with increased blood pressure.

CONCLUSION

By investigating complements C 3, C 4 and immunoglobulins M and A in mothers and cord blood sera and also IgG and properdin factor in urine we found significant changes. Therefore we think that these investigations should be continued by including other specific proteins, which will be the subject of our further investigations.

REFERENCES

- 1) Gollery E. D., Raftos J., Gyory A. Z., Wells J. V.: "A prospective study of serum complement (C 3 and C 4) levels in normal human pregnancy: effect of the development of pregnancy associated hypertension". *Aust. N.Z. J. Med.*, 11 (3), 243, 1981.

- 2) Faulk W. P., Jarret R., Keane M., Johnson P. M., Boakle R. J.: "Immunological studies of human placentae: complement components in immature and mature chorionic villi". *Clin. Exp. Immunol.*, 40 (2), 299, 1980.
- 3) Bendster B., Wood E. J.: "Immunoglobulin levels in normal pregnancy and pregnancy complicated by hypertension". *J. Obst. Gyn. Cwib.*, 76, 41, 1970.
- 4) Symonds E. M., Andersen G. J.: "The effect of bed rest on plasma renin in hypertensive disease of pregnancy". *J. Obst. Gyn. Brit. Cwib.*, 81, 676, 1974.
- 5) Thaler J., Goodman J. D., Dames G. S.: "Effects of maternal cigarette smoking on fetal breathing and fetal movement". *Amer. J. of Obst. Gyn.*, 138, 282, 1980.
- 6) Griffin D.: "Fetal activity". *Progress in Obst. Gyn.* Churchill Livingstone, London, 4, 92, 1984.
- 7) Genbačev O., Šulović V.: "The in vitro biosynthetic capacity of placenta in EPH gestosis dynamic tests". Current status of EPH gestosis, edited by A. Kurjak, E. T. Rippman, V. Šulović, Excerpta medica, Amsterdam, Oxford, Princetown, 11-19, 1981.
- 8) Hadi H. A.: "Fetal cerebral maturation in hypertensive disorders of pregnancy". *Obst. Gyn.*, 2, 214, 1984.
- 9) Cauchi M. N., Gilbert G. L., Brown B. J.: "The clinical pathology of pregnancy and the newborn infant". Edward Arnold, London, 154-172, 1984.
- 10) Williams R. C., Gershowitz H.: "IgG levels in mother - father cord trios. Evidence for a large reduction of maternal IgG at birth". *Vox Sang.*, 37, 103, 1979.

Address reprint requests to:
Prof. V. SULOVIĆ
Dept. of Obstetrics and Gynecology
University of Belgrade
Visegradska, 26
11000 Beograd - Yugoslavia