ESTIMATION OF MATERNAL SERUM HEAT STABLE ALKALINE PHOSPHATASE IN NORMAL PREGNANCY AND PREGNANCY WITH PRE ECLAMPTIC TOXAEMIA

by

A. K. Bhattacharjee

and

M. P. Gogoi

SUMMARY

HSAP was estimated in 68 normal and 63 women with PET. There was a gradual rise in HSAP from 12 to 40 weeks. There was fall in HSAP level after 40 weeks. There was abrupt fall immediately after delivery.

Introduction

Heat stable alkaline phosphatase (HSAP) was estimated in 68 normal pregnant women and 63 women with pre-eclamptic toxaemia (PET). The measurement of this enzyme is comparatively an easy and simple and cheap procedure to know the placental function.

Material and Methods

The study was carried out in the Department of Obstetrics and Gynaecology, Gauhati Medical College during 1977-80.

HSAP was estimated in 68 normal pregnant women at different period of gestation and out of which in 23 cases serial estimation of the enzyme was done (more than 3 occasions during the course of pregnancy). Out of 63 cases of PET serial enzyme estimation was done in 15 cases. In 8 cases cord blood was estimated for HSAP. Estimation of the enzyme was done during puerperium on the 1st, 2nd, 3rd, 5th and 7th post partum days and at the end of 6 weeks in 5 normal cases. Sera from 10 healthy males and 10 normal non-pregnant women were tested for HSAP. Enzyme was estimated in maternal serum and cord blood in 8 cases.

Cases were selected from O.P.D. as well as indoor. Patients with doubtful L.M.P., multiple pregnancy, diabetes mellitus, Rh. incompatibility were ecxluded. After delivery weight of the baby and placenta were taken.

5 ml. of venous blood was collected and serum was separated. The serum was first heated for 30 minutes at 65°C, and then allowed to cool. HSAP was estimated by Bodansky incubation procedure with slight modification by Fiske and Subha Rao method (1933). Estimation was done within 3 hours from collection of blood sample. In normal group, 19 were primigravidas, 46 multigravidas and 3 grand multiparas.

From: Department of Obstetrics and Gynaecology, Gauhati Medical College, Gauhati.

Accepted for publication on 4-3-85.

Results and Observations

It was seen that serum of males and non-pregnant females (10 cases each) showed absence of HSAP.

The enzyme levels in all the different maternal age groups and different socio-economic status were almost similar at any particular period of gestation and during labour ($P > 0.05$ in all cases).

The levels of the enzyme HSAP are also almost similar in women with different parity at any particular period of gestation and during labour.

During 1st post partum day, 63% fall in the maternal serum HSAP was noticed, compared to the level attained during labour. The fall thereafter was gradual and was nil at the end of 6 weeks.

No statistically significant difference ($P > 0.05$) in the maternal serum enzyme level was observed in relation to the sex and weight of the child born.

The HSAP level in cord blood was significantly low compared to the maternal serum levels during labour.

The relation of maternal serum HSAP to placental weight was stastically not significant.

Unlike normal pregnancy the enzyme level rises in PET even after 41 weeks, but this increase is statistically not significant between 39-40 and 41 weeks ($P > 0.05$). The llevel during labour is also not significantly higher than that during 39-40 weeks ($P > 0.05$). As in normal pregnancy the rise in the enzyme level

TABLE I

HSAP Levels in Normal Pregnancy at Different Periods of Gestation and during Labour

Duration of pregnancy (weeks)	No. of cases	HSAP in B.U. range	100 ml. Mean	Serum S.D.	't' test analysis
0-12	10	0.12-0.5	0.28	0.11	P <0.01
13-28	10	0.2-0.98	0.51	0.22	
29-32	12	0.58-1.7	1.15	0.32	P <0.001
33-34	11	0.58-1.82	1.3	0.33	P >0.05)
35-36	19	1.2-2.35	1.69	0.26	P <0.01
37-38	15	1.8-2.83	2.4	0.4	P <0.001
39-40	13	1.8-3.6	2.6	0.43	P >0.05)
41 & above	6	1.5-2.9	2.07	0.52	P <0.05
Labour	20	1.6-5.8	3.2	0.9	P <0.05

TABLE II

Level of HSAP at Different Periods of Gestation and During Labour in PET Cases

Duration of pregnancy (weeks)	No. of cases	Serum HSAP in B.U. /100 ml. in severe PET		No. of cases	Serum HSAP in B.U. /100 ml. in mild PET	
		Mean	S.D.		Mean	S.D.
29-31	12	1.73	0.34	3	2.9	0.34
35-36	8	2.18	0.5	3	3.22	0.87
37-38	19	2.75	0.54	6	4.35	1.74
41 & above	7	3.66	0.54	—	—	—
Laour	9	3.17	0.3	—	—	—

from 37-38 weeks to 39-40 weeks is not significant ($P > 0.05$).

Comparing Tables I and II, it is found that enzyme level in PET is significantly higher than normal pregnancy at corresponding weeks of pregnancy. The enzyme levels of severe PET are also significantly higher than those of mild PET, at corresponding periods of gestation ($P > 0.05$).

normal level observed in the present study was also observed by Sinha (1978) and Goswami (1979) from the same laboratory. The fall in the enzyme level after 40 weeks is due to placental aging resulting in fall in the enzyme synthesis. The rise during labour has been attributed to the release of large quantities of enzyme into the blood due to uterine contractions. The abrupt fall of the enzyme

TABLE III

Pattern of Rise in the Level of HSAP in the 5 Normal Cases who Developed PET at a Later Date

Case No. (normal)	HSAP in B.U./100 ml. of serum						
	13-28 weeks	29-32 weeks	33-34 weeks	35-36 weeks	37-38 weeks	39-40 weeks	Labour
54	0.62	1.33	—	2.7	2.9	—	—
55	—	1.24	1.3	2.9	3.1	—	3.5
61	—	1.2	1.4	2.5	3	—	—
62	—	1.15	1.32	2.8	3.1	—	—
63	—	1.12	1.38	2.75	—	3.12	—

Sudden and abnormal rise of serum HSAP preceeds the clinical onset of PET by about 2 weeks. The sudden rise of HSAP level at 35-36 and 37-38 weeks were higher than the highest normal mean value at those periods of pregnancy.

It was also observed that the level of serum HSAP fluctuates with the fluctuation of the clinical condition to toxaemia the level falling with the clinical improvement and rising up with the deterioration of the clinical condition.

Discussion

Peter and Parihar (1968); Gupta *et al* (1969); Tewari and Khanchandani (1971); Kapoor and Mehta (1973); Rana *et al* (1975) and Agarwall and Bedi (1980) also observed a gradual rise in the maternal serum HSAP from 12 weeks upto 40 weeks and a fall thereafter. The low level after delivery is due to removal of placenta from the body and the gradual fall thereafter is due to gradual excretion of the enzyme from the body.

Rana *et al* (1975); Peter and Parihar (1968) and Kerleau *et al* (1939) also observed significantly low cord blood enzyme level.

Peter and Parihar (1968); Kapoor and Mehta (1973) and Tewari *et al* (1980) also observed the rise of maternal serum HSAP with the progress of pregnancy in mild and severe PET cases. The insignificant difference in the enzyme level during labour in normal and PET cases was also observed by Mitra and Joshi (1976).

In PET cases due to degenerative changes in the placenta more enzyme escapes into the maternal circulation leading to its increased level in the maternal serum. It is not because of the increase

in the production of the enzyme by the damaged placenta in this disease condition.

Conclusion

The enzyme HSAP is pregnancy specific. The estimation of this enzyme level in the maternal serum may be used as a diagnostic and prognostic test for pre eclamptic toxaemia. This will enable us to adopt immediate measures for controlling the cases of toxaemia and thus to achieve a better foetal prognosis apart from reducing the maternal morbidity during pregnancy.

Acknowledgement

We express our gratitude to the Principal and Superintendent, Gauhati Medical College and Hospital for allowing us to use the hospital records.

References

1. Agarwal, S. and Bedi, V. R.: J. Obstet. Gynaec. India. **30**: 248, 1980.
2. Goswami, R. K. (1979): Thesis submitted to the Gauhati University for M.D. (Biochemistry).
3. Gupta U., Gupta, A. K. and Mital, V. K.: J. Obstet. Gynaec. India. **19**: 700, 1969.
4. Kapoor, U. and Mehta, H. C.: Ind. Jr. Med. Res. **61**: 749, 1973.
5. Kerleau, J. C. and Cayla, J. (1939): Quoted by Mc. Master Y. Tennant R., Clubb J. S., Neal F. C. and Posen S.: J. Obstet. Gynaec. Brit. C'Wlth. **71**: 735, 1964.
6. Mitra, R. and Joshi, L. D.: J. Obstet. Gynaec. India, **26**: 391, 1976.
7. Peter, E. and Parihar, T.: J. Obstet. Gynaec. India, **18**: 9, 1968.
8. Sinha, N. (1978): Thesis submitted to the Gauhati University for M.D. (Biochemistry).
9. Tiwari, P. and Khanchandani, K. C.: J. Obstet. Gynaec. India, **30**: 76, 1980.
10. Rana, J., Malkani, P. K. and Buckshree, K.: J. Obstet. Gynaec. India, **25**: 151, 1975.