# LEUCINE AMINOPEPTIDASE ACTIVITY IN MATERNAL AND CORD BLOOD IN NORMAL PREGNANCY AND TOXAEMIA OF PREGNANCY

by

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*Introduction*

The enzymes produced by placenta are of special interest to obstetrician for assessing placental function. Aminopeptidases, a group of intracellular enzymes, which comprises of cystine aminopeptidase and leucine aminopeptidase (LAP) show moderate increase in pregnancy. LAP is also present in small amount in the sera of non-pregnant women, while cystine aminopeptidase is specific to pregnancy. LAP is increased during pregnancy and very high levels were reported in last trimester by various workers. (Green *et al* 1955, Arst *et al* 1959 and Miller *et al* 1964). Abnormally high levels of LAP in maternal blood and placenta in cases of toxaemia of pregnancy reported by Ibrahim *et al* (1976) were thought to be of placental origin with spill over to peripheral blood as a result of its infarction and degeneration so common in toxaemia of pregnancy.

*Material and Methods*

The present study was conducted on 71 cases which were selected from Gynaecological Out Patient, Antenatal clinics, Obstetric Wards, Medical and para-medical personnel of J.N. Medical College Hospital, Aligarh. All the subjects were thoroughly examined with special care to exclude any hepatic or pancreatic disorder with appropriate laboratory investigation. For analysis of the results the patients were grouped as follows:

| | |
|---|---|
| Grou I Control | |
| Non-pregnant women | — 21 cases |
| Group II Normal pregnant | — 20 cases |
| A. 30-36 weeks | — 10 cases |
| B. 37-40 weeks | — 10 cases |
| Group III Toxaemia of pregnancy | — 30 cases |
| A. Mild P.E.T.* i.e. with hypertension diastolic blood pressure (B.P.) below 100 mm of Hg.) pedal oedema, but no albuminuria | — 10 cases |
| B. Moderate and severe P.E.T. i.e. with hypertension (diastolic B.P. 100 mm of Hg. or more), pedal oedema and albuminuria, (1-5 grams per litre) | — 10 cases |
| C. Eclampsia: All cases in this group were emergency admission and had fits before coming to hospital. The B.P. in these cases was above 150/110 mg. of Hg. with pedal oedema and albuminuria (More than 5 gram/litre) | — 10 cases |

*P.E.T.—Pre-Eclamptic Toxaemia.

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Maternal blood was collected before the onset of labour, while cord blood was taken immediately after delivery and the placental weight was also recorded. 4.5 ml. of blood was drawn in dry sterilised glass syringe, serum separated and subjected to LAP estimation which was done by the method of Goldberg *et al* (1959) and results were expressed in Sigma Units (S.U.).

*Observation*

Present study comprised of 71 cases which included 21 controls, 20 normal pregnant and 30 cases of pregnancy toxaemia. Maternal and cord blood LAP values of normal pregnant group and toxaemia group were statistically analysed (in accordance with period of gestation) and compared amongst themselves and also with those of control subjects. Maternal blood LAP values were correlated with placental weight and outcome of pregnancy. The results of analysis are given in the following Tables.

*Discussion*

The present study is an attempt to evaluate the clinical applicability of LAP estimation in toxaemia of pregnancy. In the present study, there is significant increase in levels of serum LAP during pregnancy as compared to those in non-pregnant controls and highest values were obtained at term (Table I). Similar trend was reported by Arst *et al* (1959) and Miller (1964). The maternal blood values of LAP in cases of mild, moderate and severe P.E.T. and eclampsia showed a significant elevation when compared with corresponding value in normal pregnancy (Table I). There is significant elevation in values with severity of disease and highest values were obtained in eclampsia. However, Ibrahim *et al* (1976) reported significant rise of LAP activity only in severe toxaemia cases as compared to normal pregnant group but rise with severity of disease was in conformity with present observation. The rise of LAP during pregnancy may be due to hydrolysis of substrate by oxytocinase as subtrate is common for both the enzyme (Page *et al* 1961). However, according to Ibrahim *et al* (1976) the rise of LAP during pregnancy may be due to increased levels of this enzyme in placenta and abnormally high levels in toxaemia is a result of infarction and degeneration of placenta so common in toxaemia of pregnancy (Young, 1913-14).

The cord serum LAP levels in normal pregnant group is near those in controls (Table I). However, the values in case of moderate and severe toxaemia and eclampsia showed a significant elevation when compared with control group, while elevated values in eclampsia cases were only statistically significant when compared with corresponding normal pregnant group. Ibrahim *et al* (1976) also recorded only significant elevation in severe P.E.T. when compared with cord serum values of normal pregnant group. The cord serum levels of LAP were not greatly affected in toxaemia indicating that the enzyme may not cross the placental barrier.

The study of placental weight (Table II) showed only significant lowering of weight in moderate and severe P.E.T. and eclampsia when compared with normal pregnant group which is consistent with the findings of Halder *et al* (1973). Rise in serum LAP was inversely related to

TABLE I

*Mean LAP Values in Maternal and Cord Blood in Different Groups and Their Statistical Analysis*

| Groups | Number of cases | Mean LAP values in Sigma Units (S.U.) | | Comparison between the groups | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Maternal Blood | | | Cord Blood | | |
| | | Maternal Blood | Cord Blood | Groups | Value of t | Df | Groups | Value of t | Df |
| Group I Control non-pregnant | 21 | 2.75 ± 0.55 | — | — | — | — | — | — | — |
| Group II (normal pregnant) | | | | | | | | | |
| A. 30-36 wks. | 10 | 6.41 ± 1.47 | 2.89 ± 0.569 | I & IIA | 10.666** | 29 | I & IIA | 0.651 (N.S.) | 29 |
| B. 37-40 wks. | 10 | 9.97 ± 1.865 | 3.18 ± 0.524 | I & IIB | 16.48** | 29 | I & IIB | 2.05 (N.S.) | 29 |
| | | | | IIA & IIB | 4.76** | 18 | | | |
| Group III Toxaemia pregnancy | | | | | | | | | |
| A. Mild P.E.T. | 10 | 12.3 ± 2.305 | 3.17 ± 0.48 | IIB & IIIA | 2.49* | 18 | I & IIIA | 2.05 (N.S.) | 29 |
| B. Moderate P.E.T. | 10 | 21.16 ± 2.248 | 3.58 ± 0.349 | IIB & IIIB | 12.117** | 18 | I & IIIB | 4.32* | 29 |
| C. Eclampsia | 10 | 25.31 ± 2.483 | 3.67 ± 0.249 | IIA & IIIC | 20.726** | 18 | I & IIIC | 4.95** | 29 |
| | | | | IIIA & IIIB | 8.699** | 18 | I & III (A+B+C) | 3.35** | 29 |
| | | | | IIIB & IIIC | 3.92** | 18 | IIB & IIIA | 0.179 (N.S.) | 18 |
| | | | | | | | IIB & IIIB | 1.88 (N.S.) | 18 |
| | | | | IIIA & IIIC | 12.142** | 18 | IIA & IIIC | 8.04** | 18 |

t—Comparison between the groups made by testing the difference of means with the help of student t. df—Degree of freedom. P.E.T.—Pre-Eclamptic Toxaemia. N.S.—Not Significant. *—Significant at 5% level. **—Highly significant at 1% level.

TABLE II

*Mean Placental Weight in Different Groups and Comparison of Placental Weight of Normal Pregnant Cases With Different Degrees of Toxaemia*

| Groups | Number of cases | Mean weight in grams | Comparison of different groups | Value of t | wf |
|---|---|---|---|---|---|
| Group II (Normal Pregnant) | | | | | |
| A. 30-36 weeks | 10 | 405 ± 0.03 | — | — | — |
| B. 37-40 weeks | 10 | 455 ± 0.056 | — | — | — |
| Group III | | | | | |
| A. Mild P.E.T. | 10 | 449 ± 0.071 | IIB & IIIA | 1.472 N.S. | 18 |
| B. Moderate & severe P.E.T. | 10 | 407 ± 0.046 | IIB & IIIB | 2.13* | 18 |
| C. Eclampsia | 10 | 350 ± 0.046 | IIA & IIIC | 3.179** | 18 |

placental weight (as represented in Dotogram Fig. 1). The coefficient of correlation (-.932, Table III) is statistically signi-

TABLE III

*Co-relation Co-efficient in Mild, Moderate and Severe P.E.T. and Eclampsia Cases Between Maternal Blood LAP and Placental Weight*

| | | |
|---|---|---|
| Mild P.E.T. | LAP (Sigma Units) | Placental weight 0.3040 (10) |
| Moderate and severe P.E.T. | LAP (Sigma Units) | —0.3918 (10) (N.S.) |
| Eclampsia | LAP (Sigma Units) | —0.932 (10) |

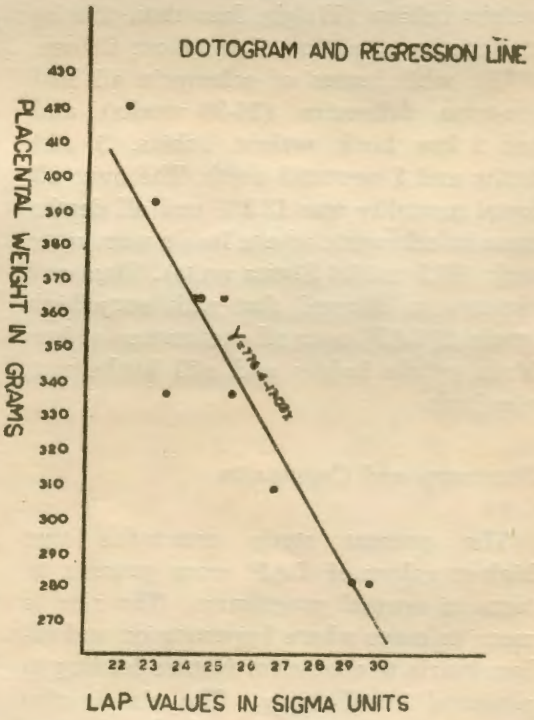
Regression Co-efficient of Y on X in cases of Eclampsia

| Y | X | byx |
|---|---|---|
| Placental weight (Grams) | LAP (Sigma Units) | —17.03 |

ficant. The regression line (Fig. 1) is obtained and indicates that one unit rise of LAP is indicative of lowering of 17.03 gm of placental weight.

FIG.1

DOTOGRAM AND REGRESSION LINE




*Outcome of Pregnancy*

In the present study, all the cases of mild, moderate and severe toxaemia had

TABLE IV

*Outcome of Pregnancy in Relation to Maternal Blood LAP*

| Groups | Term of Pregnancy | No. of cases | LAP (Sigma Units) | Term deliveries | Low birth weight babies | Still birth | Neonatal death |
|---|---|---|---|---|---|---|---|
| IIB. Normal Pregnancy | 37-40 wks. | 10 | 9.97 ± 1.865 | 10 | — | — | — |
| III Toxaemia of Pregnancy | | | | | | | |
| A. Mild P.E.T. | 37-40 wks. | 10 | 12.3 ± 2.305 | 10 | 4 | — | — |
| B. Moderate & severe | 37-40 wks. | 10 | 21.16 ± 2.248 | 10 | 5 | — | — |
| C. Eclampsia | 34-36 wks. | 10 | 25.31 ± 2.483 | — | 9 | 3 | 1 |

deliveries after 37 weeks of pregnancy (20 cases) out of which 9 had low birth weight babies (Weight less than 2.5 kg irrespective of period of gestation; Crosse, 1975), while cases of eclampsia all had pre-term deliveries (34-36 weeks) and had 9 low birth weight babies, 3 still births and 1 neonatal death. The over all foetal mortality was 13.3% and all deaths were in eclampsia where levels were very high (26.7 to 29.6 Sigma units). Thus our observation showed that with very high levels of LAP, over all occurrance of low birth weight babies and still births was also high.

## *Summary and Conclusion*

The present study concludes that highest values of LAP were present at term in normal pregnancy. The rise is more in cases where hypertension and albuminuria is a constant feature leading to placental insufficiency. The rise is also consistent with severity of the disease. Cord Blood LAP level was not much affected in pre-eclampsia indicating that the enzyme may not cross the placental barrier.

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