THE STUDY OF PLACENTAL FUNCTION BY HUMAN PLACENTAL LACTOGEN IN NORMAL AND POST-TERM PREGNANCIES

by

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The estimation of serum Human Placental Lactogen (HPL) has recently caught the attention of obstetricians in assessing foetal maturity as well as in predicting placental function.

Human Placental Lactogen (HPL) which is a protein hormone secreted by the syncytiotroproblast. This hormone is secreted into the maternal circulation, is probably metabolised by the liver and excreted by the kidneys. The maternal urine contains only a trace of this hormone (Grupbah *et al*, 1968). Its concentration in the cord blood is 1% due to an effective placental barrier. The amniotic fluid concentration is about 10% of the maternal serum level (Singer *et al*, 1970).

This hormone is detected in the maternal serum as early as the fifth week of gestation. The level gradually rises upto 36-38th week. but remains constant thereafter uptil term. A drop in the level after 40 weeks is reported by some authors (Verma and Murphy, 1977). A low HPL is noted in placental insufficiency, postmaturity and when the placenta is damaged as in PET and accidental haemorrhage.

The reliability of HPL as an indicator of placental activity is enhanced by its short life (20 minutes), and by the fact that HPL production is autonomous and not altered by change of posture, stress, maternal metabolic or endocrine factors.

Material and Methods

The present work was undertaken to study the normal pattern of HPL secretion at different periods of gestation in normal Indian pregnant women. The study was extended to postdated pregnancies which were otherwise uncomplicated. The estimation of serum HPL was done using a radio-immunoassay kit (JIAK-2) obtained from Bhabha Atomic Research Centre. The serum was separated from 5 ml of venous blood obtained from each pregnant women by refrigerated centrifuge soon after collecting the sample. This serum was kept at 4°C for the assay on the same day or stored frozen if the assay had to be postponed to a later date.

Group I: 65 normal pregnant women were chosen at different weeks of gestation, 7 cases were between 6-12 weeks, 35 cases were between 16-36 weeks, 23 cases were between 38-40 weeks.

Group II: 44 post-dated pregnancies all except 1 extending up to 42 weeks were

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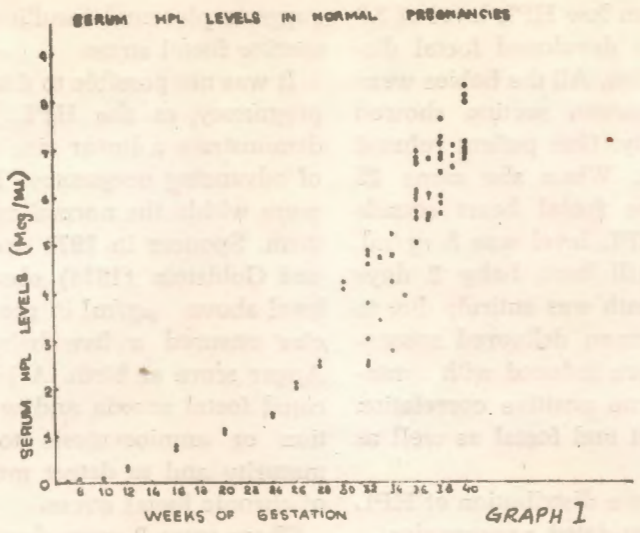
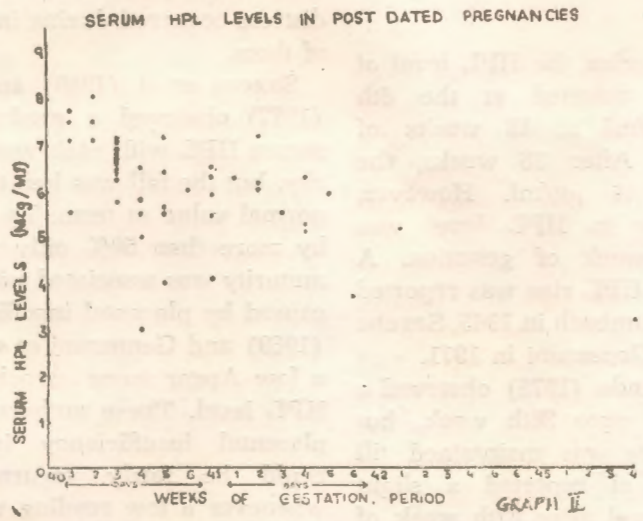


GRAPH 1



GRAPH II

included in the HPL study. One case claimed to be 25 days postdated.

Observation

Normal pregnancy-HPL level gradually rose from 0.02 μg/ml at 6th week, and 1 μg/ml at 18 weeks to 8.6 μg/ml at 40 weeks. All these women delivered vaginally at term. The average placental weight was 399.8 gms and the mean birth weight was 2.84 kg.

Graph I shows the distribution of HPL level at different weeks of gestation in normal pregnancies.

Post-dated pregnancies—44 cases

The HPL level was found to be within the normal range in all but 4 cases. Three

patients with a mean low HPL level of 3.8 μg/ml at 41 weeks developed foetal distress during induction. All the babies were delivered by caesarean section showed signs of dysmaturity. One patient refused admission at term. When she came 25 days post-dated, the foetal heart sounds were not heard. HPL level was 3 μg/ml. She delivered a still born baby 2 days later. The foetal death was entirely due to postmaturity. 5 women delivered spontaneously and 39 were induced with syntocinon. There was no positive correlation between HPL level and foetal as well as placental weights.

Graph II shows the distribution of HPL values in these post-dated pregnancies.

Discussion

In the present series, the HPL level of 0.02 μg/ml was detected at the 6th week end 1 μg/ml at 18 weeks of normal gestation. After 36 weeks, the level was over 6 μg/ml. However, no consistant rise in HPL level was seen after 38th week of gestation. A similar pattern of HPL rise was reported by Kaplan and Grumbach in 1965, Saxena *et al* in 1969 and Genazzani in 1971.

Mohanti and Nanda (1978) observed a rise in the level upto 36th week, but thereafter a plateau was maintained till term. Verma *et al* reported a slight decrease in the level after 37th week of gestation.

Our findings tally with those reported by Raghavan *et al* (1977) who found the HPL values in Indian women were similar to those reported in western women.

HPL values had no bearing on placental and birth weight in the present series.

This study indicated that serum HPL of 6 μg/ml and over indicates foetal maturity of at least 36 weeks. The low HPL value for the corresponding period of gestation suggests placental insufficiency and intrauterine foetal stress.

It was not possible to diagnose postdated pregnancy, as the HPL level failed to demonstrate a linear rise with each week of advancing pregnancy. The HPL values were within the normal range found near term. Sponcer in 1971 and later Hobbins and Goldstein (1974) observed that HPL level above μg/ml in postdated pregnancies ensured a live baby with normal Apgar score at birth. A lower level indicated foetal anoxia and warranted induction or amniocentesis to verify foetal maturity and to detect meconium, a sign of chronic foetal stress.

There were 3 cases showing mean HPL value of 3.8 μg/ml at 41 weeks and foetal distress occurred during induction in each of them.

Saxena *et al* (1969) and Verma *et al* (1977) observed a gradual fall in the serum HPL with each week of postmaturity, but the fall was less than 50% of the normal value at term. The level dropped by more than 50% only when the postmaturity was associated with foetal anoxia caused by placental insufficiency. Gudson (1969) and Genazzani *et al* in 1971 noted a low Apgar score associated with low HPL level. These authors conceded that placental insufficiency in postmaturity could be fairly accurately predicted whenever a low reading was obtained.

Berkowitz *et al* (1978) reported that when the serum HPL was more than 6 μg/ml, only 12% infants showed signs of dysmaturity. When however the levels were less than 5 μg/ml, 40.5% showed foetal anoxia.

Summary

It is possible to assess foetal maturity of over 36 weeks with serum HPL of over 6 μg/ml.

The diagnosis of postmaturity is not possible. However, the placental insufficiency and foetal anoxia associated with postdated pregnancy can be strongly suspected with HPL level falls below 5 μg/ml.

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References

1. Berkowitz, R. L., Hobbins, J. C.: and Gohari, P.: Obstet. Gynec. 52: 127, 1978.
2. Genazzani, A. R., Cocola, F., Casoli, M., Mella, G. Scarselli, G., Neri, P. and Fioretti, P.: J. Obst. Gynec. of Brit. C'wealth. 78: 577, 1971.
3. Grumbach, M. M., Kaplan, S. L., Abrams, C. L., Bell, J. J. and Conte, F. A.: J. of Clinical Endocrinol. 26: 478, 1966.
4. Gudson, J. P.: Obstet. Gynec. 32: 397, 1969.
5. Hobbins, J. C. and Goldstein, L.: Obstet. Gynec. 44: 802, 1974.
6. Josimovich, J. B. and Mclaren, J. A.: Endocrinology, 71: 209, 1962.
7. Kaplan, S. L and Grumbach, M. N.: J. Clinical Endocrinol. 25: 1370, 1965.
8. Mohanti, S. and Nanda, S.: J. Obstet. Gynec. India. 28: 715, 1978.
9. Raghavan, V., Seth, A. R., Shanta S. Rao, S. Dave and Purandare, B. N.: J. Obst. Gynec. India. 27: 363, 1977.
10. Saxena, B. N., Emerson, K. and Solenkow, H. A.: New England Journal of Medicine, 281: 225, 1969.
11. Singer, W., Desjardins, P. and Friesen, H. G.: Obstet. Gynec. 36: 222, 1970.
12. Spencer, T. S.: J. Obstet. Gynec Brit. C'wealth. 78: 232, 1971.
13. Verma, K., Driscoll, S. G. and Solenkow, H. A.: Obstet. Gynec. 38: 487, 1971.
14. Verma, T. R. and Murphy, H: J. Obstet. Gynec. India. 27: 858, 1977.