SERUM PROLACTIN LEVELS DURING PREGNANCY, INTRAPARTUM AND POSTPARTUM PERIODS IN MALAY WOMEN

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SUMMARY

Serum human prolactin (hPRL) levels in Malay women during pregnancy, intrapartum and immediately postpartum have been investigated by means of a double - antibody radioimmunoassay technique. There was a progressive rise of serum prolactin concentration from 31.9 ± 10.4 ng/ml in the first trimester to 242.0 ± 24.6 ng/ml at 36 weeks pregnancy with the mean values during the second and third trimester of 118.9 ± 12.7 ng/ml and 214.7 ± 10.3 ng/ml respectively. During intrapartum the concentration of hPRL was 191.9 ± 26.9 ng/ml and that of immediately postpartum was 178.3 ± 14.5 ng/ml. Suckling of the breast within 6 hours postpartum has resulted in a minor elevation of prolactin level, and this could have been due to the greater basal prolactin level, and/or the ineffectiveness of suckling as a potent stimulus during this period.

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INTRODUCTION

The rise in human serum prolactin (hPRL) concentration during pregnancy has been well documented. [1,2,3,4] These workers have reported a progressive rise in prolactin concentration from about 20ng/ml in the first trimester to about 200 ng/ml at term. The postpartum decline was fairly rapid; by the end of the first week the mean concentration had dropped to about 30 ng/ml. [1] Data on hPRL concentration in Malaysian women, particularly among Malays during pregnancy and intra- and postpartum period is not available. The following is a cross-sectional study carried out as an attempt to present some data from this group.

MATERIALS AND METHODS

For pregnancy study, a total of 116 samples from 109 patients were analysed. These patients were classified into four groups based on their periods of gestation: 5 were between 1-12 weeks of pregnancy (first trimester), 24 were between 13-24 weeks (second trimester), 44 were between 25-36 weeks (third trimester) and 36 were over 36 weeks pregnant. All patients were free from medication except for some who were receiving prenatal vitamins and Ferrous Sulphate. [5] The subjects were well - informed regarding the objectives of the study and the procedures employed. Personal particulars regarding the subjects were noted including the age, marital status, parity, last normal menstrual cycle, length and duration of menstrual cycle and the incidence of coitus two days prior to sampling. Blood samples (2.0 ml) were collected by venipuncture from patients attending antenatal

clinics at the General Hospital, Kuala Lumpur, between 0900 and 1100 hours.

For the study of intrapartum prolactin levels, blood samples were collected from 29 subjects at any time during the established labour i.e. regular contraction with Os at least 3 cm dilated.

Forty seven patients were studied for their serum prolactin levels in the immediate postpartum period i.e. within one hour after delivery. Only patients with spontaneous vaginal delivery (SVD) were selected. Patients delivering twins or who had caesarean section were considered to have complicated pregnancies and their results were therefore excluded from the study. [6] Patients receiving analgesic agents (sendopart, given orally, or pitocin, given as intravenous drip) were accepted. Ten patients were studied for the effect of suckling on hPRL concentration, within 6 hours postpartum. Blood samples were taken before commencement of suckling and again after the infants had suckled both breasts. The procedure for specimen collection and radioimmunoassay for prolactin have been described previously. [7]

Assay Procedure

Radioimmunoassays for prolactin were carried out using kits from Abbott Laboratories, Diagnostic Division, North Chicago, IL 60064, U.S.A. All samples were measured in duplicate. The intra- and interassay coefficients of variation were 5.8% and 13.6% respectively. Estimates for intra-and interassay variation were obtained by repeated estimation of the hPRL concentration from human serum pools. The sensitivity of the prolactin RIA kit was found to be 2.3 ng/ml. [8] In conditions where high concentrations were expected, serum samples were diluted 1:6 with 0.1 M phosphate buffered saline containing 2.5% bovine serum albumin.

The significance of the difference between means was assessed by t-test.

RESULTS

Data on serum prolactin level among pregnant women who had coitus within two days prior to sampling was pooled with those from coitus-free women since the difference between the two groups was not statistically significant. Serum prolactin levels were found to increase progressively during pregnancy with peak values obtained at term (Fig. 1). The concentration (mean ± SEM) in the first, second and third trimester were 31.9 ± 10.4 ng/ml, 118.9 ± 12.7 ng/ml and 214.7 ± 20.3 ng/ml

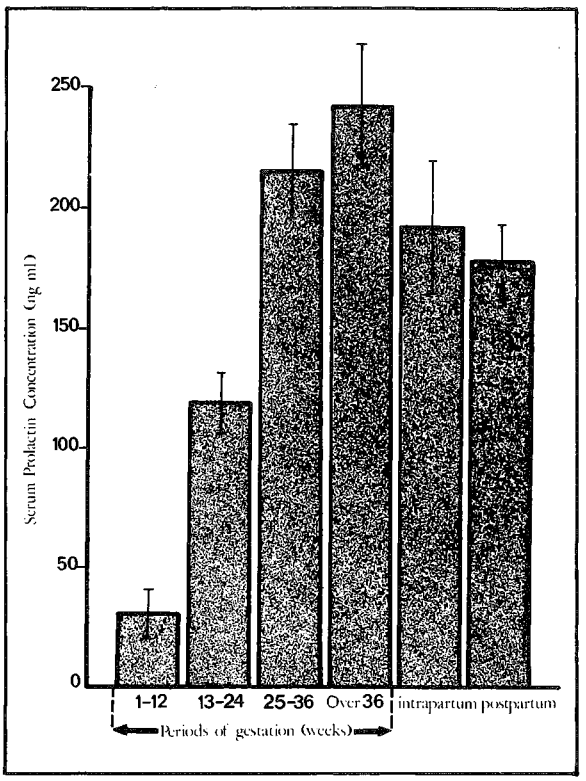

Fig. 1 Serum prolactin level at different periods of gestation, intrapartum and postpartum. Verticle bars denote standard error of the mean.

respectively. The means were significantly different ($p < 0.001$) from each other. The highest concentrations of prolactin (242.0 ± 24.6 ng/ml) were seen in subjects who were more than 36 weeks pregnant. During labour, the mean prolactin concentration was 191.9 ± 26.9 ng/ml and this declined marginally to 178.3 ± 14.5 ng/ml within one hour postpartum. Except for patients from first trimester pregnancy, prolactin concentrations from second and third trimesters and those of over 36 weeks were each grouped according to their parities. During second trimester, prolactin level in nulliparous women, para 1 and para 2 and above were 135.3 ± 14.0 ng/ml, 117.6 ± 18.9 ng/ml and 104.2 ± 24.6 ng/ml respectively. In the third trimester the values were 249.0 ± 35.0 ng/ml, 230.8 ± 51.5 ng/ml and 190.0 ± 26.1 ng/ml respectively, whilst that for women over 36 weeks pregnant were 229.3 ± 41.3 ng/ml, 256.9 ± 44.5 ng/ml and 245.8 ± 44.7 ng/ml respectively. Prolactin concentrations from 52 subjects measured within 6 hours postpartum period were grouped

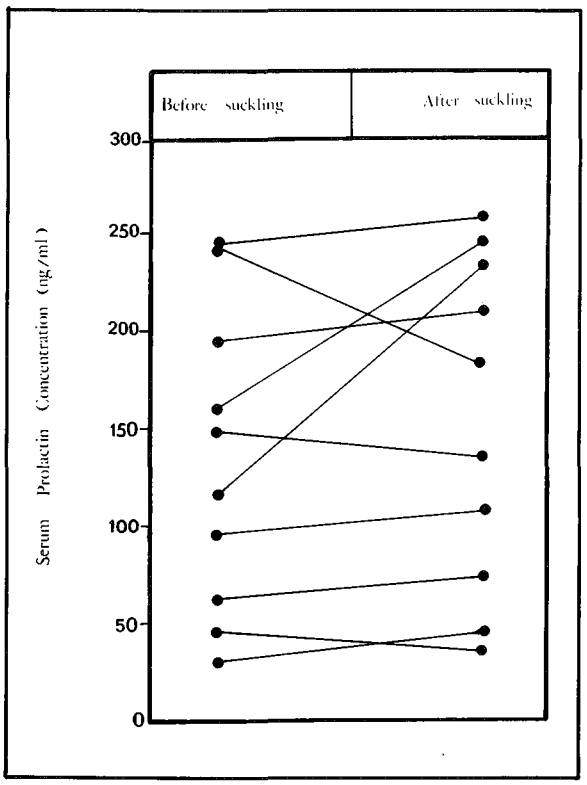

Fig. 2 Serum prolactin level in response to suckling within six hours postpartum.

according to their parities. It was found that out of these, 16 (31 percent) were para 1, 9 (17 percent) were para 2 and 27 (52 percent) were para 3 and above. The prolactin levels for these groups were 143.6 ± 23.7 ng/ml, 142.3 ± 22.3 ng/ml and 205.4 ± 20.1 ng/ml respectively. The mean prolactin concentrations between subjects of para 2 and para 3 and above was significantly different ($P < 0.05$).

In the study of the effect of suckling on prolactin concentration, 3 subjects showed decline, 2 substantial elevation and 5 had 10-15% elevation of basal levels (Fig. 2).

DISCUSSION

In this study, prolactin levels in pregnant women who had coitus within two days prior to blood sampling were found to be not significantly different from those in women who had abstained from sex. A similar observation has been reported by Stearns *et al* [9] in a group of non-pregnant married women where serum prolactin was shown to decline to basal levels 24 hours after coitus. In Malay women who were the subjects of this study, advancing pregnancy from the first trimester to term was accompanied by a five to ten fold increase in serum prolactin concentration. The magnitude of the increase was similar to that reported for Caucasian women. [1] Several other workers [2,3,4] have also reported increases in prolactin levels during pregnancy. The increase in the number of prolactin producing cells in the maternal adenohypophysis during pregnancy [10] would seem to account for the increased secretion of prolactin.

Suckling is a potent stimulus for prolactin release. [1,3] In the 10 women studied within 6 hours postpartum, 5 showed a 10-15% elevation of prolactin after suckling, 2 had elevation of 96% and 51% respectively while 3 surprisingly had a reduction in prolactin levels. In our limited study confined to women in the immediate 6 hours post-partum period, the majority had increased prolactin levels after nursing. The decline observed in three subjects was probably due to the greater basal prolactin concentration, and/or the ineffectiveness of suckling as a potent stimulus during this period. Reports in the literature [1,3] on the effects of suckling on PRL release in nursing mothers were based on studies conducted several weeks after delivery at which time basal prolactin levels are substantially lower. Our subsequent study (unpublished data) has indeed shown that suckling in nursing mothers two weeks after delivery has produced a higher concentration of serum prolactin.

Our studies have also shown that serum hPRL level during labour was lower but not significantly different from that of 36 weeks pregnancy, whereas Rigg and Yen [5] found a significant decline in the maternal plasma prolactin during labour. Based on the lower prolactin observed during labour, Rigg, and Yen [5] suggested that hPRL secretion during delivery is independent of stressful stimuli. It has however been well established that severe stress causes an elevation of serum prolactin concentrations [11,9] and therefore the observation of lowered prolactin level is somewhat paradoxical and it is possible that the reduction in hPRL may act as a trigger for some other processes essential for labour. Recently Bigazzi and Nardi [12] found that sera containing a minimum of 10 ng/ml PRL from hyperprolactinemic patients increased the

spontaneous contraction of rat uterus, and the exposure to PRL greatly reduced the sensitivity of this tissue to relaxin. They have also found that PRL antagonized the action of relaxin on rat myometrium when it was added after relaxin. Thus, the presence of these hormones with antagonistic effects on the myometrium could signify a local mutual interaction in the regulation of the uterine contractility during pregnancy and labour. Further work in this area seems to be clearly indicated.

Our results have suggested that during pregnancy mothers with high parity have lower prolactin concentrations as compared to those of low parity. In contrast in women between 17-42 years of age, the increase in parity was associated with an increase in prolactin level during 6 hours postpartum period. The explanation for these findings is uncertain. It is possible that several mechanisms involving an adaptive capability of nervous system in controlling hPRL secretion in multiparous mothers may be involved.

ACKNOWLEDGEMENTS

The authors wish to thank the following: the subjects for their cooperation; Dr. J. Loh and Assoc. Prof. Nafisah Adeeb and the nursing staff of Maternity unit, General Hospital, Kuala Lumpur for giving their consents to use their patients; Head Department of Physiology, UKM for allowing us to work in his research radioisotope laboratory; the staff of the Medical illustration unit, UKM; Puan Fuziah Jalil and Cik Rosnah Daud for their technical help. This study was supported by grants from the National Family Planning Board, Malaysia.

REFERENCES

[1] Hwang P, Guyda H and Friesen H G (1971). A radioimmunoassay for human prolactin. *Proc. Nat. Acad. Sci.* **68:** 1902-1906.

[2] L'Hermite M, Stauric V and Robyn C (1972). Human pituitary prolactin during pregnancy and postpartum as measured in serum by radioimmunoassay. *Acta Endocrinol.* (kbl) suppl. **159:** 37.

[3] Tyson J E, Hwang P, Guyda H and Friesen H G (1972). Studies of Prolactin secretion in human pregnancy. *Am. J. Obstet. Gynec.* **113:** 14-20.

[4] Jacobs L S, Mariz I K and Daughaday W H (1972). A mixed heterologous radioimmunoassay for human prolactin. *J. Clin. Endocr.* **34:** 484-490.

[5] Rigg L A and Yen S C C (1977). Multiphasic prolactin secretion during parturition in human subjects. *Am. J. Obstet. Gynecol.* **128:** 215-218.

[6] Rodeck C H, Campbell S and Biswas S (1976). Maternal plasma alphafetoprotein in normal and complicated pregnancies. *Brit. J. Obstet. Gynec.* **83:** 24-32.

[7] Mohd Hamim Rajikin, Ramli Abdullah and Hamid Arshat (1981). Serum prolactin levels at different stages of menstrual cycle and during a 24 - hour period in Malay women. *Med. J. Malaysia.* **36:** 155-158.

[8] Rodbard S D and Lewald J E (1970). Computer analysis of radioligand assays and radioimmunoassay data, Kaerolinska symposia, research methods in reproductive endocrinology, Geneva. *Acta Endocr.* **64:** suppl. 147, 79-103.

[9] Stearns D, Winter J S D and Faiman C (1973). Effects of coitus on Gonadotrophin, prolactin and sex steroid levels in man. *J. Clin. Endocr. Met.* **37:** 687-691.

[10] Pasteels J L (1963). Recherches morphologiques et experimentales sur la secretion de prolactine. *Arch. Biol.* **74:** 439.

[11] Noel G L, Suh H K and Frantz A C (1971). Stimulation of prolactin release by stress in humans. *Clin. Res.* **19:** 718 (Abstr).

[12] Bigazzi M and Nardi E (1981). Prolactin and relaxin: antagonism on the spontaneous motility of the uterus. *J. Clin. Endocr. Metab.* **53:** 665-667.