PARATHYROID FUNCTION IN PREGNANCY

by

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In the later months of pregnancy, parathyroid glands are considered to undergo hyperplasia, in order to mobilise calcium for the foetus (Albright & Reifenstein, 1948; McLean & Urist, 1961). This has been accepted to be true in spite of lack of any objective data on the subject (Rasmussen, 1968). There are only few studies of calcium and phosphate metabolism in pregnancy and the results are often conflicting. Total serum calcium has been reported to be low (Kerr *et al*, 1962; Newman, 1947), and by some workers this low serum calcium is considered to be an evidence of relative insufficiency of parathyroid (Page, 1964). Page & Page (1953) have also reported the common occurrence of leg cramps and positive Chvostek sign in pregnancy. However, ionic serum calcium is reported to be normal (Kerr *et al*, 1962). Similarly, serum inorganic phosphate has been reported to be normal (Kerr *et al*, 1962; Page, 1964). Obviously, the status of parathyroid function in pregnancy needs further investigation. This paper presents the results of parathyroid function tests carried out in 30 cases of pregnancy in the third trimester.

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Material and Methods

The study has been conducted on 30 females attending the antenatal clinic of Medical College, Hospital, Rohtak. In addition, 20 normal healthy females in childbearing age were investigated to serve as controls. The pregnant subjects were investigated soon after their first visit to the clinic. All the pregnant females who cooperated happened to be in the third trimester. Cases with complications like oedema, hypertension or pyelonephritis were excluded. The following investigations were carried out:

Total plasma calcium by the oxalate permanganate procedure (Varley, 1963); plasma inorganic phosphate by the method of Fiske and Subharrow (Varley, 1963); phosphate clearance (Kyle *et al*, 1958); and specific gravity of plasma by copper sulphate method (Varley, 1963). To eliminate the effect of changes in plasma protein level on plasma calcium values, the latter were corrected to the specific gravity of 1.027 by the method of Dent (1962) i.e. for every unit in the third decimal place below 1.027, 0.25 mg% was added to the actual plasma calcium value and vice versa and the result was described as "corrected plasma calcium".

Observations and Results

The pregnant cases belonged to 18 to 30 years age group. Excepting 5 cases, all were multiparae. The results of investigations of the pregnancy group as compared to those of the control group are given in the Table I.

TABLE I

Showing Comparison of Pregnancy and Control Groups

	Control group	Pregnancy group	Statistically significant change
Plasma calcium (mg%)	(9.0-11.0) 10.2 ± 0.52	(7.3-10.6) 9.07 ± 1.21	Hypocalcemia p< .001
Corrected plasma calcium (mg%)	(9.0-11.25) 10.40 ± 0.43	(8.20-11.0) 9.90 ± 1.20	Nil
Total plasma proteins (gm%)	(6.4-7.4) 7.05 ± 0.26	(5.3-7.75) 6.21 ± 0.61	Hypoproteinemia p<.001
Plasma inorganic phosphate (mg%)	(2.0-5.0) 2.88 ± 0.72	(1.8-5.0) 2.83 ± 0.97	Nil
Phosphate clearance (ml/min.)	(3.0-10.8) 5.95 ± 2.2	(3.5-25.0) 11.7 ± 6.1	Hyperphosphaturia p<.01

Plasma calcium

In cases of pregnancy, mean plasma calcium value was 9.07 mg% ± 1.21 SD as compared to the control value of 10.2 mg% ± 0.52 SD. The difference between the two was highly significant statistically (P<.001). In sixteen cases of pregnancy, the plasma calcium level was 9 mg% or less. However, when the "corrected plasma calcium" level was compared in the two groups, there was no statistical difference (9.90 mg% ± 1.20 & 10.40 mg% ± 0.43 in pregnancy and control groups respectively). Thus, the low total plasma calcium in the pregnancy group was primarily because of hypoproteinaemia. In this study, total plasma protein level in the pregnancy group was 6.21 gm% ± 0.61 SD as compared to 7.05 gm% ± 0.26 SD in the control group.

Plasma Inorganic Phosphate

Mean plasma inorganic phosphate level in the pregnancy and control groups was 2.83 mg% ± 0.97 SD & 2.88 mg% ± 0.72 SD respectively. The difference between the two groups was not statistically significant.

Phosphate clearance

Phosphate clearance showed a marked and statistically significant difference (P<.01) between the pregnancy and control groups, the mean values being 11.7 ml per minute ± 6.1 SD & 5.95 ml per minute ± 2.2 SD. respectively. In twelve cases of pregnancy the value was greater than 10.8 ml. per minute and in 27 cases the value was greater than the average of the control group.

Discussion

Plasma calcium: The pregnancy group showed a statistically significant decrease in the plasma calcium level. Hypocalcaemia in pregnancy is well documented (Kerr *et al*, 1962; Newman, 1947), and is sometimes, considered a sign of relative insufficiency of parathyroid in pregnancy (Page, 1964). Actually it is entirely because of hypoproteinaemia, since no statistically significant difference was observed in this study between the corrected calcium levels of the pregnancy and control groups. Total plasma proteins

level in the pregnancy group, on the other hand, showed statistically significant fall ($P<.001$) as compared to the control group. Other workers have also reported normal plasma ionic calcium (Kerr *et al*, 1962) or even elevated plasma diffusible calcium level (Nicholas, *et al*, 1934) in pregnancy. In the face of these observations it is surprising to note the findings of Page & Page (1953) that leg cramps and positive Chvostek sign are present in majority of the pregnancies. In this series, no patient complained of leg cramps and only 5 (out of 30) women showed positive Chvostek sign. All our cases belonged to poorer section of society and their milk consumption was ¼ litre per day or less with no calcium or vitamin D supplement.

Plasma inorganic phosphate

It was essentially normal in all the cases of pregnancy excepting two, who had a level less than 2.0 mg%. Other workers (Page, 1964) have also reported normal plasma inorganic phosphate levels in pregnancy.

Phosphate clearance

Phosphate clearance, tubular reabsorption of phosphate (T.R.P.) or phosphate excretion index are the tests used to evaluate the phosphaturic action of parathormone. Phosphate clearance is relatively simple and has same degree of reliability as the other two tests (Kyle *et al*, 1962).

The pregnancy group showed a statistically significant ($P<.01$) increase in the phosphate clearance as compared to the control group. In 27 out of 30 cases of pregnancy, the phosphate clearance was greater than the mean of the control group. In pregnancy, glomerular filtration rate is known to increase, and therefore, higher values of creatinine clearance and urea clearance are recorded (Hytten & Leitch, 1964). However, phosphate excretion is decreased in normal pregnancy (Rasmussen & Reifenstein, 1962). Thus, in pregnancy the increased phosphate clearance in the presence of normal "corrected plasma calcium" seems to indicate the presence of secondary hyperparathyroidism since other causes of increased phosphate clearance like sarcoidosis, diabetic acidosis, hypervitaminosis D or metastatic neoplasm in the bone are not likely to be present in normal pregnancies. In 12 cases out of 30 (40%) there was evidence of secondary hyperparathyroidism (phosphate clearance more than 10.8 ml/min.). Moreover, during the balance studies on Indian pregnant women, Narasingha Rao (1969) observed that with no change in dietry calcium or vitamin-D the amount of calcium absorbed in the intestine increased during the second and third trimesters. The occurrence of secondary hyperparathyroidism can explain this increased calcium absorption. Such a common occurrence of secondary hyperparathyroidism in our cases of pregnancy is highly significant but not surprising, since the diet of pregnant women in India is extremely inadequate in calcium (Pasricha, 1958).

Thus, it may be concluded that although, secondary hyperparathyroidism may not be an obligatory aspect of pregnancy in western countries (Rasmussen, 1968), it is present in a large percentage of pregnant women in India.

Summary

Calcium and phosphate metabolism has been studied in 30 cases of pregnancy in the third trimester. The results showed hypocalcaemia (primarily because of hypoproteinaemia), normal levels of plasma inorganic phosphate and increased phosphate clearance. These results indicate the presence of secondary hyperparathy-

roidism in a large percentage of pregnant women.

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