Rapid Publications

Elevated 1,25-Dihydroxyvitamin D Plasma Levels in Normal Human Pregnancy and Lactation

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Abstract Plasma 1,25-dihydroxyvitamin D levels are elevated in early pregnancy and continue to increase throughout pregnancy. They remain elevated postpartum in lactating women. The elevated levels probably represent a physiological response to increased calcium requirements.

Introduction Vitamin D₃, through its active hormonal form 1,25-dihydroxyvitamin D₃, increases calcium transport in the intestine (1). Moreover, its synthesis appears to be regulated by the calcium needs of the animal (2). As calcium absorption increases in pregnancy (3) in response to fetal demands, it seems likely to us that 1,25-dihydroxyvitamin D levels would increase. We obtained plasma from normal women during the first, second, and third trimesters of pregnancy as well as from postpartum lactating women, to measure levels of 1,25-dihydroxyvitamin D and, in some instances, 25-hydroxyvitamin D.

Methods

31 normal pregnant women were seen by one of us during the course of antenatal care. Six postpartum lactating women were also enrolled in the study. Plasma from 10 age-matched females (mean age 25±4 yr vs. 26±4 yr in experimental subjects, P = NS) was used as a control.

5 ml of plasma were extracted and used in a competitive binding assay for 1,25-dihydroxyvitamin D (4). The only modification was the separation of bound from free hormone. Incubation of cold and radiolabeled 1,25-dihydroxyvitamin D with rachitic chicken duodenum cytosol (1 ml/tube, 1 mg/ml protein) was carried out for 1 h at 25°C. After incubation, 0.2 ml of a 0.5% dextran (Pharmacia Fine Chemicals Inc., Piscataway, N. J.) 5% Norit A (American Norit Co., Jacksonville, Fla.) (wt/vol) suspension, in a 0.05-M phosphate buffer (pH 7.4), was added to the tubes. Exposure time was 15 min. After centrifugation, the supernatant radioactivity was determined.

In this assay, plasma samples from anephric humans have undetectable amounts of 1,25-dihydroxyvitamin D. Normal levels in a mixed population are 39.5±24.6 pg/ml (mean±SD).

Plasma 25-hydroxyvitamin D levels were determined by a modification of the method of Haddad and Chyu (5). Normal vitamin D replete rat plasma (1:3,000 vol/vol dilution in 0.05 M phosphate buffer) was used instead of rachitic rat kidney cytosol. Plasma from pregnant patients and controls was obtained during the summer months.

Serum calcium was measured with an atomic absorption spectrometer. Serum phosphorus was determined by the method of Chen et al. (6).

Statistical analyses were carried out with Student's t test and linear regression analysis by the method of least squares.

Results

Plasma 1,25-dihydroxyvitamin D levels are elevated early in pregnancy (87.1±52.8 pg/ml (mean±SD) first trimester vs. 52.8±14.8 pg/ml in age-matched controls, P < 0.05). Linear regression analysis (Fig. 1) demonstrates that plasma 1,25-dihydroxyvitamin D levels are correlated with the duration of pregnancy (r = 0.47,
lactogen (8), circulating hydroxyvitamin D, and degradation. Likely a result of physiologically appropriate intake (41.7±7.9 ng/ml in normal pregnant women (3)). Noted increased plasma 1,25-dihydroxyvitamin D levels during pregnancy. The latter values were obtained in older (mean age of 55 yr) male and female subjects. 1,25-dihydroxyvitamin D levels in adolescents are 37.1±11.9 pg/ml (18). No values are available in the literature for young, normal women in whom circulating estrogen levels are high. In an older, mixed, male and female population our values for 1,25-dihydroxyvitamin D are 39.5±24.6 pg/ml.

The increase in the level of 1,25-dihydroxyvitamin D observed in plasma probably serves a useful purpose in pregnancy and during lactation. It is likely that the increase in calcium absorption observed during pregnancy occurs as a result of increased production of 1,25-dihydroxyvitamin D.

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REFERENCES


