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VITAMIN D DEFICIENCY AND HORMONAL IMBALANCE: OSTEOMETABOLIC CONSEQUENCES OF HYPERPROLACTINEMIA SYNDROME

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Background: Hyperprolactinemia is a common endocrine disorder that adversely affects reproductive and metabolic health. Recent findings emphasize the significant role of vitamin D and mineral metabolism in women with hyperprolactinemia, particularly in the context of comorbid hypothyroidism or pituitary microadenoma.
Aim: To evaluate the levels of vitamin D, calcium, phosphorus, and magnesium, as well as parathyroid and calcitonin hormones in women with hyperprolactinemia, and to analyze their osteometabolic consequences.
Methods: A comparative clinical study was conducted on three groups: Group 1: women with hyperprolactinemia and hypothyroidism (n=52), Group 2: women with hyperprolactinemia due to pituitary microadenoma (n=42), Control group: healthy reproductive-age women (n=40).
Biochemical, hormonal, and densitometric analyses were performed. A predictive model was developed using binary logistic regression and validated via ROC-curve analysis.
Results: In this study, the levels of vitamin D and minerals in women with hyperprolactinemia were compared to those in the control group, and their statistical differences were evaluated. Normal levels of vitamin D (30–45 ng/mL) were found in only 21.2% of women in Group 1 and 14.3% in Group 2. In contrast, 80% (n=32) of the control group had normal vitamin D levels. These results indicate that the likelihood of having normal vitamin D levels is significantly lower in women with hyperprolactinemia, and the differences are statistically highly significant ($p_1<0.001$; $\chi^2=43.2$, $p_2<0.001$; $\chi^2=53.9$). Vitamin D insufficiency (20–29 ng/mL) was observed in 44.2% (n=23) of Group 1, 50% (n=21) of Group 2, and 20% (n=8) of the control group, and these differences were statistically significant ($p_1<0.001$; $\chi^2=29.3$, $p_2<0.001$; $\chi^2=45$). Vitamin D deficiency (<20 ng/mL) was observed in

34.6% (n=18) of women in Group 1 and 35.7% (n=15) in Group 2. This condition was not observed at all in the control group. This finding suggests that serious disturbances in vitamin D synthesis or metabolism may occur in the context of hyperprolactinemia.

In women with hyperprolactinemia syndrome, levels of hormones that regulate mineral metabolism — parathyroid hormone (PTH) and calcitonin — were analyzed. In Group 1 (women with hyperprolactinemia associated with hypothyroidism), the level of parathyroid hormone was 72.2±1.85 pg/mL, which is above the normal range (15–65 pg/mL).

In Group 2 (patients with hyperprolactinemia associated with pituitary microadenoma), this indicator was 56.8±2.34 pg/mL, while in the control group, it was 47.34±1.77 pg/mL. According to statistical analysis: The difference between Group 1 and the control group was significant ($p_1 \leq 0.01$), Between Group 2 and the control group ($p_2 \leq 0.05$), Between Group 1 and Group 2 ($p_3 \leq 0.05$). The amount of calcitonin, which functions as a counter-regulatory hormone in calcium metabolism, was:0.52±0.034 pg/mL in Group 1,1.45±0.053 pg/mL in Group 2, and 3.3±0.16 pg/mL in the control group. The differences between these values were highly statistically significant: $p_1 \leq 0.001$, $p_2 \leq 0.001$, and $p_3 \leq 0.001$. A notably low level of calcitonin was observed especially in Group 1 women, indicating a reduction in the ability to retain calcium in bone tissue.

To evaluate mineral homeostasis in women with hyperprolactinemia syndrome, the levels of calcium, magnesium, and phosphorus in the blood were analyzed. In Group 1, the calcium level was 1.83±0.027 mmol/L, which is significantly below the normal range (2.0–2.6 mmol/L). In Group 2, this level was 2.04±0.036 mmol/L and in the control group, it was 2.25±0.0299 mmol/L. The differences between all groups were statistically significant at: $p_1 \leq 0.01$, $p_2 \leq 0.01$, and $p_3 \leq 0.01$. This may be due to impaired calcium absorption or metabolism in the context of hyperprolactinemia. In Group 1, the magnesium level was 1.27±0.04 mmol/L, which was above the normal range (reference: 0.75–1.05 mmol/L), with a statistically significant difference from the control group ($p_1 \leq 0.001$). In Group 2, the magnesium level was 0.87±0.0136 mmol/L, and in the control group (Group 3), it was 0.866±0.0239

mmol/L. The difference between Groups 2 and 3 was not statistically significant ($p_2 \geq 0.05$).

However, the elevated magnesium level in Group 1 may indicate electrolyte disturbances associated with hypothyroidism. Phosphorus levels were:1.76±0.05 mmol/L in Group 1,1.8±0.02 mmol/L in Group 2, and 1.957±0.039 mmol/L in Group 3 (control),All within the normal range (1.3–2.26 mmol/L). However, statistical analysis revealed that the differences between: Group 1 and the control group ($p_1 \leq 0.05$), Group 2 and the control group ($p_2 \leq 0.05$) were statistically significant, while the difference between Groups 2 and 3 was not significant ($p_3 \geq 0.05$). One of the key indicators of mineral metabolism — the mean calcium concentration in the blood — differed significantly across groups. In women with hypothyroidism-related hyperprolactinemia, the calcium level was 1.8±0.01 mmol/L, which was much lower than normal. In women with hyperprolactinemia caused by pituitary microadenoma, the calcium level was found at the lower limit of the normal range.

We attribute this to relative hyperestrogenism and androgenism observed in women with PCOS (Polycystic Ovary Syndrome) and anovulatory cycles.

Conclusion:

Vitamin D deficiency and impaired mineral metabolism are prevalent in women with hyperprolactinemia, particularly in those with coexisting hypothyroidism. These changes contribute to osteopenia, osteoporosis, and reproductive dysfunction. Regular monitoring of vitamin D, calcium, and related hormones is essential in the preconception and gestational periods. The predictive model developed can aid in early detection and intervention.

References

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