

# The role of sex hormones in the development of carious and non-carious dental diseases in hyperparathyroidism

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**Abstract.** Under physiological conditions, thyroid glands affect the activity of the nervous, musculoskeletal, cardiovascular systems by releasing parathyroid hormone, which regulates the amount of calcium in the blood serum, stimulates the release of calcium from bone tissue and reduces calcium loss in the urine. Pathology of the parathyroid glands can manifest itself as hyperparathyroidism and hypoparathyroidism. Today, the clinical picture and condition of the oral cavity and teeth in carious and non-carious diseases have been studied quite well, however, many issues of pathogenesis, pathomorphology, differential diagnosis and approach to their treatment in hyperparathyroidism still remain insufficiently addressed. The purpose of this scientific work is to develop timely diagnosis of clinical and structural changes in teeth in case of parathyroid gland dysfunction, prevention and treatment of caries and non-carious diseases by pharmacological and/or non-pharmacological methods. A multidisciplinary program is offered for the diagnosis of carious and non-carious dental diseases in patients with hyperparathyroidism, which consists of the following steps: dental examination of the patient with determination of the degree of damage to the oral cavity.

**Keywords:** dentistry, osteoporosis, parathyroid hormone, oral cavity, carious, non-carious, teeth.

## **Introduction:**

It has been proven all over the world that hyperparathyroidism (HPT), which is one of the types of parathyroid gland dysfunction (PTG), is sporadic in 90-95% of cases, and hereditary in nature in about 5%. "...According to WHO (2018), the frequency of hypercalcemia is more than 3%, with hyperproduction of parathyroid hormone (PTH) caused by HPT, this year among the adult population, the manifest forms are 67%, mild – 33%" Epidemiological studies in Western Europe and North America have shown that HPT ranks third in prevalence among endocrine diseases after diabetes mellitus and thyroid pathology, accounting for 1% of the population, and more often affects people over 55 years of age (up to 2%) (2019) [3;5]. The ratio of men to women is 1:3. While research by European scientists proves [4;7] that the etiopathogenetic factor of carious and non-carious dental diseases in 30-40% of cases is hyperparathyroidism. Overproduction of PTH leads to an increase in plasma calcium concentration by stimulating the release of calcium and phosphate from the bone matrix, accelerating the reabsorption of calcium in the kidneys and increasing the renal production of the vitamin D3 metabolite 1,25-dihydroxycholecalciferol (calcitriol), which has a wide evidence base, but the formation of carious and non-carious dental diseases in HPT remains open, requiring careful research [2;3]. The highest frequency of non-carious lesions (erosion, abrasion, abfraction) of the tooth neck was recorded

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in the examined age group of 50-70 years. Alexandra Zuza et al. (2019) in their study examined the prevalence of non-carious dental diseases in the Republic of Serbia and did not find a relationship between the development of non-carious diseases and age, however, they noted that the lowest prevalence of the disease was recorded in the age group of 10-25 years. They also noted that the development of non-carious dental lesions in the elderly is associated with the influence of certain factors such as somatic pathology and age itself. Andréa Cristina Barbosa da Silva (2015) reviewed orthodontic treatment which, while noting “has many recognized benefits, including improvements in dental health, function, appearance and self-esteem”, however, pointed out that orthodontic appliances may cause undesirable complications if proper care is not provided during treatment. M.M. Nascimento (2016) in his research notes the importance of educating patients about potential risks so that they can be prepared about the progress of their treatment, which ensures successful results without any side effects. Potential intraoral risks include enamel demineralization/caries, periodontal tissue damage, tissue damage, enamel fractures, enamel wear (abrasion/erosion), root resorption, pulpal reactions, and allergic reactions to nickel and latex.

**Materials and Methods** This scientific work is based on our own clinical observations conducted from 2020 to 2024. Only 88 patients who applied for oral cavity sanitation were subjected to dental and somatic examination. The work is based on the results of a clinical, laboratory, instrumental study of patients of the endocrinological dispensary of the regional dental clinic at the Bukhara State Medical Institute.

For the objectivity and reliability of the results obtained, all 88 patients examined were divided into two groups: the first group consisted of 30 (34.1%) patients with various dental diseases without parathyroid pathology, considered as a comparison group; the second group consisted of 58 (65.9%) patients with carious and non-carious diseases of the teeth, after eruption, considered as the main patients suffering from hyperparathyroidism.

For the correct diagnosis and choice of treatment for the disease, the patients' medical history was carefully collected, and regardless of the complaints presented (with an analysis of the cause and time of occurrence of the pain syndrome; localization, nature; duration, concentration; causes) and the identified dental and clinical symptoms were The dentofacial and facial areas were examined. To identify the main cause of the disease, we assessed the general condition of the body, studied the results of biochemical blood tests, and, if necessary, consulted with specialized specialists (endocrinologist, orthopedist, therapist, cardiologist).

**Results and Discussion.** The reliability of the research results is justified by the use of modern, complementary research methods, a sufficient volume of clinical material, as well as the reliability of the results obtained according to the data of a comprehensive clinical-dental, morphological, radiological, biochemical study, diagnostic issues and dental tactics, comparable with the data domestic and foreign researchers, confirmation of results and conclusions by authorized structures. In addition, all results are based on the principles of evidence-based medicine.

The KPU index, reflecting the intensity and prevalence of dental caries in the comparative group averaged  $3.27 \pm 0.36$  teeth, and in the main group  $13.2 \pm 0.71$  teeth, which was equal to 10.9% with low intensity and prevalence in patients in the comparison group, and 48.9% of the average intensity and prevalence of caries in patients of the main group suffering from hyperparathyroidism.

Steroid sex hormones (estrogen and estradiol), as well as a number of other hormones (progesterone, testosterone and dihydrotestosterone (DHT), androstenedione, dihydroepiandrosterone, and sex hormone binding globulin), play an important role in the physiological functioning of mineral metabolism in bone tissue

In the main group, in patients with hyperparathyroidism, the LH level in men and women was statistically higher than in the reference group. When comparing by age and gender categories, it was noted that the level of LH in men aged 10 to 14 years was significantly different, exceeding by 3.9 times even the maximum reference values ( $P < 0.001$ ). Despite the excess of LH levels in men of the main group aged 19 years and older by 1.3 times in relation to the comparative group and reference values, no statistically significant difference was observed between them. In postmenopausal age, LH indices in women were within the reference values, however, these values approached the minimum level, which, apparently, was associated with a compensatory response of the body to a long-term increase in parathyroid hormone in hyperparathyroidism.

Table 1.

LH level in the surveyed groups by age and gender

| Group b-x      | Gender  | Indicator, avg. (IU/L) | Age (years)    | Indicator (IU/L) | Reference     |
|----------------|---------|------------------------|----------------|------------------|---------------|
| 1group (N=30)  | husband | 6,04±0,74              | 10 – 14        | -                | <0,2 – 3,28   |
|                |         |                        | 14 – 19        | -                | 0,81 – 8,96   |
|                |         |                        | 19 <           | 6,04±0,74        | 1,24 – 8,62   |
|                | wives   | 12,0±0,86              | 10 – 14        | -                | <0,2 – 8,09   |
|                |         |                        | 14 – 19        | 5,9±0,71         | 1,59 – 18,99  |
|                |         |                        | 19 <           | 12,6±0,82        | 1,20 – 12,86  |
|                |         |                        | Postmeno-Pause | 17,5±1,78        | 10,87 – 57,64 |
| 2-group (N=58) | husband | 10,0±0,82              | 10 – 14        | 12,05±1,35       | <0,2 – 3,28   |
|                |         |                        | 14 – 19        | -                | 0,81 – 8,96   |
|                |         |                        | 19 <           | 9,6±0,9          | 1,24 – 8,62   |
|                | wives   | 15,7±1,05              | 10 – 14        | 9,7±0,9          | <0,2 – 8,09   |
|                |         |                        | 14 – 19        | 13,5±1,1         | 1,59 – 18,99  |
|                |         |                        | 19 <           | 16,1±1,13        | 1,20 – 12,86  |
|                |         |                        | Postmeno-Pause | 19,7±1,04        | 10,87 – 57,64 |

Further, we began to compare the obtained results of FSH in a similar direction.

**Conclusions** For the first time, on the basis of a comprehensive clinical-dental, radiological, morphological, biochemical study, irreversible structural (carious and non-carious) changes in teeth associated with dysfunction of the parathyroid glands were substantiated; a correlation between parathyroid hormone and age indicators, the level of follicle-stimulating hormone (FSH) and calcium in the blood in case of parathyroid gland dysfunction has been proven;

changes in the hard tissues of the tooth were identified - a violation of the integrity of the enamel with a change in the enamel resistance of the teeth, a pathological process in the periodontium, desolation of the dentinal tubules during hyperparathyroidism; We set a goal to study the relationship between parathyroid hormone, sex hormones and some electrolytes with the development of carious and non-carious dental diseases in patients with hyperfunction of the parathyroid glands. A comparative analysis of LH levels in women was carried out by age categories, since it varied as much as possible depending on age. Thus, at the ages of 10 to 19 years, LH values were within the reference limits, however, in women over 19 years of age it was 1.2 times higher, at which point there was no

statistically significant difference. In postmenopausal age, LH levels in women were within the reference values, but these values approached the minimum level, which was apparently associated with a compensatory response of the body to a long-term increase in parathyroid hormone during hyperparathyroidism.

Therapeutic and preventive dental measures have been developed and scientifically substantiated to improve the condition of the oral cavity and reduce the symptoms of carious and non-carious dental diseases in hyperparathyroidism.

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