

# Vitamin D Deficiency Correlates with an Increased Risk of Thyroid Cancer

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## STORY AT-A-GLANCE

- › Thyroid cancer incidence has tripled over the past decades, with an estimated 44,020 new cases in 2024. Vitamin D deficiency has been linked to increased thyroid cancer risk
- › A recent meta-analysis found thyroid cancer patients had significantly lower vitamin D levels. Every 10 ng/ml increase in vitamin D levels decreased thyroid cancer risk by 6%
- › Vitamin D influences hormonal balance beyond your thyroid, affecting adrenal and sex hormones. It impacts testosterone in men and estrogen and progesterone in women, influencing reproductive health
- › Vitamin D deficiency is also associated with other hormone-related cancers, including ovarian, prostate and breast cancer. It demonstrates anticancer, antimetastatic and anti-tumorigenic effects
- › Sunlight exposure is your best source of vitamin D. Optimal levels for cancer prevention range from 60 to 80 ng/mL

Your thyroid gland plays an important role in regulating your body's most vital functions, including metabolism, energy production, growth and development. Located at the base of your neck, this small, butterfly-shaped organ produces hormones that influence nearly every cell, tissue and organ. Keeping it functioning properly is essential for overall health, as any disruption in its activity can lead to serious health issues, including thyroid cancer.

Thyroid cancer is now becoming an increasingly prevalent concern, with its incidence more than tripling in the United States over the past decades.<sup>1</sup> The American Cancer Society estimates that in 2024 alone, about 44,020 new cases will be diagnosed, with women being three times more likely to develop the disease than men.<sup>2</sup>

One significant factor that has been implicated in the development of thyroid cancer is vitamin D deficiency. A comprehensive meta-analysis published June 18, 2024, in the journal *Frontiers in Nutrition*, examined the existing evidence surrounding this topic, highlighting the importance of maintaining optimal vitamin D levels as a potential protective strategy against thyroid cancer.

## **The Link Between Vitamin D and Thyroid Cancer**

The featured meta-analysis analyzed data from 21 studies involving 2,434 patients with thyroid cancer and 7,398 controls. The researchers focused on two key forms of vitamin D – 25-hydroxyvitamin D (25 (OH)D), a marker of overall vitamin D status, and 1,25-hydroxyvitamin D (1,25 (OH)D), the active form of the vitamin.

*"[A]ccumulating evidence has highlighted the potential anticancer action of vitamin D through its ability to hinder the proliferation, invasiveness and metastatic potential of malignant cells and promoting cell differentiation.*

*In light of those mechanisms above, it is widely believed that the deficiency of vitamin D may be closely associated with an increased susceptibility to various types of cancers. Also, the relationship between TC (thyroid cancer) and vitamin D levels has been a topic of debate.*

*Numerous clinical and experimental studies have suggested that individuals with TC tend to exhibit lower levels of vitamin D compared to both healthy individuals and those with benign thyroid nodules, while findings in some other studies have presented contrasting results. As a result, the association between vitamin D deficiency and the risk of TC has also remained inconclusive so far."*

The analysis found that patients with thyroid cancer had significantly lower levels of both 25 (OH)D and 1,25 (OH)D compared to healthy individuals and those with benign thyroid conditions. Specifically, 25 (OH)D levels were about 13% lower while 1,25 (OH)D levels were 10% lower in thyroid cancer patients. The study also indicated that vitamin D deficiency can increase the risk of thyroid cancer by 49%.

Moreover, their findings revealed an inverse linear association between vitamin D levels and thyroid cancer risk. The authors suggest that for every 10 ng/ml increase in vitamin D levels, your risk of getting thyroid cancer decreased by 6%. According to the authors:

*"[A]lthough numerous negative results have been published, we still propose vitamin D deficiency as a potential risk factor for TC. Furthermore, robust clinical and preclinical evidence is needed for a large, well-executed and more inclusive systematic review with meta-analysis on this topic."*

## **How Vitamin D Influences Hormonal Balance**

The influence of vitamin D on thyroid health is partly due to its role in maintaining hormonal balance and overall endocrine health. It regulates thyroid hormones through several key mechanisms. First, it binds to vitamin D receptors (VDRs) in various tissues, including the thyroid gland. This interaction helps modulate the expression of genes involved in the synthesis and metabolism of thyroid hormones.<sup>3</sup>

Vitamin D also has a direct effect on the enzymes type 1 and type 2 iodothyronine deiodinases (Dio1 and Dio2), which are responsible for converting inactive thyroid hormones (T4) into their active form (T3).<sup>4</sup> It helps regulate thyroid-stimulating hormone (TSH) as well, which is secreted by the pituitary gland and is crucial for controlling thyroid hormone production.

According to the University of Rochester Medical Center,<sup>5</sup> "TSH is also known to encourage the growth of the thyroid gland. It may also encourage the growth of some types of thyroid cancer cells." Hence, maintaining normal TSH levels supports balanced thyroid hormone secretion and helps reduce thyroid cancer risk.

Additionally, vitamin D supports your immune system, helping reduce the risk for autoimmune conditions like Hashimoto's thyroiditis, which can disrupt thyroid hormone levels.<sup>6</sup> It also affects cellular growth and differentiation, including in thyroid cells. By promoting normal cell function and preventing abnormal growth, vitamin D helps maintain healthy thyroid tissue and hormone production.<sup>7</sup>

Aside from influencing thyroid hormones, vitamin D plays a role in the regulation of other hormones, including adrenal and sex hormones. In men, it impacts testosterone levels, and in women, it affects estrogen and progesterone, influencing fertility and reproductive health.<sup>8</sup>

## **Vitamin D Plays a Role in Other Hormone-Related Cancers**

Given the pivotal role of vitamin D in regulating your hormone systems, it's no wonder that a deficiency has been linked to the development of other hormone-related cancers. For example, a 2024 study published in the *International Immunopharmacology*<sup>9</sup> examined how vitamin D affects the progression of ovarian cancer, especially in relation to the enzyme CYP24A1, which is responsible for breaking this vitamin down.

The researchers found that vitamin D "promoted the polarization of macrophages towards the M1 phenotype while inhibiting M2 polarization, thus demonstrating anticancer potential." To put it simply, vitamin D helps create more cancer-fighting immune cells in the tumor environment.

However, when CYP24A1 is overexpressed, it counteracts the beneficial effects of vitamin D by breaking it down more rapidly. These findings demonstrate the importance of maintaining optimal vitamin D levels and reducing CYP24A1 for reducing the risk of ovarian cancer.<sup>10</sup>

Another study published in *The Journal of Nutritional Biochemistry*<sup>11</sup> found that vitamin D deficiency aggravates prostate cancer growth and metastasis by promoting epithelial-mesenchymal transition (EMT). This process enhances the cancer cells' ability to invade surrounding tissues and spread to other parts of the body.

In terms of breast cancer, the leading cause of death in women globally, numerous studies have found that patients often have lower vitamin D levels compared to healthy controls.<sup>12,13</sup> This similar trend was also observed in other types of cancer, including colorectal, bladder, multiple myeloma, kidney and squamous cell lung cancer.<sup>14,15</sup>

## More About the Cancer-Fighting Effects of Vitamin D

A review published in The Journal of Steroid Biochemistry and Molecular Biology<sup>16</sup> summarizes the different ways vitamin D targets cancer, including:

- **Anticancer effects**, referring to vitamin D's ability to influence various stages of cancer development, including the initiation, growth and spread of cancer cells.
- **Antimetastatic effects**, which describe vitamin D's capacity to inhibit cancer cells from spreading beyond the original tumor site. By preventing this spread, vitamin D can help enhance prognosis and survival rates.
- **Anti-tumorigenic**, meaning vitamin D helps inhibit the formation and growth of tumors. It achieves this through mechanisms such as triggering cancer cell death, interrupting cell cycle progression and blocking pathways that support tumor growth.

The authors highlighted vitamin D's role against the following cancers:<sup>17</sup>

Breast	Prostate	Bladder
Colon	Glioblastoma	Melanoma
Squamous cell carcinoma	Ovarian	Multiple myeloma
Osteosarcoma	Head and neck	

## Sun Exposure Is the Best Way to Optimize Your Vitamin D Levels

The most natural and effective way to boost your vitamin D levels is through exposure to sunlight. On a typical sunny day, your body may produce up to 25,000 international units (IU) of vitamin D.<sup>18</sup>

Another reason why I strongly recommend getting your vitamin D from proper sun exposure, if possible, is that it provides benefits beyond vitamin D optimization, including increased longevity and production of melatonin, which may help protect against oxidative stress and cancer.<sup>19,20</sup>

Unfortunately, many people aren't in the sun enough to optimize their vitamin D levels. If you're unable to get adequate sun exposure each day, vitamin D supplementation may be necessary. However, the only way to determine how much sun exposure is enough and/or how much vitamin D3 you need to take is to measure your vitamin D level, ideally twice a year.

Once you've confirmed your vitamin D levels via testing, adjust your sun exposure and/or vitamin D3 supplementation accordingly. Then, remember to retest in three to four months to make sure you've reached your target level.

## **The Optimal Vitamin D Level for Cancer Prevention**

Research has shown that once you reach a minimum serum vitamin D level of 40 ng/mL (100 nmol/L), your risk for cancer diminishes by 67%, compared to having a level of 20 ng/mL or less.<sup>21</sup> However, I believe 40 ng/mL is only the cutoff for sufficiency.

For health and disease prevention, including cancer prevention, I recommend you aim for optimal levels between 60 ng/mL and 80 ng/mL. In Europe, the measurements you're looking for are 150 to 200 nmol/L respectively.

It's important to remember that calcium, vitamin D3, magnesium and vitamin K2 must be properly balanced for optimal overall health. Your best and safest bet is to simply eat more calcium-, magnesium- and vitamin K2-rich foods, along with sensible sun exposure.

However, if you find supplementation is necessary after a serum vitamin D test, also supplement with magnesium and vitamin K2 (MK-7) to ensure proper balance. You'll also want to ensure you're following an overall healthy lifestyle to reduce your cancer risk as much as possible. As researchers explained in [Nutrients](#):<sup>22</sup>

*"Vitamin D supplementation is not the magic pill that miraculously solves the cancer burden or that can replace a healthy lifestyle. It is necessary to foster a good environment and invigorate a healthy lifestyle, including a high-quality diet and physical activity. Both have been proven to confer health benefits in many diseases, including cancer, and are the best preventive measures available."*

## Sources and References

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