

Asian Journal of Pharmaceutical and Health Sciences

<http://www.ajphs.com>

ISSN: 2231- 2331(Print) | ISSN: 2231–234X(Online)



Review Article

Quality of Life in Thyroid Cancer Patients Receiving Radioactive Iodine Therapy: A Narrative Review

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Article History

Received : 08.04.2026

Revised : 27.06.2026

Accepted : 06.07.2026

DOI

10.5530/ajphs.2026.16.98

Keywords

Iodine-131

Radioiodine therapy

Thyroid cancer

Thyroidectomy

Quality of life

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ABSTRACT

Thyroid cancer is regarded as the most prevalent form of endocrine malignancy, with a consistently rising global incidence. Differentiated thyroid cancer (DTC), which includes papillary and follicular types, usually has a good prognosis and high survival rates. Radioactive iodine (RAI) therapy with iodine-131 is crucial in the management following thyroidectomy. But the side effects of treatment have a big impact on how well patients live (QoL). The goal of this review is to look at how radioactive iodine therapy affects the quality of life of people with thyroid cancer. A comprehensive literature review was conducted using PubMed and Google Scholar to locate studies published between 2000 and 2025. Eligible studies included original research articles, cohort studies, and reviews assessing the quality of life in patients undergoing radioactive iodine therapy. The results show that RAI therapy has an effect on many areas of quality of life. Fatigue, dry mouth, problems with the salivary glands, changes in taste, and trouble swallowing are some of the most common physical side effects. People often say they feel anxious, depressed, or afraid of getting sick again, even though they have good survival rates. Social and functional impairments, such as diminished work productivity and temporary isolation during treatment, contribute to a decline in quality of life (QoL). Although some studies suggest gradual improvement over time, long-term survivors may continue to experience persistent symptoms and reduced well-being. Incorporating routine QoL assessments and adopting a multidisciplinary, patient-centered approach can help mitigate these effects and improve overall patient outcomes.

1. INTRODUCTION

Thyroid cancer is a malignant tumor that originates from the cells of the thyroid gland and results from abnormal and uncontrolled cell division. The most prevalent endocrine cancer, thyroid

carcinoma has been on the rise worldwide in recent decades. The majority of instances are differentiated thyroid cancers (DTC), which include papillary and follicular subtypes. These malignancies often have a good prognosis and high survival rates. Thyroidectomy

Cite this article as: Amiya NT, Jayakrishnan S S, Najiya Mahamood, Fasmiya Thabassum, Keerthana K. Quality of Life in Thyroid Cancer Patients Receiving Radioactive Iodine Therapy: A Narrative Review. Asian J Pharm Health Sci. 2026;16(3):3311-3316. doi:10.5530/ajphs.2026.16.98



is typically followed by radioactive iodine (RAI) therapy utilizing iodine-131 for adjuvant treatment, remnant ablation, or metastatic disease control. Iodine enters the body absorbed by the thyroid gland. So radioactive iodine can be used to treat thyroid cancers (Cabanillas et al., 2016; Haugen et al., 2016)

Patients' quality of life (QoL) is greatly impacted by treatment-related issues, despite favourable survival results. The psychological state and quality of life (QoL) of patients and their families may be significantly impacted by the treatment and follow-up, which can be extremely difficult for medical professionals. Despite its effectiveness, RAI therapy is linked to both immediate and long-term side effects. It includes fatigue, taste alterations, dry mouth, difficulty swallowing, salivary gland dysfunction, and psychological distress. (Banihashem et al., 2020; Lu et al., 2016).

Both surgery and radioiodine therapy can cause short-term fluctuations in quality of life in thyroid cancer patients. Quality of life, which reflects patients' physical, emotional, and social well-being, has become a crucial outcome metric in cancer. Assessment of quality of life is particularly important for guiding patient-centered care and optimizing therapeutic strategies (Cella & Tulsky, 1993).

Several reviews have discussed survivorship and outcomes in thyroid cancer patients. However, limited reviews have specifically focused on the multidimensional impact of radioactive iodine therapy on quality of life, including physical, psychological, social and long-term survivorship outcomes. In addition to highlighting patient-centered approaches for enhancing quality of life among survivors with differentiated thyroid cancer following radioactive iodine therapy, this narrative review summarizes recent research published up until 2025.

2. LITERATURE SEARCH STRATEGY

A comprehensive literature search was conducted using PubMed and Google Scholar to identify relevant studies published between January 2000 and March 2025. The search strategy employed the following Boolean expression:

("thyroid cancer" OR "differentiated thyroid carcinoma") AND ("radioiodine therapy" OR "radioactive iodine" OR "iodine-131") AND ("quality of life" OR "health-related quality of life").

Studies were screened based on their titles and abstracts, followed by full-text review for eligibility. After applying the inclusion and exclusion criteria, 24 studies were included in this narrative review.

Inclusion criteria:

- Differentiated thyroid cancer patients
- Studies assessing QoL after radioiodine therapy
- Original research, cohort studies, and reviews
- English-language publications

Exclusion criteria:

- Case reports and editorials
- Non-human studies

Relevant studies were screened based on title, abstract, and full-text review.

3. EPIDEMIOLOGY AND PREVALENCE

Thyroid cancer is one of the malignancies with the fastest-growing detection rates due to its consistent global incidence (Haugen et al., 2016). According to the Global Burden of Disease (GBD) 2021 study, thyroid cancer continues to represent a significant global health burden. In 2021, there were approximately 1.99 million prevalent cases of thyroid cancer worldwide, representing a 193.7% increase compared with 1990. The age-standardized prevalence rate increased from 14.9 per 100,000 population in 1990 to 23.1 per 100,000 population in 2021. Furthermore, 249,538 new cases were reported globally in 2021, reflecting a 177.6% increase since 1990. Despite the rising incidence, mortality rates have remained relatively stable, with 44,798 thyroid cancer-related deaths reported in 2021. These findings indicate that while advances in diagnosis and treatment have improved survival, the growing number of thyroid cancer survivors highlights the importance of addressing long-term quality-of-life outcomes and survivorship issues (Tang et al., 2025).

The highest prevalence and incidence were observed in the 55-59 age group, followed by a gradual decline (Tang et al., 2025). With a female-to-male ratio of roughly 3:1, thyroid cancer is more common in women than in men (Cabanillas et al., 2016). Adults between the ages of 30 and 60 are most frequently diagnosed with the illness. Improved diagnostic imaging techniques, particularly ultrasound and fine-needle aspiration cytology, have contributed significantly to the increased detection of small thyroid nodules (Vaccarella et al., 2020).

Thyroid cancer has been linked to a number of risk factors, such as genetic predisposition, iodine imbalance, and exposure to ionizing radiation. About 80–85% of thyroid cancer patients have papillary thyroid carcinoma, which often has a good long-term survival rate (Cabanillas et al., 2016). The long-term

impacts of treatment on patient well-being, however, have emerged as a major area of emphasis for clinical study despite high survival rates.

4. DIAGNOSTIC TECHNIQUES

The first step in identifying thyroid problems is clinical examination. Patients usually present with incidental nodules or a palpable neck tumor. Rapid growth, hardness, fixation to surrounding tissues, hoarseness, and cervical lymphadenopathy are all suspicious features (Haugen et al., 2016). Serum T3 and T4 levels are used to assess thyroid function. Most patients with thyroid cancer present with normal thyroid function (Cabanillas et al., 2016). The initial imaging method for thyroid nodules is high-resolution ultrasonography. Fine-needle aspiration cytology (FNAC) remains the gold-standard diagnostic technique for evaluating thyroid nodules (Cibas & Ali, 2009).

5. TREATMENT OF THYROID CANCER

Surgery and, when indicated, radioactive iodine (RAI) therapy are effective treatments for most thyroid malignancies. However, in cases where RAI therapy is ineffective, there is a need for alternative therapeutic strategies, and researchers and clinicians are actively investigating novel treatments with improved efficacy and fewer adverse effects (American Cancer Society, n.d.).

6. RADIOIODINE THERAPY

Radioactive iodine may be administered orally as a capsule or liquid preparation. Following administration, radioactive iodine is selectively concentrated in thyroid tissue and differentiated thyroid cancer cells. The thyroid gland and any other thyroid cells that absorb iodine, including cancer cells, may be destroyed by the radiation from the treatment. The radiation has less of an impact on the rest of the body because the majority of RAI accumulates in thyroid cells (Haugen et al., 2016).

Compared to radioiodine scans, which are detailed in Tests for Thyroid Cancer, the radiation dose utilized in radioactive iodine therapy is significantly higher (Haugen et al., 2016).

6.1 Mechanism of radioiodine therapy

The unique physiological capacity of thyroid follicular cells to concentrate iodine from the bloodstream is the basis for the therapeutic mechanism of radioiodine therapy (Schlumberger & Leboulleux, 2021). Iodide ions are actively transported into thyroid cells via the sodium-iodide symporter, which facilitates

this process.

Iodine-131 is absorbed through the digestive system and circulated throughout the bloodstream when taken orally. Radioactive iodine is accumulated by thyroid tissue and differentiated thyroid cancer cells that are still capable of absorbing iodine.

Iodine-131 releases beta particles that harm cells by creating reactive oxygen species and breaking DNA strands (Pacini et al., 2006). These processes restrict radiation exposure to nearby organs while destroying thyroid tissue and cancerous cells.

Clinicians can determine the distribution of radioactive iodine and detect metastatic disease by using nuclear imaging techniques to detect the gamma radiation that iodine-131 emits in addition to beta radiation.

6.2 Problems associated with radioiodine therapy

Radioiodine therapy is usually well tolerated; however, it may be associated with several adverse effects that can affect patients' quality of life. Nausea, neck pain, digestive problems, fatigue, transient hypothyroid symptoms, disturbances in taste, dry mouth and temporary inflammation of the salivary glands (sialadenitis) are typical acute adverse effects (Haugen et al., 2016; Lu et al., 2016).

Most acute adverse effects such as nausea, neck discomfort, altered taste sensation, and fatigue occur within days to weeks after treatment and generally resolve spontaneously. However, some patients may experience xerostomia (dry mouth), salivary gland dysfunction, dental issues, and lacrimal gland dysfunction (dry eyes or excessive crying) for months or years. Fertility-related concerns have also been reported, particularly among patients receiving higher cumulative doses of radioactive iodine. These adverse effects may negatively influence physical functioning and overall quality of life among thyroid cancer survivors (Jeong et al., 2013; Lu et al., 2016; Reiners & Luster, 2012).

6.3 Current ATA recommendations for radioiodine therapy

The American Thyroid Association's 2015 guidelines state that individuals with high-risk differentiated thyroid carcinoma and certain intermediate-risk patients are recommended for radioactive iodine therapy. For low-risk patients with small intrathyroidal tumors, routine administration is not advised. The decision to administer RAI should be individualized based on tumor characteristics, recurrence risk, and patient-specific factors (Haugen et al., 2016).

7. MEASUREMENT OF QUALITY OF LIFE

Thyroid cancer patients' health-related quality of life is assessed by using a number of validated questionnaires. The Short Form-36 (SF-36) health survey is a frequently used tool that assesses social functioning, mental health, physical functioning and physiological discomfort (Ware & Sherbourne, 1992).

The EORTC QLQ-C30, created by the European Organization for Research and Treatment of Cancer, is another popular instrument. Fatigue, nausea, emotional wellness and general health state are just a few of the topics that this questionnaire assesses. Also, thyroid-specific instruments such as the PRO are used to assess unique symptoms of thyroid disorders.

7.1 Physical Impact of Radioiodine Therapy

A variety of physical adverse effects linked to RAI therapy have the potential to seriously lower quality of life. While xerostomia, dental caries and lacrimal gland dysfunction are common long-term side effects, nausea, neck pain and sialadenitis are common acute side effects (Haugen et al., 2016; Lu et al., 2016; Reiners & Luster, 2012). Lu et al. (2016) reported that among 117 patients receiving radioactive iodine therapy, 79 experienced gastrointestinal symptoms, 55 reported neck pain or swelling, 15 developed salivary gland pain or swelling, 10 experienced headache or vertigo, and 6 reported fatigue or general malaise.

One of the most commonly reported side effects is salivary gland injury, which can last long after treatment and interfere with eating, speaking and general comfort (Jeong et al., 2013).

Another common side effect of RAI therapy is fatigue, which is frequently made worse by hypothyroid conditions induced before treatment. This could limit daily activities and make it harder to do things. (Husson et al., 2013).

7.2 Psychological and Emotional Well-being

Despite favorable survival outcomes, many thyroid cancer patients experience considerable psychological distress. Anxiety about cancer recurrence, social isolation during radioactive iodine therapy and the lifelong use of thyroid hormone replacement therapy may lead to emotional stress and reduced quality of life. A study reported that 43.3% of newly diagnosed thyroid cancer patients experienced significant psychological distress, with emotional problems being a major predictor of higher distress levels (Buchmann et al., 2015).

Similarly, 75% of patients reported fear of cancer recurrence at diagnosis, while 23% reported a negative view of life. These patients demonstrated

significantly lower health-related quality of life across multiple SF-36 domains both at diagnosis and one year after follow-up ($p < 0.05$) (Hedman et al., 2018). These findings suggest that psychological consequences may persist long after treatment despite favorable survival outcomes, highlighting the importance of long-term psychosocial support.

Fear of radioactivity and related anxiety can be alleviated by improving communication and supplying patients with targeted information (e.g., brochures, informed medical personnel, and specialized websites) (Barbus et al., 2018).

7.3 Social and functional outcome

RAI therapy may impact patients' social and professional responsibilities. Temporary seclusion, dietary restrictions, and treatment-related exhaustion can lead to diminished productivity and social withdrawal (Ming et al., 2022). Changes in voice, appearance, and energy levels may negatively affect self-image and interpersonal relationships (Singer et al., 2016).

Reduced productivity and absenteeism from work are commonly observed, particularly in the initial stages following therapy (Dagan et al., 2004).

7.4 Long-term Quality of Life and Survivorship

Long-term survivors of thyroid cancer often continue to face challenges that can affect their quality of life compared to the general population, which can be attributed to chronic symptoms such as fatigue, cognitive decline and endocrine malfunction (Hoftijzer et al., 2008).

The risk of chronic problems and subsequent cancer is high in patients undergoing repeated RAI doses or overtreatment (Rubino et al., 2003).

When patients receive proper symptom management, psychological support and education, their quality of life improves significantly (Nickel et al., 2019).

7.5 Strategies to Improve Quality of Life

A comprehensive approach is necessary to improve QoL for patients with thyroid cancer. Important tactics consist of:

- Thyroid hormone replacement therapy optimization
- Protective measures for salivary glands (sour candies, water)
- Support groups and psychological counselling
- Teaching patients about the expectations of their treatment

- Reducing needless exposure to RAI

Patient outcomes can be greatly improved by customized care plans and regular QoL evaluations using approved instruments (Husson et al., 2013).

8. CONCLUSION

RAI therapy continues to be a key component of the treatment of differentiated thyroid carcinoma, greatly enhancing survival rates. RAI therapy is linked to a number of medical, psychological and social issues that can have a detrimental impact on patients' quality of life, despite its clinical efficacy. Long-term follow-up and supportive care are necessary since common side effects such as fatigue, salivary gland malfunction and mental discomfort may last long after therapy, highlighting the need for long-term follow-up and supportive care. Enhancing patient education, symptom management and psychosocial support is essential to improve overall well-being and treatment outcomes in thyroid cancer survivors.

Future research should focus on long-term prospective studies evaluating the impact of radioactive iodine therapy on quality-of-life outcomes. More studies are required to evaluate the efficacy of psychosocial support techniques and to create efficient therapies for minimizing treatment-related side effects, including xerostomia and salivary gland dysfunction. In addition, research investigating tailored therapies and survivorship care initiatives may improve long-term results for survivors of differentiated thyroid cancer.

Acknowledgement

The authors express their immense gratitude to the Department of Pharmacy Practice and the faculty members of the institution for their continuous support and guidance. We also acknowledge the valuable contributions and effort of researchers and healthcare professionals whose published work formed the basis of this review article.

Funding

Nil.

Conflict of Interest

None declared.

Ethical Statement

There is no ethical approval required.

Declaration of Generative AI

No artificial intelligence (AI) tools were used in the preparation of this manuscript.

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