International Journal of Otorhinolaryngology and Head and Neck Surgery
Mili MK et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Oct;11(5):550-554
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20252987

Original Research Article

Incidence of thyroid dysfunction post radiotherapy in head and neck cancer

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Received: 23 June 2025
Revised: 05 August 2025
Accepted: 07 August 2025

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ABSTRACT

Background: Globally, head and neck cancer rank sixth in terms of incidence with squamous cell carcinoma being the most common. In case of early-staged cancer (T1 or T2), it is treated with a single modality of treatment, such as radiation therapy or surgery. In locally advanced head and neck cancer, it is treated with radiotherapy with or without chemotherapy. Primary hypothyroidism is indicated to be in between 11-53%. Aim is to estimate the incidence of thyroid dysfunction post radiotherapy in head and neck cancer.
Methods: This is a prospective and observational study done in a tertiary care centre over a period of 1 year in 66 patients. Written and informed consent was taken, data was collected in a predesigned questionnaire and baseline blood tests was done prior, 3rd and 6th month post radiotherapy.
Results: The incidence of hypothyroidism in our study was 15.15% with maximum incidence was found in Ca larynx (29.16%) followed by Ca hypopharynx (22.22%). 15.5% hypothyroid patients were treated with concurrent radiotherapy whereas 12.5% were not.
Conclusions: Hypothyroidism incidence increases with time, where majority develop after 6 months post-radiotherapy. Age, sex and concurrent chemotherapy were not identified as relevant risk factors in our study. Smaller sample size, shorter time period and single centre based were the limitations of the study.

Keywords: Hypothyroidism, Head and neck cancer, Thyroid function test

INTRODUCTION

Globally, head and neck cancer rank sixth in terms of incidence.[1] Squamous cell carcinoma, the most common kind of head and neck cancer, is associated with alcohol and/or tobacco usage. Non-squamous cancers include sarcomas, thyroid cancer and salivary gland cancer; there is no connection between these tumors and alcohol or tobacco use.[2] When most head and neck cancers are diagnosed, they are already locoregionally progressed.[1] Patients who need substantial surgical resection of tumors that need the sacrifice of organs like the base of the tongue or the larynx are often now regarded as candidates for organ-preserving strategies using chemoradiation therapy, saving surgery for salvage. When it comes to early-staged cancers (T1 or T2), the main tumor and, if applicable, the neck (restricted low volume neck metastases) is treated with a single modality, such as radiation therapy or surgery.[7] Major treatment modality in locally advanced head and neck cancer is radiotherapy with or without chemotherapy.[4] The 6-MV photon is most frequently employed in head cancer patients whose tumors are not firmly seated.[7] Inadvertent radiation injury to the thyroid gland during radiotherapy in Head and neck cancer patients, can lead to primary hypothyroidism, which is a common late endocrine complication is reported to be between 11-53%, thus thyroid function tests should be monitored before and after treatment.[3]

Radiation induced vessel damage, fibrosis of capsule of the gland or autoimmune reaction are the mechanisms of causing radiation induced hypothyroidism. Hypothyroidism is a deficiency of the thyroid hormones caused either due to lesser production of the thyroid hormones or end-organ resistance to it.[1] The time for development of hypothyroidism after radiotherapy is not yet defined, but most cases occur within first three years of post-treatment. Among adults treated with radiation in the thyroid region, only 5% may develop symptomatic clinical hypothyroidism and in case of previous hemithyroidectomy, subclinical hypothyroidism may be approximated to about 66% and in case of radiation to the hypothalamic-pituitary axis, a complete endocrine screening is to be done.[7] Younger age, female gender, addition of chemotherapy or neck surgery are the possible risks factors for developing hypothyroidism. Higher radiation volume or bilateral neck irradiation increases the risk of hypothyroidism.[4] The objective of this study is to estimate the incidence of thyroid dysfunction post radiotherapy in head and neck cancer patients.

METHODS

This is a prospective and observational study conducted in a tertiary care centre over a period of 1yr (January 2023-December 2023) on all histologically proven Head and Neck cancer indoor and outdoor patients attending the Otorhinolaryngology department and receiving external beam radiotherapy on either Telecobalt or LINAC for more than or equal to 33 fractions radiation. Patients with prior thyroid disorder and surgery and with thyroid metastasis were excluded from the study. Considering thyroid dysfunction in post radiotherapy patients with head and neck cancer to be 20.8% 8, confidence interval to be 95% and absolute precision of 10%, sample size is calculated to be 66.

Calculating using Leslie Fischer's formula, n=z2pq/d2.

Where z=1.96 for 95% confidence interval, p =20.8% (from previous study), q =100-p, d (absolute precision) =10.[8]

The study was done in the department of Otorhinolaryngology and head and neck surgery. Written and informed consent taken from patients and data collected with the help of predesigned questionnaire and blood tests (S.TSH, ft3, ft4) done for the same. Baseline blood tests were done prior to radiotherapy and at 3rd and 6th month post radiotherapy. Data were entered and analysis was done using SPSS version 22.

RESULTS

The findings of the study are presented in the form of the tables and accordingly observations are made. In the study, the overall incidence of hypothyroidism was 15.15%. Out of 45 male, 84.4% (38) were found to be euthyroid and 15.5% (7) were hypothyroid. Out of 21 female, 85.7% (18) were euthyroid and 14.2% (3) were hypothyroid.

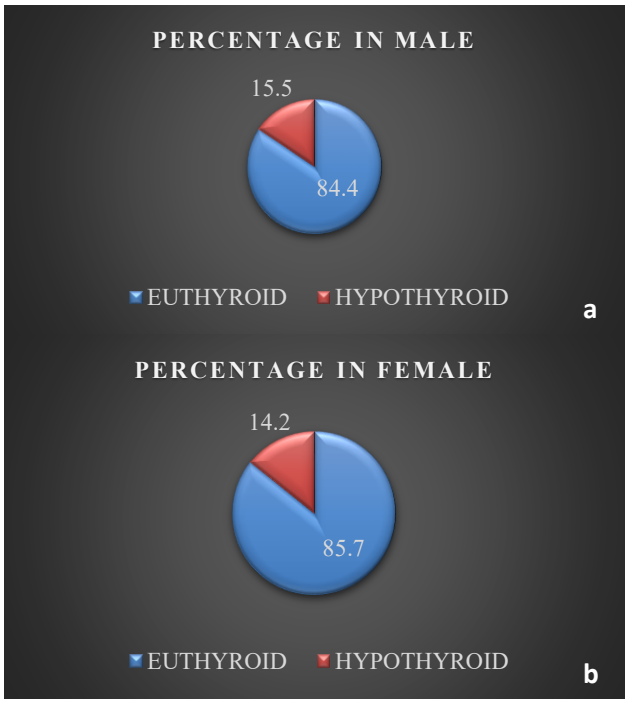

Figure 1 (a and b): Sex distribution.

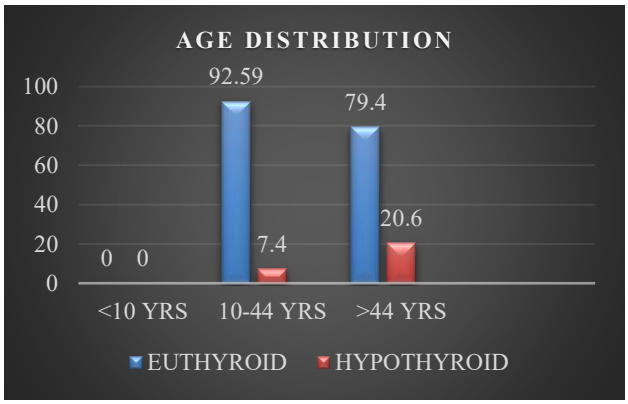

Figure 2: Age distribution.

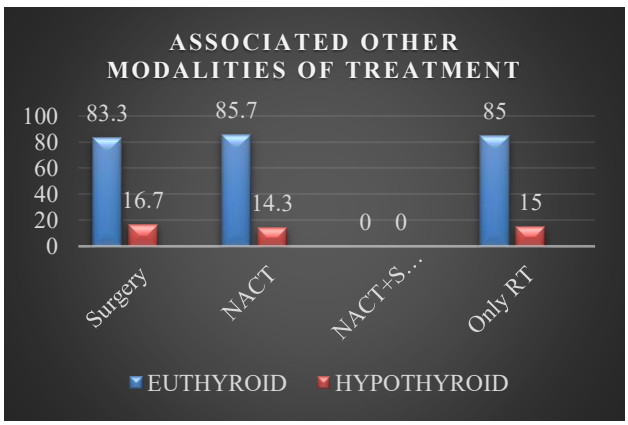

Figure 3: Associated other modalities of treatment.

In 10-44 years, age group, 92.59% (25) were euthyroid and 7.4% (2) were hypothyroid. In >44 years 79.4% (31) were euthyroid and 20.6% (8) were hypothyroid.

Out of 66 patients, 1.5% (1) was of Ca ear, 15.2% (10) were of Ca nose and nasopharynx, 25.7% (17) were of Ca Oral Cavity, 7.6% (5) were Ca oropharynx, 13.6% (9) were Ca hypopharynx and 36.4% (24) were Ca larynx. In Ca oropharynx, out of 5 only 1 was reported of be hypothyroid post radiotherapy (20%), in Ca hypopharynx out of 9 only 2 (22.22%) and in Ca larynx out of 24 only 7 (29.16%) were hypothyroid post radiotherapy. 16.7% hypothyroid patients were previously treated with surgery, 14.3% with NACT (neo-adjuvant chemotherapy), 15% only RT. Out of 66 patients, 17% (11) were treated with radical radiotherapy, 54% (36) with adjuvant radiotherapy and 29% (19) with palliative radiotherapy. 16% hypothyroid patients were treated with concurrent chemotherapy whereas 13% were not.

Table 1: Site of primary disease.

Site	Number of cases	%
Ca ear	1	1.5
Ca nose and nasopharynx	10	15.2
Ca oral cavity	17	25.7
Ca oropharynx	5	7.6
Ca hypopharynx	9	13.6
Ca larynx	24	36.4

Table 2: Incidence of hypothyroidism in various cancer sites.

Site	Number of cases	%
Ca ear	0	0
Ca nose and nasopharynx	0	0
Ca oral cavity	0	0
Ca oropharynx	1	20
Ca hypopharynx	2	22.22
Ca larynx	7	29.16

Table 3: Radiation type received.

	Number of cases	%
Radical	11	17
Adjuvant	36	54
Palliative	19	29

Table 4: Concurrent chemotherapy.

	Number of cases		%	
	Euthyroid	**Hypothyroid**	**Euthyroid**	**Hypothyroid**
Yes (58)	49	9	84	16
No (8)	7	1	87	13

Table 5: Machine used in EBRT.

	Number of cases	%
Telecobalt	28	42
LINAC	38	58

Table 6: Incidence of hypothyroidism in different machines.

	Number of cases	%
Telecobalt	4	40
LINAC	6	60

Out of 66, 42% (28) were given radiation by Telecobalt and 58% (38) by LINAC. Out of 10 hypothyroid patients in our study, 4 were given radiation by Telecobalt and 6 by LINAC.

DISCUSSION

Shewalkar et al found that maximum patients developed hypothyroidism after 6 months post irradiation (14%) whereas in our study 15.15% developed hypothyroidism.[1] In Fujiwara et al found 20.8% patients to be hypothyroid post radiotherapy compared to 15.15% in our study.[8]

Kim et al found that 46% patients developed hypothyroidism compared to our study which was 15.15%.[4] Kim et al 39% male and 13% female were found hypothyroid and in our study 15.5% male and 14.2% female were found to be hypothyroid.[4]

Shewalkar et al found maximum number of hypothyroid patients are of oral cavity cancer (67.85%) but in our study it is laryngeal cancer (29.16%).[1] Eighteen (64.28%) hypothyroid patients were treated by surgery, four (14.28%) by NACT, none by NACT and surgery, only RT was six (21.42%), whereas in our study only surgery was 30%, 100% by NACT, none by NACT and surgery and 9.8% by RT alone.[1]

Chow et al in 2022 found out that incidence of hypothyroidism post radiation was 41.4% in a mean follow up duration ranging from 1 to 5.3 years, whereas in our study it is 15.15% at the end of 6 months period.[3]

Srikantia et al found the hypothyroidism incidence to be 42.2% at the end of nine months of follow-up period, where 31.1% had clinical hypothyroidism whereas 11.1% had subclinical hypothyroidism compared to our study which was 15.15% at the end of 6 months.[5] Pil et al found out the incidence of hypothyroidism to be 32% after 1 year compared to 15.15% in our study after 6 months period.[6]

According to Fujiwara et al maximum hypothyroidism was found in glottic cancer (42.24%) followed by hypopharyngeal cancer (21.55%) and in our study laryngeal cancer was 29.16% followed by hypopharyngeal cancer (22.22%).[8] Oropharyngeal cancer patients had highest hypothyroidism risks (33%) followed by nasopharynx (25%) whereas in our study highest was in laryngeal cancer (29.16%) followed by hypopharyngeal cancer (22.22%).[4]

According to Kim et al 20% of hypothyroid patients received concurrent chemotherapy and 32% did not whereas in our study 15.5% received concurrent chemotherapy and 12.5% did not.[4]

In Luo et al 21.8% hypothyroid patients received concurrent chemotherapy whereas 5.26% did not compared to our study where 15.5% received concurrent chemotherapy and 12.5% did not.[7]

Smaller sample size, shorter time and single centre based were the limitations of our study.

CONCLUSION

Hypothyroidism can develop as early as 1 month post radiotherapy and can also be delayed to more than 5 years later. Hypothyroidism incidence increases with time, where majority develop after 6 months post radiotherapy. Age, sex and concurrent chemotherapy were not identified as relevant risk factors in our study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Mili MK, Goswami G, Nath N, Deb M, Payeng R, Patel P. Incidence of thyroid dysfunction post radiotherapy in head and neck cancer. Int J Otorhinolaryngol Head Neck Surg 2025;11:550-4.