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# Prognostic Factors Affecting Survival in Thyroid Carcinoma: A Retrospective Single-center Study

## Tiroid Karsinomunda Sağkalımı Etkileyen Prognostik Faktörler: Retrospektif Tek Merkezli Bir Çalışma

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## Abstract

**Objective:** To investigate the relationship between clinical, pathological, and treatment-related characteristics and survival outcomes in patients with thyroid carcinoma.

**Methods:** This retrospective study included 45 patients with histopathologically confirmed thyroid carcinoma who were treated and followed at the Surgical Department of University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital over a 20-year period. Demographic features, histological tumor subtypes, metastatic status, and surgical treatment details were reviewed. Potential prognostic factors associated with survival were evaluated.

**Results:** The mean age of the patients was 48±15 years. Of the study population, 71.1% were female and 28.9% were male. Papillary thyroid carcinoma was the predominant histological subtype, representing 60% of all cases. Lymph node metastasis was present in 35.6% of patients, whereas distant metastasis was present in 17.8% of patients. Patients with differentiated thyroid carcinomas showed better survival outcomes than those with other histological subtypes. Older age, metastatic disease, and aggressive tumor histology were associated with reduced survival. Among these factors, distant metastasis showed the most pronounced association with mortality.

**Conclusion:** Differentiated thyroid carcinomas are generally associated with favorable survival; however, the presence of metastases and aggressive histological subtypes adversely affect prognosis. Age, histological subtype, and metastatic status should be considered important factors in prognostic assessment and risk stratification of patients with thyroid carcinoma.

**Keywords:** Thyroid cancer, differentiated thyroid carcinoma, metastasis, prognosis, survival

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## Öz

**Amaç:** Bu çalışmada, tiroid karsinomu tanısıyla takip ve tedavi edilen hastalarda klinik ve histopatolojik özelliklerin sağkalım üzerine olan etkisinin değerlendirilmesi amaçlandı.

**Yöntem:** Retrospektif olarak planlanan bu çalışmaya, Sağlık Bilimleri Üniversitesi, İzmir Tepecik Eğitim ve Araştırma Hastanesi Cerrahi Kliniği'nde 20 yıllık süreç içerisinde takip edilen ve histopatolojik inceleme sonucunda tiroid karsinomu tanısı kesinleşen 45 hasta dahil edildi. Hastalara ait demografik veriler, tümörün histolojik alt tipi, lenf nodu ve uzak metastaz durumu ile uygulanan cerrahi tedavi yöntemleri incelendi. Sağkalım üzerinde etkili olabilecek klinik ve patolojik prognostik faktörler değerlendirildi.

**Bulgular:** Çalışmaya dahil edilen hastaların yaş ortalaması 48±15 yıl idi. Olguların %71,1'i kadın, %28,9'u erkekti. Histolojik alt tipler arasında en sık papiller tiroid karsinomu saptandı ve bu grup tüm olguların %60'ını oluşturdu. Lenf nodu metastazı hastaların %35,6'sında, uzak metastaz ise %17,8'inde mevcuttu. Diferansiye tiroid karsinomu olan hastalarda sağkalım oranlarının daha yüksek olduğu görüldü. Buna karşılık ileri yaş, metastatik hastalık varlığı ve agresif histolojik alt tipler daha kötü sağkalım sonuçları ile ilişkiliydi. Uzak metastaz varlığı, mortalite ile en güçlü ilişki gösteren faktör olarak öne çıktı.

**Sonuç:** Diferansiye tiroid karsinomlarında sağkalım genel olarak iyi olmakla birlikte, metastatik hastalık ve agresif histolojik alt tipler prognozu olumsuz yönde etkilemektedir. Bu nedenle tiroid kanseri tanılı hastalarda yaş, histolojik alt tip ve metastaz durumunun prognozun belirlenmesinde dikkate alınması gereken temel faktörler olduğu düşünülmektedir.


**Anahtar Kelimeler:** Tiroid kanseri, diferansiye tiroid karsinomu, metastaz, prognoz, sağkalım

## Introduction

Thyroid carcinoma is the leading malignant disease of the endocrine system and represents a relatively small proportion of all cancers. Over recent decades, the number of diagnosed thyroid cancer cases has increased in many regions. This increase is generally attributed to the broader use of neck ultrasonography and cross-sectional imaging, which has led to more frequent detection of small and clinically silent thyroid nodules. In contrast to the rise in incidence, mortality has remained relatively stable, particularly among patients with differentiated thyroid carcinoma, in whom long-term outcomes are usually favorable[1,2].

Histopathologically, thyroid malignancies are primarily classified as papillary, follicular, medullary, and anaplastic carcinomas. Papillary and follicular carcinomas are commonly evaluated together as differentiated thyroid carcinomas and account for the great majority of thyroid malignancies[3]. Papillary thyroid carcinoma is the predominant subtype and often has an indolent clinical course. By contrast, anaplastic carcinoma is rare but is associated with highly aggressive biological behavior and poor survival[4].

Despite the generally favorable course of differentiated thyroid carcinoma, the prognosis is not uniform across all patients. Some patients develop recurrence, metastatic spread, or disease-related mortality during follow-up. Therefore, defining prognostic variables is important for risk assessment, treatment planning, and long-term surveillance. Age, sex, tumor size, histological subtype, capsular invasion, extrathyroidal extension, nodal status, and distant metastasis have all been reported to influence survival outcomes in thyroid carcinoma[5].

Age is one of the most frequently used parameters in prognostic evaluation. Older patients have been shown to experience higher disease-specific mortality in several clinical series. Tumor-related characteristics, particularly larger tumor diameter and extrathyroidal extension, may also reflect more advanced disease and have been associated with poorer outcomes[6].

Regional lymph node metastasis is especially common in papillary thyroid carcinoma. Its effect on survival may vary depending on patient age, tumor burden, and other pathological features; however, nodal disease remains an important component of staging and risk evaluation. Distant metastasis more directly and adversely affects survival. In differentiated thyroid carcinoma, the lungs and bones are among the most frequent metastatic sites, and the development of distant metastatic disease is associated with a substantial reduction in long-term survival[7,8].

Several scoring systems have been developed to estimate prognosis in thyroid cancer. Models such as AGES, AMES, and MACIS combine clinical and pathological parameters including age, metastasis, tumor extent, tumor size, grade, completeness of resection, and invasion. These systems may help clinicians stratify patients into risk groups and choose appropriate follow-up and treatment strategies[9].

Although most thyroid cancers follow a favorable clinical course, outcomes may differ considerably between patients. For this reason, recognition of high-risk features and individualized risk stratification remain essential in the management of thyroid carcinoma. Evaluation of demographic, clinical, and pathological characteristics may provide useful information for estimating prognosis and tailoring follow-up after treatment[10].

The aim of this study was to evaluate the relationship between clinical and pathological characteristics and survival outcomes in patients with thyroid carcinoma treated at a single tertiary center over a 20-year period.

## Materials and Methods

### Study Design and Patient Population

This retrospective study was designed to assess factors associated with survival in patients with thyroid carcinoma. Patients who underwent surgical treatment and who were followed in the Department of Surgery at University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital were evaluated. The study cohort consisted of 45 patients with thyroid malignancy who were treated during a 20-year period. Demographic data, clinical presentation, laboratory findings, operative details, pathological results, and follow-up information were retrieved from hospital archives and patient files.

The diagnosis of thyroid carcinoma was confirmed in all cases by histopathological examination of surgical specimens. The study was approved by University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital. Data recorded at diagnosis, tumor-related characteristics, and clinical outcomes during follow-up were reviewed for each patient.

### Inclusion and Exclusion Criteria

Patients were eligible for inclusion if they had histopathologically confirmed thyroid carcinoma, had undergone surgery at the Department of Surgery at University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital, and had clinical, pathological, and follow-up data sufficient for survival assessment. Patients were excluded if the diagnosis was not confirmed histopathologically, essential clinical or pathological information was missing, follow-up data could not be obtained, or surgical treatment was not performed.

### Clinical and Demographic Variables

The variables analyzed included age, sex, clinical presentation, tumor size at diagnosis, type of surgical treatment, lymph node metastasis, distant metastasis, extrathyroidal extension, and histopathological tumor subtype.

Laboratory data recorded during diagnosis and follow-up were reviewed retrospectively. These parameters included serum levels of thyroid-stimulating hormone, triiodothyronine, thyroxine, thyroglobulin, and calcitonin, with calcitonin particularly considered in patients with medullary thyroid carcinoma. Laboratory findings were evaluated together with the clinical data available at diagnosis.

### Pathological Evaluation

Surgical specimens were assessed in the pathology laboratory. Tumors were classified according to histological features, and pathological variables, including tumor diameter, capsular invasion, extrathyroidal extension, and lymph node metastasis, were recorded when available.

### Follow-up and Survival Assessment

Follow-up information was obtained from outpatient records and patient files. Survival duration was calculated from the date of diagnosis to the date of death or the last documented follow-up visit. Overall survival (OS) was defined as the primary endpoint.

### Statistical Analysis

Statistical analysis was performed using SPSS for Windows (SPSS Inc., Chicago, IL, USA, version 7.5). Descriptive data were presented as mean ± standard deviation for continuous variables and as numbers and percentages for categorical variables. Categorical variables were compared using the chi-square test, whereas continuous variables were analyzed using the Student's t-test. Survival was evaluated using the Kaplan-Meier method, and differences between survival curves were assessed using the log-rank test. A p-value $<0.05$ was accepted as statistically significant.

## Results

The study included 45 patients with histopathologically confirmed thyroid carcinoma who underwent treatment in the Department of Surgery at University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital, during a 20-year period. Demographic and clinical features of the cohort are presented in Table 1.

Patient age ranged between 18 and 80 years, and the mean age was 48±15 years. Twenty-seven patients (60%) were younger than 45 years, while 18 (40%) were 45 years of age or older.

There were 32 female patients (71.1%) and 13 male patients (28.9%), corresponding to a female-to-male ratio of approximately 2.5:1 (Table 1).

Papillary thyroid carcinoma was the most frequent histological diagnosis, identified in 27 patients (60%). Follicular carcinoma was observed in 9 patients (20%), and Hürthle cell carcinoma was observed in 4 patients (8.9%). Less common subtypes were medullary carcinoma (n=2, 4.4%), anaplastic carcinoma (n=1, 2.2%), and other malignancies (n=2, 4.4%).

Overall, differentiated thyroid carcinomas, including papillary and follicular subtypes, accounted for approximately 80% of the study population (Table 2).

Lymph node metastasis was present in 16 patients (35.6%), and distant metastasis was identified in 8 patients (17.8%). The lungs and bones were the most common sites of distant metastasis.

Among patients with papillary carcinoma, lymph node metastasis was detected in 10 (37%), whereas distant metastasis was present in 2 (7.4%). Among patients with follicular carcinoma, the rate of distant metastasis was 33.3% (Table 2).

All patients in the cohort underwent total thyroidectomy. Depending on disease extent, nodal involvement, and clinical risk profile, selected patients underwent additional radical procedures, such as modified neck dissection. Additional radical surgery was performed in a total of 5 patients: 4 in the high-risk group and 1 in the low-risk group. Patients classified as high-risk more commonly underwent more extensive surgical procedures (Table 3).

In the analysis of survival-related factors, lower survival rates were observed in patients of advanced age, male patients, and patients with metastatic disease. Survival was 96.3% in patients younger than 45 years and 77.8% in those aged 45 years or older. Mortality was also higher in male patients than in female patients (Table 4).

Metastatic status was closely related to survival outcomes. Survival was 96.6% in patients without lymph node metastasis, and 75.0% in those with nodal involvement.

**Table 1. Demographic and clinical characteristics of the study population**

| Variable | n (%) |
|---|---|
| Age (mean ± SD) | 48±15 |
| Age range | 18-80 |
| **Age groups** | |
| <45 years | 27 (60) |
| ≥45 years | 18 (40) |
| **Sex** | |
| Female | 32 (71.1) |
| Male | 13 (28.9) |
| **Histological subtype** | |
| Papillary carcinoma | 27 (60) |
| Follicular carcinoma | 9 (20) |
| Hürthle cell carcinoma | 4 (8.9) |
| Medullary carcinoma | 2 (4.4) |
| Anaplastic carcinoma | 1 (2.2) |
| Other malignancies | 2 (4.4) |
| Lymph node metastasis | 16 (35.6) |
| Distant metastasis | 8 (17.8) |

SD: Standard deviation

**Table 2. Clinical course and oncological outcomes according to histological subtypes**

| Histological subtype | Patients, n (%) | LN metastasis, n (%) | Distant metastasis, n (%) | Recurrence, n (%) | Death, n (%) |
|---|---|---|---|---|---|
| Papillary carcinoma | 27 (60) | 10 (37) | 2 (7.4) | 3 (11.1) | 1 (3.7) |
| Follicular carcinoma | 9 (20) | 3 (33.3) | 3 (33.3) | 0 (0) | 1 (11.1) |
| Hürthle cell carcinoma | 4 (8.9) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Medullary carcinoma | 2 (4.4) | 1 (50) | 1 (50) | 0 (0) | 1 (50) |
| Anaplastic carcinoma | 1 (2.2) | 1 (100) | 1 (100) | 1 (100) | 1 (100) |
| Other malignancies | 2 (4.4) | 1 (50) | 1 (50) | 1 (50) | 1 (50) |
| Total | 45 (100) | 16 (35.6) | 8 (17.8) | 5 (11.1) | 5 (11.1) |

LN: Lymph node

The difference was more pronounced for distant metastasis: survival was 97.3% in patients without distant metastasis and 50.0% in patients with distant metastasis (Table 4).

Survival was highest among patients with differentiated thyroid carcinoma. The survival rates were 96.3% for papillary thyroid carcinoma and 88.9% for follicular carcinoma. In contrast, mortality was higher in medullary carcinoma and particularly evident in anaplastic thyroid carcinoma.

The duration of follow-up ranged from 1 month to 20 years, with a mean follow-up period of approximately 8 years. During follow-up, recurrence and disease-related death each occurred in 5 patients (11.1%).

Major prognostic factors and corresponding survival outcomes are summarized in Table 5. Patients aged ≥45 years had lower survival than younger patients. Similarly, nodal or distant metastatic disease was associated with reduced survival. Papillary and follicular carcinomas showed better survival outcomes than medullary and anaplastic carcinomas.

## Discussion

In this retrospective single-center study, clinical and pathological factors associated with survival were evaluated in 45 patients treated for thyroid carcinoma over a 20-year period. The results showed that papillary thyroid

**Table 3. Distribution of surgical procedures according to risk groups**

| Surgical treatment | Low-risk group, n (%) | High-risk group, n (%) | Total, n (%) |
|---|---|---|---|
| Total thyroidectomy | 23 (100.0) | 22 (100.0) | 45 (100.0) |
| Additional radical surgical procedure | 1 (4.3) | 4 (18.2) | 5 (11.1) |
| No additional radical surgical procedure | 22 (95.7) | 18 (81.8) | 40 (88.9) |

**Table 4. Prognostic factors associated with survival**

| Prognostic factor | Patients, n (%) | Death, n (%) | Survival (%) |
|---|---|---|---|
| Age <45 years | 27 (60) | 1 (3.7) | 96.3 |
| Age ≥45 years | 18 (40) | 4 (22.2) | 77.8 |
| Female | 32 (71.1) | 2 (6.3) | 93.7 |
| Male | 13 (28.9) | 3 (23.1) | 76.9 |
| No lymph node metastasis | 29 (64.4) | 1 (3.4) | 96.6 |
| Lymph node metastasis present | 16 (35.6) | 4 (25) | 75 |
| No distant metastasis | 37 (82.2) | 1 (2.7) | 97.3 |
| Distant metastasis present | 8 (17.8) | 4 (50) | 50 |

**Table 5. Overall survival according to major prognostic factors**

| Prognostic factor | Category | Patients, (n) | Deaths, (n) | Survival (%) |
|---|---|---|---|---|
| Age | <45 years | 27 | 1 | 96.3 |
| Age | ≥45 years | 18 | 4 | 77.8 |
| Sex | Female | 32 | 2 | 93.7 |
| Sex | Male | 13 | 3 | 76.9 |
| Lymph node metastasis | Absent | 29 | 1 | 96.6 |
| Lymph node metastasis | Present | 16 | 4 | 75 |
| Distant metastasis | Absent | 37 | 1 | 97.3 |
| Distant metastasis | Present | 8 | 4 | 50 |
| Histological subtype | Papillary carcinoma | 27 | 1 | 96.3 |
| Histological subtype | Follicular carcinoma | 9 | 1 | 88.9 |
| Histological subtype | Hürthle cell carcinoma | 4 | 0 | 100 |
| Histological subtype | Medullary carcinoma | 2 | 1 | 50 |
| Histological subtype | Anaplastic carcinoma | 1 | 1 | 0 |

carcinoma was the most common histological subtype, that differentiated thyroid carcinomas had better survival outcomes, and that survival was lower among patients of advanced age, those with metastatic disease, and those with aggressive histological subtypes.

Papillary thyroid carcinoma accounted for approximately 60% of the cases in the present cohort, making it the predominant subtype. This distribution is in line with the general epidemiological pattern of thyroid malignancies, in which differentiated thyroid cancers, particularly papillary and follicular carcinomas, constitute the majority of cases[11]. Consistent with this biological profile, patients with papillary and follicular carcinomas in our cohort had higher survival rates than those with less common and more aggressive subtypes[12].

Age has long been incorporated into prognostic assessment in thyroid cancer. Classical staging and scoring systems have frequently used age thresholds, including 45 years, to estimate risk[13,14]. In our cohort, patients aged 45 years or older had lower survival rates than younger patients, supporting the clinical relevance of age for outcome evaluation.

However, age should not be interpreted as an isolated determinant of prognosis. Contemporary risk assessment emphasizes the combined evaluation of patient age, tumor biology, disease extent, and response to treatment. Therefore, age is best considered together with pathological and clinical risk factors rather than as a stand-alone parameter[15].

Histological subtype was another important factor related to the outcome. Survival was higher in differentiated tumors, including papillary and follicular carcinomas, whereas outcomes were worse in medullary and particularly in anaplastic thyroid carcinomas. Although anaplastic thyroid carcinoma is uncommon, it is known for its rapidly progressive course and poor prognosis[16]. These findings highlight the prognostic value of tumor histology in addition to its diagnostic role.

Regional lymph node metastases are frequently encountered in papillary thyroid carcinoma. Its prognostic significance has been debated, because some studies suggest a stronger association with locoregional recurrence than with OS[17]. In the present study, patients with lymph node metastasis had poorer survival than those without nodal disease. This observation may indicate that nodal involvement reflects a higher tumor burden or more aggressive disease characteristics in selected patients.

Distant metastasis was the factor most clearly associated with reduced survival in this cohort. Survival was markedly lower in patients with distant metastatic disease than in those without distant metastatic disease. This finding is compatible with previous reports showing that metastatic spread to distant organs substantially worsens prognosis, even in differentiated thyroid carcinoma[18]. The lungs and bones were the most frequent metastatic sites in our patients, which is consistent with the typical metastatic pattern of differentiated thyroid cancers[19].

Extrathyroidal extension and local invasion are also important components of risk evaluation in thyroid carcinoma. Previous studies have linked extrathyroidal extension with increased recurrence risk and mortality[20]. In the present study, these variables were assessed as part of the pathological evaluation and contributed to the overall characterization of disease extent and risk profile.

Risk stratification in thyroid cancer has evolved over time. In addition to traditional staging systems, dynamic risk stratification models that incorporate response to treatment are now widely used to refine prognosis during follow-up[21]. The long time span covered by the present study may limit direct comparisons with modern risk-adapted management strategies. Nevertheless, our findings support the ongoing relevance of classical prognostic variables such as age, histological subtype, and metastatic status.

### Study Limitations

This study has some limitations. The small sample size reduced statistical power, particularly for analyses of rare histological subtypes. In addition, the retrospective design and the 20-year study period may have resulted in variations in diagnostic methods, treatment approaches, and follow-up practices. The long follow-up is a strength of the study, providing information about long-term outcomes in thyroid carcinoma.

The results indicate that prognosis in patients with thyroid carcinoma is influenced by both patient- and tumor-related factors. Differentiated thyroid carcinomas generally have favorable survival, whereas metastatic disease and aggressive histology are associated with poorer outcomes.

These findings support the importance of risk-based follow-up and individualized treatment planning.

## Conclusion

This retrospective study evaluated the effect of clinical and pathological characteristics on survival in patients with thyroid carcinoma. Differentiated thyroid carcinomas were the most common histological group and were associated

with favorable survival outcomes. In contrast, advanced age, metastatic disease, and aggressive histological subtypes were associated with decreased survival.

Age, tumor histology, and metastatic status should be considered key parameters when estimating the prognosis for patients with thyroid carcinoma. Early recognition of these factors may help clinicians identify high-risk patients and plan appropriate follow-up strategies.

Differentiated thyroid carcinomas usually have favorable outcomes; however, metastasis and aggressive histological subtypes adversely affect prognosis. Risk-adapted management and long-term surveillance remain essential in the care of patients with thyroid carcinoma.

### Ethics

**Ethics Committee Approval:** The study was approved by University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital.

**Informed Consent:** Retrospective study.

### Footnotes

This study is based on the specialty thesis conducted by Dr. Semra Salimoğlu at University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital in 1999. At the time the study was conducted, an ethics committee and an ethics committee approval number system in their current form were not in place at our institution. Specialty thesis studies were conducted with the approval of the Education Planning Committee (EPC).

The thesis approval document issued by the EPC at that time has been submitted to the journal. Therefore, a separate ethics committee approval number is not available for this study.

### Authorship Contributions

Surgical and Medical Practices: S.S., E.K., Concept: S.S., A.D., Design: S.S., A.D., E.K., Data Collection or Processing: S.S., A.D., R.K., Analysis or Interpretation: S.S., A.D., E.K., R.K., Literature Search: S.S., R.K., Writing: S.S., A.D., E.K., R.K.

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