



Top 100 Cited Articles in Thyroid Cancer: A Bibliometric Analysis

Tiroid Kanserinde En Fazla Atıf Alan 100 Makale: Bibliyometrik Bir Analiz

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Abstract

Objective: To identify and analyze the 100 most cited articles on thyroid cancer since 1975, thus, allowing their easy access for researchers in this field. **Material and Methods:** This study is a bibliometric analysis of research publications acquired from the Web of Science database. We evaluated the first 100 articles receiving the most citations in the field of thyroid cancer since 1975. Then, all research publications were compiled using journal information into different categories based on the study type, country, research centers, authors, and publication dates. All data were reported as percentages, numbers, and graphs. **Results:** In this study, we listed 8,608 full-length English-language articles. Our findings showed that the most cited article received 4,325 citations to date, while the Journal of Clinical Endocrinology Metabolism, a Thyroid journal, received the most number of citations (n:6531), publishing seventeen of the articles from our study. Also, thirty-two articles were from the field of oncology. The country with the most number of publications was the United States of America (n=70) in the years 2005, 2008, and 2009 (n=8). **Conclusion:** It is essential to acknowledge the top-cited articles in thyroid cancer since they contain essential information, research, and advances in its treatment. Our analysis of the first 100 articles included the most important papers with the most significant impact on thyroid cancer research. In our list, we acknowledged the most productive authors and institutions along with their research articles.

Keywords: Bibliometric study; citation; thyroid cancer

Özet

Amaç: Bu makaledeki amacımız, 1975 yılından bu yana tiroid kanseri ile ilgili en çok atıf alan 100 makaleyi belirlemek ve analiz etmek, böylece bu alandaki araştırmacılara kolay erişim sağlamaktır. **Gereç ve Yöntemler:** Bu çalışma, Web of Science veri tabanından elde edilen araştırma yayınlarının bibliyometrik analizidir. 1975 yılından bu yana tiroid kanseri alanında en çok atıf alan ilk 100 makaleyi değerlendirdik. Ardından tüm makaleler, dergi bilgileri kullanılarak, çalışma türü, çalışmanın yapıldığı ülke, çalışmanın yapıldığı araştırma merkezi, makalenin yazarları ve yayın tarihlerine göre farklı kategorilerde değerlendirildi. Tüm veriler yüzde, sayı ve grafik olarak rapor edildi. **Bulgular:** Bu çalışmada, 8.608 tam uzunlukta İngilizce makale listelendi. Bulgularımız, bugüne kadar en çok atıf alan makalenin 4.325 atıf aldığını, bir tiroid dergisi olan Journal of Clinical Endocrinology Metabolism'in ise en fazla atıf aldığını (n:6531) ve konumuzla ilgili 17 makale yayımladığını gösterdi. Ayrıca onkoloji alanından 32 makale vardı. 2005, 2008 ve 2009 yıllarında (n=8) en fazla yayına sahip ülke Amerika Birleşik Devletleri (n=70) olmuştur. **Sonuç:** Tiroid kanserinde en çok atıf alan makaleleri, temel bilgileri, araştırmaları ve tedavisindeki ilerlemeleri içerdiği için bilmek önemlidir. İlk 100 makaleye ilişkin analizimiz, tiroid kanseri araştırmaları üzerinde en önemli etkiye sahip en önemli makaleleri içeriyordu. Listemizde en verimli yazarları ve kurumları araştırma makaleleriyle birlikte seçtik.

Anahtar kelimeler: Bibliyometrik çalışma; alıntı; tiroid kanseri

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Introduction

An increasing incidence of thyroid cancer has been observed in the last 50 years. From 1990 to 2013, the global age-standardized incidence rate of thyroid cancer has increased by 20%, with a more significant increase in low-income countries (33%) compared to high-income countries (19%) (1). A large body of research has been published in journals within oncology, surgery, medical, basic sciences, and radiology fields. Although important studies and clinical trials have been conducted on thyroid cancer, most clinicians are not aware of the existence of these studies. However, these publications can significantly improve future treatments for thyroid cancer patients since the decision of clinicians is based on evidence and scientific research of a high impact. Hence, it is required to identify the 100 most cited articles (2). Several bibliometric studies in the past have identified the most cited articles in various fields, such as colon cancer (3), breast cancer (4), general surgery (5), and bariatric surgery (6), which has allowed the medical researchers and personnel in this field to easily access such studies. However, to date, no such research has been conducted to determine the most influential papers in the areas of thyroid cancer research and treatment.

This study aimed to identify and analyze the qualities of the top 100 most cited papers in thyroid cancer or related research. Here, we observed how the knowledge related to thyroid cancer has evolved and changed the management of the disease over time. This study served as a reliable reference for the most cited articles on thyroid cancer.

Material and Methods

We obtained the data from the WoS Core Collection database (Clarivate Analytics, USA) of Thomson Reuters. The data were accessed in the WoS database between 1975 and 2021 using the keyword "thyroid cancer" (access date: 04.01.2021). Articles not related to thyroid cancer were excluded from our study, and only the original research articles written in English were included. Our search initially produced 14,467 published articles. Out of which, the first 100 articles with the most citations were evaluated. Due to the differences in publica-

tion time between the first 100 articles, the older articles were more likely to receive more citations due to the availability of longer citation time. Due to this bias, we calculated the average number of citations per year (ACY) for each article. Finally, we collected the following information from the top 100 cited articles: the article title, the journals where they were published, the study categories, the country the research was conducted in, the centers where the study was conducted, the authors, and the publication dates. For each research journal, the five-year impact factor (2020) responsible for publishing the articles was also recorded.

Ethical Statement

Since this study is a bibliometric assessment designed as citation analysis, it did not require approval from the ethics committee. The study was performed according to the Helsinki declaration.

Statistical Analysis

Since our study was a bibliometric analysis, no statistical analysis methods were used. All data obtained are presented in the form of tables and bar charts.

Results

In this study, we listed 8,608 full-length articles in English. The 100 most cited articles in our list were published between 1987 and 2017 and are shown in Table 1. The number of citations ranged from 197 to 4,325, with the average number of citations being 427.14 ± 498.55 , while the average number of ACY was 45.75 ± 109.35 . The most cited article on thyroid cancer was written by Haugen et al. (7) with an ACY of 1081.25, which was published in the Thyroid journal in 2016, while the least cited article was published by Kim et al. in 2012 (8) with 197 citations and an ACY of 24.63.

The number of most cited articles peaked in 2005, 2008, and 2009 which included eight publications (Figure 1). In the listed 100 articles, a total number of 42,714 citations were made collectively. The most citations were from the articles published in 2019, with the total citation number being 4,046. These first 100 articles were published in 38 different journals (Table 2).

Table 1. The top 100 cited papers in thyroid cancer.

Rank	First author	Journal	Title	Published year	Citation	ACY*
1	Haugen BR, et al.(7)	Thyroid	2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer the American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer	2016	4325	1081.25
2	Davies L, et al.(17)	JAMA-Journal of the American Medical Association	Increasing Incidence of Thyroid Cancer in the United States, 1973-2002	2006	2219	158.50
3	Mazzaferri EL, et al.(18)	American Journal of Medicine	Long-Term Impact of Initial Surgical and Medical Therapy on Papillary and Follicular Thyroid-Cancer	1994	1795	69.04
4	Liaw D, et al.(29)	Nature Genetics	Germline Mutations of the PTEN Gene in Cowden Disease, an Inherited Breast and Thyroid Cancer Syndrome	1997	1489	64.74
5	Kimura ET, et al.(30)	Cancer Research	High Prevalence of BRAF Mutations in Thyroid Cancer: Genetic Evidence for Constitutive Activation of the RET/PTC-RAS-BRAF Signaling Pathway in Papillary Thyroid Carcinoma	2003	1132	66.59
6	Ron E, et al.(31)	Radiation Research	Thyroid-Cancer After Exposure to External Radiation-A Pooled Analysis of 7 Studies	1995	911	36.44
7	Davies L, et al.(17)	JAMA Tolarngology-Head & Neck Surgery	Current Thyroid Cancer Trends in the United States	2014	783	130.50
8	Wells SA, et al.(19)	Journal of Clinical Oncology	Vandetanib in Patients with Locally Advanced or Metastatic Medullary Thyroid Cancer: A Randomized, Double-Blind Phase III Trial	2012	708	88.50
9	Schlumberger M, et al.(20)	New England Journal of Medicine	Lenvatinib versus Placebo in Radioiodine-Refractory Thyroid Cancer	2015	676	135.20
10	Xing MZ, et al.(32)	Journal of Clinical Endocrinology & Metabolism	BRAF Mutation Predicts a Poorer Clinical Prognosis for Papillary Thyroid Cancer	2005	660	44.00
11	Chen AY, et al.(33)	Cancer	Increasing Incidence of Differentiated Thyroid Cancer in the United States, 1988-2005	2009	656	59.64
12	Brose MS, et al.(21)	Lancet	Sorafenib in Radioactive Iodine-Refractory, Locally Advanced or Metastatic Differentiated Thyroid Cancer: A Randomized, Double-Blind, Phase 3 Trial	2014	642	107.00
13	Lim H, et al.(34)	JAMA-Journal of the American Medical Association	Trends in Thyroid Cancer Incidence and Mortality in the United States, 1974-2013	2017	549	183.00

Table 1. The top 100 cited papers in thyroid cancer. (Continue)

Rank	First author	Journal	Title	Published year	Citation	ACY*
14	Enewold L, et al.(35)	Cancer Epidemiology Biomarkers & Prevention	Rising Thyroid Cancer Incidence in the United States by Demographic and Tumor Characteristics, 1980-2005	2009	531	48.27
15	Elashoff M, et al.(36)	Gastroenterology	Pancreatitis, Pancreatic, and Thyroid Cancer With Glucagon-Like Peptide-1-Based Therapies	2011	529	58.78
16	Elisei R, et al.(27)	Journal of Clinical Oncology	Cabozantinib in Progressive Medullary Thyroid Cancer	2013	525	75.00
17	Perros P, et al.(37)	Clinical Endocrinology	Guidelines for the management of thyroid cancer.	2014	514	85.67
18	Xing MZ, et al. (38)	JAMA-Journal of the American Medical Association	Association Between BRAF V600E Mutation and Mortality in Patients with Papillary Thyroid Cancer	2013	505	72.14
19	Gupta-Abramson V, et al.(24)	Journal of Clinical Oncology	Phase II Trial of Sorafenib in Advanced Thyroid Cancer	2008	499	41.58
20	Tuttle RM, et al.(39)	Thyroid	Estimating Risk of Recurrence in Differentiated Thyroid Cancer After Total Thyroidectomy and Radioactive Iodine Remnant Ablation: Using Response to Therapy Variables to Modify the Initial Risk Estimates Predicted by the New American Thyroid Association Staging System	2010	479	47.90
21	Cohen EEW, et al.(29)	Journal of Clinical Oncology	Axitinib is an active treatment for all histologic subtypes of advanced thyroid cancer: Results from a phase II study	2008	463	38.58
22	Schweppe RE, et al.(40)	Journal of Clinical Endocrinology & Metabolism	Deoxyribonucleic Acid Profiling Analysis of 40 Human Thyroid Cancer Cell Lines Reveals Cross-Contamination Resulting in Cell Line Redundancy and Misidentification	2008	425	35.42
23	Kilfoy BA, et al.(41)	Cancer Causes & Control	International patterns and trends in thyroid cancer incidence, 1973-2002	2009	416	37.82
24	La Vecchia C, et al.(42)	International Journal of Cancer	Thyroid cancer mortality and incidence: A global overview	2015	410	82.00
25	Kloos RT, et al.(25)	Journal of Clinical Oncology	Phase II Trial of Sorafenib in Metastatic Thyroid Cancer	2009	408	37.09
26	Ho AL, et al. (30)	New England Journal of Medicine	Selumetinib-Enhanced Radioiodine Uptake in Advanced Thyroid Cancer	2013	383	54.71
27	Bilimoria KY, et al.(43)	Annals of Surgery	Extent of Surgery Affects Survival for Papillary Thyroid Cancer	2007	380	29.23
28	Schlumberger M, et al.(44)	New England Journal of Medicine	Strategies of Radioiodine Ablation in Patients with Low-Risk Thyroid Cancer	2012	366	45.75
29	Smallridge RC, et al.(45)	Thyroid	American Thyroid Association Guidelines for Management of Patients with Anaplastic Thyroid Cancer	2012	363	45.38
30	Rubino C, et al.(46)	British Journal of Cancer	Second Primary Malignancies in Thyroid Cancer Patients	2003	358	21.06
31	Scheumann GFW, et al.(47)	World Journal of Surgery	Prognostic-Significance and Surgical-Management of Locoregional Lymph-Node Metastases in Papillary Thyroid-Cancer	1994	357	13.73

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Table 1. The top 100 cited papers in thyroid cancer. (Continue)

Rank	First author	Journal	Title	Published year	Citation	ACY*
32	Francis GL, et al.(48)	Thyroid	Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer	2015	356	71.20
33	Sherman SI, et al.(49)	New England Journal of Medicine	Motesanib Diphosphate in Progressive Differentiated Thyroid Cancer	2008	356	29.67
34	Cardis E, et al. (50)	JNCI-Journal of the National Cancer Institute	Risk of Thyroid Cancer After Exposure to I-131 in Childhood	2005	351	23.40
35	Kurzrock R, et al.(51)	Journal of Clinical Oncology	Activity of XL184 (Cabozantinib), an Oral Tyrosine Kinase Inhibitor, in Patients with Medullary Thyroid Cancer	2011	349	38.78
36	Singer PA, et al.(52)	Archives of Internal Medicine	Treatment Guidelines for Patients with Thyroid Nodules and Well-Differentiated Thyroid Cancer	1996	345	14.38
37	Machens A, et al.(53)	New England Journal of Medicine	Early Malignant Progression of Hereditary Medullary Thyroid Cancer	2003	341	20.06
38	Xing MZ, et al.(54)	Journal of Clinical Oncology	BRAF V600E and TERT Promoter Mutations Cooperatively Identify the Most Aggressive Papillary Thyroid Cancer with Highest Recurrence	2014	334	55.67
39	Wells SA, et al.(19)	Journal of Clinical Oncology	Vandetanib for the Treatment of Patients with Locally Advanced or Metastatic Hereditary Medullary Thyroid Cancer	2010	332	33.20
40	Maxon HR, et al.(55)	New England Journal of Medicine	Relation Between Effective Radiation-Dose and Outcome of Radioiodine Therapy for Thyroid-Cancer	1983	330	8.92
41	Mallick U, et al.(56)	New England Journal of Medicine	Ablation with Low-Dose Radioiodine and Thyrotropin Alfa in Thyroid Cancer	2012	322	40.25
42	Sipos JA, et al.(57)	Clinical Oncology	Thyroid Cancer Epidemiology and Prognostic Variables	2010	318	31.80
43	Feine U, et al.(58)	Journal of Nuclear Medicine	Fluorine-18-FDG and Iodine-131-Iodide Uptake in Thyroid Cancer	1996	317	13.21
44	Machens A, et al.(59)	World Journal of Surgery	Pattern of Nodal Metastasis for Primary and Reoperative Thyroid Cancer	2002	316	17.56
45	Xing MZ, et al.(60)	Lancet	Progress in Molecular-Based Management of Differentiated Thyroid Cancer	2013	307	43.86
46	Kouvaraki MA, et al.(61)	Surgery	Role of Preoperative Ultrasonography in the Surgical Management of Patients with Thyroid Cancer	2003	307	18.06
47	Leenhardt L, et al.(62)	Thyroid	: Increased Incidence of Thyroid Carcinoma in France: A True Epidemic or Thyroid Nodule Management Effects? Report from the French Thyroid Cancer Committee	2004	305	19.06
48	Kebebew E, et al.(63)	Annals of Surgery	The Prevalence and Prognostic Value of BRAF Mutation in Thyroid Cancer	2007	304	23.38
49	Ron E, et al.(64)	JNCI-Journal of the National Cancer Institute	A Population-Based Case Control Study of Thyroid-Cancer	1987	298	9.03

Table 1. The top 100 cited papers in thyroid cancer. (Continue)

Rank	First author	Journal	Title	Published year	Citation	ACY*
50	Ciampi R, et al.(65)	Journal of Clinical Investigation	Oncogenic AKAP9-BRAF Fusion is a Novel Mechanism of MAPK Pathway Activation in Thyroid Cancer	2005	297	19.80
51	Simpson WJ, et al.(66)	American Journal of Medicine	Papillary and Follicular Thyroid-Cancer-Prognostic Factors In 1,578 Patients	1987	294	8.91
52	Elisei R, et al.(33)	Journal of Clinical Endocrinology & Metabolism	Prognostic Significance of Somatic RET Oncogene Mutations in Sporadic Medullary Thyroid Cancer: A 10-Year Follow-Up Study	2008	289	24.08
53	Clark OH, (67)	Annals of Surgery	Total Thyroidectomy-The Treatment of Choice for Patients with Differentiated Thyroid-Cancer	1982	281	7.39
54	Elisei R, et al.(32)	Journal of Clinical Endocrinology & Metabolism	Impact of Routine Measurement of Serum Calcitonin on the Diagnosis and Outcome of Medullary Thyroid Cancer: Experience in 10,864 Patients with Nodular Thyroid Disorders	2004	278	17.38
55	Hou P, et al.(68)	Clinical Cancer Research	Genetic Alterations and their Relationship in the Phosphatidylinositol 3-Kinase/Akt Pathway in Thyroid Cancer	2007	277	21.31
56	Carr LL, et al.(69)	Clinical Cancer Research	Phase II Study of Daily Sunitinib in FDG-PET-Positive, Iodine-Refractory Differentiated Thyroid Cancer and Metastatic Medullary Carcinoma of the Thyroid with Functional Imaging Correlation	2010	274	27.40
57	Melillo RM, et al.(70)	Journal of Clinical Investigation	The RET/PTC-RAS-BRAF Linear Signaling Cascade Mediates the Motile and Mitogenic Phenotype of Thyroid Cancer Cells	2005	273	18.20
58	Xing MZ, et al.(71)	Journal of Clinical Oncology	Association Between BRAF V600E Mutation and Recurrence of Papillary Thyroid Cancer	2015	271	54.20
59	Nikiforova MN, et al.(72)	Journal of Clinical Endocrinology & Metabolism	Targeted Next-Generation Sequencing Panel (ThyroSeq) for Detection of Mutations in Thyroid Cancer	2013	270	38.57
60	Pineda JD, et al.(73)	Journal of Clinical Endocrinology & Metabolism	I-131 Therapy For Thyroid-Cancer Patients with Elevated Thyroglobulin and Negative Diagnostic Scan	1995	270	10.80
61	Chen H, et al.(74)	Pancreas	The North American Neuroendocrine Tumor Society Consensus Guideline for the Diagnosis and Management of Neuroendocrine Tumors Pheochromocytoma, Paraganglioma, and Medullary Thyroid Cancer	2010	265	26.50
62	Gudmundsson J, et al.(75)	Nature Genetics	Common Variants on 9q22.33 and 14q13.3 Predispose to Thyroid Cancer in European Populations	2009	265	24.09
63	Lam ET, et al.(26)	Journal of Clinical Oncology	Phase II Clinical Trial of Sorafenib in Metastatic Medullary Thyroid Cancer	2010	264	26.40
64	Maxon HR, et al.(76)	Journal of Nuclear Medicine	Radiiodine-131 Therapy for Well-Differentiated Thyroid-Cancer-A Quantitative Radiation Dosimetric Approach-Outcome and Validation in 85 Patients	1992	261	9.32

Table 1. The top 100 cited papers in thyroid cancer. (Continue)

Rank	First author	Journal	Title	Published year	Citation	ACY*
65	Leboulleux S, et al.(77)	Journal of Clinical Endocrinology & Metabolism	Ultrasound Criteria of Malignancy for Cervical Lymph Nodes in Patients Followed Up for Differentiated Thyroid Cancer	2007	260	20.00
66	Haymart MR, et al.(78)	Journal of Clinical Endocrinology & Metabolism	Higher Serum Thyroid-Stimulating Hormone Level in Thyroid Nodule Patients is Associated with Greater Risks of Differentiated Thyroid Cancer and Advanced Tumor Stage	2008	259	21.58
67	Morris LGT, et al.(79)	Thyroid	The Increasing Incidence of Thyroid Cancer: The Influence of Access to Care	2013	256	36.57
68	Garcia-Rostan G, et al.(80)	Journal of Clinical Oncology	Ras Mutations are Associated with Aggressive Tumor Phenotypes and Poor Prognosis in Thyroid Cancer	2003	256	15.06
69	Schlumberger MJ, et al.(81)	Journal of Clinical Oncology	Phase II Study of Safety and Efficacy of Motesanib in Patients with Progressive or Symptomatic, Advanced or Metastatic Medullary Thyroid Cancer	2009	254	23.09
70	White ML, et al.(82)	World Journal of Surgery	Central Lymph Node Dissection in Differentiated Thyroid Cancer	2007	253	19.46
71	Sigurdson AJ, et al.(83)	Lancet	Primary Thyroid Cancer After a First Tumor in Childhood (the Childhood Cancer Survivor Study): A Nested Case-Control Study	2005	248	16.53
72	Kim DW, et al.(84)	Journal of Clinical Endocrinology & Metabolism	An Orally Administered Multitarget Tyrosine Kinase Inhibitor, SU11248, is a Novel Potent Inhibitor of Thyroid Oncogenic RET/Papillary Thyroid Cancer Kinases	2006	246	17.57
73	Tucker MA, et al.(85)	Cancer Research	Therapeutic Radiation at a Young Age is Linked to Secondary Thyroid Cancer	1991	246	8.48
74	Aschebrook-Kilfoy B, et al.(86)	Thyroid	Thyroid Cancer Incidence Patterns in the United States by Histologic Type, 1992-2006			
75	Podnos YD, et al.(87)	American Surgeon	The Implication of Lymph Node Metastasis on Survival in Patients with Well-Differentiated Thyroid Cancer	2005	244	16.27
76	Wang WP, et al.(88)	Journal of Clinical Endocrinology & Metabolism	[F-18]-2-Fluoro-2-Deoxy-D-Glucose Positron Emission Tomography Localizes Residual Thyroid Cancer in Patients with Negative Diagnostic I-131 Whole-Body Scans and Elevated Serum Thyroglobulin Levels	1999	242	11.52
77	Jazdzewski K, et al.(89)	Proceedings of the National Academy of Sciences of the United States of America	Polymorphic Mature microRNAs from Passenger Strand of pre-miR-146a Contribute to Thyroid Cancer	2009	240	21.82
78	Stulak JM, et al.(90)	Archives of Surgery	Value of Preoperative Ultrasonography in the Surgical Management of Initial and Reoperative Papillary Thyroid Cancer	2006	238	17.00

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Table 1. The top 100 cited papers in thyroid cancer. (Continue)

Rank	First author	Journal	Title	Published year	Citation	ACY*
79	Garcia-Rostan G, et al.(91)	Cancer Research	Mutation of the PIK3CA Gene in Anaplastic Thyroid Cancer	2005	238	15.87
80	Sywak M, et al.(92)	Surgery	Routine Ipsilateral Level VI Lymphadenectomy Reduces Postoperative Thyroglobulin Levels in Papillary Thyroid Cancer	2006	237	16.93
81	Cailleux AF, et al.(93)	Journal of Clinical Endocrinology & Metabolism	Is Diagnostic Iodine-131 Scanning Useful After Total Thyroid Ablation for Differentiated Thyroid Cancer?	2000	236	11.80
82	Landa I, et al.(94)	Journal of Clinical Endocrinology & Metabolism	Frequent Somatic TERT Promoter Mutations in Thyroid Cancer: Higher Prevalence in Advanced Forms of the Disease	2013	235	33.57
83	Kang SW, et al.(34)	Surgical Endoscopy and Other Interventional Techniques	Robot-Assisted Endoscopic Surgery for Thyroid Cancer: Experience with the First 100 Patients	2009	229	20.82
84	Vivacqua A, et al.(95)	Molecular Pharmacology	17 Beta-Estradiol, Genistein, and 4-Hydroxytamoxifen Induce the Proliferation of Thyroid Cancer Cells Through the G Protein-Coupled Receptor GPR30	2006	226	16.14
85	Scollo C, et al.(31)	Journal of Clinical Endocrinology & Metabolism	Rationale for Central and Bilateral Lymph Node Dissection in Sporadic and Hereditary Medullary Thyroid Cancer	2003	225	13.24
86	Hanscheid H, et al.(96)	Journal of Nuclear Medicine	Iodine Biokinetics and Dosimetry in Radioiodine Therapy of Thyroid Cancer: Procedures and Results of a Prospective International Controlled Study of Ablation After rhTSH or Hormone Withdrawal	2006	224	16.00
87	Ryder M, et al.(97)	Endocrine-Related Cancer	Increased Density of Tumor-Associated Macrophages is Associated with Decreased Survival in Advanced Thyroid Cancer	2008	222	18.50
88	Grunwald F, et al.(98)	European Journal of Nuclear Medicine	Fluorine-18 Fluorodeoxyglucose Positron Emission Tomography in Thyroid Cancer: Results of a Multicentre Study	1999	222	10.57
89	Wang WP, et al.(99)	Journal of Clinical Endocrinology & Metabolism	Prognostic Value of [F-18]Fluorodeoxyglucose Positron Emission Tomographic Scanning in Patients with Thyroid Cancer	2000	219	10.95
90	Leboulleux S, et al.(21)	Lancet Oncology	Vandetanib in Locally Advanced or Metastatic Differentiated Thyroid Cancer: A Randomized, Double-Blind, Phase 2 Trial	2012	216	27.00
91	Brown AP, et al.(100)	Journal of Clinical Endocrinology & Metabolism	The Risk of Second Primary Malignancies up to three Decades After the Treatment of Differentiated Thyroid Cancer	2008	216	18.00
92	Jung CK, et al.(101)	Journal of Clinical Endocrinology & Metabolism	The Increase in Thyroid Cancer Incidence During the Last Four Decades is Accompanied by a High Frequency of BRAF Mutations and a Sharp Increase in RAS Mutations	2014	210	35.00

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Rank	First author	Journal	Title	Published year	Citation	ACY*
93	Sgouros G, et al.(102)	Journal of Nuclear Medicine	Patient-Specific Dosimetry for I-131 Thyroid Cancer Therapy Using I-124 PET and 3-Dimensional-Internal Dosimetry (3D-ID) Software	2004	204	12.75
94	Griffith OL, et al.(103)	Journal of Clinical Oncology	Meta-Analysis and Meta-Review of Thyroid Cancer Gene Expression Profiling Studies Identifies Important Diagnostic Biomarkers	2006	203	14.50
95	Frattini M, et al.(104)	Oncogene	Alternative Mutations of BRAF, RET, and NTRK1 are Associated with Similar But Distinct Gene Expression Patterns in Papillary Thyroid Cancer	2004	200	12.50
96	Belfiore A, et al.(105)	Journal of Clinical Endocrinology & Metabolism	Increased Aggressiveness of Thyroid-Cancer in Patients with Graves-Disease	1990	200	6.67
97	Jarzab B, et al.(106)	Cancer Research	Gene Expression Profile of Papillary Thyroid Cancer: Sources of Variability and Diagnostic Implications	2005	199	13.27
98	Dow KH, et al.(107)	Thyroid	Quality-of-Life Changes in Patients with Thyroid Cancer After Withdrawal of Thyroid Hormone Therapy	1997	199	8.65
99	Simpson WJ, et al.(108)	International Journal of Radiation Oncology Biology Physics	Papillary and Follicular Thyroid Cancer: Impact of Treatment in 1,578 Patients	1988	198	6.19
100	Kim TH, et al.(8)	Cancer	The Association of the BRAF(V600E) Mutation with Prognostic Factors and Poor Clinical Outcome in Papillary Thyroid Cancer	2012	197	24.63

The Journal of Clinical Endocrinology Metabolism published most of the articles in the top 100 list (17 articles) and had the most citations (4,740 citations) as well. The European Journal of Nuclear Medicine, now known as the European Journal of Nuclear Medicine And Molecular Imaging, published one manuscript, which ranked 88th in the top 100.

The country with the highest number of publications among the top 100 cited articles was the United States of America, with 70 papers. The result of this bibliographic analysis identified the Memorial Sloan Kettering Cancer Care Center as the top institute having the most articles in the top 100, which included a total number of 17 articles and 9,347 citations (Table 3).

Of the top 100, most cited articles were published by Fagin JA. and Schlumberger M., who were the most cited co-authors with a rate of 10%, followed by Elisei R. and Sherman SI. (Table 4). Also, 32% of these articles were categorized under the title of oncology, followed by the fields of endocrinology metabolism, internal general medicine, and surgery.

Discussion

One of the earlier studies reported that nearly half of all scientific publications received no citations, where the number of articles having more than 100 citations was less than 2% (5). Even the most scientifically interesting articles needed time to obtain citations from subsequent publications. The bibliometric analysis can help researchers easily access and analyze a variety of topics providing a historical perspective on medical-related scientific progress.

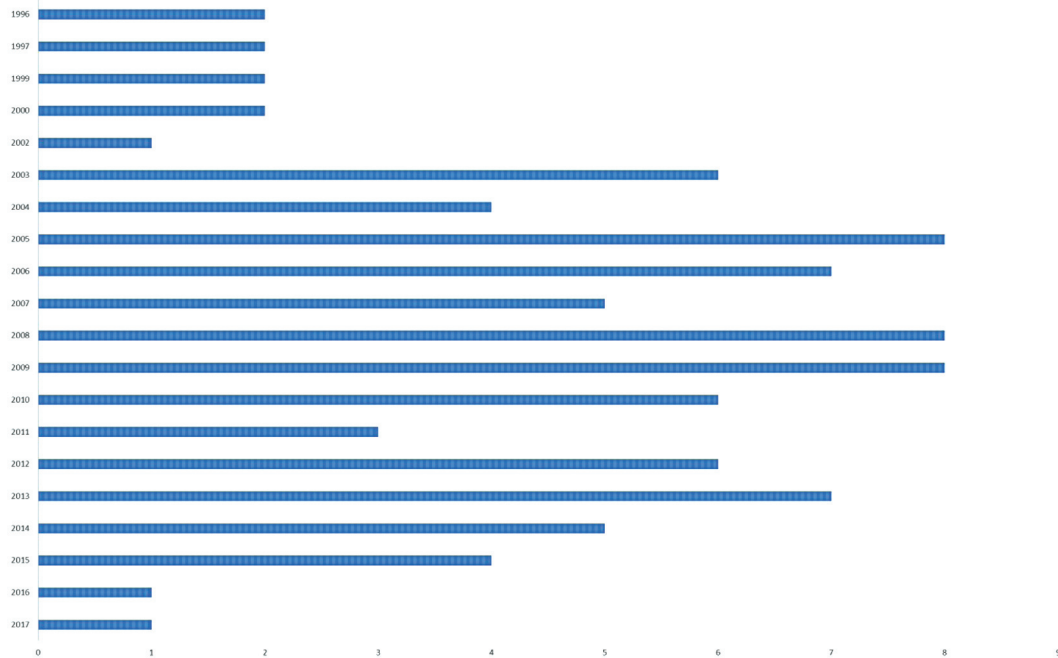


Figure 1. The number of peaks for the most cited articles.

A bibliometric study includes information about the trends in research over time. The number of times other research articles cite a publication is often used to measure the impact of the journal along with validating authors' contributions (9,10). This study aimed to identify the first 100 most cited articles on thyroid cancer, making it easier for researchers to locate and read these papers. Although bibliometric studies have been conducted on many other subjects before, ours is the first of its kind study for thyroid cancer (4-6,9,10).

The time of publishing can significantly impact an article's citation ranking. Logically, the citations of an article depend on publication time because citations tend to accumulate over time. Although the number of citations shows an increase as time passes, some valuable articles may receive a high number of citations in the year they are published. An example of this is the article published in 2016, which ranked first in our study with 4,325 citations (7). As time goes by, articles published a long time ago may get fewer citations as their findings become assimilated and do not need further references. Additionally, the absence of articles before 1982 in our list of the most cited ar-

ticles may indicate the futility of outdated articles in modern times. Although it is difficult to examine the top 100 articles with the most citations, we found the publication duration for the first 100 articles to be between 1982 and 2017. Most articles within the top 100 list were between 2008 and 2009, with another peak observed in 2013. The reason for this may be the involvement of phase III studies of specific agents in advanced stage cancers, which were published in the above-mentioned years. In the bibliometric analysis study on colon cancer (3), 2004 was found to be the peak year for the number of publications, while the highest publication years for breast cancer were 2001 and 2010 (4). Of the top 100 articles, 70 were from the United States of America (USA). Moreover, the publications from the USA preferred to cite other articles also from the USA (11,12). The country's publications were also high in other clinical disciplines, such as cardiology (13), intensive care (14), respiratory (15), and urology (16). These findings show that the USA is at the forefront of thyroid cancer studies. A wide range of patient populations with significant financial support to the researchers could be the main reason behind this.

Table 2. Journals that published the top 100 cited thyroid cancer papers.

Source Titles	5 year impact factor*	Records	Total Citations
Journal of Clinical Endocrinology Metabolism	5.879	17	4,740
Journal of Clinical Oncology	25.597	13	4,866
Thyroid	6.332	8	6,531
New England Journal of Medicine	72.098	7	2,774
Cancer Research	9.883	4	1,816
Journal of Nuclear Medicine	6.782	4	1,006
Annals of Surgery	9.306	3	965
Journal of the American Medical Association	47.677	3	3,272
Lancet	59.345	3	1,197
World Journal of Surgery	2.754	3	926
American Journal of Medicine	5.262	2	2,089
Cancer	5.517	2	853
Clinical Cancer Research	10.115	2	551
Journal of the National Cancer Institute	11.641	2	649
Journal of Clinical Investigation	13.393	2	570
Nature Genetics	30.334	2	1,754
Surgery	3.717	2	544
American Surgeon	0.692	1	244
Archives of Internal Medicine	13.098	1	345
Archives of Surgery	4.893	1	238
British Journal of Cancer	6.210	1	358
Cancer Causes Control	2.621	1	416
Cancer Epidemiology Biomarkers Prevention	4.898	1	531
Clinical Endocrinology	3.366	1	514
Clinical Oncology	3.213	1	318
Endocrine Related Cancer	5.129	1	222
European Journal of Nuclear Medicine	n/a	1	222
Gastroenterology	18.785	1	529
International Journal of Cancer	6.485	1	410
International Journal of Radiation Oncology Biology Physics	5.652	1	198
JAMA Otolaryngology Head Neck Surgery	4.097	1	783
Lancet Oncology	35.843	1	216
Molecular Pharmacology	3.904	1	226
Oncogene	7.066	1	200
Pancreas	2.820	1	265
Proceedings of the National Academy of Sciences of the United States of America	10.620	1	240
Radiation Research	2.802	1	911
Surgical Endoscopy and Other Interventional Techniques	3.239	1	229

*2019 Journal Citation Reports (Clarivate Analytics).

The authors for the most cited article were Haugen et al. (7), and their publication was reviewed by the guidelines for the American Thyroid Association (ATA). It is not surprising that this article, examined by the ATA

guideline, was the most frequently used article by the surgeons interested in thyroid surgery. This study has developed evidence-based recommendations to make clinically-informed decisions in managing thyroid

Table 3. Institutions with the highest number of papers in the top 100.

Rank	Institution	Number*
1	Memorial Sloan Kettering Is at the Forefront of Cancer Care	17
2	National Cancer Institute	13
3	Johns Hopkins University	12
4	Ohio State University	12
5	University Pisa	12
6	Institute Gustave Roussy	11
7	University of Texas MD Anderson Cancer Center	10
8	University of Paris-Sud (Paris 11)	7
9	Maria Skłodowska Curie Memorial Cancer Centre and Institute of Oncology	6
10	University of Cincinnati	6
11	University of Pennsylvania	6
12	University of Pittsburgh	6
13	University of Siena	6
14	Yale University	6
15	Inst Oncol	5
16	University of Sydney	5
17	University of Texas	5
18	University of Toronto	5

*Number of times listed of highest-ranking 18 institutions in the top 100 cited articles.

Table 4. The most common first authors of the top 100 cited articles.

Authors	Records	% of 100
Fagin JA	10	10
Schlumberger M	10	10
Elisei R	9	9
Sherman SI	9	9
Jarzab B	8	8
Nikiforov YE	6	6
Pacini F	6	6
Schlumberger MJ	6	6
Tuttle RM	6	6
Xing MZ	6	6

nodules and differentiated thyroid cancer. Further, seven different guideline studies were also present in the top 100. The second most cited article investigated the incidence, histology, size distribution, and mortality caused by thyroid cancer (17), along with highlighting the advances in the diagnosis of subclinical disease. The third

most cited article was by Mazzaferri et al., published in 1994, which has considerably progressed thyroid cancer treatment in the years to follow (18).

The connection between the thyroid gland and genetics is one of the topics discussed in many studies, and over 22 manuscripts in the top 100 list included research on genetic mutations. Our result is not surprising since there is a well-established link between genetics and thyroid cancer. Research articles, including four drugs for advanced and iodine-131 resistant thyroid cancers, were shown to act as promising treatments between 2012 and 2015.

Of the top 100 cited studies, 17 were drug trials with three papers on Vandetanib. The first study was published in 2010 (19) and had concluded that vandetanib might be an effective therapeutic option in patients with locally advanced or hereditary medullary thyroid cancer (MTC). Vandetanib, the first targeted drug, showed efficacy in a randomized phase II trial in the year 2012, along with efficacy in a phase III study of patients with advanced MTC (20,21). Lenvatinib was associated with significant improvements in progression-free survival and response rates in patients with iodine-131-resistant thyroid cancer compared to placebo (22). Similarly, Sorafenib significantly improved progression-free survival in patients with progressive and radioactive iodine-refractory differentiated thyroid cancer compared to placebo (23). A phase II study of Sorafenib was published in 2008 and was identified among our list of the first 100 articles (24). Apart from that, two other papers also discussed the efficacy of sorafenib in thyroid cancer (25,26). Cabozantinib showed a statistically significant improvement of progression-free survival in patients with progressive metastatic MTC (27,28). In the same year, a phase II study on axitinib was published due to its effectiveness in treating all thyroid cancer stages (29). Also, we observed that the Selumetinib article published in 2013 was in the top 100 list (30), and a significant breakthrough for advanced-stage thyroid cancer treatment was made in the same year.

Of the top 100 articles, 12 articles are on MTC, indicating the importance of this cancer type. A 2003 article discussed the lymph

node dissection patterns of hereditary and sporadic medullary cancer along with the early malignant progression of hereditary MTC (31). Further, an article on the importance of using calcitonin in the follow-up in MTC patients was published in 2004 (32). Later, the prognostic significance of somatic RET oncogene mutations in sporadic MTC was investigated as well (33). Among the top 100 articles, the studies of Elisei et al. were mainly about MTC, while three of the 12 MTC-related articles belonged to another research group (27,32,33).

Investigating the incidence of the disease has always been a popular topic. In our study, 12 papers included incidence studies. We also encountered three studies investigating the effects of external radiation on thyroid cancer. Among the top 100 cited studies, ten papers were based on I-131 treatment. A study on robotic surgery, a popular topic of recent times, was also included in the top 100 list (34), and we believe that this may increase in the future.

The most cited co-authors standing out in their fields were Fagin JA and Schlumberger M, who wrote 20 articles in the top 100 list. The most interesting finding of our study was that not all articles published in journals with high impact factors received high citation scores. However, previous studies had concluded that high citation articles were found in journals with high impact factors (4). Our study showed that even journals with a 5-year impact factor of 0.692 could enter the top 100 list with just one article, and although the New England Journal of Medicine had the highest impact factor, it was not the most-cited. Also, the Thyroid journal, even at the top of the list with eight articles, had more than half of the citations taken only from a single article (7).

In this bibliometric analysis, the vast majority of the top 100 articles were from the field of oncology, followed by endocrine sciences and the general internal medicine research, while pharmacology was at the bottom of the list. General surgeons also contributed significantly to the field of thyroid cancer. However, there are some limitations to our research. Firstly, deliberate omissions of many citations were done for reasons such as disproportionate or inappropriate citations, institutional and language bias, self-

attribution, and strong personal bias. Secondly, there were differences in the broadcast times since older articles had the opportunity to get more citations. For this reason, valuable studies published recently may show up with high citations in similar bibliometric studies conducted in the future. Also, many writers in the top 100 may have contributed to multiple articles, although they were not the first or senior authors. To our knowledge, this article is the first bibliometric study in the field of thyroid cancer. In this study, we identified that the most cited article provided a guideline analysis while the most popular subjects were genetics and medullary cancer. We believe that this study can shed light on the authors working in this field and provide easy access to all medical researchers and staff, thus, contributing to the thyroid cancer field.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Veysel Barış Turhan; Design: Veysel Barış Turhan; Control/Supervision: Veysel Barış Turhan; Data Collection and/or Processing: Abdul Kadir Ünsal; Analysis and/or Interpretation: Abdul Kadir Ünsal; Literature Review: Veysel Barış Turhan; Writing the Article: Veysel Barış Turhan; Critical Review: Veysel Barış Turhan; References and Fundings: Abdul Kadir Ünsal; Materials: Veysel Barış Turhan.

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