Bibliometric analysis of radiology residency theses in Türkiye: publication metrics and trends

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PURPOSE

This study aimed to conduct the first comprehensive bibliometric analysis of radiology residency theses in Türkiye, evaluating publication rates, indexing characteristics, citation performance, and key factors associated with successful thesis-to-publication conversion.

METHODS

This retrospective study included 3,136 radiology residency theses completed between 1971 and December 2024, retrieved from the National Thesis Center. Data were collected on the thesis topic, advisor title, institution type, and study design. Publication status was assessed through searches using author and advisor names and keywords across Google, Google Scholar, PubMed, Web of Science, TR Index, and DergiPark. For published articles, the journal name, indexing category, impact factor quartile, citation count, and time to publication were recorded. Statistical analyses included descriptive statistics, the chi-squared, Mann–Whitney U, and Kruskal–Wallis tests, and regression models (a P value of <0.05 was considered significant).

RESULTS

Most theses were from university hospitals (83.1%) and supervised by professors (45.8%). A total of 1,165 theses (37.1%) were published as journal articles, of which 651 (20.8% of all theses) appeared in Science Citation Index Expanded (SCIE)-indexed journals. Among the SCIE publications, 39.2% were in Q3 or Q4 journals. The most frequent thesis topics were neuroradiology (16.0%) and abdominal radiology (13.3%), whereas imaging physics and radiation safety was least represented (1.6%). Publication rates significantly increased over time ($P = 0.045$), and time to publication decreased ($P < 0.001$), with a median of 1,300 days. Theses supervised by assistant professors had the highest publication rate (43.0%, $P = 0.013$). University-based theses received more citations than those from training and research hospitals ($P < 0.001$). Residency students were first authors in 76.4% of publications. Articles with the advisor or another researcher as the first author were more frequently published in SCIE journals ($P < 0.001$), received more citations ($P < 0.001$), and had shorter time to publication ($P < 0.001$).

CONCLUSION

Approximately one-third of radiology theses in Türkiye are published, with a notable share in SCIE-indexed journals. Thesis publication performance has improved significantly over time.

CLINICAL SIGNIFICANCE

This study highlights the publication potential of radiology residency theses and reveals key factors associated with research visibility. Recognizing these trends may help guide institutional policies, promote academic mentorship, and encourage residents to pursue higher-impact publications. Residency theses should be regarded as integral components of scholarly activity, rather than solely as graduation requirements.

KEYWORDS

Bibliometrics, radiology, residency training, thesis publication, journal impact factor

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Bibliometrics, defined in 1969, is a method that enables the statistical analysis of academic documents.[1] Such studies reveal research trends and the development of the literature, thereby guiding future investigations. In Türkiye, medical residency students are required to prepare an original thesis in their field of specialization to qualify for the specialty examination. This requirement is explicitly stated in the "Regulation on Medical Specialization Training".[2] Similar practices also exist in some European countries.[3] The thesis process is a fundamental component of medical education, providing physicians with scientific research skills while contributing to the academic literature. Moreover, residency theses carry significant potential to enrich the medical literature. Thesis data serve as valuable resources for evaluating research trends, knowledge gaps, and academic productivity; their bibliometric analysis is therefore critical for scientific guidance.[4]

In recent years, bibliometric analyses of residency theses in various medical specialties have been conducted in Türkiye.[4-8] However, as of February 2025–when this study was initiated–no such study specific to the field of radiology had been identified. In this regard, our study represents the first bibliometric analysis of radiology residency theses in Türkiye.

Methods

This retrospective and descriptive study examined the bibliometric characteristics of radiology residency theses in Türkiye, as well as their publication rates in peer-reviewed journals. Theses were retrieved from the online database of the National Thesis Center of the Council of Higher Education of Türkiye.[9] During the search process, "medical residency thesis" was selected as the thesis type, and both "Radiology" and "Radiodiagnostics" were selected separately as the department fields. Records from all available years were included without applying a date restriction. Theses with incomplete data or access restrictions, as well as those belonging to other specialties but erroneously categorized under radiology due to user error, were excluded from the study. Additionally, based on the assumption that the conversion of a thesis into a publication generally requires a minimum of 6 months, theses dated January 2025 and later were excluded. As a result, a total of 3,136 theses were included in the final analysis (Figure 1).

For each thesis, variables such as the title, gender of the author, gender and academic title of the advisor, number of pages, year of publication, name and type of institution, number of advisors, study type, and sample size were recorded. In cases of dual supervision, the advisor with the higher academic title was considered the primary advisor.

Thesis topics were categorized into 14 subgroups based on the subject areas defined with reference to the Education and Scientific Research Groups of the Turkish Society of Radiology (TSR):[10] Neuroradiology, Head and Neck Radiology, Musculoskeletal Radiology, Breast Radiology, Thoracic Radiology, Abdominal Radiology, Genitourinary Radiology, Interventional Radiology, Cardiovascular Radiology, Imaging Physics and Radiation Safety, Obstetric Radiology, Emergency Radiology, Pediatric Radiology, and Other (for theses not falling into the aforementioned 13 groups). The classification of the theses into subgroups was performed by a team of two radiology consultants, and consensus was achieved in all evaluations.

For each thesis, its status of publication as an original research article was investigated. Conference presentations and abstracts were excluded due to systematic accessibility limitations and lack of alignment with the study's objectives. Searches were conducted using the names of the thesis author and advisor, along with relevant keywords, across multiple databases and platforms: Google, Google Scholar, PubMed, Web of Science (WoS), and TR Index (a national citation index for Turkish academic journals).[11-15] Additionally, Dergi-Park, an academic publication platform based in Türkiye, was included in the screening process.[16] When a corresponding article was identified, the following data were recorded: article title, name of the journal, country of publication, year of publication, identity of the first author (i.e., whether the thesis author), number of citations (according to Google Scholar and PubMed), and the indexing status. The indexing status was determined based on how the journal was indexed at the time of article publication. Furthermore, the number of days between the thesis completion date and the article publication date was calculated to determine the time to publication.

Publications were classified into the following five categories based on the indexing status of the journals:

1. Journals indexed in the Science Citation Index Expanded (SCIE)

Main points

- Approximately 37% of radiology residency theses in Türkiye have been published in peer-reviewed journals, with 20.8% appearing in Science Citation Index Expanded (SCIE)-indexed journals.

- More than half of these SCIE publications were in lower-quartile (Q3–Q4) journals.

- Publication performance has significantly improved over time, with higher publication rates and shorter time to publication.
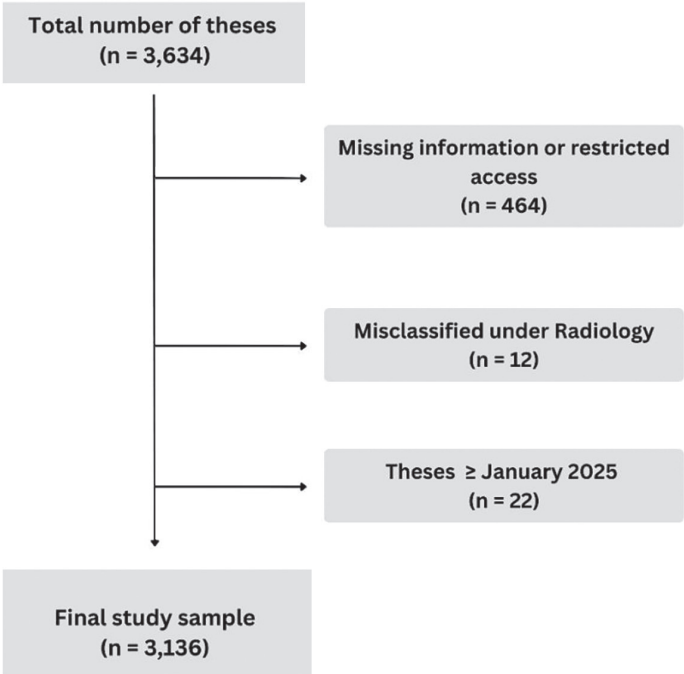
Figure 1. Flowchart illustrating the selection process of radiology residency theses included in the study.

In the flowchart:

Total number of theses (n = 3,634)

→ Missing information or restricted access (n = 464)

→ Misclassified under Radiology (n = 12)

→ Theses ≥ January 2025 (n = 22)

Final study sample (n = 3,136)

2. Journals indexed in the Emerging Sources Citation Index (ESCI)

3. Other internationally indexed journals not listed in WoS

4. National peer-reviewed journals indexed in TR Index

5. Other national peer-reviewed journals not indexed in TR Index

Note: Currently, the WoS platform includes only the SCIE category. Journals previously categorized under the Science Citation Index are now considered part of the SCIE.

If a journal was indexed in more than one database, it was classified only under the highest-ranking category according to the predefined hierarchy. Accordingly, journals indexed in both TR Index and ESCI were classified under ESCI only, while those indexed in both TR Index and SCIE were classified under SCIE only.

For publications in the SCIE category, the Journal Impact Factor quartile ranking (Q1–Q4) was determined using the Journal Citation Reports database provided by Clarivate's WoS.[17] These rankings were recorded based on the year in which the article was published.

Ethical approval for the study was obtained from the İzmir Katip Çelebi University Ethics Committee (date: January 16, 2025; decision no: 0014). This study did not involve any patient data or human participants; therefore, informed consent was not required.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were reported as mean, median, standard deviation, and minimum–maximum values for continuous variables, and as frequencies and percentages for categorical variables. The Shapiro–Wilk test was used to assess the distribution characteristics of continuous variables. For data that did not show a normal distribution, non-parametric tests were applied. The chi-squared test was used to evaluate associations between categorical variables. For comparisons between two independent groups with non-normally distributed continuous data, the Mann–Whitney U test was used; for comparisons among three or more groups, the Kruskal–Wallis H test was employed. In cases where the Kruskal–Wallis test indicated statistical significance, Bonferroni-corrected post-hoc Mann–Whitney U tests were con-ducted to determine pairwise differences. The Z-test for proportions was used for pairwise comparison of proportions and to identify which groups differed in chi-squared analyses with significant results. The annual number of theses was analyzed using Poisson regression, and the probability of publication according to thesis year was assessed using binary logistic regression. A P value of <0.05 was considered statistically significant in all tests.

Results

The majority of the 3,136 radiology residency theses were conducted at university hospitals (83.1%) and under the supervision of professors (45.8%). A total of 84 theses were supervised by two advisors. Additional descriptive characteristics are presented in Table 1.

A statistically significant increase in the number of radiology residency theses was observed after the year 2000 (P < 0.001), with the highest number recorded in 2010 (n = 198) (Figure 2). Among thesis topics, neuroradiology (16.0%), abdominal radiology (13.3%), and interventional radiology (12.4%) were the most frequently selected fields, whereas imaging physics and radiation safety (1.6%) was the least preferred (Figure 3). The distribution of topics by year is detailed in Figure 4.

Out of the 3,136 radiology residency theses, 1,165 (37.1%) were found to have been published as scientific articles in national or international peer-reviewed journals. Among all theses, the publication rate in journals indexed in the SCIE was 20.8% (n = 651). However, when considering only the published articles, more than half (55.9%) appeared in SCIE-indexed journals, and 39.2% of these were published in journals classified under the Q3 and Q4 quartiles (Table 2).

The most frequently published-in journals were *Diagnostic and Interventional Radiology* (7.0%) and the *European Journal of Radiology* (4.2%), and the detailed distribution of journals is provided in Supplementary Table 1. The time from thesis completion to publication ranged from 151 to 11,680 days, with a median of 1,300 days [interquartile range (IQR): 826–2,106]. The mean time was 1,662.6 ± 1,270.2 days. The number of citations per publication ranged from 0 to 416, with a median of 3 (IQR: 0–17). The mean number of citations was 14.7 ± 30.2. In the vast majority of published articles (76.4%, n = 890), the first author was the residency student; in contrast, thesis advisors and other researchers were listed as first authors in 12.9% (n = 150) and 10.7% (n = 125) of publications, respectively.

The rate at which theses were converted into publications showed an upward trend, particularly after the year 2000, with a statistically significant increase in the probability of publication over time (P = 0.045) (Figure 5). Similarly, the time to publication significantly decreased over the years (P < 0.001) (Figure 6). The publication rates of theses varied across different radiology subspe-

| Table 1. Descriptive characteristics of radiology residency theses (n = 3,136)		
	Category	n (%)
Resident gender	Male	1,977 (63.1%)
	Female	1,159 (36.9%)
Supervisor gender	Male	2,187 (69.8%)
	Female	949 (30.2%)
Academic titles of supervisors	Professor	1,437 (45.8%)
	Associate professor	1,047 (33.4%)
	Assistant professor	498 (15.9%)
	Consultant	154 (4.9%)
Institution	University hospital	2,605 (83.1%)
	Training and research hospital	531 (16.9%)
Study design	Retrospective	2,718 (86.7%)
	Prospective	409 (13.0%)
	Other (e.g., experimental)	9 (0.3%)
Page count	Mean ± SD (min–max)	77.4 ± 22.9 (28–226)
Number of patients per thesis	1–50 patients	1,129 (36.1%)
	51–100 patients	791 (25.3%)
	≥101 patients	1,208 (38.6%)

SD, standard deviation; min, minimum; max, maximum.

cialties. The highest publication rate was observed in the field of imaging physics and radiation safety (51.0%), followed by abdominal radiology (40.4%) and musculoskeletal radiology (40.3%). In contrast, the lowest publication rates were recorded in breast radiology (32.6%), thoracic radiology (33.2%), and obstetric radiology (34.0%) (Table 3).

No statistically significant relationship was found between thesis topic and publication rate, number of citations, or time to publication ($P = 0.296$, $P = 0.842$, and $P = 0.280$, respectively) (Table 3). Since the overall group differences were not statistically significant, no post hoc comparisons were performed for these analyses.

There were no significant differences in publication rate ($P = 0.537$) or citation count ($P = 0.089$) based on the gender of the residency student. However, the time to publication was significantly longer for theses authored by female residents than by their male counterparts ($P < 0.001$).
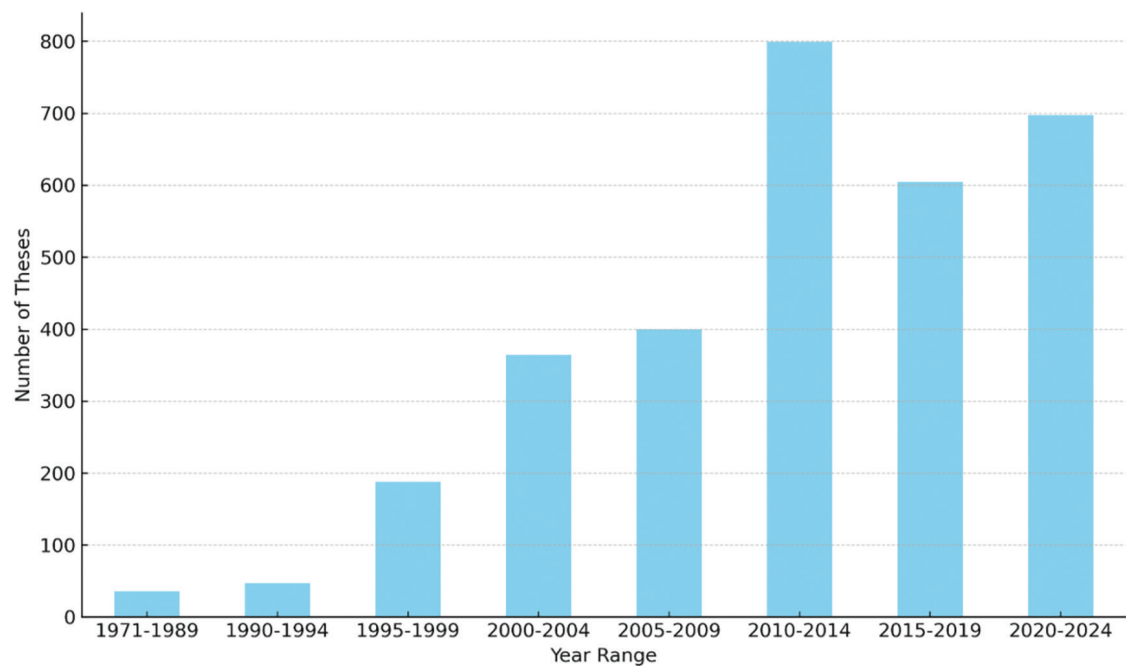
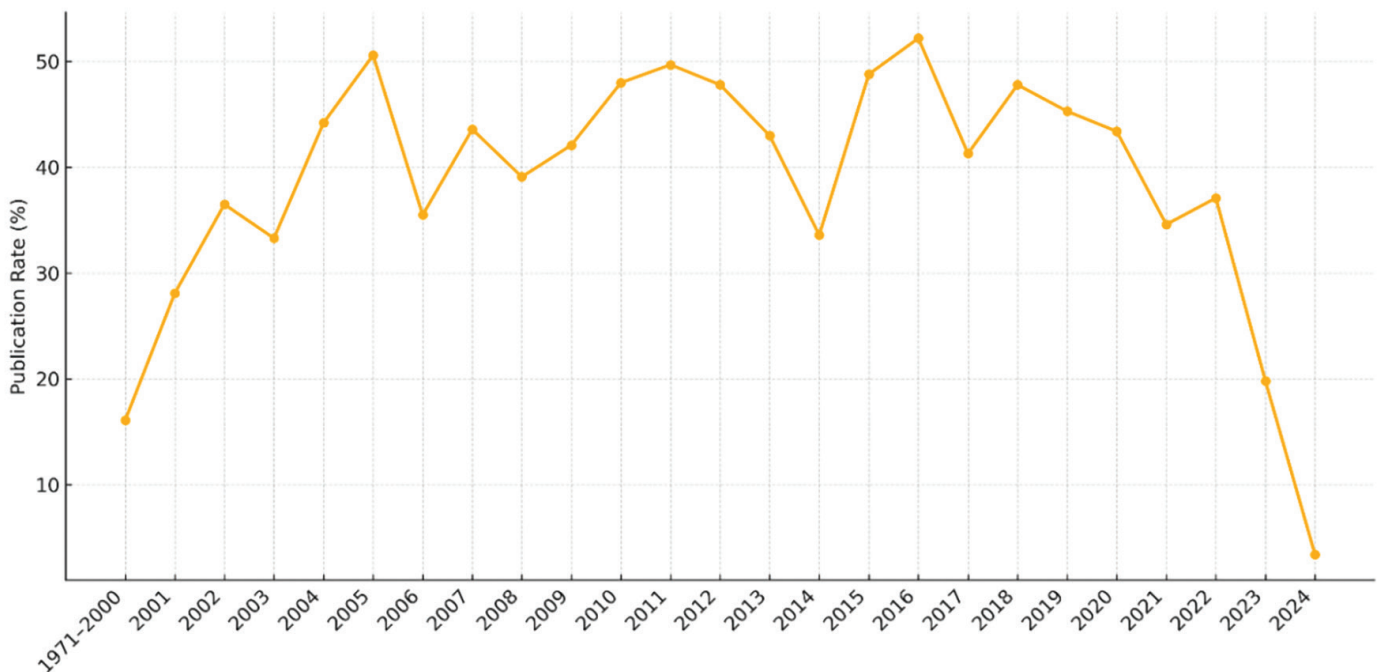**Figure 2.** Distribution of radiology residency theses by year range. The number of theses shows a marked increase starting from the 2000s, with the highest number of theses observed during the 2010–2014 period.
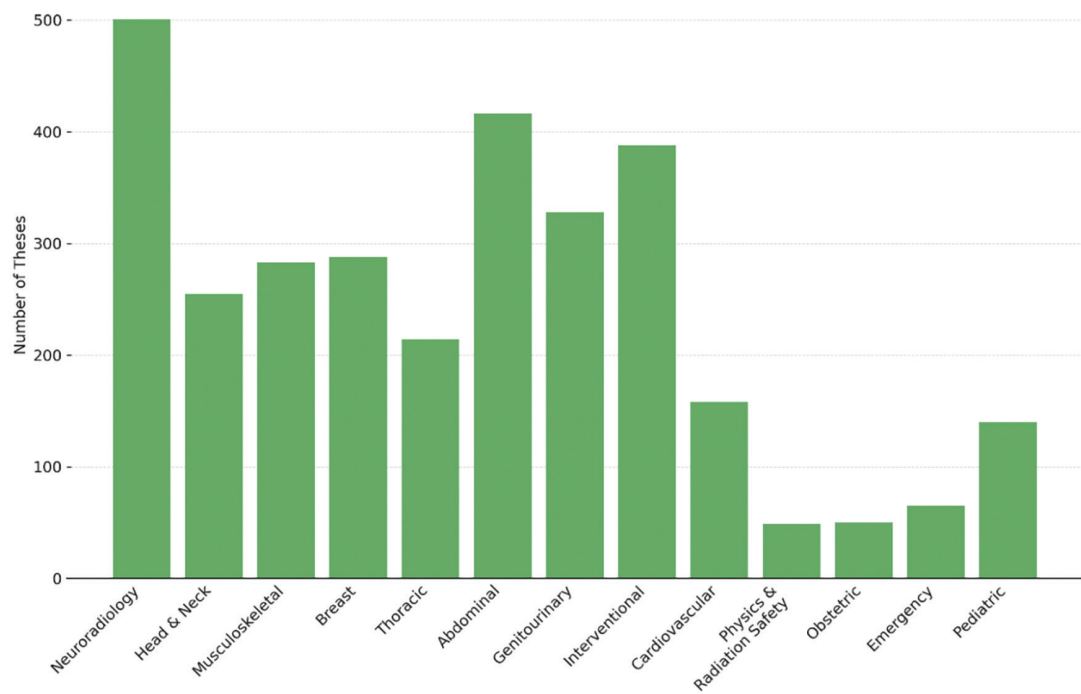
Figure 3. Distribution of radiology residency theses by subspecialty area. One thesis categorized as "Other" was excluded for visual clarity. The data cover the entire period of 1971–2024.
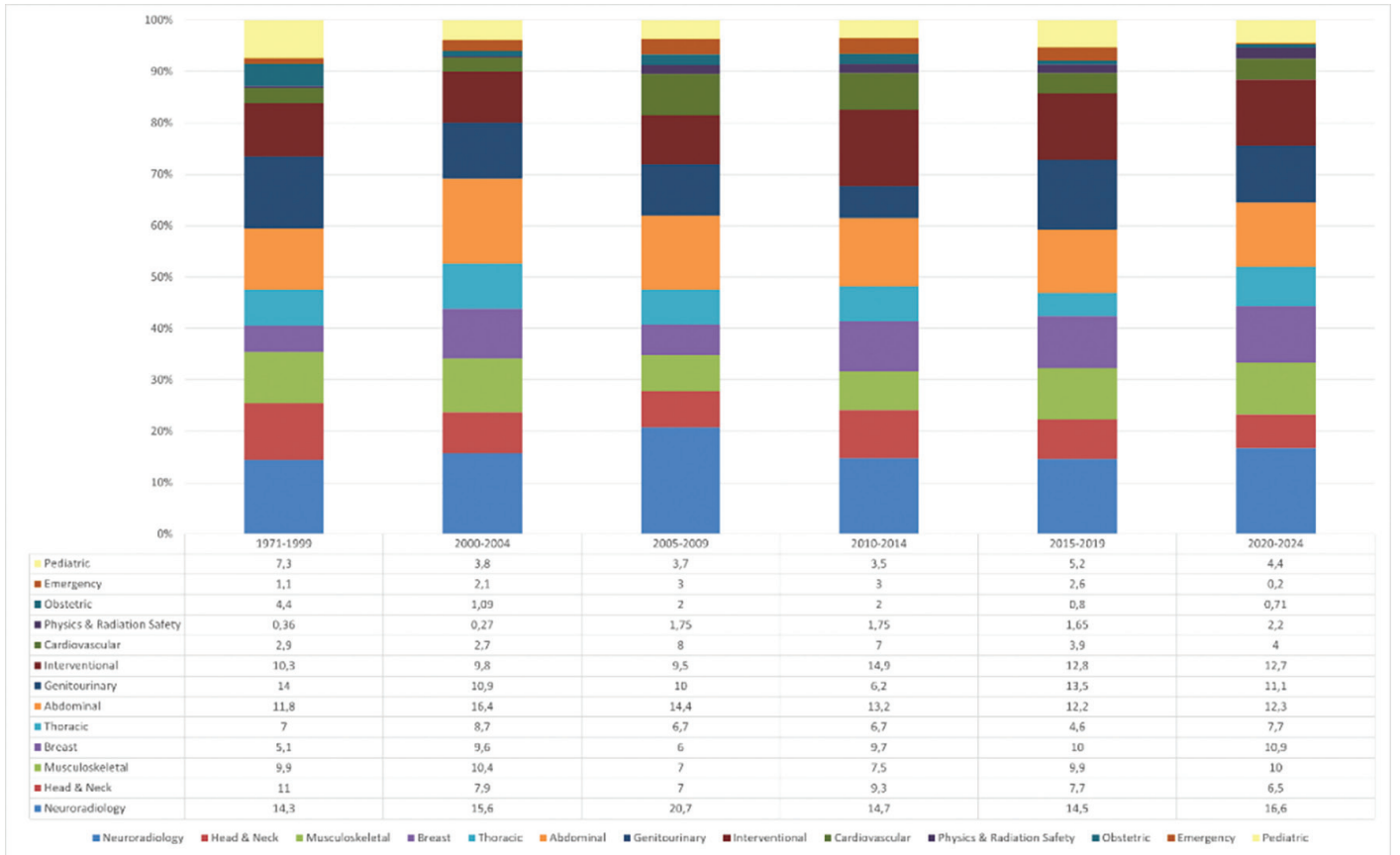
Figure 4. Temporal distribution of radiology residency thesis topics by 5-year intervals. The chart illustrates the proportional representation (%) of each subspecialty area between 1971 and 2024. Neuroradiology and abdominal radiology have consistently remained among the most frequently studied fields, whereas topics such as imaging physics and radiation safety, emergency radiology, and obstetric radiology have maintained relatively low proportions across all periods.

	1971-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020-2024
Pediatric	7,3	3,8	3,7	3,5	5,2	4,4
Emergency	1,1	2,1	3	3	2,6	0,2
Obstetric	4,4	1,09	2	2	0,8	0,71
Physics & Radiation Safety	0,36	0,27	1,75	1,75	1,65	2,2
Cardiovascular	2,9	2,7	8	7	3,9	4
Interventional	10,3	9,8	9,5	14,9	12,8	12,7
Genitourinary	14	10,9	10	6,2	13,5	11,1
Abdominal	11,8	16,4	14,4	13,2	12,2	12,3
Thoracic	7	8,7	6,7	6,7	4,6	7,7
Breast	5,1	9,6	6	9,7	10	10,9
Musculoskeletal	9,9	10,4	7	7,5	9,9	10
Head & Neck	11	7,9	7	9,3	7,7	6,5
Neuroradiology	14,3	15,6	20,7	14,7	14,5	16,6

Figure 5. Article publication rates of radiology residency theses by year (1971–2024). Years indicate the thesis completion year. Percentages represent the proportion of theses that were published as journal articles.
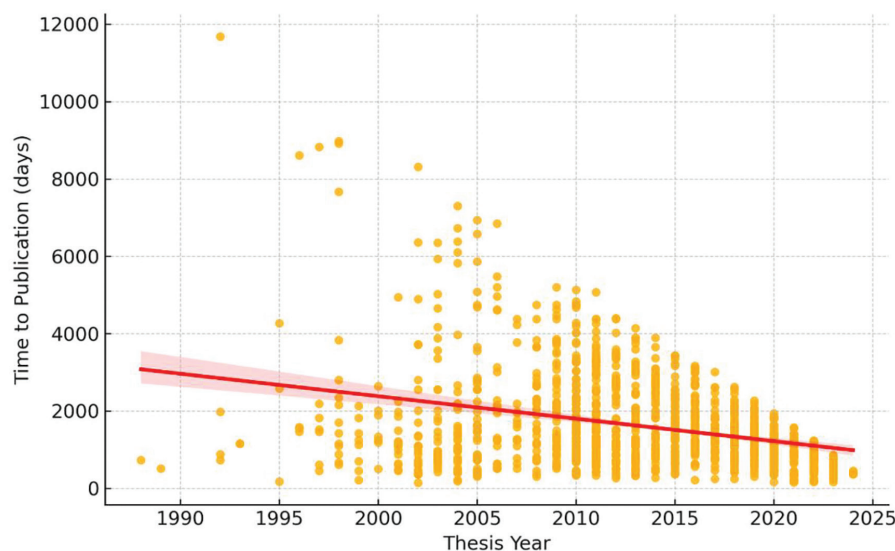
Figure 6. Time to conversion into a published article by thesis year. Each dot represents a thesis that was eventually published as a journal article. The red regression line indicates a statistically significant decrease in time to publication over the years ($\beta = -58.1$; $P < 0.001$).

Table 2. Journal index and quartile distribution of published theses

Journal index	n	%
SCIE	651	55.9%
Q1	53	4.6%
Q2	141	12.1%
Q3	222	19.1%
Q4	234	20.1%
ESCI	135	11.6%
TR Index	235	20.2%
Other international	31	2.7%
Other national	113	9.7%
Total	1,165	100%

SCIE, Science Citation Index Expanded; ESCI, Emerging Sources Citation Index; TR Index, a national database of scholarly journals published in Türkiye, maintained by ULAKBIM (Turkish Academic Network and Information Center), and often referred to as TR Dizin; Other international, International peer-reviewed journals that are not indexed in Web of Science Core Collection (i.e., not included in SCIE or ESCI); Other national, peer-reviewed Turkish journals that are not indexed in TR Index; Q1–Q4, Journal Impact Factor-based quartile rankings within SCIE-indexed journals, as defined by Web of Science.
Note: One SCIE-indexed article published in 1996 was not assigned a quartile rank, as journal quartile data were introduced by Web of Science starting in 1997.

No significant differences were observed in publication rate, citation count, or time to publication based on the gender of the thesis advisor (Table 3). Similarly, there were no statistically significant differences in citation count ($P = 0.322$) or time to publication ($P = 0.057$) according to the academic title of the advisor. However, a statistically significant difference was found in publication rates based on the advisor's academic title ($P = 0.013$). The highest publication rate (43.0%) was observed in theses supervised by advisors with the title of assistant professor, which was significantly higher than those supervised by professors ($P = 0.001$) and associate professors ($P = 0.041$). No significant differences were observed between assistant professors and consultants ($P = 0.243$), or among the other group pairs, including professor versus associate professor ($P = 0.160$), professor versus consultant ($P = 0.479$), or associate professor versus consultant ($P = 0.976$).

No statistically significant differences were found in publication rate ($P = 0.539$) or time to publication ($P = 0.659$) based on the type of institution. However, when citation counts were compared, publications originating from universities had significantly higher citation numbers than those from training and research hospitals ($P < 0.001$) (Table 3).

Among the theses that were converted into publications, the rate of publication in SCIE-indexed journals was 50.8% when the residency student was the first author, whereas this rate was higher for publications where the advisor (74.7%) or another researcher (69.6%) was the first author. A statistically significant difference was found between groups when comparing SCIE publication rates according to first authorship status ($P < 0.001$). Articles with the advisor or another researcher as the first author were significantly more likely to be published in SCIE-indexed journals than those authored by the residency student ($P < 0.001$ for both comparisons). No significant difference was found between publications with the advisor versus another researcher as first author ($P = 0.349$).

Articles with the advisor or another researcher as the first author received significantly more citations than those authored by the residency student ($P < 0.001$ for both comparisons), with no significant difference between the advisor and other researcher groups ($P = 1.000$).

Time to publication also differed significantly among the groups ($P < 0.001$); publications first-authored by the residency student had a longer time to publication than those authored by the advisor ($P < 0.001$) or another researcher ($P < 0.001$). No significant difference was observed between the advisor and other researcher groups ($P = 0.101$).

Discussion

This bibliometric analysis is the first comprehensive study to evaluate the publication rates and academic characteristics of medical residency theses in the field of radiology in Türkiye. By examining all radiology theses available in the National Thesis Center database, the study systematically identified the factors influencing the publication process.

The finding that the majority of theses were conducted in university hospitals (83.1%) and primarily under the supervision of professors (45.8%) and associate professors (33.4%) is consistent with trends observed in other medical specialties.[4,7,18] This distribution may be related to the number of residency students in these institutions and the academic experience of the advisors.

A marked increase in the number of radiology residency theses has been observed, particularly since the 2000s, which is associated with the expansion of radiology residency quotas in Türkiye (e.g., from 38 positions in 2008 to 105 in 2018).[19] Considering

Table 3. Publication rate, citation count, and time to publication by demographic and institutional variables

Variable	Category	Publication rate (%)	Citations median (IQR)	Time to publication (days); median (IQR)
Resident gender	Male	37.6 (743/1,977)	3 (0–15)	1,247 (777–1,984)
	Female	36.4 (422/1,159)	4 (0–20)	1,461 (933–2,329)
	P	P = 0.537	P = 0.089	**P < 0.001**
Supervisor gender	Male	37.0 (810/2,187)	4 (0–18)	1,289 (791–2,029)
	Female	37.4 (355/949)	3 (0–14)	1,339 (872–2,274)
	P	P = 0.875	P = 0.224	P = 0.159
Titles of supervisors	Professor	34.8 (500/1,437)	4 (0–17)	1,308 (837–2,099)
	Assoc. Prof.	37.5 (393/1,047)	3 (0–19)	1,316 (832–2,176)
	Asst. Prof.	43.0 (214/498)	2 (0–14)	1,166 (787–1,836)
	Consultant	37.7 (58/154)	2.5 (0.25–18)	1,547 (900–2,822)
	P	**P = 0.013***	P = 0.322	P = 0.057
Institution type	University	36.9 (961/2,605)	4 (0–18)	1,294 (838–2,071)
	TRH	38.4 (204/531)	1 (0–9)	1,309 (792–2,218)
	P	P = 0.539	**P < 0.001**	P = 0.659
Thesis topic	Neuroradiology	34.7 (174/501)	4 (0–15.5)	1,416 (794–2,192)
	Head and neck	37.6 (96/255)	4 (0–18)	1,304 (767–2,146)
	Musculoskeletal	40.3 (114/283)	2.5 (0–15.75)	1,299 (901–2,249)
	Breast	32.6 (94/288)	3.5 (0–15.75)	1,254 (930–2,034)
	Thoracic	33.2 (71/214)	2 (0–10)	1,322 (835–2,069)
	Abdominal	40.4 (168/416)	4 (0–14.25)	1,249 (814–2,004)
	Genitourinary	34.8 (114/328)	5 (0–24.75)	1,220 (732–1,639)
	Interventional	38.9 (151/388)	3 (0–19)	1,461 (974–2,512)
	Cardiovascular	39.9 (63/158)	3 (0–14)	1,236 (790–2,267)
	Physics and radiation safety	51.0 (25/49)	3 (0–11)	974 (780–1,978)
	Obstetric	34.0 (17/50)	2 (0–5)	1,698 (1,034–2,192)
	Emergency	40.0 (26/65)	5 (0.25–20)	1,488 (1,113–1,697)
	Pediatric	37.1 (52/140)	4 (0–21.25)	1,200 (716–1,910)
	P	P = 0.296	P = 0.842	P = 0.280
First author identity	Resident	-	2 (0–11)	1,430 (882–2,300)
	Supervisor	-	17 (3–35)	916 (638–1,393)
	Other researcher	-	12 (3–40)	1,072 (700–1,734)
	P		**P < 0.001***	**P < 0.001***

Note: *Post-hoc pairwise tests were conducted for these variables (see Results section for details). The "Publication rate (%)" column includes all theses, while the "Citations" and "Time to publication" columns reflect data derived exclusively from published theses. Assoc. Prof., Associate professor; Asst. Prof., Assistant professor; TRH, training and research hospital; IQR, interquartile range.

that residency training lasts 5 years, the sevenfold increase in quotas after 2022 is also expected to be reflected in the number of theses in the coming years.

In our study, the most frequently selected fields for radiology residency theses were neuroradiology (16.0%), abdominal radiology (13.3%), and interventional radiology (12.4%). This trend largely aligns with the academic and clinical areas of interest reported in the literature. Among the most highly cited radiology articles, neuroradiology has been identified as the most commonly represented subspecialty.[20] A similar distribution has been observed in resident preferences in the United Kingdom and in Oral Presentations at National Radiology Congresses in Türkiye.[21,22] According to the residency training curriculum of the Qualification Board of the TSR, these three subspecialties collectively account for 15 months of training duration.[23] The broad patient population, diversity of imaging techniques, and extended allocated training time may explain the high preference rates for these fields.

In contrast, subspecialties such as imaging physics and radiation safety and obstetric radiology were represented in only 1.6% of the theses. The low number of theses in the field of imaging physics and radiation safety in Türkiye is concerning, especially given the reported deficiencies in radiation safety knowledge among radiology personnel and the fundamental importance of physics for image quality.[24,25] This limited representation may be attributed to residents' tendency to focus on clinically oriented fields and the relatively low level of academic interest in these topics. Considering the existing knowledge gaps and shortcomings in radiation safety practices in Türkiye, promoting more thesis work in this area is crucial for both optimizing clinical practice and enhancing the quality of training.

The low proportion of theses in obstetric radiology may be attributed to several factors previously described in the literature, including insufficient training duration, limited theoretical content, and a lack of hands-on experience in this field.[26,27] In addition, obstetric imaging in Türkiye is predominantly performed by obstetricians, which may reduce radiology residents' exposure to this subspecialty and, consequently, their motivation to pursue thesis work in this area. Improving the educational and clinical infrastructure in obstetric radiology could help enhance both care quality and academic engagement in the field.

In our study, 37.1% of radiology residency theses were found to have been published in national or international peer-reviewed journals, and 20.8% of all theses were published in journals indexed in the SCIE. When compared with studies conducted in other medical specialties in Türkiye, these rates are higher than those reported in fields such as anesthesiology,[7] general surgery,[28] public health,[29] family medicine,[30] physical medicine and rehabilitation,[31] and emergency medicine,[32] however, they are lower than those in thoracic surgery,[33] child and adolescent psychiatry,[34] and endocrinology.[35] In neurosurgery, reported publication rates have ranged between 26.8% and 37.9%.[36,37] Such variation, observed both across different specialties and within the same specialty, may be attributed to differences in study periods, indexing criteria, and overall methodological designs. A similar pattern is also observed across medical specialties in terms of SCIE publication rates (Table 4).[7,28-38] These findings suggest that, in terms of publication output, radiology

theses in Türkiye occupy an upper-intermediate position among medical specialties. However, the majority of radiology theses published in SCIE-indexed journals (456 out of 651) appeared in journals ranked in the lower quartiles, specifically Q3 and Q4, in terms of impact factor. The literature emphasizes that experimental and prospective studies not only tend to have higher publication rates but are also more likely to be published in higher-impact and more prestigious journals.[28,39] In this context, the fact that 86.7% of theses had a retrospective design highlights the need to encourage prospective and methodologically stronger studies. Nevertheless, well-designed retrospective studies can also make significant contributions, particularly in data-rich fields, such as radiology. To improve publication quality, not only the study design but also methodological rigor is a key determinant.

The publication process in high-impact journals is shaped not only by scientific content but also by structural and economic factors. It has been reported that Turkish researchers place importance on journal prestige, yet high article processing charges pose a significant challenge.[40] This financial barrier may lead some authors to prefer journals with lower impact factors.

The study demonstrated a statistically significant increase over time in the rate of thesis-to-article conversion, alongside a significant decrease in the time interval between thesis completion and article publication. In the study by Ozgen et al.,[41] which covered the period 1980–2005, the publication rate of radiology theses in SCIE-indexed journals was reported as 6.3%, whereas in our study (covering 1971–2024), this rate increased to

20.8%. This finding indicates a substantial improvement in the publication potential of radiology theses over time.

Similarly, Akpinar and Karcaaltincaba[42] reported an increase in Turkish radiology publications after the year 2000 in their study covering the period 1945–2008. This trend may be associated with the updated academic promotion criteria established by the Council of Higher Education.[38,43] In particular, the increased academic credit awarded for publications in internationally indexed journals, such as those in the SCIE, has become a motivating factor for both advisors and residency students to publish their theses. However, the contribution of alternative indexing platforms should also be acknowledged. In our study, TR Index was the second most common indexing source among published theses, accounting for 20.2% of all publications. Additionally, 11.6% of the publications appeared in journals indexed in the ESCI, a component of the WoS that includes newer or regionally focused journals. These results suggest that both national (TR Index) and secondary international platforms (ESCI) can provide useful publication avenues, particularly for researchers in the early stages of their academic careers or working with limited resources.

In our study, the highest publication rate was observed in the field of imaging physics and radiation safety (51.0%), whereas lower rates were noted in breast radiology (32.6%), thoracic radiology (33.2%), and neuroradiology (34.7%). Although neuroradiology was the most frequently selected thesis topic, its publication rate remained relatively limited. In contrast, a study investigating the publication outcomes of presentations from the

Table 4. Publication rates and Science Citation Index Expanded (SCIE)-indexed publication rates of residency theses in various medical specialties in Türkiye

Study	Specialty	Years evaluated	Publication rate (%)	SCIE-indexed publication rate (%)
Ferhatoğlu et al.[28]	General surgery	1998–2018	20.5	14.4
Güc et al.[7]	Anesthesiology	1970–2016	25.7	11.3
Bahadır and Başar[36]	Neurosurgery	2015–2019	26.8	-
Bahadır and Lüleci[29]	Public health	1973–2022	29.2	<9
Karakullukçu and Ardıç[30]	Family medicine	2000–2020	28.1	5.6
Yılmaz et al.[31]	Physical medicine and rehabilitation	2010–2020	34.3	24.5
Özturan and Sarbay[32]	Emergency medicine	1998–2021	35.5	18
Current study	Radiology	1971–2024	37.1	20.8
Sarica and Aksu Sayman[37]	Neurosurgery	2000–2017	37.9	36.2
Sarbay[33]	Thoracic surgery	2001–2019	38.5	20.7
Sipahi et al.[38]	Microbiology & infectious diseases	1997–2007	-	11.4
Usta and Şahin[34]	Child and adolescent psychiatry	1997–2017	50.6	40.7
Tura Bahadir and Yilmaz[35]	Endocrinology	1980–2023	51.3	38.6

European Congress of Radiology reported higher publication rates for breast radiology (50%) and thoracic radiology (58%) than for radiologic physics (30%).[44] This discrepancy may stem from differences in study methodology, time periods covered, and research types. Although congress presentations typically originate from more recent and shorter-term projects, theses usually involve longer research timelines, and their conversion into publications may vary depending on individual and institutional factors.

In our study, no statistically significant differences were found between the gender of the residency student and publication rate or citation count. However, the time to publication was significantly longer for female authors than for their male counterparts. Similarly, studies conducted in the fields of psychiatry and ophthalmology have also reported that female researchers face greater challenges in the publication process.[45,46]

The highest publication rate (43.0%) was observed in theses supervised by assistant professors, whereas the lowest rate (34.8%) was found in those supervised by professors. Additionally, the shortest time to publication was noted in theses conducted under the supervision of assistant professors. This finding contrasts with the common assumption that professors, due to their greater academic experience, tend to produce more publications. Although a study conducted in the field of neurosurgery reported no significant difference in publication rates based on advisor academic title, similar findings to ours have been documented in other specialties, such as anesthesiology, otorhinolaryngology, and plastic surgery, where theses supervised by assistant professors were more frequently published and converted into articles in a shorter time frame.[7,36,39] This may be related to the increased contribution of faculty members who are in the process of academic advancement and are therefore more engaged in the publication process.

In our study, no statistically significant differences were found between institution type and either publication rate or time to publication. However, publications originating from universities received significantly more citations than those from training and research hospitals.

The literature indicates that this relationship varies by specialty; in some fields, universities (e.g., emergency medicine) demonstrate greater publication success, whereas in others, training and research hospitals (e.g., endocrinology, cardiovascular surgery)

perform better.[32,33,35] These findings indicate that, although publication rates were similar, the higher citation impact of university-based theses is particularly noteworthy. This highlights the need for strategies that aim not only to increase the number of publications but also to enhance their scientific impact. To achieve this, it is essential for institutions to develop policies that strengthen research infrastructure and improve academic visibility.

In our study, the identity of the first author was found to influence publication success in the thesis-to-article conversion process. Publications in which the first author was someone other than the thesis student—either another researcher or the advisor—were more frequently published in higher-impact journals, received more citations, and were published in a shorter time. This may be attributed to the academic writing experience, knowledge of journal selection, and process management skills of these individuals. In our study, the thesis student was the first author in 76.4% of the published articles, a rate that is comparable with those reported in other medical specialties.[7,47] This finding suggests that radiology residents are actively involved in the publication process. However, the extended time to publication indicates that students may require greater support from their advisors, particularly in areas such as academic writing, journal selection, and publication management.

This study has several limitations. Since the thesis-to-publication status was investigated solely through online databases, some articles, particularly those published in local or low-visibility journals, may have been missed. Although multiple platforms were used for the screening process (e.g., Google Scholar, PubMed, and WOS), certain major databases, such as Scopus, were not separately queried. Although there is substantial overlap between Scopus and the databases already utilized, publications indexed exclusively in Scopus and not visible in the other sources may have been inadvertently overlooked. The thesis–article linkage was based on name and content similarity, as direct verification was not feasible, which may have led to occasional mismatches. Conference abstracts, proceedings, and book chapters were excluded. Due to the time-dependent nature of citation counts, the data—especially for recently published articles—represent only a snapshot and may underestimate long-term citation impact. Both our findings and previous studies indicate that the process of converting a thesis into a journal ar-

ticle typically takes >2 years. Therefore, some of the theses completed in 2023 and 2024 may not yet have been published. This may have led to an underestimation of recent publication rates and should be considered an important limitation of our study. Finally, the study included only theses available in the National Thesis Center of the Council of Higher Education; inaccessible or externally archived theses were not evaluated. Despite these limitations, this study represents the first comprehensive bibliometric analysis to evaluate systematically the publication outcomes of radiology residency theses in Türkiye and offers valuable academic insights into the field.

In conclusion, certain subspecialty areas were more frequently chosen as thesis topics, whereas others remained underrepresented. Approximately one-third of the theses were published in peer-reviewed journals, with a substantial proportion appearing in journals indexed by the SCIE. The increasing publication rates and the decreasing time to publication over the years highlight a growing trend of academic productivity during residency training. To sustain this progress, it is essential to promote effective mentorship practices, provide structured training on the publication process for early-career researchers, and strengthen institutional research infrastructure. Ultimately, a holistic approach should be adopted in which residency theses are regarded not merely as a graduation requirement but as an integral part of academic research.

Footnotes

Conflict of interest disclosure

The authors declared no conflicts of interest.

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Supplementary Table 1. Most common journals publishing radiology residency theses

Journal name	Number of articles	Percentage (%)	JIF	Index	Country
Diagnostic and Interventional Radiology	81	7.0	1.4	SCIE	Türkiye
European Journal of Radiology	49	4.2	3.2	SCIE	Ireland
Acta Radiologica	25	2.1	1.1	SCIE	England
Journal of Ultrasound in Medicine	23	2.0	2.1	SCIE	USA
Polish Journal of Radiology	23	2.0	0.9	ESCI	Poland
Clinical Imaging	21	1.8	1.8	SCIE	USA
Cukurova Medical Journal	16	1.4	0.3	ESCI	Türkiye
Neuroradiology	15	1.3	2.4	SCIE	Germany
American Journal of Neuroradiology	15	1.3	3.1	SCIE	USA
Turkish Journal of Medical Sciences	14	1.2	1.2	SCIE	Türkiye
Journal of Clinical Ultrasound	13	1.1	1.2	SCIE	USA
European Radiology	13	1.1	4.7	SCIE	Germany
Dicle Medical Journal	13	1.1	-	TR Index	Türkiye
Ultrasound Quarterly	13	1.1	0.9	SCIE	USA
Journal of Computer Assisted Tomography	13	1.1	1.0	SCIE	USA
Abdominal Radiology	12	1.0	2.3	SCIE	USA
American Journal of Roentgenology	12	1.0	4.7	SCIE	USA
Surgical and Radiologic Anatomy	10	0.9	1.2	SCIE	France
Japanese Journal of Radiology	10	0.9	2.9	SCIE	Japan
Journal of Harran University Medical Faculty	10	0.9	-	TR Index	Türkiye
Iranian Journal of Radiology	10	0.9	0.2	SCIE	Iran
Ortadogu Medical Journal	10	0.9	-	TR Index	Türkiye
*JBR–BTR, Journal of the Belgian Society of Radiology**	10	0.9	1.0	SCIE	Belgium
European Review for Medical and Pharmacological Sciences	9	0.8	3.3	SCIE	Italy
Balkan Medical Journal	9	0.8	1.9	SCIE	Türkiye
Medical Bulletin of Sisli Etfal Hospital	9	0.8	1.0	ESCI	Türkiye
Others (<9)	698	59.8	-	-	-
Total	1,165	100	-	-	-

JIF, Journal Impact Factor; SCIE, Science Citation Index Expanded; ESCI, Emerging Sources Citation Index; TR Index, a national database of scholarly journals published in Türkiye, maintained by ULAKBIM (Turkish Academic Network and Information Center), and often referred to as TR Dizin.

**JBR-BTR* changed its name to *Journal of the Belgian Society of Radiology* in 2016. Data for both titles were combined as they represent the same journal continuum.

Note: Journal indexes presented in this table reflect their most current status. The Journal Impact Factor values listed here are for descriptive purposes only and correspond to the year 2023. For the primary bibliometric analysis, both indexing status and JIF quartile rankings (Q1–Q4) were based on the journal's classification in the year of article publication, as detailed in the Methods section.