Research Article

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Indigenous urological research in Türkiye: a bibliometric and thematic analysis of the Web of Science Core Collection (2015-2025)

Türkiye'de üroloji araştırmaları: Web of Science Core Collection'da dizine alınan makalelerin bibliyometrik ve tematik analizi (2015-2025)

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Abstract

Purpose: This study aims to evaluate the specific characteristics, development, and scientific impact of indigenous urological research originating from Türkiye through bibliometric and thematic analysis.

Materials and methods: We analyzed 1.924 original urology research articles with a Turkish corresponding author indexed in the Web of Science Core Collection (2015-2025) using the Bibliometrix R-package (Biblioshiny) and VOSviewer.

Results: Our findings reveal an overall upward trend in national scientific production, although this was not statistically significant (p=0.1972), characterized by a remarkably high single-country publication rate (94.6%). The analysis highlights the dominance of the University of Health Sciences as the central institutional hub. Thematically, endourology and stone disease (e.g., percutaneous nephrolithotomy, retrograde intrarenal surgery) emerged as the primary "motor themes," contrasting with global oncology-driven trends, while uro-oncology and andrology formed foundational basic themes.

Conclusion: This study provides researchers and policymakers with a clearer understanding of the influential authors, institutions, and thematic hotspots driving Turkish urology. The findings underscore Türkiye's pioneering role and surgical mastery in endourology, offering strategic insights for future collaborations and research directions.

Keywords: Urology, bibliometric analysis, Web of Science, urolithiasis, scientific mapping.

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Öz

Amaç: Bu çalışmanın amacı, Türkiye kaynaklı yerli üroloji araştırmalarının spesifik özelliklerini, gelişimini ve bilimsel etkisini bibliyometrik ve tematik analiz yöntemleriyle değerlendirmektir.

Gereç ve yöntem: Web of Science Core Collection'da (2015-2025) dizine alınan ve sorumlu yazarının Türkiye'den olduğu 1,924 özgün üroloji araştırma makalesini Bibliometrix R-paketi (Biblioshiny) ve VOSviewer kullanarak analiz ettik.

Bulgular: Bulgularımız, istatistiksel olarak anlamlı olmamakla birlikte (p=0,1972) tek ülkeli yayın oranının (%94,6) oldukça yüksek olduğu ulusal bilimsel üretimde genel bir artış eğilimi olduğunu göstermektedir. Analiz, Sağlık Bilimleri Üniversitesi'nin (SBÜ) en büyük kurumsal merkez olarak hakimiyetini vurgulamaktadır. Tematik olarak, endoüroloji ve taş hastalığı (örn. perkütan nefrolitotomi, retrograd intrarenal cerrahi), küresel onkoloji ağırlıklı eğilimlerin aksine birincil "motor temalar" olarak öne çıkarken, üroonkoloji ve androloji temel (basic) temaları oluşturmuştur.

Sonuç: Bu çalışma, araştırmacılara ve politika yapıcılara Türk ürolojisine yön veren etkili yazarlar, kurumlar ve tematik sıcak noktalar hakkında daha net bir anlayış sunmaktadır. Bulgular, Türkiye'nin endoürolojideki öncü rolünün ve cerrahi ustalığının altını çizerek, gelecekteki iş birlikleri ve araştırma yönelimleri için stratejik içgörüler sağlamaktadır.

Anahtar kelimeler: Üroloji, bibliyometrik analiz, Web of Science, urolitiyazis, bilimsel haritalama.

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Introduction

The exponential growth of scientific literature in the 21st century has necessitated the use of advanced quantitative methods to map the intellectual structure and evolution of academic disciplines. Bibliometric analysis has emerged as a fundamental tool in this regard, offering a systematic, transparent, and reproducible approach to identifying research trends, core journals, and global collaboration networks [1]. Beyond traditional literature reviews, bibliometrics utilizes mathematical and statistical techniques to evaluate publication distribution models, enabling researchers to perform comprehensive science mapping. This is particularly critical in the era of evidence-based medicine, where the surge in systematic reviews and meta-analyses requires constant monitoring of global synthesis trends to guide research priorities [2].

The evolution of bibliometric research has been significantly accelerated by the development of open-source software designed to process large-scale datasets from primary indices such as the Web of Science Core Collection (WoSCC). At the forefront of this methodological shift is the Bibliometrix R-package and its web-based interface, Biblioshiny, which provides a comprehensive workflow for science mapping [3]. These tools have democratized scientometric research by allowing scholars to perform sophisticated data visualizations, such as thematic mapping and trend analysis, without requiring advanced programming skills [4].

Within the medical sciences, urology is a highly dynamic specialty characterized by rapid technological advancements, from minimally invasive treatments for kidney stones [5] to the rise of single-port robotic surgery [6]. Türkiye has long maintained its position as a leading contributor to both European and global urological literature. Recent studies have demonstrated that Turkish urologists quickly adapt to emerging topics, including web-based evaluations of robotic radical prostatectomy [7] and the global research landscape of urological emergencies such as paraphimosis [8]. Notably, recent trend analyses on the integration of artificial intelligence and chatbots in urology have revealed that Türkiye is the second most productive country globally in this emerging niche [9].

Furthermore, the 2015-2025 period was shaped by the unprecedented challenges of the COVID-19 pandemic. Research indicates a significant surge in pandemic-related urological publications [10], with specific journals playing a central role in disseminating “Urology and COVID-19” studies [11].

Despite these thematic achievements, the macro-level impact of structural transformations in Türkiye’s academic research ecosystem remains insufficiently explored. Revised criteria for associate professorship and academic incentives introduced by the Turkish Council of Higher Education (YÖK) have prioritized publication quality, specifically targeting journals indexed in the Science Citation Index Expanded (SCIE) with high Journal Impact Factor (JIF) quartiles (Q1 and Q2). While current literature has successfully mapped specific surgical modalities or crisis reflexes, it has overlooked the JIF Quartile (Q1, Q2, Q3, Q4) evolution of general Turkish urological publications over the last decade. Analyzing the quartile distribution is essential, as it serves as a proxy for the scientific rigor and international competitiveness of a nation’s research output.

This study aims to bridge this gap by performing a comprehensive bibliometric and conceptual analysis of 2,898 urological publications originating from Türkiye between 2015 and 2025. By evaluating the shifting distribution of JIF Quartiles alongside thematic evolution, this research diagnoses the current state of Turkish urology and provides evidence-based insights into its future trajectory in a competitive global academic landscape.

Materials and methods

Study design and database selection

This study was designed as a retrospective, descriptive bibliometric analysis of the urological literature originating from Türkiye over a 10-year period. The Web of Science Core Collection (WoSCC) was selected as the primary database for data retrieval. WoSCC is widely recognized as the gold-standard database for scientometric studies due to its rigorous indexing standards,

comprehensive citation tracking, and optimal compatibility with advanced bibliometric mapping software. To ensure the highest quality of the evaluated literature, the search was strictly limited to journals indexed in the Science Citation Index (SCI) and Science Citation Index Expanded (SCIE).

Search strategy and data extraction

Data retrieval was conducted on a single day (January 5, 2026) to prevent any discrepancies caused by daily database updates. The initial search strategy was constructed to capture publications originating from urology departments in Türkiye. The query used in the WoSCC "Advanced Search" module was: AD=(Urol* AND (Turkey OR Türkiye)) AND PY=(2015-2025) AND WC=(Urology & Nephrology). The timeframe was restricted to the period from January 1, 2015, to December 31, 2025, and the document type was limited to "Articles", excluding letters, abstracts, and editorial materials.

To ensure that the analysis specifically reflected the research output intellectually spearheaded and managed by Turkish institutions, a rigorous filtration was subsequently applied based on corresponding authorship. The dataset was refined to include only those documents where the Corresponding Author (Reprint Address) was affiliated with an institution in Türkiye. After applying this crucial intellectual property filter, a final cohort of 1.924 documents met the strict inclusion criteria. The data were exported in "Plain Text" format containing "Full Record and Cited References" for subsequent network analyses.

Journal Impact Factor (JIF) and quartile analysis

To evaluate the qualitative evolution of the research output, a macro-level quality assessment was performed based on the Journal Impact Factor (JIF) Quartile rankings (Q1, Q2, Q3, Q4). The quartile data for the journals were obtained from the Journal Citation Reports (JCR) database under the "Urology & Nephrology" category. Each of the 1.924 publications was manually cross-referenced and tagged with the corresponding quartile of the journal in which it was published. This stratification allowed for an objective assessment of the shift in publication quality over the targeted decade, moving beyond mere publication volume.

Bibliometric analysis and visualization

The exported data were processed and analyzed using two distinct software tools to provide a comprehensive science mapping evaluation:

Descriptive and Conceptual Analysis (Biblioshiny): The data were imported into the R environment (v. 4.5.1) [12] using the Bibliometrix package [3]. Its web-based interface, Biblioshiny, was utilized for descriptive statistical analysis and source dynamics. Key metrics extracted included the annual scientific production, the most relevant sources based on Bradford's Law, and the most globally cited documents.

Network Visualization and Data Cleaning (VOSviewer): The VOSviewer software (version 1.6.20, Leiden University, The Netherlands) was employed for advanced network visualization. To ensure academic rigor and avoid the visual clutter commonly known as the "hairball effect," strict data cleaning protocols and thresholds were applied to both keyword and institutional analyses:

Keyword Co-occurrence Network: "Author Keywords" were selected to accurately reflect the specific terminology intended by the researchers. A minimum occurrence threshold of 10 was established. Furthermore, a custom keyword thesaurus file (thesaurus_kw.txt) was created and integrated into VOSviewer. This dictionary was used to merge synonymous clinical abbreviations under standardized umbrella concepts (e.g., standardizing "kidney calculi" and "nephrolithiasis" into "urolithiasis") and to exclude generic, non-discipline-specific terms (e.g., "surgery," "treatment").

Institutional Co-authorship Network: To map the core collaborative structure, an institutional co-authorship analysis was conducted with a minimum threshold of 10 documents per organization. Documents co-authored by more than 25 organizations were deliberately excluded from this analysis to prevent the artificial distortion of the network by mega-multicenter international guidelines. Crucially, a separate institutional thesaurus file (thesaurus_org.txt) was meticulously designed and applied.

This step was mandatory to consolidate affiliated training and research hospitals, as well as city hospitals, under their primary academic umbrella (i.e., merging various state hospitals under the “University of Health Sciences”) and to resolve naming variations of the same universities.

Since this study is a bibliometric analysis utilizing exclusively publicly available metadata from published literature, it did not involve any human participants, animal experiments, or patient data. Therefore, ethical committee approval and informed consent were not required.

Results

Bibliometric summary of the dataset and annual trends

A total of 1.924 original research articles meeting the strict inclusion criteria—specifically filtered for corresponding authorship affiliated with Turkish institutions—were published in the Web of Science Core Collection (WoSCC) between January 2015 and December 2025.

The main descriptive statistics of the dataset are summarized in Table 1. The research output was published across 54 specialized sources. The intellectual structure was driven by 4,016 distinct authors, utilizing a rich vocabulary of 3,381 unique author’s keywords. The dataset demonstrates a highly collaborative domestic environment, with an average of 6.38 co-authors per document. The international co-authorship rate stands at a remarkably low 5.41%, confirming that the vast majority of these publications (~94.6%) are purely domestic intellectual products (Single Country Publications). Overall, the articles possess a strong academic impact, achieving an average of 8.339 citations per document with a mean document age of 5.63 years.

Table 1. Bibliometric summary of the dataset

Authors	
Authors	4016
Authors of Single-Authored Docs	25
Authors collaboration	
Single-authored docs	25
Co-Authors per Doc	6.38
International co-authorships %	5.41
Document Contents	
Author’s Keywords (DE)	3381
Document Types	
Article	1898
Article; Early Access	18
Article; Proceedings Paper	8
Main Information About Data	
Timespan	2015:2025
Sources (Journals, Books, etc.)	54
Documents	1924
Annual Growth Rate %	4.52
Document Average Age	5.63
Average Citations Per Doc	8.339
References	33328

The temporal evolution of the publications exhibited an overall upward trend, although this was not statistically significant (p=0.1972), characterized by a 4.52% annual growth rate. As illustrated in Figure 1, the annual scientific production showed momentum, with a notable spike in recent years, culminating in over 300 articles published by the end of the studied period. Conversely, Figure 2 demonstrates the expected inverse relationship in average citations per year; older articles have accumulated more citations over time, establishing the foundational literature, while more recent publications naturally display lower mean total citations due to their shorter time in print.

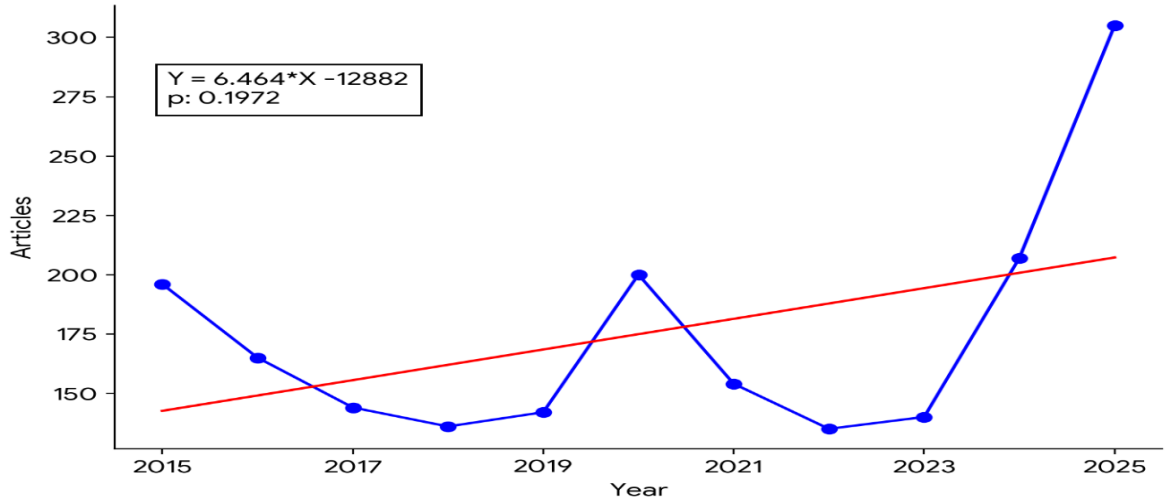

Figure 1. Annual scientific production

The regression line (red) indicates a positive growth trend (Y=6.464*X -12882, p=0.1972) in the volume of urological research originating from Türkiye between 2015 and 2025, although it does not reach statistical significance

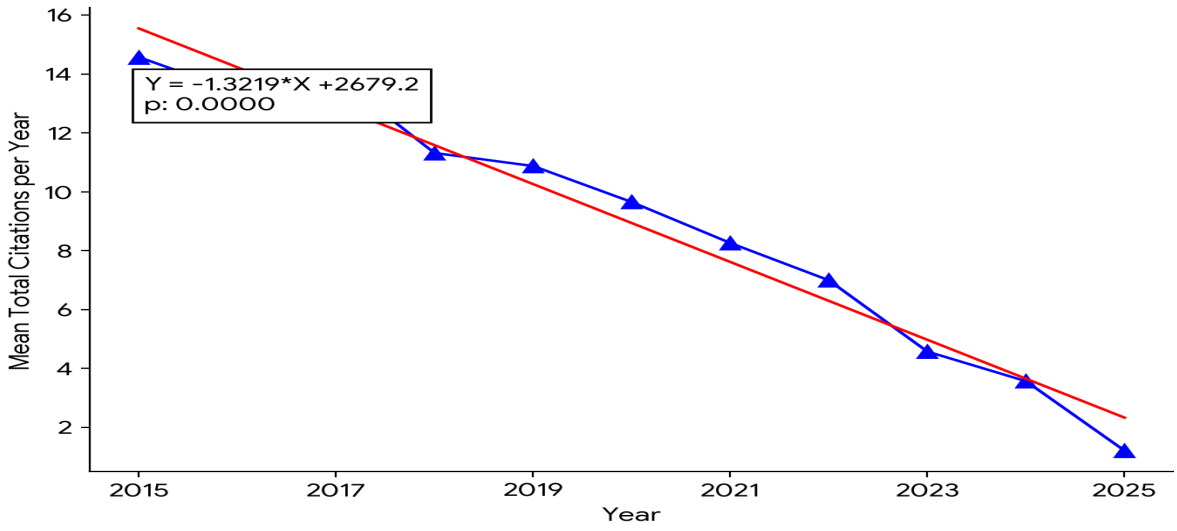

Figure 2. Average citations per year

The downward trend illustrates the natural citation accumulation cycle, where newer articles have had less time to be cited compared to those published earlier in the decade

Top most relevant sources and quartile distribution

The distribution of publications across scientific journals serves as a critical indicator of both research quality and the targeted audience. The 1.924 articles were distributed across 54 different SCIE-indexed journals.

As detailed in Table 2, the most relevant source accommodating the highest volume of this indigenous output was the *International Urology and Nephrology* (Q3), publishing 157 articles. This was closely followed by the *Urology Journal* (Q4, n=148) and *Urolithiasis* (Q2, n=139). Notably, a significant portion of the top 10 core journals consists of highly prestigious Q1 and Q2 publications, such as *International Braz J Urol* (n=133, Q1) and *World Journal of Urology* (n=122, Q2). Furthermore, *Urolithiasis* and *Journal of Endourology* exhibited the highest Mean Normalized Local Citation Scores (MNLCS of 1.814 and 1.669, respectively), indicating that Turkish authors frequently cite domestic research published within these specific endourology-focused journals.

Most globally cited documents

Citation analysis is a fundamental metric for evaluating the influence and penetration of specific research outputs within the global scientific community. The most globally cited document during the study period was authored by Ozkan et al. [13] (2016), published in the *Scandinavian Journal of Urology*, which accrued 147 total citations (Table 3). This highly impactful study was followed by Koras et al. [14] (2015) published in *Urolithiasis* with 122 citations, and Çayan et al. [15] (2020) in *The Aging Male* with 99 citations.

It is particularly noteworthy that the scientific focus of these highly cited top documents aligns perfectly with the dominant thematic clusters identified in the subsequent network analyses—specifically urolithiasis, endourological techniques, and andrology.

Social structure: most relevant authors and institutional collaboration network

The analysis of prolific authors and their institutional affiliations reveals the driving forces behind the national academic output. As shown in Table 4, K. Sarica (Health Science University) emerged as the most prolific author with 80 publications, generating 769 total citations and the highest local citation impact (MNLCS: 2.055). He was followed by A. Yildirim (İstanbul Medeniyet University) (37 articles) and T. Değirmenci (Health Science University) (33 articles, with a notably high global average of 16.03 citations per document).

To map the micro-level scientific collaborations, a Co-authorship Network was generated using VOSviewer (Figure 3). The network reveals distinct, highly cohesive research clusters representing specific institutional “schools” or dedicated working groups. While several strong, isolated subgroups exist (e.g., the dense blue and red clusters indicating tight institutional research teams), prominent key authors like K. Sarica (Health Science University) act as central hubs, bridging diverse working groups and fostering inter-institutional multicenter studies.

Furthermore, to evaluate the macro-level structural partnerships, an Institutional Collaboration Network was constructed (Figure 4). A custom thesaurus file was meticulously applied to consolidate affiliated training and research hospitals under their primary academic umbrellas. The resulting network reveals a highly centralized national structure. The University of Health Sciences (univ hlth sci) emerges as the undisputed epicenter of urological research output in Türkiye (Table 5), possessing the largest node size. Adjacent to this central hub, a tightly knit cluster of well-established traditional academic pillars—such as Ankara University, Hacettepe University, and Marmara University—forms a dense sub-network with thick connecting lines, indicating a robust tradition of multicenter domestic collaborations.

Table 2. Top 10 most relevant sources

Source	Articles	Number of Citations	Average Article Citations (Global)	Mean Normalized Global Citation Score (MNGCS)	Average Article Citations (Local)	Mean Normalized Local Citation Score (MNLCS)	h-index	g-index	m-index	JIF 2024
International Urology and Nephrology	157	1096	6.98	0.973	0.49	1.085	15	22	1.250	Q3
Urology Journal	148	1118	7.55	0.690	0.46	0.656	18	24	1.500	Q4
Urolithiasis	139	1315	9.46	1.199	1.06	1.814	20	28	1.667	Q2
International Braz J Urol	133	1481	11.14	0.973	0.53	0.634	19	25	1.583	Q1
Archivos Espanoles De Urologia	124	295	2.38	0.338	0.14	0.204	8	11	0.667	Q4
World Journal of Urology	122	951	7.80	1.234	0.50	1.048	16	24	1.333	Q2
Urologia Internationalis	111	747	6.73	0.744	0.60	1.117	15	20	1.250	Q3
Urology	109	1188	10.90	1.111	0.75	1.105	19	28	1.583	Q2
Journal of Pediatric Urology	83	925	11.14	1.143	0.98	1.356	18	25	1.500	Q3
Journal of Endourology	81	923	11.40	1.298	1.07	1.669	18	24	1.500	Q2

Table 3. Top 10 most globally cited documents

Document	Doi	Total Citations	TC per Year	Mean Normalized Global Citation Score (MNGCS)	Local Citations	Mean Normalized Local Citation Score (MNLCS)
Ozkan TA, [13] 2016, Scand J Urol	10.1080/21681805.2016.1206619	147	13.36	10.980	0	0.000
Koras O, [14] 2015, Urolithiasis	10.1007/s00240-014-0730-8	122	10.17	8.373	6	6.426
Çayan S, [15] 2020, Aging Male	10.1080/13685538.2020.1807930	99	14.14	10.259	0	0.000
Zeng GH, [16] 2016, BJU Int	10.1111/bju.13242	99	9.00	7.395	8	8.919
Besiroglu H, [17] 2015, J Sex Med	10.1111/jsm.12885	91	7.58	6.245	2	2.142
Kadihasanoglu M, [18] 2021, J Sex Med	10.1016/j.jsxm.2020.11.007	88	14.67	10.654	0	0.000
Silay MS, [19] 2016, J Pediatr Urol	10.1016/j.jpurol.2016.04.007	83	7.55	6.200	1	1.115
Coskun B, [20] 2023, Urology	10.1016/j.urology.2023.05.040	80	20.00	17.500	3	8.077
Karagöz MA, [21] 2021, Int J Impot Res	10.1038/s41443-020-00378-4	75	12.50	9.080	0	0.000
Baş O, [22] 2017, World J Urol	10.1007/s00345-016-1930-3	71	7.10	5.102	8	7.945

Table 4. Top 10 most relevant authors

Author	Articles	Number of Citations	Average Article Citations (Global)	Mean Normalized Global Citation Score (MNGCS)	Average Article Citations (Local)	Mean Normalized Local Citation Score (MNLCS)	h-index	g-index	m-index
Sarica K.	80	769	9.61	1.249	1.30	2.055	13	24	1.083
Yildirim A.	37	252	6.81	1.003	0.73	1.055	8	14	0.667
Degirmenci T.	33	529	16.03	1.271	0.82	1.009	13	22	1.083
Ozgor F.	32	315	9.84	1.910	0.91	2.227	10	16	0.833
Sen V.	32	361	11.28	0.946	0.59	0.719	10	18	0.833
Bozkurt IH.	31	470	15.16	1.181	0.81	0.947	11	21	0.917
Yazici CM.	30	177	5.90	1.323	0.77	1.988	7	11	0.583
Otunctemur A.	30	427	14.23	1.190	0.67	0.847	13	20	1.083
Tuncel A.	29	232	8.00	0.978	0.62	0.895	10	13	0.833
Baltaci S.	29	188	6.48	0.771	0.24	0.400	8	13	0.667

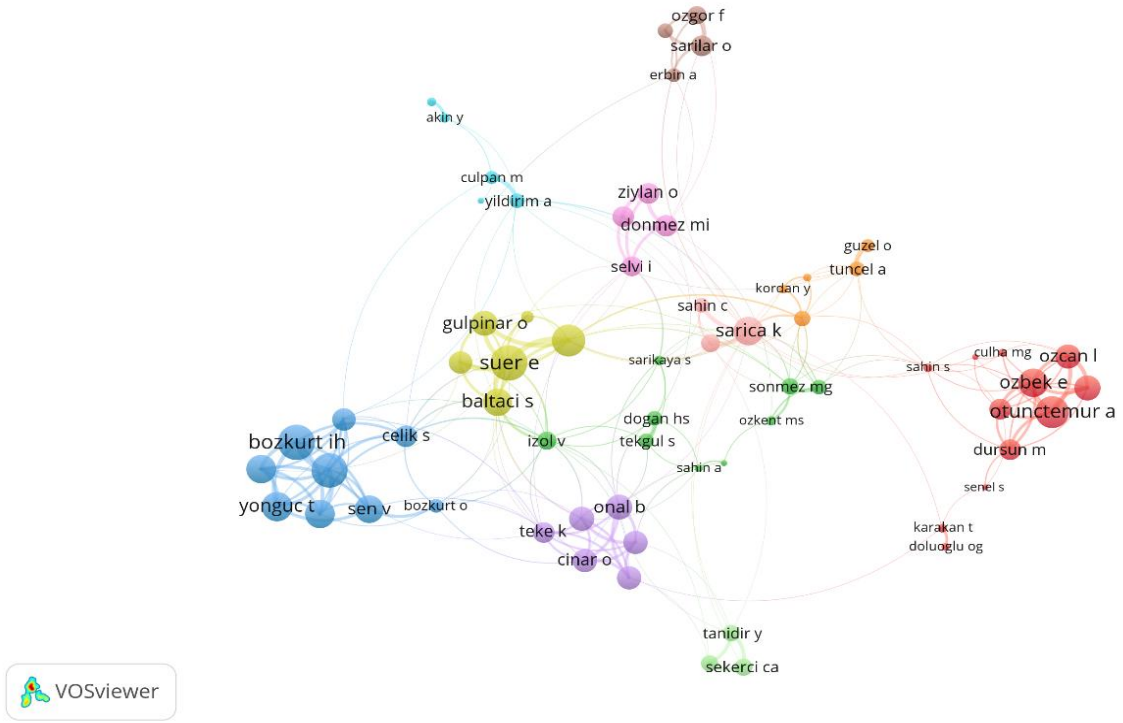

Figure 3. Co-authorship network of highly prolific researchers

Node size reflects the number of publications, and line thickness indicates the strength of collaboration between distinct urological research groups

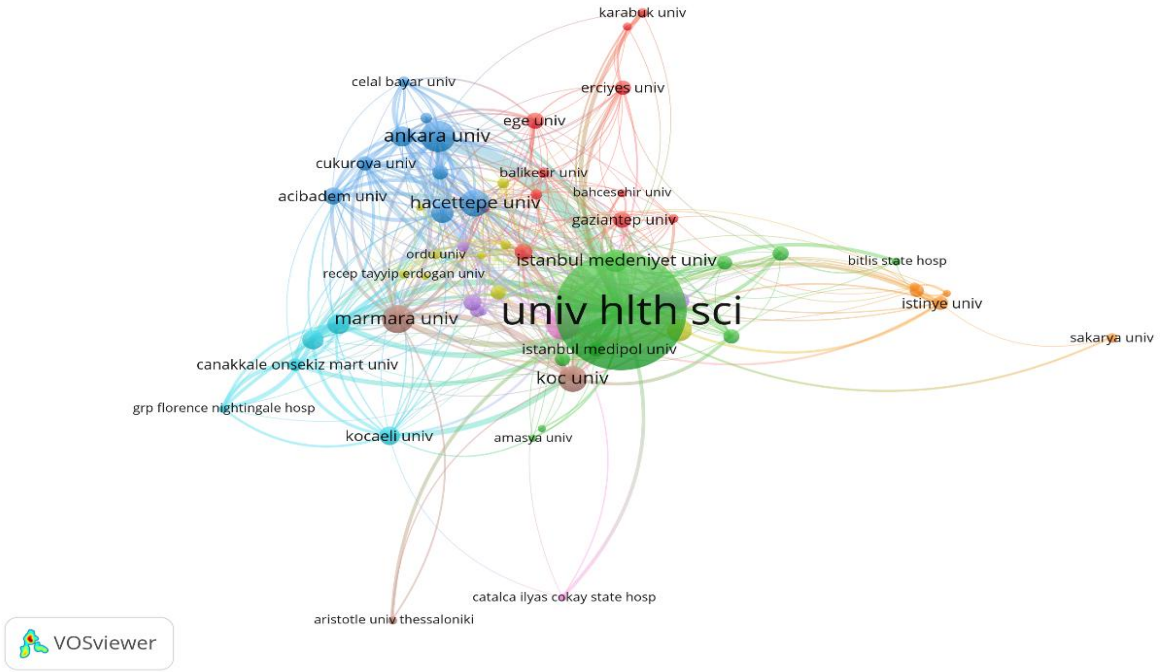

Figure 4. Co-Occurrence network of universities

Node size indicates the number of published documents, while line thickness represents the strength of collaborative links between domestic institutions

Table 5. Top 10 Most Relevant Affiliations

Affiliation	Articles	Number of Citations	Average Article Citations
University of Health Sciences (Univ Hlth SCI)*	553	4467	8.08
Ankara Unıversity	61	566	9.28
Marmara University	54	519	9.61
Istanbul University	51	330	6.47
Hacettepe University	45	420	9.33
Istanbul Medeniyet University	38	335	8.82
Istanbul University- Cerrahpasa	28	109	3.89
Ege University	25	171	6.84
Kocaeli University	24	131	5.46
Namık Kemal University	22	169	7.68

*The data for the University of Health Sciences (Sağlık Bilimleri Üniversitesi) includes all affiliated training and research hospitals, as well as city hospitals, consolidated under a single institutional umbrella to accurately reflect its total academic output

Conceptual structure: thematic map and keyword network

To elucidate the conceptual framework and identify the indigenous research hotspots, a multifaceted analysis of Author's Keywords was conducted.

A Thematic Map (Figure 5) was generated to plot keyword clusters on a two-dimensional grid based on their Centrality (relevance degree) and Density (development degree). Topics such as *urolithiasis*, *percutaneous nephrolithotomy*, and *retrograde intrarenal surgery* are positioned strongly in the Motor Themes (upper-right quadrant), indicating they are well-developed, strongly structured, and constitute the primary driving forces of Turkish urological research. Themes like *prostate cancer* and *radical prostatectomy* appear in the Basic Themes (lower-right quadrant), signifying they are foundational and highly relevant topics that connect various subdisciplines.

Finally, a Keyword Co-occurrence Network (Figure 6) was mapped using VOSviewer. The network highlights massive, self-sustaining clusters. The Endourology and Stone Disease domain dominates the map, deeply anchored by variations of stone surgery acronyms. A highly distinct red cluster underscores a very active output in Andrology, centered around erectile dysfunction and men's health, visually confirming the dominant subspecialties driving the national literature.

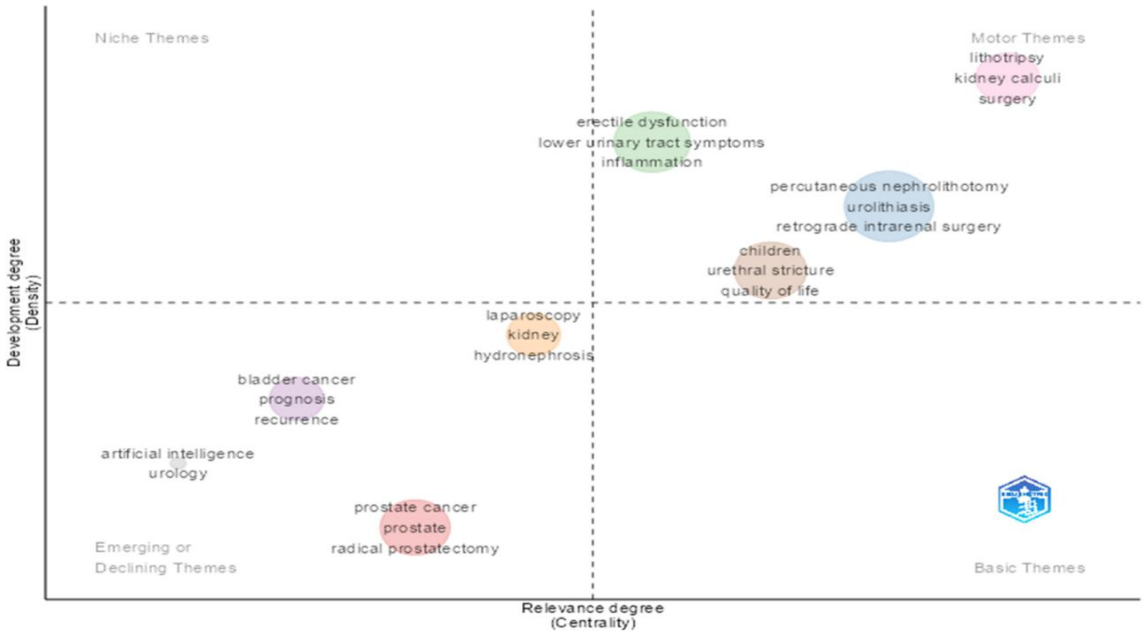

Figure 5. Thematic map analysis of author's keywords

The map divides the conceptual structure into four quadrants: Motor themes, Niche themes, Basic themes, and Emerging/Declining themes based on centrality and density

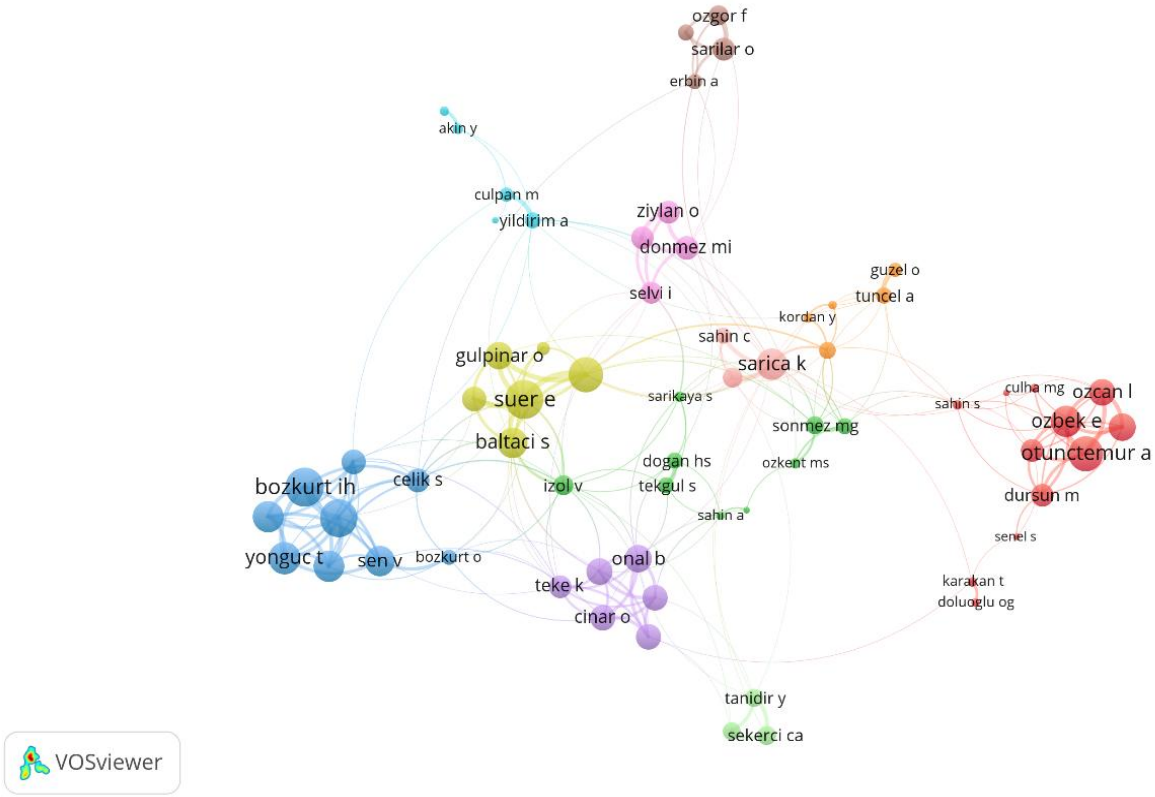

Figure 6. Co-occurrence of Author's Keywords Network Mapping

Nodes represent author keywords; node size corresponds to occurrence frequency. Lines indicate co-occurrence within the same documents

Discussion

This study provides the first comprehensive, corresponding-author-filtered bibliometric evaluation of the indigenous urological research output originating from Türkiye over the past decade (2015-2025). The most striking macro-level finding of our analysis is the remarkably high Single Country Publication (SCP) rate of 94.6%. In contemporary medical research, high-impact publications are often driven by massive international multicenter collaborations. However, our dataset demonstrates that Turkish urologists possess a highly self-sufficient and robust domestic research ecosystem, capable of independently generating evidence that frequently meets the stringent criteria of Q1 and Q2 international journals.

Previous bibliometric evaluations of the global urological literature consistently report that uro-oncology (specifically prostate and bladder cancer) dominates as the primary 'motor theme' of worldwide research [2, 7]. Interestingly, our thematic map (Figure 5) reveals a striking contrast: in the Turkish cohort, uro-oncology is positioned as a 'basic theme', while 'urolithiasis' and endourological interventions explicitly occupy the 'motor theme' quadrant. This divergence from the global norm highlights Türkiye's unique epidemiological landscape and its strategic scientific response to the regional burden of stone disease.

Located within the Afro-Asian "stone belt," Türkiye has a notoriously high prevalence of urolithiasis. This epidemiological burden translates into exceptionally high clinical volumes, fostering a profound surgical mastery in minimally invasive endourological techniques. Furthermore, while recent global analyses indicate a massive shift towards robotic-assisted surgeries and artificial intelligence (e.g., large language models) in urology [6, 9], the conceptual structure of the Turkish literature is heavily weighted towards the miniaturization of endourological techniques. The dominance of keywords such as 'RIRS', 'mini-PCNL', and 'microperc' (Figure 6), coupled with the high global citation rates of these specific documents (Table 3), illustrates that Turkish urology is actively pioneering and exporting surgical innovations in minimally invasive stone management [5], rather than merely following standard global trends. It is no coincidence that specialized journals like Urolithiasis and the Journal of Endourology have exceptionally high Mean Normalized Local Citation Scores (MNLCS of 1.814 and 1.669, respectively). This mathematically proves the existence of a strong "Turkish School of Endourology," where domestic researchers actively read, build upon, and cite each other's surgical innovations, driving the global edge of the field.

Alongside stone disease, Andrology—centered around erectile dysfunction (ED) and testosterone—emerged as a highly distinct and cohesive cluster in our co-occurrence networks. Highly cited observational cohort studies and meta-analyses authored by leading domestic figures underscore the impact of this niche. The high citation rates of these indigenous studies in journals like The Aging Male and The Journal of Sexual Medicine highlight that Turkish urologists are producing globally recognized, practice-modifying clinical data regarding men's health, metabolic syndrome, and surgical prosthetics.

Several studies in the existing literature suggest that a high rate of robust international collaboration networks, typically measured as Multiple Country Publications (MCP), is a prerequisite for achieving high citation impacts and publishing in top-tier journals [2, 5]. Contrary to this widespread assumption, our dataset demonstrates an overwhelmingly high Single Country Publication (SCP) rate of 94.6%. Despite this lack of international co-authorship, Turkish urologists frequently publish in prestigious Q1 and Q2 journals (e.g., International Braz J Urol, World Journal of Urology).

This paradox can be explained by the highly centralized domestic institutional ecosystem. In many Western countries, bibliometric networks are typically decentralized among several historical universities. In Türkiye, however, the consolidation of dozens of high-volume state training and research hospitals, along with mega "City Hospitals," under the single academic umbrella of the University of Health Sciences (SBÜ) has created a unique research titan (Table 5). This centralization provides academic urologists with access to unprecedented, massive patient cohorts, facilitating the rapid execution of large-scale clinical trials without relying on international

consortia. Furthermore, the co-authorship network (Figure 3) demonstrates how core opinion leaders act as critical “hubs,” connecting these massive clinical centers with traditional academic pillars (such as Ankara, Hacettepe, and Marmara Universities), thereby creating a highly integrated and synergistic national workflow.

This study has several limitations that should be acknowledged. First, the data were exclusively retrieved from the Web of Science Core Collection (WoSCC). While WoSCC is the gold standard for bibliometric analysis, excluding other databases such as Scopus or PubMed may have resulted in the omission of certain publications, particularly those in local or non-SCIE-indexed journals. Second, and perhaps most importantly, the Journal Impact Factor (JIF) and corresponding Quartile (Q1-Q4) rankings used to evaluate publication quality were based on the most recent Journal Citation Reports (JCR) metrics available at the time of data extraction, rather than the historical Q value of the journal in the exact year a specific article was published. Since journal quartiles are dynamic, this approach provides a contemporary snapshot of the journals’ standing rather than a retrospective qualitative assessment. Finally, citation counts are dependent on WoS metrics, which may not capture citations from non-indexed sources. Despite these limitations, the rigorous application of corresponding author filtering and semantic data cleaning (thesaurus implementation) ensures that this study provides the most accurate, unfiltered representation of the indigenous Turkish urological research ecosystem to date. In conclusion, this bibliometric analysis reveals that Turkish urology possesses a highly prolific, self-sufficient, and cohesive domestic research ecosystem. Defying the global necessity for extensive international collaboration, Turkish researchers consistently generate high-impact publications, particularly excelling in the fields of endourology, urolithiasis, and andrology. The concentration of massive clinical data within centralized institutional hubs like the University of Health Sciences (SBÜ), combined with a profound geographical surgical experience in stone disease, has established Türkiye not just as a contributor, but as a pioneering force in minimally invasive urological innovations. Future strategies should aim to leverage this immense domestic clinical volume into prospective, multicenter international consortia to further amplify the global footprint of Turkish urological research.

Ethics committee approval: Since this study is a bibliometric analysis utilizing exclusively publicly available metadata from published literature, it did not involve any human participants, animal experiments, or patient data. Therefore, ethical committee approval and informed consent were not required.

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