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Temporal Trends in Orthopaedic Residency Theses in Turkey: A Bibliometric Analysis Between 2015 and 2025 with Emphasis on Anterior Cruciate Ligament Research

Türkiye'de Ortopedi ve Travmatoloji Uzmanlık Tezlerinde Zamansal Eğilimler: 2015-2025 Dönemine Ait Ön Çapraz Bağ Araştırmalarına Odaklanan Bibliyometrik Analiz

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Abstract

Objective: Orthopaedic residency theses reflect academic priorities and research feasibility within postgraduate training programs. Bibliometric analyses of theses provide insight into longitudinal changes in research focus; however, data on temporal trends in specific orthopaedic topics—particularly anterior cruciate ligament (ACL)-related research—and the impact of the coronavirus disease-2019 (COVID-19) pandemic remain limited. This study aimed to evaluate the annual distribution of orthopaedic residency theses in Turkey between 2015 and 2025 and to assess temporal changes in ACL-related theses.

Method: A retrospective bibliometric analysis was conducted using data from the National Thesis Center of the Council of Higher Education of Turkey. All approved orthopaedic residency theses completed between 2015 and 2025 were included and categorized into pre-pandemic, pandemic, and post-pandemic periods. Topic identification was performed using predefined keyword-based abstract screening to classify ACL, arthroplasty, and trauma-related

Öz

Amaç: Ortopedi ve travmatoloji asistanlık tezleri, uzmanlık eğitimi sürecindeki araştırma eğilimlerini ve klinik uygulanabilirliği yansıtan önemli akademik çıktılardır. Bu tezlere yönelik bibliyometrik değerlendirmeler, zaman içerisinde değişen araştırma önceliklerinin ortaya konmasına katkı sağlar. Ancak ön çapraz bağ (ÖÇB) başta olmak üzere belirli konulara odaklanan tezlerin yıllara göre dağılımı ve koronavirüs hastalığı-2019 (COVID-19) pandemisinin bu süreç üzerindeki etkisi yeterince incelenmemiştir. Bu çalışmanın amacı, Türkiye'de 2015-2025 yılları arasında tamamlanan ortopedi ve travmatoloji asistanlık tezlerinin yıllara göre dağılımını incelemek ve ÖÇB ile ilişkili tezlerdeki zamansal değişimi değerlendirmektir.

Yöntem: Çalışmada, Yükseköğretim Kurulu Ulusal Tez Merkezi'nde yer alan ve 2015-2025 yılları arasında tamamlanmış ortopedi ve travmatoloji asistanlık tezleri retrospektif olarak incelendi. Tezler pandemi öncesi (2015-2019), pandemi dönemi (2020-2021) ve pandemi sonrası (2022-2025) olmak üzere üç döneme ayrıldı. Konu sınıflandırması, tez özetlerinde yer alan anahtar kelimeler

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Abstract

theses. Temporal trends were evaluated using logistic regression and proportion comparisons, with exploratory analyses applied to residual topics.

Results: A total of 1,778 theses were analyzed. Annual thesis production increased over time, with no reduction during the pandemic period. ACL-related theses comprised 5.9% of all theses and demonstrated a significant decline over time (odds ratio per year =0.914, p=0.005), with a lower proportion observed in the post-pandemic period compared with the pre-pandemic period (7.16% vs. 4.05%, p=0.009). No significant changes were identified in arthroplasty- or trauma-related thesis proportions. Theses unrelated to ACL, arthroplasty, or trauma increased proportionally after the pandemic, without a dominant subspecialty driving this trend.

Conclusion: Although overall orthopaedic thesis production in Turkey increased between 2015 and 2025, the proportion of ACL-related theses declined significantly. This decline was not accompanied by increases in trauma- or arthroplasty-related research, suggesting diversification of research topics rather than a shift toward alternative high-volume subspecialties. Residency-level research priorities may therefore be influenced by clinical feasibility and external disruptions such as the COVID-19 pandemic and may not directly reflect global publication trends.

Keywords: Anterior cruciate ligament, bibliometric analysis, COVID-19 pandemic, orthopaedics, research trends, residency thesis

Öz

kullanılarak ÖÇB, artroplasti ve travma başlıkları altında yapıldı. Yıllara bağlı değişimler istatistiksel olarak analiz edildi.

Bulgular: Toplam 1,778 asistanlık tezi değerlendirmeye alındı. İncelenen dönem boyunca tez sayısında genel bir artış gözlenirken, pandemi döneminde belirgin bir azalma saptanmadı. ÖÇB ile ilişkili tezler tüm tezlerin %5,9'unu oluşturdu ve yıllar içerisinde anlamlı bir azalma gösterdi. ÖÇB tezlerinin oranı pandemi öncesi dönemde %7,16 iken pandemi sonrasında %4,05'e geriledi. Artroplasti ve travma ile ilişkili tez oranlarında ise yıllara göre anlamlı bir değişim izlenmedi. ÖÇB, artroplasti ve travma dışındaki konulara ait tezlerin oranı pandemi sonrasında anlamlı düzeyde arttı.

Sonuç: Türkiye'de ortopedi ve travmatoloji asistanlık tezlerinin sayısı 2015-2025 döneminde artış göstermiştir. Buna karşın, ÖÇB ile ilişkili tezlerin oranında belirgin bir azalma dikkat çekmektedir. Bu durum, araştırma odağının belirli alt uzmanlık alanlarından ziyade daha geniş bir konu yelpazesine yayıldığını düşündürmektedir. Asistanlık tezlerinde konu seçiminin, klinik koşullar ve pandemi gibi dışsal faktörlerden etkilenebileceği göz önünde bulundurulmalıdır.

Anahtar kelimeler: Araştırma eğilimleri, asistanlık tezi, bibliyometrik analiz, COVID-19, ortopedi ve travmatoloji, ön çapraz bağ

Introduction

Orthopaedic residency theses constitute a fundamental component of postgraduate medical education, serving both as a requirement for specialty certification and as an indicator of academic priorities and research capacity within training programs. Beyond individual academic achievement, the cumulative analysis of residency theses may provide insight into longitudinal changes in clinical focus, research feasibility, and institutional interests over time. Accordingly, thesis-based bibliometric analyses have been increasingly recognized as useful tools for evaluating trends in medical education and research output (1,2).

Bibliometric and meta-research approaches have been widely applied to assess scientific productivity, topic evolution, and research dynamics across medical disciplines (1). Previous studies have demonstrated that postgraduate research topics are shaped by multiple factors, including disease prevalence, surgical case volume, accessibility of clinical data, institutional expertise, and healthcare system priorities (2-4). Within orthopaedics, academic activity has traditionally concentrated on high-volume clinical domains such as trauma, joint arthroplasty, and sports-related knee injuries, particularly anterior cruciate ligament (ACL) pathology.

ACL injury represents one of the most extensively investigated conditions in orthopaedic sports medicine due to its high incidence, functional impact, and continuous evolution of surgical and rehabilitation strategies. Sustained global interest in ACL reconstruction techniques, graft selection, and postoperative outcomes has been consistently documented in the literature (5-8). Bibliometric analyses of journal publications further confirm a steady increase in ACL-related scientific output over recent decades, underscoring its prominent position within orthopaedic research (9,10). However, whether this global publication trend is similarly reflected in postgraduate training output, particularly at the national level, remains unclear.

The coronavirus disease-2019 (COVID-19) pandemic introduced substantial disruptions to healthcare systems worldwide, affecting elective surgical care, outpatient services, and clinical research activity. In orthopaedic surgery, pandemic-related restrictions were associated with reduced elective case volumes and postponement of sports-related procedures (11-14). These changes may have influenced research feasibility and data availability; however, their potential impact on postgraduate research output and topic selection remains unclear. Although several studies have examined the immediate impact

of the pandemic on orthopaedic practice and journal-based research output (11-13), data regarding its potential influence on postgraduate research trends, particularly at the level of residency training, remain limited (13,14).

In Turkey, all approved medical specialty theses are systematically archived within the National Thesis Center of the Council of Higher Education, providing a comprehensive and centralized database for longitudinal analysis. The centralized and comprehensive nature of this database provides a unique opportunity to evaluate longitudinal research patterns within a structured national training system. A previous bibliometric study evaluated orthopaedic theses completed in Turkey, offering valuable baseline information on general thesis characteristics and national research output (4). While informative, a detailed assessment of temporal changes in thesis topics, topic-specific trends, and potential pandemic-related influences was beyond the scope of that study. Although other bibliometric analyses have examined orthopaedic research output originating from Turkey using journal-based metrics (3); investigations specifically addressing residency theses and temporal shifts in thesis topics remain limited. Consequently, how orthopaedic residency research priorities may have evolved over time—particularly for high-volume areas such as ACL pathology—remains insufficiently explored.

Importantly, understanding trends in residency theses may provide insight into research feasibility and training exposure within orthopaedic education, as thesis topics are often influenced by clinical accessibility, institutional resources, and supervisory priorities.

Therefore, the primary aim of this study was to perform a bibliometric analysis of orthopaedic residency theses completed in Turkey between 2015 and 2025, incorporating temporal analyses with a focus on ACL-related research trends. Secondary objectives included evaluating concurrent trends in trauma and arthroplasty-related theses and assessing overall thesis production across pandemic-defined periods. In addition, exploratory, hypothesis-generating analyses were performed to examine patterns within theses outside these major categories. By addressing these aims, this study provides a structured evaluation of research trends within orthopaedic training and offers insight into how external factors and research feasibility may be reflected in residency-level academic output.

Materials and Methods

Study Design

This study was designed as a retrospective bibliometric and exploratory keyword analysis of orthopaedic residency theses completed in Turkey. As the study was based exclusively on publicly available data and did not involve human participants, patient data, or identifiable personal information, ethical committee approval was not required.

Data Source and Thesis Selection

Data were obtained from the National Thesis Center of the Council of Higher Education of Turkey (*YÖK Ulusal Tez Merkezi*). The database was searched using predefined keywords related to orthopaedics and traumatology (e.g., "orthopaedics," "traumatology," and related terms in Turkish and English), without additional filters beyond department and thesis type criteria, to identify all approved medical specialty theses completed between January 2015 and December 2025. The screening process was performed in a stepwise manner, including initial identification based on database filters followed by manual review of titles and abstracts by the authors to confirm eligibility.

Theses were eligible for inclusion if they met the following criteria:

- Approval status marked as approved in the database,
- Department listed as orthopaedics and traumatology,
- Thesis type classified as medical specialty thesis,

A total of 1.778 theses meeting these criteria were included in the final analysis.

Data Extraction

For each thesis, the following information was extracted:

- Year of approval,
- Thesis title,
- Turkish and/or English abstract text.

All extracted data were compiled into a structured dataset for analysis. Abstract texts were converted to lowercase to ensure consistency during keyword-based searches.

Period Definition

To evaluate the impact of the COVID-19 pandemic, theses were categorized into three predefined periods:

- Pre-pandemic period: 2015-2019
- Pandemic period: 2020-2021
- Post-pandemic period: 2022-2025.

Primary comparative analyses were performed between the pre-pandemic and post-pandemic periods to assess delayed and sustained changes in research trends.

Keyword-based Topic Identification

Topic identification was performed using predefined keyword lists applied to thesis abstracts. Keywords were selected to maximize sensitivity while maintaining conceptual specificity and were developed based on commonly used terminology in the literature and clinical practice. To reduce misclassification risk, multiple linguistic variations, abbreviations, and synonyms were included for each keyword group. Theses were classified as ACL-related if at least one predefined ACL-related keyword appeared in the abstract; as arthroplasty-related if keywords associated with joint replacement surgery, including knee and hip arthroplasty, were present; and as trauma-related if keywords related to fractures or acute orthopaedic trauma were detected. This approach was chosen to ensure consistent and reproducible classification across a large dataset. Each topic category was coded as a binary variable (present/absent), and a single thesis could be assigned to more than one category. These topics were selected due to their high clinical volume and traditional prominence within orthopaedic training. Predefined keyword lists used for topic identification are provided in Supplementary Table S1.

Residual Topic Group

Theses that did not contain any ACL-, arthroplasty-, or trauma-related keywords were categorized as non-ACL, non-arthroplasty, non-trauma theses. This residual group was analyzed to determine its relative contribution to overall changes in thesis production.

Exploratory Binary Presence Analysis

An exploratory analysis was conducted within the residual thesis group to assess changes in the representation of selected clinical term groups, including upper extremity/hand-wrist, shoulder-related, cartilage/osteochondral, pediatric-related, foot and ankle-related, and meniscus-related terms.

For this analysis, each thesis was coded using a binary presence approach, indicating whether at least one term from a predefined group appeared in the abstract. This method was chosen to avoid bias related to abstract length or repeated keyword usage. The exploratory analysis was considered hypothesis-generating and not intended as definitive subspecialty classification. Given the large dataset and retrospective design, keyword-based classification was considered a pragmatic and reproducible approach for identifying broad research domains, although it may not fully capture all nuances of individual thesis topics.

Statistical Analysis

Descriptive statistics were used to summarize thesis counts and proportions. Temporal trends in ACL-related theses were evaluated using logistic regression analysis, with year of approval as a continuous predictor.

Comparisons of proportions between periods were performed using two-proportion Z-tests.

All statistical analyses were conducted using standard statistical software [SPSS version 29.0 (IBM Corp., Armonk, NY, USA)]. A p-value <0.05 was considered statistically significant.

Reporting Standards

The study was conducted and reported in accordance with general principles for bibliometric and meta-research studies. Given the use of publicly accessible, aggregated data, informed consent and institutional review board approval were not applicable. No formal protocol was registered for this study.

Results

Overall Thesis Production

Between 2015 and 2025, a total of 1.778 orthopaedic residency theses registered in the National Thesis Center of Turkey were included in the analysis. Annual thesis production demonstrated an overall increasing trend throughout the study period. Notably, no reduction in the total number of theses was observed during the COVID-19 pandemic, and thesis output increased further in the post-pandemic period (Table 1). Annual thesis production over time is illustrated in Figure 1.

Temporal Trends in ACL-related Theses

Using predefined and comprehensive keyword criteria, 105 ACL-related theses were identified across the entire study period (2015-2025), representing 5.9% of all included

Table 1. Overall thesis production by period (2015-2025)

Period	Years	n	%
Pre-pandemic	2015-2019	670	37.7
Pandemic	2020-2021	317	17.8
Post-pandemic	2022-2025	791	44.5
Total	2015-2025	**1.778**	**100**

Distribution of approved orthopaedic residency theses in Turkey across predefined pandemic periods

theses. The proportion of ACL-related theses demonstrated a significant decline over time. Logistic regression analysis using year of approval as a continuous variable revealed a significant annual decrease in the likelihood of an ACL-related thesis [odds ratio per year =0.914, 95% confidence interval (CI) 0.858-0.974, p=0.005] (Figure 2).

Period-based analysis showed that the proportion of ACL-related theses decreased significantly from 7.16% (48/670) in the pre-pandemic period (2015-2019) to 4.05% (32/791) in the post-pandemic period (2022-2025) (two-proportion Z-test, p=0.009) (Table 2).

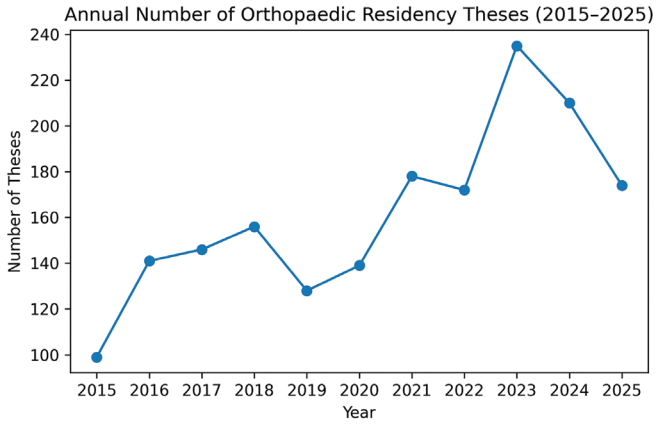

Figure 1. Annual number of orthopaedic residency theses completed in Turkey between 2015 and 2025. No decline in annual thesis production was observed during the COVID-19 pandemic period, with a further increase noted in the post-pandemic years

COVID-19: Coronavirus disease-2019

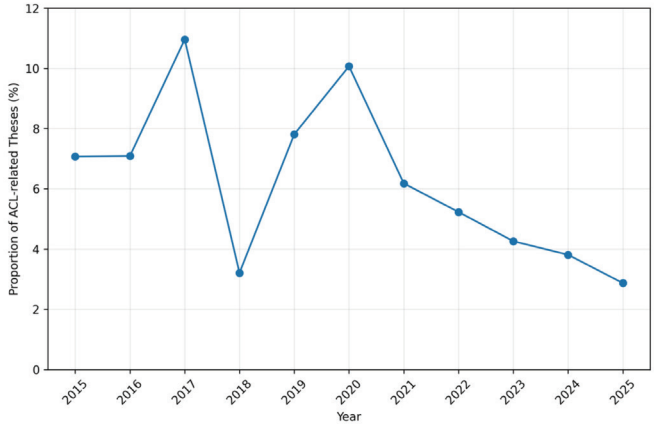

Figure 2. Temporal trend in the proportion of ACL-related orthopaedic residency theses between 2015 and 2025. A progressive decline in ACL-related thesis representation over time is observed, consistent with the results of logistic regression analysis

ACL: Anterior cruciate ligament

No significant difference was observed between the pre-pandemic and pandemic periods (p=0.686).

Arthroplasty and Trauma-related Thesis Trends

Arthroplasty-related theses accounted for 19.25% (129/670) of theses in the pre-pandemic period and 16.06% (127/791) in the post-pandemic period. This difference did not reach statistical significance (two-proportion Z-test, p=0.109).

Similarly, trauma-related theses constituted 55.97% (375/670) of theses in the pre-pandemic period and 56.01% (443/791) in the post-pandemic period, with no significant change in proportion between periods (two-proportion Z-test, p=0.989) (Table 2).

Residual (Non-ACL, Non-arthroplasty, Non-trauma) Thesis Trends

Theses unrelated to ACL, arthroplasty, or trauma demonstrated a significant proportional increase in the post-pandemic period compared with the pre-pandemic period (p<0.001) (Table 2). This residual group contributed substantially to the observed rise in overall thesis production following the pandemic (Figure 3).

Exploratory Binary Presence Analysis of Clinical Term Groups

Binary presence analysis was performed on non-ACL, non-arthroplasty, and non-trauma theses to evaluate post-pandemic changes in the representation of selected clinical term groups. No clinical term group

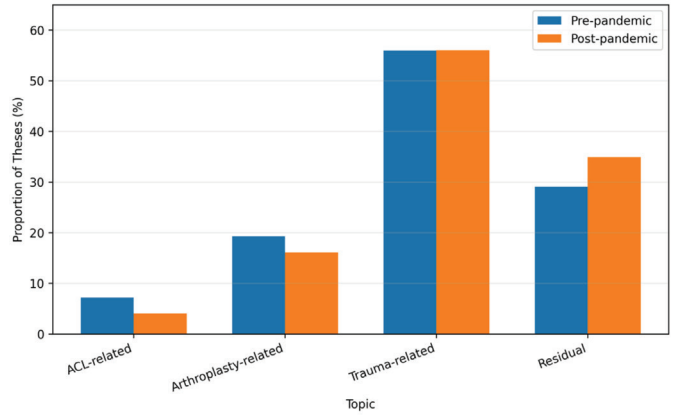

Figure 3. Proportional distribution of major thesis topic groups before and after the COVID-19 pandemic. While the proportion of ACL-related theses decreased in the post-pandemic period, no compensatory increase was observed in trauma- or arthroplasty-related theses, with the overall increase distributed across residual topics

ACL: Anterior cruciate ligament, COVID-19: Coronavirus disease-2019

Table 2. Topic-specific proportions (pre vs. post) with p-values and 95% CIs

Topic (binary presence)	Pre-pandemic n/N (%)	Pre 95% CI	Post-pandemic n/N (%)	Post 95% CI	p-value pre vs. post
ACL-related	48/670 (7.16%)	5.45-9.37	32/791 (4.05%)	2.88-5.66	0.009
Arthroplasty-related	129/670 (19.25%)	16.45-22.41	127/791 (16.06%)	13.66-18.78	0.109
Trauma-related	375/670 (55.97%)	52.19-59.68	443/791 (56.01%)	52.53-59.43	0.989
Residual*	195/670 (29.10%)	25.79-32.66	276/791 (34.89%)	31.65-38.28	0.018

Temporal trend (ACL): Logistic regression with year as a continuous predictor: OR per year =0.914 (95% CI 0.858-0.974), p=0.005. *Residual: Not ACL, not arthroplasty, and not trauma. CI: Confidence interval, ACL: Anterior cruciate ligament

demonstrated a statistically significant increase in proportional representation in the post-pandemic period, including upper extremity/hand-wrist, shoulder-related, cartilage/osteochondral, pediatric-related, or foot and ankle-related terms (all p>0.05). Meniscus-related terms showed a non-significant decline. Detailed results are provided in Supplementary Table S2.

Collectively, these findings show that overall orthopaedic thesis production increased after the COVID-19 pandemic, while the proportion of ACL-related theses declined significantly. No significant compensatory increase was observed in arthroplasty- or trauma-related theses, and the post-pandemic increase in thesis output was distributed across a heterogeneous group of topics rather than driven by a single orthopaedic subspecialty.

Discussion

The present study provides a bibliometric evaluation of orthopaedic residency theses completed in Turkey over an extended decade-long period, with particular emphasis on temporal trends in ACL-related research. The principal finding of this analysis is a significant decline in the proportion of ACL-related theses over time, despite an overall increase in total thesis production. Importantly, this decline was not accompanied by a proportional rise in trauma- or arthroplasty-related theses, indicating that the observed changes were not explained by a shift toward these major clinical domains.

ACL pathology has historically represented a cornerstone of orthopaedic sports medicine research, driven by its high incidence, impact on young and athletic populations, and continuous advancements in surgical techniques and rehabilitation strategies (15-17). Bibliometric analyses of journal publications have consistently demonstrated sustained growth in ACL-related scientific output worldwide (9,10,15,16). In contrast, the findings of the present study indicate that this global publication trend is not fully mirrored in postgraduate thesis production in Turkey, particularly in the post-pandemic period. This divergence indicates that residency-level research trends may not fully align with patterns observed in journal-based academic output and may be influenced by different contextual factors.

One possible explanation for the observed decline in ACL-related theses may relate to changes in clinical exposure and case availability during and after the COVID-19 pandemic. Previous studies have reported reductions in elective orthopaedic procedures, including sports-related surgeries, during pandemic-related restrictions (18-20). However, the present study does not include direct data on surgical volume or resident case exposure. Therefore, any potential relationship between pandemic-related changes and thesis topic selection should be interpreted with caution. The observed temporal pattern, including the absence of a significant difference between the pre-pandemic and pandemic periods and the decline in the post-pandemic period, may reflect a delayed effect, although this remains speculative.

The absence of a compensatory increase in trauma- or arthroplasty-related theses suggests that the observed changes were not directly offset by increases in these major clinical domains. Trauma-related theses remained proportionally stable across periods, consistent with reports indicating that trauma care was relatively preserved during the pandemic (21-23). Arthroplasty-related thesis proportions also did not demonstrate a statistically significant increase.

This interpretation is further supported by the significant increase observed in the residual thesis group, comprising topics unrelated to ACL, trauma, or arthroplasty. Exploratory analyses did not identify a single orthopaedic subspecialty responsible for this increase. Therefore, the rise in the residual group likely reflects a heterogeneous distribution of topics rather than a shift toward a clearly defined alternative research focus. Such diversification may reflect adaptive strategies by residents and supervisors, favoring

study designs and topics less dependent on elective surgical volume, long-term follow-up, or narrowly defined patient populations.

From an educational perspective, these findings highlight variability in thesis topic selection within orthopaedic residency training. The increased heterogeneity of thesis topics may reflect the influence of research feasibility, methodological considerations, or institutional factors. While this diversification may enrich academic training, the observed decline in ACL-related theses raises questions regarding sustained engagement with a foundational area of orthopaedic sports medicine during residency.

The results of this study extend previous bibliometric analyses of orthopaedic theses in Turkey by incorporating a longitudinal perspective and explicitly examining pandemic-period effects (4). Whereas prior work provided valuable baseline descriptions of thesis characteristics, the present analysis demonstrates that major external events can exert lasting influences on research priorities within structured training programs. In this context, the centralized structure of the National Thesis Center offers a unique opportunity to monitor and evaluate such trends at a national level.

Study Limitations

Several limitations should be acknowledged. First, topic identification was based on keyword presence within thesis abstracts, which may not fully capture the scope of all included studies. However, the use of comprehensive keyword lists, including linguistic variations, was intended to maximize sensitivity. Second, the exploratory nature of the binary presence analysis limits definitive conclusions regarding subspecialty-specific trends within the residual group. Finally, this study did not assess thesis quality, study design, or subsequent publication outcomes, which may provide additional insight into the academic impact of observed trends.

The findings of this study provide insight into temporal patterns in residency-level research output and suggest that external factors may be associated with changes in thesis topic distribution. Further studies incorporating clinical exposure, case volume, and training characteristics are needed to better understand the underlying mechanisms. The significant decline in ACL-related theses, in the absence of compensatory increases in other major domains, suggests that external disruptions such as the COVID-19 pandemic may have reshaped research priorities in a sustained manner. Future studies evaluating thesis quality, publication rates, and alignment with clinical training objectives may further elucidate the long-term educational implications of these findings.

In addition, the database may not include all theses due to restricted access or incomplete indexing, which could have influenced the completeness of the dataset.

Conclusion

This bibliometric analysis of orthopaedic residency theses in Turkey between 2015 and 2025 demonstrated that overall thesis production increased over the last decade, while the proportion of ACL-related theses declined significantly. This decline was not accompanied by proportional increases in trauma- or arthroplasty-related research, and the observed changes were distributed across a heterogeneous range of topics without evidence of dominance by a specific subspecialty. These findings suggest that residency-level research trends may not fully mirror global publication patterns and may be associated with factors such as research feasibility and external conditions. Further studies incorporating clinical exposure and training characteristics are needed to better understand the underlying mechanisms.

Ethics

Ethics Committee Approval: This study uses data obtained from publicly available databases and does not involve human patients or volunteers, it was decided at the meeting on November 27, 2024, by University of Health Sciences Turkey, Bakırköy Dr. Sadi Konuk Training and Research Hospital that ethical committee approval is not required.

Informed Consent: In accordance with national and international research ethics guidelines, ethical committee approval and informed consent were not required for this study.

Footnotes

Authorship Contributions

Concept: A.C.K., A.Y., O.Ç., Design: A.C.K., A.Y., M.A.K., Data Collection or Processing: A.C.K., M.A.K., T.K., V.Ö., Analysis or Interpretation: A.C.K., O.Ç., V.Ö., Literature Search: A.C.K., A.Y., M.A.K., T.K., V.Ö., Writing: A.C.K., O.Ç., T.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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Supplementary Tables: https://d2v96fxpocvxx.cloudfront.net/cf9d60d6-523c-458a-a2e6-78728d3ffbb0/content-images/7fda5f2b-5f43-40ac-9101-49d6f9f54594.pdf

References

1. Ioannidis JPA. Meta-research: why research on research matters. PLoS Biol. 2018;16(3):e2005468.
2. Bornmann L, Mutz R. Growth rates of modern science: a bibliometric analysis based on the number of publications and cited references. JASIST. 2015;66(11):2215-2222.
3. İpek D, Dündar A. Publication trends and global productivity about the anterior cruciate ligament: a bibliometric analysis between 1980-2021. J Health Sci Med. 2023;6(2):228-237.
4. Baysan C, Yapar D, Ali Tokgöz M, Yapar A, Kul Baysan E, Tolunay T. Bibliometric analysis of orthopedic theses in Turkey. Jt Dis Relat Surg. 2021;32(3):752-758.
5. Duquin T, Wind W, Fineberg M, Smolinski R, Buyea C. Current trends in anterior cruciate ligament reconstruction. J Knee Surg. 2009;22(01):7-12.
6. Tuca M, Valderrama I, Eriksson K, Tapasvi S. Current trends in anterior cruciate ligament surgery. A worldwide benchmark study. Journal of ISAKOS. 2023;8(1):2-10.
7. Garlapaty AR, Parola R, Kluge MC, Blankenship QP, Njai A, Stannard JT, et al. Anterior cruciate ligament injuries in national football league players from 2012 to 2022: a descriptive epidemiology study. J Knee Surg. 2026;39(1):1-8.
8. Dodson CC, Secrist ES, Bhat SB, Woods DP, Deluca PF. Anterior cruciate ligament injuries in national football league athletes from 2010 to 2013: a descriptive epidemiology study. Orthop J Sports Med. 2016;4(3):2325967116631949.
9. Alzobi OZ, Almannai H, Hantouly A, Salman LA, Ahmed AF, Alkhelaifi KA, et al. Anterior cruciate ligament reconstruction with lateral extra-articular augmentation: a bibliometric analysis of the top 100 cited articles. J Knee Surg. 2025;38(11):580-591.
10. Hoon T, Chillakuru R, Ganti L. Tears, tendons, and trends: a bibliometric analysis on anterior cruciate ligament research. Orthop Rev (Pavia). 2025;17:142052.
11. Chauhan GS, Kaur J, Habeebullah A, Dewan V, Pemmaraju G. The Impact of the COVID-19 pandemic on orthopaedic trauma surgery in a district general hospital in the United Kingdom. Cureus. 2024;16(2):e53928.
12. Al-Omran AS. COVID-19 pandemic impact on orthopaedic trauma practice: a global perspective. Orthop Res Rev. 2022;14:9-15.
13. Blum P, Putzer D, Liebensteiner MC, Dammerer D. Impact of the Covid-19 pandemic on orthopaedic and trauma surgery - a systematic review of the current literature. In Vivo. 2021;35(3):1337-1343.
14. Wong JSH, Cheung KMC. Impact of COVID-19 on orthopaedic and trauma service: an epidemiological study. J Bone Joint Surg Am. 2020;102(14):e80.
15. Becerra-Patiño BA, Paucar-Uribe JD, Olivares-Arancibia J, Ojeda-Aravena A, Yáñez-Sepúlveda R, Gamonales JM, et al. Mapping the knowledge of research trends in sports performance asymmetries from 2015 to 2024: a bibliometric study and analysis of the most-cited papers. Sports (Basel). 2025;13(4):93.
16. Liang J, Luo Y, Yang Y, Xie H, Huang Z, Zhong M, et al. Global overview of anterior cruciate ligament reconstruction in children and adolescents over the past 20 years: a bibliometric analysis. J Orthop Surg Res. 2024;19(1):350.
17. Jin H, Tahir N, Jiang S, Mikhail H, Pavel V, Rahmati M, et al. Management of anterior cruciate ligament injuries in children and adolescents: a systematic review. Sports Med Open. 2025;11(1):40.
18. Hsu CH, Huang HT, Chen CH, Fu YC, Chou PH, Hsu NC. Global impact of the COVID-19 pandemic on orthopedics and the implications of telemedicine: a systematic review of the literature. J Clin Med. 2022;11(11):2983.
19. Baraza N, Odari I, Lomole EM, Karanja S, Ating'a M. Impact of the Covid-19 pandemic on elective and trauma orthopaedic surgery in a tertiary referral hospital in Kenya: a retrospective cross-sectional study. Orthopedics. 2024.
20. Dell'Isola A, Kiadaliri A, Turkiewicz A, Hughes V, Magnusson K, Runhaar J, Bet al. The impact of first and second wave of COVID-19 on knee and hip surgeries in Sweden. J Exp Orthop. 2021;8(1):60.
21. Padilla-Rojas LG, López-Cervantes RE, López-Almejo L, Gutiérrez-Mendoza I, Amadei-Enghelmayer RE, Pesciallo CA, et al. Orthopaedic trauma care during the COVID-19 Pandemic: the Latin American perspective. OTA Int. 2021;4(1 Suppl):e114.
22. Özşahin MK, Değer GU, Aydın N. The impact of COVID-19 pandemic in the first 100 days on orthopedic trauma surgery practice, the experience of a university hospital in Istanbul. Ulus Travma Acil Cerrahi Derg. 2022;28(1):27-32.
23. Can Ö, Yalçınlı S, Altuncı YA, Ersel M. Retrospective examination of trauma patients referred to the emergency department during the COVID-19 pandemic restriction period. Anatolian J Emerg Med. 2024;7(1):27-31. Turkish.