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Research Article

A bibliometric analysis of Turkish orthopedics and traumatology in high-impact global literature over a decade (2014-2023)

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ABSTRACT

Objective: This study aimed to assess the contributions and global impact of Turkish orthopedics and traumatology research published in high-impact international journals over the past decade (2014-2023). By examining article types, citation metrics, journal impact factors, and author affiliations, the aim was to highlight publication trends, strengths, and areas needing improvement within Turkish orthopedic research.

Methods: Using the Web of Science database, keywords were searched under journal categories including "Orthopedics," "Orthopedics, Rehabilitation and Sports Medicine," and "Sports Sciences." Articles from the top 40 orthopedic journals indexed in Science Citation Index Expanded were identified and selected based on their 2022 impact factors. Articles published between January 2014 and December 2023 with first authors affiliated with a Turkish institution were included. Citation density was calculated by dividing the total number of citations by the number of years since publication. Data extracted included publication type, citation count, citation density, research methodology, author affiliations, and institutional contributions.

Results: Out of 70 279 articles published globally, 425 orthopedic articles with Turkish first authorship were identified in the selected journals. Most articles were clinical (88.7%), with the most frequent article types being case presentations (31.3%), retrospective cohort studies (17.9%), and laboratory research (11.3%). The least common types were expert opinions, epidemiological studies, and meta-analyses. The majority of articles appeared in *Spine Journal* (34.6%) and *Knee Surgery, Sports Traumatology, Arthroscopy* (27.3%), with no articles published in the highest-ranked journal (*British Journal of Sports Medicine*). Spine surgery was the leading subfield (29.9%), followed by sports, shoulder, and elbow surgery (22.6%) and reconstructive surgery (16%). Orthopedic specialists comprised 56% of first authors, with multicenter studies representing 65.4% of the articles. Public institutions accounted for 80.1% of published articles, while private institutions contributed 19.9%. A total of 356 articles were cited 8349 times, with a median citation number of 9 per article. Mean citation density was highest in meta-analysis (8.5 citation/year), epidemiological studies (8.3 citation/year), and randomized controlled trials (7.8 citation/year), while lowest in case presentations (0.3 citation/year), expert opinions (0.4 citation/year), and laboratory research (2.2 citation/year).

Conclusion: Turkish orthopedic research has maintained a significant presence in top orthopedic journals, mostly through clinical studies, especially in spinal and sports injury subfields. Despite high publication volume, citation impact remains relatively lower. Future efforts should encourage higher-impact study designs, international collaborations, and standardized research evaluations to enhance the global influence of Turkish orthopedic literature.

Level of Evidence: N/A.

Introduction

The term bibliometrics is derived from the Greek words biblion (book) and metron (measure) and refers to the quantitative analysis of scientific literature. First introduced by Alan Pritchard[1] in 1969, bibliometric analysis has become a valuable tool for evaluating research productivity, citation impact, and publication trends within a given field. In medical sciences, bibliometric studies help identify influential research, track scientific advancements, and assess international collaboration networks.

In the field of orthopedics and traumatology, bibliometric analyses help track advancements in surgical techniques, implant technologies, and rehabilitation approaches. Orthopedics has seen significant growth due to increasing global healthcare demands, which has also led to an increase in academic studies, as shown in the previous bibliometric studies from various countries from all over the world.[2-11] These studies have examined research output, impact factors, and citation patterns, helping to identify trends and knowledge gaps in orthopedic research.

For Türkiye, Gürbüz et al[3] conducted a bibliometric analysis of orthopedic publications from Türkiye between 1980 and 2013, providing a historical perspective on Turkish contributions to the field. However, there remains a need for an updated analysis covering more recent years, particularly in high-impact international journals. This study might be complementary to the work of Gürbüz et al[3] by extending the analysis to 2014-2023, offering a more current evaluation of Türkiye's presence in global orthopedic literature.

By analyzing parameters such as journal rankings, impact factors, publication types, and citation

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metrics, this study aims to provide a comprehensive overview of Turkish orthopedic research in high-impact international journals. To the best of the authors' knowledge, the academic productivity of the Turkish Orthopedic Society over the past decade has not been previously analyzed. This study aims to assess its position in this regard. Identifying strengths, weaknesses, and trends in publication output will help guide future research efforts and contribute to the continued development of Turkish orthopedics on the global stage.

Material and methods

The Web of Science database was searched for journals indexed in the Science Citation Index Expanded under the categories "Orthopedics," "Orthopedics, rehabilitation, and sports medicine," and "Sports sciences." A total of 172 journals were identified, and the top 40 journals were selected based on their impact factor according to Journal Citation Reports 2022 (JCR, Clarivate Analytics, Philadelphia, PA). Articles published between January 2014 and December 2023 in these 40 journals were screened, with each journal issue reviewed individually. Articles were included if the first author was affiliated with an institution in Türkiye. Articles were excluded if the first author was affiliated with an institution outside Türkiye, regardless of the co-authors' affiliations. Surgeons /faculty/residents affiliated with an orthopedic department were considered orthopedic authors; those with any non-orthopedic departments were considered non-orthopedic authors.

Letters to the editor, conference abstracts, meeting abstracts, book chapters, notes, corrections, and reprints were excluded. Original articles, reviews, and meta-analysis were selected. To maintain the focus on orthopedic research, articles primarily dedicated to physical therapy and rehabilitation were deemed ineligible. The selection of articles related to the orthopedic field was made by 3 independent authors through mutual agreement.

The data, including the article's title, year of publication, study type (clinical or laboratory research), level of evidence, research methodology, citation count, and citation density, were collected. Citation density was calculated as the total number of citations divided by the number of years since the article's publication. Details regarding the authors were recorded, including their names, the total number of authors, and affiliations. Journal-related information, such as the journal name, impact factor, quartile, and review periods were also documented.

Statistical analysis was made employing absolute values, means, minimum and maximum values, and percentages, as it is a descriptive study. Advanced statistical analysis was neither required nor performed.

Ethics committee approval was not required, as this study exclusively involved bibliometric data analysis and did not include human or animal subjects.

HIGHLIGHTS

- This is the most recent bibliometric analysis of Turkish orthopedic publications in the top 40 high-impact international journals from 2014 to 2023.
- A total of 425 articles with a Turkish-affiliated first author were identified, published across 20 of the selected 40 journals.
- Case presentations were the most common article type but had the lowest citation rates; randomized controlled trials were the most highly cited.
- Compared to the 1980-2013 analysis by Gürbüz et al,[3] this study revealed a noticeable rise in contributions from private institutions.

Results

A total of 70 279 scientific articles were published between January 2014 and December 2023 in the 40 orthopedic journals with the highest impact factors. After excluding letters to the editor, conference abstracts, book chapters, notes, corrections, and reprints, 448 articles with a first author affiliated with an institution in Türkiye remained. Twenty-three articles primarily dedicated to physical therapy and rehabilitation were excluded. A total of 425 articles were included in this study, which primarily focused on the orthopedic field. A summary of the articles included in the study is shown in Table 1.

A total of 425 orthopedic articles with a first author from Türkiye were published in the 40 most impactful orthopedic journals between January 2014 and December 2023 (Table 2). The majority of the articles were published in *Spine Journal* (147 articles, 34.6%), followed by *Knee Surgery, Sports Traumatology, Arthroscopy* (116 articles, 27.3%), and *Journal of Arthroplasty* (32 articles, 7.5%). Articles were published in 20 of the 40 selected journals. Notably, there were no articles published in the highest-ranked journal, the *British Journal of Sports Medicine*, and there were 5 articles published in the top 10 journals.

The median review time from submission to publication was 5 months (range: 1-25). Clinical studies comprised 88.7% of the articles, while the remaining were laboratory research.

The most common article types among clinical studies were case presentations (133 articles, 31.3%), retrospective cohort studies (76 articles, 17.9%), and case series (32 articles, 7.5%) while the least common types were expert opinions (3 articles), epidemiological

Table 1. Summary of the Articles Included in the Study

Category	Number (%)
Journal	40
Article	425
First author	298
Total citation	8349
Institution	127
• Public	• 344 (80.1)
• Private	• 81 (19.9)
Study type	
• Clinical	• 377 (88.7)
• Laboratory	• 48 (11.3)
Clinical study method	
• Randomized control trial	• 31 (7.3)
• Case control	• 17 (4)
• Prospective cohort	• 30 (7.1)
• Meta-analysis	• 6 (1.4)
• Case series	• 32 (7.5)
• Review	• 24 (5.6)
• Case presentation	• 133 (31.3)
• Expert opinion	• 3 (0.7)
• Retrospective cohort	• 76 (17.9)
• Validation	• 14 (3.3)
• Epidemiological	• 5 (1.2)
• Other	• 6 (1.4)
Subfield	
• Spine	• 127 (29.9)
• Shoulder, elbow, and knee sports injuries	• 96 (22.6)
• Reconstructive surgery	• 68 (16)
• General orthopedics	• 47 (11.1)
• Orthopedic oncology	• 38 (8.9)
• Foot and ankle surgery	• 18 (4.2)
• Trauma	• 16 (3.8)
• Pediatric orthopedics	• 15 (3.5)

Table 2. Top 40 Orthopedic Journals Based on 2022 Impact Factors and Number of Orthopedic Articles from Türkiye Published Between 2014 and 2023

Rank	Journal Name	Impact Factor	Number Of Orthopedic Articles from Türkiye*
1	*British Journal of Sports Medicine*	18.6	–
2	*Journal of Sport and Health Science*	12.2	1
3	*Journal of Physiotherapy*	12.1	–
4	*Sports Medicine*	9.8	–
5	*Exercise Immunology Review*	7.3	–
6	*Osteoarthritis and Cartilage*	7.0	–
7	*Journal of Orthopaedic Translation*	6.6	2
8	*Journal of Orthopaedic & Sports Physical Therapy*	6.1	–
9	*Exercise and Sport Sciences Reviews*	5.7	–
10	*Biology of Sport*	5.6	2
11	*Journal of Bone and Joint Surgery-American Volume*	5.3	6
12	*Qualitative Research in Sport Exercise and Health*	4.9	–
13	*American Journal of Sports Medicine*	4.8	17
14	*Arthroscopy-The Journal of Arthroscopic and Related Surgery*	4.7	14
15	*Bone & Joint Journal*	4.6	9
16	*Annals of Physical and Rehabilitation Medicine*	4.6	2
17	*Bone & Joint Research*	4.6	1
18	*Sports Medicine-Open*	4.6	–
19	*European Journal of Physical and Rehabilitation Medicine*	4.5	16
20	*Spine Journal*	4.5	147
21	*Disability and Health Journal*	4.5	–
22	*Clinical Orthopaedics and Related Research*	4.3	17
23	*Archives of Physical Medicine and Rehabilitation*	4.3	4
24	*Medicine & Science in Sports & Exercise*	4.1	–
25	*Current Reviews in Musculoskeletal Medicine*	4.1	–
26	*Scandinavian Journal of Medicine & Science in Sports*	4.1	–
27	*Journal of Science and Medicine in Sport*	4.0	–
28	*Knee Surgery Sports Traumatology Arthroscopy*	3.8	116
29	*Physical Therapy*	3.8	–
30	*Jor Spine*	3.7	–
31	*Acta Orthopaedica*	3.7	7
32	*Journal of Sport Management*	3.6	–
33	*Journal of Arthroplasty*	3.5	32
34	*Journal of Rehabilitation Medicine*	3.5	–
35	*Efort Open Reviews*	3.4	24
36	*Brazilian Journal of Physical Therapy*	3.4	1
37	*Psychology of Sport and Exercise*	3.4	–
38	*Science and Medicine in Football*	3.4	1
39	*Journal of Sports Sciences*	3.4	1
40	*Physiotherapy*	3.3	–
			425

*Articles from Türkiye with a first author affiliated with a Turkish institution.

studies (5 articles), and meta-analyses (6 articles). Regarding the subfields, "Spine" (127 articles, 29.9%) was the most common, followed by "Sports, shoulder and elbow surgery" (96 articles, 22.6%) and "Reconstructive surgery" (68 articles, 16%).

At the time of analysis, 356 articles had been cited a total of 8349 times, while 69 articles had not been cited. The most cited category was randomized controlled trials (31 articles, 1754 citations, 21% of total citations). This was followed by retrospective cohort studies (76 articles, 1346 citations, 16.1%), case series (31 articles, 1087 citations, 13.0%), prospective cohort studies (29 articles, 871 citations, 10.4%), and validation studies (10 articles, 742 citations, 8.9%). Case presentations, making up the largest number of articles, received 317 citations (3.8%). Fewer citations were observed for meta-analyses (6 articles, 195 citations, 2.3%) and epidemiological studies (5 articles, 201 citations, 2.4%), and the least cited category was expert opinions (3 articles, 3 citations). The mean and median number of citations were 19.7 and 9 (range: 0-404), respectively. The mean and median citation density values were 3.0 citation/year and 1.4 citation/year (range: 0-57.7), respectively. Mean citation density was highest for meta-analyses (8.5 citation/year), epidemiological studies (8.3 citation/year), and randomized controlled trials (7.8 citation/year), while lowest in case presentations (0.3 citation/year), expert opinions (0.4 citation/year), and laboratory research (2.2 citation/year).

A total of 298 different first authors contributed to these 425 articles. The most cited first authors were Caglar Yilgor (442 citations, 2 articles), Gökay Görmeli (366 citations, 1 article), and Tahir Mutlu Duymus (275 citations, 1 article). The median number of authors per article was 5 (range: 1-50). More than half of the first authors were orthopedic authors (56%), whereas the remaining were from other specialties, primarily radiology and physical therapy.

The most cited article (404 citations) and the article with the highest citation density (57.7) was Global Alignment and Proportion (GAP) Score: Development and Validation of a New Method for Analyzing Spinopelvic Alignment to Predict Mechanical Complications After Adult Spinal Deformity Surgery by Yilgor et al[12] in *The Journal of Bone and Joint Surgery*. Table 3 presents the 10 most frequently cited publications.

The highest number of articles was published in 2016. While the number of articles increased from 2014 to 2016 (from 70 to 103 articles), a significant drop occurred between 2016 and 2017 (from 103 to 25 articles) (Figure 1). Overall, the total number of articles published from 2017 to 2023 (n=166, 39%) was lower than that from 2014 to 2016 (n=259, 61%).

Based on institutional rankings, Ataturk University ranked first with 29 articles, followed by Hacettepe University with 27 articles, and by Acibadem Mehmet Ali Aydınlar (MAA) University with 20 articles published (Table 4). The ranking for citation numbers was highest for Hacettepe University (n:946), Acibadem MAA University (n:648), and Istanbul University-Istanbul Medical Faculty (n:516). Multicenter studies accounted for 65.4% of the articles, while 34.6% were single-center studies.

A comparison of public and private institutions revealed that 80.1% of the articles were published by public institutions (including state universities, research hospitals, city hospitals, and state hospitals), while 19.9% were published by private institutions (including private universities and hospitals).

Discussion

This bibliometric analysis provides a comprehensive evaluation of Turkish contributions to high-impact orthopedic research over the past decade. Türkiye ranks 15th globally in terms of the number of publications in orthopedics and sports medicine between 1996 and 2022, with a total of 10 899 publications.[2] However, in terms of the h-index, which reflects research impact, Türkiye ranks 30th.[2] This discrepancy suggests that while Turkish researchers contribute significantly in terms of volume, their influence on the field—measured by citation impact—is relatively lower than that of countries like the USA, UK, and Australia. One possible explanation may be the

Table 3. Top 10 Most Frequently Cited Publications

Number of Citation (Citation Density)	404 (57.7)	366 (40.7)	275 (35.4)	162 (18)	149 (24.8)	123 (15.3)	123 (30.9)	120 (16)	111 (12.3)	109 (12.1)
LoE*	II	I	I	II	V	IV	III	II	IV	I
Type of Article	Validation	Randomized Controlled Trial	Randomized Controlled Trial	Prospective Cohort	Review	Case Series	Epidemiologic	Prospective Cohort	Case Series	Randomized Controlled Trial
Institution of First Author	Department of Orthopedics and Traumatology, Acibadem University	Department of Orthopedics and Traumatology, Inonu University	Department of Orthopedics, Istanbul Kanuni Sultan Suleyman Training and Research Hospital	Department of Orthopedics and Traumatology, Erciyes University	Department of Orthopedics and Traumatology, Hacettepe University	Physiotherapy and Rehabilitation, School of Health Science, Haliç University	Department of Orthopedics and Traumatology, Istanbul Medical Faculty, Istanbul University	School of Physical Therapy and Rehabilitation, Dokuz Eylul University	Department of Orthopedics and Traumatology, Balikesir University	Department of Orthopedics and Traumatology, Bozok University
Publication Year	2017	2015	2016	2014	2018	2016	2020	2016	2015	2015
Journal	*The Journal of Bone and Joint Surgery*	*Knee Surgery, Sports Traumatology, Arthroscopy*	*Knee Surgery, Sports Traumatology, Arthroscopy*	*Knee Surgery, Sports Traumatology, Arthroscopy*	*EFORT Open Reviews*	*The Spine Journal*	*Knee Surgery, Sports Traumatology, Arthroscopy*	*The Journal of Arthroplasty*	*The American Journal of Sports Medicine*	*The American Journal of Sports Medicine*
First Author	Caglar Yilgor	Gökay Görmeli	Tahir Mutlu Duymus	Ahmet Guney	Mahmut Nedim Doral	Hurriyet Yilmaz	Gokhan Polat	Ertugrul Yuksel	Gokhan Meric	Fatih Karaaslan
Title	Global Alignment and Proportion (GAP) Score development and validation of a new method of analyzing spinopelvic alignment to predict mechanical complications after adult spinal deformity surgery[12]	Multiple PRP injections are more effective than single injections and hyaluronic acid in knees with early osteoarthritis: a randomized, doubleblind, placebocontrolled trial[17]	Choice of intra-articular injection in treatment of knee osteoarthritis: platelet-rich plasma, hyaluronic acid or ozone options[18]	Clinical outcomes of platelet rich plasma (PRP) as an adjunct to microfracture surgery in osteochondral lesions of the talus[19]	Modern treatment of meniscal tears[20]	Prevalence of adolescent idiopathic scoliosis in Turkey: an epidemiological study[21]	Longterm results of microfracture in the treatment of talus osteochondral lesions[22]	Assessing minimal detectable changes and test-retest reliability of the timed up and go test and the 2-minute walk test in patients with total knee arthroplasty[23]	Fresh osteochondral allograft transplantation for bipolar reciprocal osteochondral lesions of the knee[24]	Reducing intra-articular hemarthrosis after arthroscopic anterior cruciate ligament reconstruction by the administration of intravenous tranexamic acid: a prospective, randomized controlled trial[25]

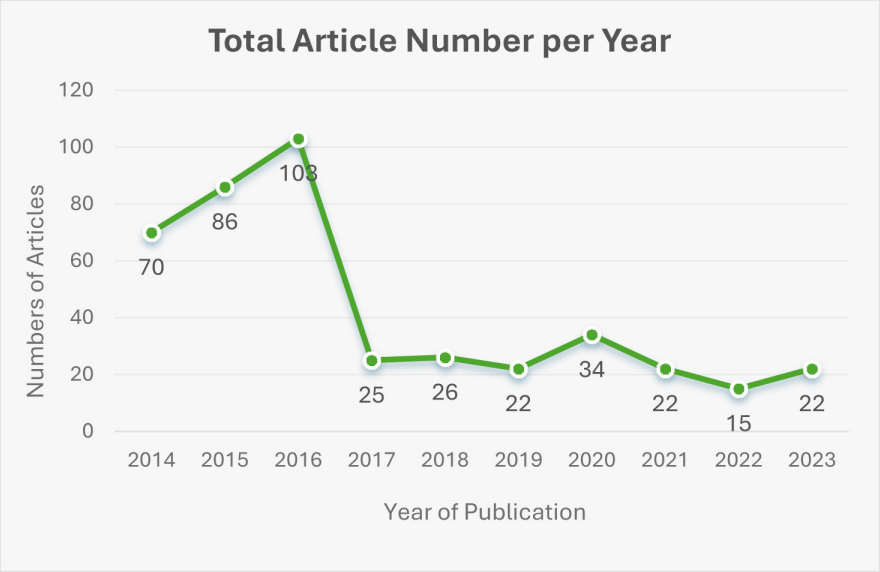

Figure 1. Number of articles published over a decade (2014-2023).

predominance of case reports and single-center studies in Turkish orthopedic research, which may not attract as many citations as large-scale, multicenter randomized controlled trials. Nevertheless, Scott B et al[13] did not find a significant correlation between a study's level of evidence and citation counts. These findings differ from those of Scott B et al,[13] as it was observed that the most cited categories were randomized controlled trials (21% of total citations) and meta-analyses showed the highest citation density. It is believed that encouraging Turkish researchers to prioritize multicenter collaborations and high-impact study designs could improve citation impact in the future.

In this study, 356 articles were cited 8349 times, with a mean citation of 19.7, compared to Gürbüz et al,[3] who reported 1398 articles cited 9085 times with a mean citation of 7.5. Although the findings suggest potentially higher impact or improved visibility of recent Turkish orthopedic publications, differences in study periods (Gürbüz et al[3] between 1980 and 2013 vs the study between 2014 and 2023) must be considered. The global increase in published articles during the more recent study period likely influences citation patterns, making direct comparisons of citation counts and densities between these 2 distinct periods somewhat unreliable.

Table 4. Institutions with the Highest Number of Publications

Institution	Number of Publications	Number of Citations
Ataturk University	29	51
Hacettepe University	27	982
Acibadem MAA University	20	648
Istanbul University-Istanbul Medical Faculty	19	516
Gülhane Military Medical Academy (GATA)	19	80
Gazi University	16	247
Bahcesehir University Hospitals	14	22
Ondokuz Mayis University	11	23
Bezmialem Vakif University	9	207
Selcuk University	9	185
Istanbul University- Cerrahpasa	8	224
Ankara Numune Training and Research Hospital	8	123

By including publications until the end of 2023, a more accurate reflection of citation density was ensured; however, this approach also introduced a limitation in citation calculations. Articles published in different months of the same year were treated as if they had identical publication durations. An article published in January 2020 and another in December 2020 were both considered to have 4 years of citations. This simplification may have led to minor biases, and future studies could refine citation density calculations by accounting for exact publication dates.

A peak in publication output in 2016, followed by a decline in subsequent years, particularly in 2021-2022 was observed. Similarly, in the bibliometric analysis of Gürbüz et al[3] which covered studies published between 1994 and 2013, most productive years were between 2004 and 2008, followed by a gradual decline. The decline in the study may be partially attributed to Türkiye's political climate in 2016 and COVID-19 pandemic, which disrupted research activities worldwide.[14] An additional factor influencing Turkish research output might be a shift in institutional priorities and funding availability. Given Türkiye's strong clinical focus in orthopedics, the decline in research productivity may reflect a broader trend of prioritizing clinical practice over academic output.

These findings highlight an increase in publications from private institutions, a trend not specifically analyzed in previous studies. Compared to the earlier study by Gürbüz et al,[3] the analysis demonstrates both continuity and notable shifts in publication patterns and institutional productivity. Gürbüz et al[3] identified Hacettepe University, Istanbul University, and Ankara University as the leading institutions. However, a significant rise in contributions from private institutions was observed, notably Acıbadem University, suggesting increased research engagement from private sector institutions in recent years. This could be due to greater institutional support for research in private hospitals, financial incentives for academic productivity, or a shift in career trajectories, with high-contribution researchers moving from public to private institutions. Future studies should explore whether private institutions are becoming dominant research hubs in Turkish orthopedics and whether their research quality differs from that of public institutions.

This study defined a Turkish contribution based on the first author's nationality and institutional affiliation, differing from Gürbüz et al,[3] who required all authors to be affiliated with Turkish institutions. While their approach ensured a more stringent definition of national research, it also led to a lower number of included publications. Given the increasing trend of international collaborations, it is believed that this approach provides a more accurate representation of Turkish authors' primary contributions. Publications based on the first author's affiliation were chosen to be analyzed because the first author is typically assumed to be the primary investigator leading the study. In academic publishing, individuals without substantial contributions can sometimes be included as authors.[15] This practice can dilute the accuracy of authorship-based analyses. However, this methodology also meant that senior authors could not be included, as they are traditionally listed as the last author in scientific publications. As a result, the study does not capture the contributions of some of Türkiye's most influential figures in orthopedic research, such as Ahmet Alanay, whose work has had a significant impact on the field and who is also the senior (last) author of the most cited article in the analysis.[12] Other bibliometric analyses could consider alternative methodologies to better account for senior authorship and its role in guiding high-impact research.

Assessing research productivity in a standardized manner is crucial for improving scientific output. Currently, Türkiye lacks an institutional-level research evaluation system, relying primarily on individual metrics such as the h-index to assess academic performance. One potential approach for Türkiye to enhance its research evaluation framework is the development of a national bibliometric software system similar to SIGAPS (Système d'Interrogation, de Gestion et d'Analyse des Publications Scientifiques), which is used in France. Système d'Interrogation, de Gestion et d'Analyse des Publications Scientifiques evaluates the scientific production of authors and institutions by querying PubMed and categorizing journals based on their impact factor percentiles within their respective disciplines. Journals are classified into categories (A, B, C, D, E, and NC), providing a nuanced evaluation of both the quantity and quality of research.[9] Developing a national system in Türkiye could provide a standardized ranking of research institutions, ensure fair distribution of research funding, and help track academic progress and identify gaps in orthopedic research.

A critical challenge in bibliometric analyses of Turkish research is the inconsistency in institutional naming, which complicates the accurate tracking of scientific output. As previously highlighted by Gürbüz et al,[3] inconsistencies in the spelling and abbreviation of institution names remain a persistent issue. This study similarly encountered this problem, particularly with training and research hospitals and former military hospitals, where institutional name changes and variations in abbreviations have led to fragmented research recognition, such as Gülhane Military Medical Academy, which has appeared under multiple variations in the literature, or Marmara University and Marmara Eğitim ve Araştırma Hastanesi, which have been used interchangeably. This discrepancy, along with other institutional name variations, necessitated a manual count of publications, ensuring that all contributions were properly attributed. Unlike automated bibliometric tools, which may fail to recognize these variations, this approach required individual verification of each publication, highlighting the labor-intensive nature of ensuring data accuracy.

Bibliometric analyses have inherent limitations. Journal impact factor does not necessarily correlate with individual article citation rates, as high-impact journals often contain a mix of highly cited and less influential papers.[4] The 2-year citation window used to calculate impact factors may be insufficient for fields like orthopedics, where research impact tends to accumulate over longer periods. Extending the citation window to 5 years, as suggested in previous studies, may offer a more accurate measure of long-term influence.[16]

Another limitation in evaluating Türkiye's global impact is the scope of journal selection. The search was restricted to "Orthopedics," "Orthopedics, Rehabilitation, and Sports Medicine," and "Sports Sciences" journals indexed in Web of Science, which may have led to the omission of orthopedic studies published in high-ranking general medical journals such as *The Lancet* or *NEJM*. A more inclusive approach, incorporating non-specialty journals, could provide a broader perspective on the international visibility of Turkish orthopedic research. Additionally, incorporating national specialty journals with rising international visibility, such as *Acta Orthopaedica et Traumatologica Turcica* (AOTT), may offer valuable insights into evolving publication trends within Turkish orthopedics. A recent bibliometric study by Turgut and Beyaz analyzing AOTT publications from 2013 to 2022 revealed several parallels with the findings. They reported a continued dominance of retrospective observational studies and trauma-related research, while systematic reviews and meta-analyses, although fewer in number, achieved the highest average citation rates—supporting the observation that study design significantly influences citation impact. Furthermore, their analysis highlighted a substantial increase in contributions from private institutions and international authors, reflecting a notable shift in authorship patterns and institutional involvement. These developments underscore the growing role of high-evidence-level studies and broader institutional participation in shaping the academic output of Turkish orthopedic literature, both in national and international platforms.[26]

Subjective classification of orthopedic articles was also a limitation. While this issue was mitigated by employing a consensus-based approach among 3 authors, future studies could improve reproducibility by using machine-learning algorithms to classify articles based on keywords or citation patterns.

Finally, Türkiye currently lacks a national bibliometric evaluation system; implementing such a system could provide a standardized metric for assessing both individual and institutional contributions to medical research. Developing a national orthopedic research index could help institutions track progress, allocate funding more effectively, and identify areas for improvement in academic productivity. This study provides an updated bibliometric analysis of Turkish orthopedic research in high-impact journals. While Türkiye maintains a strong publication volume, its citation impact remains lower than that of leading research nations. The decline in publications after 2016, exacerbated by the COVID-19 pandemic, and the increasing role of private institutions are noteworthy trends. Future efforts should focus on promoting high-impact study designs, enhancing international collaborations, and developing national bibliometric evaluation tools to better assess and improve Türkiye's research impact in the field of orthopedics.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: N/A.

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