



# A bibliometric analysis of orthopedic publications originating from Turkey

Yusuf GÜRBÜZ, Tahir Sadık SÜĞÜN, Kemal ÖZAKSAR

*Hand Microsurgery Orthopaedics and Traumatology (EMOT) Hospital, Izmir, Turkey*

**Objective:** The objective of this study was to analyze the research productivity originating in Turkey using articles published in the top 40 orthopedic journals according to the Journal Citation Reports for 2013.

**Methods:** All scientific papers published in English and included in the Science Citation Index Expanded between 1980 and 2013 were analyzed using the “Web of Science”. The number of publications per million (PmP) was calculated. All selected journals were analyzed for the numbers of articles, authorships, institutions and 100 most frequently cited papers.

**Results:** From a total of 130,494 articles published worldwide, the United States ranked first according to output. Turkey ranked 14<sup>th</sup> in the number of orthopedic publications and 26<sup>th</sup> out of 30 countries in the PmP index. 2012 produced the greatest number of publications worldwide and 2008 for Turkey. Gunal I., Yazici M. and Ozturk C. were the most frequent contributors. Hacettepe University, Istanbul University and Ankara University were the most frequent intuitions among all Turkish publications. The Archives of Orthopaedic and Trauma Surgery was the most frequently published journal in this period with a rate of 16.3%. There was a total of 9,085 (8,765; excluding self-citations) citations of the 1,398 publications published in Turkey until December 2013, with a citation-to-work ratio of 7.47 and an h-index of 34.

**Conclusion:** With the newly established universities, as well as training and research clinics, the approach of increasing number of orthopedics and traumatology clinics and specialists to scientific activities would be more fruitful in the light of these data.

**Key words:** Bibliometric analysis; impact factor; orthopedics; Turkey; Web of Science.

Bibliometrics is the analysis of books and other media of communication using mathematics and other statistical methods. Bibliometric analyses provide significant advantages for the investigation of publications, journals, authors and publishing institutions and in the demonstration of the scientific productivity of countries.<sup>[1]</sup> The advances in computer technology and the wider use of the Internet have resulted in an increase in bibliometric analysis since the beginning of the 2000s. In recent years,

bibliometric analyses of publications on orthopedics, pediatric orthopedics, hand surgery and knee surgery have been published.<sup>[1-5]</sup> Using the Web of Science (WoS) database, studies on countries' self-assessment of their scientific productivity have also been reported.<sup>[6]</sup>

In an attempt to determine the contribution of Turkey to global science and the country's international publication productivity, bibliometric analyses have been conducted under the auspices of ULAKBİM Cahit Arf

**Correspondence:** Yusuf Gürbüz, MD. El Mikrocerrahi Ortopedi ve Travmatoloji (EMOT) Hastanesi, 1418 Sok., No: 14, Kahramanlar 35230, Izmir, Turkey.

Tel: +90 232 – 441 01 21 e-mail: ygurbuz@gmail.com

**Submitted:** April 17, 2014 **Accepted:** July 06, 2014

©2015 Turkish Association of Orthopaedics and Traumatology

Available online at  
www.aott.org.tr  
doi: 10.3944/AOTT.2015.14.0044  
QR (Quick Response) Code



Information Center. However, no detailed assessment of publications on Orthopedics and Traumatology has been reported.

The purpose of this study was to conduct a bibliometric analysis of Turkish publications in the top 40 orthopedic journals according to the Journal Citation Reports (JCR) Impact Factor List 2013 by Thomson-Reuters.

## Materials and methods

The 68 journals of orthopedics and traumatology listed in the Science Citation Index Expanded (SCI-E) were ranked based on impact factor scores. The top 40 journals were defined as the study group (Table 1). The articles published in these journals between 1980 and 2013 were accessed using the WoS database on 12/31/2013

**Table 1.** Distribution of Turkish publications according to journals and impact factors of journals.

Journal	Number of articles (Total: 1398)	Impact factor	Most cited 100 article
1 Archives of Orthopaedic and Trauma Surgery	228	1.358	7
2 Knee Surgery, Sports Traumatology, Arthroscopy	156	2.676	10
3 Spine	116	2.159	22
4 International Orthopaedics	92	2.319	4
5 European Spine Journal	91	2.133	10
6 Foot Ankle International	82	1.474	1
7 Injury - International Journal of The Care of The Injured	70	1.931	3
8 Journal of Hand Surgery - British and European Volume	62	1.223	4
9 Arthroscopy: The Journal of Arthroscopic and Related Surgery	54	3.103	6
10 Clinical Orthopaedics and Related Research	52	2.787	4
11 Journal of Pediatric Orthopaedics	51	1.163	4
12 Journal of Spinal Disorders Techniques	44	1.767	3
13 Journal of Hand Surgery - American Volume	40	1.572	1
14 Orthopedics	39	1.013	
15 Journal of Bone and Joint Surgery - British Volume	33	2.689	2
16 Journal of Orthopaedic Trauma	27	1.751	3
17 Knee	26	2.01	–
18 Journal of Bone and Joint Surgery - American Volume	20	3.234	7
19 Journal of Shoulder And Elbow Surgery	20	2.319	1
20 Spine Journal	15	2.159	–
21 American Journal of Sports Medicine	12	4.439	–
22 Clinical Biomechanics	10	1.869	2
23 BMC Musculoskeletal Disorders	9	1.875	2
24 Clinical Journal of Sport Medicine	9	1.6	–
25 Journal of Arthroplasty	9	2.11	2
26 Gait Posture	5	1.969	–
27 Journal of Orthopaedic Research	5	2.875	–
28 Orthopaedics & Traumatology: Surgery & Research	5	1.061	–
29 Acta Orthopaedica	4	2.736	–
30 Connective Tissue Research	3	1.788	–
31 Journal of Orthopaedic & Sports Physical Therapy	2	2.947	–
32 Physician and Sportsmedicine	2	0.156	–
33 Journal of Hand Therapy	1	1.169	–
34 Osteoarthritis and Cartilage	1	4.262	1
35 Physical Therapy	1	2.787	1
36 Journal of American Academy of Orthopaedic Surgeons	–	2.455	–
37 Journal of Physiotherapy	–	2.255	–
38 Journal of Foot and Ankle Research	–	1.466	–
39 Revista Brasileira De Fisioterapia	–	1	–
40 Journal of Orthopaedic Surgery and Research	2	1.013	–

to identify the total number of publications worldwide between 1980 and 2013. The number of non-article publications (letters to the editor, conference or meeting summaries, chapter of a book, reviews, notes, corrections, and reprints) were removed from the total. The total number of publications from Turkey, and its rank in the world were determined. The number of publications originating from Turkey and other countries per year was also identified. Publications per million (PmP) was calculated by dividing the total number of publications by the population of each country.<sup>[6]</sup> Articles not originating from Turkey were then excluded from the study.

The number of articles from Turkey, the first published article, the year of publication, the journal the article was published in, publishing institutions and the total number of articles of the authors and their total number of articles as the lead author were determined. The differences in the names of educational institutions in the literature were examined one by one. For the correct identification of the number of publications written by authors with identical names (for example, C. Yılmaz), full names of the authors in the top 50 articles were searched.

Using the same software, the total number of cita-

tions of publications from Turkey, the distribution of citations according to year and the most cited 100 articles and their authors and institutions were determined. Among the top 100 articles, the institutions with the most publications were determined and the journals the articles were published in and the authors of the oldest and newest articles were also specified.

## Results

Out of the 167,072 publications listed in the SCI-E, 1,877 (1.12%) scientific publications were written by Turkish authors. When the non-article publications were excluded, a total of 130,494 publications were identified and the number of total and publications per million were calculated for each country (Table 2).

The United States of America (USA) ranked first with 60,016 publications and Turkey 14th with 1,594 publications in the mentioned journals. Among the top 30 publishing countries based on the number of publications per million, Switzerland ranked first with 407.5 (\*10<sup>6</sup>) and Turkey 26<sup>th</sup> with 21(\*10<sup>6</sup>) (Table 3). The highest number of articles (n=7,656) worldwide was published in 2012 and in 2008 from Turkey (n=149)

**Table 2.** Number and percentage of publications according to years in Turkey and worldwide.

Year of publication	World	% (n=130,494)	Turkey	% (n=1,594)
1990 and earlier	21,334	16,348	10	0.627
1991	2,513	1.926	5	0.314
1992	2,672	2.048	4	0.251
1993	2,838	2.175	4	0.251
1994	2,787	2.136	9	0.565
1995	2,956	2.265	10	0.627
1996	3,629	2.781	15	0.941
1997	3,664	2.808	25	1.568
1998	3,780	2.897	36	2.258
1999	3,722	2.852	36	2.258
2000	3,855	2.954	39	2.447
2001	4,007	3.071	75	4.705
2002	4,301	3.296	94	5.897
2003	4,589	3.517	102	6.399
2004	4,794	3.674	135	8.469
2005	5,362	4.109	133	8.344
2006	5,885	4.510	122	7.654
2007	6,212	4.760	132	8.281
2008	6,394	4.900	149	9.348
2009	6,604	5.061	118	7.403
2010	7,018	5.378	87	5.458
2011	7,291	5.587	89	5.583
2012	7,656	5.867	76	4.768
2013	6,631	5.081	89	5.583

**Table 3.** The total number of articles in the literature and the number of publications per million.

Countries	Number of publications	% (n=130,494)	Population	Number of publications per million (*10 <sup>6</sup> )
United States of America	60,016	45.992	310,232,863	193.4
Britain	11,416	8.748	61,284,806	186.2
Japan	8,478	6.497	126,804,433	66.8
Canada	6,850	5.249	33,759,742	202.9
Germany	6,212	4.760	82,282,988	75.4
Australia	3,907	2.994	21,515,754	181.5
Sweden	3,570	2.736	9,074,055	393.4
The Netherlands	3,413	2.615	16,783,092	203.3
France	3,277	2.511	40,548,753	80.8
Switzerland	3,259	2.497	7,997,000	407.5
South Korea	3,033	2.324	48,636,068	62.3
People's Republic of China	2,904	2.225	1,354,040,000	2.1
Italy	2,687	2.059	58,090,681	46.2
Turkey	1,594	1.222	75,627,384	21
Taiwan	1,577	1.208	23,024,956	68.4
Scotland	1,534	1.176	5,228,000	293.4
Finland	1,491	1.143	5,255,068	283.7
Denmark	1,462	1.120	5,515,575	265
Austria	1,439	1.103	8,462,000	170
Spain	1,435	1.100	40,548,753	35.3
Israel	1,343	1.029	7,353,985	182.6
Belgium	1,253	0.960	10,423,493	120.2
Greece	1,120	0.858	11,062,508	101.2
Brazil	1,096	0.840	199,321,000	5.4
Norway	1,041	0.798	4,676,305	222.6
India	1,008	0.772	1,236,686,732	0.08
Ireland	645	0.494	4,250,163	151.7
New Zealand	604	0.463	4,252,277	142
Wales	508	0.389	3,063,456	165.8

(Fig. 1). While the number of publications from Turkey increased dramatically since the 2000s, there has been a considerable decrease since 2010 (Fig. 1 and Table 2).

After the exclusion of 196 articles of non-Turkish origin or published with authors from different countries (152 from USA, 11 from Canada, 10 from Britain, 10 from the Netherlands, and 13 from other countries), a total of 1,398 articles from Turkey remained. In the top 40 journals as ranked by impact factor, the first article published was "Treatment of open fractures with external fixation" by Aslanoğlu O. et al. in the Orthopedics journal in 1984.<sup>[7]</sup>

Of the publishing institutions, Hacettepe University ranked first with 141 publications, followed by Istanbul University (including Çapa and Cerrahpaşa) with 135 and Ankara University with 94. On the other hand, between 2010 and 2014 Istanbul University ranked first with 30 publications, followed by Hacettepe University

**Table 4.** Distribution of publications from Turkey according to authors.

	Author	Number of articles	% (n=1,398)
1	Günel I	47	3.290
2	Yazıcı M	40	2.861
3	Ozturk C	39	2.790
4	Alanay A	35	2.504
5	Bozkurt M	31	2.217
6	Sen C	28	2.003
	Acaroğlu E	28	2.003
7	Kocaoğlu B	26	1.860
	Tandogan RN	26	1.860
8	Akpınar S	25	1.788
	Eralp L	25	1.788
	Doral MN	25	1.788
9	Surat A	22	1.573
10	Bicimoglu A	21	1.502

**Table 5.** Distribution of publications from Turkey according to universities and the number of publications between 2010 and 2013.

Institution	Total number of publications	Articles published between 2010-2013
1 Hacettepe University	141	29
2 Istanbul University (Capa and Cerrahpasa Medical School)	135	30
3 Ankara University	94	7
4 Dokuz Eylül University	86	7
5 Ankara Numune Training and Research Hospital	70	21
6 Başkent University and Hospitals	66	14
7 Gülhane Military Medical Academy	64	9
8 Gazi University	61	13
9 Marmara University	52	14
10 Acibadem University and Hospitals	43	18

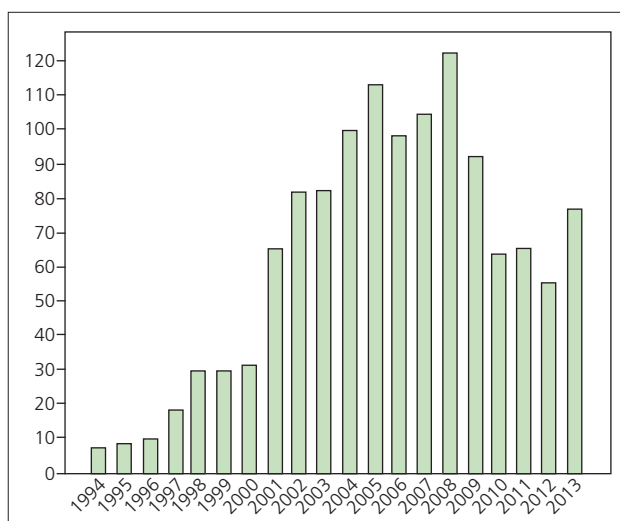
with 29 and Ankara Numune Training and Research Hospital with 21 (Table 5).

With regard to the authors, the authors with the greatest number of publications were İzge Günel with 46 publications, Muharrem Yazıcı with 40, and Çağatay Öztürk with 39, respectively (Table 4). The highest number of articles, as the lead author, belonged to İzge Günel and Murat Bozkurt with 15 publications (total publications (TP): 31), Hakan Ömeroğlu with 10 (TP: 20), Mehmet Aşık with 9 (TP: 17), Ulunay Kanatlı (TP: 16), Cengiz Şen (TP: 28), Mehmet Demirhan (TP: 19), and Sinan Karaoğlu (TP: 18) with 8 publications each.

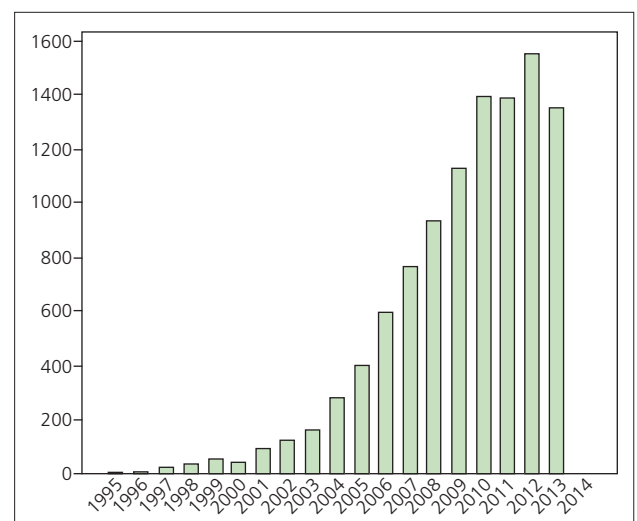
The 10 journals publishing articles originating from Turkey were the *Archives of Orthopaedic and Trauma Surgery* with 228 articles (16.3%), *Knee Surgery, Sports Traumatology, Arthroscopy* with 156 (11.1%), *Spine* with

116 (8.3%), *International Orthopedics* with 92 (6.5%), *European Spine Journal* with 91 (6.5%), *Foot Ankle International* with 82 = (5.9%), *Injury - International Journal of the Care of the Injured* with 70 (5%), *Journal of Hand Surgery - British and European Volume* with 54 (3.9%), *Clinical Orthopaedics and Related Research* with 52 (3.7%) and the *Journal of Pediatric Orthopedics* with 51 (3.6%) (Table 1).

The 1,398 published articles were cited 9,085 (8,765; excluding self-citations) times, for an average of 7.47 (Fig. 2 and Table 6). Table 6 presents the most frequently cited 10 publications. The most cited publication was "Short-segment pedicle instrumentation of thoracolumbar burst fractures: does transpedicular intracorporeal grafting prevent early failure?" by Alanay A. et al. published in the *Spine* journal in 2001 and was referenced 85 times.<sup>[8]</sup> In recent years, the number of citations to publications



**Fig. 1.** Number of publications according to years. [Color figures can be viewed in the online issue, which is available at [www.aott.org.tr](http://www.aott.org.tr)]



**Fig. 2.** Number of citations according to years. [Color figures can be viewed in the online issue, which is available at [www.aott.org.tr](http://www.aott.org.tr)]

**Table 6.** Most cited 10 publications and the total number of citations.

		2010 1,401	2011 1,390	2012 1,554	2013 1,351	2014 6	Total 10,446	Mean number of citations per year 417.84
1.	Title: Short-segment pedicle instrumentation of thoracolumbar burst fractures: does transpedicular intracorporeal grafting prevent early failure? Authors: Alanay A, Acaroglu E, Yazici M, et al. Journal: Spine Volume: 26 Issue: 2 Pages: 213-7 DOI: 10.1097/00007632-200101150-00017 Publishing date: Feb 2001 <sup>[8]</sup>	6	12	10	6	0	85	6.07
2.	Title: Anterior instrumentation for the treatment of spinal tuberculosis. Authors: Yilmaz C, Selek HY, Gurkan I, et al. Journal: Journal of Bone and Joint Surgery -American Volume Volume: 81 Issue: 9 Pages: 1261-7 Publishing date: Sep 1999 <sup>[12]</sup>	8	8	15	6	0	84	5.25
3.	Title: Lumbar spinal stenosis: clinical radiologic therapeutic evaluation in 145 patients. Conservative treatment or surgical intervention? Authors: Onel D, Sari H, Donmez C. Journal: Spine Volume: 18 Issue: 2 Pages: 291-8 DOI: 10.1097/00007632-199302000-00020 Publishing date: Feb 1993 <sup>[13]</sup>	4	4	1	3	0	77	3.50
4.	Title: Gabapentin is a first line drug for the treatment of neuropathic pain in spinal cord injury. Authors: Levendoglu F, Ogun CO, Ozerbil O, et al. Journal: Spine Volume: 29 Issue: 7 Pages: 743-51 DOI: 10.1097/01.BRS.0000112068.16108.3A Publishing date: Apr 1, 2004 <sup>[14]</sup>	7	10	4	4	0	73	6.64
5.	Title: Analysis of meniscal and chondral lesions accompanying anterior cruciate ligament tears: relationship with age, time from injury, and level of sport. Authors: Tandogan RN, Taser O, Kayaalp A, et al. Journal: Knee Surgery, Sports Traumatology, Arthroscopy Volume: 12 Issue: 4 Pages: 262-70 DOI: 10.1007/s00167-003-0398-z Publishing date: Jul 2004 <sup>[15]</sup>	13	10	9	8	0	69	6.27
6.	Title: A single-stage posterior approach and rigid fixation for preventing kyphosis in the treatment of spinal tuberculosis. Authors: Guven O, Kumano K, Yalcin S, et al. Journal: Spine Volume: 19 Issue: 9 Pages: 1039-43 Publishing date: May 1, 1994 <sup>[16]</sup>	4	6	10	5	0	66	3.14
7.	Title: Flexor tendon repair in zone 2 followed by early active mobilization. Authors: Baktir A, Turk CY, Kabak S, et al. Journal: Journal of Hand Surgery - British and European Volume Volume: 21 Issue: 5 Pages: 624-8 DOI: 10.1016/S0266-7681(96)80145-8 Publishing date: Oct 1996 <sup>[17]</sup>	6	5	3	3	0	61	3.21

**Table 6.** Most cited 10 publications and the total number of citations (cont.).

		2010	2011	2012	2013	2014	Total	Mean number of citations per year
		1,401	1,390	1,554	1,351	6	10,446	417.84
8.	Title: Comparison of landing maneuvers between male and female college volleyball players. Authors: Salci Y, Kentel BB, Heycan C, et al. Journal: Clinical Biomechanics Volume: 19 Issue: 6 Pages: 622-8 DOI: 10.1016/j.clinbiomech.2004.03.006 Publishing date: Jul 2004 <sup>[18]</sup>	10	2	9	9	0	57	5.18
9.	Title: Acceptability, reliability, validity and responsiveness of the Turkish version of WOMAC osteoarthritis index. Authors: Tuzun EH, Eker L, Aytar A, et al. Journal: Osteoarthritis and Cartilage Volume: 13 Issue: 1 Pages: 28-33 DOI: 10.1016/j.joca.2004.10.010 Publishing date: Jan 2005 <sup>[19]</sup>	10	6	11	8	0	53	5.30
10.	Title: Mechanical strength of four different biceps tenodesis techniques. Authors: Ozalay M, Akpınar S, Karaeminogullari O, et al. Journal: Arthroscopy: The Journal of Arthroscopic and Related Surgery Volume: 21 Issue: 8 Pages: 992-8 DOI: 10.1016/j.arthro.2005.05.002 Publishing date: Aug 2005 <sup>[20]</sup>	10	10	8	7	0	51	5.10

from Turkey has been increasing. In addition, 2012 saw the highest number of citations to publications from Turkey (Fig. 2). Publications from Turkey were most frequently cited by American authors (n=2,586).

## Discussion

A bibliometric analysis allows for the identification of the number and quality of publications from a specific country. In general, Turkey ranked 14<sup>th</sup> out of 122 countries in terms of the number of publications in the field of orthopedics and traumatology. The 2000s in particular, can be described as the golden years in terms of the publication of articles in the study group journals. The ratio of the number of articles between the USA and Turkey was 16,171 to 145 between 1990 and 2000, which

increased to 22,767 to 1,099 between 2000 and 2010. The number of publications from the USA increased by 40% whereas the number of publications from Turkey increased by 657%. This dramatic increase can be attributed to the increased number of educational institutions and easier access to studies through more widespread Internet use. There was a dramatic increase in the number of articles published in the mentioned journals between 2004 and 2010. Worldwide there was an increase in the number of publications compared to the previous year with the exception of 2013, whereas the number of publications showed a decline since 2010 in our country. It is interesting to note that there was a persistent increase in European countries such as Ireland, while the number of publications decreased in Turkey. The average number of publications decreased from 157.8 between 2004 and

**Table 7.** Distribution of authors among the most cited 100 articles.

Number of citations	Authors
6	Alanay A, Surat A, Yazıcı M
5	Acaroğlu E, Aşık M, Eralp L, Ozturk C, Şen C
4	Aydın T, Demirhan M, Tezer M
3	Goksan SB, Gunal I, Hamzaoglu A, Havitcioglu H, Kabak S, Kılıcoğlu O, Kocaoğlu M, Tandogan RN, Tekdemir I, Yıldız Y

2009 to 85.25 between 2010 and 2013. The increased number of publications worldwide was attributed to a number of factors, in particular increased gross national product and scientific support,<sup>[6]</sup> However, the decreased number of scientific publications in Turkey despite an increased gross national product is not supportive of this hypothesis. This decrease might have resulted from an unstable healthcare policy and the according temporary or permanent separation of the majority of faculty members from universities due to the implementation of the 'full day law'.

One of the parameters used in the measurement of scientific productivity of a community is the PmP index, which is the ratio of the number of publications to the population of a country. When the top 30 countries according to the publication ranking were ordered based on the PmP, Turkey ranked 26<sup>th</sup> with 21 PmPs (Table 2). Scandinavian countries such as Switzerland, Sweden and Norway ranked high. Among the G8 countries; China, France, Germany and Italy ranked below 100. It is evident that global productivity associated with industrialization and economic growth does not trigger scientific productivity. Therefore, it can be concluded that economic growth is not the only way to increase scientific productivity.

A total of 130,494 articles were published in journals included in our study. The highest number of articles was published by authors from the USA (60,016 articles; 46%) (Table 2). With regard to the number of publications, Turkey ranked first among countries of the Middle East and Eastern Europe. It is of interest that G8 countries such as Germany, France and Russia did not rank among the top 10. For instance, the number of publications from Russia was 44. This decrease can be explained by the fact that these countries refuse to adopt English as the scientific *lingua franca* and continue to publish in their own language and region.

Inter-university communication and joint scientific publication is common in Turkey, as in other countries. A total of 196 articles published when Turkish academicians were observers in foreign universities or conducted by interinstitutional cooperation were detected. The institutions with the highest number of articles published in cooperation with authors from foreign universities were Hacettepe University (45 publications), Ankara University (14 publications) and Istanbul University (9 publications), respectively. On the other hand, Turkish authors had the highest number of joint scientific publications with Alfred I. duPont Hospital for Children (USA) and Children's Hospital Philadelphia (USA). The authors with the highest number of joint publica-

tions with foreign institutions and academics were Muharrem Yazıcı (15 publications), Mahmut Nedim Doral (14 publications) and Muharrem İnan (13 publications), respectively. The continuation and increase of this cooperation is of great importance for the globalization of Turkish orthopedic science.

Publishing institutions are also as important as countries. Ensuring the continuity of articles and their successful publication are important indicators of institutional scientificity. Hacettepe University had 141 Turkish articles, Istanbul University 135 and Ankara University 94 published in the study group journals (Table 5). Between 2010 and 2013, a period when the number of publications from Turkey decreased, Istanbul University (30 publications) and Hacettepe University (29 publications) ranked first and second, respectively. During this period, Acıbadem University and Hospitals published 18 articles, Başkent University and Ankara Numune Hospital 14 each, and Kırıkkale University 13.

The continuity of name is important for the recognition of an educational institution and follow-up of its scientific activities. A literature review demonstrated a mean difference of 4.1<sup>[1-18]</sup> in the spelling of the names of publishing institutions from Turkey. Similar results were found for the abbreviation of author names. For instance, 'Gülhane Military Medical Academy' was published under 16 different names, GATA Haydarpaşa Military Hospital under 14 and Acıbadem University and Hospitals 18 in the literature. In particular, the names of training and research hospitals and military hospitals tend to be published with spelling errors and differences in abbreviations due to their long names. The use of a standard name and abbreviation is important for the follow-up of scientific activities of a country and/or institution. The Ministry of Health and the Turkish Orthopedics and Traumatology Society can play an effective role in developing an infrastructure in this regard.

Institutional productivity is triggered by individual scientific productivity. An analysis of the publications from Turkey revealed that the authors with the highest number of publications between 1980 and 2013 were İzge Günel (46), Muharrem Yazıcı (40) and Çağatay Öztürk (39), respectively. With regard to the publications as the lead author, İzge Günel and Murat Bozkurt ranked first with 14 publications each (Table 4). The total number of publications of Ahmet Atalay and Barış Kocaoğlu was 8 between 2010 and 2013. In addition, there were 5 authors with 7 publications and 13 authors with 6 publications.

The journal with the highest number of publications between 1980 and 2013 was the *Archives of Orthopaedic*



and Trauma Surgery with 228 publications (17.9%). In addition, *Knee Surgery, Sports Traumatology, Arthroscopy* published 156 articles from Turkey (12.2%), *Spine* 116 (8.3%) and the *Journal of Hand Surgery - British and European Volume 52* (7.4%) between 1980 and 2013. Six of the published articles were reported to have been submitted as proceedings in previous seminars. Of the 1,398 publications, 37 institutions provided financial support to 28 publications. Authors most commonly preferred to receive financial support from their own universities (n=23). The Ministry of Health provided financial support to one publication, Turkish Society of Orthopedics and Traumatology (TSOT) to two publications and The Scientific and Technological Research Council of Turkey (STRCT) to five publications, which might indicate insufficient knowledge of authors or insufficient scientific publication support in our country. Five publications of Hacettepe University and 3 publications each of Akdeniz University, Middle East Technical University and Istanbul University received financial support. The provision of financial support for the encouragement of scientific researchers is of particularly great importance. The increased scientific scholarship amount was associated with the increased number of publications in foreign countries.<sup>[6]</sup>

A scientific citation to a publication indicates its validity and scientific value. Thus, 2012 saw the highest number of citations of publications from Turkey (Fig. 2). There has been an increase in citations over years. An analysis of citations to Turkish publications in the literature revealed that the most frequently cited 100 publications were written by 390 different authors. The most frequently cited authors were Alanay A, Surat A and Yazıcı M with 6 publications each. Five authors received 5 citations and 3 authors received 4 (Table 7). Fourteen publications from Ankara University, 13 from Istanbul University and 11 from Hacettepe University received the highest number of citations. *Spine* published most of the most cited 100 publications (22 publications). The oldest publication among the top 100 was “*Congenital dislocation of the hip and its relation to swaddling used in Turkey*” by Kutlu et al., which was published in the *Journal of Pediatric Orthopedics* in 1992 and was referenced 35 citations.<sup>[9]</sup> The newest paper is “*The Microfracture Technique for the Treatment of Full-Thickness Articular Cartilage Lesions of the Knee: Midterm Results*” by Aşık et al., which was published in *Arthroscopy: The Journal of Arthroscopic and Related Surgery* in 2008 and received 28 citations.<sup>[10]</sup> There was a total of 9,085 citations to publications from Turkey (self-citation: 320). The highest number of citations to publications from Turkey was

made by the USA, China, England, and India. Furthermore, publications from Turkey were second most commonly cited by Turkish authors.

In this study, as in all WoS-based bibliometric analyses, articles published before 1980, those not included in the top 40 and journals which terminated publishing activities before 2013 could not be assessed. Furthermore, this study might be unable to reflect the actual scientific activities of authors and institutions. An analysis based on SciVerse, Scopus or PubMed or other databases also including the assessment of articles published in the journals excluded from the study and in domestic journals can provide more satisfactory information. The number of publications of an institution may vary depending on an author's failure to use standard names and abbreviations during the course of submission. To avoid this, all institution names in the literature were examined individually. Authors' names and legal changes in the surnames could not be documented. The impact factor of the journals is another matter of debate. A high impact factor is not always linked to scientific quality of a journal.<sup>[11]</sup> However, bibliometric analyses provide objective data reflecting one scientific activities of a country in a specific field of science or in any research field and enables comparison with scientific activities of other countries.

In conclusion, of 122 countries, Turkey ranked 14th in the number of orthopedic publications and 26th out of 30 countries in the PmP index. We believe that, with the newly established universities, as well as training and research clinics, the approach of increasing number of orthopedics and traumatology clinics and specialists to scientific activities would be more fruitful in the light of these data.

**Conflicts of Interest:** No conflicts declared.

## References

1. Ajuied A, Back D, Smith C, Davies AJ, Wong F, Earnshaw PH. Publication trends in knee surgery: a review of the last 16 years. *J Arthroplasty* 2013;28:751-8. [CrossRef](#)
2. Ahn CS, Li RJ, Ahn BS, Kuo P, Bryant J, Day CS. Hand and wrist research productivity in journals with high impact factors: a 20 year analysis. *J Hand Surg Eur Vol* 2012;37:275-83. [CrossRef](#)
3. DeMola PM, Hill DL, Rogers K, Abboud JA. Publication rate of abstracts presented at the shoulder and elbow session of the American Academy of Orthopaedic Surgery. *Clin Orthop Relat Res* 2009;467:1629-33. [CrossRef](#)
4. Fernandes CH, Meirelles LM, Raduan Neto J, dos Santos JB, Faloppa F, Albertoni WM. Characteristics of global publications about wrist arthroscopy: a bibliometric analysis. *Hand Surg* 2012;17:311-5. [CrossRef](#)

5. Kelly JC, Glynn RW, O'Briain DE, Felle P, McCabe JP. The 100 classic papers of orthopaedic surgery: a bibliometric analysis. *J Bone Joint Surg Br* 2010;92:1338-43. [CrossRef](#)
6. Kennedy C, O Sullivan P, Bilal M, Walsh A. Ireland's contribution to orthopaedic literature: a bibliometric analysis. *Surgeon* 2013;11:267-71. [CrossRef](#)
7. Aslanoglu O, Ayas I, Kaymak O, Atik OS, Kunak F. Treatment of open fractures with external fixation. *Orthopedics* 1984;7:996-9.
8. Alanay A, Acaroglu E, Yazici M, Oznur A, Surat A. Short-segment pedicle instrumentation of thoracolumbar burst fractures: does transpedicular intracorporeal grafting prevent early failure? *Spine (Phila Pa 1976)* 2001;26:213-7.
9. Kutlu A, Memik R, Mutlu M, Kutlu R, Arslan A. Congenital dislocation of the hip and its relation to swaddling used in Turkey. *J Pediatr Orthop* 1992;12:598-602. [CrossRef](#)
10. Asik M, Ciftci F, Sen C, Erdil M, Atalar A. The microfracture technique for the treatment of full-thickness articular cartilage lesions of the knee: midterm results. *Arthroscopy* 2008;24:1214-20.
11. Patsopoulos NA, Analatos AA, Ioannidis JP. Relative citation impact of various study designs in the health sciences. *JAMA* 2005;293:2362-6. [CrossRef](#)
12. Yilmaz C, Selek HY, Gürkan I, Erdemli B, Korkusuz Z. Anterior instrumentation for the treatment of spinal tuberculosis. *J Bone Joint Surg Am* 1999;81:1261-7.
13. Onel D, Sari H, Dönmez C. Lumbar spinal stenosis: clinical/radiologic therapeutic evaluation in 145 patients. Conservative treatment or surgical intervention? *Spine (Phila Pa 1976)* 1993;18:291-8. [CrossRef](#)
14. Levendoglu F, Oğün CO, Ozerbil O, Oğün TC, Ugurlu H. Gabapentin is a first line drug for the treatment of neuropathic pain in spinal cord injury. *Spine (Phila Pa 1976)* 2004;29:743-51.
15. Tandogan RN, Taşer O, Kayaalp A, Taşkıran E, Pinar H, Alparslan B, et al. Analysis of meniscal and chondral lesions accompanying anterior cruciate ligament tears: relationship with age, time from injury, and level of sport. *Knee Surg Sports Traumatol Arthrosc* 2004;12:262-70. [CrossRef](#)
16. Güven O, Kumano K, Yalçın S, Karahan M, Tsuji S. A single stage posterior approach and rigid fixation for preventing kyphosis in the treatment of spinal tuberculosis. *Spine (Phila Pa 1976)* 1994;19:1039-43. [CrossRef](#)
17. Baktir A, Türk CY, Kabak S, Sahin V, Kardeş Y. Flexor tendon repair in zone 2 followed by early active mobilization. *J Hand Surg Br* 1996;21:624-8. [CrossRef](#)
18. Salci Y, Kentel BB, Heycan C, Akin S, Korkusuz F. Comparison of landing maneuvers between male and female college volleyball players. *Clin Biomech (Bristol, Avon)* 2004;19:622-8. [CrossRef](#)
19. Tüzün EH, Eker L, Aytar A, Daşkapan A, Bayramoğlu M. Acceptability, reliability, validity and responsiveness of the Turkish version of WOMAC osteoarthritis index. *Osteoarthritis Cartilage* 2005;13:28-33. [CrossRef](#)
20. Ozalay M, Akpınar S, Karaeminogullari O, Balcık C, Tasci A, Tandogan RN, et al. Mechanical strength of four different biceps tenodesis techniques. *Arthroscopy* 2005;21:992-8. [CrossRef](#)

Most bibliometric analyses use data originating from one or more of the three citation indices supplied by Thomson Reuters. (ISI – the Institute for Scientific Information – founded by Eugene Garfield in 1958 is now a part of Thomson Reuters.) The most important Thomson Reuters citation index for medicine, life science and the natural sciences is the Science Citation Index Expanded (SCIE).<sup>Â</sup> The starting point in a bibliometric analysis is to select a group of publications. This selection of publications forms the unit of analysis. The publications may for example be selected on the basis of the authors’<sup>TM</sup> organizational affiliation, such as For that purpose, a bibliometric analysis was conducted over the 33560 medicine-related articles published by Turkish universities during the years 2010 to 2012 in journals indexed by the Web of Science. In order to conduct in depth subject-based analysis of publication patterns, the publications are classified under three medical divisions by aggregating medical subject categories provided by Web of Science.<sup>Â</sup> Even though there are in depth studies of medical publications originated from Turkey in the literature, existing studies either focus on identifying the performance of a particular medical school in Turkey or comparing the performance of all Turkish institutions to another country in a specific medical subject.