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# Bibliometric and Altmetric Analyses of Publication Activity in the Field of Behcet's Disease in 2010–2019

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The authors have no potential conflicts of interest to disclose.

**Author Contributions**

Conceptualization: Kocyyigit BF, Akyol A. Data curation: Kocyyigit BF, Akyol A. Formal analysis: Kocyyigit BF. Investigation: Kocyyigit BF, Akyol A. Methodology: Kocyyigit BF, Akyol A. Software: Kocyyigit BF.

## ABSTRACT

**Background:** Behcet's disease (BD) is a systemic vasculitis accompanied by oral-genital ulcers, ocular, cerebral, and gastrointestinal disorders. The aim of this study was to evaluate BD articles published between 2010–2019 bibliometrically and to provide up-to-date data. A secondary aim was to present a different perspective using altmetric assessments.

**Methods:** This bibliometric and altmetric research was performed with data obtained from the Web of Science database. The key terms “Behcet's disease,” “Behcet's syndrome,” and “Behcet” were used for listing the articles. The number of articles, citation data, and active countries were determined. Trend and correlation analyses were performed. Altmetric attention scores (AASs) and Mendeley readers count (MRC) of the articles were acquired for the altmetric evaluations.

**Results:** A total of 5,201 articles were listed. After the exclusion criteria, a total of 2,163 articles were obtained for further analysis. A significant and increasing trend was detected in the number of articles from 2010 to 2019 ( $P < 0.001$ ). Turkey (28.24%), China (9.57%), South Korea (9.20%), Japan (6.38%), and Italy (5.64%) were the five most productive countries. France, the United States and, the United Kingdom were the top three countries in respect of the average number of citations per article. A weak significant correlation was detected between the number of citations and AAS ( $P < 0.001$ ). The number of citations was significantly and strongly correlated with the MRC ( $P < 0.001$ ).

**Conclusion:** An increasing trend was found in BD research productivity. Although the Silk Road countries were prominent in the number of articles, a similar ranking was not valid for the average number of citations per article.

**Keywords:** Behcet's Disease; Bibliometric Analysis; Altmetric; Articles; Web of Science

## INTRODUCTION

Behcet's disease (BD) is mainly a systemic vasculitis that affects various vessel types and different sizes of vascular structures. As a result of systemic inflammation, oral-genital ulcers, ocular, cerebral, and gastrointestinal disorders can accompany the clinical presentation.<sup>1-3</sup> BD has a geographic distribution and is more common in countries along

the route known as the ancient Silk Road. The spread of various genetic factors, including HLA-B51, along this route, may trigger the emergence of such a distribution.<sup>4,5</sup>

Bibliometric analysis is an approach used to assess scientific productivity on a particular subject within a strictly specified date range.<sup>6</sup> Studies based on bibliometric analysis present a substantial snapshot of the global scientific contribution to the literature on a specified topic.<sup>7</sup> These studies provide summarized information, including high-impact papers, the most productive countries, the most active journals, and leading authors and institutions. In the light of the basic information obtained from the bibliometric analysis, gaps that should be taken into consideration in future research can be determined.<sup>8</sup> As a result of the widespread use of the Internet and the increasing use of social media platforms in all areas of life, alternative article metrics (altmetrics) have started to be used frequently in measuring the academic and social impact of articles.<sup>9,10</sup> Various Internet-based tools allow the rapid following of the social impact of a scientific publication by evaluating the shares on social media, comments on YouTube, Facebook, Twitter and mentions in news outlets and on academic platforms.<sup>11</sup>

Bibliometric studies have been conducted in various fields and topics, including rheumatology.<sup>12-15</sup> A previous study evaluated BD articles published between 1980 and 2014 but did not include altmetric analyses.<sup>16</sup> Therefore, the aim of this study was to analyse BD articles published between 2010–2019 bibliometrically and present up-to-date data, and to offer a different perspective using altmetric analyses.

## METHODS

### Database selection and search strategy

Similar studies in the literature were reviewed before the study, and the methodology was created based on those studies.<sup>17-19</sup> Whole article data to be used in the bibliometric analysis were obtained from the Web of Science (WoS) database (access date: 25.03.2021). WoS is a reliable and reputable scientific database that is widely used by the academic community. All article data and scientific impact information used in the bibliometric analysis can be easily accessed on WoS. Therefore, it has been frequently used in similar bibliometric research.<sup>20-22</sup>

A topic search was selected and the key terms "Behcet's disease," "Behcet's syndrome," and "Behcet" were used in the listing of the publications. During the listing, the date range on the WoS settings was defined as January 2010–December 2019. The entire article list was extracted from WoS and recorded in a file on the access date. Duplicated papers were excluded and a list including all types of publications was obtained. Articles in English were included in the study. From this list, original articles and reviews were selected for bibliometric and altmetric analyses, and other article types were not included.<sup>21,23,24</sup> Following this, all the abstracts were reviewed by two authors (BFK, AA). If deemed necessary, the full texts of the articles were accessed and irrelevant articles were excluded.

### Bibliometrics evaluation

The total number of articles, year of the article, the country from which the article originated, and citation count were recorded. The index status of the journal in which each article was published (Science Citation Index Expanded [SCIE] or Emerging Sources Citation Index [ESCI]) was checked and recorded. In addition, data including the quarter status (Q1 to Q4) of the SCIE journals were obtained. The total number of articles produced each year was calculated

for the specified 10-year period. To avoid any difficulties in determining the country of publications that included authors from different countries, the corresponding author's country was accepted as the country of origin of the article. This method has been used in similar studies.<sup>15,19</sup> The population size and gross domestic product (GDP) values of the countries that produced articles on BD were obtained from the 'https://www.cia.gov/the-world-factbook/countries/' website. The average number of citations was calculated using 'the total number of citations ÷ the total number of articles' formula. This value was recorded for each of the main active countries. According to the World Bank data, the countries were categorized into groups as follows: high-income, upper middle-income, low middle-income, and low-income.

The main active country criterion was determined as 'producing 1% or more of the total number of articles published from 2010 to 2019'. The number of articles provided from a country was divided by the total number of articles to reach the contribution rate.<sup>25,26</sup> The five most active journals on this topic were listed considering the total number of articles they published. Five countries that provided the highest number of articles to each of the five journals were identified.

### Altmetrics evaluation

A toolbar was downloaded from the 'https://www.altmetric.com/products/free-tools/bookmarklet/' to access the altmetric attention scores (AAS) of the articles. AAS was obtained automatically and free of charge using this toolbar. The AAS was created to assess the personal influence of a publication, primarily using the attention collected on various online platforms. Although the parameters used in AAS calculations are given, the algorithm is not clearly explained. After the function is used, AAS is presented as the altmetric donut, which contains various colors, each color indicating attention on a different platform (medium blue indicates LinkedIn, light blue indicates Twitter, red indicates news, yellow indicates blogs, etc.).<sup>9,27</sup> In addition, the AAS details were accessed and the tweets count for each article was recorded.

Another parameter used in article altmetric evaluations is the Mendeley readers count (MRC). This value was obtained from the Mendeley platform, accessed via 'https://www.mendeley.com/research-papers/'. The MRC correctly mirrors bookmarks sourced from Mendeley users. On this platform, article links are stored, personal libraries are created and the user reference lists that can contain previously saved papers are managed. It is not possible to manipulate and change the MRC values.<sup>9,10,28</sup>

### Statistical analysis

The bibliometric and altmetric analyses were performed using the Statistical Package for the Social Sciences version 20.0 software (SPSS Inc., Chicago, IL, USA). Data were expressed as number and percentage (%). Trend evaluations in terms of the number of articles between 2010 and 2019 were revealed with regression analysis. Correlations between altmetric data and citation values were examined using the Spearman's rho test. A rho score < 0.250 was interpreted as weak, 0.250–0.499 as moderate, 0.500–0.749 as strong, and ≥ 0.750 as a very strong correlation. A value of  $P < 0.05$  was accepted as statistically significant in all the analyses.

## RESULTS

### Total number of published items

A total of 5,201 articles were listed without any restrictions using the specified search terms. At the end of the inclusion-exclusion process, a total of 2,163 articles were obtained for further

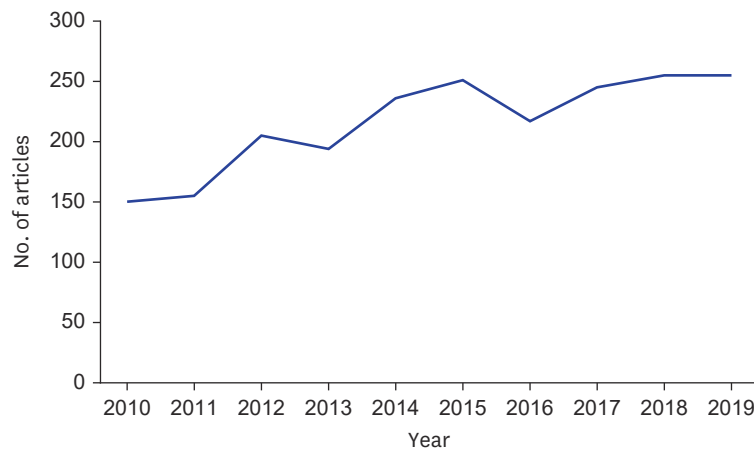


Fig. 1. Publication trend from 2010 to 2019.

analysis. Trend analysis was performed based on the number of articles published each year from 2010 to 2019, and a statistically significant and increasing trend was determined ( $P < 0.001$ ) ( $n = 150$  in 2010;  $n = 255$  in 2019) (Fig. 1). A total of 59 different countries provided articles on BD and 16 of these were classified as the main active country. Nearly half of the articles originated from high-income countries ( $n = 1,012$ ; 46.7%), followed by upper middle-income countries with a slight difference ( $n = 995$ , 46.0%), then lower middle-income countries provided 155 (7.2%) articles, and only 1 article was from a low-income country.

#### Article production of the countries

Turkey ( $n = 611$ ; 28.24%), China ( $n = 207$ ; 9.57%), South Korea ( $n = 199$ ; 9.20%), Japan ( $n = 138$ ; 6.38%), and Italy ( $n = 122$ ; 5.64%) were the five most productive countries. When trend analyses were performed for these five countries according to the number of articles per year, a significant increasing trend was found in Turkey ( $n = 46$  in 2010;  $n = 69$  in 2019), China ( $n = 6$  in 2010;  $n = 27$  in 2019) and Italy ( $n = 6$  in 2010;  $n = 16$  in 2019) ( $P < 0.05$ ). Data from South Korea ( $n = 10$  in 2010;  $n = 13$  in 2019) and Japan ( $n = 17$  in 2010;  $n = 17$  in 2019) showed a stable and balanced picture over the 10-year period ( $P > 0.05$ ).

The contribution rates of the five most productive countries were calculated for each year from 2010 to 2019 and are presented in Table 1. Turkey ranked first over the 10-year period. Despite China's relatively low contribution rate in 2010 and 2011, the value was seen to increase in the following years.

Table 1. Contribution rate of the five most productive countries between 2010 and 2019

Year	Turkey	China	South Korea	Japan	Italy
2010	30.66	4.00	6.66	11.33	4.00
2011	29.03	3.87	11.61	7.74	2.58
2012	30.24	9.26	13.17	7.80	1.95
2013	29.38	9.27	12.88	5.15	4.63
2014	29.23	12.28	7.20	6.77	4.66
2015	28.68	9.56	7.56	5.17	5.57
2016	29.95	12.44	5.99	5.99	6.91
2017	25.30	9.38	10.83	6.12	6.93
2018	25.09	10.98	10.98	3.52	10.19
2019	27.05	10.58	5.09	6.66	5.88

Values are presented as number (%).

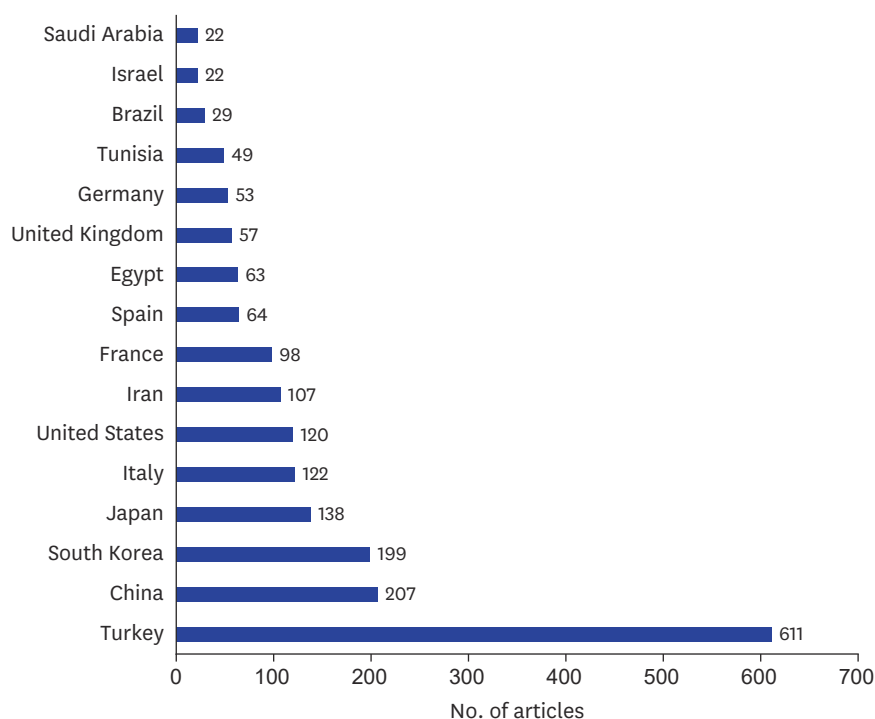


Fig. 2. Number of articles in the main active countries.

### Country analyses according to the population, GDP, and citation data

The main active countries, consisting of 16 countries, produced 85.11% (n = 1,841) of the total articles (Fig. 2). Of the main active countries, 10 were classified in the high-income group, 5 in the upper middle-income group, and 1 in the lower middle-income group. The number of articles per million population was calculated and it was determined that Turkey (7.40), Tunisia (4.14), and South Korea (3.84) ranked in the top three. In addition, the number of articles per 100 billion dollars of GDP was calculated and it was determined that Tunisia (40.83), Turkey (25.78), and Iran (10.49) were the three leading countries. When the list was created according to the average citation value per article, France (28.16), the United States (25.70), and the United Kingdom (21.84) were ranked as the top three, respectively (Table 2).

Table 2. The main active countries between 2010 and 2019

Country	Value	No. <sup>a</sup>	No. <sup>b</sup>	Total citations	Average citations
Turkey	611 (28.24)	7.40	25.78	6,869	11.24
China	207 (9.57)	0.14	0.91	2,713	13.10
South Korea	199 (9.20)	3.84	9.00	2,309	11.60
Japan	138 (6.38)	1.10	2.63	2,763	20.02
Italy	122 (5.64)	1.95	4.76	2,434	19.95
United States	120 (5.54)	0.35	0.58	3,084	25.70
Iran	107 (4.94)	1.24	10.49	1,983	18.53
France	98 (4.53)	1.43	3.71	2,760	28.16
Spain	64 (2.95)	1.35	3.33	1,344	21.00
Egypt	63 (2.91)	0.59	5.33	391	6.20
United Kingdom	57 (2.63)	0.86	1.83	1,245	21.84
Germany	53 (2.45)	0.66	1.18	508	9.58
Tunisia	49 (2.26)	4.14	40.83	756	15.42
Brazil	29 (1.34)	0.13	0.93	317	10.93
Israel	22 (1.01)	2.50	6.11	214	9.72
Saudi Arabia	22 (1.01)	0.63	1.37	424	19.27

Values are presented as number of articles (%).

<sup>a</sup>Number of articles per million population; <sup>b</sup>Number of articles per \$100 billion gross domestic product.

More than three-quarters of the papers were original articles ( $n = 1,704$ ; 78.77). The number of citations per article was calculated as 13.98 for original articles and 19.17 for reviews.

### SCIE and ESCI journals

The vast majority of journals listed on WoS were SCIE ( $n = 2,004$ ; 92.64%) (for ESCI journals  $n = 159$ ; 7.36%). Articles published in SCIE and ESCI journals were evaluated separately in terms of the average number of citations per article. The value was 15.98 for SCIE journals and 3.85 for ESCI journals. The articles were mostly published in Q2 and Q3 SCIE journals ( $n = 584$ ; 29.14% for Q2 and  $n = 569$ ; 28.39% for Q3), followed by Q4 and Q1 SCIE journals ( $n = 457$ ; 22.81% for Q4 and  $n = 394$ ; 19.66% for Q1).

### Journal data

Journals were listed according to the number of articles published on BD and the top five journals were ranked as follows: *Clinical and Experimental Rheumatology (Clin Exp Rheumatol)* ( $n = 144$ ; 6.65%), *Clinical Rheumatology (Clin Rheumatol)* ( $n = 68$ ; 3.14%), *Ocular Immunology and Inflammation (Ocul Immunol Inflamm)* ( $n = 68$ ; 3.14%), *Rheumatology International (Rheumatol Int)* ( $n = 60$ ; 2.73%), and *International Journal of Rheumatic Diseases (Int J Rheum Dis)* ( $n = 53$ ; 2.45%). The five most active countries in these five journals were identified. Turkey ranked first in *Clin Exp Rheumatol*, *Clin Rheumatol*, *Ocul Immunol Inflamm*, and *Rheumatol Int*, and Iran ranked first in *Int J Rheum Dis* (Table 3).

### Altmetric data

Correlations were examined between citation data and altmetric scores, and significant and weak correlations were detected between the number of citations and AAS and tweet counts ( $P < 0.001$ ,  $\rho = 0.234$ ;  $P < 0.001$ ,  $\rho = 0.183$ ). The number of citations was significantly and strongly correlated with MRC ( $P < 0.001$ ,  $\rho = 0.652$ ).

The main active country-based analyses including altmetric scores were performed. The United States, Spain, and the United Kingdom were the top three countries in the AAS per article data. Spain, the United States, and the United Kingdom ranked in the top three in the tweets count per article. The top three places for MRC per article were held by the United Kingdom, the United States, and France (Table 4). Altmetric scores per article were calculated in the five most active journals. *Rheumatol Int* was ranked in first place in the average AAS per article and average tweets count per article. *Clin Rheumatol* was placed first for the average MRC per article (Table 5).

## DISCUSSION

Bibliometric studies provide extensive information about global publication productivity, trends over the years, the status of countries, and citation data. Altmetric analyses reveal the

**Table 3.** Top five countries in the five most active journals

Rank	<i>Clin Exp Rheumatol</i>	<i>Clin Rheumatol</i>	<i>Ocul Immunol Inflamm</i>	<i>Rheumatol Int</i>	<i>Int J Rheum Dis</i>
1	Turkey (54)	Turkey (15)	Turkey (19)	Turkey (25)	Iran (20)
2	South Korea (16)	Italy (15)	Japan (7)	South Korea (6)	Turkey (15)
3	Italy (14)	Egypt (8)	South Korea (6)	Italy (4)	South Korea (7)
4	Spain (8)	Iran (7)	Saudi Arabia (5)	Japan (4)	China (4)
5	China (7)	China (6)	Italy (4)	China (3)	Austria (2)

Values are presented as number of articles.

*Clin Exp Rheumatol* = Clinical and Experimental Rheumatology, *Clin Rheumatol* = Clinical Rheumatology, *Ocul Immunol Inflamm* = Ocular Immunology and Inflammation, *Rheumatol Int* = Rheumatology International, *Int J Rheum Dis* = International Journal of Rheumatic Diseases.

**Table 4.** Altmetric scores in the main active countries

Country	No. <sup>a</sup>	No. <sup>b</sup>	No. <sup>c</sup>
Turkey	1.37	1.48	18.18
China	0.80	0.82	15.65
South Korea	0.95	0.60	14.62
Japan	1.04	0.71	20.57
Italy	2.43	1.83	32.36
United States	3.54	3.04	37.95
Iran	0.60	0.57	20.49
France	2.07	1.65	34.23
Spain	3.50	3.90	33.78
Egypt	0.79	0.74	12.42
United Kingdom	2.96	2.89	38.80
Germany	0.90	0.37	16.43
Tunisia	0.79	0.83	15.93
Brazil	0.31	0.34	25.10
Israel	1.13	1.45	27.63
Saudi Arabia	1.18	1.22	19.27

<sup>a</sup>Altmetric attention score per article; <sup>b</sup>Tweets count per article; <sup>c</sup>Mendeley readers count per article.

**Table 5.** Altmetric scores in the five most active journals

Altmetrics	<i>Clin Exp Rheumatol</i>	<i>Clin Rheumatol</i>	<i>Ocul Immunol Inflamm</i>	<i>Rheumatol Int</i>	<i>Int J Rheum Dis</i>
No. <sup>a</sup>	0.58	1.32	0.47	1.40	0.62
No. <sup>b</sup>	0.72	1.60	0.41	1.93	0.45
No. <sup>c</sup>	16.96	23.02	18.39	21.62	20.79

*Clin Exp Rheumatol* = Clinical and Experimental Rheumatology, *Clin Rheumatol* = Clinical Rheumatology, *Ocul Immunol Inflamm* = Ocular Immunology and Inflammation, *Rheumatol Int* = Rheumatology International, *Int J Rheum Dis* = International Journal of Rheumatic Diseases.

<sup>a</sup>Altmetric attention score per article; <sup>b</sup>Tweets count per article; <sup>c</sup>Mendeley readers count per article.

individual impact of scientific articles via the internet and various social media platforms. The results of this study demonstrated an increasing trend in the number of articles on BD from 2010 to 2019, which suggests ongoing scientific development in the field of BD. More than 90% of the articles were provided by high and upper middle-income countries. Taking into consideration the positive influence of economic development on scientific production, this can be evaluated as an expected result. Nevertheless, it also suggests that lower middle-income and low-income countries should be supported in terms of scientific productivity.

The five most productive countries were Turkey, China, South Korea, Japan, and Italy, respectively. Turkey also dominated this area in terms of the number of articles. The rising trend that China gained in the contribution rate after 2011 cannot be ignored. The high prevalence of BD in these countries, with the effect of geographic distribution, as well as the historically high awareness of BD among physicians in these countries may have led to this result.

When the number of articles was adjusted according to population, Turkey, Tunisia, and South Korea were in the top three. Despite the large population size, Turkey was the first in terms of the number of articles with a major difference, and relatively low population size was effective for Tunisia and South Korea.

In calculations based on GDP, Tunisia, Turkey, and Iran were ranked as the first three. Despite the relatively low GDP of these countries, the high number of articles produced with geographic influence may explain this result. For the average number of citations per article, the top three countries were France, the United States and, the United Kingdom. Although they produced a relatively low number of articles as they are geographically not a part of the Silk Road, these countries provided high-quality articles as a result of their general scientific

development. High research budgets allocated to this field and accurate use of human resources may have also contributed to this result.

The number of articles sourced from high-income countries was divided by the number of articles sourced from countries in other GDP groups, and although a ratio of 9/1 (in favor of high-income countries) has been reported in similar bibliometric studies,<sup>29</sup> the current study results do not support this ratio. The high number of articles originating from Turkey and China, in particular, prevented reaching this ratio.

Although more than three-quarters of the papers were original articles, reviews reached a higher value in terms of average citation per article. This can be attributed to the fact that BD can be presented more comprehensively with all aspects in reviews.

The vast majority of journals publishing BD articles were indexed in SCIE. In addition, there was a considerable difference in favor of SCIE journals in the average number of citations per article (15.95 for SCIE journals and 3.85 for ESCI journals). These results show that ESCI journals have a long way to go, both qualitatively and quantitatively. When SCIE journals were evaluated in terms of Quarters, the lowest publication rate was found in Q1 journals. This can be explained by the fact that the articles were not at the level to be published in top-class journals and that Q1 journal editors do not give priority to this field.

The five most active journals in terms of the number of articles on BD were ranked as *Clin Exp Rheumatol*, *Clin Rheumatol*, *Ocul Immunol Inflamm*, *Rheumatol Int*, and *Int J Rheum Dis*, respectively. It was noteworthy that four of the five journals were primary rheumatology journals, which could be due to the fact that rheumatology journals prioritize BD articles rather than ophthalmology, dermatology, and immunology journals. In addition, authors may have preferred to publish in rheumatology journals. The five most active countries in these five journals were identified. Turkey ranked first in *Clin Exp Rheumatol*, *Clin Rheumatol*, *Ocul Immunol Inflamm*, and *Rheumatol Int*, and Iran was first in *Int J Rheum Dis*. As Turkey produced a high number of articles, this cannot be considered a surprising result. Significant and weak correlations were found between the number of citations and AAS and tweet counts. In addition, the number of citations was significantly and strongly correlated with MRC. Mendeley users are generally researchers specialized in certain areas utilizing the online reference network. Researchers add publications to their library on the Mendeley platform and potentially cite them in future articles. Therefore, MRC increases before the number of citations and can be considered as an accurate reflection of future citations.

In contrast, AAS is calculated based on current interactions sourced from social media platforms, news, policy documents, and blogs, etc. Therefore, it reflects the individual users' effect rather than professional researchers. This can explain the weak correlations between AAS - tweet counts and citation data. Despite this weak correlation, it can be recommended that the altmetric values and standard bibliometric analyses be accepted as complementary elements to determine the whole impact of the articles.

*Rheumatol Int* was the journal ranked first in the average AAS per article and average tweets count per article. *Clin Rheumatol* was the first and *Rheumatol Int* was the second in respect of average MRC per article. The active use of social media and other internet platforms by *Rheumatol Int* editors may have led to this result. Furthermore, the articles published in *Rheumatol Int* may have attracted more attention from individual internet users.



One of the limitations of this study was that only the WoS database was used. Results may differ in other databases such as Scopus, Pubmed, and Google Scholar. However, when it is considered that WoS is the most preferred database in bibliometric-altmetric analyzes, there is established literature on the use of WoS in this study type, and the reputation and reliability of WoS among researchers, this was not thought to be a substantial deficiency. Only articles in English were included in the study and the date range was limited to 2010–2019. As a previous study evaluated articles on BD between 1980–2014,<sup>16</sup> the 2010–2019 date range was selected to update the data and to present a different perspective. Self-citations were not assessed or removed. Despite the aforementioned limitations, this article also has various strengths. A comprehensive, systematic, scientific, and objective research methodology was used and bibliometric and altmetric analyses were combined. Therefore, up-to-date data are provided on worldwide publication productivity in the BD field.

In conclusion, global productivity increased in BD articles from 2010 to 2019, and there was determined to be consistency between the article productions of the countries and the ancient Silk Road routes. Rather than prominent countries in terms of article production, France, the United States, and the United Kingdom were at the forefront in respect of average citations per article. The relationship between altmetric data and standard bibliometric analysis was not completely consistent. Therefore, it can be suggested that bibliometric and altmetric analyses be considered as complementary to each other.

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