D J Med Sci 2022;8(3):108-114
doi: 10.5606/fng.btd.2022.25

Original Article

A bibliometric analysis of tularemia, endemic for Türkiye

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ABSTRACT

Objectives: We conducted a bibliometric analysis study to determine the sufficiency of the national literature on this disease, which is endemic to our country, and to guide future studies.

Materials and methods: The Turk Medline database was scanned in the study. Publications between January 1999 and December 2020 were searched using the keyword "tularemia". A total of 101 publications were detected. Reviews and case reports were not included in the study. A total of 40 articles and letters to the editor (including study data) were evaluated. Google Scholar and Google Search engine were used to access the full texts of the articles. Because the full text of five articles was unavailable, they were not included in the content analysis. Articles were evaluated in terms of the year of publication, the institution, the location, the number of authors, the keywords, the sampling, sample size, the number of keywords, the study subject, the number of citations, the language of publication, and the journal which it was published. The social network analysis method was also utilized to define the network structure and examine the connections between structures. For this purpose, UCINET and NetDraw programs were used.

Results: A total of 24 provinces participated in the research. The publications were from 31 different institutions, with the majority being from university hospitals (45%) and the Central Anatolia Region (45%). The majority of studies were carried out on patients (40%). The average number of citations was 4.5±1.13. Two articles got more than 20 citations. Most studies (60%) were conducted between 2010 and 2015.

Conclusion: Tularemia is a zoonotic disease with complex epidemiology. Many aspects of this disease are currently unclear. Studies on these subjects are required since the epidemiological role of animal hosts, potential vectors, maintenance mechanisms in different ecosystems, and the transmission routes of the disease need to be better understood.

Keywords: Bibliometric analysis, tularemia, Türkiye.

Tularemia is a zoonotic disease caused by *Francisella tularensis*, and it is characterized by fever and lymphadenopathy. Tularemia is also known as "Francis disease, Ohara's disease, rabbit fever, deer-fly fever, Siberian ulcer, and meat-cutter's disease".[1] *F. tularensis* is a gram-negative intracellular bacterium. This highly contagious microorganism is regarded as a potential biological threat. People are frequently infected as a result of direct contact with animal reservoirs and tick bites. However, cases of tularemia have been reported following contact with a contaminated environment. In the last decade, there have been sporadic cases and waterborne tularemia outbreak with distinct clinical and epidemiological characteristics all over the world. These infections are also a major public health concern. Contamination with human factors has occurred as a result of *F. tularensis*-contaminated water consumption, use, and various water activities such as swimming and fishing. Furthermore, mosquitoes are the primary vectors of tularemia in Sweden and Finland due to the infection of mosquito larvae in contaminated water environments. Many new aquatic *F. tularensis* species have been identified

Received: March 17, 2021
Accepted: May 04, 2021
Published online: December 26, 2022

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Cite this article as:
Yılmaz M, Alıravcı ID, Uyar C, Dindar Demiray EK, Alkan S. A bibliometric analysis of tularemia, endemic for Türkiye. D J Med Sci 2022;8(3):108-114.

in recent years, and these should be considered in tularemia surveillance and control.[2,3]

Tularemia, which has been on the list of mandatory diseases in our country since 2004, has been added to the list of diseases, i.e. group C diseases, that are required to be sentinel notifications in the application of the National Notifiable Diseases Surveillance System due to an increase in the number of cases and reporting of cases from across our country.[4]

This disease is a zoonosis with complex epidemiology, and the reservoir hosts for this pathogen have yet to be identified. Tularemia has been shown in recent years to have a much broader range of hosts and transmission routes than previously thought.[5] This disease, which can cause outbreaks across the world, has remained a major concern in recent years. The disease is considered endemic in countries such as the former Soviet Union, Tunisia, Iran, Canada, Mexico, Türkiye, Israel, China, and Japan. Even though it is rarely reported in African countries, there is more evidence of an increasing presence in Africa.[6] We conducted a bibliometric analysis to assess the sufficiency of the national literature on this disease, which is also endemic in our country, and to guide future research.

MATERIALS AND METHODS

In the study, the Turk Medline database (www.turkmedline.net/) was searched using the keyword "tularemia". Publications between January 1999 and December 2020 (a total of 101) were detected. Reviews and case reports were not included in the study. A total of 40 articles and letters to the editor (including study data) were evaluated.[7-46] Google Scholar and Google Search engine were used to access the full texts of the articles. Because the full text of five articles was unavailable, they were not included in the content analysis. Articles were evaluated in terms of the year of publication, the institution, the location, the number of authors, the keywords, the sampling, sample size, the number of keywords, the study subject, the number of citations, the language of publication, and the journal which it was published. The study was conducted in accordance with the principles of the Declaration of Helsinki.

The social network analysis method was also utilized to define the network structure and examine the connections between structures. For this purpose, UCINET 6,718 Windows and NetDraw programs were used. To analyze data, a free version of the program was downloaded from the "https://sites.google.com/site/ucinetsoftware/home" site. This program is a software package for the analysis of social network data that was created by Lin Freeman, Martin Everett, and Steve Borgatti. It comes with the NetDraw network visualization tool.

RESULTS

In the study, 35 articles with full text were subjected to content analysis and general evaluation, while five articles without a full text were subjected to general evaluation only.

The number of authors ranged from two to 13, with up to four (22.5%) authors. The average number of pages was 6.575±1.75. A total of 24 provinces participated in the research. The publications were from 31 different institutions, with the majority being from university hospitals (45%) and the Central Anatolia Region (45%). The majority of studies were carried out on patients (40%). The majority of articles on the subject were published in the Bulletin of Microbiology and the KLIMIK Journal. It was found to be the first publication in 1999. The most of studies (60%) were conducted between January 2010 and December 2015 (Table 1).

Table 1. Journals in which articles are published

The Name of Journal	n	%
The Bulletin of Microbiology	13	32.5
KLIMIK Journal	4	10
The Turkish Bulletin of Hygiene and Experimental Biology	3	7.5
The Journal of Current Pediatrics	3	7.5
KBB-Forum	2	5
Other Journals*	15	37.5

*Bursa State Hospital Bulletin, Journal of Pediatric Infection, Journal of Duzce University Health Sciences Institute, Fırat Medical Journal, Gazi Medical Journal, Turkish Journal of Infection, Medical Journal of Istanbul Kanuni Sultan Süleyman, Journal of Dr. Behcet Uz Children's Hospital, The Turkish Journal of Ear Nose and Throat, Mersin University Journal of Health Sciences, Medical Journal of Mugla Sitki Kocman University, Journal of Continuing Medical Education, The Anatolian Journal of Clinical Investigation, The Turkish Archives of Otorhinolaryngology, and Turkish Journal of Pathology (Each of these journals only had one publication).

Table 2. General characteristics of the articles (n=40)

Characteristics of the articles	n	%
The number of authors		
2	3	7.5
3	7	17.5
4	9	22.5
5	7	17.5
6	6	15
7	2	5
8	3	7.5
9	2	5
13	1	2.5
Publication date		
1999-2004	4	10
2005-2010	4	10
2010-2015	24	60
2016-2020	8	20
Number of publications by region		
The Aegean Region	2	5
The Black Sea Region	6	15
The Marmara Region	4	10
The Central Anatolia Region	18	45
The Southeast Anatolia Region	2	5
The Eastern Anatolia Region	4	10
Unspecified	2	5
Multicenter	1	2.5
Number of publications per institution		
Ministry of Health Hospitals	11	27.5
Universities	18	45
The Türkiye Public Health Agency	5	12.5
Multiple institutions	1	2.5
Unspecified	5	12.5
Sampling		
Healthcare workers	2	5
People with possible risk factors	7	17.5
(residents of the endemic zone, hunters)	3	7.5
Children	2	5
Animal experiments (mice, dog)	16	40
Patients	4	10
Laboratory samples (serum samples, pathology specimens)		
Publication language		
Turkish	31	77.5
English	5	12.5
Inaccessible	4	10
Types of studies		
Survey	2	5
Prospective	11	27.5
Retrospective	19	47.5
Outbreak analysis/field study	2	5
Unspecified	1	2.5
Inaccessible	5	12.5
Content analysis (35 articles)		
Clinical features	18	45
Laboratory (biochemical)	13	32.5
Laboratory (microbiological)	6	15
Epidemiological features	18	45
Pathological features	1	2.5
Treatment	2	5
Epidemic investigation	3	7.5
Seroprevalence	3	7.5
Knowledge level	2	5
Seasonal factors	1	2.5
Citation presence		
Yes	22	55
No	13	32.5

Table 3. The journals in which cited articles

The Name of Journal	n	%
The Bulletin of Microbiology	9	40.1
KLIMIK Journal	4	18
The Turkish Bulletin of Hygiene and Experimental Biology	2	9
Turkish Journal of Infection	2	9
Journal of Dr. Behcet Uz Children's Hospital	1	4.5
KBB-Forum	1	4.5
The Turkish Journal of Ear Nose and Throat	1	4.5
The Journal of Current Pediatrics	1	4.5
Turkish Journal of Pathology	1	4.5

The sample size ranged from 6 to 1,503. Only five studies included a control group, and the average resources were 20±2.52. The average number of keywords was 4.11±1.29, and the number of citations was 4.5±1.13. There were over 20 citations for the two articles (Table 2).

When the journals in which the cited articles were published were examined, it was found that there were citations to articles published in nine journals, with the most citation heading to the Bulletin of Microbiology (40.1%) and the KLIMIK Journal (18%) (Table 3).

DISCUSSION

Overall, between 1992 and 2012, 18,343 cases of human tularemia were reported in the WHO-CISID (World Health Organization-The Computerized Information System for Infectious Diseases) and ECDC (European Centre for Disease Prevention and Control) databases. Sweden reported 25% of all reported cases, Finland 22%, Türkiye 13%, and the Czech Republic and Hungary each reported about 9%.[5] The ECDC reported 18 cases of tularemia in the EU (European Union) in 2018 and 441 (358, 81% confirmed) in the EEA (European Economic Area). This report includes data from 12 countries, with Norway and Sweden accounting for 45% of all reported cases, accounting for 0.07 cases per 100,000 overall reporting rate.[47]

Since the first case was reported in Lüleburgaz in 1936, tularemia, which can cause epidemics in our country on occasion, has been reported primarily from the Thrace Region of Türkiye.

After 1988, cases from the Marmara Region were reported in and around provinces, such as Çanakkale, Bursa, and Susurluk town, and began to be seen throughout the country.[48] There were notifications from other regions of our country, particularly from the Central Anatolia Region, especially in 2009-2010.[1] Figure 1 presents the distribution of case numbers based on data from our country. Similarly, our study revealed that most articles were published between January 2010 and December 2015, particularly as cases began to emerge across the country and the number of cases increased. Although 45% of the publications examined in our study were from the Central Anatolia Region, there was no publication from the Mediterranean Region alone.

Tularemia can affect people of all ages, however, it is less common in children. The number of reported child cases has risen dramatically in recent years, accounting for nearly 10% of all tularemia cases.[1] Our study included three (7.5%) publications that examined child patient groups. These studies were conducted in 2012 and 2013.[22,25,28]

Tularemia is frequently accompanied by nonspecific symptoms, which can cause a delay in diagnosis. In humans, if left untreated, it can lead to serious disease. Sporadic human cases are frequently overlooked, particularly in areas where the disease's prevalence is low.[50] Therefore, clinical findings must be precisely defined. In this context, it was determined that clinical findings and laboratory findings accounted for 40% of all studies.

According to the Türkiye Public Health Agency, there are no tularemia-related mortality reported between 2008 and 2017. According to reports, it causes 0.1-2.88/100,000 morbidities.[1] It was found that there was no research on morbidity and mortality in our study.

In our country, tularemia outbreaks are most common in rural areas, primarily among farming families, housewives, children, hunters, and forest workers.[1] Several publications claim that hunters are at risk for tularemia.[51,52] There were two articles in our study that looked into the presence of tularemia in hunters.[7,32]

F. tularensis holarctica, a less virulent subspecies of *F. tularensis*, is the most common cause of infection outside of North America.[6] Only one study[35] was found to research on *F. tularensis holarctica* in our study. This can be interpreted as missing subspecies studies.

In the last 20 years, cases of drinking water-related tularemia have been reported in Türkiye, Kosovo, Bulgaria, Georgia, Macedonia, Norway, Sweden, Italy, and Germany. In our country, 28 outbreaks of tularemia and many sporadic cases of tularemia related to contaminated water consumption were reported between 1988 and 2018.[2] This has sparked a global interest in tularemia among researchers. The data on cases of tularemia related to water resources, the existence of Francisella species in aquaculture, and their mechanisms of living in aquaculture were investigated from the British literature in the PubMed database in the Hennebique et al.[2] review study. Only articles from the last two decades (1998-2018) were included It has been reported in this review that outbreaks in Türkiye have a considerable number of cases. According

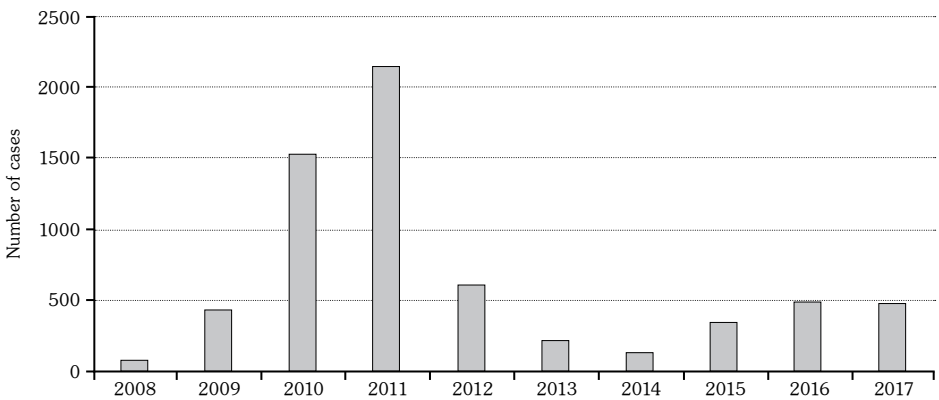

Figure 1. Distribution of tularemia cases in Türkiye by year (2008-2017).[49]

to reports, the oropharyngeal form is the most common, with a similar male-to-female ratio. The review by Hestvik et al.[5] examined cases in humans, pets, and wildlife from 38 European countries between 1992 and 2012, as well as studies on the detection of *F. tularensis* in arthropod vectors. Searching for *F. tularensis holarctica* in water samples of *F. tularensis* subspecies and studies exploring water sources as permanent reservoirs are two environmental studies in Türkiye published in international journals from our country in the medical literature.[53,54] In our research, we found studies on epidemic analysis/retrospective evaluation/field study,[9,20,34,38,45] investigation of the presence of *F. tularensis* in stream/mains water,[11] and the search for the existence of *F. tularensis* in mice using culture, serology, and molecular methods.[21]

In conclusion, tularemia is difficult to understand and hence control the disease with complex epidemiology. Many aspects of this disease are still unidentified. Studies on these issues are needed to gain a better understanding of the epidemiological role of animal hosts, potential vectors, care mechanisms in different ecosystems, and disease transmission.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: All authors contributed equally to the article.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

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