

## ORIGINAL ARTICLE

## A BIBLIOMETRIC STUDY ON FOURNIER'S GANGRENE RESEARCH

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**Abstract**

*Fournier's gangrene (FG) is a progressive necrotizing soft-tissue infection of the external genitalia and perineum. Early recognition of the disease is essential to reduce high morbidity and mortality rates. Bibliometric research aims to reveal the content and citations of the journal articles to show scientific metrics of published data. Our aim in this study is to analyze the publications on FG and to add a new perspective for researchers. The bibliometric analysis method was used in this study. The keywords 'Fournier's' or 'scrotum' and 'gangrene' or 'spontaneous gangrene' were entered in the title search bar. The search was done in English. The articles were sorted by author, journal, country, affiliation, publication date, and citations. All study data were given in percentages, and numbers. 1297 publications were found, 1062 (81.88%) were articles. The number of publications increased in recent years, reaching its peak in 2020. Most of the articles were written in English. The articles were from 80 countries. Most of the articles were in the fields of medicine (n=103) and nursing (n=23). The highest number of articles on Fournier's gangrene appeared in the Urology journals. The most cited article is by Laor et al. FG is an attractive surgical topic in the literature. Various publications from different countries resulted in an increased body of knowledge and experience. Although the management of FG involves many surgical specialties, urologists have a more prominent role in terms of publications.*

**Keywords:** *Fournier's gangrene, scrotum, gangrene, bibliometric method, Scopus database***Introduction**

Fournier's gangrene (FG) is a progressive necrotizing soft-tissue infection mainly affecting the external genitalia and perineum. FG is a surgical emergency for patients with comorbidities and patients of advanced age. Its treatment requires multidisciplinary and multidimensional management. Prompt diagnosis and immediate treatment are essential. Treatment consists of aggressive surgical debridement and broad-spectrum antibiotics admission to decrease mortality [1].

Bibliometric research aims to reveal the content and citations of journal articles to quantify the published data in terms of the trends in publication type, topic area, institutions of origin, and dissemination [2]. The citation refers to the referencing of a publication by a peer-reviewed article. High citation numbers imply the value of the publication in the scientific community [3]. Journals and articles are ranked and evaluated based on the number of times they are cited. Recently, medical, and surgical specialties have made use of this method [4]. In this study, we aimed to analyze the publications

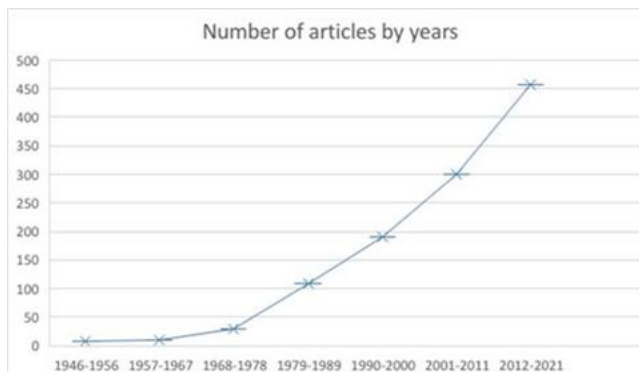
on FG and to add a new perspective for researchers.

**Materials and Method**

The bibliometric analysis method was used in this study. The data in this study were obtained via a search of the Elsevier Scopus database. The keywords ‘Fournier’s’ or ‘scrotum’ and ‘gangrene’ or ‘spontaneous gangrene’ were entered in the title search bar. The search was done in English. The study was performed on a single day, October 15, 2021, to avoid bias, as the database is still open and is updated daily. The graphics function of Scopus was used for visualization, and Microsoft Office 2010 was used to create graphics. The articles were sorted by author, journal, country, affiliation (where the studies were published), publication date, and citations. Çanakkale Onsekiz Mart University’s online library and digital resources were used to access information. As this was not a human or animal study, approval from the ethical committee was not required. The study was conducted in accordance with the Declaration of Helsinki guidelines revised in 2013. All study data were given in percentages, and numbers.

**Results**

A total of 1297 publications were found, 1062 (81.88%) were articles. As reviews, letters, case reports, etc. have less scientific value only articles were analyzed. The first article was published in 1946 [5]. The number of publications increased in recent years, reaching its peak (n=54) in 2020 (Figure 1).



**Figure 1 – Number of articles by years**

Most of the articles were written in English (n=737, 69.39%), followed by Japanese, Spanish, German, French, Italian, Russian, Chinese, Czech, and Polish. The articles were from 80 countries, with the majority coming from the United States, Japan, and Turkey. The top 10 countries producing articles on FG are listed in Table 1.

Country	No.	%
United States	153	14.40
Japan	102	9.60
Turkey	93	8.75
Germany	58	5.46
Italy	58	5.46
Spain	47	4.42
United Kingdom	41	3.86
India	32	3.01
Taiwan	24	2.25
France	21	1.97

**Table 1 – Top 10 ranked countries on FG publications (n=1062)**

Most of the funding sponsors were national health institutions (n=5). Commonly used keywords were ‘human’ (n=892), ‘Fournier gangrene’ (n=849) and ‘male’ (n=805). Most of the articles were in the fields of medicine (n=103) and nursing (n=23). Of the articles; 263 (24,76 %) were published in Open Access journals, and 1040 (97,92 %) were not funded by any institution.

The highest number of articles on Fournier’s gangrene appeared in the Nishinohon Journal of Urology (n=25), the Journal of Urology (n=24), and Urology (n=20).

Peter Kujath from Germany was the most productive author on FG research, having published six articles on this topic. The VA Medical Center was the most common affiliation associated with FG research. The top 15 affiliations associated with FG research are listed in Table 2.

The most cited article is by Laor et al., and it was cited 283 times (6). Only one article was cited more than 250 times. Twelve articles were cited more than 100 times, 47 were cited more than 50 times, and 303 had no citations. A list of most-cited publications is given in Table 3 [6-17]

Affiliation	No.	%
VA Medical Center	9	0.84
Ankara Numune Education and Research Hospital	8	0.75
Sapienza Università di Roma	7	0.65
Bursa Uludağ Üniversitesi	6	0.56
National and Kapodistrian University of Athens	6	0.56
Mackay Memorial Hospital Taiwan	6	0.56
Ruhr-Universität Bochum	5	0.47
Hospital General Universitario Gregorio Marañón	5	0.47
Atatürk University	4	0.37
Northeast Ohio Medical University NEOMED	4	0.37
Erciyes University	4	0.37
Universität zu Lübeck	4	0.37
Dicle University	4	0.37
Università degli Studi di Napoli Federico II	4	0.37
Hospital Universitario "Dr. Jose Eleuterio Gonzalez"	4	0.37

Table 2 – Top 15 ranked affiliations on FG research (n=1062)

Author	Year	Document title	Source	Citations
Laor E, et al	1995	Outcome Prediction in Patients with Fournier's Gangrene	The Journal of Urology	283
Spirnak JP, et al	1984	Fournier's gangrene: Report of 20 patients	Journal of Urology	178
Hejase MJ, et al	1996	Genital Fournier's gangrene: Experience with 38 patients	Urology	153
Levenson RB, et al	2008*	Fournier gangrene: Role of imaging	Radiographics	145
Sorensen MD, et al	2009*	Fournier's Gangrene: Population Based Epidemiology and Outcomes	Journal of Urology	142
Samuel S. Laucks	1994	Fournier's gangrene	Surgical Clinics of North America	136
Yeniyol CO, et al	2004	Fournier's gangrene: Experience with 25 patients and use of Fournier's gangrene severity index score	Urology	128
Korkut M, et al	2003	Outcome analysis in patients with Fournier's gangrene: Report of 45 cases	Diseases of the Colon and Rectum	121
Morpurgo E & Galandiuk S	2002	Fournier's gangrene	Surgical Clinics of North America	111
Hollabaugh Jr., RS, et al	1998	Fournier's gangrene: Therapeutic impact of hyperbaric oxygen	Plastic and Reconstructive Surgery	110
Stephens BJ, et al	1993	Fournier's Gangrene: Historic (1764-1978) versus contemporary (1979-1988) differences in etiology and clinical importance	American Surgeon	110
Corcoran AT, et al	2008	Validation of the Fournier's Gangrene Severity Index in a Large Contemporary Series	Journal of Urology	102

Table 3 – The list of publications with more than 100 citations

## Discussions

Publications in the literature on FG include studies related to epidemiology, pathophysiology, diagnosis, prognostic indicators, and management [1]. To our best knowledge, there is no published bibliometric research on FG. Our study is the first in that respect.

Quantitative and qualitative bibliometrics were used to assess the published literature. Academic productivity can be analyzed objectively using the bibliometric method; so, a lack of knowledge in a specific research field can easily be detected [18]. Therefore, bibliometric analysis has increased in popularity recently. Several important studies have been conducted to reveal the trend of publications in many fields of surgery based on bibliometric research [4].

FG is a rare but severe condition where evolving diagnostic and therapeutic approaches have been tried to minimize the high morbidity and mortality rates. In a period exceeding half a century, continuous publications reaching a total of 1297 of which 1062 (81.88%) are articles is a strong indicator for the interest of surgeons in this topic.

The number of publications increased in recent years, reaching its peak (n=54) in 2020. Although the first modern study on FG was published more than 50 years ago, its epidemiology and pathogenesis have only become better understood in recent years [1]. Recently, treatments such as VAC (Vacuum Assisted Closure) therapy have been utilized; however, there is no statistically significant benefit in terms of mortality [19]. Therefore, early, and adequate debridement and antibiotics are the mainstays of FG treatment. As demonstrated by the case series, mortality rates are still high and haven't changed for the last quarter-century [20]. Consequently, the quest for better treatment modalities to reduce the mortality rate might explain the recent increase in publications.

Our analysis revealed that most articles were written in English (n=737, 69.39%), followed by Japanese, Spanish, German, French, Italian, Russian, Chinese, Czech, and Polish. English is accepted as the de facto universal language of science, and therefore most of the cited articles are from English-language journals [21]. The

articles were from 80 countries, but most were from the US, Japan, and Turkey. The literature research revealed that FG is a global concern. According to Eke et al., the highest number of reported cases are in North America, followed by Africa and Europe. However, ethnicity does not seem to be a risk factor for developing the disease [22]. Most publications are from Western countries, and therefore it can be concluded that the disease might be considered more significant or might be documented more carefully in those countries.

Our research findings revealed that the studies were mainly published in Open Access journals, and most did not have any funding institutions. The word 'male' was one of the most used keywords, as males are mostly affected in FG [23].

The highest number of articles on FG occurred in urology journals. One of the common clinical presentations of patients with FG is swelling of the external genitalia [1]. Therefore, urologists may be consulted at an earlier stage of the disease for patients with suspected FG, and they must intervene and report the cases. FG mainly affects anogenital regions, and the surgical procedures for this region are mainly performed by urologists and general surgeons. However, it seems that urologists focus more on scientific publications about FG.

Our results show that most of the high-volume cases are from research centers and the most productive authors are from tertiary referral centers. Comprehensive diagnostic and therapeutic approaches by high-volume centers and surgeons are not only essential for dealing with FG but are also for the scientific literature.

While highly cited older publications mainly discussed epidemiology based on case series, newer publications tend to focus on disease severity indexes and therapeutic advancements. Named after the French venerologist Jean-Alfred Fournier, FG was primarily described by Baurienne in 1764. Since then, the disease has become well-known for its presentation and rapid progress. The management of FG consists of early surgical intervention and multiple debridement supported by broad-spectrum antibiotics [1-3]. However, this generally accepted approach is still not a gold standard algorithm, thus more research is required for better outcomes leading to the reduction of the

high morbidity and mortality rates. Newer publications seem to focus on treatment modalities, supporting our conclusion.

This study has several limitations related to the nature of bibliometric analysis metrics and bias. Prominent databases have been used in performing the bibliometric analysis; however, these major databases do not represent the entire body of scientific literature. Disproportionate multiple citations may be related to the power of institutions and people and the dominant language of the literature. Furthermore, citation rates of older publications do not always represent their scientific importance/relevance. Newer studies with high scientific metrics may have more citations in the future, and trends for the publications may change dramatically.

## Conclusion

FG is an evolving surgical topic in the literature. Various publications have been produced by institutions and researchers from different countries, resulting in an increased body of knowledge and experience. Although the management of FG involves many surgical specialties, urologists have a more prominent role in terms of publications.

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