*Research Article / Araştırma Makalesi*

# Bibliometric Analysis of the Bladder Cancer Publications Between 1975-2018

## 1975-2018 Yılları Arasındaki Mesane Kanseri Yayınlarının Bibliyometrik Analizi

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Abstract

Background: Bladder cancer is one of the major health problems studied over the years. Emerging technologies on follow-up and treatment of bladder cancer increased scientific literature worldwide. Despite this, there is limited data about the bibliometric analysis of bladder cancer.
Materials and Methods: The bibliometric analysis of bladder cancer publications between 1975-2018 was performed by using the Thomson Reuters Web of Science database. The VOSviewer software tool was used for arranging and setting bibliometric networks.
Results: The United States of America ranked first in this field with 7963 publications and 28.3% of the world generation, followed by the Peoples Republic of China and Germany. The University of Texas System is the leading institute in published documents with 1081 papers and 3.8% of the total literature. 15.9% of the papers were printed in The Journal of Urology with 4483 manuscripts, followed by European Urology (n=867, 3.0%) and Urology (n=810, 2.8%).
Conclusions: There are relatively few articles on bibliometric analysis of urologic disorders and bladder cancer. Advanced evaluation parameters have to be defined for a more confident assessment of scientific work. Bibliometric analyses can guide young clinicians in investigating new studies.

Keywords: Bibliometrics; Bladder cancer; Database; Citation

Öz.

Amaç: Mesane kanseri, yıllardır üzerinde çalışılan en önemli sağlık sorunlarından biridir. Mesane kanserinin takibi ve tedavisi ile ilgili gelişen teknolojiler dünya çapında bilimsel literatürü artırmıştır. Buna rağmen, mesane kanserinin bibliyometrik analizi ile ilgili veriler sınırlıdır.
Materyal ve Metod: 1975-2018 yılları arasında mesane kanseri yayınlarının bibliyometrik analizi, Thomson Reuters Web of Science veri tabanını kullanılarak gerçekleştirildi. Bibliyometrik ağların düzenleme ve ayarlanması için de VOSviewer yazılımı kullanıldı.
Bulgular: Amerika Birleşik Devletleri, 7963 yayın ve toplam yayınların % 28.3'ü ile bu alanda ilk sıradayken, onu Çin Halk Cumhuriyeti ve Almanya izlemiştir. The University of Texas System 1081 makale ve toplam literatürün %3.8'i ile yayınlanan dökümanlarda üst sıradaki kurumdur. Makalelerin %15.9'u The Journal of Urology'de 4483 makale olarak basılmıştır, bunu European Urology (n = 867, %3.0) ve Urology (n = 810, %2.8) izlemiştir.
Sonuç: Ürolojik hastalıklar ve mesane kanserinin bibliyometrik analizi hakkında nispeten az yayın vardır. Bilimsel çalışmaların daha güvenilir bir şekilde değerlendirmesi için gelişmiş değerlendirme parametreleri tanımlanmalıdır. Bibliyometrik analizler genç klinisyenlere yeni çalışmaların ortaya çıkartılmasında rehberlik edebilir.

Anahtar Kelimeler: Bibliyometri; Mesane kanseri; Veri tabanı; Atıf

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**Geliş tarihi / Received:** 01.05.2020

Kabul tarihi / Accepted: 04.06.2020

DOI: 10.35440/hutfd.730440

## Introduction

Bibliometrics is a recent field and performs to quantitatively assess the academic quality of journals or authors by statistical procedures such as citation rates, contents, authorship relations, and productivity. Bibliometrics is in collaboration with the broader term "infometrics" (1,2) and the narrower term "scientometrics" (2-4). Pritchard was the first author that suggested the term of "statistical bibliography" in 1969 (5). Scientometrics and bibliometrics often involve the scientific contribution of journals or specific works, citation analysis and a content analysis of words in titles, abstracts or the full text of journals. They also focus on authorship, social network analysis, co-word and keywords assigned to published articles. Nowadays, producing these reports with a number of tools have apparently made it much easier. Databases such as Web of Science (WoS), Scopus or Google Scholar have added and incorporated reference handling features (6). Bibliometrics could be considered knowledge of science because scientific literature itself becomes the subject of analysis.

Bladder cancer is the 9th-most common cancer worldwide (7,8) with 430.000 new cases diagnosed in 2012 (9). In the same year in Europe, 118.000 new cases and 52.000 deaths were estimated (10) and overheads €4.9 billion in the European Union in 2012 (11). Its high prevalence, cost, and progression risk despite local therapy lead to a major health service burden (12). Studies in the "bladder cancer" field have been increasing worldwide. The aim of this study was to perform bibliometric and scientometric analysis of the documents of such an important health problem.

## Materials and Methods

Ethical approval is not obligatory as this is a retrospective, screening study and doesn't involve any human participation or personal data. The data of this study were extracted from the database of Thomson Reuters Web of Science (Thomson Reuters, New York, NY, USA) from 1975 to November 2018. WoS is the strictest in terms of acceptance and includes four databases titled Core Collection, SciELO Citation Index, Korean Journal Database and Russian Science Citation Index. The database is accessible back to 1975 and we searched all the documents using keywords [bladder cancer OR bladder tumor OR bladder neoplasm] in the "Title" field. We used the VOSviewer software tool for arranging and setting bibliometric networks and figures (VOSviewer 2018). Data were transferred from WoS in "Full Record and Cited References" content pattern.

## Results

WoS database search recorded a total of 28.103 publications between 1975 and November 12, 2018. More than half of the publications were articles (n=15370, 54.4%), followed by meeting abstracts (n=7895, 27.9%), editorial materials (n=1812, 6.4%), and reviews (n=1566, 5.5%).

The number of publications according to years in bladder cancer has been shown in Figure 1.

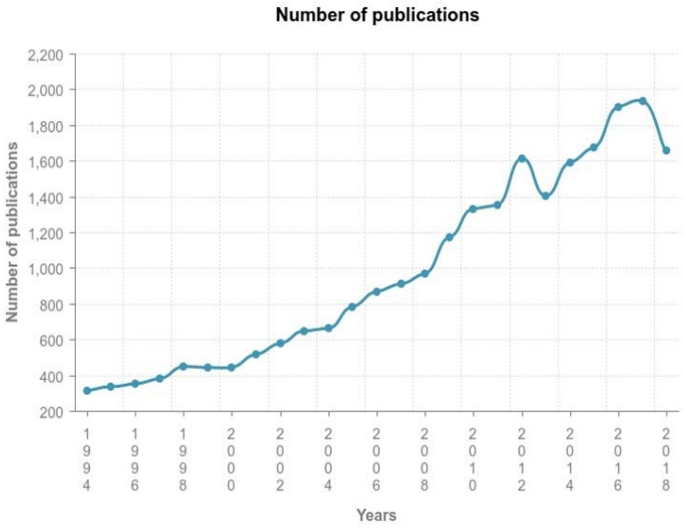


Figure 1. The number of publications according to years in bladder cancer

Publication numbers had been increased continuously and exceed 1000 after 2009. For example, in 1997, 2005, 2009 and 2014 there are 380, 783, 1172, 1591 records; respectively. The most productive year is 2017 with 1932 records.

The number of citations chart is in Figure 2. Sum of the articles cited in this field are 244.334 and if we exclude self-citations the number is 200.871. Before the 1980s the citation numbers are about 50, but after than increased evidently. Between 2005-2012 citation records are over 10.000, with the most counting 12.830 in 2006. The increase in the number of publications, according to years shows the importance of this malignancy.

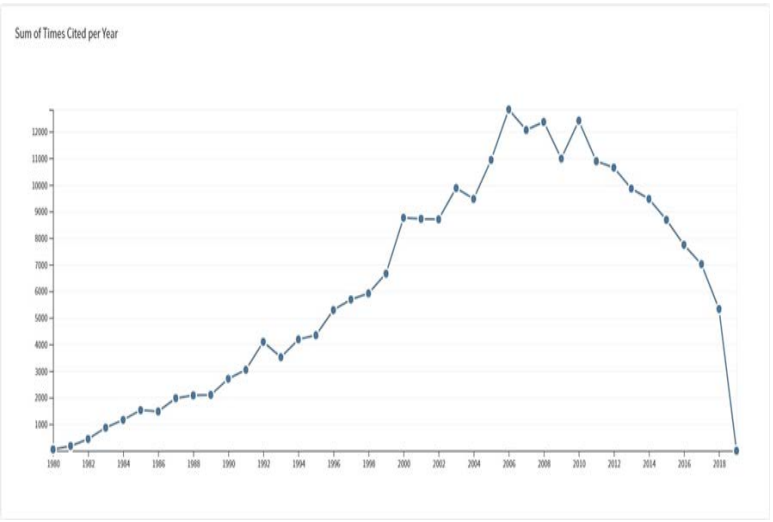


Figure 2. The number of citations to the articles in bladder cancer, per year

The country with the greatest number of publications was the United States of America (USA) with 7963 subjects, followed by the Peoples Republic of China (n=2386) and Germany (n=1987), England (n=1948) and Japan (n=1841). The publication density distribution of the manuscripts was shown on the world map (Figure 3).

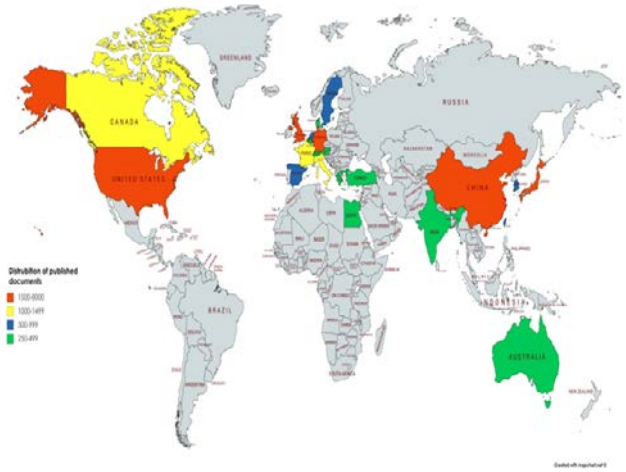


Figure 3. The worldwide publication density distribution of the manuscripts

The co-authorship network for the countries in bladder cancer was interrogated by using the WoS database. The relationship network is described with at least 100 joint publications. VOSviewer returned by this criterion with 32 countries in 5 clusters (Figure 4). This network shows the productivity power of the countries by the size of the point and the connections between the countries, authors publishing together. Five coloured clusters mean that each colour group worked with each other significantly.

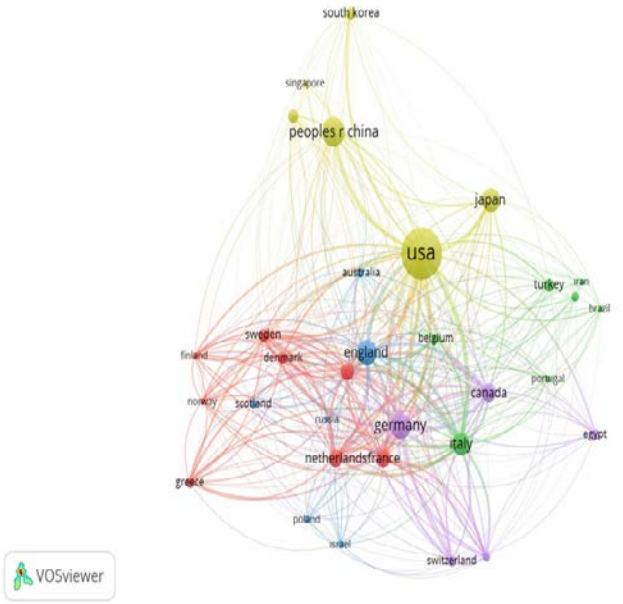


Figure 4. The co-authorship network graph for the countries

The USA with the biggest point size had the highest number of publications in bladder cancer. For example, authors from the USA worked with the authors from the Peoples Republic of China, Japan, Singapore and South Korea. USA, France and England had 31 links over 100 joint publications, while Germany, Italy, Canada had 30 links.

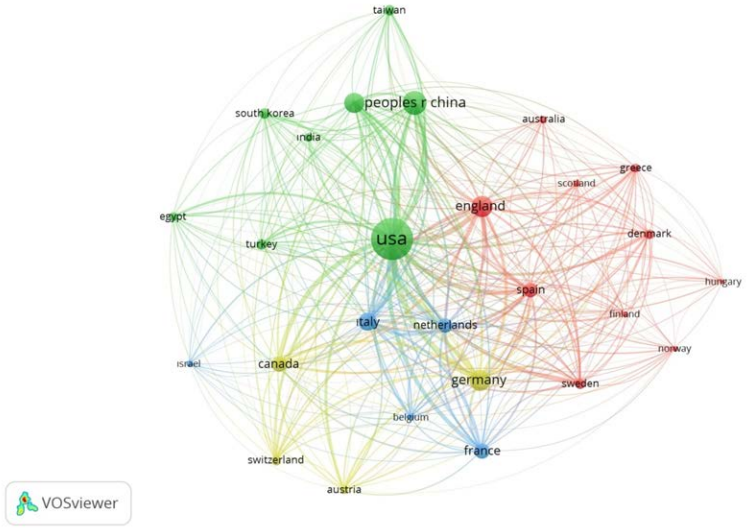


Figure 5. The citation network graph of the countries

We also created a citation network of these countries with VOSviewer (Figure 5). We defined the cut off boundary as 2000 citations, we found 27 countries in four clusters. In this classification the USA also the most cited country (183.720) followed by England (43.480), Germany (39.381), Japan (31.348), and Netherlands (30.244). Connected countries were located closely in the same colour as clusters.

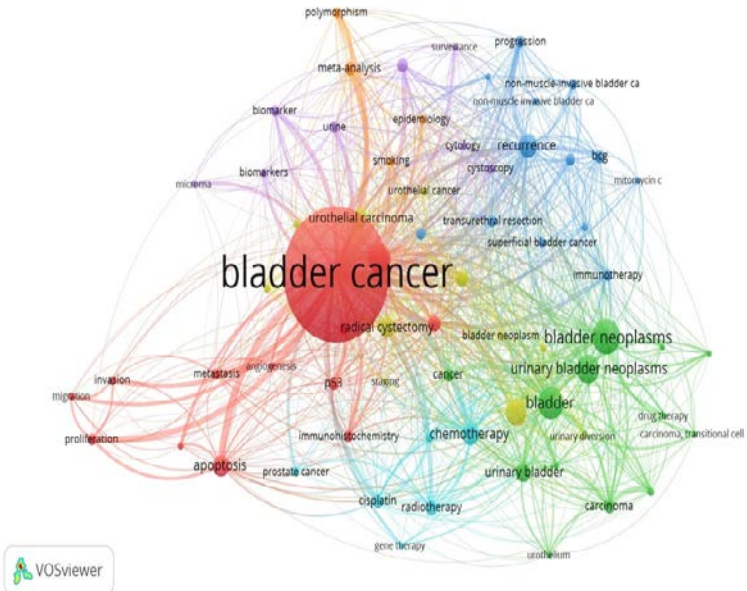


Figure 6. The keyword analysis graph (most used keywords for bladder cancer studies)

The University of Texas System had the most published documents in bladder cancer with 1081 papers and 3.8% of the total literature. This had been followed by UTMD Andersen Cancer Center (n=735, 2.6%), Memorial Sloan Kettering Cancer Center (n=651, 2.3%), University of California System (n=561, 1.9%), Harvard University (n=542, 1.9%). The first ten centers which had most publications were shown in Table 1.

Table 1. The most productive institutes in bladder cancer

| Institute | Record Count | % of 28103 |
|---|---|---|
| University Of Texas System | 1081 | 3.847 |
| UTMD Anderson Cancer Center | 735 | 2.615 |
| Memorial Sloan Kettering Cancer Center | 651 | 2.316 |
| University Of California System | 561 | 1.996 |
| Harvard University | 542 | 1.929 |
| National Institutes Of Health NIH USA | 482 | 1.715 |
| NIH National Cancer Institute NCI | 430 | 1.530 |
| Assistance Publique Hopitaux Paris APHP | 429 | 1.527 |
| University Of London | 410 | 1.459 |
| Johns Hopkins University | 346 | 1.231 |
| VA Boston Healthcare System | 346 | 1.231 |
| University Of Southern California | 340 | 1.210 |
| Radboud University Nijmegen | 333 | 1.185 |
| University Of Toronto | 291 | 1.035 |

The most productive authors are Grossman HB, Shariat SF, Lerner SP (n=290, 285, 237 documents respectively) (Table 2). Most cited three authors are Herr H, Grossman H, Lotan Y (n=9663, 6668, 5283) citations respectively.

Table 2. The most productive 15 authors

| Authors | Records | % of 28103 |
|---|---|---|
| Grossman HB | 290 | 1.032 |
| Shariat SF | 285 | 1.014 |
| Lerner SP | 237 | 0.843 |
| Lotan Y | 233 | 0.829 |
| Herr HW | 222 | 0.790 |
| Witjes JA | 210 | 0.747 |
| Soloway MS | 181 | 0.644 |
| Kamat AM | 175 | 0.623 |
| Hartmann A | 151 | 0.537 |
| Stenzl A | 149 | 0.530 |
| Kassouf W | 148 | 0.527 |
| Fradet Y | 147 | 0.523 |
| Dalbagni G | 136 | 0.484 |
| Kim WJ | 135 | 0.480 |
| Burger M | 134 | 0.477 |

The Journal of Urology is the leading journal with 4483 manuscripts (15.9% of the articles in the field), followed by European Urology (n=867, 3.0%), Urology (n=810, 2.8%), BJU International (n=803, 2.8%), and Journal of Clinical Oncology (n=751, 2.6%).

The most cited article is "Normalization of real-time quantitative reverse transcription-PCR data: A model-based variance estimation approach to identify genes suited for normalization, applied to bladder and colon cancer data sets" published in 2004 by Andersen, Jensen and Orntoft in "Cancer Research". This is also the most-cited study by the number of citations per year with an average of 207.7. The article "MPDL3280A (anti-PD-L1) treatment leads to clinical activity in metastatic bladder cancer" is relatively a new publication with an average citation per year of 201.8 published in 2014 in ''Nature'' (Table 3).

Table 3. The prominent 10 most cited articles in the field

| Article | Author | Publication Year | Total citation | Average citations per year |
|---|---|---|---|---|
| Normalization of real-time quantitative reverse transcription-PCR data: A model-based variance estimation approach to identify genes suited for normalization, applied to bladder and colon cancer data sets | Andersen, CL; Jensen, JL; Orntoft, TF | 2004 | 3116 | 207.73 |
| Radical cystectomy in the treatment of invasive bladder cancer: Long-term results in 1,054 patients | Stein, JP; Lieskovsky, G; Cote, R; et al. | 2001 | 2071 | 115.06 |
| Predicting recurrence and progression in individual patients with stage Ta T1 bladder cancer using EORTC risk tables: A combined analysis of 2596 patients from seven EORTC trials | Sylvester, RJ; van der Meijden, APM; Oosterlinck, W; et al. | 2006 | 1231 | 94.69 |
| Neoadjuvant chemotherapy plus cystectomy compared with cystectomy alone for locally advanced bladder cancer | Grossman, HB; Natale, RB; Tangen, CM; et al. | 2003 | 1159 | 72.44 |
| Gemcitabine and cisplatin versus methotrexate vinblastine, doxorubicin, and cisplatin in advanced or metastatic bladder cancer: Results of a large randomized, multinational, multicenter, phase III study | von der Maase, H; Hansen, SW; Roberts, JT; et al. | 2000 | 1109 | 58.37 |
| The World Health Organization International Society of Urological Pathology consensus classification of urothelial (transitional cell) neoplasms of the urinary bladder | Epstein, JI; Amin, MB; Reuter, VR; Mostofi, FK | 1998 | 1107 | 52.71 |
| MPDL3280A (anti-PD-L1) treatment leads to clinical activity in metastatic bladder cancer | Powles, Thomas; Eder, Joseph Paul; Fine, Gregg D.; et al. | 2014 | 1009 | 201.8 |
| Identification of p53 gene-mutations in bladder cancers and urine samples | Sidransky, D; Voneschenbach, A; Tsaı, YC; et al. | 1991 | 797 | 28.46 |
| Long-term-survival results of a randomized trial comparing gemcitabine plus cisplatin, with methotrexate, vinblastine, doxorubicin, plus cisplatin in patients with bladder cancer | von der Maase, H; Sengelov, L; Roberts, JT; et al. | 2005 | 771 | 55.07 |
| Superficial bladder - cancer - progression and recurrence | Heney, NM; Ahmed, S; Flanagan, MJ; et al. | 1983 | 745 | 20.69 |

Keyword analysis identifies the most popular subjects used in this field. The total number of keywords is 15.450, when

we limited the minimum number of occurrences with 100, meeting the criteria is 50 (Figure 6). Most used five keywords were "bladder cancer (n=5716)", "bladder neoplasms (n=823)", "bladder (n=697)", "prognosis (n=596)", "urinary bladder neoplasms (n=592)". As seen in the infographic network there are 6 clusters related to each other. For example, bladder cancer is mostly used with apoptosis, metastasis, proliferation, p53, invasion, migration and angiogenesis.

## Discussion

The first operations targeting bladder cancer are performed in 16th–17th centuries (13). The beginning of the modern urology starts in 1877 with producing the first cystoscope by Max Nitze. Advances in diagnosis and anaesthesia allowed total cystectomy to be performed, the first was in 1884 by Bardenheur of Cologne. Bladder cancer is a lethal disease, associated with age and environmental toxins; therefore, the incidence rate is rising in regions where industrialization has led to carcinogenic exposure (14). Along with the aging population and the increasing age of surgical patients, the issue of perioperative complications and its costs gains importance (15). Despite the developing technologies, follow-up, and treatment of patients with invasive methods, bladder cancer still continues to be one of the expensive malignancies (16).

There are relatively few articles on bibliometric analysis of urologic disorders; and one in bladder cancer. It is probably due to the need for a sufficient volume of materials to be analysed and for well-established databases. The emergence and widespread distribution of the internet also made data gathering easier (17). Even though; improved general awareness, the increasing popularity of bibliometric studies, the need for classification analysis and citation analysis, the number of reports that bring urologic disorders is rather limited. To best of our knowledge, our study is the second precise international bibliometric evaluation of bladder cancer research between 1975 and November 2018.

Schöffel et all reported the bibliometric study "A critical perspective on the global research activity in the field of bladder cancer" in 2016; investigating academic publications during the period of 1900-2007 (18). Schöffel's study is the first, but printed in German; our study is the second bibliometric study but first in English in bladder cancer. We received the publication numbers since 1975 and have calculated the percentages by this time because there are few publications before 1975. Therewithal, before 1994 overall publication numbers are less than 300 per year as shown in Figure 1. Since 1900s publications about bladder cancer had been increased continuously and reached 1932 records in 2017. Up to November 2018, total records are 1655, less than 2017. Schöffel et all published their article in 2016 and the data are limited to 2007 but the bounce of the papers is after 2009 exceeding over 1172 per year. 88% of the publications about bladder cancer are published in the last 25 years. This is probably due to understanding the seriousness, prevalence of the disease and improvements in diagnostic, molecular, genetic, screening, treatment modalities and interest in this subject. The USA was found to be the most productive country with 28.3% of total literature. There is no country from South America and Africa, except Egypt in the top 25 list. This is probably due to; bladder cancer is the most common malignancy in some parts of Africa where schistosomiasis is a widespread problem.

After a manuscript published, usually reaches to its maximum citation levels after 4-7 years (19,20). We see this citation chart in Figure 2. Although the number of publications is the highest between 2012-2016, global citation numbers are at the highest level between 2005-2012. Probably, after waiting a decade we will see the citation numbers of 2012-2016 more than 2005-2012.

The co-authorship network for the countries in bladder cancer with at least 100 joint publications created 32 countries in 5 clusters (Figure 4). WoS database revealed that most of the prolific country institutions cooperate mainly at the national level and it can be shown in this analysis that international cooperation has risen intensely over the past 25 years. This finding simply shows only the publication relationship between countries, because research is only good if performed internationally.

The citation network with the cut off boundary as 2000 citations, 27 countries were found in four clusters in four different colours (Figure 5). The USA with the biggest point is the most cited country, followed by England, Germany, Japan, Netherlands, Italy, China, and Canada. The USA, Japan and China are in green clusters while England is in red, Germany and Canada are in yellow, Netherlands and Italy are in blue. This means that the first three most cited countries haven't chosen themselves for citation. Most preferred cited countries are in the same colours.

The American institutions lead the superiority of published documents as expected. Assistance publique hôpitaux de Paris (429/28.103 records) and University of London (410/28.103 records) are the French and English institutes at the top 10, while 8 foundations are American (Table 1). This raises the question that whether research/ publication funding of these institutions in the USA are better than in other institutions. The worldwide dominance of the USA is also apparent in the journals. Through thousands of journals "The Journal of Urology" published the majority of manuscripts (n=4483, 15.9%), followed by "European Urology" (n=867, 3.0%).

In contrast to these statistics, the most cited article is from Denmark; printed in "Cancer Research", "Normalization of real-time quantitative reverse transcription-PCR data: A

model-based variance estimation approach to identify genes suited for normalization, applied to bladder and colon cancer data sets" published in 2004 by Andersen, Jensen and Orntoft. This article has cited 3116 times with an average of 207.7 citations per year. Surprisingly this is a very high rate of citation; because of including two topics (bladder and colon cancer) and a molecular study (can be cited for many fields) (Table 3).

There are some limitations to the current study. We used only one internationally established database to search the literature by Web of Science, because it is the most reliable scientific database for publications and citations (21); and one bibliometric tool "VOSviewer" for arranging and setting networks (22,23). Although the literature goes back to 1909s in PubMed, we could reach back to 1975 by searching WoS.

This study will be the beginning of a new field in the scientific literature at the evaluation of bladder cancer. Our bibliometric study; in one of the oldest and expensive malignancies, may encourage researchers to carry out further studies. Advanced evaluation parameters have to be defined for a more confident assessment of scientific work. Physicians in undeveloped and developing countries should be supported to perform studies in bladder cancer.

*Acknowledgements: None*

*Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.*

*Ethical Approval: This study is not a clinical study and doesn't involve any human participation or personal data. Ethical approval is not obligatory for retrospective screening studies.*

*Conflicting interests: The authors report no conflicts of interest.*

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